Eliminating Occupational Disease: Translating Research into Action EPICOH 2017

28–31 August 2017, Edinburgh, UK

Poster Presentation

Pesticides

0007   ASSESSMENT OF PESTICIDE EXPOSURE AND OCCUPATIONAL SAFETY AND HEALTH OF FARMERS IN THE PHILIPPINES

Jinky Leilanie Lu. *National Institutes of Health, Institute of Health Policy and Development Studies, University of the Philippines Manila, Manila, The Philippines*

Aims This is a study conducted among 534 farmers in an agricultural area in the vegetable industry. The target site is Benguet, Philippines which is the largest vegetable producer in the Philippines. This study assessed the pesticide exposure and occupational safety and health benguet farmers, and identified the work risks to the occupational health of the farmers.
Methods Survey questionnaires look into pesticide exposures and work practices of the farmers. Physical and hematologic health assessment tools as well as laboratory examinations for blood were conducted to look into occupational health of farmers.
Results The most commonly used pesticides were Tamaron (36.1%), Dithane,(34.1%), Sumicidine (29.0%), and Selecron (24.9%). Tamaron, being the most commonly used, has an active ingredient of methamidophos and classified as an organophosphate pesticide. About 41% who underwent the physical examination were diagnosed to have abnormal assessment results. Pesticide use and risk factors were found to be associated with easy fatigability, weight loss, loss of appetite, cerebellar function, creatinine levels, haemoglobin, mean corpuscular volume, mean corpuscular haemoglobin count, and platelet count (p=0.05). About 51% of the farmers had abnormal RBC cholinesterase which can be indicative of oganophosphate exposure.
Conclusion There was association between pesticide exposure and work practices with the occupational health of the framers in Benguet. The results of the study underscore the need to improve protection measures so as to reduce the exposure of the population and environment to pesticides.

Oral Presentation

Developing Countries

0008   OCCUPATIONAL EPIDEMIOLOGY OF HEALTH RISKS AND CHEMICAL EXPOSURES AMONG SMALL SCALE MINERS IN THE PHILIPPINES

Jinky Leilanie Lu. *National Institutes of Health with the Institute of Health Policy and Development Studies, University of the Philippines Manila, Manila, The Philippines*

The study investigated occupational hazards in small scale mining in Benguet, Philippines which is one of the largest mining areas in the country. The study studied 40 small scale industries, and collected 40 water samples (potable) for cyanide and mercury which are used in mining. Questionnaire-guided interviews and work analysis covering mining practices and risk exposures were conducted, as well as chemical analysis through gas chromatography. Results of the study showed unsafe conditions in the industries such as risk of fall during erection and dismantling of scaffolds, guard rails were not provided in scaffoldings, manual extraction of underground ores, use of explosives, poor visibility in looking for ores to take out to surface, exposure to noise from explosives, and to dust from the demolished structures. Mine waste was drained into soil or ground and/or rivers and streams. The most common health problems among miners were hypertension (62%), followed by hypertensive cardiovascular disease due to left wall ischemia (14%). Health symptoms such as dermatitis, and peripheral neuropathy were noted and these can be considered as manifestations of chronic cyanide poisoning, further, aggravated by improper use of protective equipment. For the environmental samples of potable water, 88% and 98% were positive with mercury and cyanide respectively. About 52% of drinking water samples exceeded the TLV for mercury while 2% exceeded the TLV for cyanide. There is a need to establish programs on miners' occupational and environmental health and safety, and the community.

Oral Presentation

Working Conditions

0009   ERGONOMIC HAZARDS AND INJURIES AMONG SMALL SCALE MINERS IN THE PHILIPPINES

Jinky Leilanie Lu. *National Institutes of Health with the Institute of Health Policy and Development Studies, University of the Philippines Manila, Manila, The Philippines*

Worldwide, small-scale mining (SSM) provides employment to about 13 million people and affects the livelihood of 80–100 million. This study investigated the ergonomic and safety hazards of 93 small scale miners in one of the largest small scale mining area in the Philippines which is the area of Itogon, Benguet. The methods consisted of survey questionnaires, health physical examination guide, and work process observation tool. The results showed that the small-scale miners worked for an average of 10.7 years, and a maximum work year of 40. The hazards identified were noise exposure from the dynamite blast, temperature extremes, and dust from dynamite blasting. The miners experienced prolonged crouching and bending, prolonged handling of tools, and carrying heavy sacks filled with mineral ores. In the cyanide leaching which uses massive amounts of cyanide, hazards were heat, dust, and chemicals such as cyanide fumes. In the smelting process, hazards were borax and nitric acid fumes, and smoke from burning ore and coal, and burn injuries. A third (31.2%) of miners have experienced accidents. Of this, the most common injury was laceration at 47.8%, followed by methane inhalation, fracture of hand digits, and contusion at 17.4%. The most prevalent health symptom reported by the miners was muscle pain which points to exposure to ergonomic hazards and risks. It is suggested that intervention programs for ergonomics and safety measures be implemented by the local government.

Poster Presentation

Developing Countries

EPIDEMIOLOGY OF ROAD CRASH AND ACCIDENT FATALITIES AMONG BUS AND TRUCK DRIVERS: VULNERABLE OCCUPATIONAL GROUP

Sophia Francesca Lu. *College of Arts and Sciences, University of the Philippines Manila, Manila, The Philippines*

Aim This study looked at occupational road crashes among truck and bus drivers in comparison to other drivers and motorists on the road of Metro Manila which is one of the cities with a high traffic density. One of the most precarious and risky occupations is driving especially buses used for public transportation, and trucks for commercial activities.

Methods The study used meta-analysis of previous studies conducted, grey literature, government statistics, and validation through key database research in concerned national government agencies involved in road traffic from 2010–2015.

Results The study found that the in terms of the number of public utility vehicles registered in Metro Manila (2015), 51.27% were buses and 20.21% were trucks. Majority of the drivers worked more than 12 hours a day. In terms of time and peak of accidents, it is alarming to note that about 35% of the road crashes occurred from 22–23 gmt (2010–2015), and 30% from 23–24 (2010–2015) gmt. Human error accounted for the overwhelming cause of road crashes such as drunk driving, beating the red light, sleepiness, at 99.52% in 2012, 99.47% in 2013, 95.33% in 2014, and 97.19% in 2015.

Conclusion The study has shown how risky driving is as an occupation especially due to the work schedule. The study suggests developing better information, education and communication campaign and policies particularly on pedestrian safety, road safety, road-sharing concepts. Moreover, it is suggested that occupational health and safety among drivers as a special occupational group should be carried out.

Poster Presentation

Respiratory

PULMONARY FUNCTION AND HIGH-RESOLUTION COMPUTED TOMOGRAPHY (HRCT) IN OFFSHORE OIL DRILLERS

Niels Kirkhus*, Øivind Skare, Dag Gunnar Ellingsen, Raymond Olsen, Yngvar Thomassen. *National Institute of Occupational Health, Oslo, Norway*

Purpose 1 to study short-term changes in pulmonary function in drill floor workers exposed to airborne contaminants from drilling fluids offshore compared to a reference group of non-exposed offshore workers; and 2 to detect possible signs of pulmonary disease by HRCT scans in previously exposed workers.

Methods In a follow-up study 51 drill floor workers and 55 referents were examined with measurements of pulmonary function at the heliport before and after 14 days of work.

Additionally 57 drill floor workers exposed to drilling fluids in the 1980's were examined in a cross sectional study with HRCT of the lungs.

Results Mean declines in forced vital capacity (FVC) and forced expiratory volume in 1 s (FEV_1) were 50 mL and 60 mL in the drill floor workers, respectively, and in the referents 60 mL and 70 mL. Average base-line examination time was 10:47 a.m., and re-examination time 14 days later was 15:05. After adjusting for possible diurnal changes in pulmonary function, the exposed workers still experienced a statistically significant decline in FEV_1 while the referents did not. Declines in FEV_1 and FVC among exposed workers were correlated to fewer days of active drilling during the 14 days offshore.

HRCT abnormalities were detected in 54%, but coarse fibrosis with honeycombing was not observed.

Conclusion After correction for diurnal variation in pulmonary function, a statistically significant decline in FEV_1 was observed among the drill floor workers. There were indications of a connexion between pulmonary function decline and exposure factors other than oil mist.

Poster Presentation

Disease Surveillance

HOW DO WE ELIMINATE OCCUPATIONAL DISEASES IN GREAT BRITAIN?

[1]Anne Raynal*, [2]Robbert Hermanns. [1]*University of Cape Town, Cape Town, South Africa;* [2]*University of Glasgow, Glasgow, UK*

In our view there is an inverse care law operating in Great Britain (GB), in that access to occupational health services (OHS), which are adequate to find occupational diseases (ODs) at an early enough stage to prevent progression, is accessible to only the circa 13% of the labour force[1], who are mostly at low risk[2].

This is because:

- There is no access to OHS through the National Health Service[2]
- There is no legal obligation, either on the state or on employers, to provide OD surveillance, except for circa 0.1% of the workforce[2].
- There is no protection for occupational health professionals (OHPs), who are paid directly or indirectly by employers. Employers can change service providers if they receive unwelcomed reports of diseases or hazards[2,3]
- Doctors who diagnose ODs are not required to report them to a compensation scheme or the Labour Regulator in GB[4]
- As the duty to report cases of ODs rests on employers, these are negligibly reported to the Regulator; consequently the causative workplaces are not being identified or rectified[2,5]
- OHPs now spend most of their time on sickness absence/performance management cases, rather than on detecting and preventing cases of OD[2].

The result of the above is that workers in GB are unjustly denied early detection of harm to their health, with prompt compensation and the opportunity to avoid further harmful exposures.

Unless action is taken to address these issues, by accurately ascertaining the distribution and addressing the determinants of ODs, their elimination will not be achieved in GB.

Poster Presentation

Psychosocial

0015   THE SIGNIFICANCE AND APPLICATION OF SALIVARY BIOMARKERS OF STRESS, CORTISOL AWAKENING RESPONSE, IN OCCUPATIONAL PSYCHOLOGY

Wei-Te Wu, Wei-Jin Li, Hui-Yi Liao, Saou-Hsing Liou*. *National Health Research Institutes, Miaoli county, Taiwan*

Objectives This study aims to investigate the correlation between cortisol awakening response (CAR) and sleep quality, mental stress, fatigue, workload and health status in a period of 28 days.

Materials and Methods A total of 28 subjects participated in this study. The saliva was collected by cotton-based Salivette at awakening, 30 min after awakening, and bedtime for a period of 4 weeks. The saliva cortisol was measured by LC-MS-MS. Four parameters were used to present CAR, 30 min post-awakening cortisol, CAR denoting rise from awakening to 30 min post-awakening (slope), AUC for CAR, and full AUC (= AUC for CAR + AUC for late decline). The outcomes variables included sleep quality measured by Pittsburgh sleep quality index (PSQI) questionnaire, and self-rated workload, mental stress, fatigue, and health score for each day.

Results CAR were correlated with fatigue score and stress score, but not with sleep quality (PSQI), workload and health score. Regarding parameters of CAR, AUC for CAR and full AUC are better than CAR slope and 30 min post-awakening to correlate with fatigue and stress. AUC for CAR and full AUC may represent the degree of mental stress and fatigue in the previous day.

Discussion We have found single day CAR and 4 week CAR were correlated with mental stress. But how to design a study to elaborate whether CAR can predict the occurrence of cardiovascular diseases (Karoshi) needs further to be solved. Solution for variation of CAR day-to-day and pick-up the day of most stressful are urgent.

Poster Presentation

Methodology

0016   ASSOCIATION BETWEEN PM 2.5 EXPOSURE AND LIPID PEROXIDATION WAS CONFIRM BY REPEATED MEASUREMENTS LONGITUDINAL STUDY WITH A PROPER INTERACTION TERM

Wei-Te Wu*, Wei-Jin Li, Hui-Yi Liao, Saou-Hsing Liou. *National Health Research Institutes, Miaoli county, Taiwan*

Objective to examine the relations between personal exposure to PM2.5 and inflammatory and oxidation markers.

Methods We conducted a panel study with three sampling time points (baseline, two months follow-up, and four months follow-up) among 68 healthy non-smoking young adults from 3 different areas (Area A [residential and commercial area], Area B [industrial area] and Area C [scientific park]).

Results the average PM2.5 concentrations was 37.3 μg/m^3 for personal sampling and 31.6 μg/m^3 for nearest air quality monitoring station. Among them, the personal PM2.5 concentrations in B zone was significant highest than A and C zone. For the longitudinal study, we used linear Mixed-model was as follows: $Y_{it} = \alpha_0 + \alpha_1 Time_{it} + \beta_0 Z_{km} + \beta_1 Z_{km} Time_{it} + \gamma X_{i0} + \epsilon_{km} + \epsilon_i + \epsilon_{it}$, where Z_{km} used four PM2.5 counting methods: (1) personal PM2.5 concentrations; (2) average personal PM2.5 concentrations at three sampling times; (3) average personal PM2.5 concentrations with area under the curve during 120 days; (4) average personal PM2.5 concentrations during 120 days (>35 μg/m3 vs.≤35μg/m^3). After adjustment for age, gender, smoking habits, sampling zones, height, weight, temperature, and relative humidity, we found that the Urinary N7-MeG/creatinine was significantly decreased with PM2.5 exposure concentrations, and Urinary HEL/creatinine was significantly increased with PM2.5 exposure concentrations by time, regardless of which PM2.5 exposure models were used. While we only used average personal PM2.5 concentrations at three sampling times, we found that SDNN and GPx were significantly increased with PM2.5 exposure concentrations by time.

Poster Presentation

Working Conditions

0018   DO HIGHLY ACTIVE WORKERS DIE EARLY? ELUCIDATING THE PHYSICAL ACTIVITY HEALTH PARADOX IN A SYSTEMATIC REVIEW WITH META-ANALYSES

[1]Pieter Coenen*, [1]Maaike Huysmans, [3]Andreas Holtermann, [4]Niklas Krause, [1]Willem van Mechelen, [2]Leon Straker, [1]Allard van der Beek. [1]*Department of Public and Occupational Health, VU University Medical Centre, Amsterdam Public Health Research Institute, Amsterdam, The Netherlands;* [2]*School of Physiotherapy and Exercise Science, Curtin University, Perth, Australia;* [3]*National Research Centre for the Working Environment, Copenhagen, Denmark;* [4]*Department of Environmental Health Sciences and Department of Epidemiology, School of Public Health, University of California Los Angeles, Los Angeles, USA*

Introduction New evidence suggests a physical activity (PA) health paradox, with positive health outcomes associated with high intensity leisure-time PA (LTPA), but negative health outcomes for those engaging in high intensity occupational PA (OPA). The aim of this study was to examine this paradox by systematically reviewing evidence on the association between high OPA and all-cause mortality.

Methods A systematic search of the literature was performed screening for eligible (peer-reviewed articles on prospective studies. Meta-analyses were performed assessing the association of high (compared to low) intensity OPA and all-cause mortality in males and females, estimating pooled hazard ratios (HR) with 95% confidence intervals (95% CI).

Results 2060 unique articles were screened of which 28 (from 24 studies with 2 88 264 participants) were included. We statistically pooled information from 19 studies, showing that males with high intensity OPA had a higher risk of early mortality than those with light intensity OPA (HR [95% CI]: 1.24 [1.03 1.49]). Such an association was not observed for females (0.88 [0.75 1.03]).

Conclusion These findings support the PA health paradox, with levels of high intensity OPA being associated with ill-health (for males). An explanation for this finding may be the nature of OPA, involving sustained demanding tasks, causing chronically elevated blood pressure and heart rate responses. Males may be more prone than females because of gender differences in OPA, with males more likely to work in higher intensity occupations. Future research (preferably using objectively measured OPA) should further explore these potential mechanisms.

Poster Presentation

Musculoskeletal

0019 THE ASSOCIATION OF ADOLESCENT SPINAL PAIN WITH WORK ABSENTEEISM IN EARLY ADULTHOOD – SIX-YEAR FOLLOW-UP DATA FROM A POPULATION-BASED COHORT

[1,2]Pieter Coenen*, [1]Anne Smith, [1]Peter Kent, [3]Mark Harris, [1]Darren Beales, [1]Peter O'Sullivan, [1]Leon Straker. [1]School of Physiotherapy and Exercise Science, Curtin University, Perth, Australia; [2]Department of Public and Occupational Health, Amsterdam Public Health Research Institute, VU University Medical Centre, Amsterdam, The Netherlands; [3]Curtin Business School, Curtin University, Perth, Australia

Introduction For many, spinal pain first develops during adolescence. However, the extent to which adolescent spinal pain impacts work absenteeism later in life is largely unknown. We assessed the association of spinal pain in adolescence with work absenteeism in early adulthood, using a population-based cohort.

Methods Data from a sample of working people in the Western Australian Pregnancy Cohort (Raine) Study (n=476) were analysed. At 17 years of age, spinal pain (low-back or neck) with impact on work and/or study behaviour was self-reported. Six years later (at 23 years), participants replied to four quarterly text messages asking them about their work absenteeism, from which annual total and sickness absence were estimated. Negative binominal mixed-models were used to estimate the association between spinal pain and work absenteeism (Incidence Rate Ratios (IRR) with 95% confidence intervals (95% CI)).

Results Participants with adolescent spinal pain with impact at year 17 reported significantly higher (mean [SD]) total work absenteeism at year 23 (148.7[243.4] hours/year), compared to those without pain (43.7 [95.2] hours/year); with IRR [95% CI]: 3.9 [1.5 10.3]. Comparable findings were found for sickness absence (IRR: 3.6 [1.3 10.2], with 94.1 [201.5] and 29.3 [75.0] hours/year absence, respectively).

Conclusion Results of our study show a more than three-fold higher risk of work absenteeism in early adulthood among those with adolescent spinal pain with impact compared to those without spinal pain. These findings indicate that pain behaviour during adolescence can set a stage for work absenteeism later in life, underlining the importance of early pain prevention and management.

Poster Presentation

Injuries

0020 ROAD TRAFFIC COLLISIONS RISK IN PROFESSIONAL DRIVERS WITH DIABETES MELLITUS AND RECEIVING TREATMENT- A PROSPECTIVE COHORT STUDY

[1]Wei-Te Wu*, [2]Su-Shan Tsai, [1]Hui-Yi Liao, [1]Wei-Jin Li, [1]Saou-Hsing Liou. [1]National Institute of Environmental Health Sciences, National Health Research Institutes, Miaoli, Taiwan; [2]Graduate Institute of Life Sciences, National Defense Medical Centre, Taipei, Taiwan

Aim A cohort study was used to follow up the outcomes of DM and treatments to assess for the 6 year risk of RTC event.

Methods Taiwan Bus Driver Cohort Study (TBDCS) recruited 1650 professional drivers in Taiwan since 2005. The subjects were interviewed in person, completed the basic and working patterns questionnaires. Moreover, this cohort of drivers was linked to the National Traffic Accident Database (NTAD), and researchers found 152 new RTC events from 2005 to 2010. History of DM and DM treatments were found from National Health Insurance Research Dataset (NHIRD). Cox proportional hazards model were performed to estimate the hazard ratio (HR) for RTC.

Results The RTC drivers had high frequency of DM (13.8% vs. 7.3%; p=0.007), type 2 DM (13.2% vs. 7.0%; p=0.009), and DM treatment (11.2% vs. 5.8%; p=0.014) in comparison to non-RTC drivers. DM and type 2 DM increased the 6 year RTC risks among professional drivers (HR: 2.31, 95% CI: 1.33 to 4.01; p=0.003, and HR: 2.31, 95% CI: 1.31 to 4.06; p=0.004), even after adjusting for education, caffeine drinks used, sleeping pills used, time since first employment, hypertension, and overnight oxygen desaturation index. Moreover, DM treatment with insulin secretagogue (Sulfonylurea and Meglitinde) and insulin sensitizer (Biguanide) had an increased risk for RTC (HR: 2.22, 95% CI: 1.01 to 4.93; p=0.049, and HR: 2.07, 95% CI: 1.06 to 4.05; p=0.033).

Conclusion This study have proposed recommendations to labour or health care professionals for managing professional drivers with diabetes.

Poster Presentation

Occupational Medicine (SCOM/Modernet)

0022 ASSESSING SELF-REPORTED HEALTH EFFECTS BY FORKLIFT OPERATORS

[1]Hülya Gül*, [2]Savas Kanbur. [1]Istanbul Medical Faculty, Public Health Department, Istanbul, Turkey; [2]Gedik University, Istanbul, Turkey

Aim Forklift is a special machine used in transporting, lifting, carrying and storing heavy objects in logistics and in all other

industrial fields. Our aim in this study is to draw attention to the increasing number of health problems of forklift operators, caused by working conditions and by structural features and usage of the forklift machines.

Material and Method 140 forklift operators working in industrialised cities of Marmara region were included in the study. As a control group, 140 workers from the same working fields and with similar demographic features were included. All the participants were male and married. Necessary ethical permission was obtained. The first section described the demographic properties of the workers; the second and third sections contained the information about health problems of applied questionnaire.

Results The significant differences in this study, which was conducted on a questionnaire basis, were the number of preterm deliveries, FGR (fetal growth restriction), interval to conceive, the number of stillbirths, congenital anomalies and newborn malignancies. In addition, the incidence of musculoskeletal system disorders, chronic diseases and the incidence of being under treatment currently were also significantly higher among forklift operators.

Conclusion Related to occupational environment, structural and functional features of the machines used, physical and chemical risk factors, there is an adverse impact on the health of forklift operators the number of whom are increasing every day because of industrialization. The results have achieved shows that the studies evaluating reproductive health and musculoskeletal system of the forklift operators should continue incrementally.

Poster Presentation

Intervention Studies

0023   A PROSPECTIVE COHORT STUDY OF THE IMPACT OF RETURN-TO-WORK COORDINATORS IN GETTING INJURED WORKERS BACK ON THE JOB

[1,2]Tyler Lane*, [3]Rebbecca Lilley, [4,5]Sheilah Hogg-Johnson, [6]Tony LaMontagne, [1]Malcolm Sim, [4]Peter Smith. [1]*School of Public Health and Preventive Medicine, Melbourne, Victoria, Australia*; [2]*Institute for Safety, Compensation and Recovery Research, Monash University, Melbourne, Victoria, Australia*; [3]*Dunedin School of Medicine, University of Otago, Dunedin, New Zealand*; [4]*Institute for Work and Health, Toronto, Ontario, Canada*; [5]*Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada*; [6]*Centre for Population Health Research, Deakin University, Melbourne, Victoria, Australia*

Background Globally, 313 million missed at least four days of work in 2010 due to a work-related injury. Extended periods of work absence are costly and associated with poor health outcomes. Interventions that include return-to-work (RTW) Coordinators improve RTW outcomes, though they have often been investigated as part of a larger intervention package. We investigated whether Coordinator impact varies based on the stressfulness of interactions and whether it goes above and beyond functional aspects of their role and other workplace factors.

Methods A prospective cohort study of 632 workers in Victoria, Australia with more than ten days of compensation due to work-related injury. Participants rated the stressfulness of their Coordinator interactions, dichotomised into good and poor, and said whether they had a RTW plan. RTW plans are a functional responsibility of Coordinators. We analysed responses at baseline and six-month follow-up using logistic regression analyses, adjusting for demographic and workplace factors.

Results At baseline, RTW plans doubled odds of RTW and attenuated the impact of good Coordinator interactions, which had been associated with better RTW outcomes. At follow-up, the reverse was found: good interactions doubled odds of RTW while RTW plans were non-significant.

Conclusions The findings suggest that different aspects of Coordinator intervention have varied impacts on injured workers' RTW outcomes depending on their trajectory. Functional benefits improved outcomes among shorter-duration claims, while interpersonal intervention improved outcomes among longer-duration claims. There are implications for how Coordinators target and interact with injured workers and other ways of improving their effectiveness.

Declaration of potential conflict of interest: I (Tyler Lane) receive salary support from WorkSafe Victoria through a grant for another project, the Compensation and Return to Work Effectiveness (ComPARE) Project. All participants were Work-Safe clients, and WorkSafe conducted initial recruitment.

Oral Presentation

Respiratory

0024   THE OCCUPATIONS AT INCREASED RISK OF COPD IN THE UK BIOBANK COHORT

[1]Sara De Matteis*, [1]Deborah Jarvis, [2]Andrew Darnton, [2]David Fishwick, [1]Lesley Rushton, [1]Paul Cullinan. [1]*Imperial College London, London, UK*; [2]*Health and Safety Executive, Bootle, UK*

Background Occupational hazards are important, preventable causes of COPD but the high-risk occupations are uncertain. In an analysis of current occupation in the UK Biobank cohort we reported 14 jobs of increased risk (De Matteis, S. et al. OEM 2016).

Aims and objectives Our aim was to develop these findings using lifetime job-histories to identify occupations at increased COPD risk, taking into account potential confounders.

Methods We used OSCAR, an online tool that automatically codes full job-histories using the UK Standard Occupational Classification (SOC) v.2000 (De Matteis, S. et al. SJWEH 2016). In 2016 we administered OSCAR to all UK Biobank participants with an email address (n=324,653). All paid jobs of >6 months duration, were collated and coded. COPD was spirometry-defined as $FEV1/FVC < LLN$. Prevalence ratios (PRs) for ever-exposure to each job vs. lifetime office work were estimated using Poisson regression adjusted for age, sex, centre and lifetime smoking.

Results Among 116,375 OSCAR-responders, we analysed the 94 551 with acceptable spirometry data and smoking information. Six occupations showed an increased risk of COPD confirmed by positive exposure-response trends, and in analyses restricted to never-smokers and never-asthmatics. In comparison with our findings for current occupation, some associations were confirmed (e.g. food/drink/tobacco processors: PR 1.70;95% CI:1.17–2.48) while others emerged (e.g. plastics processors: PR 1.86;95% CI:1.09–3.17; agriculture/fishing: PR 1.76;95% CI:1.22–2.55).

Conclusions In order to focus workplace preventive strategies, we are in the process of applying a job-exposure matrix to identify the underlying occupational respiratory hazards.

Oral Presentation
Occupational Medicine (SCOM/Modernet)

0025   **CONDUCTING GLOBAL OCCUPATIONAL EPIDEMIOLOGY RESEARCH IN A CHANGING SOCIO-POLITICAL CLIMATE: CASE STUDY OF RESEARCH AMONG SHANGHAI, CHINA TEXTILE WORKERS**

[1]Harvey Checkoway, [2]David Christiani, [3]David Wegman*. [1]University of California, San Diego, Departments of Family Medicine and Public Health and Neurosciences, San Diego, California, USA; [2]Harvard T.H. Chan School of Public Health, Departments of Environmental Health and Epidemiology, Boston, Massachusetts, USA; [3]University of Massachusetts Lowell, Lowell, Massachusetts, USA

There is a long and continuing legacy of epidemiologists from high income countries conducting occupational health research in low and middle income countries. Opportunities to investigate occupational hazards in relatively high exposure settings and to develop multi-country research partnerships that can lead to disease prevention globally are the main motivations for this type of research. However, it should be appreciated that changes in the cultural, economic, and political environment of the country where the research is conducted can have profound influences on the likelihood of research success. Our research groups have long histories of conducting epidemiologic investigations among textile workers in Shanghai, China. The research includes studies of multiple different cancers and parkinsonism (HC) and respiratory disorders (DCC) in relation to exposures to textile industry dusts and chemicals. Several gene/environment investigations have also been conducted. We present the historical background leading to the research, and the logistical challenges that have emerged over time as political, social, and economic conditions in Shanghai have changed. These challenges include reduced access to workplaces, reduced worker participation rates, and governmentally imposed restrictions on transporting bio-specimens outside of China. Based on our experiences, we can offer some recommendations that occupational epidemiologists in high and low/middle income countries might consider to facilitate collaborative research: being cognizant of national and regional political, social, and economic policy changes; maintaining flexibility in research protocols and budgetary allocations during the course of study conduct; and, keeping lines of communication open throughout the research design and implementation.

Poster Presentation
Dusts and Fibres

0026   **DEVELOPMENT OF A NEW PREPARATION METHOD OF HUMAN LUNG TISSUES FOR ANALYSING ASBESTOS FIBRES BY TEM**

[1]Hyunwook Kim*, [1]Kyung-Hoon Park, [1]Kwang-Myong Jang, [2]Sungwon Choi. [1]The Catholic University of Korea, Seoul, Republic of Korea; [2]Occupational Lung Diseases Institute, Seoul, Republic of Korea

Characterisation and quantification of asbestos fibres in human lung tissues are critical for assessing occupational environmental exposures and epidemiological studies of asbestos related disease. To develop a reliable preparation method of human lung tissues for TEM-EDXA analysis, three conventional preparation methods and a new method were compared. Tissue preparation methods compared were; 5% NaOCl(digestion I), 40% KOH(digestion II), a low temperature plasma(ashing), and the new proposed method of 30% H_2O_2 digestion followed by a low temperature plasma (sequential application of the digestion and ashing). After treatment, aliquot of samples were filtered and filters were carbon coated and jaffe washed for TEM analysis. A total of 90 human tissues were tested for comparison.

Results showed that the digestion I method could not detect asbestos fibres because of using limited amount of aliquot sample for analysis. For the digestion II method, organic materials were not completely removed which obscured the images of the asbestos fibres. For the ashing method, clear background images were obtained but some tremolite asbestos fibres were found to be damaged, either bent or broken. Using the proposed method, asbestos fibres were detected clearly and no fibres were damaged.

In summary, we proposed a new preparation method for treating asbestos fibres in the human lung tissues for TEM analysis. Not only showed it a superior quality for asbestos fibres detection but also no damages on asbestos fibres observed. Therefore, we are confident that it can be utilised for preparing human lung tissues for TEM analysis.

Poster Presentation
Musculoskeletal

0027   **MUSCULOSKELETAL DISORDER SURVEY OF CAREGIVERS IN DISABILITY SERVICES CENTRES**

Chihwei Lu*, EW Yeh. Chung Yuan Christian University, Taoyuan City, Taiwan

In a disability service centre, the caregivers have serviced patients turning over, hanging diaper, taking a shower, feeding on and other activities and if they proceed under unnatural postures and overloading for a long time easily causes themselves musculoskeletal (MSD) injuries. The goal of this study is to recognise and record the potential factors of MDS injuries of caregivers in disability service cemter.

The used methods were conducted mainly by questionnaires (Nordic Musculoskeletal Questionnaire (NMQ)), and ergonomics checklists (Musculoskeletal Disorders checklist (MSDs) and Baseline Risk Identification of Ergonomic Factors checklist (BRIEF) by observation and record to discover the other damages of such operations. Research results showed there existed a significant correlation ($p<0.05$) between the musculoskeletal injuries with the used hand, daily average working hours, and whether rest was taken in working hours.

Poster Presentation

Cardiovascular Disease

0028   JOB STRESS AND GLYCEMIC LEVELS: THE ROLE OF GENDER AND EDUCATIONAL LEVEL IN THE BRAZILIAN LONGITUDINAL STUDY OF ADULT HEALTH (ELSA-BRASIL)

[1]Raíla Santos*, [1]Fabíola Eto, [2]Rosane Griep, [1]Enirtes Melo. [1]National School of Public Health – Fundacao Oswaldo Cruz, Rio de Janeiro – RJ, Brazil; [2]Oswaldo Cruz Institute – Oswaldo Cruz Foundation, Rio de Janeiro – RJ, Brazil

This study intends to evaluate the association between psychosocial stress at work according to the model Demand-Control and changes in glycemic levels, investigating the role of gender and educational level.

The Brazilian Longitudinal Study of Adult Health (ELSA - Brasil) is a multicenter study whose. In this transversal cut, 11.922 active workers were selected at the baseline. Job strain was evaluated through the Brazilian version of the Swedish Demand-Control-Support Questionnaire (DCSQ). Glycemic levels were assessed through glycosylated haemoglobin (HbA1c). We calculated odds ratio (OR) with respective 95% of confidence intervals (CI) and multiplicative interactions for education level. The study was approved by the National Research Ethics Commission.

For men with low education, the low skill discretion is strongly associated with altered glycemia (OR 1.91, 95% CI 1.56–2.25). Equivalent pattern is observed among women of low education (OR 1.51, 95% CI 1.18–1.9). Likewise, low decision authority is associated with altered glycemia among men of low education (OR 1.62, 95% CI 1.29–1.95). Among women of low educational level, there is an association between low decision authority at work and intermediate glycemic levels (OR 1.19, 95% CI 1.01–1.37) and altered (OR 1.65, 95% CI 1.28–2 , 02).

The relationship between job strain and changes in glycemic levels was mediated by education level that stands out as a determining factor for glycemic changes at intermediate (pre-diabetes) and elevated (diabetes) levels, for both men and women.

Poster Presentation

Developing Countries

0029   TREND STUDY OF METABOLIC SYNDROME IN A WORKING POPULATION FROM A DEVELOPING NATION TO CONTROL PREVALENCE OF NON-COMMUNICABLE DISEASES

Rajat Kumar Saha. Hero MotCorp Ltd, Dharuhera, Haryana, India

Introduction Non-communicable diseases play a vital role in the determination of overall health status of an individual. Metabolic syndrome, as per WHO criteria is associated with obesity as a major pre-determinant risk factor and other co-morbidities viz. diabetes mellitus, which increases the risk of coronary artery disease.

Aim/Objective To analyse its trend in a working population w. r.t some important defined variables, to correlate the prevalence over a few years and to justify need for control measures.

Methodology The study was conducted on executives of an automobile manufacturing unit; data was collected through health check reports; analysed by cross sectional study from last 6 years' data. Total data sample strength was 700 approx. 4 sample groups were, thus selected from 2009–10 to 2015–16. Correlation regression and ANOVA were used through SPSS v16. Study was pre-approved ethically and informed consent for the study was received.

Results The prevalence of MS, {p-hat (p)} over the years varied age group wise with p increasing in 2013–14 and 2015–16 data from 0.017 to 0.111 and 0.052 to 0.084 respectively. Correlation between BMI and SBP showed r=0.093 and r2=0.009. Similarly, BMI vs DBP, BMI vs FBS and BMI vs TG- showed positive correlation. Comparison of BMI means through ANOVA revealed statistically significant p value while comparing data set of 2011–12 with 2013–14 and also between 2013–14 and 2015–16.

Conclusion The study justified the need for application of preventive measures in the form of health education, promotion of health awareness and regular health check-ups.

Oral Presentation

Occupational Medicine (SCOM/Modernet)

0030   OPPORTUNITIES FOR RECOVERY AT WORK AND EXCELLENT WORK ABILITY – A CROSS-SECTIONAL POPULATION STUDY AMONG YOUNG WORKERS

[1]Maria Boström*, [2]Judith K Sluiter, [1]Mats Hagberg, [1]Anna Grimby-Ekman. [1]Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; [2]Academic Medical Centre, Coronel Institute of Occupational Health, Amsterdam, The Netherlands

Background The aim was to examine cross-sectional associations between opportunities for recovery at work and excellent work ability among young workers and specifically for young workers with high work demands.

Methods A study group of 1295 women and 1056 men aged 18–29 years was selected from three biennial years of a population cohort. The study group had completed a work environment questionnaire in a survey conducted by Statistics Sweden. Associations between opportunities for recovery at work and excellent work ability were assessed by multiple logistic regression models stratified for gender.

Results Having varied work was associated with excellent work ability in all young men (p<0.0006; prevalence ratio [PR] 1.3) and also specifically in men with high work demands (p=0.019; PR 1.3). For the latter group the possibility of deciding when to perform a work task was also associated with excellent work ability (p=0.049; PR 1.3). Among young women with high work demands, the possibility of deciding one's working hours was associated with excellent work ability (p=0.046; PR 1.2).

Conclusions For young men, having varied work can contribute to excellent work ability. In addition, for men with high work demands, the possibility of deciding when to perform a work task may be favourable for excellent work ability. For young women with high work demands, the possibility of deciding one's working hours can contribute to excellent work ability. Employers could use these opportunities for recovery in promoting work ability among young workers.

Oral Presentation

Occupational Medicine (SCOM/Modernet)

0031   WORK-RELATED PHYSICAL RISK FACTORS FOR SPECIFIC SHOULDER DISORDERS: SYSTEMATIC REVIEW AND META-ANALYSIS

[1]Henk van der Molen*, [2]Chiara Foresti, [1]Joost Daams, [1]Monique Frings-Dresen, [1]Paul Kuijer. [1]*Coronel Institute of Occupational Health, Netherlands Centre for Occupational Diseases, Academic Medical Centre, Amsterdam, The Netherlands;* [2]*School of Occupational Medicine, Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy*

Objective To examine the association between work-related physical risk factors and clinically assessed specific soft tissue shoulder disorders like supraspinatus tendinitis and impingement.

Methods Medline and Embase were searched from 2009 until 24 march 2016 and references were added of a systematic review on this topic describing studies published before 2009. Case-control and cohort studies were included if the soft tissue shoulder disorder was clinically assessed. Meta-analyses and GRADE were performed to assess the evidence and quality for the studies on work-related risk factors.

Results In total seven longitudinal studies including 16 710 patients with specific soft tissue shoulder disorders from a population of 2,427,535 workers from Denmark, Finland, France, Germany and Poland were included in the meta-analysis. Moderate to high evidence was found for associations between arm-hand elevation (OR=2.10, 95% CI 2.01–2.20), arm repetition (OR=1.69, 95% CI 1.03–2.78), hand force exertion (OR=1.57, 95% CI 1.27–1.93), shoulder load (OR=2.01, 95% CI 1.90–2.12) and low evidence for hand-arm vibrations (OR=1.34, 95% CI 1.01–1.77).

Conclusions Arm-hand elevation, arm repetition, hand force exertion and/or hand-arm vibration during work, increase the incidence of specific soft tissue shoulder disorders.

Oral Presentation

Ageing Workforce

0032   PHYSICAL CAPACITY IN MIDLIFE AND LABOUR MARKET ATTACHMENT AMONG OLDER WORKERS: PROSPECTIVE COHORT STUDY WITH REGISTER FOLLOW-UP

[1]Emil Sundstrup*, [1,2]Åse Marie Hansen, [2,4]Erik Lykke Mortensen, [1]Otto Poulsen, [1]Thomas Clausen, [1,2]Reiner Rugulies, [3]Anne Møller, [1]Lars Andersen. [1]*National Research Centre for the Working Environment, Copenhagen, Denmark;* [2]*Department of Public Health, University of Copenhagen, Copenhagen, Denmark;* [3]*Department of Psychology, University of Copenhagen, Copenhagen, Denmark;* [4]*Center for Healthy Ageing, University of Copenhagen, Copenhagen, Denmark*

Introduction We aim to determine the prospective association of different physical capacity tests with health related labour market outcomes among older workers.

Methods The prospective risk of register-based long-term sickness absence (LTSA) and disability pension from measured musculoskeletal capacity (jump performance, postural balance, sit-to-stand, explosive muscle strength, and maximal strength of the hand, back and abdominal muscles) and cardiovascular capacity (lung function and aerobic fitness) were estimated among 5076 older workers from the Copenhagen Ageing and Midlife Biobank. Time-to-event analyses were censored for competing events and adjusted for age, gender, physical and psychosocial work environment, lifestyle, socioeconomic position and previous LTSA.

Results Low physical capacity in many of the tests (less than 1SD below mean) predicted risk of LTSA and disability pension. Specifically, low aerobic fitness (HR 5.9), low jump performance (HR 2.7) and low abdominal muscle strength (HR 3.3) predicted risk of disability pension. A dose-response association was observed between number of musculoskeletal capacity tests with low performance and disability pension and LTSA - with the risk-estimate for disability pension being 7.6 when low capacity was present in ≥5 musculoskeletal capacity tests. Population attributable risks for disability pension and LTSA from poor musculoskeletal capacity were 33% and 8%, respectively.

Conclusions Poor musculoskeletal and cardiovascular capacity in midlife increased the risk for LTSA and disability pension. Promoting physical capability to a normal level among older workers with low capacity may have the opportunity to prevent premature exit from the labour market.

Poster Presentation
Migrant Workers

Rima Habib. *American University of Beirut, Beirut, Lebanon*

Background Since the outbreak of the war in Syria in 2011, over 1 million Syrians have sought refuge in Lebanon, more than half of whom are children below 18 years of age. Recent reports have highlighted the increasing numbers of Syrian children working in Lebanese agricultural settings.

Methods This research will utilise cluster random sampling to enrol into a survey 500 households living in informal tented settlements near the agricultural areas of the Beqaa Valley, Lebanon. A questionnaire was designed to capture information on the living and working conditions of child labourers living in these communities. The surveys will collect data on household socioeconomic and demographic information, migration history, and service usage. Data will also be collected on child labourers demographics, work history and experience, education, health status, and life experiences. The quantitative data from the survey will be entered into a descriptive analysis aimed at identifying trends in the population data. The findings will be categorised by age, gender, location, and other salient variables.

Results This report will highlight the working conditions that predominate Lebanon's migrant child labour force, while exploring the familial and household context that affect these children's experiences as migrants, workers, and children.

Discussion The analysis will highlight how migration push factors such as war and the conditions of extreme familial poverty may necessitate child labour. This research will provide contextualised understandings of refugee children's participation in the agricultural labour force and support targeted interventions aimed at increasing education and childhood opportunities for these young people.

Poster Presentation
Pesticides

[1]Zineb Nabih, [2]Maria Windy, [2]Naima Rhalem, [1]Soumaia Hmimou, [1]Abdelmajid Soulaymani, [1]Abdelrhani Mokhtari, [2,3]Rachida Soulaymani-Bencheikh, [1]Hinde Hami*. *[1]Laboratory of Genetics and Biometry, Faculty of Science, Ibn Tofail University, Kenitra, Morocco; [2]Moroccan Poison Control Centre, Rabat, Morocco; [3]Faculty of Medicine and Pharmacy, Mohammed V University, Rabat, Morocco*

Introduction Pesticide poisoning has become a major public health problem worldwide, following the intensification of agriculture. The easy availability of highly toxic pesticides in the homes of farming communities has made pesticides the preferred means of suicide with an extremely high fatality rate. Similarly, the extensive use of pesticides exposes the community to both long-term and acute occupational health problems. The aim of this study is to describe the epidemiological characteristics of acute occupational pesticide poisoning in Morocco.

Methods This is a descriptive retrospective study of occupational poisoning cases, notified between 2007 and 2012 in the Moroccan Poison Control Centre.

Results There were 151 cases of acute occupational pesticide poisoning (35.7% of women and 64.3% of men), which was 43.7% of all occupational poisoning cases notified during the period of study. These products were responsible for poisoning of varying severity, depending on the types of pesticides, the route of exposure, and the duration and frequency of exposure. The average age of victims was 27.9 ± 0.9 years. More than half of reported cases resulted from inhalation (53%), 36.2% from oral exposure and only 9.4% from dermal exposure. The risk was mainly related to the use of insecticides (50%). Among the 136 cases for whom the evolution is known, a 26-year-old man died. For other cases, the outcome was favourable with or without sequelae.

Conclusions Preventive measures should be taken to rationalise pesticide use, which pose a real public health problem, not only for users, but also for the general population.

Poster Presentation
Disease Surveillance

[1,3]Theerasit Chernbamrung*, [2]Wittaya Pichetvirachai, [1]Sirinthip Chanduaywit, [1]Wantanee Hwanraruen, [1]Wanida Inchit. *[1]Occupational Medicine Department, Rayong Provincial Hospital, Rayong, Thailand; [2]The Office of Disease Prevention and Control 2, Phitsanulok, Thailand; [3]Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand*

Introduction For Surveillance of Noise-induced hearing Loss (NIHL), Thai Workers in Hearing Conservative Programs (HCPs) must have hearing test (audiograms) annually. Occupational Medicine Physicians (OMPs) use Notch Criteria for early diagnosis of NIHL. Naturally, notch would be deeper and wider after additional exposure to loud noise. The purpose of this study was to describe nature of Notch and Notch Area in target population.

Method In 2015, a descriptive cross-sectional study was performed by collecting audiograms from 1122 employees at chemical industries in Rayong province, Thailand. The investigators used criteria concluded from previous study to identify Notch at 3,000 4,000 6,000 Hertz, V-shape Notch, U-shape Notch and calculate Notch Area.

Results The most common Notch was 6,000 Hertz 4,000 Hertz and 3,000 Hertz respectively. V-shape notch is more common than U-shape Notch. The means of notch area (square unit) in right ear and left ear were 17.7 and 21 accordingly. For workers with bilateral notch, mean difference of notch area between right and left ear was 19.4.

Discussion and Conclusion Occupational Medicine Physician may use Notch Area to make diagnosis of ONIHL. Notch Area was useful for identifying symmetrical hearing loss. Longitudinal study should be conducted to show how Notch Area

may change gradually which would be useful for identifying gradual onset of hearing loss. Another descriptive study of Notch and Notch Area should be conducted in population with diagnosed Occupational NIHL and other work-related hearing loss. 6,000 Hertz Notch and V-shape notch were common

Poster Presentation

Other

| 0038 | AN EPIDEMIOLOGICAL CROSS-SECTIONAL COMPARATIVE STUDY OF MORBIDITY PROFILE IN AN AUTOMOBILE MANUFACTURING UNIT |

Rajat Kumar Saha. *Hero MotCorp Ltd, Dharuhera Haryana, India*

Introduction Occupational aetiology as a determinant of morbidity risk factor is often correlated but difficult to signify.
Aim To study the socioeconomic, demographic and occupational profile of 2 groups- workers + junior management vs senior management, to identify and assess the morbidity factors influencing them, to make comparison of the factors between the two groups and deduce inference and to suggest recommendations for controlling them.
Method A cross-sectional simple random sampling study was done over a period of 12 months in 2013–14. The sample sizes were 923 and 229 respectively. Study inclusion criteria- All permanent workers working more than 2 years. Group 1- Upto Manager grade and group 2- senior manager and above. Study process- Informed consent, structured interview, clinical check-up with documentation and data analysis.
Results Average age was 40.05 ± 9.54 years and 46.9 ± 6.22 years respectively, literacy more than secondary level 30%–100%, experience 15.3 ± 3.1 and 6.7 ± 2.4 years, work was hazardous and sedentary in group 1 while sedentary and supervisory in group 2, addiction $21\% \pm 5\%$ and $9\% \pm 2.74\%$, obesity $49\% \pm 9.4\%$ and $65\% \pm 6.29\%$, hypertension $20\% \pm 5.5\%$ and $23\% \pm 10.25\%$, diabetes mellitus $4\% \pm 2.2\%$ and $8\% \pm 4.5\%$, high stress levels $5\% \pm 2.3\%$ and $24\% \pm 7.9\%$, dyslipidaemia $4\% \pm 2.4\%$ and $22\% \pm 6.97\%$, sedentary lifestyle $6\% \pm 2.3\%$ and $21\% \pm 5.3\%$, musculoskeletal disorders $55\% \pm 9.8\%$ and $10\% \pm 5.3\%$, allergic/inflammatory manifestations $14\% \pm 5.1\%$ and $4\% \pm 2.7\%$, eye complaints $32\% \pm 9.4\%$ and $29\% \pm 3.6\%$, respiratory symptoms $21\% \pm 6\%$ and $4\% \pm 2.5\%$ respectively.
Conclusions Morbidities related to allergic, inflammatory or infective aetiology were more significant in the first group but those related to psychosocial hazards and lifestyle disorders were predominant in 2nd group.

Poster Presentation

Other

| 0039 | A STUDY ON KAP (KNOWLEDGE, ATTITUDE, PRACTICE) OF DIABETES MELLITUS IN AN OCCUPATIONAL HEALTH BACKGROUND |

Rajat Kumar Saha. *Hero MotCorp Ltd, Dharuhera Haryana, India*

Introduction Diabetes Mellitus, a known risk factor for CAD was chosen for study in a selected population in Occupational Health background.
Aim KAP study to assess the need for intervention studies in lifestyle management, to conduct training for increasing awareness and to assess the final intervention impact through statistical tool.
Methods Workplace based cross-sectional study conducted over a month by the use of questionnaire for pre and post training assessment of KAP towards DM control.
Results 56 employees were selected for study, with age 50.7 ± 5.4 years, 15% were graduates, 46 were known diabetics, 3 non-diabetic and 7 failed to comply with survey. Of the diabetics, 43.47% had a positive family history, 23.9% had stress at work, 15.21% had diabetic complications, 54.34% were addicted. 30.4% had started early treatment, 43.47% had started late while 26.08% were not taking treatment. 79.4% were on regular treatment, while 20.6% were irregular. 26% were getting blood sugar monitored at home regularly, 76% were following exercise program, 93.5% had changed their eating habits but only 28.3% were using personalised diet charts. 65.2% were overweight during diagnosis and 34.8% did weight reduction after following lifestyle modification. Training was conducted to increase awareness about DM control and change their attitude and practice. Post training survey showed a significant improvement in KAP (p=0.001).
Discussion Although the employees had significant knowledge about control of DM, evidenced by high pre-training value and a mild increase post training, there was marked positive change in their attitude and practice.

Oral Presentation

Psychosocial

| 0041 | WORK-RELATED ILL-HEALTH IN DOCTORS WORKING IN GREAT BRITAIN: INCIDENCE RATES AND TRENDS |

Anli Yue Zhou, Melanie Carder, Matthew Gittins, Raymond Agius*. *The University of Manchester, Manchester, UK*

Background Higher mental ill-health (MIH) prevalence rates have been reported in doctors compared to other professionals. Previous studies have investigated MIH prevalence in doctors, but trends in their incidence rates (IR) of work-related mental ill-health (WRMIH) have not yet been reported.

Objectives This study measured IR and IR trends of work-related ill-health (WRIH) and WRMIH in doctors in comparison to nurses, paramedics, social workers and teachers as reported by occupational physicians to the Occupational Physician Reporting Activity (OPRA) Network.

Methods OPRA reported WRIH and WRMIH incidence data was collected prospectively from 2001–2014. OPRA reporting denominators were surveyed during two triennial periods (2005–07; 2008–10) and corrections undertaken to improve IR accuracy. IR trends were investigated using 'multilevel' regression.

Results Between 2005–2010, 1097 WRIH cases were reported in doctors, of which 905 (82.5%) were WRMIH. Annual average WRIH and WRMIH IR in doctors were 515 and 431 per 1 00 000 employed, respectively, with little variation between the two triennia. Compared to doctors, higher IR for WRIH and WRMIH were observed in nurses and paramedics.

From 2001–2014, doctors demonstrated an annual average IR increase for WRIH (6.1% [95%CI 2.2%, 10.1%]), whereas teachers and nurses demonstrated decreasing trends (−4.3% [95%CI −5.3%, −1.0%] and −3.2% [95%CI −5.3%,−1.0%]). Doctors also demonstrated an annual average IR increase for WRMIH (6.5% [95%CI 2.2%, 11%]), whereas teachers showed a decreasing trend (−3.9% [95%CI −6.5%,−1.2%]).

Conclusions Nurses and paramedics demonstrated higher IR than doctors but trends analyses suggested that IR is increasing for both WRIH and WRMIH only in doctors.

Poster Presentation

Injuries

0044 INJURIES IN CONSTRUCTION SITES: A COMMUNITY-BASED SURVEY IN BANGLADESH

Mohammed Abul Kalam. *Siam Health Care, Dhaka, Bangladesh*

Background Construction sector is well recognised as higher risk industry where injury rates are much higher comparison to other industry; and accidents at construction site are major Public Health problem throughout the world as well as in Bangladesh.

Methods This was a cross-sectional study. The study was carried out during 2015 (January to December) in Dhaka Metropolitan City. Anyone who was injured in construction site and received treatment or could not perform normal activities for at least 3 days was included as a case of machine injury. Close-ended questionnaires were used to collect data/information. Mothers were preferred as respondents.

Results A total of 337 non-fatal unintentional machine injury cases were found in this study. Among the cases, 87.4% (n=295) were male and 12.6% (n=42) were female. The incidence of machine related injury was 41.14 in year in 1 00 000 populations. The highest incidence was found in the age group 15 to 19 years. Service provider 25.5% (n=86) and daily labour 23% (n=77) are the main victims. Most of the victims are poor 83.2% (n=281) and monthly income was below 100 US \$. The highest number of injury was found in industrial setting 39.3% (n=132) and 86.3% (n=291) were victim in the day time.

Conclusion Machine injury is a significant cause of morbidity and disability in Bangladesh. The magnitude and consequences of this problem make machine injury an urgent public health problem. A national strategy and program is needed to be taken to prevent machine injury in Bangladesh.

Poster Presentation

Methodology

0045 REPORTING BIAS IN OBSERVATIONAL EPIDEMIOLOGIC RESEARCH ON PHTHALATES

Gerard Swaen*, Miriam Urlings, Maurice Zeegers. *Maastricht University, Maastricht, The Netherlands*

Withdrawn at the author's request

Oral Presentation
Risk Assessment

0046   **MORTALITY STUDY OF A COHORT OF CHEMICAL WORKERS PRODUCING PERFLUORINATED DERIVATIVES AND OTHER CHEMICALS**

[1,2]Paolo Girardi*, [3]Enzo Merler. [1]*Venetian Mesothelioma Registry, Occupational Health Unit, Padua, Italy*; [2]*SER Epidemiological Department, Veneto Region, Venice, Italy*; [3]*Promotion and Development of Hygiene and Public Health, Veneto Region, Venice, Italy*

Since 1968 a single factory (Veneto Region, Italy) has been the largest manufacturer of perfluorinated derivates (PF) in UE. Intermediates for pharmaceutical and crop protection chemicals have been also produced. In total 609 subjects have been employed since production began. PF are manufactured by electrochemical fluorination. Higher homologues are no longer produced since 2012. Nowadays, a groundwater pollution of PF is involving the water supplies for a population of about 1 10 000 inhabitants.

As a first step for an evaluation of long-term health effects, we conducted a retrospective cohort mortality study on male employees, hired before year 2004, at work for at least one year, followed up until June 2016 (415 subjects), using the regional mortality rates as a reference.

High serum levels of perfluorooctanoic acid (PFOA) have been detected since year 2000 covering 121 workers (median PFOA concentration, 1817 ng/g; range, 166 ng/g for nonexposed workers to 5101 ng/g for directly exposed workers).

The cohort as a whole (12,449 PYs, 79 deaths) expresses an unexpected over-mortality (SMR: 1.07; 95% CI: 0.86–1.34), mainly due to liver cirrhosis and liver tumours. The subset of employees with a certain exposure to PFOA (plant operator, maintenance and laboratory workers) (2,351 PYs, 22 deaths) shows an higher overall mortality (SMR=1.48 95% CI 0.98–2.33) and a statistically significant excess of deaths from diseases of the circulatory system (infarct; SMR: 7.21; 95% CI: 1.80–28.85) and diabetes (SMR: 6.75; 95% CI: 1.69–26.99).

The study suffers from the limited size, and mortality is not an appropriate end-point for some diseases of interest.

Oral Presentation
Ageing Workforce

0047   **POOR HEALTH, LIFESTYLE, WORK-RELATED FACTORS AND PREMATURE LOSS OF EMPLOYMENT IN OLDER WORKERS – RESULTS FROM THE HEALTH AND EMPLOYMENT AFTER FIFTY (HEAF) STUDY**

Stefania D'Angelo*, Holly Syddall, Georgia Ntani, E Clare Harris, Cathy Linaker, Martin Stevens, Karen Walker-Bone, Keith T Palmer. *MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK, Southampton, UK*

Background Populations of Western countries are ageing; in response to this, governments encourage longer working lives. However, many workers leave paid employment prematurely.

We have examined the combined importance of poor health, lifestyle and work-related characteristics as risk factors for health-related job loss among older workers.

Methods 8134 men and women aged 50–64 were recruited from 24 English general practices to the HEAF study. Participants provided information on their socio-demographic, lifestyle, health (self-rated health, depression, chronic disabling musculoskeletal pain, severe difficulties in daily activities), and employment characteristics. Those in paid employment at baseline were categorised at 1 year follow-up as: 'still in work and didn't change job on health grounds' (n=4,232) versus 'not in work due to health reasons (n=101)'. The remaining participants were excluded from this analysis.

Multivariate Poisson regression with robust standard errors was used to analyse the data.

Results All ill-health measures were strongly associated with health-related exit from the workplace (RR for poor self-rated health=4.5, (95%CI 3.1, 6.6)). Adjustment for smoking, leisure-time physical activity (LTPA) and job dissatisfaction attenuated these associations (RR for poor self-rated health=3.1, (95%CI 2.0, 4.8)). Smoking, lack of LTPA, and job dissatisfaction (RR=5.4; (95% CI 3.4, 8.5)) were associated with health-related job loss independently of health variables.

Conclusions Poor self-rated health, depression, chronic disabling musculoskeletal pain and severe problems with daily activities significantly increased the risk of leaving employment on health grounds. Tackling unhealthy behaviours and improving job satisfaction could reduce the risk of exiting the workforce for older workers with poor health.

Poster Presentation
Developing Countries

0048   **THE TWO-DECADE CONTRIBUTION OF OCCUPATIONAL MEDICINE TRAINING IN THAILAND — EXPERIENCE FROM THE FOUNDATION TOWARD THE FUTURE**

[1]Jate Ratanachina*, [2]Pornchai Sithisarankul. [1]*Department of Preventive and Social Medicine, King Chulalongkorn Memorial Hospital, The Thai Red Cross Society, Bangkok, Thailand*; [2]*Department of Preventive and Social Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand*

For two decades, the Department of Preventive and Social Medicine, Faculty of Medicine, Chulalongkorn University has firstly served the Occupational Medicine Residency training program in Thailand. Occupational physicians have dedicated their potentials to occupational medicine works in terms of health promotion in the workplaces, prevention, and occupational medical services towards Thai working population.

At present, there are 159 Thai board-certified occupational physicians. Thai occupational physicians are presently working nationwide in both public and private healthcare practice. A number of certified occupational physicians have currently occupied various top national health leading positions. Furthermore, the occupational medicine knowledge is currently essential for Thai undergraduate medical students mentioned in the Thai Medical Council's Medical Competency Assessment Criteria.

Being awarded the postgraduate diploma of occupational medicine in Thailand can be divided into 2 categories: by

attending three-year residency training or by five-year working experience in the field of occupational medicine including an elective two-month short course. Occupational medicine is a prevailingly attractive specialty-training program among Thai physicians.

As a country which occupational medicine training program is in its childhood period, lessons learned from prior occupational medicine developed countries, updating contents and employers' demand is the key to success. In Thailand, occupational physician supply is still less than the increasing demand. Additionally, the study among the majority of Thai working populations in the informal sector, particularly in agriculture, and the advancement of current health research schemes would strengthen the training. These are future challenges influencing the progression of occupational medicine training in Thailand.

Oral Presentation
Specific Occupations

0049   A COHORT STUDY OF JOB STRESS AND FATIGUE ON HEALTH PSYCHOLOGY AMONG PROFESSIONAL DRIVERS

[1]Yu Jen Lin*, [2]Wei Te Wu, [2]Saou Hsing Liou, [1,2]Yue Liang Guo. [1]National Taiwan University, Taipei, Taiwan; [2]National Health Research Institutes, Miaoli, Taiwan

Background Long-term effects of work-related factors on risk of psychiatric disorders among professional drivers have not been conclusive. A follow-up study was conducted to evaluate the individual and combined effects of stress and fatigue on drivers' risk of developing psychiatric disorders.

Methods The Taiwan Bus Driver Cohort Study (TBDCS) recruited 1650 professional drivers from a large bus company in 2005. The subjects were interviewed in person and completed two scales of job stress- the Demand-Control-Support model (DC) and Effort-Reward Imbalance model (ERI), and one job fatigue model- Swedish Occupational Fatigue Inventory (SOFI). Psychiatric diseases were the outcomes of this study, including substance abuse, anxiety, mood, and sleep disorders. Cox proportional hazards model was used to estimate the hazard ratio (HR) for psychiatric disorders.

Results Between 2006 and 2012, 108 bus drivers were diagnosed as having psychiatric disorders. Neither DC nor ERI score was associated with psychiatric disorders risk. Drivers with high SOFI (>3.5) had an elevated risk for psychiatric disorders, adjusting for age, BMI, marriage status, education, drinking, smoking, exercise, sleeping pills, bus driving experience and shift work (HR: 2.02, 95% CI: 1.37 to 2.99; p=0.025). Among psychiatric disorders, those having anxiety or mood disorders were related to high SOFI in 2005.

Conclusion Among professional drivers, occupational fatigue as indicated by high SOFI might have predicted higher risk of psychiatric disorders, especially anxiety or mood disorders.

Oral Presentation
Other

0050   WORKING TOWARDS ASSESSING OCCUPATIONAL CARCINOGENIC EXPOSURES IN AN AFRICAN LOWER AND MIDDLE INCOME COUNTRY

[1,3]Caradee Wright*, [2]Johan du Plessis, [1]Renee Street, [3]Patricia Forbes, [4]Hanna-Andrea Rother, [1]Thandi Kapwata, [5]Manisha Pahwa, [5]Paul Demers, [6,7]Cheryl Peters. [1]South African Medical Research Council, Pretoria, Gauteng, South Africa; [2]North-West University, Potchefstroom, North-West, South Africa; [3]University of Pretoria, Pretoria, Gauteng, South Africa; [4]University of Cape Town, Cape Town, Western Cape, South Africa; [5]Cancer Care Ontario, Toronto, Ontario, Canada; [6]Carleton University, Ottawa, Ontario, Canada; [7]CAREX Canada, Simon Fraser University, British Columbia, Canada

Aim We aim to use the Canadian CAREX (CARcinogen EXposure) tool, adapted for local context, as a method to assess prevalence and level of exposure to priority occupational carcinogens in South Africa.

Methods The work entails first understanding the CAREX tool, and adapting it as well as reviewing its use in other countries (phase 1). Once the tool and database are prepared, we will gather publicly available data (i.e. Census data, information on chemical use, trade data, published and grey literature, expert consultation, etc.) on occupational exposure to carcinogens as well as exposure monitoring data (phase 2). We will consider all occupational health and safety legislation and its regulations regarding occupational exposure limits, and those carcinogens prioritised locally and internationally, for example by the International Agency for Research on Cancer. All data will be used to estimate the number of South African workers occupationally exposed to carcinogens (and where possible, their level of exposure) (phase 3). Ultimately, this will help guide the development of appropriate health promotion and worker protection programmes, among other resources aimed at cancer prevention (phase 4).

Results Here we will present the experience of the team during phase 1 of the project, including challenges and opportunities encountered.

Expected outcomes Key future outcomes include prevalence of exposure to occupational environmental carcinogens in the South African workplace; also proportions of the workforce in various occupational groups exposed to specific carcinogens; key occupational groups in need of protection; data and information that can be used to guide prevention programs.

Poster Presentation
Exposure Assessment

0051   ESTIMATING WORKER EXPOSURE TO SOLAR UV RADIATION IN SOUTH AFRICA BY POSSIBLE EXTENT AND OCCUPATIONAL GROUP

[1,2]Caradee Wright*, [3,4]Cheryl Peters. [1]South African Medical Research Council, Pretoria, Gauteng, South Africa; [2]University of Pretoria, Pretoria, Gauteng, South Africa; [3]Carleton University, Ontario, Canada; [4]Simon Fraser University, British Columbia, Canada

Skin cancer has been deemed one of the large, unmet challenges to modern medicine given that it's the most frequently occurring and fastest growing malignant disease in terms of incidence and prevalence. Occupational solar ultraviolet radiation (UVR) exposure is a skin cancer risk factor. Outdoor workers have long exposure hours and need photoprotection against solar UVR, an IARC group 1-defined human carcinogen. In South Africa, skin cancers account for one third of all histologically-diagnosed cancers. Physiological presentation of non-melanoma skin cancers (NMSC) is most common on the head in all population groups. It is expected that occupational exposure plays a role in NMSC aetiology in South Africa, although such data are presently lacking. We aimed to estimate the number of outdoor workers potentially exposed to solar UVR in South Africa. Building on CAREX Canada methods, we used a combination of 2011 Statistics South Africa data and Canadian job prevalence assumptions. Of 51 770 560 South Africans in 2011, the working population was ~13 204 496. Estimated total working population exposed to solar UVR was 1 156 000 (8.7% of the working population). Riskiest job categories were subsistence agricultural and fishery workers and related labourers, and extraction and building trades workers and labourers in mining, construction, manufacturing and transport. Results suggest that solar UVR exposure among outdoors in South Africa may be high. More research is required to identify high-risk groups that may differ in the South African context, perform better risk assessment and inform skin cancer prevention awareness campaigns.

Poster Presentation

Neurological Effects

0052   **ODOUR AS A DETERMINANT OF PERSISTENT PHYSICAL AND PSYCHOLOGICAL HEALTH COMPLAINTS AFTER AN OIL TANK EXPLOSION, A LONGITUDINAL STUDY**

[1,2]Gro Tjalvin*, [2]Nils Magerøy, [1]Magne Bråtveit, [2]Stein Håkon Låstad Lygre, [2]Bjørg Eli Hollund, [3]Bente Elisabeth Moen. [1]*Department of Global Public Health and Primary Care, Faculty of Medicine and Dentistry, University of Bergen, Bergen, Norway;* [2]*Department of Occupational Medicine, Haukeland University Hospital, Bergen, Norway;* [3]*Centre for International Health, Faculty of Medicine and Dentistry, Bergen, Norway*

Background Foul-smelling environmental pollution was a major concern following a chemical workplace explosion. Malodorous pollution has previously been associated with aggravated physical and psychological health. Furthermore, in persons affected by a trauma, an incidence-related odour can act as a traumatic reminder. Olfaction may even be of significance in the development and persistence of post-traumatic stress symptoms (PTSS).
Aims To assess whether perceived smell related to malodorous environmental pollution in the aftermath of the explosion was a determinant of subjective health complaints (SHC) and PTSS among gainfully employed adults before and after clean-up of the malodorous pollution.

Methods Questionnaire data from validated instruments, the Subjective Health Complaints Inventory and the Impact of Event Scale-Revised, were analysed using mixed effects models in a longitudinal study design comprising three surveys. Individual odour scores were computed, and the participants (n=486) were divided into high (n=233) and low (n=253) odour score groups.
Results Participants in the high odour score group reported more SHC and PTSS than those in the low odour score group, before and also after the pollution was eliminated. The difference between the groups lasted for at least three years after the pollution was eliminated.
Conclusion Perception of malodorous environmental air pollution was a determinant of both SHC and PTSS. Prompt clean-up might be important to avoid persistent health effects after malodorous chemical spills.

Poster Presentation

Musculoskeletal

0053   **EVALUATION OF THE OUTCOME OF THE APPLIED ERGONOMICS TRAININGS IN A CEMENT FACTORY**

[1]Ferdi Tanir*, [1]Rengin Guzel, [2]Ramazan Azim Okyay. [1]*Cukurova University Faculty of Medicine, Adana, Turkey;* [2]*Sutcu Imam University Faculty of Medicine, K.Maras, Turkey*

This study sought to present the outcomes of the applied trainings delivered in a cement factory on the ergonomic risks of a cement factory.

Applied ergonomics trainings were given to 246 employees in a cement factory located in Adana province between May and October 2015. The subject matters of the training were as follows: ergonomic risks at workplaces, occupational diseases, work-related diseases, occupational accidents and protection, reasons for pains on neck, arm and waist and measures for protection against these pains, office ergonomics and ergonomic use of computers and exercises for protection. A test was applied before and after the training of each group.

408 employees, including 311 blue collars and 97 white collars, work in the factory. It was determined that the least known question (15.9%) prior to the training was that smoking causes chronic waist pain. It was found that the subject matter on which employee's knowledge was least improved by the training was the knowledge that the most frequently encountered occupation accident in the cement sector is not explosion 40.7%. Trainings were repeated on five subject matters in particular which were known less than 80% by the trained employees. Following these repeated trainings, the total knowledge level on all questions was increased up to at least 89.4%.

Minimization of exposure to the work-related musculoskeletal disorders is possible with provision of the required information and application, and conduct of periodical delivery of applied trainings, as in our study.

Poster Presentation

Working Conditions

0054   THE RELATIONSHIP BETWEEN ON-CALL WORK AND HEALTH PROBLEM AND INJURY AMONG KOREAN WORKERS

[1]Jae Bum Park*, [2]Chulin Baek. [1]School of Medicine, Ajou University, Suwon, Gyeonggi-do, Republic of Korea; [2]Ajou University Hospital, Suwon, Gyeonggi-do, Republic of Korea

Objective In case of on-call work, it is mixed with day-duty and night-duty, so that workers may have to work anytime of the day. This study aimed to understand the relations between Korean workers' on-call work, health problem, and injury.

Methods Using the 3rd Korean Working Conditions Survey in 2011, this study targeted 29 246 paid workers working for more than a year. Conducting the logistic regression analysis of on-call work and health problem based on the surveyed data, the personal/occupational characteristics, working environment, and job stress were controlled.

Results In case of on-call work, it showed higher odds ratio like physical health problems (OR, 1.33; 95% CI 1.22–1.44), psychological health problems (OR, 1.31; 95% CI 1.08–1.60), and injury (OR, 2.76; 95% CI 2.26–3.37). In the results of analysing the detailed health problems, workers on-call work showed higher odds ratio of hearing problems (OR, 2.06; 95% CI 1.63–2.62), skin problems (OR, 1.71; 95% CI 1.38–2.12), back pain (OR, 1.22; 95% CI 1.08–1.38), muscular pain in shoulders, neck, and upper limbs (OR, 1.23; 95% CI 1.12–1.34), muscular pain in lower limbs (OR, 1.27; 95% CI 1.15–1.40), headache and eyestrain (OR, 1.46; 95% CI 1.32–1.60), abdominal pain (OR, 1.37; 95% CI 1.02–1.85), depression or anxiety (OR, 1.43; 95% CI 1.07–1.93), overall fatigue (OR, 1.36; 95% CI 1.24–1.49), insomnia or sleep difficulties (OR, 1.41; 95% CI 1.13–1.76).

Discussion In the results of this study, on-call work was related to health problems and injury. Additional study should be conducted to understand the correlations in the future.

Poster Presentation

Intervention Studies

0055   THE HEALTH RISKS OF OCCUPATIONAL EXPOSURE TO N-HEXANE IN PRINTING INDUSTRY

He Jia-Xi. Shenzhen Centre for Occupational Disease Prevention and Treatment, Shenzhen, Guangdong, China

Objective To evaluate the risks of occupational exposure to n-hexane in printing industry.

Methods 76 printing factories using n-hexane were investigated. The concentrations of n-hexane in workplaces were tested. The medical examination was carried out for 179 exposed workers and 208 controls. The concentrations of 2,5-hexanedione in urine were tested among 162 exposed workers and 54 controls. The neural electromyography (EMG) examination was performed on 28 cases exposed to n-hexane for more than 4 years.

Results The solvents containing n-hexane are used to clean the printing machines. The concentration of n-hexane in the air of the workplaces was 1.5~1553.5 (median=178.2) mg/m3% and 17.59% of them exceeded the occupational exposure limit (OEL). The concentration of n-hexane for exposed individuals was 39~215 mg/m3 and 66.67% of them exceeded the OEL.

The results of medical examination showed that the occurrence of conjunctiva congestion (10.65%)*, tremor of fingers (10.06%)* and tendon hyporeflexia (13.41%)** among the exposed workers were significantly higher than that of the controls (4.81%, 6.25% and 4.33%, respectively) (*p<0.05, **p<0.01). The concentrations of 2,5-hexanedione in urine were 0.25~15.6 (1.78±2.98)mg/L among the exposed workers and 11.73% of them exceeded 5 mg/L. The EMG showed that 2 cases suffer from a slight peripheral nerve injury.

Conclusion The concentration of n-hexane in workplaces exceeds the OEL and the abnormal results of medical examinations performed on the exposed workers indicate health risks in the printing industry. These risks are caused by manual labour, overtime work, lack of harmful chemical removal devices and PPE.

Poster Presentation

Intervention Studies

0056   INVESTIGATION ON OCCUPATIONAL EXPOSURE TO NON-IONISING RADIATION IN PHYSIOTHERAPY WORKPLACES

Yang Jing*, He Jia-Xi. Shenzhen Centre for Occupational Disease Prevention and Treatment, Shenzhen,Guangdong, China

Objective To understand the occupational exposure to non-ionising radiation in physiotherapy workplaces.

Methods An investigation was conducted in 16 physiotherapy agencies used non-ionising radiation physiotherapy instruments. The ultra-high-frequency radiation, high-frequency radiation and microwave were measured in the points of the head, chest and abdomen. The laser was measured on skin.

Results The intensity of ultra-high-frequency radiation produced by 17 ultra-short wave therapeutic apparatus were 0.001~0.306 (median=0.085)mW/cm2, 0.008~4.225 (median=0.102)mW/cm2 and 0.011~2.701 (median=0.292) mW/cm2 in the point of the head, chest and abdomen, and 70.6%, 47.1% and 17.64% meet the occupational exposure limits (OELs) respectively. The high-frequency radiation in the point of chest (26.7 V/m) and abdomen (40.8 V/m) produced by 1 of the 4 high frequency thermotherapy instruments respectively exceed the OELs. The microwave (0.001~4.668 mW/cm2) of 18 microwave therapeutic apparatus meets the OELs in all points mentioned above. The laser of 12 laser therapeutic apparatus were <0.01×10–4~0.13×10–4 W/cm2 in wavelength range 400~1400 nm on the skin, all of them meeting the OELs.

Conclusion The physical therapists are exposed to occupational hazard factors such as ultra-high-frequency radiation, high-frequency radiation, microwave and laser in the workplace. The ultra-high-frequency radiation and high-frequency radiation that exceed the OELs in some measurement points indicate the risks currently in physiotherapy workplaces. It is necessary

to take steps to protect the physical therapists, such as separating the offices of physical therapist from the treatment areas, installing protective facilities in the workplace, and using PPE where necessary.

Poster Presentation
Psychosocial

0058 ACCURACY OF A SINGLE ITEM ON MENTALLY TIRING WORK AS PROXY MEASURE OF JOB DEMANDS AND EFFORTS IN THE GAZEL COHORT

[1]Alexis Descatha*, [2]Linda L Magnusson Hanson, [3]Ida E H Madsen, [3]Reiner Rugulies, [2]Paraskevi Peristera, [2]Hugo Westerlund. [1]Inserm UVSQ, Villejuif, France; [2]Stockholm University, Stockholm, Sweden; [3]National Research Centre for the Working Environment, Copenhagen, Denmark

Objective Comparing the accuracy of single item about mentally tiring work against validated scales, Demand-Control (DC) and the Effort Reward Imbalance (ERI).

Methods We analysed data from the Gazel cohort, where a question about mentally tiring work was administered simultaneously with the DC (in 1997 and 1999) and ERI (in 1998) scales. Correlation and accuracy were studied comparing this single question (8 categories, and recoded into 2 or categories) with DC and ERI scales (without and with recoding into 2 categories based on usual threshold), using sensitivity, specificity, predictive values, and likelihood ratio.

Results For the years considered, 5706 (1998) to 11 304 (1997) workers had responded to the questionnaires. The demand and effort dimensions were moderately correlated with the mentally tiring work question showing a good sensitivity (>0.8), and a negative likelihood ratio (<0.33), with a possible dose-response-relationship. Specificity and positive likelihood ratio were low (respectively <0.5 and<2). Job control, Job strain and ERI were not captured by mentally tiring work, and reward only partly.

Conclusion Though a single question does not replace validated scales as the DC and the ERI scales, these results indicate that it would be possible to use simple measures in questionnaires and non-specialised cohorts for screening purpose.

Oral Presentation
Burden of Disease

0059 A GLOBAL PERSPECTIVE ON COAL-FIRED POWER PLANTS AND LUNG CANCER MORTALITY

ChengKuan Lin*, David Christiani, Ro-Ting Lin. Deaprtment of Environmental Health, Harvard Chan School of Public Health, Boston, USA

Background Lung cancer is the leading cause of cancer mortality in many countries and leads to substantial financial burden globally. The lack of consideration of the widely diverse compositions of particulate matter (PM) may lead to inaccurate estimation and inability to capture respective contributions as current estimates.

Methods Age- and sex-adjusted lung cancer mortalities of 61 countries were followed from 1979 to 2013 while 10-year-accumulative coal capacities is the primary independent variable. We applied a change-in-change model to estimate the preventable deaths of lung cancer from the changes of coal capacities during periods from 1999–2003 to 2009–2013, adjusting for various socioeconomic, demographic determinants, and lag period.

Results The average log coal capacity increased from $9·58$ in 1980 to $10·35$ in 2010, and smoking prevalence dropped by $13·82\%$ among males in the same period. One log coal capacity (unit: logMW) was associated with an increase in lung cancer mortality by $58·31$ per million males (SD$=28·49$, $p<0·05$); while the savings from decreasing smoking prevalence was only $4·86$ per million males (SD$=0·03$, $p<0·05$). Based on the model, we estimated a total of $123·68$ thousand lives could be saved from lung cancer among 3477 million males in 2011.

Conclusion This study answered a key policy question on the externality cost of coal power plants and estimated global disease burden from preventable lung cancer attributable to coal-fired power plants. By changing a nationwide energy matrix from brown energy to green, some European countries have prevented lung cancer mortality among males successfully.

Poster Presentation
Shift Work

0062 "ROTATING SHIFT WORK AND METABOLIC SYNDROME AMONG EMPLOYEES WORKING IN TERTIARY CARE HOSPITAL IN SOUTHERN INDIA"

Reginald George Alex*, Santhosh Kumar, Henry Kirupakaran. Christian Medical College, Vellore, Tamil Nadu, India

Background Metabolic syndrome and shift workers are on the rise. There is conflicting evidence whether shift work predisposes to development of metabolic syndrome.

Objectives To study the prevalence of metabolic syndrome among shift and daytime workers in a South Indian hospital and to assess the association between shift work and metabolic syndrome.

Methodology The study had 2 groups: shift and daytime workers between ages 25–50 years. The sample size calculated was 79 in each group to demonstrate 12.5% difference in the prevalence of metabolic syndrome with a power of 80% and α error of 5%.

The primary outcome studied was the prevalence of metabolic syndrome and secondary outcomes studied were the odds of developing metabolic syndrome among shift workers. Chi square test was used to measure the difference in the categorical variables; independent student t test for mean difference in the continuous variables. Univariate analysis and multivariable logistic regression were used to test the significance of relevant variables on metabolic syndrome.

Results We studied 80 shift and 80 daytime workers. Baseline characteristics were different for the following parameters: daytime workers were older, had more vegetarians, better

sleep and were less physically active. Metabolic syndrome prevalence was 33.1% among the participants. The adjusted odds ratio for the shift workers to develop metabolic syndrome was 0.55 (95% CI 0.24–1.29) with a P value of 0.17. **Conclusion** Metabolic syndrome was present in every third person among the study participants and there was no significant association with shift work.

Poster Presentation

Intervention Studies

0063 A LITERATURE REVIEW OF WORKPLACE INTERVENTIONS WITH RESPECT TO RISK MANAGEMENT MEASURES AND THEIR IMPACT ON OCCUPATIONAL EXPOSURE LEVELS TO HAZARDOUS SUBSTANCES

Susann Wothe. *Federal Institute for Occupational Safety and Health (BAμA), Unit 4.1 Exposure Scenarios, Dortmund, North Rhine-Westphalia, Germany*

Background and aims: Workplace intervention studies play an important role in supporting and complementing scientific validation of non-intervention assessments of the effectiveness of risk management measures (RMMs) under controlled conditions. We are reviewing a collection of published workplace intervention studies with particular focus on studies assessing changes in occupational exposure to hazardous substances with a broad scope spanning a variety of approaches in different industries.
Methods Workplace interventions were defined as events aimed at reducing occupational exposure to hazardous substances at the workplace or where reductions occurred as a side effect, e.g. due to changes in the production process. Intervention studies published in English from 1999 up to January 2017 were considered for inclusion based on a systematic search of Pubmed.
Results In total 50 intervention studies have been included in this review including, but not limited to, studies in the metal industry (10), hospitals (4), bakeries (3), on welding (6), or dust in construction (4). Overall the interventions reviewed have succeeded at reducing exposure levels.
Conclusion There is evidence that decreases in workplace exposure levels to hazardous substances followed a variety of workplace interventions in a variety of industries underlining the benefits of implementing RMMs at workplaces. However, a direct comparison of a specific RMM among different studies, even when focussing on one specific industry, remains difficult as the majority of studies assessed a set of different RMMs; hence the quantification of the impact of individual interventions on exposure remains difficult due to the heterogeneity in methods.

Oral Presentation

Shift Work

0064 OBJECTIVELY MEASURED NON-OCCUPATIONAL AND OCCUPATIONAL PHYSICAL ACTIVITY LEVELS OF SHIFT WORKERS COMPARED TO NON-SHIFT WORKERS

[1,2]Bette Loef*, [3]Debbie van Baarle, [2]Allard van der Beek, [4]Andreas Holtermann, [1]Karin Proper. [1]*Center for Nutrition, Prevention and Health Services, National Institute for Public Health and the Environment, Bilthoven, The Netherlands;* [2]*Department of Public and Occupational Health, Amsterdam Public Health research institute, VU University Medical Centre, Amsterdam, The Netherlands;* [3]*Center for Immunology of Infectious Diseases and Vaccines, National Institute for Public Health and the Environment, Bilthoven, The Netherlands;* [4]*National Research Centre for the Working Environment, Copenhagen, Denmark*

Background Shift work may alter workers' physical activity (PA) level, making PA a potential underlying mechanism of the negative health effects of shift work. As prior studies on shift work and PA have generally used self-reported, overall PA measures, the results may be susceptible to bias. Therefore, our aim was to compare objectively measured non-occupational and occupational PA levels between shift workers and non-shift workers.
Methods Data were used from Klokwerk+, a prospective cohort study examining the health effects of shift work among health care workers. In total, 401 rotating and/or night shift workers and 78 non-shift workers were included, who wore Actigraph GT3X+ accelerometers for 7 consecutive days. Time spent sitting, standing, walking, running, stairclimbing, and cycling during leisure and at work was estimated using Acti4-software. Linear regression was used to compare proportions of time spent in these activities between shift and non-shift workers.
Results Average accelerometer wear-time was 105.9 hours (SD=14.0) over an average of 6.9 days (SD=0.6). No differences between shift workers and non-shift workers were found in PA behaviours during leisure-time (p>0.05). At work, shift workers were less sedentary (B=−10.6 (95%-CI=−14.3-−6.8)) and spent larger proportions of the time standing (B=9.5 (95%-CI=6.4–12.6)) and walking (B=1.2 (95%-CI=0.1–2.2)) than non-shift workers.
Conclusions Non-occupational PA levels of shift workers were similar to that of non-shift workers, but shift workers were more physically active (i.e. standing/walking) at work. Future research should focus on the role of this difference in occupational PA in the health effects of shift work.

Oral Presentation
Risk Assessment

0065   SLEEP QUALITY AMONG HEALTH SCIENCES STUDENTS LIVING IN DORMITORY

Alireza Dehdashti*, Mahshid Bahrami, Meysam Karami. *Semnan University of Medical Sciences, Semnan, Iran*

Introduction Sleep disturbances have been associated with an increased risk of health problems among higher education students. The purpose of this survey was to determine the prevalence and identify the factors that influence the sleep quality in dormitory students.

Materials and Methods We applied a descriptive and cross-sectional survey. The participants consisted of 249 health sciences students at Semnan University of Medical Sciences. Data were collected through a self-reported reliable and validated questionnaire.

Results the students aged 21.7±1.1 years. In overall, 80.7% of female and 72.1% of male students revealed insufficient sleep. Mental engagement commonly reported as a frequent risk factor for sleep disturbance (53.8%). Uncomfortable sleeping environment in dormitories (p=0.03) and behaviours that cause arousal till midnights (p=0.05) were significantly associated with poor sleep quality. Approximately half of students perceived daytime somnolence as sleep disorder consequence.

Conclusion Our results indicated high prevalence of poor sleep quality among university students. Sleep disorders should be considered a major health concerns among dormitory students. Providing better environmental conditions, training and advisory programs may help to improve students' sleep quality and academic achievement.

Oral Presentation
Cancer

0066   MATERNAL OCCUPATIONAL EXPOSURE TO BENZENE INCREASES THE RISK OF CHILDHOOD LEUKAEMIA IN OFFSPRING – A PROSPECTIVE STUDY IN THE NORWEGIAN MOTHER AND CHILD COHORT STUDY

[1,2]Jorunn Kirkeleit*, [2]Trond Riise, [2,3]Tone Bjørge, [4]David C Christiani, [5]Andrea Baccarelli, [6]Stefano Mattioli, [1,2]Bjørg Eli Hollund, [2]Bjørn Tore Gjertsen. [1]*Haukeland University Hospital, Bergen, Norway*; [2]*University of Bergen, Bergen, Norway*; [3]*Cancer Registry Norway, Oslo, Norway*; [4]*Harvard School of Public Health, Boston, USA*; [5]*Columbia University Mailman School of Public Health, New York, USA*; [6]*University of Bologna, Bologna, Italy*

Introduction There is an established causal relationship between benzene exposure and acute myelogenous leukaemia in adults, but the association between parental benzene exposure and childhood leukaemia in offspring remains inconclusive.

Objective Using the prospective population-based Norwegian Mother and Child Cohort Study (MoBa) comprising 1 13 754 offspring (1999–2009), we investigated the association between parental exposure to "gasoline or exhaust" as a proxy to benzene exposure and childhood leukaemia.

Method Around the 17th gestational week mothers and fathers responded to questions on a range of occupational exposures during the last 6 months and pre-conception, respectively. Exposure to benzene was assessed through self-reported exposure to "gasoline or exhaust" ("never exposed", "ever exposed" and "exposed>30 days"), the latter interpreted as being occupational. Development of subsequent childhood leukaemia (n=70) were identified through linkage with the Cancer Registry of Norway. The risk was estimated by odds ratios (OR) with 95% confidence intervals (95% CI) comparing the offspring from exposed and unexposed parents using a logistic regression model, adjusting for maternal smoking and birth weight.

Results Maternal exposure was associated with an increased risk of childhood leukaemia (OR 2.6; 95% CI 1.03, 6.50). The risk increased with number of days being exposed during the last 6 months categorised in "0", "1–30", "31–180" (p-value for trend=0.03). No excess risk of leukaemia was found for paternal exposure.

Conclusion We found an excess risk of leukaemia in children having a mother reporting being exposed to benzene-containing "gasoline or exhaust" prior to and/or during pregnancy.

Oral Presentation
Migrant Workers

0068   USING WORKERS COMPENSATION DATA TO ESTIMATE INJURY PATTERNS IN INTER-PROVINCIAL WORKERS

Cherry Nicola, Haynes Whitney. *University of Alberta, Edmonton, Alberta, Canada*

Background The western Canadian province of Alberta attracts skilled workers from across Canada to work in the oilfields. We investigated whether information from Workers Compensation Board (WCB) claims would provide unbiased estimates on the rate of injury in such migrant workers. Work injuries in Alberta are compensated by the Alberta WCB regardless of province of residence.

Methods The Alberta WCB provided claims data with home province, sex, age, industry and time lost from work. Denominator data came from Statistics Canada, linking census and taxation information. We also recruited a cohort of workers in Fort McMurray, the hub city for oil and gas, and followed them for 4 months to record work injuries.

Results From Statistics Canada, we had 1,720,716 people working in Alberta in 2012 whose home was Alberta and 10403 whose home was Newfoundland. The overall rate of injury (with no correction possible for days employed) was lower in the migrant workers, after adjustment for age, sex and industry. Within claims, the pattern of time loss differed importantly: those from Newfoundland had a marked deficit in claims with time loss 1-28 days (OR=0.18: 95%CI 0.12-0.27). WCB reporting among the 151 cohort members was lowest among those from out of province or recently settled: overall only 38% of loss time injuries were reported. Those in precarious employment were more likely to self-medicate or quit their job to avoid being labelled with a history of injury.

Conclusion Injury risk in inter-provincial workers could not be estimated using only WCB data.

Poster Presentation
Musculoskeletal

0069 KNEE DISORDERS, WORK LIMITATIONS AND WORK STATUS. FIRST RESULTS FROM THE CONSTANCES COHORT

[1]Alexis Descatha*, [2]Paul Kuijer, [3]Ann-Marie Dale, [4]Audrey Petit, [2]Monique Frings-Dresen, [3]Bradley A Evanoff, [1]Annette Leclerc, [4]Yves Roquelaure. [1]Inserm UVSQ AP-HP, Villejuif, France; [2]Academic Medical Centre, Coronel Institute of Occupational Health, Amsterdam, The Netherlands; [3]Washington University in St Louis, St-Louis,MO, USA; [4]CHU Angers Inserm, Angers, France

Objective Knee disorders, including osteoarthritis and knee replacement, are a growing problem for more and more workers due to increasing retirement ages. Aim is to describe work-related outcomes of possible knee replacement, meniscal surgery and other knee pain in a new large population cohort at its inception.

Methods The CONSTANCES cohort is a randomly selected representative sample of French adults aged 18–69 years at recruitment. Participants completed symptom questionnaires, and surgery in the last 4 years period was collected from a national health claims database. Knee disorders were defined as severe or daily knee pain, or history of surgery for meniscal tear or knee replacement. We considered several outcomes, including self-reported functional limitations (climbing stairs, walk 1 km, carrying 5 kg), task modifications and current work status. Multinomial logistic models were built separately for men and women; only variables with an Odds Ratio >2 (or <0.5) at p<0.001 were considered significant after adjustment for other relevant variables.

Results Of 85.826 participants, of whom 38.571 (44.9%) reported knee pain. 10.683 (12.4%) reported severe knee pain, 1305 (1.5%) with meniscal tear surgery, and 403 (0.5%) with knee replacement. All limitations considered were significantly associated with severe knee pain, meniscus surgery and knee replacements among men and women, such as task modification for knee disorders. Loss of activity was only significantly associated with knee replacement among men.

Conclusions Based on a cross-sectional design at this time, theses first analyses reported a poor outcomes of knee disorders for work-related activities.

Oral Presentation
Dusts and Fibres

0071 VALIDATION OF ACM CHECK: A MOBILE APPLICATION TO SCREEN FOR ASBESTOS IN RESIDENTIAL SETTINGS

Matthew Govorko. Curtin University, Perth, Western Australia, Australia

Background/Aim A large reservoir of in situ asbestos-containing materials (ACM) remain in residential settings throughout Australia. Tradesmen and householders are at risk of exposure if they work on or near these materials, without knowing they contain asbestos. The aim of this study was to validate ACM Check, a screening tool to identify and assess the condition of potential ACMs located in and around Western Australian homes.

Methods A two stage cross-sectional study was undertaken: 1) completion of ACM Check by 40 Western Australian householders, and 2) an on-site asbestos inspection by an experienced Environmental Consultant, which included collecting samples of suspect ACM to be tested in a laboratory. Cohen's kappa coefficient compared the results obtained from ACM Check with those of the Environmental Consultant.

Results 40 houses ranging in date of construction from 1898 through to 1988 with a median year of 1966, were sampled. 38 of the 40 houses (95%) were identified as having one or more 'possible' or 'likely' asbestos-containing materials present on the property. Overall, there was perfect agreement between ACM Check and the Environmental Consultant's assessment for any (1 or more) ACM present, K=1.00, p<.005, perfect agreement for any ACM located outside the house, K=1.00, p<.005, and moderate agreement for any ACM located inside the house, K=0.593, p<.005.

Conclusions ACM Check is a reliable screening tool to identify in situ ACMs in Western Australian residential settings. Its method can potentially be modified for implementation in other countries

Poster Presentation
Chemicals

0072 OIL MIST, FROM EXPOSURE DETERMINANTS TO EARLY EFFECT MARKERS: AN INTEGRATIVE STUDY DESIGN

[3]Sébastien Hulo, [1]Eve Bourgkard, [2]Jean-Jacques Sauvain, [1]Valérie Demange, [2]Nancy Hopf, [1]Yves Guichard, [1]Fanny Jeandel, [3]Jean-Louis Edmée, [3]Nathalie Chérot, [1,2]Pascal Wild*. [1]INRS, Vandoeuvre, France; [2]IST, Lausanne, Switzerland; [3]CHU Lille, EA 4483 – IMPECS – IMPact de l'Environnement Chimique sur la Santé humaine, Lille, France

The present project focuses on the effects of occupational exposure to oil mists on a panel of exposure and effect biomarkers in an epidemiological study. The assumption is that different health outcomes are caused by reactive particles causing oxidative stress leading to lung inflammation and ultimately cancer or asthma.

Ninety workers from France and Switzerland (30 controls, 30 exposed to straight cutting oil and 30 to soluble cutting oil) will be followed over two days after a non-exposed period of at least two days.

The exposure assessment is based on measurements of particles, metals, aldehydes, amines, the intrinsic oxidative potential of aerosols and the cutting oil. Furthermore, exposure biomarkers are measured in exhaled breath condensate (EBC)- metals, ions (nitrite, nitrate...) and urine –metals, metabolites of PAHs- . Finally, exposure determinants will be collected to guide future efforts in exposure prevention.

Effect biomarkers of oxidative stress (malondialdéhyde, 8-isoprostane, 8-hydroxy-2'-deoxyguanosine) in EBC and urine will be repeatedly measured as well as exhaled nitric oxide (FeNO), an inflammation marker.

Genotoxic effects will be assessed using the buccal micronucleus cytome assay. Finally, the possible chronic effects of oil mist exposure on respiratory health will be explored by standard questionnaires.

This integrative project will gain insights in the exposure determinants that drive the physiopathological effects, thus allowing an efficient prevention strategy to be developed.

Poster Presentation

Exposure Assessment

| 0073 | RESPIRABLE DUST AND CRYSTALLINE SILICA EXPOSURE AMONG CONCRETE FINISHING WORKERS IN CONSTRUCTION INDUSTRY |

Hyunhee Park, Ensong Hwang*. *Korea Occupational Safety and Health Agency, Ulsan, Republic of Korea*

Objectives The objective of this study was to evaluate the concentration and size-distribution of respirable crystalline silica among concrete finishers in the construction industry.

Methods Active-specific personal air sampling(n=129) were carried out in eight apartment complex construction sites by using PVC(poly vinyl chloride) filters with aluminium cyclones (flow rate at 2.5Lpm). Crystalline silica was analysed by FTIR (Fourier-transform infrared spectroscopy). The concentration of crystalline silica were showed by three different types of construction jobs(concrete chipping, grinding, plastering) and four different workplace(exterior wall, inside of apartment unit, staircase, underground parking lot).

Results The concentration of respirable crystalline silica was highest in concrete grinding(2.058 mg/m^3) followed by concrete chipping(0.123 mg/m^3), and plastering work(0.003 mg/m^3). Concentration of crystalline silica was differ by the types of workplace in concrete grinding work, the concentration of respirable crystalline silica in staircase shows highest concentration(4.177 mg/m^3) followed by inside of apartment unit (2.761 mg/m^3), underground parking lot(1.302 mg/m^3), and exterior wall(0.893 mg/m^3). Considering the proportion of crystalline silica in the dust from job type, crystalline silica content was higher for concrete chipping work. The crystalline silica content was 6.921% in chipping work, 4.121% in grinding and 0.943 in plastering work. The correlation factors between respirable crystalline silica and respirable dust was 0.970 ($p<0.01$) in chipping work, 0.793 ($p<0.01$) in grinding and 0.100 ($p=0.568$) in plastering work.

Poster Presentation

Cancer

| 0074 | LUNG CANCER RISK DUE TO EXPOSURE TO RESPIRABLE CRYSTALLINE SILICA IN THE ABSENCE OF SILICOSIS |

Matthias Möhner. *Federal Institute for Occupational Safety and Health, Berlin, Germany*

Background Exposures to respirable crystalline silica (RCS) occur at a variety of workplaces, especially in mining and quarrying. The International Agency for Research on Cancer (IARC) has classified RCS in the form of quartz or cristobalite dust as carcinogenic to humans (Group 1). But the role of silicosis for the development of lung cancer is still unclear: is silicosis a simple marker for a high cumulative exposure or is it an intermediate factor on the pathway to lung cancer?

Methods A review of published epidemiological studies in occupational settings with known exposure to RCS was performed.

Results The lung cancer risk among silicotics is in general higher than among subjects with unknown silicosis status. But epidemiological studies on non-silicotics, which can refer to data of silicosis registries, are scarce and often have only low statistical power. Therefore, even if the pooled lung cancer risk estimate for these studies is not significantly elevated, an independent contribution of RCS to lung cancer risk cannot be ruled out.

Conclusions The question remains whether RCS increase the lung cancer risk even in the absence of silicosis. Future studies on lung cancer mortality should include data from silicosis registries and/or information on contributing causes of death. The impact of competing occupational risk factors like radon or arsenic should also be taken into account.

Poster Presentation

Specific Occupations

| 0076 | INVESTIGATION OF OCCUPATIONAL HEALTH HAZARDS AMONG GRASS TRIMMER OPERATORS |

[1]Shih-Yi Lu*, [1]Yen-Hui Lin, [2]Kuei-Yi Lin. [1]*Chung Shan Medical University, Taichung City, Taiwan;* [2]*Institute of Labour, Occupational Safety and Health, New Taipei City, Taiwan*

Petrol-engine-driven grass (and brush) trimmers are widely used for cutting long grass in Taiwan, and the workers performing these tasks are generally contract workers with little or no awareness of the occupational hazards. In this study, the noise, vibration, and heat exposure of operators are measured in the field, and suggestions are proposed regarding potentially viable countermeasures to reduce hazards during operations.

More than half of all operators are exposed to time weighted average (TWA) sound levels greater than 85 dBA, meaning it is necessary to implement a hearing conservation program and wear hearing protectors during operations. The situation is aggravated when a number of machines are operated simultaneously, as it results in still higher levels of noise exposure, thus, operators should be separated by 15 m in order to avoid the combined level of noise exposure while working with these machines. Vibration measurements are conducted in accordance to ISO 5349 under realistic field conditions. The vibration acceleration value a_{xyz} of the studied trimmer lay between 2.41 m/s^2 and 5.74 m/s^2, and the equivalent value of 8 hours would be 2.08 m/s^2 ~4.97 m/s^2; hence, typical use greater than 2.5 m/s^2 would require reasonably practicable exposure reduction measures to be taken. In this study, heat stress level is determined based on the Wet Bulb Globe Temperature (WBGT) Index, which found that level of heat stress, as defined by WBGT, exceeded 28°C and 28.5°C, as recommended by the ISO 7243 Standard and ACGIH Standard, respectively.

Poster Presentation

Other

0077 | SHOULD OCCUPATIONAL HEALTH PATIENTS RECEIVE THE MEDICAL RECORDS CONCERNING THEIR MEDICAL VISIT?

[1,2]Shlomo Moshe*, [2]Nasrin Kabaha, [1,2]Ayala Krakov. [1]Maccabi Healthcare Services, Holon, Israel; [2]Tel Aviv University, The Division of Environmental and Occupational Medicine, Israel

Objectives Our study examines the impact and importance of providing medical records at the end of the visit in occupational medicine clinics (OMC) on patients and occupational physicians.

Methods This study is a cross-sectional study. Data was collected from patients visiting four different OMC during 2015 for a fitness for work evaluation and includes 287 questionnaires. We also collected questionnaires from 62 occupational physicians (OPs). The satisfaction range in the questionnaires was between 1 (very slightly satisfied) and 5 (very satisfied).

Results When patients were provided with the medical information in writing and orally, they showed a higher level of understanding (4.3 and 4.4 compared to 3.8 respectively, $p < 0.001$), higher level of confidence in their OP (4.4 and 4.3 compared to 3.7 and 4 respectively, $p < 0.001$), higher level of satisfaction (4.3 and 4.4 compared to 3.8 respectively, $p < 0.001$), and higher sense of control and ability to correct the record (1.8 compared to 1.4 respectively, $p < 0.01$). Doctors responded that giving the results orally to patients (39/62, 63%) would lead to more appeals of decisions. However, they believed that giving oral information would better clarify the work restrictions (4.6 compared to 4.1 respectively, $p < 0.05$) and cause patients to trust them more (4.6 compared to 4.1 respectively, $p < 0.05$).

Conclusions We recommend sharing the medical records with patients and including an oral explanation, understanding that the advantages overcome the disadvantages of this approach.

Poster Presentation

Musculoskeletal

0078 | THE RISK FOR LOW BACK PAIN CAUSED BY DRIVING PROFESSIONS IN A YOUNG ADULT POPULATION

[1,2]Shlomo Moshe*, [2,3]Regina Levin, [2,4]Aharon S Finestone, [1,2]Ayala Krakov, [2,3]Oren Zack. [1]Maccabi Healthcare Services, Holon, Israel; [2]Tel Aviv University, School of Public Health, Department of Environmental and Occupational Medicine., Tel Aviv, Israel; [3]The Israel Defense Forces, Medical Corps, Ramat Gan, Israel; [4]Assaf Harofeh Medical Centre, Zerifin, Israel

Background The aim of this study was to assess the relationship between the incidence and exacerbation of Low Back Pain (LBP) in young professional drivers

Methods In this controlled historical prospective study we included all male Israel Defense Forces (IDF) soldiers drafted between the years 1997–2006, followed them for 3 years and categorised them into three groups: administrative, light-duty vehicle drivers and heavy vehicle drivers. The incidence and recrudescence of LBP was calculated for soldiers with or without a medical history of LBP in either professional group accordingly.

Results The incidence rates for LBP were 0.7%, 0.34% and 0.43% for the combined administrative and light vehicle driver groups, heavy vehicle driver and total driver groups, respectively (averagely 0.65%). The Relative Risk (RR) for severe LBP exacerbation for soldiers with a history of LBP without clinical findings was 1.4 ($p < 0.001$) and for soldiers with a history of LBP with mild clinical/radiographic findings was 3.8 ($p < 0.01$). Examination of RR exacerbation rates within different severity tiers yielded a similar trend amongst all professions.

Conclusions The crude incidence rate for LBP was found to be 0.65% - lower than literature reported rates, possibly attributable to our more stringent variable definition of severe LBP. The most prominent risk factors identified in our study include: a history of LBP and multiple complaints of LBP at recruitment. Driving profession in young age is not a risk for LBP.

Poster Presentation

Exposure Assessment

0079 | CHARACTERISTICS OF PARTICLE SIZE DISTRIBUTION IN CONCRETE FINISHING WORK

Hyun-Hee Park, Eun-Song Hwang*, Jae-Kil Jang. Korea Occupational Safety and Health Agency, Ulsan, Republic of Korea

It is known that workers at construction sites are exposed to the risk of dust containing crystalline silica while crushing concrete, grinding concrete surfaces, cutting bricks, cutting rocks, and ballasting structures. This study was conducted to identify size-distribution of crystalline silica among concrete finishers in the construction industry to establish systemized management for the construction sites.

In order to measure the size of dust, a Personal Cascade Impactor (Model 298, Anderson Sampler Inc., USA) composed of an 8-stage impact board was used. Dust was weighed three times using an electronic balance with $10{-}7$ g readability (XP2U, Mettler toledo,Switzerland) to acquire the mean value. Crystalline silica was analysed using Fourier-transform infrared spectroscopy (FT-IR) in accordance with the NIOSH Manual of Analytical Methods of NIOSH #7602. To calculate the mass fraction of dust for each size of dust particle, ACGIH's Particle size-Selective Sampling Criteria for Airborne Particulate Matter was used.

The results of weighing dust collected from each stage and a cumulative graph was illustrated from the stage with the smallest particle size (stage, 0.52 μm or smaller) to draw the trend line and find the median diameter of mass using the effective diameter limit corresponding to 50% cumulative probability. Then, it was 10.958 μm~12.206 μm for concrete chipping and 10.462μm~11.476 μm for concrete grinding. Considering the proportion of crystalline silica in the dust from each stage, crystalline silica content was higher for smaller particle sizes. The content was particularly high in stage 6 (1.55~3.5 μm) and stage 8 (0.52~0.93 μm).

Poster Presentation

Musculoskeletal

0080   **MEASUREMENT OF PHYSIOLOGICAL WORKLOAD AND MUSCULOSKELETAL FATIGUE AMONG NURSING ATTENDANTS IN TAIWAN**

Pi-Min Shih, Shih-Yi Lu, Yen-Hui Lin*. *Department of Occupational Safety and Health, Chung Shan Medical University, Taichung city, Taiwan*

Introduction During the process of caring for patients, nursing attendants frequently require to help patients with lifting/transferring, patting/turning and rehabilitation. Nursing attendants are required to exert forceful and awkward postures for extended periods of time that caused musculoskeletal disorders. This study is to survey the work situation, physiological workloads, and musculoskeletal disorders associated with prolonged nursing attendance tasks in nursing attendants.

Method The self-administered questionnaires are assessed via a cross-sectional study of 190 female workers in Taiwan. Information is obtained on demographics, job characteristics, health status, and physiological workload.

Results and Discussion The observational result shows that the most common prevalence of physical discomfort was lower back (69.5%), followed by right shoulder (47.9%), left shoulder (44.2%), and neck (37.9%). Meanwhile, the most pronounced tired is to help patients with lifting/transferring (79.2%), followed by patting/turning (55.1%). The anticipated results of this study could be a workplace task design reference for improvement of musculoskeletal fatigue and disorders among nursing attendants.

Poster Presentation

Respiratory

0081   **CHANGE IN RESPIRATORY HEAT FLOWS IN RESPONSE TO WEARING HALF-MASK RESPIRATORS IN HOT-AND-HUMID ENVIRONMENT**

[1]Chen-Peng Chen*, [2]Yi-Chun Lin, [1]Hui-Chen Wei. [1]*Department of Occupational Safety and Health, China Medical University, Taichung, Taiwan*; [2]*Department of Public Health, China Medical University, Taichung, Taiwan*

Objectives When using a respirator a microenvironment develops around the nasal cavity. The heat load in this microenvironment deviates from that in the ambient air, shifting the paradigm of metabolic heat transfer via respiratory heat flows. This study determined the change in respiratory heat flows among users of half-mask respirators under different thermal conditions.

Methods Twenty-five participants (13 males and 12 females) were required to wear two models of half-mask respirators (one filtering facepiece without exhalation valve and one elastomeric facepiece with valve) and walked on stairs (130–200 W/m^2) for 30 min in a climatic chamber. Combinations of air temperature (25, 29, and 33°C) and relative humidity (55% and 75%) were applied to develop various levels of heat stress.

Results The temperature of the respired air taken inside the filtering facepiece was greater than the level inside the elastomeric facepiece. Using the ISO/TS 16976–5 model, a reduction in the respiratory convective and evaporative heat flows was observed when the heat load in the ambient air was raised (R^2=0.447 and 0.470, respectively). The difference between the respiratory heat flow via convection and that via evaporation decreased as the heat stress from the ambient air increased when the filtering facepiece was used (0.721).

Conclusions The metabolic heat built up in the microenvironment inside a respirator without an exhalation valve could alter the development of respiratory heat flows. Caution should be exercised to prevent imbalance in thermoregulation when using these respirators in hot-and-humid conditions.

Poster Presentation

Other

0083   **MARKET VARIABILITY- SAFETY FLUCTUATIONS. MINERAL PRICES AND OHS AMONG BOLIVIAN COOPERATIVE MINERS**

Mei Trueba. *University of Sussex, Brighton, UK*

Drawing on a combination of quantitative and ethnographic data this presentation explores the relationship between commodity prices and work-related injuries and fatalities among Bolivian cooperative miners. The presentation describes the short term health and safety impacts of rises and falls in mineral prices together with their complex pathways of influence before analysing the long term OHS impacts of market variability. Inviting reflection about the role of global trade relations and interdependencies in shaping workplace' health and safety this presentation demonstrates that a focus on exposure assessment calculations and workplace interventions is not enough for improving OHS. I suggest that greater attention is to be paid to understanding the macro-economic determinants of OHS in order to identify locally-relevant policy points of action.

Poster Presentation

Policy/Impact

0084   **OVERWORK AND ITS IMPACT ON WORKERS' HEALTH: A CROSS-COUNTRY COMPARISON OF OVERWORK-RELATED CARDIOVASCULAR MORTALITIES AND ITS REFLECTION IN THE TAIWANESE SITUATION**

[1]Cheng-Kuan Lin*, [2]Ro-Ting Lin. [1]*Harvard T.H. Chan School of Public Health, Boston, MA, USA*; [2]*China Medical University, Taichung, Taiwan*

Many Asian countries experienced the rapid change in industrial structure, which has resulted in a notable increase in occupational diseases, particularly overwork-related cardiovascular diseases (CVDs). "Overwork" or "Karoshi" has since been a major

health concern for workers in Asia. Taiwan is the third country in the world after Japan and Korea where national governments announced criteria to recognise overwork-related CVDs. However, the public's worries persisted, as the criteria seemed unable to solve the problem of long working hours in these countries. In the December 2016 and early 2017, a series of regulatory changes in Taiwan has received significant attentions, triggered by increasing social criticism indicating that Taiwanese regulations lagged behind international labour standards and many highly industrialised countries. As a result, increases in research addressing overwork-related CVDs issues and in the reported CVD cases could be a good reflection of the national policy change. We first compared the trends of research focus in Taiwan with those in Japan and Korea, respectively. We further collected 10 year data for Taiwan and Japan to investigate the impact of introducing a new policy. We found consistent and plausible correlations between the implementation of new policy and the number of recognised overwork-related CVDs. On the other hand, our results of Taiwan suggested a systematic problem of under-recognition of occupational diseases. Although the industrial development contributed to the country's economic growth substantially, the country will need to keep bearing the underlying burden of overwork-related CVDs.

Oral Presentation

Injuries

| 0085 | INJURY REPORTING, EMPLOYER LODGEMENT AND COMPENSATION PAYMENT DELAYS AND DURATION OF WAGE REPLACEMENT IN INJURED WORKERS |

[1]Fiona Cocker, [2,3]Peter Smith*, [1]Helen Kelsall, [1]Malcolm Sim. [1]*Monash University, Melbourne, Victoria, Australia*; [2]*Institute for Work and Health, Toronto, Canada*; [3]*Dalla Lana School of Public Health, University of Toronto, Toronto, Canada*

Objective To determine if delays in the workers' compensation process, indicated by failures in claim filing, adjudication and provision of wage replacement (WR), are associated with poorer RTW outcomes.
Methods This study examined standard workers' compensation claims with an injury date between January 2007 and December 2012, with at least one-day of WR, and which were not terminated for reasons other than RTW within the first 12 months of the claim (n=80,322). Logistic regression models explored the association between: i) delays in the injured workers (IWs) claim lodgement, the IWs employer's lodgement of the claim with the insurer, and receipt of first compensation payment, and accumulating 52 weeks of WR; and ii) socio-demographic/economic, occupational, and injury-related factors and the aforementioned delays.
Results All delays were associated with increased odds of reaching 52 weeks of WR. The more delays, the greater odds of a long-term claim. Different factors were associated with each different delay.
Conclusions The predictive ability of delays in claim lodgement and processing and receipt of compensation payments demonstrate where improved claims management and adjudication could reduce the proportion of workers on long term WR.

Oral Presentation

Shift Work

| 0086 | SHIFTWORK, CIRCADIAN DISRUPTION AND BREAST CANCER: A FIRST APPLICATION OF THE CHRONOBIOLOGICAL THEORY AND PRACTICAL CHALLENGES WITHIN THE AUSTRALIAN BCEE STUDY |

[1]Lin Fritschi, [2]Valèrie Groß, [2]Ursula Wild, [3]Jane Heyworth, [4]Deborah Glass, [2]Thomas Erren*. [1]*Curtin University, Perth, Australia*; [2]*University of Cologne, Cologne, Germany*; [3]*University of Western Australia, Perth, Australia*; [4]*Monash University, Melbourne, Australia*

Background In 2007, the International Agency for Research on Cancer [IARC] classified shiftwork involving circadian disruption [CD] as probably carcinogenic to humans. We hypothesised that CD occurs if individuals work during their preferred sleep time (i.e. their biological nights).
Objective We intended to refine the measure of exposure to shiftwork involving CD within the Breast Cancer, Environment and Employment Study (BCEES).
Methods For each participant, we classified jobs with regard to whether their work times overlapped with their individual biological night. Preferred sleep times were obtained through the first two questions of the Horne-Östberg morningness-eveningness questionnaire [MEQ] ("perfect day" approach Groß et al., *Medical Hypotheses* 2017).
Results Re-classifications were confined to shifts which include work - in part or in full - between midnight and 7 am. Circadian disruption was defined as an overlap of the preferred sleep time and the assessed shift times (+2 hours e.g. for travelling). We found a small, non-statistically significant association between shiftwork involving CD and breast cancer risk not different from prior results (Fritschi et al., *British Journal of Cancer* 2013). Assessment of total CD was limited as numbers of chronodisrupted shifts associated with work between 0000–0700 and working times such as 0800–1600 or 1400–2200 could not be assessed.
Conclusions Whether accumulated CD doses due to variable work times during variable individual biological nights are carcinogenic must remain open at this stage. To provide interpretable answers, information on all shifts during the working life with potential CD for individuals with different biological nights must be considered.

Oral Presentation

Policy/Impact

| 0087 | THE IMPACT ON LABOUR MARKET AFFILIATION OF CHANGES IN SICKNESS ABSENCE BENEFIT LEGISLATION USING A NEWLY DEVELOPED DANISH REGISTER ON SALARY AND SOCIAL PAYMENTS, 2010–2014 |

Jacob Pedersen. *National Research Centre for the Working Environment, Copenhagen O, Denmark*

Objectives January 2012 the Danish law on sickness absence benefit was regulated in terms of the employer period. The

regulation implied that the period of which the employer must pay full salary to the sick-listed employee before being compensated by the municipality "employer period", was extended from 21 days to 30 days. The longer employer period may have influenced how companies manage sickness absence, as well as hiring and firing procedures. The regulation may have had an effect on the dynamics of the labour market as a whole and to some extend in subgroups of certain exposure of occupational health if the regulation favours certain types of industries. In the present study we investigate to what extent such regulation impact the labour market affiliation as a whole and in the context of occupational health.

Methods The labour market affiliation will be analysed by the use of the Danish Working Environment Cohort Study 2010, and the 2012 survey of the National Occupational and Health. Both surveys will be linked with the newly released register "Labour market accountant" (AMR) on salary and social payments. The labour marked affiliation will be analysed by a well-established Multi-state model containing five major stages with three trans durable stages; work, sickness absence, and unemployment, and two absorbing stages; disability pension, and early retirement scheme. The two surveys will make it possible to analyse the effect on the labour market affiliation before and after the regulation was initiated.

Poster Presentation

Cancer

| 0088 | CHARACTERISTICS OF NON-HODGKIN'S LYMPHOMA PATIENTS AMONG A COHORT OF SEMICONDUCTOR-MANUFACTURING WORKERS |

Jung-min Sung*, Sang-gil Lee, Eun-A Kim. *KOSHA, Ulsan, Republic of Korea*

Objective The Occupational Safety and Health Research Institute (OSHRI) established a cohort consisting of workers in six semiconductor-manufacturing companies to determine cancer incidence. The data gathered until 2014 revealed that 43 non-Hodgkin's lymphoma (NHL) cases occurred. This study aimed to identify the characteristics of these cases.

Methods In 2008, OSHRI established a cohort based on company personnel records and national cancer registration data that could be obtained from Statistics Korea on former and current workers of six semiconductor-manufacturing factories in South Korea since 1998. This study analysed the characteristics of NHL cases that occurred in this cohort.

Results In the cohort, 43 NHL cases occurred. Of those cases, 23 were men and 20 were women. The highest incidence of 20 cases occurred in the workers in their 30 s. The years 1995–1999 and 2000–2004 were the most common time periods for entry into the company with 11 and 10 cases, respectively. The types of occupations included: 33 manufacturing workers, 7 non-manufacturing workers, and 3 who could not be precisely categorised.

Conclusion Although NHL as an illness that is known to occur at a relatively old age, the prevalence of NHL among former and current semiconductor workers, occurring at a younger working age, may suggest causality based on occupation. As such, identifying their demographic characteristics is a necessary step towards identifying the occupational hazards in the semiconductor industry and the risk factors for development of NHL.

Oral Presentation

Ageing Workforce

| 0089 | PREDICTING WORKING BEYOND RETIREMENT IN THE NETHERLANDS: AN INTERDISCIPLINARY APPROACH INVOLVING OCCUPATIONAL EPIDEMIOLOGY AND ECONOMICS |

[1]Cécile Boot*, [1]Micky Scharn, [1]Astrid de Wind, [3]Goedele Geuskens, [1,2]Martijn Huisman, [1]Maarten Lindeboom, [1]Allard Van der Beek. [1]*VU University Medical Centre, Amsterdam Public Health research institute, Amsterdam, The Netherlands;* [2]*VU University, Amsterdam, The Netherlands;* [3]*TNO, Leiden, The Netherlands*

Objectives No study so far has combined register-based socioeconomic information with self-reported information on health, demographics, work characteristics and social environment in one study. The aim of this study is to investigate whether socioeconomic, health, demographic, work characteristics and social environmental characteristics independently predict working beyond retirement.

Methods Questionnaire data from the Study on Transitions in Employment, Ability and Motivation was linked to data from Statistics Netherlands. A prediction model was built consisting of the following blocks: socioeconomic, health, demographic, work characteristics and social environment. First, univariate analyses were performed (p<0.15), followed by correlations and logistic multivariate regression analyses with backward selection per block (p<0.15). All remaining factors were combined into one final model (p<0.05). Internal validation was performed.

Results In the final model, only factors from the blocks health, work and social environmental characteristics remained. In the final model, better physical health, >2 days/week intensively physically active, higher body height and working in healthcare predicted working beyond retirement. If respondents had a permanent contract or worked in handcraft, or had a partner that did not like them to work until the official retirement age, they were less likely to work beyond retirement. Area under the curve was 73% (p<0.05). Explained variance was 18.3%. Internal validation led to an area under the curve of 68%.

Conclusion Health, work characteristics and social environment predicted working beyond retirement, but register-based socioeconomic and demographic characteristics did not independently predict working beyond retirement. This study shows that working beyond retirement is multifactorial.

Oral Presentation
Other

0090 THE SYNERGY PROJECT

[1]Kurt Straif*, [1,2]Ann Olsson, [1]on behalf of the SYNERGY study group. [1]International Agency for Research on Cancer, Lyon, France; [2]Karolinska Institutet, Stockholm, Sweden

The SYNERGY project was established in 2007 to provide a scientific basis for recognition of lung cancer as an occupational disease in workers exposed to more than one lung carcinogen. It represents the largest database of case-control studies on lung cancer with complete life course information on occupation and tobacco smoking. Data from 19 370 lung cancer cases and 23 674 controls are available from 16 case-control studies conducted between 1985 and 2010. Cases were recruited from hospitals or cancer registries, and in most studies eligible if: 1)<75 years; 2) resident for at least one year and 3) confirmed diagnosis of lung cancer by histology or cytology. Controls were recruited from the general population (81%) or hospitals (19%), and were individually or frequency matched to cases by sex and age. Information was predominantly collected by interviews with the study participants themselves, though next-of-kin respondents were accepted in five of the studies if subjects were unavailable (9.1% of cases, 6.6% of controls). Ethical approvals for the original studies were obtained in each country and for the SYNERGY project from the IARC Ethics Committee. The database comprises around 14% never smokers, whereof 822 cases. Women represent around 20% or the study population. The strengths of SYNERGY includes bringing together epidemiologists and exposure assessment experts from around the world to advance occupational cancer epidemiology, 2) power to study small risks, 3) providing quantitative exposure estimates for population-based case-control studies, and 4) allowing sub-group analyses, e.g. by gender, histology and smoking status.

Oral Presentation
Methodology

0091 EVALUATING THE EPIDEMIOLOGICAL EVIDENCE – A COMPARISON OF FRAMEWORKS FOR ASSESSING INDIVIDUAL STUDIES

Barbara Glenn. USA Environmental Protection Agency, Washington, D.C., USA

To be presented in an accepted mini-symposium

Introduction Frameworks and tools developed to evaluate observational studies of environmental and occupational exposures for systematic reviews draw from similar efforts in the field of healthcare management to achieve increased transparency in assessment conclusions.

Methods This presentation compares approaches developed by U.S. and European government and academic institutions that evaluate risk of bias and sensitivity for observational studies of environmental and occupational exposures. An international collaborative project to adapt a risk of bias tool developed by the Cochrane Collaborative (Risk of Bias in Non-Randomised Studies of Interventions) that will address the varied study designs and exposure assessment methods used in these types of studies is described.

Results Several commonalities are identified, including the use of signalling questions to guide evaluations, outcome-specific rather than study-specific evaluations, and avoidance of numeric scores. All frameworks evaluate participant selection/attrition/exclusion, confounding, reliability and validity of exposure and outcome assessments, and selective reporting. Less consistently used domains are analytic methods, sensitivity, and conflict of interest. The frameworks use different approaches to derive an overall conclusion about risk of bias or confidence.

Conclusion As with narrative reviews, structured frameworks depend heavily on expert judgement requiring the involvement of reviewers with the correct discipline-specific expertise. The transparency of the overall evidence integration in a systematic review depends on the knowledgeable and clear presentation of study evaluation conclusions.

The views expressed are those of the author and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.

Poster Presentation
Respiratory

0092 A CRITICAL EVALUATION OF FRACTIONAL EXHALED NITRIC OXIDE (FENO) AND PULMONARY FUNCTION TEST LEVELS IN BAKERY AND PLASTICS WORKERS

Halim Issever*, Hulya Dogan Tiryaki, Nefise Seker, Elif Ezirmik, Iklim Gurcan. Istanbul University,Faculty of Medicine, Istanbul, Turkey

This study aimed to investigate whether the irritants used in bread and plastic industry cause irritation in the respiratory tract to determine the benefits of adding FeNO measurement method to periodical controls in various business branches.

Our cross-sectional study was carried out 88 workers in the plastics and bread sectors in Istanbul. Our control group consists of 49 people. FeNO levels were measured and the relationship between these parameters and pulmonary function test parameters was investigated. When FeNO levels in control and work groups were investigated, they were found over 25 ppb in 8 persons working in bakery, 11 in plastics, and in 9 of the control group.

When parameters related with respiratory function were evaluated, people whose parameters were found to be lower than 80% were as follows respectively: PEF levels of 29 people (64,4%) working in bakery in and $FEF_{(25-75\%)}$ levels of 5 people (11,1%); whereas PEF values of 26 people (60,5%) among the workers of plastics and $FEF_{(25-75\%)}$ levels of 5 people (11,6%) were found to be less than 80%. A statistical significance was found between FeNO and PEF levels which were under 80%. In workers whose FeNO levels were found under 25 ppb and those whose PEF levels were under 80% were found to be significantly high (p=0.03).

Measuring FeNO levels will be helpful to identify the various environmental respiratory irritants at workplaces before

they cause occupational illness. The widespread use of FeNO level measurement will be beneficial for the protection and development of workers' health.

Further prospective research is required to determine the causal chain of these associations.

Poster Presentation
Ageing Workforce

0093   **WORK STRESS MEASURES ARE ASSOCIATED WITH HEALTH AND PHYSICAL FUNCTION AROUND THE AGE OF RETIREMENT: FINDINGS FROM THE HERTFORDSHIRE COHORT STUDY**

Martin Stevens*, Holly Syddall, Catherine Linaker, Stefania D'Angelo, Karen Walker-Bone. *MRC Lifecourse Epidemiology Unit, University of Southampton, Hampshire, UK*

Background Studies such as Whitehall II have shown that poor psychosocial work conditions are associated with ill health among employees; it is unclear whether these effects persist and affect health in later life. We have addressed this question using data from the Hertfordshire Cohort Study (HCS).

Method 1021 men and 753 women (59–73 years of age) underwent a home interview and clinical examination and completed a social health questionnaire detailing job-strain (JS) and effort-reward imbalance (ERI) in the current or most recent job.

Logistic and linear regression were used to compare the health of participants who reported JS and/or ERI with those who reported neither.

Results 61% reported neither JS or ERI whilst 10% reported both. 72% were no longer working. JS/ERI was not associated with cardiovascular outcomes (stroke, ischaemic heart disease, hypertension) or type II diabetes. However, participants who reported both JS and ERI had increased odds of poor physical function (SF-36) in comparison with those who reported neither (odds ratios: 2.3 [95%CI 1.5,3.7] men; 2.0 [95%CI 1.2,3.6] women). Average grip strength was 1.7 kg [95% CI 0.2,3.3] lower among men who reported both JS and ERI compared to those reporting neither.

Similarly, participants reporting both JS and ERI had poorer SF-36 mental health in comparison with those reporting neither (odds ratios: 2.8 [95%CI 1.8,4.4] men; 3.1 [95% CI 1.8,5.3] women).

Conclusions JS and ERI in combination are associated with poor physical and mental health outcomes in later life.

Poster Presentation
Ageing Workforce

0096   **BODY MASS INDEX (BMI), CHRONIC MUSCULOSKELETAL PAIN AND ADVERSE EMPLOYMENT OUTCOMES IN OLDER WORKERS: THE HEALTH AND EMPLOYMENT AFTER FIFTY (HEAF) STUDY**

[1,2]Stefania D'Angelo*, [1,2]Keith Palmer, [1,2]Karen Walker-Bone, [1,2]Clare Harris, [1,2]David Coggon, [1,2]Cathy Linaker. *[1]MRC Lifecourse Epidemiology Unit University Of Southampton, Southampton, UK; [2]Arthritis Research UK/MRC Centre for Musculoskeletal Health and Work, Southampton, UK*

Introduction The combination of an ageing population and an obesity epidemic has important health and economic implications, with growing numbers of older people remaining in work. Obesity is a risk factor for musculoskeletal disorders, which are often more common and severe at older ages and limit work capacity. As part of a longitudinal cohort study on the impact of health on employment in later life, we explored the relation between BMI, chronic musculoskeletal pain and employment outcomes.

Methods Some 8,000 50–64 year-olds recruited from 24 English general practices completed a baseline postal questionnaire about work, home circumstances and measures of health. Logistic regression was used to explore associations between BMI and pain (lasting >1 month in the past year and interfering with everyday activity) and work outcomes (health-related job loss, prolonged sickness absence, cutting down at work), adjusting for educational background and mental health.

Results A total of 7585 participants were included, 861 of whom were not in work for a health reason. More than a quarter (26%) of participants reported chronic pain and almost a quarter were obese. Adverse work outcomes were only weakly associated with obesity on its own but strongly associated with the combination of chronic pain and obesity (OR range 3.9–6.8). Significant associations were also seen in the underweight group (BMI <18.5) (OR range 3.9–14.1).

Conclusions Prevention of chronic pain and obesity is important, but weight control is of particular importance in older workers with musculoskeletal problems, in terms of work capability and job retention.

Poster Presentation
Musculoskeletal

0097   RISK FACTORS FOR OCCUPATIONAL LOW BACK PAIN (LBP), MEDICINE USE, AND SEEKING CARE FOR LBP: RESULTS FROM A PROSPECTIVE COHORT STUDY

[1]Arun Garg*, [1]Jay Kapellusch, [2]Kurt Hegmann. [1]UWM, Milwaukee, WI, USA; [2]University of Utah, Salt Lake City, UT, USA

Objective The aim of this study was to evaluate relationships between job physical demands and risk of low-back pain (LBP), using medication to treat LBP (M-LBP) and seeking care for LBP (SC-LBP).

Methods Worker demographics, LBP history, psychosocial factors, hobbies, job physical demands (using the Revised NIOSH Lifting Equation) were assessed at the time of enrollment (551 workers). There were 258 incident-eligible workers (a continuous pain-free period of at least 90 days at the time of enrollment) and were followed monthly for up to 4.5 years to determine new LBP, M-LBP, and SC-LBP cases. Changes in job physical demands were measured. Associations between risk factors and LBP outcomes were modelled using proportional hazards regression with time varying covariates.

Results LBP and M-LBP were fairly common affecting 47.7% and 37% workers, respectively. SC-LBP much less common affecting 1 in 11 workers. Peak Lifting Index (PLI) and Peak Composite Lifting Index (PCLI) were associated with all three outcomes of LBP ($p < 0.05$). PLI and PCLI had peak Hazard Ratios of 4.3 and 4.2 for LBP, 3.8 and 4.3 for M-LBP, and 23.0 and 21.9 for SC-LBP, respectively. LBP history was associated with all three outcomes of LBP. Age, gender, BMI, hobbies, and psychosocial factors showed inconsistent relationships with the three outcomes of LBP.

Conclusion Job physical demands are associated with increased risk of LBP, M-LBP and SC-LBP. The PLI and PCLI are useful metrics for estimating job physical demands.

Poster Presentation
Shift Work

0098   EVALUATION OF SLEEP PROBLEMS AND SLEEP HYGIENE FOR SHIFT WORKERS IN KOREAN STEEL MANUFACTURING COMPANY

[1]Ji-Won Lee*, [1]Hyoung-Ryoul Kim, [2]Taewon Jang, [3]Hye-Eun Lee, [1]Junsu Byun, [1]Seyoung Lee. [1]Department of Occupational and Environmental Medicine, College of Medicine, the Catholic University of Korea, Seoul, Republic of Korea; [2]Department of Occupational and Environmental Medicine, Hanyang University Guri Hospital, Guri, Republic of Korea; [3]Department of Occupational and Environmental Medicine, College of Medicine, Kyung Hee University, Seoul, Republic of Korea

Objectives To estimate self-reported sleep health of shift workers and construct plans to minimise harm of the shiftwork.

Methods A cross-sectional survey was conducted by using structured questionnaires on workers who were employed in a steel company. They divided into 3 groups (daytime workers, 4 teams 3 shifts, and other shifts). The survey contains questionnaires about demographic characteristics, sleep hygiene, condition of their work place, Insomnia Severity Index (ISI) and the Epworth Sleepiness Scale (ESS) to evaluate workers' sleep disorder and daytime sleepiness. Among shift-workers, 'insomnia group' is compared to 'normal sleep group' with chi-square test. The multiple logistic regression analysis was performed to explore risk factors of 'severe insomnia'.

Results Workers with severe insomnia were 6.7% in other shifts group, and 2.3% in 4 teams 3 shifts group. There was no severe insomnia in daytime workers. Among 4 teams 3 shifts group, 12.9% workers complained severe daytime sleepiness. With the practice of sleep hygiene, generally the items for improving environment to sleep well showed higher rate in 'severe insomnia group' than 'normal sleep group'. It might be that the workers who suffered from insomnia tried to overcome it. The items which disrupt sleep were concordantly higher in 'insomnia group' than in 'normal sleep group', suggesting that such kind of adverse sleep habits are negatively affect sleep of shift workers.

Conclusion The results of present study suggest relationship between sleep hygiene and sleep disorders among shift workers. To minimise shift worker's sleep problem, proper sleep hygiene is necessary.

Poster Presentation
Psychosocial

0099   PSYCHOLOGICAL WORK ENVIRONMENT AND SUICIDAL IDEATION AMONG NURSES IN TAIWAN

[1]Weishan Chin*, [2]Juidth Shu-Chu Shiao, [3,4]Yue-Liang Leon Guo, [2]Yu-Ju Li, [5]Pei-Yi Hu, [5]Jiune-Jye Ho. [1]Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University School of Public Health, Taipei, Taiwan; [2]Department of Nursing, College of Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan; [3]National Institute of Environmental Health Science, National Health Research Institutes, Zhunan, Taiwan; [4]Department of Environmental and Occupational Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan; [5]Institute of Labour, Occupational safety and Health, Ministry of Labour, Taipei, Taiwan

Background Nurses are exposed to poor psychological work environment which in turn may cause poor mental health. Poor mental health is a risk factor for suicidal ideation.

We intended to understand the association between psychosocial work environment and suicidal ideation among hospital nurses in Taiwan.

Method A self-reported questionnaire including demographic data, psychological work environment, and the question of suicidal ideation was sent to our participants- female nurses working in hospitals. Multiple logistic regression and population attributable risks (PARs) were preformed to assess the effect of psychological work environment on reporting having suicidal ideation.

Results A total of 2492 (72.6%) returned the questionnaires and were eligible for final analysis. The prevalence of reporting suicidal ideation was 18.3%. Higher risk of suicidal ideation was found associated with age between 36 and 40, educational level of Junior college or below, working for more than 60 hours per week, higher personal burnout, higher client-related burnout, and always felt stressed at job.

Estimation of PAR showed that higher personal and client-related burnout, and always felt stressed at job were the most crucial factors and accounted for 12.2%, 9.3%, and 7.7% suicidal ideation among nurses.

Conclusion A significant proportion of nurses developed suicidal ideations. Poor psychological work environment and long working hours were relevant factors for suicidal ideation. A good psychological work environment is warranted to dissuade nurses from developing suicidal ideations.

Poster Presentation

Specific Occupations

0100 CHILDHOOD IN BACKSTAGE: REPERCUSSIONS, RISKS AND CHALLENGES OF ARTISTIC CHILD LABOUR

Sandra Cavalcante*, Rodolfo Vilela. *Public Health Faculty – University of São Paulo, São Paulo/SP, Brazil*

In Brazil, despite constitutional prohibition of labour before 16 years and absence of law that sets limits to protect the young artist health, court orders have authorised children and adolescents participation in artistic productions, based on the international standard and the judge´s subjective criteria.

The study aims to describe and analyse the young artist activity and its possible impact on the child´s development, according to the reports from such youth and their parents.

This qualitative exploratory research collected data using 25 individual interviews: 10 junior artists, aged between 10–13, and their mothers, in semi-structured individual interviews. Open mode Interviews were conducted with 5 adult professional of artistic segment working with child artists. This survey also made 3 days of observation in soap opera backstage with characters being played by children.

The results show that child participation in the artistic segment have characteristics of labour and that there is no special care to adapt the production process observed to the young artist needs; relationships are established in atmosphere of pressure, competition and vanity, and the accompanying mothers are aware of the presence of risks. Bio-psycho-social health effects have been reported both, positively: increased self-esteem, improved learning skills, higher culture acquisition; and negatively: low self-esteem, elevated self-criticism, poor nutrition, sleep disorders, deficits in school performance and damages to relationships.

The law is often disregarded due to lack of court permits or due to accompanying parent is not allowed to remain in set to supervise the child during testing, recording or presentation.

Poster Presentation

Working Conditions

0101 OCCUPATIONAL EXPOSURES AND DEPRESSIVE SYMPTOMS OF PREGNANT WORKERS IN TAIWAN

[1]Sherri Yeh, [1]Chi-Hsien Chen*, [2]Chien-Nan Lee, [1]Ying-Hsuan Wu, [1]Nai-Chi Tu, [1,4]Yue-Leon Guo, [1,3]Pau-Chung Chen. *[1]Department of Environmental and Occupational Medicine, and Centres for Occupational Disease and Injury Service, National Taiwan University Hospital, Taipei City, Taiwan; [2]Department of Gynaecology and Obstetrics, National Taiwan University Hospital, Taipei City, Taiwan; [3]Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University College of Public Health, Taipei City, Taiwan; [4]National Health Research Institute, Miaoli County, Taiwan*

Objectives This study aimed to describe the prevalence of exposures to occupational hazards among pregnant workers and examine the prevalence of depressive mood and the associated underlying risk factors.

Materials and Methods Subjects were recruited during their regular prenatal screening at 12 weeks gestation in one medical centre and one local clinic in Northern Taiwan. Data were obtained through questionnaires containing demographic characteristics, workplace exposures, occupational burnout inventory, job content questionnaire, and Edinburgh Postnatal Depression Scale (EPDS).

Results Of 172 women screened, the most commonly encountered exposure was to prolonged standing (30%), followed by repetitive movements (26%) and noise (26%). 65% reported that consultation services on maternity protection or right were not provided in the work place, but those who were exposed to four or more hazards had more access to these services (p=0.0157). 13% of pregnant workers scored above the cutoff point (=10) on EPDS; in addition, higher work-related burnout, lower job control, and lower workplace support were significantly associated with antenatal depressive symptoms (adjusted odds ratio of 1.50, 0.68, and 0.89, respectively).

Conclusion These data revealed that pregnant workers suffered a substantial amount of occupational hazards and experienced depressive symptoms in Taiwan, and their work conditions may require increased monitoring and better improvement.

Poster Presentation

Specific Occupations

0103 FARMING AND MORTALITY FROM NON-HODGKIN'S LYMPHOMA IN TAIWAN

[1]Chun-Yuh Yang*, [2]Shang-Shyue Tsai. *[1]Department of Public Health, Kaohsiung Medical University, Kaohsiung, Taiwan; [2]Department of Healthcare Administration, Kaohsiung, Taiwan*

Mortality and incidence studies have suggested that agricultural workers may be at an increased risk for some cancers including non-Hodgkin's lymphoma (NHL). We used a death certificate-based case-control study design to investigate whether farmers in Taiwan had an increased risk of dying from NHL (ICD-9 codes 200 and 202). Data on all deaths of Taiwan residents were obtained from the Taiwan Death Certification Registry. Cases were deaths from NHL that occurred between 1997 and 2009 who were at least 50 years of age at death. Controls were deaths from all causes other than cancers. From each death certificate we extracted information on sex, marital status, year of birth, year of death, cause of death, county of residence, and usual occupation. The mortality odds ratio (MOR) and their 95% confidence interval (CI) were calculated using logistic regression models. From 1997 to 2009, a total of 32 456 deceased farmers were identified. Of these 32 456 decedents, 205 deaths were coded as NHL. Farmers were at a slightly but statistically non-significant excess risk of NHL (aMOR=1.11, 95% CI=0.96–1.29) compared to nonfarmers. The MOR for NHL among farmers was higher among those who died at ages 65 or older (aMOR=1.25, 95% CI=1.06–1.48) than those who died at younger ages (aMOR=0.81, 95% CI=0.60–1.10). Further investigation of NHL among farmers is warranted.

Oral Presentation
Dusts and Fibres

| 0104 | CURRENT AND FUTURE ASBESTOS EXPOSURE RISKS IN AUSTRALIA |

Alison Reid. *Curtin University, Perth, Western Australia, Australia*

To be presented in an accepted mini-symposium.

Background Australia mined, and manufactured asbestos and imported asbestos products. More than 90% of this asbestos was used in the form of asbestos cement, which was used in the construction of private, public and residential properties, including fencing. Today there is a legacy of *in situ* asbestos throughout the built environment. The aim of this study was to identify possible sources of current and future asbestos exposure from the built environment.

Methods A review of the literature and telephone interviews with environmental health officers, asbestos removalists and assessors across the country, sought information about common exposure scenarios encountered.

Results Substantial amounts of asbestos remain *in situ* throughout the Australian built environment. Potential current and future sources of exposure risk to the public are from asbestos-cement containing roofs and fences, unsafe asbestos removal practices, illegal dumping and do-it-yourself home renovations.

Conclusion Consistent approaches in the regulation and enforcement of safe practice for the management and removal of asbestos is needed across all states, to ensure that *in situ* asbestos in the built environment is managed safely.

Oral Presentation
Working Conditions

| 0106 | ASSOCIATION BETWEEN HIGH TEMPERATURE AND WORK-RELATED INJURIES IN GUANGZHOU, CHINA |

Rongrong Sheng*, Changchang Li, Cunrui Huang. *School of Public Health, Sun Yat-sen University, Guangzhou, China*

Background Despite increasing concerns about the health effects of climate change, the extent to which workers are affected by temperature increases is not well documented. This study aims to investigate the association between high temperatures and work-related injuries in Guangzhou, China.

Methods We used workers' compensation claims to identify work-related injuries occurred in Guangzhou, China during 2011–2012. A time-stratified case-crossover study design was used to examine the association between temperatures and work-related injuries. Workers' compensation claims data were transformed into time series format, merged with meteorological data and analysed using conditional Poisson regression models.

Results Overall, a 1°C increase in minimum temperature was associated with a 0.9% increase in daily injury claims. Specifically, the incidence rate ratio (IRR) for male workers and workers aged 25–45 were (1.011, 95% CI 1.002 to 1.006), and (1.018, 95% CI 1.014 to 1.022), respectively. Significant associations were also found between daily minimum temperature and risk of injury for fractures injuries, lower degrees of disability, manufacture, outdoor industries combined and small-sized enterprises, and between maximum temperature and injury for workers aged 25–45 and indoor industries combined. Larger effects were observed in the warm season for Guangzhou (1 June–31 October).

Conclusions There is a significant association between injury claims and temperature in Guangzhou, China, for certain industries and groups. This study provides valuable epidemiological evidence for policy-makers and relevant stakeholders for reducing potential effects of the projected increase in global average temperature due to climate change.

Poster Presentation
Policy/Impact

| 0107 | EUROPEAN SURVEY OF NATIONAL HEPATITIS B VACCINATION POLICIES FOR HEALTHCARE WORKERS |

[1,2]Antoon De Schryver*, [2]Tom Lambaerts, [2]Nathalie Lammertyn. [1]*University of Antwerpen, Epidemiology and Social Medicine, Antwerpen, Belgium;* [2]*IDEWE, Leuven, Belgium*

Background The risk of transmission of blood-borne pathogens, including hepatitis B virus (HBV) to healthcare workers (HCWs) is well known. Under current European Union (EU)

legislation, all employers have to perform a risk assessment to identify workers exposed to HBV and offer them vaccination. Immunisation should be done as early as possible after the start of their career to avoid HBV infection and the development of a carrier status.

Methods We performed a cross-sectional survey of representatives from the Occupational Medicine section of the European Union of Medical Specialists (UEMS), to find out how policies have been put into practice in the European countries.

Results Answers were received from 21 countries, representing 78% of the population in the EU-28. HBV vaccination was mandatory for medical and nursing staff in 10 countries, mandatory for other paramedical staff, medical and nursing students in nine countries, for paramedical students in eight countries. It was recommended in all other participating countries. Serotesting before vaccination was done in eight countries. The vaccination schedule most often used was 0, 1, 6 months (18 countries). Serotesting after vaccination was done in 18 countries, boosters were recommended in 14 countries. A non-responder policy, including testing for carrier state, was present in 18 countries.

Discussion More consultation between key actors from MS at EU level could help to optimise the way this matter is dealt with in different MS in order to contribute to further reducing HBV transmission to HCWs

Oral Presentation

Shift Work

| 0108 | SHIFT WORK AND SLEEP-RELATED PROBLEMS: A NATIONWIDE SURVEY IN TAIWAN |

[1,2]Wei An Lin*, [2,3]Wei Shan Chin, [4]Chih Yong Chen, [4]Li Wen Liu, [4]Yi Tsong Pan, [1,2]Po Ching Chu, [1,3]Yue Leon Guo. [1]Department of Environmental and Occupational Medicine, National Taiwan University (NTU) College of Medicine and NTU Hospital, Taipei, Taiwan; [2]Institue of Occupational Medicine and Industrial Hygiene, NTU School of Public Health, Taipei, Taiwan; [3]National Institute of Environmental Health Sciences, National Health Research Institutes, Zhunan, Taiwan; [4]Institute of Labour, Occupational Safety and Health, Ministry of Labour, New Taipei City, Taiwan

10.1136/oemed-2017-104636.82

Objective 1) To estimate the prevalence of insufficient sleep and poor sleep quality by different shiftwork status in a representative sample of the Taiwan working population. 2) To estimate PARs of sleep-related problems as related to shiftwork.

Methods The data of 22 600 workers aged 20 to 65 years were retrieved from the Survey of Perceptions of Safety and Health in the Work Environment, a nationwide cross-sectional survey conducted in 2010. Insufficient sleep was defined as self-reported short sleep duration interfering with life or work activity. Sleep quality was categorised into very good, good, poor and very poor. Work shifts were classified into fixed daytime, evening, or night, rotating night shift, rotating shift not including night, and irregular. Multivariate logistic regression was used to calculate the ORs and then estimated PARs of sleep-related problems.

Results Among all workers, shift status were as follows: fixed daytime shift 74.7%, fixed evening 10.6%, fixed night 2.3%, rotating night shift 5.3%, rotating shift not including night 2.0%, and irregular 5.2%. The highest prevalence of sleep-related problems was observed among fixed night workers

with insufficient sleep of 12.1% and poor sleep quality 3.5%. Fixed night shift was associated with the highest risk of both insufficient sleep (OR=3.20, 95% CI 2.41–4.18, p<0.0001) and poor sleep quality (OR=3.51, 95% CI 2.07–5.62, p<0.0001). The estimated PARs of insufficient sleep and poor sleep quality related to rotating night shift were 9.0% and 8.9%, respectively.

Conclusions Night shiftwork was significantly associated with increased risk of insufficient sleep and poor sleep quality among Taiwanese workers.

Oral Presentation

Chemicals

| 0109 | HEALTH EFFECTS OF EXPOSURE TO ARSENIC: A 39 YEARS COHORT STUDY IN MANFREDONIA, ITALY |

[1,2]Emilio AL Gianicolo*, [1]Antonella Bruni, [3]Cristina Mangia, [4]Marco Cervino, [5]Maurizio Portaluri, [9]Roberta Pirastu, [10]Pietro Comba, [6,7]Annibale Biggeri, [1,8]Maria Angela Vigotti, [2]Maria Blettner, [11]on behalf of "Manfredonia environment and health Committee". [1]Italian National Research Council Institute of Clinical Physiology, Lecce, Italy; [2]University of Mainz, Institute for Medical Biostatistics, Epidemiology and Informatics, Mainz, Germany; [3]Italian National Research Council Institute of Atmospheric Sciences and Climate, Lecce, Italy; [4]Institute of Atmospheric Sciences and Climate, Bologna, Italy; [5]General Hospital Radiotherapy Department, Brindisi, Italy; [6]Epidemiologia e Prevenzione Giulio Maccacaro Social Enterprise, Torino, Italy; [7]University of Florence, Department of Statistics, Computer Science, Applications, Florence, Italy; [8]University of Pisa, Pisa, Italy; [9]Sapienza Rome University, Rome, Italy; [10]Istituto Superiore di Sanità Dipartimento Ambiente e Salute, Rome, Italy; [11]"Manfredonia environment and health Committee", Manfredonia, Italy

10.1136/oemed-2017-104636.83

Background On September 26th 1976 an accident occurred in a chemical plant located in Manfredonia (Apulia region, Italy) where Caprolactam (plastic) and Urea (fertilisers) were produced. More than 12 tons of arsenic compounds, used in the production of Urea, were released in the atmosphere, contaminating the plant and surrounding areas. Our study investigates late effects of arsenic exposure among workers present on the day of the accident and during the site clearance.

Methods We performed a historical cohort study including 1467 workers (39 females). Follow-up was performed by contacting municipalities of residence in Italy. Death certificates were collected. End of follow-up was either date of death, lost to follow-up or 15th March 2016. Cause specific mortality rates for the period 1976–2015 and 5 year age group were obtained for Apulia region and Foggia Province. Standardised Mortality Ratios will be calculated. Additionally, we will analyse data with Cox regression models by assigning workers to job category (white-collars, blue-collars and contract workers) and work area (fertiliser/plastic).

Results In the analysis restricted to men, we observed a total number of 51 102 person-years, 32 609 for 923 workers directly employed in the plant and 18 415 for 544 contract workers. We observed 307 deaths; 161 among contract workers. Highest mortality rate (8.7 deaths per 1000 person-year) was observed among contract workers. Higher values were observed among workers of the fertiliser work area.

Conclusions The results suggest an increased mortality for all causes among contract workers and employees in the fertiliser area. Cause-specific analysis will be presented.

Poster Presentation

Psychosocial

| 0110 | THE ASSOCIATION BETWEEN PSYCHOSOCIAL FACTORS AND NEEDLESTICK INJURIES AMONG NURSES WORKING IN DIFFERENT HEALTHCARE SETTINGS |

[1]Ting-Ti Lin*, [2]Judith Shu-Chu Shiao, [3,4]Yue-Liang Guo, [5]Hsueh-Ching Wu, [6]Jiune-Jye Ho. [1]College of Nursing, University of Illinois at Chicago, Chicago, USA; [2]School of Nursing, College of Medicine, National Taiwan University, Taipei City, Taiwan; [3]Institute of Occupational Medicine and Industrial Hygiene, School of Public Health, National Taiwan University, Taipei City, Taiwan; [4]Department of Environmental and Occupational Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei City, Taiwan; [5]Department of Nursing, Hsin Sheng Junior College of Medical Care and Management, Taoyuan City, Taiwan; [6]Institute of Labour, Occupational Safety and Health, Ministry of Labour, New Taipei City, Taiwan

Objective To understand the psychosocial effects of needlestick injuries (NSIs) among nurses working in different healthcare settings.

Method A total of 5535 fulltime registered nurses (RN) working among secondary referral hospitals (SRH) or primary clinics (PC) were recruited between 2009 and 2010. A structured self-administered questionnaire was used to assess nurses' psychosocial working conditions and their experiences of NSIs. The psychosocial working conditions were assessed by the Chinese Job Content Questionnaire and a workplace justice scale. The NSIs were assessed by asking nurses' experiences of NSIs in the past 12 months. Multivariable logistic regression was used to analyse the associations between psychosocial factors and NSIs.

Results A total of 1032 and 1020 eligible questionnaires for SRH and PC nurses were included for final analysis. The incidence rate of NSIs was 15.2% for SRH nurses and 19.9% for PC nurses. Shift work (AOR: 1.8, 95% CI: 1.2, 3.0) and high psychological demands (AOR: 1.5, 95% CI: 1.0, 2.1) were identified as risk factors of the annual incidence of NSIs among SRH nurses, whilst the risk factors of the annual NSIs included low job control (AOR: 1.4, 95% CI: 1.0, 2.0) and low workplace justice (AOR: 1.6, 95% CI: 1.1, 2.4) among PC nurses.

Conclusion This study identified that the psychosocial factors of nurses' NSIs varied across different healthcare settings. Specific strategies for different healthcare settings to prevent nurses' NSIs are warranted.

Oral Presentation

Shift Work

| 0111 | THE ASSOCIATION BETWEEN WORK SCHEDULE CONTROL AND NURSES' BURNOUT IN TAIWAN |

[1]Ting-Ti Lin*, [2]Judith Shu-Chu Shiao, [3,4]Yue-Liang Guo, [2]Yi-Chuan Chen, [2]Yu-Ju Li, [5]Jiune-Jye Ho. [1]College of Nursing, University of Illinois at Chicago, Chicago, USA; [2]School of Nursing, College of Medicine, National Taiwan University, Taipei City, Taiwan; [3]Department of Environmental and Occupational Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei City, Taiwan; [4]Institute of Occupational Medicine and Industrial Hygiene, School of Public Health, National Taiwan University, Taipei City, Taiwan; [5]Institute of Labour, Occupational Safety and Health, Ministry of Labour, New Taipei City, Taiwan

Background Shiftwork and long work hours have been reported as significant risk factors for nurses' burnout. In addition, whether nurses have ability to *control* their own *schedule*, such as having options and decision over swapping shifts or taking unpaid leave, remain lacking.

Objective To examine the associations between nurses' work schedule control (WSC) and their effect on burnout.

Method A total of 3431 fulltime registered nurses working in the hospital were systematically sampled in 2013. A structured self-administered questionnaire was performed to assess nurses' WSC, work schedule demands (WSDs) and their effect on burnout. The WSC was assessed by asking nurses' experiences of requesting leave. Personal and client burnout status were measured using the Chinese version of the Copenhagen Burnout Inventory. Multivariable logistic regression was used to analyse the associations between nurses' WSC and their effect on burnout. The WSDs, including shiftwork patterns and average weekly working hours, were controlled.

Results A total of 2631 questionnaires were eligible for final analysis. Only 5% of participants experienced unrestricted leave. After adjusting for demographic data, both average weekly working hours and unrestricted leave were significantly associated with nurses' personal and client burnout. Nurses exposed to rotating shift work were more likely to experience client burnout.

Conclusion This study identified that work schedule control (WSC) was related to personal and client burnout among hospital nurses. Hospitals wishing to proactively *reduce nurses' burnout may* permit more unrestricted leaves when requested by the staff nurse.

Poster Presentation

Musculoskeletal

| 0112 | WORK ENVIRONMENT AND HEALTH IN DENMARK – RISK FACTORS RELATED TO PHYSICAL WORK DEMANDS FOR LONG-TERM SICKNESS ABSENCE |

Lars L Andersen. *National Research Centre for the Working Environment, Copenhagen, Denmark*

In 2012, more than 20 000 people of the general working population in Demark replied to the questionnaire Work Environment and Health. The aim of the present study is to prospectively analyse risk factors for long-term sickness absence related to physical work demands. The questionnaire from 2012 will be merged with a register of social transfer payment (DREAM) and followed up for two years after the questionnaire reply. Using cox-regression analyses, the risk of register-based sickness absence of at least 6 consecutive weeks from factors related to physical work demands will be determined. Analyses will be controlled for age, gender, lifestyle, psychosocial work factors, and socioeconomic status. The questionnaire and register has just been merged, and the analyses will be performed during April-June of 2017. The first results of this study will be presented at the conference as hazard ratios and 95% confidence intervals. Based on the results, the potential for preventing long-term sickness absence at workplaces will be discussed.

Poster Presentation

Psychosocial

| 0113 | STABLE PREVALENCE OF WORKPLACE BULLYING AMONG NORWEGIAN DOCTORS: A STUDY BASED ON NATIONAL SAMPLES IN 1993, 2004 AND 2014 |

Judith Rosta*, Olaf Aasland. *Institute for Studies of the Medical Profession, Oslo, Norway*

Objectives To describe the changes in 12 months prevalence of subjection to bullying at work for doctors in different job categories and medical disciplines from 1993 to 2014, and to find work and health-related factors associated with being subjected to workplace bullying for doctors in 2014.
Methods Nationwide postal surveys in Norway based on representative samples of 2628 doctors (72.8%) in 1993, 1004 (67%) in 2004 and 1261 (78.2%) in 2014. Main outcome measure was self-reported frequency of subjection to bullying at work from colleagues or supervisors within the last year. Response categories ranged from 1 (no) to 5 (daily or almost daily). Being subjected to bullying at work was defined as any answers above 1.
Results No significant differences were found in prevalence of subjection to workplace bullying in 1993 (5.7%, 95% CI 4.8–6.6), 2004 (7.3%, 5.4–9.2) and 2014 (7.0%, 4.5–8.5). Within job categories, the prevalence of being bullied were higher for senior hospital consultants and doctors in hospital management position than for specialty registrars, GPs and private practice specialists. Within medical disciplines, surgeons reported higher prevalence. In 2014, being bullied was significantly associated with females (OR 0.49, 95% CI 0.29–0.85), lower levels of job satisfaction (0.92, 0.90–0.94) and self-rated health (average or poor OR 2.3, 1.2–4.3; good 3.5, 1.5–8.2; very good OR 1), controlled for age and sickness absence.
Conclusions Subjection to workplace bullying remained at stable high level for doctors in Norway over a 20 year period. The findings underline the need for bullying prevention among Norwegian doctors.

Oral Presentation

Occupational Medicine (SCOM/Modernet)

| 0114 | COMPARISON OF COMPETENCY PRIORITIES BETWEEN UK OCCUPATIONAL PHYSICIANS AND NURSES |

[1]Drushca Lalloo*, [2]Evangelia Demou, [3]Marisa Stevenson, [1]Mairi Gaffney, [1]Ewan B Macdonald. *[1]Healthy Working Lives Group, Institute of Health and Wellbeing, College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow, UK; [2]MRC/CSO Social and Public Health Sciences Unit, Institute of Health and Wellbeing, College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow, UK; [3]University of The West Of Scotland, Paisley Campus, Glasgow, UK*

Objectives The competencies required of occupational physicians (OPs) and occupational health nurses (OHNs) separately have been studied in various countries but little research has made direct comparisons between these two key OH professional groups. Evolving OH practice and overlapping OP and OHN roles make it imperative that up-to-date competencies reflective of practice are established. The aim of this study was to compare current competency priorities between UK OPs and OHNs.
Methods A modified Delphi study conducted among representative networks of UK OPs and OHNs. This formed part of a larger Delphi, including international OPs. It was undertaken in two rounds (round 1- 'rating', round 2- 'ranking'), using a questionnaire based on available OH competency guidance, the literature, expert panel reviews and conference discussions.
Results The principle domain (PD) competency ranks were very highly correlated (Spearman's rho=0.972; p<0.001) with the same PDs featuring in the top four and bottom three in ranking. OPs and OHNs ranked identically for the top two PDs (good clinical care and general principles of assessment and management of occupational hazards to health). Research methods was ranked lowest by both groups.
Conclusions This study has observed a high level of agreement among UK OPs and OHNs on current competency priorities. The 'clinically-focused' competency priorities likely reflect that although OH practice will broaden in response to various factors, traditional 'core' OH activities will still be required. These mutually identified priorities can serve to strengthen collaboration between these groups, develop joint education/training programmes and identify common professional development opportunities.

Oral Presentation

Injuries

0115 GENDER AND PROPORTIONATE MORTALITY BY ACUTE OCCUPATIONAL PESTICIDES POISONING AMONG AGRICULTURAL WORKERS IN BRAZIL

Vilma Santana*, Maria Moura-Luna, Yukari Mise. *Federal University of Bahia, Salvador, Bahia, Brazil*

To identify gender-related differences in proportionate mortality estimates of acute occupational pesticides poisoning among farmer workers in Brazil. This is a proportionate mortality study, carried out with work-related injuries deaths, which occurred with farmer workers from 16 to 70 years of age, focusing acute occupational pesticide poisoning. Data were from the Brazilian Mortality Information System (SIM) from 2000 to 2013. Potential associated factors were age group, skin colour, marital status, education and country region. Estimates of proportionate mortality odds ratio of work-related acute pesticide poisoning was association the measure.

There were 6754 work-related injuries deaths among agricultural workers, 643 caused by occupational acute pesticide poisoning, a proportionate mortality of 9.5%, higher among women (n=65; 24.9%) compared with men (n=578; 8.9%) in general, and for all categories of potential associated factors. The contribution of work-related fatal pesticide poisoning relative to all occupational injuries among farmer women was higher when they were under 30 years of age, had brown or black skin colour, lived in the poorest regions of the country and the injury occurred during summer. Distinctively, males had relative excess of cases when were older, white, single or married, better education and the death occurred in all seasons but winter. Work-related deaths caused by pesticide poisoning are preventable and should not occur or be a very rare event as described in developing countries. The widespread use of pesticides in agriculture in Brazil warns to implement safer practices for all, targeting the growing number of women labour force, and young workers expressive in rural areas.

Oral Presentation

Cancer

0116 EVIDENCE OF DOSE-RESPONSE IN THE CAUSATION OF MESOTHELIOMA FROM ENVIRONMENTAL EXPOSURE

[1,2]Daniela Ferrante, [1,2]Corrado Magnani*, [3,4]Dario Mirabelli. *[1]Dept. Translational Medicine, University of Eastern Piedmont, Novara, Italy; [2]Unit of Cancer Epidemiology, Maggiore Hospital and CPO Piemonte, Novara, Italy; [3]Unit of Cancer Epidemiology, CPO Piemonte and University of Turin, Torino, Italy; [4]Interdepartmental Centre G Scansetti for Studies on Asbestos and other Toxic Particulates, University of Turin, Torino, Italy*

We investigated the relation between cumulative asbestos exposure and pleural malignant mesothelioma (PMM) in areas with environmental asbestos exposure from human activities and asbestos material in place, using our studies and a literature review.

Casale Monferrato (NW Italy) presents high PMM incidence caused by asbestos contamination at work and in the general environment from the asbestos cement Eternit plant that operated until 1986. A population-based case-control study including PMM diagnosed between January 2001 and June 2006 (200 PMM and 348 controls) observed among subjects never occupationally exposed a dose response relationship consistent with that caused by occupational exposures, based on individual assessment of environmental and domestic exposures. ORs were 3.8 (CI 95% 1.3 to 11.1) for cumulative exposure from ≥ 0.1 to < 1 f/ml-year, 14.8 (5.7 to 38.6) for ≥ 1–< 10 f/ml-y and 23.3 (CI 95% 2.9 to 186.9) for > 10 f/ml-y (reference: background level of asbestos exposure). ORs of about 2, statistically significant, were observed for domestic exposure and for living in houses near buildings with large asbestos cement parts.

Similar trends were observed in other studies that explored the dose response relationship in the low dose range (Iwatsubo et al 1998, Rodelsperger et al 2001, Lacourt et al 2014).

PMM risk increased with cumulative asbestos exposure in analyses limited to subjects non-occupationally exposed and in the environmental exposure range. These results provide indication of risk associated with common sources of environmental exposure and are highly relevant for the evaluation of residual risk after the cessation of asbestos industrial use.

Poster Presentation

Respiratory

0117 PERFORMANCE EVALUATION OF N95 RESPIRATOR AFFECTING FACTORS

Chane-Yu Lai*, Hsio-Chuan Lin, Pei-Yi Chiang. *Chung Shan Medical University, Taichung, Taiwan*

This study was to test the filtration efficiency and breathing resistance of N95 respirators of different storage periods using the most penetrating particle size aerosol by automated filter tester (TSI, model 8130). quality factor (q_f) was calculated to access possible effects of storage conditions and disinfection methods such as autoclaving and Gamma irradiation on the electric quality of fibres of the respirators.

The analysis of N95 respirators with different storage conditions revealed that: A statistical difference (p=0.0453) was noted in aerosol filtration among N95 respirators of various storage periods, and the penetration was lower in respirators within the valid date compared with those expired respirators. There was also a statistical significance (p=0.0082) in breathing resistance among various storage periods. Autoclaving method of disinfection increased penetration, but decreased q_f in respirators within valid dates when compared with those without disinfection. The dosage of 10 kGY, 25 kGY or 30 kGY Gamma irradiation also increased penetration, resistance and decreased q_f. There was no significant difference on penetration, resistance and q_f between respirators within or outside the valid dates when they were treated with the same

disinfection methods except that after autoclave, respirators within valid date have significant lower breathing resistance compared with the expired respirators (p=0.0282).

Although the various storage periods of N95 respirators reveal statistical significance, however, this is not the major affecting factor of filters fibre charge and filter quality. The method of Gamma irradiation appears stronger than storage period and autoclave method in affecting filters fibre charge and q_f.

Poster Presentation

Occupational Medicine (SCOM/Modernet)

0118   SAMPLING EVALUATION OF BIOAEROSOL AND ANTIBIOTIC-RESISTANT CHARACTERISTICS IN INTENSIVE CARE UNIT

[1,2]Chane-Yu Lai*, [1]Nien-Xin Wu, [2,3]Ann-Ru Kuo, [0]Ya-Huei Lin. [1]*Chung Shan Medical University, Taichung, Taiwan*; [2]*OSH Respirator Test Centre, Taichung, Taiwan*; [3]*Chung Shan Medical University Hospital, Taichung, Taiwan*

Our research was based in a medical centre's Internal Medicine Intensive Care Unit (MICU) and Surgery Intensive Care Unit (SICU) located in central Taiwan. Three bioaerosol samplers were utilised (Anderson six-stage, AGI-30, and BioSampler) for sampling. Upon acquisition of samples, they were inoculated and cultured on BBL Trypticase Soy Agar (with 5% Sheep Blood) medium for growth. The bacterial colonies were later identified and analysed for antibiotic-resistant characteristics via BD Phoenix automated microbial identification and susceptibility test analyzer.

Research results have showed from the bioaerosol samples acquired within the MICU that bacteria and fungi below cut off size of 4.7 μm were primarily due to high possibility to enter human lung's alveolar regions of the body, thereby causing opportunistic infections. In terms of bacterial strain identification, Gram-positive bacteria were mainly isolated with biosafety level of II. As for antibiotic-resistant bacteria analysis of MICU, strains were identified 63.5% that were resistant to National Health Insurance Administration (NHIA) designated first (17 types) and second (18 types) line antibiotics. This phenomenon could very likely affect the medical staffs working within the hospital environment. As a result, recommendations for MICU ventilation designs should be carefully evaluated for the effectiveness of controlling nosocomial infections as well as proper implementation of personal protective equipment in order to reduce bioaerosol opportunistic infections and harmful exposure effects.

Oral Presentation

Pesticides

0119   DNA VARIANTS AND ORGANOPHOSPHATE NEUROTOXICITY AMONG EMERGING FARMERS IN THE WESTERN CAPE OF SOUTH AFRICA

Tracy Glass, Mohamed Aqiel Dalvie*, Zelda Holtman, Anna Alvera Vorster, Rajkumar Sewcharan Ramesar, Leslie London. *University of Cape Town, Cape Town, Western Cape, South Africa*

Background Modulation of organophosphate (OP) neurotoxicity by genetic polymorphisms of xenobiotic metabolising enzymes (XMEs) has not previously been investigated

Objectives To investigate whether XMEs polymorphisms modify OP neurotoxicity among emerging farmers.

Methods A cross-sectional study of 301 emerging farmers was conducted. Neurotoxicity testing included forward and backward recall digit span and vibration sensitivity testing. Questionnaire data included demography, potential confounders and work history of pesticide exposures. Genomic DNA was analysed from study participants for DNA variants of two glutathione S-transferases (GST), N-acetyltransferase 2 (NAT2) and Paraoxonase 1 (PON1).

Results The median age of workers was 39 years (range: 30–48 years) of whom 54% were OP pesticide applicators. There was a low prevalence of the null genotype for GSTT1 (1%) and for GSTM1 (16%), while the genotypic frequency for the GA and AA grouping of rs1799931 (NAT2) was 10%. There was evidence of OP pesticide neurotoxicity modification by rs1799931 (NAT2), *rs662 (PON1)* and the null allele of GSTM1 in multivariate analysis. The strongest evidence of modification was observed for rs1799931 (NAT2) on the relationship between pesticide poisoning and impaired vibration sense. The increased prevalence of impaired vibration sense in OP poisoned compared to non-poisoned workers (Odds ratio=5.7, 95% confidence interval (CI): 1.4–22.7) was higher among those with the GG genotype than those with the GA and AA genotypes (Odds ratio=1.5, CI: 0.1–43.2).

Conclusion DNA variants of NAT2, PON1 and GSTM1 may modify OP neurotoxicity and this requires further exploration

Poster Presentation

Other

0120   PREDICTING LONG-TERM SICKNESS ABSENCE AND SUPPORTING RETURN-TO WORK PROCESSES, A QUANTITATIVE RESEARCH

[1]Kaat Goorts*, [3]Christiane Duchesnes, [1,2]Sofie Vandenbroeck, [3]Dorina Rusu, [1]Marc Du Bois, [3]Philippe Mairiaux, [1,2]Lode Godderis. [1]*KU LEUVEN, Leuven, Belgium*; [2]*IDEWE, Leuven, Belgium*; [3]*Université Liege, Liege, Belgium*

Long-term sickness absence is increasing in 27 European member states and Norway. Promoting good health and attendance, instead of penalising absence, has become a growing policy issue (Edwards & Greasley, 2010). As most employees will return to work spontaneously, resources for return to work projects should be focused on the high-risk group for long-term sickness absence.

In this project a questionnaire was developed to predict the risk of long-term sickness absence.

The development of the questionnaire started with a literature review of the predictive factors for long-term sickness absence, and with a review of existing questionnaires that question long-term sickness absence. The questionnaire will be validated in a pilot study of 10 000 participants. These data will be used to calculate its predictive value and to build a model to predict the risk of long-term sickness absence.

The literature study revealed 16 predictors for long-term sickness absence. The most predictive factor is, according to existing research, the patient's expectancy regarding their return to work. As the other factors are not unambiguously strong predictors, the pilot study will explore the predictive value of the complete model and each separate parameter. A new questionnaire was developed based on both reviews and the 16 predictors they revealed. The questionnaire is not specific for a certain illness, nor for use in a specific country.

The questionnaire developed in this research will support physicians to assess the risk of long-term sickness absence, and to guide more employees successfully and sustainably back to work.

Poster Presentation

Exposure Assessment

| 0121 | DATA ANALYSIS FOR BIOLOGICAL MONITORING IN SOUTH KOREA'S OCCUPATIONAL HEALTH FIELD |

Bo-Hwa Choi*, Mi-young Lee, Jungmin Sung. *Occupational Safety and Health Research Institute (OSHRI),KOSHA, Ulsan, Republic of Korea*

Object This study aims to provide a basis for policy to control the reliability of biological monitoring laboratories in occupational health by analysing data on annual biological monitoring.

Method We collected the survey requesting the number of data provided in 2014 and 2015, which laboratories participating in proficiency test program on biological monitoring responded to. Statistical data for biological monitoring (2003–2004) to reveal the current status of biological monitoring practices in the hospitals or occupational health laboratories were extracted from the KOSHA.

Result The total number of data of biological markers was up to 2 70 000 cases and 4 70 000 cases in 2013, 2014, respectively. Among them, the most dominant markers with regard to organic solvent exposure were urinary hippuric acid, methylhippuric acid and 2,5-hexanedione with 3 47 000 cases reported for 2 years. As for metal exposure, lead and cadmium in blood were the most frequently checked markers with 1 16 000 cases for 2 years. Among 180 occupational health organisations, 44% of them sent their samples to other laboratories for analysis. The problem of lack of proficiency test data was evident in biological markers including 2,5-hexanedione, N-methylformamide, and trichloroacetic acid, which were analysed in major big laboratories. Strict policy on these laboratories as well as tactics to encourage small laboratories to join more proficiency test items, were suggested.

Conclusion From the database of biological monitoring, the lack of reliability of biological monitoring in many biological markers was revealed. Future action to improve the reliability of all the biological monitoring analysis is requested.

Oral Presentation

Exposure Assessment

| 0123 | RECONSTRUCTION OF INDIVIDUAL RADIATION DOSES IN A COHORT OF FRENCH NUCLEAR WORKERS: CONSIDERING DOSES UNDER THE RECORDING THRESHOLD |

Lucie Fournier*, Dominique Laurier, Sylvaine Caër-Lorho, Eric Samson, Klervi Leuraud. *Institute for Radiological Protection and Nuclear Safety, Fontenay aux Roses, France*

Context The French nuclear worker cohort enables the evaluation of potential health effects of protracted low doses of ionising radiation. Dosimeters worn by the workers record annual individual exposure. However, below a certain value called recording threshold, dose quantification is too imprecise to be recorded and the dose is then considered to be null. This study aims to evaluate the magnitude of doses below the recording threshold with regards to the recorded doses.

Methods The cohort includes 59 004 workers, hired from 1950 and followed-up until 2004. A comprehensive review of the dosimetry practices in the facilities participating in the study was performed. Data on recording thresholds, minimal detectable levels and dosimeter reading frequencies was collected and analysed. Scenarios based on monthly data were used to impute doses under the threshold.

Results Recording threshold doses and reading frequencies decreased substantially over the cohort's follow-up period (from 0.5 to 0.2 milliSievert and from bimonthly to quarterly respectively) but the annual percentage of null recorded doses increased (from 51% to 91%). Results from the imputation of below the threshold doses will be presented.

Conclusion The estimation of doses under the threshold is complex, needs a precise reconstruction of the monitoring history, and requires modelling assumptions. Preliminary results indicate that the availability of monthly data plays a crucial role in evaluating the magnitude of doses under the recording threshold.

Declaration of potential conflict of interest: The work under consideration gets into the general framework of a research program with shared financial support by IRSN, AREVA and EDF.

Oral Presentation

Shift Work

0125 SHIFT WORK, CHRONOTYPE AND THE RISK OF CARDIOMETABOLIC DISTURBANCES

[1,2]Gerben Hulsegge*, [2]Susan Picavet, [1]Allard van der Beek, [2,3]Monique Verschuren, [1]Jos Twisk, [1]Karin Proper. [1]*VU Medical Centre and Amsterdam Public Health Research Institute, Amsterdam, The Netherlands*; [2]*National Institute for Public Health and the Environment, Bilthoven, The Netherlands*; [3]*University Medical Centre Utrecht, Utrecht, The Netherlands*

Introduction Shift work has been associated with cardiometabolic risk factors, but the relation is not clear for all risk factors, and the role of chronotype is largely unknown. We examined associations between shift work and cardiometabolic risk factors, and explored these associations in different chronotypes.

Methods Risk factors (anthropometry, blood pressure, lipids, glucose, gamma-glutamyltransferase, C-reactive protein, uric acid, and glomerular filtration rate) were assessed among 7768 adults in 1987–1991, with repeated measurements every five years. In the ongoing 6th examination wave data on shift work history have been collected, with data from 2013–2015 being available. In 2016, linear mixed models and logistic generalised estimating equations were used to estimate associations between shift work and risk factors one year later.

Results Shift workers had more often overweight (OR: 1.44, 95% CI: 1.06–1.95) and a higher body mass index (BMI) (β: 0.56 kg/m2, 95% CI: 0.10–1.03) than day workers. A significant difference in BMI between day and shift workers was observed among evening chronotypes (β: 0.97 kg/m2, 95% CI: 0.21–1.73), but not among morning chronotypes (β: 0.04 kg/m2, 95% CI: −0.85–0.93). No other significant associations between shift work and risk factors were found in the chronotype strata, except for glucose among intermediate chronotypes (β: −0.36, 95% CI: −0.62–0.11). No differences by frequency of night shifts and duration of shift work were observed.

Conclusions Shift workers, in particular evening chronotypes, have a higher risk of overweight than day workers. More research is however needed to verify our results, and establish whether tailored interventions by chronotype are wanted.

Oral Presentation

Policy/Impact

0126 OCCUPATIONAL BURDEN ESTIMATION: IS IT HAVING ANY IMPACT?

Lesley Rushton. *Imperial College London, London, UK*

Introduction Several recent occupational burden estimation studies have identified major risk factors contributing to important morbidity burdens. This paper discusses their impact.

Methods European studies include (1) the British occupational cancer burden study and (2) an EU socio-economic health impact assessment of introducing binding occupational exposure limits (OEL) for 25 workplace carcinogens. The global burden of occupational disease project (3) includes estimation for carcinogens, asthmagens, particulate matter, noise, and risk factors for low back pain and injury.

Results The British study (1) has informed the Health and Safety Executive's long latency programme and their guidance and practical interventions for risk reduction. The results have facilitated estimation of the financial impact of these cancers; the majority of the cost is borne by workers. It has also contributed to the successful Institution for Occupational Safety and Health 'No time to lose' campaigns to help industry to deliver effective workplace cancer prevention programmes.

The EU study (2) illustrates the use of cost/benefit analyses in OEL decision making processes. 'Efficient' cost/benefit ratios and 'disproportionate' compliance costs to small/medium sized enterprises are weighed against health-based predictions.

The global burden study (3) highlights inequalities in work-related disease burden between countries.

Discussion Occupational burden studies increase awareness of occupational disease generally and for particular diseases and galvanise different stakeholders to work together on prevention. They highlight potential inequalities to different sectors of society. However, they can be 'burdensome' regarding cost and effort and debate is needed on timing of and appropriate methods for future updates.

Oral Presentation

Other

0127 IF HEAVY LIFTING CAUSES RETINAL DETACHMENT, WHAT IS THE MECHANISM? IMPLICATIONS OF PATHOPHYSIOLOGY FOR EPIDEMIOLOGY

[1]David Kriebel*, [2]Stefania Curti, [1]Rebecca DeVries, [2]Andrea Farioli, [2]Stefano Mattioli, [1]Susan Sama. [1]*University of Massachusetts Lowell, Lowell MA, USA*; [2]*Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy*

Objectives Two epidemiologic studies have found evidence of increasing risk of retinal detachment (RD) with increasing occupational lifting and related physical efforts. Beyond case reports, there is little evidence to explain this association. We hypothesise two alternative mechanisms and explore their implications for epidemiology.

Methods Through literature review and discussions with retinologists, we developed hypotheses that predict different etiologic time windows for an effect of lifting on RD. The role of myopia in RD is better-understood, and provides important clues about possible roles of physical activity. Inter-ocular pressure (IOP) is likely to play a mediating role, and there are experimental studies of the effects of physical activity on IOP that may also provide useful evidence for understanding RD.

Results and Conclusions *Hypothesis 1*: brief increases in IOP caused by lifting increase the risk of retinal tears during posterior vitreous detachment (PVD) - a normal ageing process. This suggests that there may be an elevated risk of retinal tear in the weeks following PVD. If this is correct, lifting

during other times may not increase risk. *Hypothesis 2*: A long, slow pattern of increases in IOP from regular heavy lifting accelerates vitreous liquefaction, so that retinal tears are more likely to occur. Under this hypothesis, changes in IOP don't cause tears directly, but instead a long-term pattern of "peaks" in IOP may increase the chances of an RD. If this is correct, risk of RD would be associated with a longer history of heavy lifting.

Poster Presentation

Burden of Disease

0128 THE ECONOMIC BURDEN OF OCCUPATIONAL HEAT ILLNESSES IN ADELAIDE, SOUTH AUSTRALIA, 2001-2015

Xiang Jianjun, Hansen Alana, Pisaniello Dino, Bi Peng. *School of Public Health, The University of Adelaide, Adelaide, South Australia, Australia*

Objectives This study aims to investigate the characteristics of economic costs of occupational heat illnesses in South Australia, and to examine the association between high temperatures and occupational heat illness related economic costs.

Methods Workers' compensation claim data were obtained from SafeWork South Australia for the period of 2001–2015. Weather data were collected from the Bureau of Meteorology. The association between heat illness and economic loss was estimated by time-series analysis with generalized estimating equation models after controlling for day of week and long-term trends.

Results There were 306 occupational heat illness claims during the study period, resulting in medical expenditure of $1,795,640 and 2,787 days of time loss. Male workers accounted for 87.8% and 82.5% of medical costs and time-lost days, respectively. The mining industry had the greatest proportion of medical expenditure (56.0%) and days off work due to heat illnesses (67.4%), followed by "community services" and "agriculture, forestry and fishing". There was a positive relationship between maximum temperature (Tmax), medical expenditure, and days of time lost. A 1°C increase of Tmax was associated with 18.5% (IRR 1.185, 95% CI 1.071–1.312) increase in medical expenditure and 34.6% (IRR 1.346, 95% CI 1.128–1.534) increase in time-lost days due to occupational heat illnesses, respectively.

Conclusions Occupational heat related-illnesses represent a significant economic cost, and interventions in South Australia should be targeted at the mining industry.

Poster Presentation

Musculoskeletal

0129 MUSCULOSKELETAL PAIN AND WORKSTATION ASSESSMENTS AMONG OFFICE WORKERS IN A PUBLIC UNIVERSITY IN COSTA RICA

Adriana Campos-Fumero. *Costa Rica Institute of Technology, Cartago, Costa Rica*

Objectives To determine the prevalence of musculoskeletal pain (MSP) and identify workstation factors that might influence pain among office worker in a public university in Costa Rica.

Methods A sample of office workers (n=162, 13% of population) were selected at the main campus of the Costa Rica Institute of Technology. Information on MSP was collected using the Cornell Musculoskeletal Questionnaire. Collected data on workstations using OSHA Computer Evaluation Checklist. We used descriptive statistics to analyse data, prevalence was summarised in frequencies and percentages using Stata v13.

Results Prevalence of MSP was 88.2%, pain was higher among women (51.2%) than men (37.0%) and lower prevalence (17.9%) among older workers (more than 51 years of age). Musculoskeletal pain was most common in the lower back (68,3%), followed by neck (60.4%), upper back (51.8%) and wrist (24.4%). Main findings regarding workstation and postural problems were wrists not straight (63.6%), wrists/hands rest on sharp or hard edges (54.7%), glare present (51.7%), platform is not large enough to hold a keyboard and a mouse (50.8%), head, neck, and trunk do not face forward (42.1%), top of the screen is not at eye level (38.5%).

Conclusion Prevalence of MSP was common among office workers, but with a higher prevalence among women and younger people. High prevalence of pain highlights the importance of workplace interventions to reduce the influence on discomfort due to workstation design. In addition, office ergonomics training to all office worker could raise awareness and reduce risk factors due to behavioural problems.

Oral Presentation

Respiratory

0130 INCIDENCE OF WORK-RELATED RESPIRATORY ILL HEALTH ATTRIBUTED TO CLEANING AGENTS: OCCUPATIONAL AND CHEMICAL DETERMINANTS

Melanie Carder*, Martin Seed, Raymond Agius. *Centre of Occupational and Environmental Health, University of Manchester, Manchester, UK*

Introduction Exposure to cleaning products has been shown to be associated with adverse respiratory outcomes. The aim of this study was to investigate the medically reported incidence and occupational determinants of work-related respiratory disorders attributed to cleaning agents, and to explore the role of a chemical taxonomy and 'Quantitative Structure Activity Relationships' (QSAR) in categorising hazards and their mechanisms.

Methods Cases of work-related respiratory disease attributed to cleaning agents were identified and extracted from SWORD (Surveillance of Work-Related and Occupational Respiratory Disease), 1989–2015. Incidence, trends in incidence and incidence rate ratios (IRRs) by occupation were investigated. Agents were classified by chemical type and QSAR hazard indices were determined on selected typical organic chemicals.

Results A reported 667 cases (6% of the non-asbestos related cases) were attributed to cleaning agents. Diagnoses were predominantly asthma (58%) and inhalation accidents (29%). The agents were classified in ten specific chemical categories with the most frequently reported being aldehydes (33%) and chlorine/releasers (25%). An overall decrease in incidence of

−4.4% (95% CI: −6.8, −2.0) per year was observed. A large variation in risk was observed with the incidence for the highest risk occupation, 'launderers, dry cleaners and pressers', being more than 50 times the average of all other occupations. A high QSAR asthma hazard index was found in agents which were likely sensitisers.

Conclusion The data highlight a number of occupations at increased risk of adverse respiratory outcomes attributed to cleaning agents. Chemical features of the cleaning agents helped distinguish between sensitising and irritant agents.

Poster Presentation

Occupational Medicine (SCOM/Modernet)

0132   **IMMUNOLOGICAL HAZARDS IN ENGINEERED NANOMATERIAL HANDLING WORKERS**

[1]Chung-Ching Wang*, [1]Wei-Liang Chen, [1]Ying-Chuan Wang, [1]Sheng-Ta Chiang, [2,3]Saou-Hsing Liou. [1]Division of Family Medicine, Department of Family and Community Medicine, Tri-Service General Hospital, National Defense Medical Centre, Taipei, Taiwan; [2]Department of Public Health, National Defense Medical Centre, Taipei, Taiwan; [3]National Institute of Environmental Health Science, National Health Research Institutes, Miaoli, Taiwan

Based on our previous study, we found that allergic dermatitis was a prominent presentation in worker with engineered nanomaterials (ENMs) exposure. The objective of this study was to disclose the plausible immunological mechanism of allergic diseases in ENMs handling workers. We investigated 14 ENMs factories with 227 exposed workers and 137 non-exposed controls in Taiwan. We used questionnaire to collect exposures severity and probability scores and group the risk level (1 to 4) of each worker. The greater the risk level (RL), the higher the severity of nanomaterial toxicity and/or the higher the exposure probability. We found the distribution of characteristics in months of work (p=0.05), gender (p<0.01), education (p=0.001), smoking (p=0.001) and alcohol drinking (p=0.011) differed significantly between RL and control group. The LnIgE values among characteristics of study population showed the younger age (p<0.01) and male (p=0.034) had higher LnIgE values. After adjusted the confounders in multiple linear regression models, our results demonstrated that increased LnIgE values was significantly associated with RL2 (p=0.048), months of works above 42 months (p=0.008), CNT exposure (p=0.047) and nano-SiO2 exposure (p=0.034).

To our best knowledge, our study was the first study between ENMs exposure and immune responses in human. Our study highlighted that serum LnIgE values and exposure probability scores could have a positive association in the ENMs exposed worker. Moreover, the worker who exposed to CNT and nano-SiO2 might be more susceptible to IgE mediated allergic problems, like allergic dermatitis in our study population.

Oral Presentation

Respiratory

0133   **ENVIRONMENTAL AND OCCUPATIONAL TRIGGERS OF COPD SYMPTOMS: A CASE CROSSOVER STUDY**

[1,2]Susan Sama*, [1]Rebecca DeVries, [1]David Kriebel, [1]Rebecca Gore, [2]Richard Rosiello. [1]University of Massachusetts Lowell, Lowell, MA, USA; [2]Reliant Medical Group, Worcester, MA, USA

Introduction This study investigated the hypothesis that common occupational and environmental chemical exposures with known irritant or sensitising properties trigger exacerbations for patients with chronic obstructive pulmonary disease (COPD).

Methods We conducted a case crossover study in 168 COPD patients who were members of a disease management group (DMG) in central Massachusetts. Participants completed a baseline health survey and several short exposure surveys. Exposure surveys were administered by a nurse when a participant telephoned to report an exacerbation (case periods) and at a maximum of 3 randomly identified control periods when they were not experiencing an exacerbation. We compared exposures in the week preceding an exacerbation with exposures in normal (non-exacerbation) weeks. The questionnaire assessed short-term (one week) home, community and workplace activities and exposures that may be associated with COPD exacerbation.

Result Self-reported exercise was protective (OR=0.59 95% CI: 0.35–1.00). Among the chemical exposures, car and truck exhaust (OR=4.36, 95% CI: 1.76–10.80) and use of scented laundry products (OR=2.69, 95% CI: 1.31–5.52) showed strong positive effects. Self-reported respiratory infections were strongly associated with COPD exacerbation (OR=7.90, 95% CI: 4.29–14.50). Variations in outdoor temperature were associated with COPD exacerbation risk (moderate versus cold temperature OR=1.95, 95% CI: 0.26–0.70).

Discussion These results suggest that some environmental chemical exposures may play a role in triggering COPD exacerbations. If confirmed, they may provide useful guidance for COPD patients to better manage their diseases.

Oral Presentation

Methodology

0134   **WHAT TO EXPECT FROM YOUR EXPECTED**

David Richardson. University of North Carolina, Chapel Hill, NC, USA

Objectives Epidemiologists often compare the observed number of deaths in a cohort to the expected number obtained by

multiplying person-time accrued in the cohort by mortality rates for a reference population (ideally, a reference that represents the mortality rate in the cohort in the absence of exposure). However, if exposure is hazardous then this calculation will not consistently estimate the number of deaths expected in the absence of exposure. This is because exposure will have affected the distribution of person-time observed in the study cohort.

Methods This talk describes a simple way to consistently estimate the expected number of deaths and illustrates the approach using data from a cohort study of mortality among underground miners. In addition, the talk considers use of these simple counterfactual-based methods for calculation of years of life lost and demonstrate how this clarifies interpretation of results.

Results In a cohort of 3254 white male miners followed from 1960 through 2005, the observed number of deaths was 2428. A standard SMR calculation yields an estimate of 1693 expected deaths (SMR=1.4;95% CI: 1.4, 1.5). The proposed counterfactual approach yields 2167 expected deaths (CMR=1.1; 95% CI: 1.1, 1.2). However, the effect of the exposure is reflected by evidence of life shortening.

Conclusions The proposed approach yields more interpretable estimates of excess deaths and years of life lost.

Oral Presentation

Exposure Assessment

0135	DEVELOPMENT OF CAREX SYSTEMS IN LATIN AMERICA AND THE CARIBBEAN

[1]Manisha Pahwa, [2]Julietta Rodriguez-Guzmán, [3,4]Cheryl Peters, [1,4]Paul Demers*. [1]Occupational Cancer Research Centre, Cancer Care Ontario, Toronto, Ontario, Canada; [2]Pan American Health Organisation/World Health Organisation, Washington, D.C., USA; [3]Department of Health Sciences, Carleton University, Ottawa, Ontario, Canada; [4]CAREX Canada, Simon Fraser University, Burnaby, British Columbia, Canada

Objectives To describe the process of building CAREX research capacity in Latin America and the Caribbean (LAC).

Methods In LAC, CAREX projects were previously developed in Costa Rica, Nicaragua, Panama, and Colombia based on adaptations of the European model. CAREX Canada recently engaged in a capacity development project to assist more local teams to implement the CAREX tool for their contexts, and to develop methods to prioritise carcinogens for assessment. Over a dozen LAC countries participated in a workshop describing the CAREX approach, knowledge translation, and applications of CAREX data in occupational cancer research. A detailed technical guide was prepared on CAREX methods and how they can be adapted. A network has been established to provide ongoing assistance to LAC countries currently developing CAREX projects.

Results Some of the key challenges identified by local partners are a lack of exposure measurement data, establishing appropriate proportion exposed values, and obtaining detailed labour force data. There is an opportunity to develop novel methods to incorporate informal workers in exposure estimates, advancing upon what has been done in Central American CAREX projects. Countries with similar industrial composition, occupational carcinogen exposures, and/or worker demographics are collaborating on their national CAREX initiatives. New CAREX projects are underway in Peru and the Caribbean and Southern Cone.

Conclusions International collaboration has fostered the development of CAREX in LAC, where improved surveillance of occupational carcinogen exposures represents an important avenue for cancer prevention.

Poster Presentation

Cancer

0136	BREAST CANCER RISK ASSOCIATED WITH NIGHT SHIFT WORK: WHAT ARE THE META-ANALYSES TELLING US?

[1]Manisha Pahwa, [2,3]France Labrèche*, [1,4]Paul Demers. [1]Occupational Cancer Research Centre, Cancer Care Ontario, Toronto, Ontario, Canada; [2]Institut de recherche Robert-Sauvé en santé et en sécurité du travail, Montréal, Québec, Canada; [3]School of Public Health, Université de Montréal, Montréal, Québec, Canada; [4]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada

Objectives To compare results and assess the quality of recently published meta-analyses of night shift work and breast cancer risk.

Methods A comprehensive search was conducted for English or French-language meta-analyses published from 2010–2017 that included at least one meta-risk estimate (mRE) for breast cancer associated with any night shift work exposure metric and that were accompanied by a systematic literature review. mREs from each meta-analysis were ascertained and organised by various study characteristics. Assessments of heterogeneity and publication bias were also extracted. An eight-point checklist was used to evaluate quality.

Results Seven meta-analyses, published from 2013–2016, collectively included 30 cohort and case-control studies spanning 1996–2016. Five meta-analyses scored ≥6 points on the quality assessment checklist. Of these, mREs for ever/never night shift work exposure ranged from 1.15 (95% confidence interval [CI]: 1.05–1.25, n=9 studies) to 1.40 (95% CI: 1.13–1.73, n=9 studies). In these 5 reports, mREs for duration, frequency, and cumulative night shift work exposure were inconsistent. Meta-analyses of cohort, Asian, and more fully-adjusted studies generally resulted in lower mREs than case-control, European, American, or minimally-adjusted studies. Most used random effects models due to statistically significant between-study heterogeneity. Publication bias was not evident in any of the 5 meta-analyses.

Conclusions Substantial heterogeneity is to be expected in epidemiological studies done in various settings, and among diverse populations. Future evaluations of shift work carcinogenic potential need to incorporate high quality meta-analyses that better assess and account for individual study quality.

Oral Presentation

Methodology

| 0137 | EXPOSURE-LAG-RESPONSE IN OCCUPATIONAL EPIDEMIOLOGY: APPLICATION OF DISTRIBUTED NON-LINEAR LAG MODELS IN A COHORT OF DIATOMACEOUS EARTH WORKERS EXPOSED TO CRYSTALLINE SILICA |

[1]Andreas Neophytou*, [1]Sally Picciotto, [1]Daniel Brown, [1]Ellen Eisen, [2]Harvey Checkoway, [1]Sadie Costello. [1]*Division of Environmental Health Sciences, School of Public Health, University of California, Berkeley, Berkeley, CA, USA;* [2]*Department of Family and Preventive Medicine, University of California, San Diego, San Diego, CA, USA*

Occupational exposures extending over a long working life can have complex relationships with health outcomes, as timing, duration, and intensity of exposure are all potentially relevant. Simple measures of cumulative, or average intensity of exposure typically considered in occupational studies may not fully capture these relationships. We applied distributed non-linear lag models to examine the association of crystalline silica exposures with mortality from lung cancer and non-malignant respiratory disease. We fitted Cox proportional hazard models for each cause of interest to data from a cohort study of 2342 California diatomaceous earth workers exposed to crystalline silica. Our models combined various functions for exposure-response and lag-response including linear, piece-wise constant and spline functions. Models with a spline function for exposure-response and a constant term for the lag-response appeared to have the best fit for lung cancer, while models with spline functions for both exposure-response and lag-response had the best fit for non-malignant respiratory disease. Hazard ratios (HR) from these best fitting models corresponding to average daily exposures of 275 μg/m3 during lag years 11–40 prior to the age of observed cases were 1.96 (95% confidence interval (CI) 0.95–4.06) and 2.01 (95% CI: 1.02–3.97) for the two outcomes respectively. HRs from simple models with linear exposure-response and constant lag-response terms for the same exposure scenario were 1.15 (95% CI: 0.88–1.49) and 1.21 (95% CI: 1.01–1.44) respectively. Occupational studies of longitudinal cohorts with detailed exposure histories could benefit from methods allowing for non-linearities and the disentanglement of intensity, duration and timing of exposure.

Oral Presentation

Risk Assessment

| 0138 | POOLED URANIUM MINERS ANALYSIS: GOALS AND CHALLENGES |

[1]David Richardson*, [2]Michaela Kreuzer, [2]Nora Fenske, [2]Christina Sobotzki, [3]Minh Do, [3]Paul Demers, [4]Dominique Laurier, [4]Estelle Rage, [5]Mary Schubauer-Berigan, [6]Ladislav Tomasek, [7]Jon Samet, [8]Lydia Zablotska. [1]*University of North Carolina, Chapel Hill, NC, USA;* [2]*Federal Office for Radiation Protection, Neuherberg, Germany;* [3]*Cancer Care Ontario, Toronto, Canada;* [4]*Institute for Radiation Protection and Nuclear Safety, Fontenay-aux-Roses, France;* [5]*National Institute for Occupational Safety and Health, Cincinnati, OH, USA;* [6]*Radiation Protection Institute, Prague, Czech Republic;* [7]*University of Southern California, Los Angeles, CA, USA;* [8]*University of California, San Francisco, San Francisco, CA, USA*

Epidemiological studies of uranium miners helped to establish radon as a human carcinogen. However, radon remains a leading occupational cause of cancer mortality, and many workers are exposed to radon at levels at which excess risk of lung cancer has been observed in occupational cohort studies. Prior pooled studies of underground miners provided important quantitative estimates of radon-associated lung cancer risk. Recently, efforts have been undertaken to strengthen uranium miner studies to address contemporary occupational safety concerns. New cohorts of underground miners have been enumerated, existing cohorts have been expanded, and follow-up of the major cohorts of miners has been extended substantially. An international collaborative study has been undertaken to combine information from many of the world's most informative cohort studies of uranium miners; the combined study cohort encompasses more than 1 00 000 miners. This talk will describe the major themes of this project, the goals of the collaborators and the challenges that we have encountered to-date. We will describe similarities and differences between findings from these key cohorts and identify some major gaps in current knowledge about radon's effects on human health. Finally, we will discuss how international collaborative studies can strengthen our understanding of risks associated with occupational and environmental radon exposures.

Poster Presentation

Cancer

0140 **BREAST CANCER INCIDENCE AND METALWORKING FLUID EXPOSURE IN A COHORT OF FEMALE AUTOWORKERS**

[1]Erika Garcia*, [2]Patrick Bradshaw, [1]Ellen Eisen. [1]*Environmental Health Sciences Division, School of Public Health, University of California, Berkeley, Berkeley, California, USA;* [2]*Epidemiology Division, School of Public Health, University of California at Berkeley, Berkeley, California, USA*

Breast cancer is the leading cancer diagnosed among women and environmental studies have produced few leads on modifiable risk factors. Following an Institute of Medicine recommendation for occupational studies of highly exposed women, we took advantage of an existing cohort of 4503 female hourly autoworkers exposed to metalworking fluid (MWF), complex mixtures of oils and chemicals widely used in metal manufacturing worldwide. Cox proportional hazards models were fit to estimate hazard ratios (HR) for incident breast cancer and cumulative exposure (20 year lag) to straight mineral oils (a known human carcinogen), and water-based soluble and synthetic MWF. Because the state cancer registry began in 1985, decades after the cohort was defined, we restricted analyses to sub-cohorts hired closer to the start of cancer follow-up. Among those hired after 1969, the HR associated with an increase of one interquartile range in straight MWF exposure was 1.13 (95% confidence interval: 1.03, 1.23). In separate analyses of premenopausal breast cancer, as defined by age at diagnosis, the HR was elevated for exposure to synthetic MWF, chemical lubricants with no oil content, suggesting a different mechanism for the younger cases. This study adds to the limited literature regarding quantitative chemical exposures and breast cancer risk.

Oral Presentation

Specific Occupations

0142 **LONGER TERM PHYSICAL HEALTH AND WELLBEING IN AUSTRALIAN GULF WAR VETERANS, 20 YEARS AFTER DEPLOYMENT**

Helen Kelsall*, Jillian Ikin, Stella Gwini, Andrew Forbes, Malcolm Sim. *School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia*

Background Ten years after the 1990–1991 Gulf War (GW), Australian veterans were found to have significantly poorer psychological health and some indicators of poorer physical health.

Methods A cohort of GW veterans and matched military comparison group were assessed at baseline (2000–2002) and follow-up (2011–2012), including a 63-item symptom checklist, modified CDC definition of multisymptom illness (MSI), doctor-diagnosed medical conditions since 2001, chronic fatigue and neurological symptom questionnaires. Additional measures e.g. irritable bowel syndrome (IBS) were included at follow-up.

Results From baseline, 715/1,330 veterans (54%) and 675/1,449 comparison group (47%) participated at follow-up. Relative to comparison group, GW veterans reported a higher average number of symptoms (ratio of means 1.36, 95% CI 1.24–1.48), higher prevalence of MSI (risk ratio RR 1.60; 1.31–1.95), chronic fatigue RR 1.41 (1.02–1.96), IBS RR 1.64 (1.18–2.27) and 6/40 medical conditions. GW veterans were significantly more likely to report ≥ 1 RR 1.13 (1.03–1.25) or ≥ 4 RR 1.32 (1.07–1.64) neuropathic symptoms. From baseline to follow-up, overall, symptom prevalence and MSI increased and remained higher in GW veterans; the gap between GW veterans' and comparison group symptomatology remained unchanged; chronic fatigue prevalence more than doubled in both groups, and there was a non-significantly greater incidence of chronic fatigue in GW veterans.

Conclusions These finding indicate enduring increased health symptoms and longer term adverse physical health outcomes associated with GW service, and highlight the importance of effective detection and management of chronic physical conditions and improved awareness among health practitioners of conditions occurring more commonly in veterans.

Poster Presentation

Exposure Assessment

0143 **A 10 YEAR PROSPECTIVE STUDY OF TONER HANDLING WORKERS**

Ryosuke Sugano*, Satoshi Michii, Hajime Ando, Hiroki Nozawa, Kazunori Ikegami, Akira Ogami. *Department of Work Systems and Health, Institute of Industrial and Ecological Sciences, University of Occupational and Environmental Health, Kitakyushu, Fukuoka, Japan*

Purpose To measure the risk of pulmonary disease due to toner dust exposure, in a 10 year prospective cohort study among toner handling workers.

Methods Subjects that were included in the analysis of this study were 260 male employees of a Japanese photocopier, printer and toner production company. Onset of pneumoconiosis, pulmonary fibrosis, granulomatous pneumonia and lung cancer were assumed as endpoints of the investigation, and blood markers (KL-6,SP-D), respiratory function index and the chest CT shadow reading were used as substitute end-points for before the onset of these diseases. Disease onset was determined via a self-administered questionnaire, blood tests and respiratory function tests were conducted once a year, while Chest CT examinations were conducted in the 1 st, 5th and 10th year of the study. Subjects were classified by duration of toner handling work into four groups - long-exposure (>20 years): n=65 (mean 40 years, smoking rate 35%); medium-exposure (10–20 years): n=71 (mean age 31.9 years, smoking rate 47.9%), and short-exposure (<10 years): n=50 (mean age 31.6 years, smoking rate 46%). The average dust levels in the environment of the toner handling work decreased well below the ACGIH allowable concentrations through the period of the study.

Results None of the endpoint diseases developed in any of the four groups. Annual percent change for blood marker and respiratory function levels, and chest CT parameters were compared across the four groups but no statistical significance was seen.

Conclusion The risk of developing respiratory disease with the levels of toner dust exposure found in this study was extremely low.

Poster Presentation

Methodology

0144 ASSESSING AND ADDRESSING NON-RESPONSE AT FOLLOW-UP IN THE GULF STUDY

[1]Jean Strelitz*, [1]Alex Keil, [1]David Richardson, [1]Marilie Gammon, [2]Richard Kwok, [2]Dale Sandler, [1,2]Lawrence Engel. [1]University of North Carolina at Chapel Hill, Chapel Hill, NC, USA; [2]National Institute of Environmental Health Sciences, Research Triangle Park, NC, USA

Withdrawn at the author's request

Poster Presentation

Psychosocial

0145 EFFECTS OF PERCEIVED JOB INSECURITY ON DEPRESSION, SUICIDE IDEATION, AND DECLINE IN SELF-RATED HEALTH IN KOREA: A POPULATION-BASED PANEL STUDY

[2]Min-Seok Kim, [2]Yun-Chul Hong, [2]Ji-Hoo Yook, [1]Mo-Yeol Kang*. [1]Seoul St. Mary's Hospital, Seoul, Republic of Korea; [2]Seoul National University, Seoul, Republic of Korea

Purpose To investigate the effects of job security on new-onset depression, suicide ideation, and decline in self-rated health.
Methods We analysed data from the Korea Welfare Panel Study from 2012 to 2015. Participants were 2552 waged workers. Depression, suicide ideation, and health were assessed by self-reported questionnaires on an annual basis. We classified the participants into high job security group, intermediate job security group, and low job security group. To evaluate the influence of job security on outcomes, we performed survival analysis after stratification by gender with adjustment for covariates. The result was stratified by gender and based on whether the respondent was the head of the house or not.
Results After adjusting for covariates in men, the hazard ratios (HRs) were significantly higher among low job security group for depression (HR 1.52), suicide ideation (HR 4.00), and decline in self-rated health (HR 1.83). In women, the HR of depression was significantly higher for the intermediate job security group (HR 1.62). For men with low job security who were the head of the house, the HR of depression, suicide ideation, and decline in self-rated health was significantly higher. Besides, those with intermediate job security had an increased risk of decline in self-rated health. In women with intermediate and low job security, the risk of depression was higher when they were the head of the house.
Conclusions We found that perceived job insecurity is associated with the onset of depression, suicide ideation, and decline in self-rated health.

Poster Presentation

Injuries

0146 EPIDEMIOLOGICAL SURVEILLANCE OF FATAL OCCUPATIONAL INJURIES

Bengt Järvholm*, Johanna Björnstig, Ulf Björnstig. Umeå University, Umeå, Sweden

The objective was to study the epidemiology of fatal occupational injuries in Sweden as a basis for injury mitigation activities.

Data of injury incidents from the years 2010–4 registered at the Swedish Working Authority and AFA Insurance was used along with national registers for hospitalised persons combined with national registers of individual data on occupational and industry. We also compared the epidemiology of serious with fatal incidents.

On average 50 fatalities happened per year, i.e. around 1 per 1 00 000 persons in the work force. Around two of three fatalities involved a vehicle related incident or a fall from height. There was a weak association between fatal and serious incidents. Codes about occupational factors in hospital diagnoses were very often missing (60%–70%) and linkages between hospital registers, death registers and other medical data registers had limited use to find strategies for prevention. **Conclusions** Small numbers hampers the possibility to follow trends in fatal occupational incidents. The epidemiology of serious incidents is a rather poor ground for prioritising measures for preventing fatal injuries. Traditional variables in registers of fatal incidents as sex, age, industry and job has limited information for prioritising preventive measures. There are already a lot preventive measures undertaken. However, much more could be done e.g. with focus on vehicle related injuries and falls from high level. We think that an additional prioritising factor in the injury reducing work would be to address how well we know, or can find, suitable preventive strategies should be included.

Poster Presentation

Working Conditions

0148　WORKING CONDITIONS AS RISK FACTORS FOR ILL-HEALTH RETIREMENT: FINDINGS FROM THE KOREAN LONGITUDINAL STUDY OF AGEING (2006–2014)

Mo-Yeol Kang*, Jun-pyo Myong, YounMo Cho, Hyoung-Ryoul Kim. *Seoul St. Mary's Hospital, Seoul, Republic of Korea*

Purpose To investigate the difference of IHR (ill-health retirement) across occupational groups and to identify work-related factors in Korea
Methods Data were collected from a sample from the first to fourth phases of the Korean Longitudinal Study of Ageing (KLoSA) which conducted in 2006, 2008, 2010, 2012, and 2014. IHR were defined as those who retired due to their health problems before their scheduled or regular retirement age in one of the follow-up surveys. Three broad subdomains of working conditions were examined, namely work arrangements, physical working conditions and psychosocial working conditions. Cox proportional hazard models were used to evaluate the effects of working condition characteristics on IHR for each gender, after adjusting for age, household income and property.

Results Female, older, manual workers, and day labourer were more likely to experience IHR. In adjusted Cox proportional hazard models, risk for IHR of male workers was significantly higher among those with the following conditions: high physical demanding (HR=1.84), awkward posture (HR=1.76), dissatisfaction about working environment (HR=1.73), and no industrial compensation insurance (HR=1.79) nor retirement benefits (HR=1.80). However no significant association found among female subjects.
Conclusions Occupational class, physical and psychological working conditions, and work arrangement are potential risk factors for IHR among male workers in Korea. Moreover, our results revealed gender differences in the risk of IHR. Further and more specific studies are needed to identify which additional factors determine IHR according to different occupation and different disease groups.

Poster Presentation

Musculoskeletal

0149　PAIN AT OTHER ANATOMICAL SITES IS A MAJOR PREDICTOR OF SUBSEQUENT SICKNESS ABSENCE FOR LOW BACK PAIN

David Coggon, Georgia Ntani*. *University of Southampton, Southampton, UK*

Background Using longitudinal data from the Cultural and Psychosocial Influences on Disability (CUPID) study, we have previously shown that disabling low back pain (LBP) was strongly predicted by the earlier extent of pain at other anatomical sites. However, this could have occurred simply because some individuals had a lower threshold for reporting pain and associated disability.
Methods To explore whether the association extended to sickness absence because of LBP, we analysed further data on 8,610 CUPID participants from 45 occupational groups in 18 countries. A baseline questionnaire assessed potential risk factors, including general propensity to pain, which was characterised by the number (from 0 to 9) of anatomical sites other than low back that had been painful in the past year. Logistic regression was used to assess the associations of these factors with sickness absence for LBP in the month before a follow-up questionnaire some 14 months later.
Results Absence at least partially due to LBP was reported by 439 participants, and after allowance for potential confounders, was strongly associated with baseline pain propensity (ORs up to 2.6, 95% CI 1.7–4.0). For absence attributed entirely to LBP (235 participants), risk estimates were somewhat lower, but still significant (ORs up to 1.8, 95% CI 1.0–3.2).
Conclusions After adjustment for other known and suspected risk factors, sickness absence because of LBP is importantly determined by propensity to musculoskeletal pain more generally. This reinforces the need to identify the drivers of general propensity to musculoskeletal pain, which shows large international variation.

Oral Presentation

Other

| 0150 | IS A POSSIBLE RELATIONSHIP BETWEEN OCCUPATIONAL NOISE EXPOSURE AND VESTIBULAR SCHWANNOMA (ACOUSTIC NEUROMA) CAUSAL OR DUE TO BIAS? A SYSTEMATIC REVIEW AND META-ANALYSIS |

Ingrid Sivesind Mehlum*, Håkon A Johannessen, Karl-Christian Nordby, Marit Skogstad, Tore Tynes, Arve Lie. *National Institute of Occupational Health, Oslo, Norway*

Objectives Vestibular schwannoma (acoustic neuroma) is a benign, slow-growing tumour, arising from the nerve sheath of the vestibular branch of the eighth cranial nerve. Some studies show a possible relationship between noise exposure and schwannoma, while others not. Our objective was to assess possible associations between occupational noise exposure and schwannoma.

Methods We performed a systematic critical literature review of original articles from key literature databases of associations between workplace noise and health, completed in January 2017. For the meta-analysis, we selected studies of sufficient quality with a measure of association between occupational noise exposure and schwannoma.

Results Six studies were selected, all matched case-control studies, with a total of 1487 cases, five population-based and one registry study. Five studies had self-reported exposure information from interview (4) or questionnaire (1), and three had data from job-exposure-matrices (JEMs). Two studies had both self-report and JEM information. Self-reported occupational noise exposure was consistently associated with schwannoma, odds ratio (OR) 1.70 (95% CI 1.32–2.18). JEM results gave OR 1.16 (0.75–1.81), with more heterogeneity between studies. Long noise exposure ($\geq$15/18 years; 2 self-report, 2 JEM studies) was also consistently associated with schwannoma, OR 1.76 (1.04–2.99).

Conclusions The results indicate that noise exposure might be associated with schwannoma. We found strong and consistent associations for self-reported noise exposures and exposures of longer duration. JEM-based associations were weaker, maybe due to non-differential misclassification. However, reasons other than a causal relationship, such as recall bias, detection bias or publication bias, cannot be excluded.

Poster Presentation

Intervention Studies

| 0151 | SYSTEMATIC REVIEW OF WORKPLACE INTERVENTIONS FOR REDUCING OCCUPATIONAL SITTING |

Lotte Röder, Eva Backé, Ute Latza*. *b a u a : Federal Institute for Occupational Safety and Health, Berlin, Germany*

Objectives Based on a review of reviews that included studies until December 2015, we demonstrated a reduction in occupational sitting for multi-component workplace interventions, and interventions addressing the work environment and the individual. This systematic review gives an overview about the rapidly accumulating subsequent evidence and identifies research needs.

Methods A literature search was conducted in Pubmed, PsycInfo, and Sportdiscus. English and German references from 01.01.2016 until 31.07.2016 were included if they evaluated workplace interventions targeting a reduction of occupational sitting or an increase of physical activity. Quality was assessed with a modified version of the Cochrane Risk of Bias Tool.

Results Out of 380 identified references 17 were included (9 randomised controlled trials (RCTs), and 8 non-randomised interventions). Six out of 7 interventions (4 RCTs) addressing the individual, 3 out of 6 studies (1 RCT) targeting the physical work environment (sit-to-stand/dynamic workstations, active building design), and 2 out of 2 multi-component interventions (RCTs) showed statistically significant beneficial changes in objectively measured occupational sitting time and/or physical activity.

Conclusions Beyond inconsistent results for dynamic workstations and further evidence for multi-component interventions, individualised interventions (e.g. personal feedback elements) seem to be beneficial. The effect of new components (e.g. active building design) is still unclear. Future studies are warranted emphasisingorganisational interventions, and the mechanisms behind single components of multi-component interventions (e.g. social support) with their long-term effects. Further, the interrelationship of prolonged sitting on and off work, and timing of sitting interruptions for cardiometabolic effects need to be further elucidated.

Oral Presentation

Cancer

0152 | CANCER MORTALITY OF DMF EXPOSED WORKERS IN KOREA

[1]Yeon-Soon Ahn*, [1]Jin-Ha Yoon. [1]*Dongguk University Ilsan Hospital, Goyang, Republic of Korea;* [2]*Yeonsei College of Medicine, Seoul, Republic of Korea*

This study is to identify the association of urinary N-methyl-formamide level (UNMFL) with cancer mortality in N,N-dimethylformamide (DMF)-exposed male workers in Korea. A cohort was composed of 11,953 DMF exposed workers working between January 1, 2000, and December 31, 2004. These cohort members were matched with the mortality data of the Korean National Statistical Office to follow-up for cancer mortality between 2000 and 2011. Standardised Mortality Ratios (SMRs) of DMF exposed workers with reference to Korean men were calculated. Also controlling age, other carcinogen exposure including hepatitis B and C, the Adjusted Hazard Ratios (AHRs) of workers categorised by the 3 groups of UNMFL with reference to workers with zero UNMFL were calculated. There were no significantly increased or decreased SMRs except for stomach cancer (SMR=0.38, 95% CI=0.10–0.98). The AHRs of overall cancer mortality were significantly increased in in workers with 7.5 to 15 mg/L (SMR=2.72, 95% CI=1.09–6.81) and 15 and over 15 mg/L (SMR=2.41, 95% CI=1.03–5.66) compared with workers with 0 UNMFL. Hepatocellular carcinoma mortality (AHR=3.73, 95% CI=1.05–13.24) of workers with 15 and over 15 mg/L and lung cancer mortality (SMR=14.36, 95% CI=1.41–146.86) in workers with 7.5 to 15 mg/L were significantly increased compared with workers with 0 UNMFL. In this study workers with high UNMFL showed increased mortalities for overall, liver and lung cancer comparing to those of workers with zero UNMFL, which suggests DMF might be caused cancer, especially hepatocellular carcinoma which was approved carcinogenicity on liver in animal experiments.

Oral Presentation

Cancer

0153 | RISK OF BLADDER CANCER IN A COHORT OF CHEMICAL WORKERS

[1]Dirk Taeger*, [1]Beate Pesch, [2]Bierfreund Kay-Gerald, [3]Christoph Oberlinner, [2]Gabriele Leng, [4]Stenzl Arnulf, [5]Matthias Kluckert, [1]Thomas Brüning. [1]*Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Institute of the Ruhr-Universität Bochum (IPA), Bochum, Germany;* [2]*Department of Health Protection and Occupational Safety, Currenta GmbH and Co. OHG, Leverkusen, Germany;* [3]*Occupational Medicine and Health Protection, BASF SE, Ludwigshafen, Germany;* [4]*Institute of Urology, Eberhard Karls University, Tübingen, Germany;* [5]*German Social Accident Insurance's Institution for the Raw Materials and Chemical Industry (BG RCI), Heidelberg, Germany*

Objective Bladder cancer is the fourth most frequent cancer among men in Germany. Aromatic amines can cause bladder cancer and therefore cancerogenic aromatic amines have been banned a long time ago from workplace, but a long latency can still increase the risk of former exposed workers. In this study, we will assess the risk of bladder cancer in a cohort of chemical workers with earlier use of aromatic amines compared to the general population.

Methods In the prospective cohort study UroScreen, 1800 former chemical workers exposed to aromatic amines were offered to participate in an early detection of bladder cancer by means of tumour markers. In 2003–10, 1609 people were examined at least once. The exposure to aromatic amines was determined by means of questionnaires. The observed bladder cancer incidence was compared with the expected incidence in the general population. Bladder cancer risk was estimated as standardised incidence ratio.

Results Nine incidence urinary bladder carcinoma occurred during the study. Eight cases were ex-smokers and one case was non-smoker. All cases were exposed for at least 10 years, including six cases longer than 20 years. Compared to the general population, the risk of bladder cancer was 2.94 (95% CI 1.35–5.59).

Conclusions Since almost all cases have both smoked and were highly exposed, reliable risk detection is difficult. Nevertheless, in view of a threefold increased risk, the early detection of urinary bladder carcinomas were promising.

Poster Presentation

Other

0154 | OCCUPATIONAL DISEASES ATTENDED AT PARC DE SALUT MAR (BARCELONA): CARE COSTS IN A SERIES OF CONFIRMED CASES (2010–2014)

[1]M Valinho-Carrete, [2,4]FG Benavides, [1,3]A Beltran-Fonollosa*, [2,4]JM Ramada, [2]F Cots, [5]M Trapero-Bertran, [4,6]GL Delclos, [1,4]C Serra. [1]*CiSAL-Centre for Research in Occupational Health, University Pompeu Fabra, Barcelona, Spain;* [2]*IMIM Hospital del Mar Medical Research Institute, Barcelona, Spain, Barcelona, Spain;* [3]*Occupational Health Service, Parc de Salut Mar, Barcelona, Spain;* [4]*CIBER de Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain;* [5]*Facultad de ciencias económicas y sociales. Universitat Internacional de Catalunya, Barcelona, Spain;* [6]*The University of Texas School of Public Health, Houston, Texas, USA*

Background The Spanish National Health System (NHS) covers non-work-related diseases. The Social Security system, mainly through collaborating insurance companies, covers both medical and wage-related costs of occupational diseases; however, the actual exchange of resources has not been well studied until now. The objective of this study was to evaluate the economic cost of medical care generated by a series of confirmed cases of occupational disease (OD) treated at Parc Salut Mar (PSMAR) in Barcelona, an NHS health system.

Methods Economic study of 40 cases of suspected OD by the PSMAR Occupational Disease Unit (ODU). Between 2010 and 2014, information on the care received (stays, visits, emergencies, diagnostic tests, medical and surgical treatments, etc.) was independently reviewed by three experts, and discrepancies resolved by one of them. The economic value of the care received in relation to the underlying suspected OD was expressed in terms of actual cost and billing rate, according to age, sex, diagnostic group and type of care received.

Results The total cost of the 40 cases was 181,072.3€ and the average cost per case was 4,526.8€ . Cancer accounted for 84% of all cases. Men accounted for 93% of the total cost and those over 65 years were 76% of the total. The amount billed for the 40 cases was 146,964.6€ .

Conclusions This study provides precise economic information that must be considered in the coordination needed between the NHS and the Social Security, which should significantly contribute to the reporting of ODs and their prevention.

Poster Presentation

Developing Countries

| 0155 | NEGOTIATING RISKS AND UNCERTAINTIES: HEALTH AND SAFETY DECISION-MAKING IN THE MINES OF POTOSÍ (BOLIVIA) |

Mei Trueba. *University of Sussex, Brighton, UK*

It is generally agreed that knowledge of the causes and consequences of a particular OHS risk influences the way people prepare for and respond to it. My ethnographic research among the cooperative miners working in Potosí's Cerro Rico shows however a much more complex scenario, in which miners simultaneously face a number of physical, geological, socio-political and economic risks and uncertainties as they go about their work and lives which must be carefully weighed against each other. Miners often have little or no control over most of these risks that simultaneously affect them, and health and safety risks are only a small group of concerns. Prone to take risks to their health at work as a strategy to manage other risks that simultaneously affect them Potosi's miners are well aware of the potential losses of taking OHS risks, but also of the potential gains of their decisions. This presentation offers an anthropological account of the factors, conflicts and negotiations that shape voluntary health and safety risk taking amongst the cooperative miners working in the Cerro Rico of Potosií. Unveiling the complex factors and relationships that impede the miners' ability to respond to OHS risks as per their wishes and understandings this presentation demonstrates the need for revisiting the value of OHS risk perceptions as strategy to eliminate occupational injuries.

Poster Presentation

Cancer

| 0156 | LUNG CANCER AMONG MEAT INDUSTRY WORKERS: RESULTS OF THE ICARE STUDY |

[1]Soumaya Ben Khedher*, [2,3]Mireille Matrat, [1]Sylvie Cenée, [1]Marie Sanchez, [4,5]Danièle Luce, [1]Isabelle Stücker. [1]*Université Paris-Saclay, Univ. Paris-Sud, UVSQ, CESP, INSERM, Villejuif, F-94807, France*; [2]*University Paris Est-Créteil, Faculty of Medicine IFR 10, 94010 Créteil Cedex, France*; [3]*Centre Hospitalier Intercommunal, Service de Pneumologie et de Pathologie Professionnelle, 94010 Créteil Cedex, France*; [4]*INSERM, U 1085_IRSET, F-97154 Pointe-à-Pitre, France*; [5]*University of Rennes 1, F-35700, Rennes, France*

Purpose Lung cancer among butchers and others meat workers has been investigated in a French population based case-control study ICARE.

Methods Detailed information was collected on occupational history and smoking habits from 2926 patients with histologically confirmed lung cancer and 3555 matched controls. Jobs were defined according to the international Standard Classification of Occupations (ISCO) codes and categorised according to the French Nomenclature of Activities (NAF). Smoking history was combined into a comprehensive smoking index (CSI) that included mean number of cigarettes/day, duration and time since cessation.

Personal history of hand warts were used as a proxy for an eventual exposure to the HPV (2,7).

Odds ratios (OR) and 95% confidence intervals (CI) were estimated using unconditional logistic regression models and controlled for well-established risk factors for lung cancer including smoking and occupational exposure to asbestos.

Results We found an increased risk of lung cancer among meat workers (101 cases/85 controls; OR=1.46, 95% Cl=1.01–2.13), especially among those who started working before the age of 17 (OR=1.72, 95% Cl=1.08–2.74). The risk was concentrated in workers exposed to slaughtered meat including Slaughterers (ISCO code 77320) and Meat Cutters (ISCO code 77330). Associations were not affected by history of hand warts. However, pronounced inverse associations for lung cancer were shown with personal history of hand warts (OR=0.63, 95% CI=0.56–0.71).

Conclusions Working in meat industry may increase risk of lung cancer suggesting the role of oncogenic viruses other than HPV. Associations with history of hand warts remain to be clarified by future studies.

Oral Presentation

Occupational Medicine (SCOM/Modernet)

| 0157 | CHARACTERISTICS OF INDIVIDUALS RECEIVING A DISABILITY BENEFIT AND PREDICTORS OF LEAVING THE DISABILITY BENEFIT SCHEME. A 5 YEARFOLLOW-UP STUDY |

[1,2]Ilse Louwerse*, [1,2]Maaike Huysmans, [1,3]Jolanda van Rijssen, [1,2]Allard van der Beek, [1,2]Han Anema. [1]*Department of Public and Occupational Health, Amsterdam Public Health Research Institute, VU University Medical Centre, Amsterdam, The Netherlands*; [2]*Research Centre for Insurance Medicine, AMC-UMCG-VUmc, Amsterdam, The Netherlands*; [3]*Dutch Institute of Employee Benefit Schemes (UWV), Amsterdam, The Netherlands*

Nowadays, work disability is one of the largest social and labour market challenges for policy makers in almost all OECD countries. Understanding of factors associated with long-term work disability may be helpful to identify groups of individuals at risk for disability benefit entitlement or continuing eligibility, and to develop effective interventions for these groups. The purpose of this study is to give insight into the main diagnoses of workers who qualify for disability benefit and how these diagnoses differ between age groups, gender and educational level. Moreover, using a 5 year follow-up period, we study the duration of the disability benefit and examine how durations differ between individuals with different characteristics.

Our study population consisted of 31 733 individuals receiving a disability benefit from the Dutch Social Security Agency (SSA). Data were collected from the databases of the SSA. Disorders were assessed by an insurance physician at application. We tested for differences in socio-demographics, main diagnoses and comorbidity for those entering and leaving disability benefits.

Mental disorders were most often registered as the main diagnosis for work disability. Diagnoses differed between age groups and educational level categories. For younger and higher educated individuals mental disorders was the main diagnosis for work disability, and for older and lower educated individuals physical disorders (mainly musculoskeletal, cardiovascular and cancer). Five years after approval, 82% still received disability benefits. Outflow was lowest for individuals with (multiple) mental disorders and individuals with comorbidity of mental and physical disorders, and highest for individuals with (multiple) physical disorders.

Oral Presentation

Other

0158   WORK IN HEAT: A CHALLENGE FOR THE KIDNEYS

[1,2]Kristina Jakobsson*, [6]Rebekah Lucas, [3]Vidhya Venugopal, [4]Jennifer Crowe, [1]Camilla Dahlqvist, [2]Jenny Apelqvist, [5]Ilana Weiss, [5]Jason Glaser. [1]Gothenburg University, Gothenburg, Sweden; [2]Lund University, Lund, Sweden; [3]Sri Ramachandra University, Chennai, India; [4]National University of Costa Rica, Heredia, Costa Rica; [5]LaIsla Network, Chicago, USA; [6]University of Birmingham, Birmingham, UK

An epidemic of chronic kidney disease of unknown aetiology (CKDu) has emerged during the last decades, first seen in agricultural and disadvantaged communities along the Central American Pacific coast but now also evident in other countries like Sri Lanka and east India. The aetiology is likely multicausal, but occupational and environmental factors are in focus - in Central America heat stress during strenuous physical work with repeated fluid losses, in Sri Lanka environmental contaminants and agrochemicals. CKDu is a silent disease until late stages. Thus, screening with blood and urine sampling is needed for early detection

We now have good tools for CKDu research: Heat and humidity in the workplace can be monitored with affordable climatic loggers. Core body temperature can be exactly measured by swallowed sensors or estimated from heat strain models. Heart rate loggers and accelerometers enable estimations of workload. Exposure to toxins is assessed through environmental monitoring or by biomarkers of exposure. Standardised questionnaires for heat-related symptoms exist, and core protocols for assessment of renal function and kidney disease outcomes in epidemiological studies have been elaborated (the DEGREE initiative).

Occupational epidemiologists have an important role in the battle against CKDu. Collaborative and comparable studies are needed, aligned with mechanistic understanding. Such studies range from population-based prevalence studies (including also migrant workforces) to studies of the effect of piecework in hot climates, and evaluations of interventions to prevent heat strain by access to water, shade and safe toiletry at the workplace.

Poster Presentation

Cardiovascular Disease

0159   RELATION BETWEEN WORK-RELATED SILICA EXPOSURE IN FOUNDRIES AND CARDIOVASCULAR DISEASES

Chenjing Fan, Ing-Liss Bryngelsson, Pål Graff, Per Vihlborg, Lena Andersson*. Department of Occupational and Environmental Medicine, Örebro University Hospital, Örebro, Sweden

Background Work-related exposure to silica is a health hazard worldwide causing i.e. silicosis. Some studies have also presented elevated cardiovascular disease mortality in relation to silica exposure. However, few studies focus on these diagnoses and there is lack of studies accessing morbidity. The aim of this study is to examine the morbidity and mortality of different cardiovascular diseases among Swedish silica-exposed foundry workers.

Methods Measurement database, consisting of historical and present measurements (1968–2006) of respirable silica exposure, are matched against job categories, the different foundries and 4 time periods (1968–1979, 1980–1989, 1990–1999, 2000–2006) using mixed model. The cohort morbidity and mortality data were matched against registries from the Swedish National Board of Health and Welfare. SPSS and STATA were used for statistical analysis, with STATA stratified for age, gender and year.

Results Cardiovascular disease (SMR 141, 95% CI 126–157) and stroke mortality (SMR 161, 95% CI 118–214) showed significant elevation. Myocardial infarction showed statistically significant reduction (SMR 73, 95% CI 60–89). Results of morbidity show significant elevation of stroke (SIR 134, 95% CI 120–150). Mean age at the time of first morbidity is 60–64 years.

Conclusions This study focused on the relation between silica exposure and cardiovascular disease morbidity and mortality. Our results suggest a relation with statistically significant SMRs and SIRs, and morbidity in stroke at a younger age than the general population. Cardiovascular disease is a major cause of death worldwide, and we find a need for further examination with more extensive mapping of confounders and medical history.

Oral Presentation

Other

0160   RETINAL DETACHMENT AND HEAVY LIFTING: FINDINGS FROM A REGISTER STUDY IN DENMARK

[1]Stefania Curti*, [2]David Coggon, [3]Harald Hannerz, [1]Stefano Mattioli. [1]Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy; [2]MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK; [3]National Research Centre for the Working Environment, Copenhagen, Denmark

Introduction Candidate risk factors for retinal detachment (RD) include heavy lifting. To explore further this relationship, a population-based register study was carried out in a Danish working population.

Methods This study enrolled a dynamic cohort of all 20–59 year-old men in Denmark followed through the Danish Occupational Hospitalisation Register from 1995 to 2010 for rhegmatogenous RD as principal diagnosis. Four main occupational categories were identified according to their potential for heavy lifting: heavy lifters, manual workers unlikely to be heavy lifters, other manual workers, and non-manual workers unlikely to be heavy lifters. We compared the age-standardised rate of RD for heavy lifters with that recorded by the other three occupational categories. We estimated rate ratios (RRs) and 95% confidence intervals (95%CIs) by fitting a Poisson regression model adjusted for calendar period and age group.

Results Non-manual workers performing occupational activities unlikely to be associated with heavy lifting experienced the highest age-standardised rate of RD (18.0 cases/100,000 person-years). The RR for workers in jobs expected to involve a high frequency of heavy lifting compared to manual workers whose occupation was unlikely to be associated with heavy lifting was 0.91 (95%CI, 0.73–1.14); in comparison with other manual workers, the RR was 0.93 (95%CI, 0.78–1.11). The RR compared to non-manual workers in occupations unlikely to involve heavy lifting was 0.51 (95%CI, 0.43–0.60).

Conclusion The findings of this population-based register study do not support an association of occupational heavy lifting with RD. Further studies should use more specific measures of exposure and consider relevant confounders.

Oral Presentation

Shift Work

0161 THE ROLE OF PHYSICAL ACTIVITY IN THE ASSOCIATION BETWEEN SHIFT WORK AND BODY MASS INDEX

[1]Johan Werkhoven, [1,2]Bette Loef, [1]Karin Proper*. [1]National Institute for Public Health and the Environment, Bilthoven, The Netherlands; [2]Department of Public and Occupational Health, VU University Medical Centre Amsterdam, Amsterdam, The Netherlands

Background Shift work is increasingly being suggested to be associated with an increased risk for overweight. Physical activity (PA) has been hypothesised to play a role in the health effects of shift work, but research on this role of PA is scarce. This study aimed to examine the association between night shift work and body mass index (BMI) and the moderating role of PA therein.

Methods Data from 588 workers were used from the prospective cohort Klokwerk+ study, examining the health effects of night shift work in health care workers. BMI was calculated by measured body weight (in kg) divided by body height (in metre squared). PA was measured using the validated Short QUestionnaire to ASses Health-enhancing PA (SQUASH) questionnaire. Linear regression analyses were performed for the associations between shift work and BMI; interaction terms were added to determine the influence of PA.

Results Mean BMI for shift workers was 25.3 (SD=4.2) versus 25.4 (SD=4.2) for non-shift workers (p>0.05). Shift workers were more moderately active than non-shift workers (beta 318 min/wk, 95% CI 141–496). After adjustment, there were no significant differences in the amount of vigorous intensity PA (beta-43 min/wk, 95% CI-115-26). There was no significant interaction for either moderate or vigorous PA in the shift work-BMI association.

Conclusions Our study could not confirm the hypothesis that PA moderates the shift work-BMI relation. To confirm these findings and to get more insight into the moderating and mediating role of PA and other lifestyle behaviours, more longitudinal studies are recommended.

Poster Presentation

Cancer

0162 MORTALITY AMONG AUTOWORKERS MANUFACTURING ELECTRONICS IN ALABAMA, U.S.A

David Richardson*, Nathan DeBono. University of North Carolina, Chapel Hill, North Carolina, USA

Former employees at a large automotive electronics manufacturing facility in Alabama, U.S.A. raised concerns over a suspected excess of cancer mortality among their fellow workers. The United Autoworkers (UAW) union sought the help of epidemiologists to investigate these concerns.

A cohort of 4396 workers employed at the facility between 1972 and 1993 was enumerated. Demographic and employment history information was obtained from union records. Follow-up to ascertain information about vital status and causes of death was conducted through 2016 drawing upon records of the U.S. Social Security Administration, pension records, voter registration records, and the U.S. National Death Index. Interviews with former employees have identified lead-based solder and chlorinated organic solvents as exposures of concern during the assembly of printed computer boards. Concerns were also raised about the presence of asbestos in the workplace. The mortality experience of the cohort is compared to expectations based upon national and regional reference rates using classical standardised mortality ratios as well as more novel comparisons of cumulative incidence (i.e., complement of survival) curves. Analyses also allow for internal comparisons according to job status and race.

We will report on preliminary results describing the characteristics and overall mortality experience of this cohort as part of our ongoing investigation, which is an example of a joint effort between the UAW and academic epidemiologists to directly address the health concerns of autoworkers using a cost- and time-efficient study design.

Poster Presentation

Methodology

0163   **COMPARISON OF RISK ESTIMATES FROM COX PROPORTIONAL HAZARDS AND POISSON MODELING FOR ASSOCIATION OF OCCUPATIONAL TITANIUM DIOXIDE EXPOSURE AND SELECTED CAUSES OF DEATH**

[1]Golden Ashley, [1]Ellis Elizabeth, [2]Le Hien. [1]*Oak Ridge Associated Universities, Oak Ridge, Tennessee, USA*; [2]*The Chemours Company, Wilmington, Delaware, USA*

Cox proportional hazards and stratified Poisson regression are commonly used models for time-dependent data in epidemiologic studies. However, whether these methods consistently produce comparable results for the estimate of risk for both rare and prevalent outcomes is unclear.

Data from a previous study that utilized stratified Poisson regression to investigate relationships between selected causes of death and annual cumulative exposures to titanium dioxide (TiO2) were reanalysed using Cox proportional hazards modelling. The study cohort included 3,607 workers employed in three US manufacturing facilities, followed 1935–2006. Analyses were completed for cumulative doses in mg/m3-year with no lag and lagged 10 years, with all models specified similarly for covariates.

Overall, the Cox and Poisson models resulted in similar estimates in most dose categories for the selected causes of death, with no statistically significant indication of a positive association between TiO2 exposure and death from all cancers, lung cancers, non-malignant respiratory disease, or all heart disease. The Cox model routinely produced narrower 95% confidence intervals (CI), although overlapping with those from Poisson. Borderline disagreement results were associated with risk estimates lagged 10 years for heart disease at dose >80: 1.51 (CI: 1.00, 2.25) from Poisson and 1.356 (CI: 0.922, 1.995) from Cox; and for all cancers at dose 15-35: 1.35 (CI: 0.89, 2.04) from Poisson and 1.485 (CI: 1.005, 2.193) from Cox.

Oral Presentation

Policy/Impact

0164   **EARLY REPORTING INCENTIVES TO REDUCE TIME BETWEEN INJURY AND CLAIM: A MULTIPLE BASELINE INTERRUPTED TIME SERIES ANALYSIS OF TWO AUSTRALIAN WORKERS' COMPENSATION JURISDICTIONS**

[1]Tyler Lane*, [1]Shannon Gray, [2]Behrooz Hassani-Mahmooei, [1]Alex Collie. [1]*School of Public Health and Preventive Medicine, Monash University, Melbourne, VIC, Australia*; [2]*Monash University, Melbourne, VIC, Australia*

Background Early access to healthcare and work rehabilitation services provided by workers' compensation is associated with faster return to work and reduced claim costs. Incentivising employers to report claims early following injury may reduce time to service access and improve injured worker outcomes. We investigated the impact of legislated early reporting incentives on claim processing time in two Australian workers' compensation jurisdictions.

Methods A multiple baseline interrupted time series (ITS) design was used to evaluate incentive impact on claim processing time using Australian administrative workers' compensation data. We compared median days between injury and lodgement (lodgement time), lodgement and claim acceptance (decision time), and total processing time in South Australia (SA) and Tasmania (TAS).

Results Total time was not immediately affected by incentives, though there was a significant downward trend of one-third a day per month in both jurisdictions relative to the comparator. Lodgement time decreased significantly in both jurisdictions, though the magnitude of impacts differed. A concurrent increase in decision time was observed in TAS but not in SA.

Conclusions Our findings suggest that employer focused early reporting incentives may have long-term impacts on claim processing time. However, we also observed unanticipated effects such as increases to insurer decision making time, as well as differential impacts between jurisdictions despite identical policy intent. While co-occurring events such as other legislative changes limit causal inferences, ITS analyses provide a useful approach for investigating the impact of legislative change on policy relevant outcomes in workers' compensation systems.

Poster Presentation

Exposure Assessment

0165   **A JOB EXPOSURE MATRIX FROM SELF-REPORTED PHYSICAL EXPOSURES: A METHOD TO CONTROL BIAS FROM SYMPTOMS**

[1]Ann Marie Dale*, [2]Alexis Descatha, [3]Johann Hviid Andersen, [1]Skye Buckner-Petty, [1]Bradley Evanoff. [1]*Washington University, St. Louis, Missouri, USA*; [2]*Inserm Versailles St-Quentin University, Inserm, France*; [3]*Herning Regional Hospital, Herning, Denmark*

Background Self-reported physical exposures are prone to bias from symptoms. Job Exposure Matrices (JEM) can give unbiased estimates but do not capture variation of exposures within the same job. This study created JEMs from self-reported exposures, both including and excluding responses from symptomatic workers, and compared these three exposure measures and their associations with hand/wrist pain.

Methods 35 000 employed French workers from the CONSTANCE cohort reported work-related physical exposures and current symptoms in the hand and other body areas. We grouped self-reported exposures at the level of the job title to create two JEMs - a full JEM including all workers, and an asymptomatic JEM excluding workers with pain symptoms. We examined differences in exposure estimates between the full and asymptomatic JEMs and the change of within-group and between-group variance. Log-binomial models tested strength of association between individual, full and asymptomatic JEMs to hand pain.

Results Most job-level exposure estimates were lower in the asymptomatic JEM. There was smaller within-group variance and larger between group variance in the asymptomatic JEM, demonstrating more homogenous exposure groups. Preliminary regression models showed similar estimates of association

between each exposure method (individual, full JEM and asymptomatic JEM) and hand pain (Prevalence ratios with asymptomatic JEM=1.15–1.34; all p<0.05).

Conclusions A JEM using responses only from asymptomatic workers created more homogenous exposure groups, but initial analyses showed no other significant evidence of biassed exposure estimates due to symptoms. JEMs are a useful method of exposure assignment for some epidemiological studies of musculoskeletal disorders.

Oral Presentation

Intervention Studies

<table>
<tr><td>0166</td><td>MISMATCH BETWEEN SURVEILLANCE OF RISKS AND RECORDED INJURIES IN CONSTRUCTION: INTEGRATION OF ERGONOMICS INTO A COMPREHENSIVE SAFETY PROGRAM</td></tr>
</table>

Ann Marie Dale*, Bradley Evanoff. *Washington University, St. Louis, Missouri, USA*

Background Musculoskeletal disorders (MSD) are the most common nonfatal injuries in construction, occurring more frequently in construction than in most other industries. Construction safety programs typically focus on traumatic injuries and rarely address ergonomic hazards. This project presents data from a gap analysis that is driving an ongoing intervention to incorporate MSD prevention into an existing safety program.

Methods Using data from three large construction projects, we examined differences in annual injury records for MSD compared to other common hazards (falls, struck by, electrocution), frequency of hazards noted on daily pre-task safety assessment forms (PTSA), and topics presented in weekly safety trainings.

Results 26% of recorded injuries were MSD, primarily from lifting, and similar to the proportions from falls (26%) and "struck bys" (32%). However, only 3 of 152 weekly safety trainings related to lifting. PTSA forms showed that workers commonly recognised and recorded potential hazards from falls (40%), struck bys (47%), and lifting (41%) but rarely recognised other MSD risks such as poor posture (9%). When recognised, adequate hazard controls were usually described for falls (96%) and struck bys (65%), but less often for lifting and other MSD risks (45%).

Conclusions Despite having many musculoskeletal injuries, the studied safety program paid little attention to ergonomic training, hazard recognition, and abatement compared to other types of hazards. Our ongoing intervention incorporates ergonomic surveillance, risk assessment, and consistent monitoring of controls into the overall safety management system. Initial results of worksite audits and delivery of the modified program will be presented.

Poster Presentation

Injuries

<table>
<tr><td>0167</td><td>ASSOCIATION BETWEEN AMBIENT TEMPERATURE AND OCCUPATIONAL INJURY</td></tr>
</table>

[1]Shih-Chun Pan, [1,2]Ching-Chun Huang, [1]Wei-Shan Chin*, [3]Bing-Yu Chen, [2,3]Yue-Liang Leon Guo. *[1]National Taiwan University, Taipei, Taiwan; [2]National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan; [3]National Health Research Institutes, Zhunan, Taiwan*

Background Exposure to high temperature has been linked to adverse effects including cardiovascular and renal functions. It was also proposed to diminish human performance capacity and increase accident risk. However, the effects of high temperature on occupational injury have not been extensively studied.

Objective The aim of this study was to determine the association between ambient temperature and occupational injury (OI) occurrence.

Material and Methods OI information was extracted from the National Health Insurance Research Database (NHIRD). Daily ambient temperature and relative humidity (RH) were obtained from the Taiwan EPA air monitoring station. The day of first time OI outpatient/emergency visits during 2006–2011 was used as the event day. The same weekdays of the month were used as the referent day. Time-stratified case-crossover design and conditional logistic regression was used to investigate the relationship between ambient temperature and OI outpatient visits, adjusting for RH.

Results There were 18 951 first time OI outpatient/emergency visits during 2006–2011. The odds ratio (OR) of OI outpatient visits associated with per interquartile range (7.7 degree centigrade) increase in ambient temperature of the same day (lag 0 day) was 1.15 (95% confidence interval, CI: 1.08–1.22). The ORs associated with lag1 (the day before visit day) to lag3 day was 1.13 (95% CI: 1.06–1.19), 1.11 (95% CI: 1.04–1.17), and 1.11 (95% CI: 1.02–1.14), respectively.

Conclusion Exposure to higher ambient temperature was associated with increased risk of OI outpatient visits.

Poster Presentation

Exposure Assessment

<table>
<tr><td>0168</td><td>QUANTIFICATION OF VIABLE STAPHYLOCOCCUS AUREUS AND VIABLE BACTERIA IN WORKPLACES BY PROPIDIUM MONOAZIDE WITH QPCR</td></tr>
</table>

Ching-Wen Chang*, Meng-Hsuan Lin. *National Taiwan University, Taipei, Taiwan*

Viable bacteria and Staphylococcus aureus in air have been linked to human diseases and considered as the threats in occupational health. Rapidly and accurately monitoring these bioaerosols by a reliable method is essential in characterising human exposure and health risk. This study first evaluated quantitative PCR (qPCR) with propidium monoazide (PMA) of 1.5–46 µg/mL to exclusively quantify viable S. aureus of 3–8 log CFU/mL. Results showed qPCR with 1.5 and 2.3 µg/mL PMA performed optimal with a great linearity over six orders of magnitude ($R^2 \geq 0.9$). Viable bacteria and S. aureus were further determined with PMA-qPCR for air samples collected from places including cafeteria, kitchen, food waste recycling site and public library. Viable bacteria averaged 1.9×10^4 cells/m^3 ranging from 4.7×10^2 to 1.2×10^5 cells/m^3. S. aureus were detected in 42.3% of samples for which cell levels varied between 4.2×10^1 and 2.8×10^4 cells/m^3. Concentrations of S. aureus and viable bacteria were positively correlated (r=0.61, p<0.005) and the percentages of S. aureus among viable bacteria averaged 22.7% with 11.6%–43.6% in various locations. With the PMA-qPCR technique, this study demonstrates that the abundance of viable S. aureus and total viable bacterial aerosols in various types of occupational fields can be simultaneously quantified. This molecular assay should be taken into account as it will assist occupational hygienists and epidemiologists obtain reliable exposure data in assessing exposure and health risk, managing occupational health and protecting people from biohazards.

Poster Presentation

Injuries

0169   THE EFFECT OF PSYCHOLOGICAL SYMPTOM WITHIN 1 YEAR AFTER OCCUPATIONAL INJURY ON LONG-TERM SELF-PERCEIVED HEALTH STATUS

[1]Weishan Chin*, [2]Judith Shu-Chu Shiao, [3,4]Yue-Liang Leon Guo, [5]Shih-Cheng Liao, [6]Kuan-Han Lin, [1]Chih-Chieh Chen. [1]Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University School of Public Health, Taipei, Taiwan; [2]Department of Nursing, College of Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan; [3]National Institute of Environmental Health Science, National Health Research Institutes, Zhunan, Taiwan; [4]Department of Environmental and Occupational Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan; [5]Department of Psychiatry, College of Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan; [6]The Graduate Institute of Medical Education and Bioethics, National Taiwan University College of Medicine, Taipei, Taiwan

Background Certain proportion of workers developed psychological symptoms within 1 year after occupational injury. Mental health is associated with overall health status. However, few studies examined the effect of psychological symptoms after occupational injury on long-term health status. This study aims to determine the impact of psychological symptoms within 1 year after occupational injury on health status six years later.
Method 2308 workers who sustained an occupational injury in 2009 and responded to a survey at 3 or 12 months after their injury were followed up in 2015. At 6 years after the injury, they were invited to participate in a questionnaire survey, which included return-to-work condition and self-rated health status. Population attributable risks (PARs) were estimated to assess the effect of psychological symptom on self-rated poor health.
Results A total of 570 workers (33.5%) completed the questionnaire. Injured workers who had adverse life event within follow-up period, had family member requiring care, did not return-to-work within 1 year after the injury, had severe psychological symptom within 1 year after the injury, and whose physical appearance was severely affected had a higher risk of self-rated poor health. Adverse life event within follow-up period was most important factor, accounting for 34.3% of self-perceived poor health, followed by severe psychological symptom within 1 year after the injury (15.0%), and severely affected physical appearance (11.7%).
Conclusion Injury severity and severe psychological symptoms after occupational injury were risk factors for poor health status. Interventions addressing these factors are warranted to reduce psychological ailments after occupational injury.

Oral Presentation

Occupational Medicine (SCOM/Modernet)

0171   SEDENTARY WORK AND RISK OF VENOUS THROMBOEMBOLISM

[1]Camilla Ditlev Lindhardt Johannesen*, [1]Esben Meulengracht Flachs, [1]Niels E Ebbehøj, [2]Jacob Louis Marott, [2]Gorm Boje Jensen, Børge G.[4]Nordestgaard3 , [2]Peter Schnohr, [1,4]Jens Peter E Bonde. [1]Department of Occupational and Environmental Medicine, Bispebjerg Hospital, Copenhagen, Denmark; [2]Copenhagen City Heart Study, Frederiksberg Hospital, Copenhagen, Denmark; [3]Department of Clinical Biochemistry and the Copenhagen General Population Study, Herlev and Gentofte Hospital, Copenhagen, Denmark; [4]Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark

Objective Prolonged seated immobility during long-distance flights is related to an increased risk of venous thromboembolism (VTE) but little is known on the risk, if any, related to sedentary work. The objective of this paper was to examine the risk of VTE according to sitting posture at work.
Methods A total of 88 077 participants from the Copenhagen City Heart Study and the Copenhagen General Population Study were included in the study cohort, all without previous thromboembolic events and aged below 65 years. Activity level at work was obtained at baseline through self-administered questionnaires. VTEs were identified through national patient registries with complete coverage. Survival analyses were performed to determine the risk of VTE according to activity level at work with adjustment for a range of known determinants including lifestyle and coagulation factors.
Results During the follow-up period of 5 79 116 person years (mean follow-up, 7 years) 805 participants experienced their first venous thromboembolic event. 42% of the population categorised themselves as sedentary workers. Multivariable adjusted analyses showed no difference in risk of VTE between sedentary and walking work [hazard ratio (HR) 0.95 (95% confidence interval (CI), 0.80–1.14)]. Likewise, when considering activity level at work on a continuous scale, defined by Metabolic equivalents (METs), multivariable adjusted HR for 1 MET increase was 1.04 (95% CI 0.96–1.13).

Conclusion Sedentary work defined by a wide-range group of occupations, is not a risk factor for VTE. Whether certain occupations with particularly high exposure to immobilised sitting positions are associated with thromboembolic events is not addressed.

Oral Presentation

Other

| 0172 | "TO BE PRESENTED IN AN ACCEPTED MINI-SYMPOSIUM" ASSOCIATION BETWEEN OCCUPATIONAL LIFTING AND RHEGMATOGENOUS RETINAL DETACHMENT IN A NATIONAL COHORT OF SWEDISH MEN |

[1]Andrea Farioli*, [2]David Kriebel, [1]Stefano Mattioli, [3,4]Katarina Kjellberg, [3,5]Tomas Hemmingsson. [1]Department of Medical and Surgical Sciences (DIMEC), Bologna, Italy; [2]Department of Public Health, University of Massachusetts Lowell, Lowell, USA; [3]Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; [4]Centre for Occupational and Environmental Medicine, Stockholm County Council, Stockholm, Sweden; [5]Centre for Social Research on Alcohol and Drugs, Stockholm University, Stockholm, Sweden

Objectives As the evidence on the possible association between lifting and retinal detachment (RD) is limited and controversial, we analysed a large population-based cohort to investigate the risk of RD arising from occupational lifting.

Methods We assessed the incidence of surgically treated RD occurring between 1991 and 2009 in a national cohort of 49,321 Swedish men conscripted for military service in 1969–1970. We applied a job exposure matrix to occupational data from the 1990 census to estimate the frequency of heavy lifting (>20–25 kg) at the workplace. We fitted Poisson regression models including lifting, myopia, income, and education level to estimate incidence rate ratios (IRR) and 95% confidence intervals of RRD.

Results We analysed 217 RD cases that occurred in 7 80 166 person-years. Estimates adjusted by myopia and socioeconomic factors support the hypothesis that the risk of RD increases among subjects lifting heavy weights at least twice per week, compared to workers not performing lifting (IRR 2.38, 95% CI 1.15–4.93, p for trend across lifting categories 0.014). Myopia was a strong negative confounder of the lifting - RD association. While RD was rare in the entire cohort (0.28 cases per 1000 person-years), the rate peaked at 7.9 per 1000 person-years among workers frequently lifting heavy loads, aged between 50 and 59 years, and affected by severe myopia.

Conclusions Our study provides evidence that performing heavy occupational lifting increases the risk of RD, while myopia and socioeconomic factors may be important negative confounders of this association.

Poster Presentation

Cancer

| 0173 | RADIATION-INDUCED PERITONEAL MESOTHELIOMA AFTER EXTERNAL BEAM RADIOTHERAPY FOR PROSTATE ADENOCARCINOMA: A LONGITUDINAL ANALYSIS OF SEER REGISTRIES |

[1]Andrea Farioli*, [2]Francesca Zanardi, [1]Emanuele Rizzello, [3]Giovanna Spatari, [4]Alessio Giuseppe Morganti, [1]Francesco Saverio Violante. [1]Department of Medical and Surgical Sciences (DIMEC), Bologna University, Bologna, Italy; [2]Department of Public Health Sciences and Paediatrics, Turin University, Turin, Italy; [3]Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Messina University, Messina, Italy; [4]Department of Experimental, Diagnostic and Specialty Medicine, University of Bologna, Bologna, Italy

Objective To investigate the association between external beam radiotherapy (EBRT) for prostate adenocarcinoma (PA) and malignant peritoneal mesothelioma (MPM) using data from the US Surveillance, Epidemiology and End Results (SEER) program.

Methods We identified PA cases diagnosed in 1973–2013 among patients aged ≥45 years. The follow-up started one year after the primary diagnosis (to exclude synchronous cancers and limit surveillance bias) and ended at the diagnosis of MPM, other malignancies, death, or at the study end (12/31/2013). We estimated hazard ratios (HR) and 95% confidence intervals (95% CI) of MPM for EBRT, compared to no radiotherapy, by fitting Cox models incorporating inverse probability weights to account for age at diagnosis, race, year of diagnosis, primary cancer surgery, SEER register, and county's mesothelioma relative risk (proxy for individual asbestos exposure).

Results We observed 34 MPM cases occurring in 4,755,045 person-years (rate of 0.7 per 1 00 000 person-years, 95% CI 0.5–1.0). The risk of MPM was higher among EBRT patients (HR 2.1, 95% CI 0.9–4.8) and increased steadily with increasing latency period (1–4 years, HR 1.3, 95% CI 0.4–4.6; 5–9 years, HR 1.9, 95% CI 0.5–7.7; ≥10 years, HR 4.9, 95% CI 0.9–28). However, only 8 MPM were observed for latency periods ≥10 years.

Conclusions Our study supports the hypothesis that EBRT for PA is associated with MPM. However, the incidence of MPM in our study population was very low; future studies should focus on high-risk populations (e.g. former asbestos workers) to evaluate the clinical significance of the observed association.

Oral Presentation

Respiratory

0174 MORTALITY DUE TO ASBESTOSIS IN A COHORT OF FORMER ASBESTOS TEXTILE WORKERS

[1]Andrea Farioli*, [1]Francesco Saverio Violante, [2]Carlo La Vecchia, [3]Eva Negri, [2]Claudio Pelucchi, [4]Giovanna Spatari, [5]Paolo Boffetta, [6]Enrico Pira. [1]*Department of Medical and Surgical Sciences (DIMEC), Bologna University, Bologna, Italy*; [2]*Department of Clinical Sciences and Community Health, Milan University, Milan, Italy*; [3]*Department of Biomedical and Clinical Sciences, Milan University, Milan, Italy*; [4]*Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Messina University, Messina, Italy*; [5]*Tisch Cancer Institute, Icahn School of Medicine at Mount Sinai, New York, USA*; [6]*Department of Public Health Sciences and Paediatrics, Turin University, Turin, Italy*

Background Knowledge on the role of the temporal pattern of exposure to asbestos in determining mortality from asbestosis is limited. We aim at investigating how the risk of death due to asbestosis changes according to the duration of employment and the time since the last employment (TSLE).

Methods An historical cohort of workers from a former asbestos textile factory (active between 1946 and 84) was followed up until November 2013. For each subjects, we collected information on duration of the employment, TSLE, age and year of first employment, and sex. We estimated hazard ratios (HR) and 95% confidence intervals (CI) of death from asbestosis by fitting multivariable Cox regression models with age specified as the main temporal axis.

Results We identified 51 deaths from asbestosis that occurred among 1823 workers (incidence rate of 74 cases per 1 00 000 person-years). The risk of death from asbestosis increased with increasing exposure duration (HR 3.0 [95%CI 1.3–7.6] for duration of employment $\geq$15 years compared to duration <5 years) and declined with TSLE (HR 0.3 [95%CI 0.1–0.9] for TSLE $\geq$25 compared to TSLE <5 years). We observed a strong decline of mortality due to asbestosis among workers firstly employed after 1968.

Conclusions Information on the temporal pattern of exposure to asbestos is fundamental to estimate the individual risk of asbestosis. On the opposite of what overserved in ecological studies, the risk of death due to asbestosis declines steadily after cessation of exposure to asbestos.

Oral Presentation

Occupational Medicine (SCOM/Modernet)

0175 DIFFERENT APPROACHES FOR EARLY RECOGNITION AND PREVENTION OF NEW AND EMERGING WORK-RELATED DISEASES

[1]Jelena Bakusic, [2]Annet Lenderink, [1,3]Charlotte Lambreghts, [1,3]Sofie Vandenbroeck, [4]Jos Verbeek, [5]Stefania Curti, [5]Stefano Mattioli, [1,3]Lode Godderis*. [1]*Department of Public Health and Primary Care, KU Leuven, Leuven, Belgium*; [2]*Netherlands Centre for Occupational Diseases, Coronel Institute on Work and Health, AMC/University of Amsterdam, Amsterdam, The Netherlands*; [3]*IDEWE, External Service for Prevention and Protection at Work, Heverlee, Belgium*; [4]*Finnish Institute of Occupational Health, Kuopio, Finland*; [5]*Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy*

Rapid changes in working conditions constantly give rise to new occupational health risks and work-related diseases (WRDs). Monitoring these new WRDs is essential from the aspects of early recognition and prevention. In addition, it requires a comprehensive approach, using several complementary methods. One of these methods are early warning systems designed to collect information on health effects in order to trigger interventions and prevention. These systems differ in characteristics, their ability to capture new WRDs and their link with prevention. Therefore, the aim of this study is to identify sentinel and alert systems for detecting new and emerging WRDs, describe their main characteristics, and set up a basic typology. In the first phase, we conducted an extensive scientific and grey literature review and we identified 75 surveillance systems covering 26 different countries. We set up a basic typology of these systems dividing them into four main groups: compensation-based systems (21), non-compensation related comprehensive systems (38), sentinel systems (12) and public health surveillance systems aimed at workers and non-workers (7). These systems further differed in type of WRDs, coverage, data collection, evaluation of work-relatedness; follow up of new/emerging risks, link with prevention etc. In the second phase, we chose a representative selection of 12 good practise examples to be described in-depth. Through a desk research and interviews with stakeholders, we gained additional insight into drivers and obstacles regarding these systems and usage of collected data for identification of WRDs, prevention and policy recommendations.

Oral Presentation

Cancer

0176 SINONASAL CANCER FOLLOWING OCCUPATIONAL STYRENE EXPOSURE: A NEW SIGNAL OF HUMAN CARCINOGENESIS?

[1,2]Mette Schou Nissen*, [1]Zara Ann Stokholm, [1]Mette Skovgaard Christensen, [3,4]Vivi Schlünssen, [1]Jesper Medom Vestergaard, [1]Inge Brosbøl Iversen, [1]Henrik Albert Kolstad. [1]*Department of Occupational Medicine, Danish Ramazzini Centre, Aarhus University Hospital, Aarhus, Denmark*; [2]*Centre for Integrated Register-based Research, CIRRAU, Aarhus University, Aarhus, Denmark*; [3]*Department of Public Health, Danish Ramazzini Centre, Aarhus University, Aarhus, Denmark*; [4]*National Research Centre for the Working Environment, Copenhagen, Denmark*

Objective We recently suggested an increased risk of sinonasal cancer following occupational styrene exposure. The objective of the current study is to explore this finding further by including information on quantitative measures of styrene exposure and histological information on sinonasal cancer subcategories.

Methods We followed 73 092 workers employed in 456 small and medium sized Danish reinforced plastics companies from 1968 to 2011. Incident cases of sinonasal cancer were identified by linkage with the national Danish Cancer Registry. We modelled cumulative styrene exposure level from historical styrene measurements, company information, and survey data and estimated rate ratios (RR) of overall sinonasal cancer and histological subcategories. Due to few cases, these analyses were performed with no adjustment. To account for potential confounding from age, gender and employment in wood

industries we conducted a nested case-control study matched on these factors. Analyses were performed with conditional logistic regression.

Results The RR of overall sinonasal cancer (37 cases) was doubled in the upper exposure tertile compared to the lower exposure tertile. For adenocarcinomas (9 cases), the RR in the medium and upper exposure tertiles were 1.17 (95%CI 0.07–18.72) and 7.87 (95%CI 0.97–63.94), respectively. Comparable results were obtained from the case-control analysis indicating limited confounding by age, gender and wood dust exposure. No consistent trend was observed for squamous cell carcinomas.

Conclusion Despite statistically non-significant results and limitations owing to the few cases, this study indicates increased risk of sinonasal adenocarcinomas among high level styrene exposed workers and could signal a carcinogenic effect of styrene.

Poster Presentation
Risk Assessment

0177 OCCUPATIONAL RISK ASSESSMENT ON CHRYSOTILE PRODUCTION

Serik Ibraev, Alexey Alexeyev*, Asset Izdenov. *Karaganda State Medical University, Karaganda, Kazakhstan*

The research was conducted at the only enterprise in Kazakhstan producing chrysotile - "Kostanai minerals" JSC. Sanitary and hygienic studies were carried out and working conditions were evaluated at 102 workplaces of the Processing Complex (PC). The level of Morbidity with Temporary Incapacity for Work (MTIW) was analysed for 758 employees of the PC workers. The occupational risk assessment was carried out according to the method proposed by professor Izmerov. For the processing and analysis of data, the probabilistic-statistical methods and the odds ratio method are applied.

By using results of the conducted studies of working conditions of PC workers was established that the main unfavourable factors of the labour process are the increased noise level and dustiness of workplace air. As a result of the analysis has established the following features: 1. Female`s indicators of the MTIW are more expressed than males; 2. Established that morbidity rates are significantly higher among workers aged 30–39 years and work experience at the PC up to 9 years. 3. According to the main MTIW indicators, the following groups are at the highest level: "Traumas in everyday life", "Diseases of the respiratory organs, including SARS" and "Diseases of the musculoskeletal system"

Based on the degree of significance of the location of occupational risk indicators, the categories and criteria for the health profiling of health of PC workers are defined in the following order: 1) "MTIW" and "integral disability index"; 2) "working environment class"; 3) "occupational disease" and "occupational disease index".

Poster Presentation
Psychosocial

0179 FACTORS ASSOCIATED WITH HIGH NEED FOR RECOVERY IN DIFFERENT AGE GROUPS

[1,2]Philippe Kiss*, [1,2]Marc De Meester, [2]Lutgart Braeckman. *[1]Securex Occupational Health Service, Ghent, Belgium; [2]Ghent University, Ghent, Belgium*

Aim To explore associations of occupational factors with a high need for recovery (HNFR) in different age groups.

Methods The need for recovery (NFR) is a short term health effect, predictive for future long term adverse mental health effects.

This was a cross-sectional study in 17 400 subjects (75.7% participation rate), working in 128 organisations (both private and public). The subjects were divided into 8 age groups.

NFR was assessed by the NFR scale questionnaire (0–100 scale). High need for recovery (NFR >45) was used as outcome variable.

20 work related psychosocial factors were assessed: 13 originating from the Copenhagen Psychosocial Questionnaire (COPSOQ II short version) and 7 were developed within our service. Other variables were: physical workload, gender and age (total study population).

Multivariate log-binomial regression analyses were used to calculate regression coefficients for a HNFR, for the total population and for each age group separately.

Results General prevalence of HNFR was 35.9%. Prevalences were significantly different between the different age groups, ranging from 23.8% to 39.1%.

Physical workload, quantitative demands, work-life balance and discomfort from physical work environment had a significant association with HNFR in all age groups.

Emotional demands, organisational social capital, participation in decision making, possibilities for development, growth opportunities, working more hours than desired, job insecurity, undesirable behaviour and gender were additionally significant in one or more age groups.

Conclusions Four occupational factors need to be considered throughout the whole career. Additional and different factors need to be taken into account according to age group.

Oral Presentation
Occupational Medicine (SCOM/Modernet)

0181 METHODOLOGIES TO IDENTIFY WORK-RELATED DISEASES: IN-DEPTH DESCRIPTION OF SELECTED OF SENTINEL OR ALERT SYSTEMS

[1]Annet Lenderink*, [2]Jelena Bakusic, [2]Sofie Vandenbroeck, [2]Charlotte Lambreghts, [2]Lode Godderis. *[1]Netherlands Centre for Occupational Diseases, Coronel Institute on Work and Health, AMC/University of Amsterdam, Amsterdam, The Netherlands; [2]Centre for Environment and Health, Katholieke Universiteit Leuven, Leuven, Belgium*

Objectives Drawing on a literature review on sentinel and alert systems for identifying new/emerging work-related diseases (WRDs) a basic typology of systems was developed. These systems differ in characteristics, ability to capture new WRDs and link with prevention. The objectives of the subsequent study of a subset of systems were to describe in-depth aims, drivers and obstacles of the systems and use of their data in practice, for prevention and detecting new/emerging WRDs.

Methods Twelve systems were chosen reflecting the different types (linked to compensation or not, aimed at all WRDs or a subset of diseases, sentinel systems, workers only or general public). Six systems were described based on desk research and six other systems were studied through interviews with different actors to gather information on the operation of the systems and the use of the gathered data for prevention.

Results Several important themes emerged from the comparative tables, related to the design and performance of the system: visibility, reporting methods, exposure assessment, data quality, linkage to other institutions, and related to data use for prevention, alert on hazardous situations, awareness on new/emerging diseases.

Conclusions Each system has its strengths and limitations, closely related to its purpose and the country that developed it. Sentinel systems seem to be best equipped for prevention and alert on new/emerging diseases. Enhancing reporting needs to balance required information and perceived reward for reporters. Embedding of systems in governmental or public health organisations is important in terms of financing, expertise and dissemination of results.

Oral Presentation

Other

| 0182 | HIGH SCHOOL DROPOUT AND CAUSE-SPECIFIC MORTALITY IN YOUNG ADULTHOOD: THE MEDIATING ROLE OF WORK CAREER |

[1,2]Petter Kristensen*, [1]Karina Corbett, [1]Therese N Hanvold, [3,1]Rune Hoff, [1]Ingrid S Mehlum. [1]National Institute of Occupational Health, Oslo, Norway; [2]Institute of Health and Society, University of Oslo, Oslo, Norway; [3]Institute of Basic Medical Sciences, University of Oslo, Oslo, Norway

Objectives High school dropout has unfavourable consequences. We examine the association between dropout and mortality and estimate the mediating role of an unfavourable work trajectory.

Methods Subjects born in Norway 1967–1976 were followed up in several national registries. The association between dropping out of high school by age 23 and all-cause and cause-specific mortality 10 years onwards were estimated as hazard ratios (HR), applying Cox regression in confounder-adjusted models. Characteristics relating to different trajectories during follow-up were considered as mediators of dropout effects on survival.

Results Thirty-nine percent out of 396 373 participants were classified as dropouts. All-cause mortality during follow-up was 69 per 1 00 000 person-years (2689 cases). The crude dropout HR was 2.1 (1.9–2.3), being reduced to 1.8 (1.6–2.0) in the confounder-adjusted model. After including the potential mediators in the model, dropouts no longer had an excess mortality compared to non-dropouts (HR 1.0, CI (0.9–1.1)). Mediators relating to financial situation, social benefits and employment accounted for the largest reduction in the association. Deaths caused by overdose and drug dependence were strongly associated with dropout (454 cases; rate 12; confounder-adjusted HR 5.0 (3.8–6.5)). Inclusion of work trajectory factors attenuated the association by 63% (women) and 48% (men).

Conclusions Mortality was clearly associated with high school dropout, strongest for drug-related causes. The results suggest that an unfavourable work career following high school dropout could be an important mechanism for this association.

Poster Presentation

Neurological Effects

| 0183 | PREDICTORS OF WORK ABILITY IN SOLVENT EXPOSED WORKERS |

[1,2]Ari Kaukiainen*, [1]Heidi Furu, [1]Hanna-Kaisa Hyvärinen, [1]Markku Sainio. [1]Finnish Institute of Occupational Health, Helsinki, Finland; [2]LocalTapiola General, LocalTapiola Group, Espoo, Finland

Introduction Occupational chronic solvent encephalopathy (CSE) often leads to early retirement. However, little is known about work ability in solvent exposed workers in general. The aim was to study the effect of work-related and non-occupational factors on work ability in active solvent exposed population.

Methods A questionnaire on exposure and health was sent to 3640 workers in four solvent-exposed fields, i.e. painters and floor-layers, boat builders, printers, and metal workers, resulting in 1730 responses. Work Ability Score (WAS), a single question item of Work Ability Index, solvent exposure, demographic factors, chronic diseases, and employment status were considered in univariate and multivariate analysis. The findings were compared to those of corresponding national blue-collar reference population (n=221), and in addition to a small cohort of workers with CSE (n=18).

Results WAS of solvent-exposed workers was lower than that of national reference group, the difference being significant in the oldest age group, but higher than that of workers diagnosed with CSE. Number of chronic diseases and age were the strongest explanatory factors of poor work ability. Solvent exposure was a weak independent risk factor for reduced WAS. Work ability was highest in boat builders, followed by metal workers and printers, and lowest in painters and floor layers.

Conclusions In general, the strongest explanatory factors of reduced WAS were chronic diseases, age, and working status. The weak effect of solvents on work ability is in line with improved occupational hygiene and declined solvent exposure levels in an industrialised country. As a single question WAS is easily included in occupational screening questionnaires.

Poster Presentation

Psychosocial

| 0184 | CONSIDERING GIVING UP GAINFUL EMPLOYMENT AS PREDICTOR FOR EARLY EXIT FROM THE LABOUR FORCE |

Uwe Rose*, Hermann Burr, Norbert Kersten. *Federal Institute for Occupational Safety and Health (FIOSH), Berlin, Germany*

Introduction I ll health, socio-economic status and working conditions are important determinants for labour market participation. But this perspective neglects the subjective view of individuals and the role of cognitive processes. The aim of the present study is to investigate the contribution of these considerations for the prediction of subsequent exit from the labour force.

Method The sampling frame is defined by all German employees being subject to social security contributions and born between 1951 and 1980. The sample consists of 4511 survey participants of whom 4182 employees are with full- or part-time employment. At the time of the first interview they were asked how often they have thought about giving up gainful employment within the last year. The analysis focusses on the prediction of employment status five years later.

Results At baseline 8% of female and of 7.2% male employees reported having "sometimes thoughts within the last year" and 4.4% of the female and 3.7% of the male employees reported a frequency up to "every day". The follow-up interviews are currently underway and are expected to end May 2017. Results on associations between considerations at baseline and status of employment at follow-up and will be presented at the conference.

Discussion Research on the association between cognitive processes and subsequent behaviour is very limited. We assume that the inclusion of these aspects will improve the prediction of labour force participation. However, there are strong limitations by the sample size and the number of observations at the second wave of assessment.

Poster Presentation

Cancer

| 0186 | WOMEN EPIDEMIOLOGY LUNG CANCER (WELCA) STUDY: REPRODUCTIVE, HORMONAL, OCCUPATIONAL RISK FACTORS AND BIOBANK |

[1]Diane Martin*, [1]Monica Neri, [2]Pierre Laurent-Puig, [3]Hélène Blons, [4]Martine Antoine, [5,6]Anne Guiochon-Mantel, [5,6]Sylvie Brailly-Tabard, [1]Marianne Canonico, [7,8]Marie Wislez, [9]Jean Trédaniel, [1]Isabelle Stücker. [1]*Université Paris-Saclay, Univ.Paris-Sud, UVSQ, CESP, Inserm UMRS, 1018, Villejuif, France;* [2]*Université Paris Descartes, Inserm UMR5775 EPIGENETEC, Paris, France;* [3]*INSERM UMR-S1147, Université Paris Sorbonne Cité, Hôpital Européen Georges Pompidou (HEGP) APHP, Paris, France;* [4]*Service d'anatomopathologie, APHP TENON, Paris, France;* [5]*Service de Génétique moléculaire, Pharmacogénétique et Hormonologie, Hôpital de Bicêtre APHP, Le Kremlin Bicetre, France;* [6]*INSERM UMRS1185, Faculté de médecine Paris Sud, Université Paris-Sud, Université Paris-Saclay, Paris, France;* [7]*Service de Pneumologie APHP TENON, Paris, France;* [8]*Sorbonne Université, UPMC Univ. Paris 06, GRC-04, Théranoscan, Paris, France;* [9]*Université Paris Descartes, Unité de cancérologie thoracique, Groupe Hospitalier Paris Saint Joseph, Paris, France*

Background Very few studies have examined occupational exposures in jobs that are typically performed by women. WELCA study aims at investigating the aetiology of lung cancer in women, focusing particularly on hormonal and occupational risk factors.

Methods WELCA is a population based case-control study in progress (1000 ca/1000 co) ending in 2017. Cases are women with incident lung cancer, living in the Ile de France area and aged up to 75 years. The control group is a random sample of the population living in the same area, frequency-matched for age and additionally stratified on the distribution of socio-professional categories of women residing there. Subjects are interviewed face-to-face using a standardised questionnaire (CAPI) collecting information on reproductive and hormonal factors, tobacco, residential history and a detailed description of occupational lifetime history. Specific questionnaires have been developed concerning jobs and sectors that are frequently considered of particular interest for the study: house cleaning, dry cleaning and laundry, hairdressing, catering and cooking, health, beauty therapist, nail salons. Blood samples and tumours are also collected, to establish a biobank for molecular epidemiology studies. To date 670ca/450co are already included.

Discussion The large number of women should allow to uncover occupational exposures more specific of their professional activities. In addition information on many non-occupational risk factors is available, and the study will provide an excellent framework for numerous studies in various fields. Preliminary results on participation rates, biobank, socio-demographic characteristics or number of job periods described will be presented.

Oral Presentation

Policy/Impact

| 0187 | DISABILITY AND WORKPLACE HARASSMENT AND DISCRIMINATION AMONG CANADIAN FEDERAL PUBLIC SERVICE EMPLOYEES |

[1]Andrea Marie Jones*, [2]Rodrigo Finkelstein, [1]Mieke Koehoorn. [1]*University of British Columbia, Vancouver, British Columbia, Canada;* [2]*Simon Fraser University, Vancouver, British Columbia, Canada*

Purpose To examine the impact of disability on workplace harassment and discrimination.

Methods Cross-sectional data from the 2014 Canadian Public Service Employee Survey was analysed (n=175,742) using logistic regression to investigate the relationship between self-reported disability and workplace harassment and discrimination in the last two years. Age, gender, and ethnicity were included as potential confounders and interaction terms. Additive and multiplicative interactions were examined using linear binomial and logistic regression respectively.

Results Disability was significantly associated with increased odds of harassment (odds ratio [OR]=2.80, 95% confidence interval [CI]: 2.68–2.92) and discrimination (OR=4.97, 95% CI: 4.72–5.23) in models adjusted for confounders. A significant positive additive interaction was observed between disability and 1) age in the harassment and discrimination models and 2) ethnicity in the discrimination model. Excess

risk due to an interaction between disability and age (reference = age 24 and under) was greatest amongst employees age 40–44 years in the harassment model (interaction contrast (IC)=8.19%, 95% CI: 7.22%–9.13%) and 45–59 years in the discrimination model (IC=13.32%, 95% CI: 7.25%–18.34%). In the discrimination model, excess risk due to an interaction between disability and ethnicity (reference = not a visible minority) was observed for employees who identified as visible minorities (IC=4.49%, 95% CI: 1.53=7.51%) and as Aboriginal (IC=6.00%, 95% CI: 2.85%–9.21%).

Conclusion In the current Canadian labour market disabled employees experience high levels of workplace harassment and discrimination despite policy and legislation to prevent this. Additional efforts to address workplace harassment and discrimination are needed, especially for vulnerable groups.

Poster Presentation

Psychosocial

| 0188 | TRAJECTORIES OF WELL-BEING: TIME-VARYING EFFECTS OF PSYCHOSOCIAL DETERMINANTS OF HEALTH AT WORK |

[1,2]Neto Mariana, [3]Chambel Maria José, [4]Manuel Sérgio, [2]Miguel José Pereira, [2]Reis Maria de Fátima. [1]Instituto Nacional de Saúde Doutor Ricardo Jorge, Lisboa, Portugal; [2]ISAMB – Instituto de Saúde Ambiental. Faculdade de Medicina da Universidade de Lisboa, Lisboa, Portugal; [3]Faculdade de Psicologia da Universidade de Lisboa, Lisboa, Portugal; [4]EDP – Eletricidade de Portugal, Lisboa, Portugal

Objective To analyse a simplified model of psychosocial work environment in order to estimate how changes over time in factors related to psychological working conditions, work-life interface and personal characteristics influence workers well-being trajectory.

Methods The simplified model, which includes working conditions (Job Demands, Job Control, Supervisor Support and Co-workers Support), Work-Family Conflict (Conflict based on Strain and Conflict based on Time) and Sense of Coherence, was examined in a three time points longitudinal survey including 1691 workers using latent growth curves models (LGCM) with time-varying effects through a structural equations modelling approach.

Results Group level individual trajectories of Time-Varying Covariates (TVC) showed that Job Demands and Time-based Conflict decreased, Co-Workers Support increased and Supervisor Support remained stable. Only Time-based Conflict and Supervisor Support showed individual workers variation across change. Job Control and Sense of Coherence individual trajectories had no acceptable fit to the data. Well-being trajectory showed a significantly increase over time and this growth was conditioned significantly by Job Demands, Time-based Conflict and Sense of Coherence in the three moments, by Job Control and Supervisor Support in two moments, but not by Co-Workers Support time-specific effects.

Conclusions Working environment factors have differentiated intervention regardless of their isolated trajectories in a dynamic compatible with a systemic mechanism of homeostatic and adaptive type, with the ability to activate resources necessary to maintain the highest possible Well-Being level.

Knowledge of this adaptive dynamics is a critical issue to the adoption of company's policies favourable to employees Well-Being and individual resources improvement.

Poster Presentation

Injuries

| 0189 | WORK-RELATED SNAKE BITES INJURIES AMONG FARMERS IN BRAZIL |

Yukari Figueroa Mise, Tatiane Costa Meira, Maria Claudia Peres Moura Luna, Vilma Sousa Santana*. Universidade Federal da Bahia, Salvador, Bahia, Brazil

Objective To estimate annual incidence of work-related snake bites injuries, WSBI, among farmers in Brazil from 2007 to 2015.

Methods This study was carried out with data from the Information System for Notifiable Diseases and injuries, SINAN, which includes records of work-related injuries caused by poisonous animals. Population estimates are from the Brazilian Institute of Geography and Statistics, IBGE.

Results In 2007 the WSBI incidence was 5.3/100,000 and 5.2/100,000 in 2015, a reduction of −2.4% among farmers in Brazil. The highest WSBI incidence was estimated for Roraima and Espirito Santo, in 2007 (29.5/100,000 and 24.7/100,000, respectively) and 2015 (40.7/100,000 and 16.1/100,000). Over the study time, the WSBI annual incidence increased in the North (52.3%) and Northeast (14.6%). In the remaining regions there was a decrease of −66.8% (Middle West), −40.8% (Southeast) and −32.0% (South).

Conclusions There are deep regional disparities in the risk of WSBI among farmers in the country, approximately 15 million. Epidemiological data for them are scarce leaving invisible these severe, potentially disabling or fatal preventable work-related injury with simple safe shoes like rubber boots.

Oral Presentation

Methodology

| 0190 | OCCUPATIONAL EXPOSURE TO CRYSTALLINE SILICA AND DEATH FROM LUNG CANCER: G-ESTIMATION OF STRUCTURAL ACCELERATED FAILURE TIME MODELS |

[1]Sally Picciotto*, [1]Daniel M Brown, [1]Andreas M Neophytou, [3]Lisa E Gallagher, [1]Ellen E Eisen, [2]Harvey Checkoway, [1]Sadie Costello. [1]UC Berkeley, Berkeley, California, USA; [2]UC San Diego, La Jolla, California, USA; [3]Boston University, Boston, Massachusetts, USA

Background Occupational exposure to crystalline silica has been linked to mortality risk for lung cancer. The healthy worker survivor effect may bias effect estimates downward unless special methods are used to adjust for employment status, time off work, and co-exposures. Unlike traditional regression, g-estimation adjusts correctly for such time-varying confounders.

Methods We applied g-estimation of structural accelerated failure time models to estimate the number of years of life that could have been saved for mortality from all natural causes and from lung cancer if exposure to crystalline silica had been prevented among 2342 white male workers in the diatomaceous earth industry (1942–2011). Exposures were lagged 17 years because exposure data were only available through 1994; this also accounts for disease latency. Analyses adjusted for calendar year, age, Latino ethnicity, smoking status, duration of employment in the diatomaceous earth industry and exposure to crystalline silica before entering follow-up, prior exposure to crystalline silica, prior cumulative exposure to dust and asbestos, time taken off work, and employment status.

Results If all workers had been unexposed to crystalline silica, we estimated that workers who died of natural causes would have survived, on average, 1.1 years longer (95% CI: 0.3, 2.3) overall. Workers who died from lung cancer would have survived an estimated average of 9.0 years longer (95% CI: 4.4, 16.2) if they had been unexposed.

Conclusions A ban on exposure to crystalline silica in this cohort would have resulted in longer survival for workers, particularly those who died of lung cancer.

Poster Presentation

Psychosocial

| 0193 | ALCOHOL AND OTHER DRUGS AMONG WORKERS: PREVALENCE AND JOB RELATED CONSEQUENCES |

[1,3]Marie-Claire Lambrechts*, [2]Lieve Vandersmissen, [1,2]Lode Godderis. [1]*Katholieke Universiteit Leuven, University of Leuven, Leuven, Belgium*; [2]*Idewe, External Service for Prevention and Protection at Work, Heverlee, Belgium*; [3]*VAD, Flemish centre of expertise on alcohol and other drugs, Brussels, Belgium*

Few data on the use of alcohol and other drugs in workers and possible effects on job performance are available. In 2016 an anonymized questionnaire was distributed among Belgian employees while waiting for a periodical medical examination. AUDIT-C and One Single Questions were used to measure prevalence of substance use. Effects on absenteeism, lost productivity, workplace accidents, conflicts with co-workers and sanctions by employers respectively experienced by the workers and observed among colleagues were investigated.

5367 workers completed the questionnaires. 83% drank at least one standard unit in the 12 months preceding the survey; 7.5% had used cannabis or other illegal drugs, 9.3% hypnotics, 5.5% tranquillizers and 7.9% antidepressants; 11.3% took prescribed drugs for nonmedical reasons. 11.4% of current drinkers had an average consumption of 5 to 6 units a day, which was significantly higher among employees<35 year; 8.5% exhibited binge drinking at least once a week.

39.1% of last year drinkers had an indication of problem drinking and 12.2% experienced consequences on the job. 27.8% observed negative effects among their colleagues, especially being late at work (18.3%), irregular job performances (18%) and absenteeism (15.7%) Due to illicit drug use, 1.2% of the respondents experienced some negative effects on the job, 7.2% observed negative effects among their colleagues. Regarding the use of psychoactive medication, significantly more used by women, this was respectively 3% and 10.7%.

As the negative impact of work related substance use, especially of alcohol, is obvious, a tailored and multicomponent alcohol and drug policy is appropriate.

Poster Presentation

Reproductive Effects

0198   THE CHLORINATED HYDROCARBONS CONTAMINATED
GROUNDWATER AND THE REPRODUCTIVE HAZARD

[1]Ching-Chun Lin*, [1,2]Pau-Chung Chen, [1]Meng-Shan Tsai, [1]Yu Chan Chen, [1]Yu Ling Ren. [1]Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University College of Public Health, Taipei, Taiwan; [2]Department of Environmental and Occupational Medicine, National Taiwan University Hospital and National Taiwan University College of Medicine, Taipei, Taiwan; [3]3Department of Environmental and Occupational Medicine National Taiwan University College of Medicine, Taipei, Taiwan

Our study was to investigate the association between the birth outcome and infant mortality among the community with chlorinated organic contaminated groundwater.

The parents who lived in the area around the factory from1978 to1997were recruited. According to the groundwater hydrogeology, we classified into three areas, factory located as a high-exposure area, the downstream as low-exposure areas, and upstream as reference areas. Analysis with the multiple logistic regression and adjusted for infant sex, parity, maternal marital status, maternal age at birth, maternal education, and maternal occupation, the adjusted odds ratio for preterm delivery among the high-exposure and low-exposure areas. We exclude the population who ever worked in the factory. Associations between the exposure area and adverse birth outcomes were divided into four periods 1978–82, 1983–87, 1988–92, and 1993–97.

For the preterm delivery, the odds ratio for the factory located were1.60 (CI=1.14–2.24) for the period of 1993–1997, 1.67 (CI=1.03–2.71) for the period of 1988–1992 and 1.57 (95% CI=1.07–2.30) for the downstream for the period of 1988–1992. For the low birth weight, the odds ratio for the downstream were1.36 (CI=1.00–1.84) for the period of 1993–1997. The infant mortality have the trend for the

The Chlorinated Hydrocarbons organic solvents contaminated water and the environment could be increased the risk of preterm delivery and the low birth weight. The more evidence need more explore and further studies need to strength the relation.

Oral Presentation

Respiratory

0199   OCCUPATIONAL AND ENVIRONMENTAL RISK FACTORS
FOR CHRONIC FIBROSING IDIOPATHIC INTERSTITIAL
PNEUMONIA IN SOUTH KOREA

[1]Se Yeong Kim*, [2]Dong Mug Kang. [1]Korea worker's health centre, Pusan National University School of Medicine., Busan, Republic of Korea; [2]Occupational and Environmental Medicine, Pusan National University Yangsan Hospital, Busan, Republic of Korea

Background Idiopathic pulmonary fibrosis (IPF) and idiopathic nonspecific interstitial pneumonia (INSIP) have recently been classified together as chronic fibrosing idiopathic interstitial pneumonia (IIP). Occupational and environmental factors are believed to be risk factors for the development of chronic pulmonary fibrosis. Previous case-control studies have suggested that occupational and environmental agents may contribute to the aetiology of IPF, but the association with INSIP has not been examined. Therefore, we aimed to evaluate the association of occupational and environmental agents with chronic fibrosing IIP, including INSIP.

Methods This was a retrospective case-control study performed at a university hospital in South Korea. We recruited patients with chronic fibrosing IIP diagnosed from January 2011 to December 2014 at a respiratory centre at our institute and randomly matched healthy controls who had normal chest X-ray findings by age and gender. Ninety-two chronic fibrosing IIP patients and 92 matched controls were analysed. We used a structured questionnaire to evaluate potential occupational and environmental risk factors for chronic fibrosing IIP, with adjustments for age, smoking, and clinical risk factors.

Results We used conditional logistic regression models to analyse associations with chronic fibrosing IIP adjusted for age, smoking and clinical risk factors. Exposure to stone, sand, or silica significantly increased the risk of chronic fibrosing IIP (odds ratio [OR]=5.01; 95% CI, 1.07–24.21).

Conclusions Our findings indicate that exposure to stone, sand, and silica might constitute a risk factor for developing chronic fibrosing IIP in the Korean population.

Oral Presentation

Exposure Assessment

0200   CREATION OF A QUANTITATIVE HISTORICAL JOB-
EXPOSURE MATRIX FOR PLUTONIUM WORKERS AND
FEASIBILITY OF ITS USE WITH RECONSTRUCTED
OCCUPATIONAL HISTORIES FOR EPIDEMIOLOGICAL
PURPOSES

[3]Tony Riddell, [2]Hanhua Liu, [2]Richard Wakeford, [3]Jacqueline A O'Hagan, [2]Raymond Agius, [4]David MacGregor, [4]Christine Wilson, [4]Mark Peace, [4]David Herdman, [1]Frank de Vocht*. [1]University of Bristol, Bristol, UK; [2]University of Manchester, Manchester, UK; [3]Public Health England, Chilton, UK; [4]Sellafield Ltd, Seascale, UK

Introduction The UK Sellafield workforce is important for studying potential health risks of plutonium (Pu) exposure. However, several hundred early workers, employed during the period 1952–63, have been excluded from epidemiological studies because their urinalysis results were insufficiently reliable to provide accurate exposure assessment. This project aimed to develop a job-exposure matrix (JEM) that would enable future inclusion of these workers in epidemiological studies.

Methods 630 plutonium workers without reliable Pu urinalysis data for 1952–63 were identified within fourteen 'homogeneous' plutonium exposure groups. For each job/work location/year, 'exposure analogues' with reliable urinalysis data were identified (n=330). The JEM was based on 4487 work history records and 6899 urinalysis results. Intake assessments were produced using the 'PuMA' plutonium mass assessment code employing the latest conventional assessment methodology.

Results The JEM provided estimates for the median plutonium intake in becquerel (Bq) per year for each job/work location/year combination, and ranged from "no intake" to 175 Bq/yr.

Cumulative plutonium intakes for these workers ranged from "no intake" to 990 Bq. Internal cross-validation indicated moderate-to-good correlations (r>0.4) and relative differences between JEM and validation sample <10%. Probabilistic evaluation indicated robust estimates of cumulative intake. Median cumulative JEM intake was 50 times lower than for conventional assessment methodology and much better aligned with prior expectation.

Conclusions The 'exposure analogues' methodology in JEM-development is a novel approach and has the potential to be a valuable tool for future epidemiological studies of the risks that may arise from plutonium exposure at Sellafield and potentially other similar cohorts.

Declaration of potential conflict of interest: Dr MacGregor, Mrs Wilson, Mr Peace and Mr Herdnan are employed by Sellafield Ltd. Professor Wakeford does consultancy work, including for the UK Compensation Scheme for Radiation-linked Diseases. The authors declare that they otherwise have no actual or potential competing financial interests.

Poster Presentation

Occupational Medicine (SCOM/Modernet)

0201 SURVEY TO DETERMINE USUAL CARE IN THE UK NHS OCCUPATIONAL HEALTH DEPARTMENTS IN MANAGING STAFF WHO GO ON SICK LEAVE WITH COMMON MENTAL HEALTH DISORDERS

Dorota Juszczyk*, Brian See, Vaughan Parsons, Ira Madan. *Guy's and St Thomas' NHS Foundation Trust, London, UK*

Introduction The National Health Service (NHS) is the biggest employer in the United Kingdom (UK). Poor mental health is estimated to account for more than 25% of sickness absence in the NHS. Little is known about the management of NHS staff who take sick leave due to common mental health disorders (CMHD).

Aims To establish the current practice of UK Occupational Health (OH) departments in managing staff who go on sick leave with CMHD.

Methods Survey of OH departments providing OH services to NHS trusts and health boards (12 questions). Analysis involved descriptive statistics and content analysis.

Results There were 49 complete responses from 126 OH departments (38.9%). The majority (98%) of the Trusts have a CMHD sickness absence policy in place. For 63.3 .% of the Trusts, the first OH consultation would occur between 8 and 28 days after a staff member going off sick and would be undertaken by someone with an OH qualification (91.8%). Assessment during the first consultation most frequently included exploration of symptoms of CMHD and assessment of medication, while case management and arranging regular timed reviews were least commonly included. 45% of the Trusts reported that they would not contact the staff member's GP to inform of the outcome of the consultation.

Conclusions We found variation in practice between trusts with respect to timing of first consultation, use of case-management approach and regular timed reviews. The most up-to-date evidence on the effectiveness of intervention is not uniformly being incorporated into current practice.

Oral Presentation

Psychosocial

0202 WORKPLACE-BASED INTERVENTIONS TO INCREASE CHANCES OF SOONER AND SUSTAINED RETURN TO WORK IN WORKERS WITH COMMON MENTAL HEALTH DISORDERS: A SYSTEMATIC REVIEW OF THE LITERATURE

Dorota Juszczyk*, Shotaro Doki, Paul Grime, Vaughan Parsons, Ira Madan. *Guy's and St Thomas' NHS Foundation Trust, London, UK*

Introduction Common mental health disorders (CMHD) are highly prevalent in the working population. Sick leave due to CMHDs is contributing to the exclusion form the labour market.

Aims To give an overview of the efficacy and effectiveness of interventions to increase chances of sooner and sustained return to work (RTW) in staff who go on sick leave with CMHDs. We aimed to include a wide variety of study designs, mental health conditions and types of interventions to allow for increased generalizability of the findings.

Methods We systematically searched MEDLINE, EMBASE, CINAHL, PsychINFO, and Cochrane Database of Systematic Reviews for studies published between 2009 and 2016. We included workplace- based interventions that focused on initiatives undertaken or strongly facilitated by the employer or the insurer. We used a narrative synthesis.

Results We retrieved 934 articles and 56 included in the qualitative synthesis. Of these 16 were randomised controlled trials. There was strong evidence that workplace focused interventions reduce the time until RTW (i.e. the number of sick-leave days), but did not improve RTW rates compared with controls. The evidence regarding lasting return to work and job performance is less clear. There is strong evidence that multiple domain interventions are more effective compared with single domain interventions.

Conclusions Individual-based interventions are more prevalent. However, more studies on workplace-focused interventions are needed, especially since connecting healthcare and workplace systems appears vital to influence the return-to-work process. There remains an evidence gap for which, if any, interventions lead to sustained return to productive work.

Poster Presentation

Cancer

0203 FARMING AND MORTALITY FROM LEUKAEMIA IN TAIWAN

[1]Chih-Ching Chang*, [2]Shu-Chen Ho, [2]Chun-Yuh Yang. *[1]National Cheng Kung University, Tainan, Taiwan; [2]Kaohsiung Medical University, Kaohsiung, Taiwan*

Agricultural workers might be at an increased risk for several cancers, including leukaemia, in mortality and incidence studies. A death certificate-based case-control study was designed

to investigate whether farmers in Taiwan had an increased risk of dying from leukaemia (ICD-9 codes 204–208). All deaths of Taiwan residents were retrieved from the Taiwan Death Certification Registry. Cases were defined as deaths from leukaemia who were at least 50 years of age between 1997 and 2009. Controls were deaths from all causes other than cancers. We extracted information on sex, marital status, year of birth, year of death, cause of death, county of residence, and usual occupation from each death certificate. Logistic regression models were applied to calculate the mortality odds ratio (MOR) and their 95% confidence interval (CI). A total of 32 456 deceased farmers were identified between 1997 and 2009. Of these 32 456 decedents, 140 deaths were coded as leukaemia. After adjusted for gender, marital status, age at death, year of death, and urbanisation level, farmers were not with significant increase in the risk of leukaemia (aMOR=0.92, 95% CI=0.77–1.10), compared to non-farmers. There were no significant difference in term of the death by age and gender between farmers and non-framers. The patterns of death by age and gender were similar between farmers and non-farmers. Further investigation of leukaemia risk among farmers is warranted.

Oral Presentation

Other

0204   **RETINAL DETACHMENT AND OCCUPATIONAL LIFTING: THE EVIDENCE TO DATE**

Stefano Mattioli. *Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy*

Introduction There is an "oral tradition", especially among myopics, that heavy lifting leads to retinal detachment (RD). Some years ago, searching the literature, we failed to find evidence supporting this theory. Then, in the early 2000s, we performed a case-control study to test the hypothesis that repeated lifting tasks could be a risk factor for RD.
Methods Cases were identified among myopic patients surgically treated for RD in a large urban hospital. Controls were drawn from myopic outpatients attending an eye clinic in the same catchment area. Both filled in a questionnaire on personal and work-related factors, including past/present occupational lifting tasks. Three categories of exposure to lifting (product of load, manoeuvres/hour and lifting-years) were identified: no lifting, light lifting (≤8000 kg freq yr), heavy lifting (>8000 kg freq yr). We estimated odds ratios (ORs) and 95% confidence intervals (95%CIs) by fitting a logistic regression model adjusted for age, sex and degree of myopia.
Results 61 cases and 99 controls were identified. In addition to ocular surgery and ocular and/or head trauma (known risk factors), strong independent associations were recorded for heavy lifting (OR 4.4, 95% CI 1.5–13) and high body mass index (OR 6.8, 95% CI 1.6–29). No association was recorded for light lifting (OR 1.1, 95% CI 0.4–3.0).
Conclusion These findings supported the a priori hypothesis that heavy lifting was a strong risk factor for RD. We are now conducting a multicentre case-control study to confirm our previous results. If confirmed, this association would open up new opportunities for prevention.

Poster Presentation

Respiratory

0205   **SPIROMETRIC CHANGES IN NORMAL OR EARLY ILO PNEUMOCONIOSIS RADIOGRAPHS OF SANDSTONE-DUST EXPOSED WORKERS: A PRELIMINARY RESULT**

[1]Peerawat Trakultaweesuk*, [1]Naesinee Chaiear, [1]Watchara Boonsawat, [1]Jiraporn Khiewyoo, [1]Phanumas Krisorn, [2]Kritin Silanun. *[1]Khon Kaen University, Khon Kaen, Thailand; [2]Thammasart University, Bangkok, Thailand*

Withdrawn at the author's request

Poster Presentation

Working Conditions

0206   **THE LONGITUDINAL ASSOCIATION BETWEEN MULTIPLE JOB HOLDING AND LONG-TERM SICKNESS ABSENCE AMONG DANISH EMPLOYEES. AN EXPLORATIVE STUDY USING REGISTER-BASED DATA**

[1,2]Stef Bouwhuis*, [3]Anne Helene Garde, [2,5]Goedele Geuskens, [1,4]Cécile Boot, [2,1]Paulien Bongers, [1,4]Allard van der Beek. *[1]VU University Medical Centre, Amsterdam, The Netherlands; [2]TNO, Leiden, The Netherlands; [3]NRCWE, Copenhagen, Denmark; [4]Amsterdam Public Health Research Institute, Amsterdam, The Netherlands; [5]Body@Work, Amsterdam, The Netherlands*

Background Multiple job holding (MJH) is common in many countries, but little is known about its (health) consequences. Our aim is to explore the longitudinal association between

MJH and long-term sickness absence (LTSA) among Danish employees.

Methods We included employees (n=8,968) who participated in the Danish Work Environment Cohort Study (DWECS), based on a representative sample of the Danish working population. Three dichotomous independent variables were created: MJH in general, combination MJH (i.e. second job as employee) and hybrid MJH (i.e. self-employed in second job). LTSA ($\geq$5 weeks) was measured using the Danish Register for Evaluation of Marginalisation (DREAM) during 78 weeks of follow-up. Potential confounders included demographics, health, and work characteristics. Logistic regression analyses were performed to study whether LTSA was associated with MJH in general, combination MJH, and hybrid MJH. Interaction effects for gender, age, total working hours per week ($\leq$37 or >37 hours a week) and shift work were tested.

Results In total, 11.7% (n=1,048) of the respondents reported having multiple jobs and 7.6% (n=678) experienced LTSA during follow-up. After adjustment for confounders, no significant association between LTSA and MJH in general (OR=0.82), combination MJH (OR=0.81), or hybrid MJH (OR=0.83) was found. Among employees working more than 37 hours per week, combination MJH was associated with a higher likelihood of LTSA (OR=1.50).

Conclusions We did not find evidence for an increased likelihood of LTSA among multiple job holders. Future research should study the likelihood of LTSA among subgroups of multiple job holders, e.g. those working long hours.

Oral Presentation

Shift Work

| 0207 | HYPERTENSIVE DISORDERS OF PREGNANCY AMONG NIGHT WORKERS IN DANISH HOSPITALS: A NATIONAL REGISTER-BASED COHORT STUDY |

[1]Paula EC Hammer*, [1]Esben M Flachs, [2]Ina O Specht, [3]Anja B Pinborg, [1]Sesilje B Petersen, [4]Ann D Larsen, [4]Karin S Hougaard, [5]Johnni Hansen, [4,6]Åse M Hansen, [7]Henrik A Kolstad, [4,6]Anne H Garde, [1,6]Jens P Bonde. [1]Bispebjerg University Hospital – Department of Occupational and Environmental Medicine, Copenhagen, Denmark; [2]Parker Institute, Bispebjerg and Frederiksberg University Hospital, Copenhagen, Denmark; [3]Hvidovre University Hospital – Department of Obstetrics and Gynaecology, Copenhagen, Denmark; [4]National Research Centre for the Working Environment, Copenhagen, Denmark; [5]The Danish Cancer Society – Research Unit of Diet, Genes and Environment, Copenhagen, Denmark; [6]University of Copenhagen – Department of Public Health, Copenhagen, Denmark; [7]Aarhus University Hospital – Department of Occupational Medicine, Danish Ramazzini Centre, Aarhus, Denmark

Objective Few studies investigated hypertensive disorders of pregnancy (HDP) in relation to work at night with inconclusive results and crude exposure assessment. Our aim is to investigate the risk of HDP after work at night during pregnancy based on objective exposure assessment from The Danish Working Hour Database (DWHD), which contains information on working hours from all public hospital employees in Denmark.

Methods The study population (n=20,385) comprised women from DWHD who have given birth at least once between 2007 and 2013. Night and day shifts were defined as at least three hours between 00:00 and 05:00 and between 06:00 and 20:00 respectively. Cases of HDP defined as gestational hypertension or preeclampsia/eclampsia were retrieved from The Danish National Patient Registry. We analysed the risk of HDP by number of night shifts during the first 20 weeks of gestation by logistic regression adjusted for relevant covariates.

Results The risk of HDP among women working 1–3 and>=4 night shifts during the first 20 pregnancy weeks was OR=0.94 (95%CI 0.77, 1.16) and OR=1.03 (0.75, 1.41), respectively, compared to day workers. Stratified analyses revealed an increased risk of HDP among women older than 35 years who worked at night compared to day workers (OR=1.76; 1.05, 3.04 p value for interaction <0.001).

Conclusion Our results of no overall increased risk of HDP among night workers are reassuring. The post hoc result finding of increased risk among women older than 35 years needs cautious interpretation.

Invited

Developing Countries

| 0208 | INVITED KEYNOTE: OBSTACLES TO CONDUCTING OCCUPATIONAL EPIDEMIOLOGICAL RESEARCH IN DEVELOPING COUNTRIES |

[1]Tar-Ching Aw*. [1]ADNOC, Abu Dhabi, United Arab Emirates; [2]Florida International University, Miami, USA; [3]University of Occupational and Environmental Health, Fukuoka, Japan

The reasons advocated for conducting epidemiological studies in developing countries often include a need to improve the data base for prevention of ill health, including occupational diseases. Evidence based on research in developed countries may not be wholly relevant to developing countries because of differences in the environment, culture, health behaviour, health systems, and other factors. The obstacles to conducting occupational epidemiology studies in developing countries include: a) A lack of understanding of the purpose and nature of epidemiological studies. This often leads to potential study populations declining to participate.

b) Difficulty in defining homogenous study populations. This is especially true in developing countries with diverse mutinational expatriate workers.

c) The absence of an infrastructure and support for conducting epidemiologcal research. Ethical committees meet infrequently. Statistical advice is difficult to obtain. Laboratories for analysis of environmental and/or biological samples are often not readily available.

d) Logistical difficulties include difficulty in contacting and recruiting study participants.

Organising teams of interviewers and research assitants can also be problematic.

e) The nature of the research. A questionnaire may well have to be translated into several languages. There may be a reluctance by study participants to provide biological samples such as a venous blood sample. If environmental monitoring devices are to be placed in workplaces, this can be viewed with apprehension.

Despite these obstacles there are approaches to overcoming the hurdles identified, and increasing occupational epidemiology research in developing countries.

Oral Presentation
Policy/Impact

CKDU: INTERVENTION TO POLICY * THIS IS PART OF THE MINI-SYMPOSIUM ORGANISED BY TORD KJELLSTROM

[1,2]Jason Glaser*, [3,4]Kristina Jakobsson, [5]Ineke Wesseling, [6]David Wegman, [8]Becky Lucas, [5]Theo Bodin, [4]Ulf Ekstrom, [1]Ilana Weiss. [1]La Isla Network, International, USA; [2]LSHTM, London, UK; [3]Gothenburg University, Gothenburg, Sweden; [4]Lund University, Lund, Sweden; [5]Karolinska Instituet, Stockholm, Sweden; [6]UMASS Lowell, Lowell, USA; [7]Harvard University, Boston, USA; [8]University of Birmingham, Birmingham, UK

Background In Mesoamerica CKDu(Chronic Kidney Disease of unknown cause) is epidemic among sugarcane workers and present in other workers. Excessive heat stress and workload are believed to contribute to onset and acceleration of CKDu. The Worker Health and Efficiency (WE) Program is the first evaluated intervention to address excessive heat stress and workload in sugarcane workers. We used the resulting press, political and industry attention to push for a wider agenda of worker protections.

Objectives • Evaluate impact of intervention on patterns of heat illness/dehydration, kidney function, physical workload and productivity.

• Demonstrate need for governments and industry to address CKDu and excessive heat stress in sugarcane- and other workers.

Methods The WE intervention was piloted in two cohorts of workers, one inland and one coastal sugarcane cutters (totaling 117 individuals); thus, allowing assessment of the intervention via self-controls. Concurrently, outreach to industries and governments was conducted to exchange information. Using press and myriad contacts, private and public policy began to rapidly change.

Results Pilot data analysis demonstrated a decrease in heat-related illness, improved hydration, and possibly a stabilisation in kidney function. Marked increase in productivity was also observed. The results drove policy discussions and measurable change in several companies, and the U.S. and Costa Rican Governments.

Conclusion An evidenced-based dialogue between sugar industry farmers, millers, buyers, and governments was created. There are several challenges that remain, and navigating the path to where we are holds valuable lessons for those doing similar work.

Oral Presentation
Reproductive Effects

COMBINED EXPOSURE TO LIFTING AND PSYCHOSOCIAL STRAIN AT WORK AND ADVERSE PREGNANCY OUTCOMES - THE DANISH NATIONAL BIRTH COHORT

[1]Sejbaek Camilla Sandal, [1]Bay Hans, [1]Larsen Ann Dyreborg, [2]Kristensen Petter, [1,3]Schlünssen Vivi, [4,5]Bonde Jens Peter, [6]Juhl Mette, [1]Hougaard Karin Sørig. [1]National Research Centre for the Working Environment, Copenhagen, Denmark; [2]National Institute of Occupational Health, Oslo, Norway; [3]Aarhus University, Aarhus, Denmark; [4]Bispebjerg Hospital, Copenhagen, Denmark; [5]University of Copenhagen, Copenhagen, Denmark; [6]Metropolitan University College, Copenhagen, Denmark

Lifting and high psychosocial strain at work has both been associated with adverse birth outcomes, but no studies have investigated the consequences for pregnancy, when they co-occur. Hence, we aimed to investigate the combined effect of lifting and psychosocial strain at work on pregnancy and foetal growth, using the Danish National Birth Cohort (children born 1996-2002). Women were included if pregnant with singletons at gestational age (GA) 22 and worked $\geq$30 hours/week (N=47,582). Work exposures were extracted from an interview at GA 16 ($\pm$3.0). We applied a continuous lifting variable from four questions about heavy and medium lifting, and a psychosocial strain variable, from two questions about demand and influence combined into the four categories of the Demand-Control Model. Pregnancy outcomes were available from the Danish Medical Birth Register: Preterm birth (week 22-36); term birth (week 37-44) but small for GA; term birth but large for GA; and term birth with normal weight (reference group). The overall adjusted multinomial logistic regression analysis showed significant interaction between lifting and job strain with respect to the four outcomes all together (p=0.007). Stratified analyses on the psychosocial exposure showed women in the high strain group had an increased risk of preterm birth (OR=1.04; 95%-CI 1.01-1.06) and having a child large for GA (OR=1.04; 95%-CI 1.01-1.06) for each additional 50 kg lifted. For women in the low strain, passive and active groups, lifting was not associated with the outcomes. Co-occurrence of high strain and lifting seems to increase the risk of adverse birth outcomes.

Oral Presentation
Other

THE IMPACT OF THE NORWEGIAN COOPERATION AGREEMENT ON A MORE INCLUSIVE WORKING LIFE (IA AGREEMENT) ON SICKNESS ABSENCE AND DISABILITY PENSIONING

[1]Therese Nordberg Hanvold*, [1]Karina Corbett, [1,2]Rune Hoff, [1,3]Petter Kristensen, [1]Ingrid Sivesind Mehlum. [1]National Institute of Occupational Health, Oslo, Norway; [2]Department of Biostatistics, University of Oslo, Oslo, Norway; [3]Institute of Health and Society, University of Oslo, Oslo, Norway

Background Increasing work participation is an important political objective in many countries. In Norway, a voluntary national intervention program aimed at increasing work participation (the IA Agreement) was implemented in 2001, and is still ongoing. One of the main goals of the IA Agreement is to reduce sickness absence (SA) and disability pensions (DP). Organisations that sign the agreement commit themselves to take active measures in order to reduce SA and DP, and in return, they are given special rights such as grants for workplace adjustments and job training. Scientific evaluations of the IA Agreement have been limited. We aim to estimate the impact of the IA Agreement on SA and DP in Norway during 2001–2009.

Methods The source population is a national cohort of all 626 928 individuals born 1967–1976. Individual-level data on SA, DP, employment, and background characteristics were obtained from national registries. We apply a quasi-experimental design using difference-in-difference analysis, comparing employees in IA organisations (intervention group) with employees in non-IA organisations (control group), with respect to pre-post differences in SA and DP.

Results The IA Agreement was signed by 13 760 organisations by March 2003 and covered 43% of Norwegian employees. Compared to the general working population, IA organisations had a higher proportion of women and workers in the healthcare sector. We will analyse the nationwide impact of the IA Agreement on SA and DP and explore differences by gender, industry and diagnostic category.

Poster Presentation

Other

| 0214 | TRANSITIONS OF BLOOD LEAD LEVELS OF PRESCHOOL CHILDREN ACROSS COUNTRIES OF VARIOUS EXTENT OF DEVELOPMENT |

Yaw-Huei Hwang*, Pei-Wen Lin. *Institute of Occupational Medicine and Industrial Hygiene, College of Public Health, National Taiwan University, Taipei, Taiwan*

Lead exposure has long been recognised as a threat to human health. In the last century, tons of studies demonstrated the adverse health effects of lead exposure on neural and haematological systems in human body, and resulted in the restrain of lead use, including the elimination of leaded gasoline and lead-containing paint in the past decades. This study was aimed to profile preschool children blood lead level distribution around the world. Information on blood lead levels was obtained based on peer reviewed articles accessed through dataset like PubMed, etc. Study subject inclusion criteria were set as children aged 1–7 years old without hot-spot lead exposure. Collected data were plotted in chronicle by group of UN Human Development Index (HDI) to establish the transition trends of blood lead levels in the past three decades. For the very high HDI countries, the mode of blood lead level of preschool children was reduced from 4~6 µg/dL to 0.8~1.5 µg/dL, while that for the high HDI countries was down from 8~12 µg/dL to 3~5 µg/dL, and no substantially decrease was observed for the medium and low HDI countries. Extrapolation analysis showed the decreasing trend would reach the possible ground level of around 0.3~0.5 ug/dL for the very high HDI countries in the next two decades. Results of this study provided advices on strategy planning and source allocation for lead exposure prevention across countries of various extent of development.

Poster Presentation

Disease Surveillance

| 0215 | INTERNATIONALISING SIGNAAL: THE EUROPEAN CHANCE IN OCCUPATIONAL HEALTH VIGILANCE – PROPOSAL FOR THE SPANISH VERSION |

[1]Chiara Foresti*, [2]Annet Lenderink, [1]Stefano Mattioli, [3,4]Lode Godderis, [5]Ana Beltran, [6,7]Consol Serra. [1]*School of Occupational Medicine, Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy;* [2]*AMC/University of Amsterdam, Netherlands Centre for Occupational Diseases, Coronel Institute on Work and Health, Amsterdam, The Netherlands;* [3]*KULeuven, Centre for Environment and Health, Kapucijnenvoer 35/5, 3000 Leuven, Belgium;* [4]*Idewe External Service for Prevention and Protection at Work, Interleuvenlaan 58, 3001 Heverlee, Belgium;* [5]*IMIM – Hospital del Mar Medical Research Institute, Barcelona, Spain;* [6]*CiSAL – Centre of Research in Occupational Health, Barcelona, Spain;* [7]*CIBER of Epidemiology and Public Health, Spain, Spain*

Introduction SIGNAAL is an online non-compensation-based sentinel system to notify possibly new work-related diseases[1]. It is in place since July 2013 in the Netherlands and Belgium and currently in pilot phase in Italy. Through SIGNAAL physicians report diseases they suspect to be work-related: experts assess them identifying possible new occupational health risks. Our aim is to develop the Spanish SIGNAAL to detect these new risks in Spain[1,2].

Methods Every part of the online tool will be translated and adapted. The online platform will be developed. A separate team of Spanish assessors within the Occupational Diseases Unit (UPL) of Barcelona will be trained to asses cases reported to the system. SIGNAAL will be promoted through publications, conferences and advertising.

Results Expected Spanish cases will be assessed within the Spanish SIGNAAL. Costs: periodically presented to assess feasibility and acceptability; effectiveness: evaluated in helping the Public Health System to obtain diseases recognition as occupational (and to claim for them); data usage: for informing policy and preventive measures, at a company level but also involving Public Health stakeholders[3,4]; spreading: progress reports and publications in peer-reviewed journals[4,5]. By August 2017 the Spanish SIGNAAL will be in pilot phase, so its first results can be presented with examples and encountered pitfalls[5].

Conclusions An online reporting system within the occupational health framework can provide valuable data on new occupational health risks, especially while using the same tool in several countries to produce comparable information. Internationalising SIGNAAL is a first step to promote Occupational Health Vigilance across Europe[2,6].

Oral Presentation

Exposure Assessment

0216	OCCUPATIONAL RADIATION DOSES IN NUCLEAR MEDICINE: A US MULTI-CENTRE STUDY

[1]Daphnee Villoing*, [2]R Craig Yoder, [3]Christopher Passmore, [4]Marie-Odile Bernier, [1]Martha Linet, [1]Cari M Kitahara. [1]Radiation Epidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, National Institutes of Health, Rockville, MD, USA Minor Outlying Islands; [2]Consultant, Weddington, NC, USA Minor Outlying Islands; [3]Landauer, Inc., Glenwood, IL, USA Minor Outlying Islands; [4]Institut de Radioprotection et de Sureté Nucléaire, Fontenay-aux-roses, France

Nuclear medicine techniques developed in the second half of the 20th century have become very sophisticated and have been used extensively in the diagnosis and treatment of disease. A surge of new dedicated radiopharmaceuticals and increased demand has led to a growing interest regarding increasing radiation exposure and possible associated health risks to the nuclear medicine technologists who perform these procedures. However, to date, very limited information has been provided on radiation doses received by nuclear medicine technologists.

In this study, we collected annual and lifetime badge dose information for United States technologists certified in nuclear medicine between 1979 and 2015. Nine large US medical institutions from several geographical locations contributed information on 208 nuclear medicine technologists, linked to historical badge dose records maintained by a major commercial dosimetry company, yielding 2618 total dose records.

The mean and median annual badge doses per technologist were 2.7 and 2.2 mSv, respectively, and more than 3% of the annual doses exceeded 10 mSv. The mean annual doses substantially increased around the year 2000, consistent with the expanded use of Positron Emission Tomography (PET). Mean and median lifetime doses of 51.4 and 32.9 mSv could be established for 45 technologists.

Doses in this sample of nuclear medicine technologists were higher than expected, compared with previously published values for nuclear workers or radiologic technologists. These results suggest that nuclear medicine technologists may be one of the most highly-exposed radiation worker populations currently.

Poster Presentation

Methodology

0217	MESOTHELIOMA AND CANCER OF THE PLEURA DEATHS – RECOVERING MISSING CASES FROM HOSPITAL RECORDS

[1]Vilma Santana*, [2]Eduardo Algranti, [1]Felipe Campos, [1]Franciana Cavalcante, [2]Ricardo Lorenzi, [3]Rosemairy Inamine, [4]William Souza, [3]Simone Santos. [1]Federal University of Bahia, Salvador, Bahia, Brazil; [2]Fundacentro, São Paulo, SP, Brazil; [3]National Health System, São Paulo, SP, Brazil; [4]Public Ministry, Goiania, GO, Brazil

Background Mesothelioma is a rare cancer of high lethality associated with asbestos exposure. In several studies mesothelioma and cancer of the pleura (MCP) are analysed together because misdiagnoses or coding errors between them are common. Undercounting and underreporting of these diseases have been demonstrated, particularly where access to diagnostic resources is poor as for developing countries.

Objective To examine the performance of a probabilistic linkage used to match data from death certificates (Mortality Information System) to deaths reported in hospital records (Authorisation of Hospital Admissions of the National Health System).

Methods Cases with diagnosis coded as C45.0 - C45.9 and C38.4 (International Classification of Diseases 10thRevision) were selected from each anonymous database from 2002 to 2012, Brazil. After probabilistic linkage, matched and unmatched cases were combined in a single individual database. Linkage performance was examined by confirming matched cases based on similar datasets which includes full names, available only for the São Paulo state.

Results A total of 1059 MPC cases were found, 718 (71.7%) with records only in the Mortality Information System, 277 (23.6%) registered exclusively in the hospital database, and 57 (5.7%) matched with data in both databases. The majority of hospital unmatched cases had other cancer diagnosis as the underlying cause of death (87.4%). Linkage failed to match only five cases due to inconsistencies in birth dates or gender records.

Conclusions Probabilistic linkage can be a tool to recover missing cases of MCP in death certificates using hospital admissions records in Brazil.

Oral Presentation

Developing Countries

0218	WORK-RELATED INJURY MORTALITY AMONG CHILDREN AND ADOLESCENTS IN BRAZIL, 2000 – 2014

[1]Vilma Santana*, [1]Tatiane Meira, [1]Maria Cláudia Peres, [1]Yukari Mise, [1]Raquel Pompeu, [2]Flávia Ferreira-de-Sousa, [3]Ligia Kiss, [4]Anne Andermann. [1]Federal University of Bahia, Salvador, Ba, Brazil; [2]Health Ministry, Brasilia, DF, Brazil; [3]London University, London, UK; [4]University of McGill, Montreal, Canada

Objective Fatal work-related injuries among children and adolescents cause outrage and reveal the failure in the protection of these vulnerable groups. This study estimates the work-related injuries mortality rate among Brazilian workers aged 10 to 24 years between 2000 and 2014.

Methods This is a mortality study carried out with data from the Mortality Information System, SIM, and census data from the Brazilian Institute of Geography and Statistics, IBGE. Cases were identified using data on the work-related nature of the injury, compulsory in death certificates for external causes. Estimates are separated by age ranges for which distinct protectives norms are applicable.

Results n total, there were 7484 fatal work-related injuries during the study time. Of these, 2.8% (n=208) among children from 10 to 14 years old, 9.2% (n=691) in the group

aged 15 to 17 years, and the majority (88%) were 18 years of age or older. In each age group, work-related mortality rates (per 100,000) were 1.5, 3.3 and 4.8 among males, and for girls 1.1, 0.3 and 0.3, respectively. The most common circumstance related to the injury involved transport. Farming predominates (89%) among occupations in the youngest group, falling to 48% and 18% in the older age ranges, respectively.

Conclusions Our findings reflect an unacceptable reality in Brazil, the 7th largest world economy. The agriculture industry needs to be targeted for actions to eliminating child labour and to enhancing compliance with protective standards against the worst forms and most hazardous occupations in the group of young workers

Oral Presentation

Other

| 0219 | THE SYNERGY EXPOSURE ASSESSMENT STRATEGY |

[1,2]Susan Peters*, [1]Roel Vermeulen, [1]Lutzen Portengen, [1]Hans Kromhout, [1]on behalf of The SYNERGY Study Group. [1]Utrecht University, Utrecht, The Netherlands; [2]University Medical Centre Utrecht, Utrecht, The Netherlands

Objective The use of measurement data in occupational exposure assessment allows more quantitative analyses of possible exposure–response relations. We describe a quantitative exposure assessment approach for the five lung carcinogens selected for the SYNERGY project, that is, asbestos, chromium-VI, nickel, polycyclic aromatic hydrocarbons (by its proxy benzo(a)pyrene (BaP)) and respirable crystalline silica. A quantitative job-exposure matrix (i.e. SYN-JEM) was developed based on statistical modelling of large quantities of personal measurements.

Methods Empirical linear models were developed using personal occupational exposure measurements from Europe and Canada, as well as auxiliary information like job (industry), year of sampling, region, an a priori exposure rating of each job (none, low, and high exposed) and sampling duration. The model outcomes were used to create SYN-JEM with a quantitative estimate of the level of exposure by job, year, and region.

Results Decreasing time trends were observed for all agents between the 1970s and 2009, ranging from −1.2% per year for personal BaP and nickel exposures to −10.7% for asbestos before a ban was implemented. Regional differences in exposure concentrations varied by agent, ranging from a factor 3.3 for chromium-VI up to a factor 10.5 for asbestos.

Conclusion We estimated time-, job-, and region-specific exposure levels for four (asbestos, chromium-VI, nickel, and RCS) out of the five considered lung carcinogens. Statistical modelling of large amounts of personal occupational exposure measurement data enabled the derivation of a quantitative general population JEM, which can be applied to the SYNERGY population.

Oral Presentation

Other

| 0220 | ADVANCING THE PREVENTION OF LONG-TERM SICKNESS ABSENCE: CONSIDERING THE IMPACT OF THE CONTEXT OF LEGISLATION IN EFFECTIVE PREVENTIVE STRATEGIES |

Ludovic van Amelsvoort*, Nicole Jansen, IJmert Kant. Maastricht University, Department of Epidemiology, CAPRHI, Maastricht, The Netherlands

Background Sickness absence is highly prevalent and has a complex multifactorial aetiology. A multitude of approaches exist aimed at health, personal, work related and cultural factors. But also the context of legislation has to be addressed when developing, evaluating or implementing preventive interventions.

Aims 1) To substantiate the role of legislation in research on the effect of strategies aimed at reducing long term sickness absence; 2) Elaborate on methodological prerequisites for advancing the evidence base of interventions, focussing on (legal) contextual factors.

Results Role of legislation can be threefold:

1. Direct, as (part of) intervention

2. Indirect, such as changing definitions of sickness absence, or (early) pensioning.

3. Facilitating/hindering factor in implementation of proven interventions

To address the context of legislation, ideally large multinational trials with large sample sizes are needed, requiring substantial resources. An alternative efficient approach might be to combine: 1) Address the impact of contextual (legal) factors by integrating contextual data from (new) trials on the effectiveness of preventive strategies by means of meta regression; 2) Use multi-regional or multi-national databases to compare intervention uptake, outcome and contextual factors in workers (registry data) testing prior hypotheses regarding the impact of legal differences on sickness absence indicators.

Conclusion Large potential gains by reducing long term sickness absence and work disability require innovative but methodologically sound approaches, and should consider the impact of the (legal) context. Enhanced access to multinational data-bases and better reporting of contextual and legal factors related to trials (extension of STROBE, CONSORT) are prerequisites.

Poster Presentation

Other

| 0223 | OCCUPATIONAL HEAT EXPOSURES IN INDUSTRIES AND RENAL HEALTH – FINDINGS FROM INDIA |

Vidhya Venugopal*, Latha Kamalkannan, Rekha Shanmugam, Manikandan Krishnamoorthy, Jeremiah Chinnadurai, Kumaravel Perumal. Sri Ramachandra University, Porur, Chennai, Tamilnadu, India

Statement of the Problem: Workers labouring in high thermally stressful environments are subjected to heat-strain and risks of heat-related health issues.

Methodology A cross-sectional study was conducted with ~700 workers engaged in heavy/moderate labour from various organised occupational sectors in India. Wet Bulb Globe Temperatures(WBGT) and heat-strain indicators such as Core-body-temperature(CBT), Heart-Rate(HR), Sweat-Rate (SwR), Urine-Specific-Gravity(USG) were measured. A questionnaire captured self-reported health symptoms of workers.

Findings About 73% of the WBGT measurements were above prescribed limits(Range:26.5°C–38.7°C) and WBGT>31.0°C was associated with significantly more heat-related health concerns among workers(89% vs 34%). Measured heat-strain indicators were above accepted levels for 60% workers, 72% had symptoms of dehydration and 49% suffered from urogenital issues. Workers had 1.4 times higher odds of heat-strain at WBGTs>29.0°C(CI 1.06 to 1.95; p=0.019), that was more pronounced during hotter seasons (CI 1.41 to 2.53; OR=1.9, p<0.0001) with significant increases in heat-related illnesses ($X2$=66.088; p=4.311e-16) and productivity losses ($X2$=62.68;p=0.024*1012). High prevalence of kidney stones and adverse renal issues(9%) in steel industry was significantly associated with years of chronic heat exposures(t=−2.3823, df=66.628, p-value=0.02006, 95% CI 0.44–0.03).

Conclusion The results demonstrate that high-heat conditions and minimum cooling interventions that are common in many occupations could create a 'silent epidemic' of kidney-related illnesses without appropriate work practices in tropical settings. The study results warrant an urgent need for further indepth research with a multi-targeted seasonal approach to identify causalities and to develop and implement appropriate preventive measures to avert adverse effects of heat on the working population in the rising temperature scenario as Climate Change proceeds.

Poster Presentation

Specific Occupations

COMPARISON OF PREVALENCE AND ASSOCIATED FACTORS OF HYPERTENSION BETWEEN SHIP OFFICERS AND IN-LAND OFFICERS OF THE ROYAL THAI NAVY

[1,2]Chamchan Chanchang*, [2]Pornchai Sithisarankul, [1]Sethasiri Sangsuwan. *[1]Naval Medical Department, Royal Thai Navy, Bangkok, Thailand; [2]Faculty of medicine, Chulalongkorn University, Bangkok, Thailand*

Background The objective of this study was to compare prevalence and associated factors of hypertension between ship officers and In-land officers of the Royal Thai Navy.

Method This was an analytic cross-sectional study of 670 naval ship officers and 647 In-land officers in Sattahip district, Chonburi province. Data was collected by self-administered questionnaires. The blood pressure was measured and recorded by medical personnel. Data were analysed by descriptive statistics. The prevalence of hypertension were compared by proportion test. The associated factors were analysed by multiple logistic regression.

Result Prevalence of hypertension in ship officers was 31.2 percent, statistically less than prevalence of hypertension in In-land officers which was 41.1 percent (95% CI −0.15,–0.04). The associated factors of hypertension were age (Adjusted Odds ratio=1.09; 95% CI 1.03, 1.15) and BMI (Adjusted Odds ratio=1.26; 95% CI 1.11, 1.42).

Discussion and Conclusion The prevalence of hypertension among ship and In-land officers were associated with increasing age and BMI rather than the difference of working unit. Thus, health promotion program for navy officers should emphasise on weight control especially in elder officers.

Poster Presentation

Psychosocial

EFFECTS OF CHANGE IN WORK ORGANISATION ON PSYCHOLOGICAL WELL-BEING: INFLUENCE OF PSYCHOLOGICAL DEMAND, DECISION LATITUDE AND SOCIAL SUPPORT

Maylis Telle-Lamberton*, Florian Pontin. *ORS Ile-de-France, Paris, France*

Consequences of organisational choices on working conditions are complex and may influence psychosocial well-being and health either positively or negatively. Changes in work organisation have been shown to be negatively associated to psychosocial experiences or health within the last French Working Condition Survey (WCS). Here we investigated how these associations were influenced by the following potential modificators: psychological demand at work, decision latitude and social support.

Psychosocial experiences examined were overwhelmed state, gratitude, internal psychological violence, meaning of work and value conflicts. Health was approached by the WHO5 scale as well as by self-perceived health status. Logistic regressions between change in organisation and psychosocial well-being and health were carried out on the 7000 market sector employees of the WCS belonging to companies with at least 10 employees. The modificator was included in the model together with an interaction term to account for the modification effect.

High psychological demand increased the effect of change in organisation on the meaning of work. Low decisional latitude increased the effect of change in organisation on gratitude, meaning of work and value conflict and low social support increased the effect of change in organisation on gratitude and internal psychological violence.

This analysis illustrates the complexity of relationships between organisation at work and psychological well-being. More analyses will be carried out on specific types of organisation such as quality management of just-in-time management.

Poster Presentation

Chemicals

0226   **AFFECTION IN THE AUDITORY BRAINSTEM PATHWAY ASSOCIATED WITH OCCUPATIONAL, LOW-LEVEL EXPOSURE TO ETHYLBENZENE**

[1]Octavio Jiménez-Garza*, [1]Sergio Márquez-Gamiño, [1]Liliana Ruiz-García, [2]Giovanni Battista Bartolucci, [2]Mariella Carrieri. [1]Universidad de Guanajuato Campus León, Health Sciences Division, Leon, Guanajuato, Mexico; [2]University of Padova, Department of Cardiologic, Thoracic and Vascular Science, Padova, Veneto, Italy

Introduction Hearing loss in occupational exposure to a solvent mixture has been already reported; however, mixture in those reports did not contain ethylbenzene, a compound showing peripheral ototoxicity in animals exposed to high levels. In this work, we evaluated the auditory brainstem pathway in two samples of workers exposed to different levels of a solvent mixture where ethylbenzene was present, compared to a reference group.

Material and methods Individual exposure levels for up to seven compounds were obtained in two groups: Exposed (n=21 gas station attendants, GS, and leather shoe factory workers, LS) and Non-exposed (n=21, administrative workers) all of them from the city of León Guanajuato, México. The click-evoked auditory brainstem response test was performed in both groups.

Results Toluene, n-hexane, acetone, ethylbenzene, xylene and methyl ethyl ketone exposure levels were higher in LS (p<0.001). Only n-hexane exposure levels were above the permissible levels, while mean ethylbenzene exposure levels ranged 0.4–14.58 mg/m3. Wave V latency at four different points of stimulation for both ears was delayed in the exposed group, as well as the I-V and I-III interwave latencies at 70 dB (p<0.05). LS workers showed a delayed I-III interpeak interval compared to non-exposed group. Also in LS, ethylbenzene exposure levels showed a significant correlation with wave V latency at 40 dB (r=0.8, p=0.008).

Conclusion Our results point out to a central affection in the auditory system caused by ethylbenzene in a dose response manner. Workers exposed to ethylbenzene levels far below the permissible exposure limit should be closely monitored for early ototoxicity effects.

Oral Presentation

Working Conditions

0227   **RISK OF HEAT RELATED ILLNESS: DIFFERENCES BETWEEN MALE AND FEMALE FARMWORKERS WITH RESPECT TO HYDRATION PRACTICES**

Diane Mitchell, Javier Castro, Tracey Armitage, Marc Schenker*. University of California, Davis, Davis, California, USA

Introduction Dehydration is a major risk factor for Heat Related Illness (HRI) in farmworkers.

Methods 587 acclimatised Latina/o farmworkers were monitored once each, in the hot, dry, California Central Valley over the summers of 2014–2015. Weight was recorded before and after the shift in a minimum level of clothing to assess change in hydration. To assess activity, accelerometers were worn, and questionnaires were administered in Spanish to collect occupational characteristics.

Results 66.2% of the participants were male; both sexes had a mean age 38.7 years. Men drank more, either total or just water (adjusted for height) than women (mean volumes 112 v 77oz, or 97 v 67 oz, PVal <0.001 for both). However men were more likely to lose $\geq$1.5% of their body weight: 64 (16.5%) v 6 (3.0%) women PVal <0.0001. Shift lengths were similar, but both total and mean activity levels were higher in males 2 02 000 v 1 33 000 and 391 v 255 counts per minute, respectively PVal <0.0001 for both.

Being male, working any type of piece rate and higher mean activity were all independently associated with weight loss over the shift in a multivariable linear regression model. Parameter and (95% CI) respectively: - 0.31 (- 0.43 to - 0.19), 0.18 (0.05–0.309), and mean cpm/100 0.022 (0.001–0.045).

Conclusion Male Latino farmworkers are more at risk of dehydration especially those who work high activity tasks or any form of piece rate. Employers should focus special attention on the safety of these workers.

Poster Presentation

Risk Assessment

0229   **RISK OF HEAT RELATED ILLNESS IN LATINO AGRICULTURAL WORKERS: CORE BODY TEMPERATURE AND WORK TASK**

Javier Castro*, Diane Mitchell, Tracey Armitage, Marc Schenker. University of California, Davis, Davis, California, USA

Introduction Environmental heat and work-rate are risk factors for Heat Related Illness (HRI). Work-rate by task and core temperature have not been quantified in California farmworkers.

Methods Farmworkers were monitored for one work-shift each in the summers of 2014–2015. Individuals' core temperature was assessed throughout the shift using an ingestible sensor, a 3 min moving average computed and maximum temperature identified. Accelerometers were worn, and NHANES criteria used to classify counts per minute (cpm) into sedentary, low, moderate and vigorous activity. Daily work-rate was categorised by the number of minutes spent in moderate and/or vigorous activity (<30, 30 to 90,>90). Questionnaires administered in Spanish collected occupational tasks conducted and self-rated environmental heat exposure.

Results 499 Latina/o farmworkers performed only one task on their shift. The mean activity in cpm was highest for tree/vine harvesters 445 (SD 225) and lowest for produce sorters 193 (SD 167). 22 workers recorded a maximal core temperature >38.5°C, a criteria for heat stress in acclimatised workers. In a multivariable logistic regression high body temperature was associated with both the number of minutes

working at a moderate/vigorous rate and self-rated environmental heat; OR and (95% CI) for ≥90 v<90 min high activity 3.6 (1.5–8.5). Irrigators were the only classification with statistically significant association with elevated core temperature; OR and (95% CI) 3.7 (1.4–9.6).

Conclusion Farmworkers, who exceed 90 min a day in moderate/vigorous activity and/or irrigators, are at higher risk of HRI. These workers may need closer monitoring for their safety.

Poster Presentation

Shift Work

0230 THE RELATIONSHIP BETWEEN SHIFT WORK AND METABOLIC SYNDROME AMONG ELECTRONICS INDUSTRY WORKERS

[1]Sae-Young Lee*, [1]Gyeongho Lee, [1]Sojung Lee, [2]Hyunjoo Kim, [2]Chung Won Kang, [3]Jungyeon Hong, [4]Mo-Yeol Kang. [1]Safety health environment RandD team, SK hynix, Icheon-si Gyeonggi-do, Republic of Korea; [2]Department of Occupational and Environmental Medicine, Ewha Womens University Mok-dong Hospital, Seoul, Republic of Korea; [3]Hanshin Medipia, Seoul, Republic of Korea; [4]Seoul St. Mary's Hospital, Seoul, Republic of Korea

Objective This study aimed to determine an association between shift work and the metabolic syndrome (MetS) in the electronics industry.

Methods In total, 12 583 employees who participated in health examination and questionnaire were evaluated. MetS was measured by the National Education Program Adult Treatment Panel III (NCEP) criteria using examination results. We performed multiple logistic regression analyses to test the relationship between shift work and MetS.

Results The prevalence rate of MetS among total group was 8.8%. After controlling for the potential confounders, MetS of male daytime workers was more prevalent compared to shift workers. However, prevalence of the MetS showed significant increasing risk according to the number of years of shift work (a period of 5~9 years : OR 3.48, 95% CI 1.20–10.08; 10~14 years : OR 4.14, 95% CI 1.34–12.74; 15 years : OR 5.72, 95% CI 1.83–17.83 vs. 1~4 years). Although no significant differences in prevalence of the MetS between daytime and shift work were observed, the risk for the development of MetS increased with accumulated years of shift work among women (a period of 5~9 years : OR 3.12, 95% CI 1.72–5.67; 10~14 years : OR 5.57, 95% CI 2.91–10.66; 15 years : OR 5.17, 95% CI 2.48–10.81 vs. 1~4 years).

Conclusion This study suggests that the duration of shift work increases the risk for developing the MetS.

Poster Presentation

Respiratory

0231 OCCUPATIONAL RESPIRABLE CYSTALLINE SILICA EXPOSURE RELATED TO FEV$_1$ DECLINE AMONG NORMAL OR EARLY ABNORMAL ILO CHEST-RADIOGRAPHS OF SANDSTONE-WORKERS; A SIX MONTH FOLLOW UP

[1]Naesinee Chaiear*, [1]Peerawat Trakultaweesuk, [2]Watchara Boonsawat. [1]Unit of Occupational Medicine, Department of Community Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand; [2]Unit of Respiratory and Critical Care, Department of Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

Background Respirable crystalline silica (RCS) exposure among cottage industrial results in rising silicosis case. Therefore medical surveillance remains crucial. Recently FEV1 decline has been established as a surveillance tool.

Objective To explore the relationship between occupational RCS exposure and FEV1 decline among sand-stone workers who had ILO chest radiographs profusion CAG ≤1/1.

Material and method This study was designed as a descriptive study. The participants were sand-stone workers and non-occupational RCS exposure (n=139) who had an ILO chest radiographs profusion CAG ≤1/1. FEV1 was measured using follow-up FVC manoeuvre spirometry testing. History of work, duration of exposure and other related issues were obtained through questionnaire interviews.

Result The majority of participants were female, non smokers and no previous respiratory diseases. Mean of FEV1 decline was found higher in the high RCS exposure group (118.6 ±137.7 ml) as compared to non-occupational RCS exposure group (median 45 ml, IQR 100 ml). When subgroup of non smokers considered, being classified into high exposure was found to have the highest FEV1 decline (99.3 ml ±129.9 ml.). In addition, the highest proportion of participants who had FEV1 decline >100 ml revealed in the high RCS exposure group (65.5%) followed by medium (43.8%) and low exposure group (19.6%) respectively .

Conclusion Intensity of RCS exposure strongly related to FEV1 decline. FEV1 decline more than 100 ml per year is appropriate to be used as a medical screening for RCS exposure and the effect could be found as early as six month exposure.

Poster Presentation

Specific Occupations

0233 PHYSICAL AND MENTAL HEALTH OF NON-PROFESSIONAL EMERGENCY RESPONDER IN A HEALTHCARE INSTITUTION

Lim Dwee Wee*, Josephlim Suan Seng, Laytin Lee. Occupational Health Services, Tan Tock Seng Hospital, Singapore, Singapore

Introduction Health of emergency responders is often overlooked. We aim to study the physical and mental health of non-professional emergency responders in a healthcare institution.

Methods This cross-sectional study used data from medical examination required for employees attending the Emergency Responder Course. The physician-administered questionnaire consisted of: demographics, medical history and lifestyle practices (smoking, alcohol and exercise). Physical examination included weight, height and blood pressure. Indirect standardisation method was used to calculate the standardised prevalence ratio (SPR) to compare with the results from the National Health Survey 2010, adjusted for age, ethnicity and gender. Kessler Psychological Distress Scale (K10) was dichotomized to assess for psychological distress. Prevalence risk ratio was used to explore the association between physical and mental health.

Results There were a total of 65 participants, with mean age of 49.4 years. Crude prevalence for diabetes, hypertension, dyslipidemia, overweight and smoking were 18.5%, 23.1%, 27.7%, 67.7% and 26.7% respectively. 41.7% of the 12 diabetics had HbA1C >7.5% and blood pressure of 66.7% of hypertensive particpants were uncontrolled. Mean BMI was 26.9 kg/m2. SPR for dyslipidemia and overweight were 1.14 and 1.39 respectively. SPR for other chronic diseases ranged from 0.76–0.89). 11 (16.9%) had abnormal K-10 score. Hypertension was associated with abnormal K-10 score (Prevalence Risk Ratio 4.0, 95% CI 1.41–11.3).

Conclusion Despite possibility of healthy worker effect, there is a high prevalence of overweight and dyslipidemia among emergency responders compared to the national population. Interventions are needed to safeguard overall health of emergency responders.

Oral Presentation

Developing Countries

| 0234 | **OCCUPATIONAL EXPOSURE TO N-HEXANE IS ASSOCIATED WITH REDUCED FSH LEVELS AND ALSO WITH PROLONGED MENSTRUAL CYCLES IN MEXICAN WORKERS OF REPRODUCTIVE AGE** |

[1]Liliana Ruiz-García*, [2]Giovanni Battista Bartoloucci, [2]Fabiola Salamon, [2]Mariella Carrieri, [1]Juan M Malacara-Hernández, [1]Nicte Figueroa-Vega, [3]Octavio Jiménez-Garza. [1]*Universidad de Guanajuato, Departamento de Ciencias Médicas, León/Guanajuato, Mexico*; [2]*Padua University, Cardiologic, Thoracic and Vascualr Science Department, Padya/Veneto, Italy*; [3]*Universidad de Guanajuato, Departamento de Enfermería y Obstetricia, León/Guanajuato, Mexico*

Introduction Former studies in rodents and cell lines have demonstrated ovarian toxicity caused by n-hexane and/or 2,5-hexanedione (2,5HD). In women occupationally exposed to solvents, variables "menstrual cycle period" and "time for getting pregnant" have been longer compared with controls, without identifying a compound responsible for those effects.

Material and methods We studied a group of Mexican women labouring in a shoe Factory (n=32). Individual environmental levels for seven compounds, included n-hexane, were measured. Also, urinary 2,5HD and seric FSH and anti-Müllerian hormone (AMH) as potential biomarkers of ovarian toxicity, in addition to a gyneco-obstetric history were obtained. We performed all tests and questionnaires in a reference group as well (n=32).

Results Mean exposure levels to n-hexane (49.2±39.6 mg/m^3) and toluene (30.8±24.5 mg/m^3) were the highest observed. There were no significant differences in serum FSH and AMH concentrations between groups (p>0.05). Exposed group showed prolonged menstrual cycles (p=0.007) and augmented time for getting pregnant compared with controls (p=0.007). Also in the exposed group, signifcant correlations were observed between FSH levels and n-hexane (r=−0.34, p=0.028) as well as FSH and 2,5HD (r=−0.33, p=0.029).

Conclusions n-hexane exposure may be responsible for a prolonged menstrual cycle. As judged by the correlations between FSH with n-hexane and 2,5HD this affection could be in the endocrine pathway rather than in the ovary itself. n-hexane could act as endocrine disruptor in women of reproductive age.

Oral Presentation

Disease Surveillance

| 0235 | **FRAMEWORK TO MATCH EXPOSURE AND HEALTH OUTCOMES TO BUILD HEALTH MANAGEMENT SYSTEM FOR CONSTRUCTION WORKERS IN KOREA** |

Hyunwoo Choi*, Dongmug Kang, Jongeun Kim. *Pusan National University Yangsan Hospital, Yangsan, Republic of Korea*

Background Majority of construction workers are daily workers who move into many places frequently. Because of this characteristic of construction workers, it is difficult to monitor their exposure status and manage health including periodic health check-up. Therefore, there is a need to establish a health management system, which includes method to assess exposure and health status.

Methods Identification data for individual will be gathered based on the database of the Construction Workers Mutual Aid Association(5 million registered) and the Korean Construction Workers Union database(7000 registered). Those databases have present job title and duration. Since the database do not have exact past exposure data, questionnaire using mobile and web survey will be considered. Main interest of exposures are asbestos and silica using Korean JEM. Major health outcomes will be asbestosis, chronic obstructive pulmonary disease, lung cancer. In addition, other diseases including musculo-skeletal disorders can be the other outcomes. Health outcomes will be recognised by the data of the National Health Insurance data by matching social security numbers whose were acquired from the exposure database.

Results This is in the beginning of the study. The detailed study design will be formed in the first year(2017). In 2018, preliminary analysis with matching of JEM and health outcomes in individual level will be given. Health management system and prospective cohort follow-up will be conducted after 2019. In the presentation, detailed study design, data-

bases regarding construction workers in Korea will be shown.

Oral Presentation

Other

| 0236 | DID A LEGISLATIVE CHANGE ENABLING USE OF PART-TIME SICK LEAVE AT AN EARLY STAGE OF WORK DISABILITY ENHANCE WORK PARTICIPATION IN FINLAND? |

[1]Svetlana Solovieva*, [2]Lauri Virta, [1]Johanna Kausto, [2]Ilona Autti-Rämö, [1]Kari-Pekka Martimo, [3]Mikko Laaksonen, [1]Taina Leinonen, [1]Kirsti Husgafvel-Pursiainen, [4]Alex Burdorf, [1]Eira Viikari-Juntura. *[1]Finnish Institute of Occupational Health, Helsinki, Finland; [2]The Social Insurance Institution of Finland, Helsinki, Finland; [3]Finnish Centre for Pensions, Helsinki, Finland; [4]Erasmus MC, University Medical Centre Rotterdam, Rotterdam, The Netherlands*

Background The introduction of part-time sick leave to enhance work participation has been adopted in several countries, including all Nordic countries.
Objectives To assess the effectiveness of the use of part-time sick leave at the early stage (first 12 weeks) of work disability due to mental disorder or musculoskeletal disease on work participation.
Method In a nation-wide register-based quasi-experimental study we compared sustained return to work (RTW) and 2 year work participation between the part-time and full-time sickness absence benefit groups using propensity score matching. Persons who received partial or full sickness absence benefit between January 1, 2010 and December 31, 2011 were eligible as cases or controls, respectively. Work participation was calculated as the proportion of time within 2 years when participants were gainfully employed and did not receive either partial or full ill-health-related or unemployment benefits.
Results Sustained RTW was observed more frequently in the part-time than in the full-time sick leave group. A difference was seen in both genders, those aged 45–64 years and especially in mental disorders. Overall work participation during the 2 year follow-up was at a higher level in the part-time sick leave group compared with the full-time sick leave group. The difference was larger in men than women and in mental disorders than in musculoskeletal diseases.
Conclusion The use of part-time sick leave during the first 12 weeks of work disability enhances overall work participation during a two-year period. The prescription of part-time sick leave can be recommended at an early stage of work disability.

Poster Presentation

Cardiovascular Disease

| 0237 | THE RELATIONSHIP BETWEEN HEART RATE VARIABILITY AND 5 YEAR RISK OF CARDIOVASCULAR DISEASE: EVIDENCE FROM THE TAIWAN BUS DRIVER COHORT STUDY |

[1]Chung-Ching Wang*, [1]Ying-Chuan Wang, [2]Wei-Te Wu, [1]Sheng-Ta Chiang, [1,3]Saou-Hsing Liou. *[1]Division of Family Medicine, Department of Family and Community Medicine, Tri-Service General Hospital, National Defense Medical Centre, Taipei, Taiwan; [2]National Institute of Environmental Health Sciences, National Health Research Institutes, Miaoli, Taiwan; [3]Department of Public Health, National Defense Medical Centre, Taipei, Taiwan*

Background We conducted a cohort study to evaluate the effectiveness of heart rate variability (HRV) to assess for the 5 year risk CVD event. The aim of our study is to find the association between HRV indices and the risk factors of reduced HRV, the association between HRV indices and CVD.
Methods The Taiwan Bus Driver Cohort Study recruited 1650 professional drivers from a large bus company in Taiwan since 2005. We only selected professional drivers whose total driving period exceeded 100 days during the 3 years. The remaining 1149 drivers completed the survey.
Results We found drivers whose driving duration more than 8 years showed the lowest risk of CVD (HR: 0,25, 95% CI 0,12 to 0,51, p<0.001). Drivers who had the drinking habits had higher CVD risk (HR: 2,19, 95% CI 1,38 to 3,50, p=0,038). BMI, SBP, DBP, Total cholesterol, Triglycerides were significantly associated with decreased HRV variables. When we compare HRV components between subjects with CVD and non-CVD group, decreased LF is found in CVD group (p=0.028), especially for hypertensive disease (p=0.039).
Conclusions This study concludes that among several HRV indices LF is an independent predictor of CVD. Moreover, there is much overlap in modifiable biological risk factors between reduced HRV and CVD. Therefore, we need to find whether a factor affect reduced HRV more or CVD risk more. Further research should be conducted regarding measures to change the modifiable risk factors of reduced HRV, and to investigate whether these interventions could reduce CVD risk in professional drivers.

Oral Presentation

Cancer

| 0239 | RADON EXPOSURE AND LUNG CANCER MORTALITY IN THE GERMAN URANIUM MINER COHORT – RESULTS FROM THE EXTENDED FOLLOW-UP TO 2013 IN THE WISMUT STUDY |

Christina Sobotzki*, Nora Fenske, Maria Schnelzer, Michaela Kreuzer. *Federal Office for Radiation Protection, Neuherberg, Germany*

Background A causal association between exposure to radon and its progeny and lung cancer is well established. However, a better knowledge on effect modification by time, age and exposure rate and on risk at low exposures or exposure rates is of high importance.

Method We analysed 58 974 male uranium miners of the German Wismut cohort with a mortality follow-up from 1946 to 2013 and a sub-cohort of 26 765 miners hired after 1960 characterised by radon values at low exposure-rates. Internal Poisson regression was applied to estimate the Excess Relative Risk (ERR) per unit of cumulative radon exposure in Working Level Months (WLM) with exponential time-related effect modifiers.

Results In the full cohort the crude ERR/WLM was 0.0019 (95% confidence interval (CI): 0.0017;0.0022) based on 3.947 lung cancer deaths. Age at median exposure, time since median exposure, and exposure-rate were strong effect modifiers. Taking them into account led to an estimate of 0.0067 (95%CI: 0.0052;0.0087) for an age at median exposure of 30 years, a time since median exposure of 20 years, and an exposure-rate of 3 WL (strong inverse exposure-rate effect). In the 1960+ sub-cohort, the crude ERR/WLM was 0.0111 (95%CI: 0.0064;0.0173) based on 495 lung cancer deaths. In this relatively young sub-cohort, time since median exposure was also a strong modifier, leading to an ERR/WLM of 0.0165 (95%CI: 0.0083;0.0247) at time since median exposure of 20 years.

Conclusion The present findings provide evidence for an increased lung cancer risk also at low exposures or exposure rates among miners.

Poster Presentation

Exposure Assessment

| 0240 | MONITORING OF ASBESTOS FIBRE DISPERSION FROM A FACTORY TO SURROUNDING RESIDENTIAL ENVIRONMENT |

[1,3]Dongmug Kang*, [1,3]Youngki Kim, [1,2]Jongeun Kim, [1]Hyunwoo Choi. [1]*Dep. Occupational and Environmental Medicine, Pusan National University Yangsan Hospital, Yangsan, Gyeong-Nam, Republic of Korea*; [2]*Environmental Health Centre for Asbestos, Pusan National University Yangsan Hospital, Yangsan, Gyeong-Nam, Republic of Korea*; [3]*Preventive, Occupational and Environmental Medicine, Pusan National University, Yangsan, Gyeong-Nam, Republic of Korea*

Background Although many studies on occupational or environmental exposure levels of asbestos have been published, it is hard to find studies that checked asbestos levels of both of inside and outside of asbestos factory. This fact make epidemiologists connect occupational and environmental asbestos exposure and health outcome simultaneously. One large asbestos textile factory, which was moved from Japan around year 1970, moved from Korea into Indonesia around year 1990.

Methods The study was conducted during 26-28th August 2008 in Cibinong, Indonesia. The field survey was carried out to check current workers' and environmental exposure level of the factory that was moved from Korea. The observed asbestos environmental asbestos levels were compared with atmospheric dispersion models (AERMOD).

Results Inside of the factory, the highest airborne asbestos concentration was 86 times higher than the permit level 0.1fiber/cc. The working condition was similar with 80 s' of Korean working condition. Dispersion pattern of asbestos from a factory was related with wind direction. The correlation coefficient (r) and determination coefficient (r^2) between air monitoring data and simulation data with AERMOD were 0.85 and 0.72 respectively.

Conclusion We confirm that asbestos workers in Indonesia had high exposure level of asbestos without proper protecting devices. Substantial level of environmental dispersion of asbestos from asbestos factory were found. This data can be used for basis of environmental exposure assessment for environmental asbestos related diseases. In addition, it is needed to transfer knowledge to protect hazards of asbestos with efforts to ban it to asbestos using countries.

Oral Presentation

Working Conditions

| 0241 | RESULTS OF A SYSTEMATIC REVIEW ON THE EFFECTS OF CLIMATE CHANGE ON THE HEALTH AND PRODUCTIVITY OF WORKERS |

Miriam Levi*, Alberto Baldasseroni. *CRIMP – Regional Centre for Occupational Diseases and Injuries, Local Health Unit Tuscany Centre, Florence, Italy*

Introduction Climate change can impact on workers' health in different ways: the increase of ambient temperature can generate heath-related illnesses, cardiovascular, respiratory and kidney diseases; extreme weather conditions can cause traumatic injuries and acute deaths; the expansion of vectors habitat can cause the increase of vector-borne diseases. In addition, the reduced work capacity can result in a lower labour productivity. The aim of the systematic literature search we are conducting as part of the EU-funded Project HEAT-SHIELD is to explore the effects of climate change on the health and productivity of workers.

Methods Four separate search strategies were conducted. The first three were focused on the health impacts of, respectively, increased ambient temperatures, extreme weather conditions, expansion of vectors habitats; the fourth was aimed to assess the effect of climate change on labour productivity.

Results For each retrieved study, we are gathering specific information. From a preliminary assessment of the literature retrieved, the population more frequently studied is the working population as a whole, followed by miners and farm workers. The most studies health outcomes are heat-related illness, physiological parameters and workers hydration status (using urine specific gravity as a proxy).

Conclusions The results of our systematic reviews will be useful for policy makers to adequately plan and coordinate actions involving particularly the strategic industries targeted by the HEAT-SHIELD Project (manufacturing, construction, transportation, tourism and agriculture), and will therefore serve as a tool to prevent heat-related illnesses and promote labour productivity, innovation and implementation in the EU.

Oral Presentation

Methodology

0242 | **MEASURING AND ESTIMATING PHYSIOLOGICAL RESPONSES TO OCCUPATIONAL HEAT EXPOSURE**

[1]Rebekah Lucas*, [2]Kristina Jakobsson, [3]Tord Kjellstrom, [4]David Wegman. [1]School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham,, Birmingham, UK; [2]Section of Occupational and Environmental Medicine, Department of Molecular and Clinical Medicine, Institute of Medicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; [3]Centre for Technology Research and Innovation, Limassol, Cyprus; [4]Department of Work Environment, University of Massachusetts, Lowell, USA

There are direct and indirect health and performance detriments associated with occupational heat stress. This presentation will review methods and tools that can be used to examine physiological responses to occupational heat stress and highlight future directions for practice and research.

Technological advancements have opened new opportunities for the capture and monitoring of physiological responses and metrics, particularly in the field. Continued validation of new technologies is necessary to benchmark the reliability and validity of field-based measures and methods.

Measures of body temperature, metabolic workload, hydration status and psychophysiological responses can yield important information as to the strain induced from working in a hot environment. While there are a range of measurement techniques and methods to measure or estimate physiological responses, there are limitations that must be considered. These include the sensitivity, reliability and practicality of proposed measures. For example, gastro-intestinal temperature measures via a telemetric pill allows for direct, wireless, non-invasive measurement of deep internal temperature. However, water ingestion can influence telemetric pill readings while it remains in the stomach and the expense of such a system makes it prohibitive to use in large cohorts.

Continued validation of new technologies is necessary to benchmark the reliability and validity of field-based measures and methods with the ultimate goal being to better quantify exposure-response and exposure-effect relationships for workers' health, wellbeing and productivity. Importantly, more comprehensive assessments of the heat strain experienced by different populations would aid the interpretation of climate change impact on worker´s health at a local and global level.

Oral Presentation

Shift Work

0243 | **ROTATING SHIFT WORK AND PREVALENCE OF DIABETES MELLITUS AND PREDIABETES IN MALE EMPLOYEES OF A LARGE GERMAN CHEMICAL COMPANY: RESULTS OF A CROSS-SECTIONAL STUDY**

Matthias Claus*, Michael Schuster, Christoph Oberlinner, Stefan Webendörfer. BASF SE, Ludwigshafen, Rhineland-Palatinate, Germany

Purpose The aim of the study was to investigate the association between rotating shift work (RSW) and prevalence of diabetes and prediabetes in male employees of a large chemical company.

Methods We used cross-sectional data, surveyed in health checks between January 1^{st}2011 and December 31^{st}2014 at BASF SE in Ludwigshafen (Germany). A blood sample, physical examination and anamnesis by a medical officer as well as a written questionnaire were part of the health-check. Diabetes status (no diabetes, prediabetes, diabetes) was assessed via HbA_{1c}-value and information provided by employees themselves. Shift status was surveyed using company records. Partial proportional odds models for ordinal response variables were applied to assess the association of RSW with diabetes status.

Results Data on 9765 male employees (40.4% rotating shift workers) with a mean age of 44.3 years (SD: 9.6) could be used for analyses. Prevalence of diabetes and prediabetes in rotating shift workers were 6.4% and 14.2% respectively. Corresponding figures for day workers were 3.6% and 11.5% (p<0.001). Unadjusted analyses yielded an Odds Ratio of 1.85 (95%-CI: 1.53–2.22) for RSW (comparing diabetes with prediabetes/no diabetes). The effect attenuated in the fully adjusted multivariable model (aOR: 1.38; 95% CI: 1.11–1.70) but remained significant. The association between RSW and diabetes status varied by BMI and occupational status. The association was stronger in skilled/supervisory workers and respondents with a BMI <30 kg/m².

Conclusions The present study found a significant association between RSW and diabetes which differed by BMI and occupational status.

Declaration of potential conflict of interest: All authors are employees of BASF SE.

Poster Presentation

Respiratory

0244 | **THE DIAGNOSIS OF PNEUMOCONIOSIS USING A SENSOR ARRAY TECHNIQUE**

[1]Hsin-Yi Peng*, [1]Che-Jui Chang, [1,2]Pau-Chung Chen, [1,2]Hsiao-Yu Yang. [1]Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University College of Public Health, Taipei, Taiwan; [2]Department of Environmental and Occupational Medicine, National Taiwan University Hospital, Taipei, Taiwan

Pneumoconiosis is a traditional occupational disease and has reemerged in recent years. Current medical surveillance program have flaws that may result in poor detection of early pneumoconiosis around the world. Pneumoconiosis could generates specific volatile organic compounds (VOCs) that may constitute a specific breath print for diagnosis. The objective of this study was to develop a breath test for pneumoconiosis using a senor array technique. We conducted a case-control study that enrolled 36 asymptomatic cases of pneumoconiosis and 64 healthy controls between October and November 2016 to construct the prediction model. One litter of breath air was collected after five minutes of tidal breathing through a non-rebreathing valve with inspiratory VOC-filter, and storage by a Tedlar bag. The air was analysed by a 32

nanocomposite sensor array electronic nose within 30 min. We used the profusion category≧1/1 in chest X-ray in accordance with the ILO-2011D criteria as the reference standard to assess the diagnostic accuracy. Data were randomly split into 80% for model building and 20% for validation. By linear discriminant analysis, the sensitivity was 71.0%, specificity was 91.8%, accuracy was 86.8%, and ROC-AUC was 0.89 in the training set, and the sensitivity was 80.0%, specificity was 66.7%, accuracy was 70.0%, and ROC-AUC was 0.79 in the validation set. Breath test might have potential in the screening for pneumoconiosis; however, a multi-centre study is warranted to establish a reliable model and all procedures must be standardised before clinical application.

Poster Presentation

Methodology

0245   BIG DATA AND OCCUPATIONAL HEALTH VIGILANCE: USE OF FRENCH MEDICO-ADMINISTRATIVE DATABASES FOR HYPOTHESIS GENERATION REGARDING OCCUPATIONAL RISKS IN AGRICULTURE

[1,2]Charlotte Maugard*, [1,2]Delphine Bosson-Rieutort, [2]Olivier François, [1,3]Vincent Bonneterre. [1]Grenoble-Alpes University (UGA)/TIMC-IMAG Laboratory (UMR CNRS 5525)/EPSP Team (Environment and Health Prediction of Populations), Grenoble, France; [2]Grenoble-Alpes University (UGA)/TIMC-IMAG Laboratory (UMR CNRS 5525)/BCM Team (Computational and Mathematical Biology), Grenoble, France; [3]Modernet Network, -, France

Surveillance of diseases and associated exposures is a major issue in occupational health, especially identifying and preventing new threats for worker's health. New complementary methods relying on exploitation of already existing data, such as those from health insurance, could be developed to look for relevant signals for early detection of emerging occupational diseases. In this context, a systematic data mining could be performed on databases from the "Mutualité Sociale Agricole" (MSA), the dedicated social security system to French agricultural workers, which covers about 3 million individuals. As this healthcare system holds a large amount of data, MSA databases could allow us to apply "big data" analytics in order to study occupational risks of French agricultural workers. Thereby, this innovative approach could permit to look for associations between diseases and occupational activities without any prior hypothesis and also could have the potential to be used on continuous data flow for vigilance.

The authorisation of the French National Commission on Informatics and Liberty allowed the cross-linking of MSA databases using a common anonymous identifier for each individual. The main methodological point is programming of unsupervised analysis, especially latent models of mixed factors, applied to the "occupational activity x diseases" matrices. Due to the lack of direct information about exposure, a complementary work is performed to estimate retrospectively the exposure to pesticides of agricultural workers.

This innovative method which will be presented, has the following advantages: 1) offers a systematic approach, 2) has a strong statistical power, 3) is costless about data acquisition.

Poster Presentation

Methodology

0246   THE IMPACT OF HIGH-SCHOOL COMPLETION - A MULTI-STATE MODEL FOR WORK PARTICIPATION AND HEALTH-RELATED ABSENCE IN YOUNG MEN

[1,2]Rune Hoff*, [1]Ingrid Mehlum, [1]Karina Corbett, [1,4]Ferdinand Mohn, [1]Therese Hanvold, [1,3]Petter Kristensen, [2]Jon Michael Gran. [1]The National Institute of Occupational Health, Oslo, Norway; [2]Oslo Centre for Biostatistics and Epidemiology, Oslo, Norway; [3]Institute of Health and Society, University of Oslo, Oslo, Norway; [4]Institute for Social Research, Oslo, Norway

Withdrawn at the author's request

Oral Presentation

Shift Work

0247   SHIFT WORK AND INCIDENCE OF CARDIOVASCULAR DISEASES IN THE DANISH NURSE COHORT

[1]Jeanette Therming Jørgensen*, [1]Rikke Horn, [2,3]Leslie Stayner, [4]Johnni Hansen, [1]Zorana Jovanovic Andersen. [1]University of Copenhagen, Copenhagen, Denmark; [2]University of Illinois at Chicago School of Public Health, Chicago, IL, USA; [3]University of Southern Denmark, Odense, Denmark; [4]Danish Cancer Society, Copenhagen, Denmark

Objective Shift work and risk of cardiovascular diseases (CVD) have been investigated during many decades. The evidence is, however, still conflicting. This study aims to examine whether shift work among Danish female nurses is associated with the risk of CVD.

Methods 28 731 women from the Danish Nurse cohort (>44 years old at recruitment in 1993 or 1999), who reported information on shift work (day, evening, night or rotating), were linked to the Danish National Patient Register, to obtain information on CVD (ICD-10: I00-99; ICD-8: 390–458) hospital contacts (emergency, in- or outpatient) from 1978 until August 2015. We used Cox regression models to examine the association between shift work and the incidence of CVD, defined as the first-ever hospital contact for CVD after cohort baseline, adjusting for the most important risk factors.

Results Of 16 086 nurses without previous CVD events at baseline, 5504 developed CVD during a mean follow-up of 16 years, with an incidence rate of 21.4 cases per 1000 person-years. 63.4% of the nurses reported day work as their primary work schedule, while 10.0%, 5.3% and 21.6% worked in evening, night and rotating shifts, respectively. We found no associations between shift work and the risk of CVD when compared to day workers, with hazard ratio of 0.99 (95% confidence interval 0.91–1.09) for evening, 1.01 (0.90–1.13) for night and 1.03 (0.96–1.10) for rotating shifts, in the fully adjusted model.

Conclusion We found no evidence of an increased risk of CVD among female shift workers.

Oral Presentation

Musculoskeletal

0248   REVERSIBLE MEDIAN NERVE IMPAIRMENT AFTER THREE WEEKS OF REPETITIVE WORK

[1]Sorosh Tabatabaeifar*, [2]Susanne Wulff Svendsen, [3]Birger Johnsen, [4,5]Gert-Åke Hansson, [3]Anders Fuglsang-Frederiksen, [1]Poul Frost. [1]Danish Ramazzini Centre, Department of Occupational Medicine, Aarhus University Hospital, Aarhus C, Denmark; [2]Danish Ramazzini Centre, Department of Occupational Medicine, Regional Hospital West Jutland – University Research Clinic, Herning, Denmark; [3]Department of Clinical Neurophysiology, Aarhus University Hospital, Aarhus C, Denmark; [4]Occupational and Environmental Medicine, University and Regional Laboratories Region Scania, Lund, Sweden; [5]Division of Occupational and Environmental Medicine, Lund University, Lund, Sweden

Objectives To evaluate the development of median nerve affection in relation to hand-intensive seasonal work. We hypothesised that at end-season, median nerve conduction would be impaired and then recover within weeks.

Methods Using nerve conduction studies (NCS), we examined median nerve affection before, during, and after engaging in 22 days of mink skinning. We used technical measurements (goniometry and surface electromyography) to characterise occupational mechanical exposures and obtained questionnaire information on symptoms, disability, and lifestyle factors.

Results 11 male mink skinners without median nerve affection at pre-season were included (mean age: 35.7, mean number of seasons with skinning: 8.9). Mink skinning was characterised by a median angle of wrist flexion/extension of 16° extension, a median velocity of wrist flexion/extension of 22 °/s, and force exertions of 11% of maximal voluntary electrical activity. At end-season, mean distal motor latency (DML) had increased 0.41 ms (p<0.001), mean sensory nerve conduction velocity (SNCV) digit 2 had decreased 6.3 m/s (p=0.004), and mean SNCV digit 3 had decreased 6.2 m/s (p=0.01); 9 had decreases in nerve conduction, 5 fulfilled electrodiagnostic criteria, and 4 fulfilled electrodiagnostic and clinical criteria (a positive Katz hand diagram) for carpal tunnel syndrome (CTS). Three to six weeks post-season, the changes had reverted to normal. Symptom and disability scores showed corresponding changes.

Conclusions In this natural experiment, impaired median nerve conduction developed during 22 days of repetitive industrial work with moderate wrist postures and limited force exertion. Recovery occurred within 3–6 weeks post-season.

Poster Presentation

Exposure Assessment

0249   JOB-EXPOSURE MATRIX FOR HISTORICAL EXPOSURE TO RUBBER DUST, RUBBER FUMES, AND N-NITROSAMINES IN THE BRITISH RUBBER INDUSTRY

[1]Mira Hidajat*, [2]Damien McElvenny, [2]Will Mueller, [2]Peter Ritchie, [2,3]John Cherrie, [4]Andrew Darnton, [5]Raymond Agius, [1]Frank de Vocht. [1]University of Bristol, Bristol, UK; [2]Institute of Medicine, Edinburgh, UK; [3]Heriot Watt University, Edinburgh, UK; [4]Health and Safety Executive, Bootle, UK; [5]The University of Manchester, Manchester, UK

In 1982 IARC concluded that there was sufficient evidence for a causal association between occupational exposures in the rubber manufacturing industry and urinary bladder cancer and leukaemia. To enable evaluations of exposure-response associations in a cohort of men age 35+ employed in the British rubber industry in 1967 with a 49 year mortality followup (n=40,867), we created a quantitative historical job-exposure matrix (JEM) covering the period 1915–2000 based on personal and area measurements previously collated within the EU-EXASRUB project for rubber dust (n=4,187), rubber fumes (n=3,852), and n-Nitrosamines (n=10,215). These data were modelled by job function using linear mixed-effects models with sample year and industry sector as explanatory factors and a random factory intercept.

Variations in exposure levels over time between compounds and department were observed. For example, rubber dust exposures ranged from −8.8%/yr (crude materials and mixing, p<0.001) to +0.5%/yr (curing, p=0.01) while rubber fumes exposures declined between −8.3%/yr (crude materials and mixing, p<0.001) and −0.2%/yr (finishing, assembly, and miscellaneous, p=0.218).

JEM-estimates were linked to all cohort members for each year worked to calculate average annual and lifetime cumulative exposures (AAE, LCE), thereby allowing quantitative evaluation of exposure-response associations between 50 year occupational exposure and cancer mortality. AAE rubber dust exposures ranged between 0.3 mg/m3 (curing) and 36.3 mg/m3 (crude materials and mixing). Rubber fumes exposures range between 0.3 mg/m3 (finishing, assembly, and miscellaneous) and 5.4 mg/m3 (crude materials and mixing). LCE trends mirrored AAE results.

JEM-estimates will allow for quantitative exposure-response association assessments between long-term occupational exposure and cancer mortality.

Poster Presentation

Occupational Medicine (SCOM/Modernet)

0250   NECK AND UPPER LIMB COMPLAINTS IN HEALTH WORKERS: A WARNING OF MENTAL STRAIN, OR JUST A MECHANICAL PROBLEM?

[1]Silvia Santo Domingo, [2,3]Rebeca Marinas*, [2]Yolanda Casalod, [2]Miguel Bolea, [2]Begoña Martínez. [1]Servicio Riojano de Salud. Servicio de Prevención de Riesgos Laborales., Logroño, La Rioja, Spain; [2]Grupo Consolidado de Investigación GIIS063 de Medicina del Trabajo del Instituto de Investigación Sanitaria de Aragón and Grupo Consolidado B44. School of Occupational Medicine, University of Zaragoza., Zaragoza, Aragón, Spain; [3]Servicio de Medicina Interna. Hospital Clínico Universitario "Lozano Blesa", Zaragoza, Aragón, Spain

Background MSDs are the most prevalent work-related diseases in the European Union (EU). Developmental pathways of these health problems are known to be related to physical and psychosocial working conditions

Objectives and Methods This study aimed to describe physical and psychological risk factors involved in the appearance of neck and upper limb MSDs in workers.

A survey was conducted in health workers of the La Rioja Regional Department of Health (Spain) (n=3939) using an observational design. Over a 12 month period, all health workers from this Department who used the Occupational Medicine Service for neck and upper limb pain and discomfort were invited to participate. Finally, a total of 707 health workers were recruited for the survey. Information on workplace exposure to physical and psychological risks was collected using three different tools: the Standardised Nordic Musculoskeletal questionnaire, the Siegrist's and a self-reporting questionnaire (drafted ad hoc and validated prior to administration) to gather socio-demographic and occupational variables.

Results and conclusions A high prevalence of neck and upper extremity symptoms has been found among our sample (73.55%). The most common location was neck (65.77%). Being a female worker with high physical workload, low career progress and over-involvement at work was configured as a risk profile. The studied symptoms were highly predicted by the existence of work stress and effort-reward imbalance. Therefore, medical doctors should be aware of what may be behind of these complaints, as they could be a warning of underlying mental strain and potential exposure to psychosocial risks.

Poster Presentation

Musculoskeletal

0251   A TWENTY-TWO YEAR LONGITUDINAL STUDY OF WORKERS EXPOSED TO HAND-HELD VIBRATING TOOLS

Rita Bast-Pettersen*, Karl-Christian Nordby, Inger Helene Gudding, Elin Einarsdottir Thornér, Lisa Aarhus. National Institute of Occupational Health, Oslo, Norway

Background Excessive use of hand-held vibrating tools can lead to hand-arm vibration syndrome (HAVS), which is composed of vascular, neurological and muscular components. Typical symptoms are vasospasm of the fingers induced by cold, loss of sensitivity, tingling and paresthesia, and impaired hand function.

Moderate exposure may lead to less serious vascular and neurological symptoms.

Objectives The objectives were to evaluate different aspects of hand function in workers with current and previous exposure to vibrating hand tools, taking into account the possible effects from life-style habits such as tobacco and alcohol consumption.

Subjects and Methods Forty workers who had been employed in a specialised engineering and construction company, were tested with a test-battery together with a clinical examination in 1994. The company was shut down in 1999. The workers were retested in 2016/2017, more than 22 years after the first/baseline testing. Age at last examination was 60.7 years (44.6 to 77.8 years). They were examined with a test-battery comprising Vibrameter, Water plethysmograph, Tremor Pen from CATSYS, Grooved Pegboard, Finger Tapping Test, Hand Dynamometer and Pinch Grip.

The workers were interviewed about their work history, health complaints and life-style factors like alcohol consumption and smoking habits. Their exposure history was assessed as acceleration x lifetime exposure.

Biological samples (Carbohydrate-deficient transferrin (CDT), glycated haemoglobin (HbA1c), cotinine, nicotine) were collected on the day of examination.

Results The data collection was finished by ultimo March 23rd 2017. Data analysis has started, and results from the project will be presented.

Oral Presentation

Other

0252   THE LEGACY OF *IN SITU* ASBESTOS CEMENT ROOFS IN SOUTH AFRICA

[1,2]David Rees*, [1,3]James Ian Phillips. [1]National Institute for Occupational Health, National Health Laboratory Service, Johannesburg, South Africa; [2]School of Public Health, University of the Witwatersrand, Johannesburg, South Africa; [3]Faculty of Health Sciences, Department of Biomedical Technology, University of Johannesburg, Johannesburg, South Africa

In the 1970s, South Africa was the world's third largest producer of asbestos. The amphiboles, amosite and crocidolite, were mined in large quantities along with chrysotile. Most asbestos was exported but some was used locally to manufacture products including asbestos cement (AC)roof sheets which were used to build houses and schools. Although asbestos was banned in South Africa in 2008, there are over a million houses with AC roofs. Asbestos Regulations promulgated in 2002 prescribe the method for working with and demolishing asbestos containing materials and a key step is the identification of asbestos. The NIOH provides a national service to identify asbestos in materials and from 2003 to 2016, some 2657 samples have been analysed, including 155 roofs. Of these, 135 (87%) contained asbestos and 97 (72%) of the AC roofs contained amphibole asbestos fibres either alone or in a mixture. This suggests that several million people are living under a roof containing amphibole asbestos. Studies that sampled the air for asbestos fibres in a township built with AC roofs indicate that fibres are not normally liberated from the roofs. Another study in the same township has shown that over many years, asbestos can be leached from roofs by rainwater and fibres can be found in the soil below roofs which have no gutters. The legacy of AC roofs on homes and schools is a concern for residents and parents. The magnitude of the problem raises concerns about the safe removal, disposal and cost to replace these roofs.

Poster Presentation

Cancer

0253 **ESTIMATED FUTURE INCIDENCE OF MALIGNANT MESOTHELIOMA IN KOREA : PROJECTION FROM 2015 TO 2034**

[1,2]Kyeongmin Kwak*, [2]Domyung Paek, [2]Seung-sik Hwang, [3]Young-su Ju. [1]Gachon University Gil Medical Centre, Incheon, Republic of Korea; [2]Seoul National University Graduate School of Public Health, Seoul, Republic of Korea; [3]Hallym University Sacred Heart Hospital, Anyang, Republic of Korea

Backgroud Malignant mesothelioma is a malignant tumour on the pleura or the peritoneum caused mostly by asbestos. Although asbestos is not currently used in Korea, the incidence of mesothelioma is increasing due to its long latent period. This study was the first to predict the future incidence of malignant mesothelioma in Korea over the next 20 years.
Method Mesothelioma incidence data from 1995–2014 was acquired from the Korea Central Cancer Registry (KCCR). Demographic data was acquired from the Korean Statistical Information Service (KOSIS) for 1995–2034. An APC model with Møller's power-link function was utilised to estimate the future incidence of mesothelioma.
Result It was predicted that 2684 and 1270 new cases of mesothelioma in men and women would occur over the next 20 years. For both sexes, the mesothelioma incidence rate was predicted to be greater in 2030–2034 (men, 0.622; women, 0.224) compared to that in 2010–2014 (men, 0.280; women, 0.152). The age-standardised incidence rate (ASR) was predicted to be slightly greater in 2030–2034 (men, 0.229; women, 0.109) relative to the rate in 2010–2014 (men, 0.216; women, 0.104) in both sex. The changes in mesothelioma incidence were mostly caused by changes in the population structure of Korea due to ageing and not by changes in the mesothelioma risk ratio.
Conclusion The projected mesothelioma incidence continuously increases in Korea over the next 20 years. Although it was not related to an increase in the mesothelioma risk ratio, continuous preventive efforts are necessary.

Poster Presentation

Injuries

0254 **OUTDOOR TEMPERATURE, AIR POLLUTANTS AND OCCUPATIONAL INJURIES RISK: A SYSTEMATIC REVIEW OF EPIDEMIOLOGICAL STUDIES AND A CASE-CROSSOVER STUDY**

[1]Michela Bonafede*, [2]Patrizia Schifano, [1]Alessandro Marinaccio, [2]Federica Asta, [2]Simona Vecchi, [2]Marina Davoli, [2]Paola Michelozzi. [1]Inail – Italian Workers Compensation Authority – Department of Occupational and Environmental Medicine, Epidemiology and Hygiene, Rome, Italy; [2]Department of Epidemiology, Lazio Regional Health Service, Rome, Italy

Introduction We have carried out a systematic review of epidemiological studies about the association between extreme weather conditions and work-related injuries (WRI). Furthermore, we have analysed the association between extreme temperature, air pollutants and WRI in three Italian cities identifying more susceptible workers' categories by the means of a case cross over study.
Methods We have performed a systematic review of epidemiological studies concerning the risk of WRI for extreme temperature. All occupational injuries between 2001–2010 in Milan, Turin and Rome have been extracted from the Italian workers compensation claims archives. Associations between temperature (T), air pollutants (PM10, NO2, O3) and WRI have been estimated using a time-stratified case-crossover study, separately in May-September (warm season, WS) and November-February (cold season, CS).
Results The epidemiological studies for estimating the association between extreme temperature and WRI appeared to be few and conducted with different methodologies. In our study exposure to NO2 (lag 0–8) showed the highest positive effect on the risk of WRI ranging, in the warm season, between +20% (CI 95%: 1.16–1.24) in Milan and +30% (CI 95%: 1.24–1.37) in Turin. Temperature, in WS, was associated to an increased risk of WRI among those working in construction, transport and energy industry with bricklayer, metalworker, mechanic, and asphalter as the most involved workers' categories.
Conclusions The findings of our study should be considered for planning health and safety prevention programs and correctly identifying measure targeted to risk mitigation for specific categories of workers.

Oral Presentation

Cancer

0255 LIFETIME CANCER RISK IN THE BRITISH RUBBER INDUSTRY: A RETROSPECTIVE COHORT WITH 49 YEAR FOLLOW-UP

[1]Mira Hidajat*, [2]Damien McElvenny, [2]Will Mueller, [2]Peter Ritchie, [2,3]John Cherrie, [4]Andrew Darnton, [5]Raymond Agius, [1]Frank de Vocht. [1]University of Bristol, Bristol, UK; [2]Institute of Occupational Medicine, Edinburgh, UK; [3]Heriot Watt University, Edinburgh, UK; [4]Health and Safety Executive, Bootle, UK; [5]University of Manchester, Manchester, UK

IARC concluded (IARC, 1982, 1987) there is sufficient evidence of a causal association between occupational exposures in the rubber-manufacturing industry and cancer. However, because of the complexity and variety of substances used in the process, a great deal of uncertainty regarding which specific exposures give rise to the increases in cancer remains. Moreover, since exposures in the rubber industry have decreased considerably and efforts have been made to remove confirmed carcinogens from the production process, it is unclear if increased cancer risks are (primarily) attributable to historical exposures.

To quantitatively evaluate exposure-response associations between specific long-term occupational exposure and cancer mortality, we updated a cohort of 40 867 men aged 35+ who were employed in the British rubber industry in 1967. A previous follow-up to 1976 identified excess risk of bladder cancer in men, excess death from lung cancer across the industry and excess stomach cancer mortality in the tyre sector.

Extending the mortality follow-up to 49 years, we are currently processing mortality data from NHS Digital and linking it to a population-specific quantitative job-exposure matrix for rubber (process) dust, rubber fumes, and n-Nitrosamines based on available data from the EU- EXASRUB project.

We hope to begin exposure-response analyses in April 2017 (and present the results at the conference). Few occupational cohorts of this size have such lengthy follow-up, so the presented analyses will provide an important overview of lifetime exposure-specific cancer mortality risks of specific exposures historically and currently encountered in the industry.

Oral Presentation

Other

0256 LABOUR MARKET SEGREGATION AND GENDER DIFFERENCES IN SICKNESS ABSENCE: TRENDS IN 2005–2013 IN FINLAND

[1]Taina Leinonen*, [1]Eira Viikari-Juntura, [1]Kirsti Husgafvel-Pursiainen, [2]Lauri Virta, [3]Mikko Laaksonen, [2]Ilona Autti-Rämö, [1]Svetlana Solovieva. [1]Finnish Institute of Occupational Health, Helsinki, Finland; [2]The Social Insurance Institution of Finland, Helsinki, Finland; [3]Finnish Centre for Pensions, Helsinki, Finland

Introduction Women have higher work disability rates than men, but less is known of changes in this gap over time. We examined gender differences in sickness absence trends focusing on sectoral and occupational gender segregation in the labour market.

Methods We used large representative register data on Finnish wage-earners aged 25–59 and generalised estimation equations based on repeated logistic regression to estimate the annual risk of having any long-term sickness absence.

Results Between 2005 and 2013, the predicted proportion of those with all-cause sickness absence decreased from the initial levels of 10.6 among men and 15.1 among women by 16.7% and 13.6%, respectively. The decreases were particularly large among male and female manual workers and among female upper non-manual employees, and there was further variation between different industrial sectors. Excess decrease among men mainly coincided with the peak of the economic recession in 2009. Widening of the gender gap was not influenced by differential distributional changes by employment factors, sociodemographic factors and previous sickness absence between the employed male and female risk populations, but it was influenced by differential within-group changes in sickness absence at the time of the recession between male- and female-dominated industrial sectors and occupational classes.

Conclusions Widening of the gender gap in sickness absence was largely explained by excess decrease in sickness absence in male-dominated sectors and occupations which were hit especially hard during the recent economic recession. The association may be related to reduced illness behaviour among employees experiencing greater labour market insecurity.

Poster Presentation

Psychosocial

0257 ASSOCIATIONS OF INDIVIDUAL LEVEL AND JOB-GROUP LEVEL ESTIMATES OF PSYCHOSOCIAL WORK FACTORS WITH DEPRESSIVE SYMPTOMS

Ole Melkevik*, Reiner Rugulies, Ida E.H. Madsen. National Research Centre for the Working Environment, Copenhagen, Denmark

Background Job exposure matrix (JEM) methodology is useful in occupational psychosocial epidemiology for eliminating reporting bias and analysing low-prevalence outcomes in register based populations. This investigation aims to compare patterns of associations between psychosocial factors, assessed by JEM estimates and individual-level estimates, respectively, with depressive symptoms and to test the linearity of the associations.

Methods In this cross-sectional analysis, we used data from the Danish Work Environment Cohort Study 2000 (n=8583) to generate JEM and individual-level estimates of quantitative demands, work pace, influence, opportunities for development, emotional demands, and role conflicts at work. JEM estimates were attained from regression models providing sex- and age specific estimates for each job-group. Depressive symptoms were measured with the MHI-5 scale of the Short Form 36 questionnaire. The shape of the association between psychosocial exposures and depressive symptoms were assessed by use of linear splines. Using F-tests we tested whether reducing model flexibility (i.e. number of splines) led to statistically significant changes in model fit.

Results Preliminary results indicate that associations between individual-level estimates of psychosocial work factors with depressive symptoms were largely linear and statistically significant. The associations of JEM estimates of psychosocial job factors with depressive symptoms showed varied patterns of non-linearity and were generally not statistically significant, after adjustment for individual-level measures.

Discussion Our study indicates that individual estimates of psychosocial work factors are consistently, strongly and linearly associated with depressive symptoms, whereas JEM estimates showed varied and non-linear patterns. JEM psychosocial work estimates may capture different phenomena than individual-level estimates.

Poster Presentation

Musculoskeletal

0258   PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISEASES AND DISABILITY IN CONSTRUCTION WORKERS IN ANKARA

[1]Necvan Tokmak*, [2]Selim Yuksel, [3]Zeynep Cavusoglu, [4]Zerrin Unlu, [5]Cemil Tuna, [6]Mustafa Unaldi, [7]Ahmet Ozlu, [8]Mustafa Kemal Basarali, [9]Frank Van Dijk, [10]Ali Naci Yildiz. [1]Public Health Institution of Turkey, Ankara, Turkey; [2]Public Health Directorate of Kocaeli, Kocaeli, Turkey; [3]Public Health Directorate of Izmir, Izmir, Turkey; [4]Public Health Institution of Turkey, Ankara, Turkey; [5]Public Health Institution of Turkey, Ankara, Turkey; [6]Public Health Directorate of Ankara, Ankara, Turkey; [7]Public Health Institution of Turkey, Ankara, Turkey; [8]Public Health Institution of Turkey, Ankara, Turkey; [9]Free University in Amsterdam, Amsterdam, The Netherlands; [10]Hacettepe University, Ankara, Turkey

Objectives Musculoskeletal diseases (MSD) affect almost 30% of the global construction sector workforce. Recent studies have shown high risks in bricklayers, plasterers and carpenters. The main causes of MSD in construction workers are heavy lifting, repetitive movements and poor ergonomic working postures. However, there are no studies in Turkey assessing work-related MSD prevalence in the construction sector and related disability in work and daily life.

The aim of this study is to examine the prevalence of musculoskeletal symptoms in manual handling construction workers active in the construction of new buildings for a city hospital in Ankara. The study includes assessing the work-relatedness of MSD. Subsequently the effect of MSD on disability is analysed.

Methods We plan a cross-sectional study using a questionnaire on sociodemographic characteristics, risk factors at work and employment conditions, work history, health status, the Nordic Musculoskeletal Questionnaire and disability as a consequence of work-related MSD, using a face-to-face interview method. The interviews will be performed by trained occupational health and safety specialists from the Public Health Institution of Turkey (PHIT).

The study proposal has been approved by the PHIT and the construction company. Workers will be asked for informed consent.

Results We planned that 1.200 people will be included in the study. The prevalence of work-related MSD and disability will be determined, stratified for occupational groups and socio-demographic variables.

Conclusion The main outcome is prevalence of work-related MSDs in construction workers studied and related disability in work and daily life. Interventions will be recommended for prevention.

Poster Presentation

Respiratory

0259   AIR POLLUTANTS ASSOCIATED WITH BASELINE IN FRACTIONAL EXHALED NITRIC OXIDE (FENO) IN SCHOOL CHILDREN

[1]Tzu-Pei Wang*, [2]Chi-Hsien Chen, [1]Bing-Yu Chen, [1,2]Yue-Leon Guo. [1]Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University, Taipei, Taiwan; [2]Department of Environmental and Occupational Medicine, National Taiwan University College of Medicine and NTU Hospital, Taipei, Taiwan

Fractional exhaled nitric oxide (FeNO) is now recognised as a surrogate marker of eosinophilic airway inflammation and is affected by several factors, air pollution is an environmental determinant of it. Previous studies provide evidence that children are sensitive to the effects of air pollution. Therefore, the main objective of this study is to determine the effects of ambient air pollution on exhaled NO levels among school children.

From March 2016 to March 2017, a nationwide cross-sectional study was conducted in Taiwan using a modified Chinese version of the International Study of Asthma and Allergies in Childhood (ISSAC-C) questionnaire. Children received FeNO measurement in the morning, and inside buildings. Air pollution data were retrieved from air monitoring stations within two kilometre of the schools.

From 37 schools, 3344 students aged 6–15 years were randomly selected as candidates of the study. We complete monitoring data of air pollution, including SO_2, O_3, CO, NO_2, $PM_{2.5}$ and PM_{10}. Our preliminary results showed that the levels of FeNO were significantly ($p < 0.05$) associated with average CO (0.48 ± 0.4 ppm), NO (5.48 ± 10.21 ppb), PM2.5 (20.96 ± 14.27 µg/m3), and PM10 (46.44 ± 22.78 µg/m3) concentrations of lag day1. In summary, results indicated that exposure ambient pollutants might affect FeNO levels of schoolchildren. In order to further investigate, multilevel modelling will be used to distinguish the sources of variation in the response. We plan to evaluate variations among children in the first level, and variations among schools in the second level.

Poster Presentation

Methodology

0260 | **VISUALISING THE UNEMPLOYMENT-TO-EMPLOYMENT TRANSITIONS TO EXPLORE FACTORS INFLUENCING RETURN TO WORK IN THE WORK PROGRAMME: RESULTS FROM THE SUPPORTING OLDER PEOPLE INTO EMPLOYMENT (SOPIE) COHORT**

[1]Judith Brown*, [2]Ronald McQuaid, [3]Srinivasa Vittal Katikireddi, [3]Alastair Leyland, [4]John Frank, [3]Oarabile R Molaodi, [1]Ewan B Macdonald. [1]*Healthy Working Lives Group, Institute of Health and Wellbeing, University of Glasgow, Glasgow, UK; [2]Stirling Management School, University of Stirling, Stirling, UK; [3]MRC/CSO Social and Public Health Sciences Unit, Institute of Health and Wellbeing, University of Glasgow, Glasgow, UK; [4]Scottish Collaboration for Public Health Research and Policy, University of Edinburgh, Edinburgh, UK*

Objectives Returning to employment after a period on welfare benefits is particularly challenging for people aged over-50 and those with health conditions. We explore the unemployment-to-employment transitions made by clients engaging with the Work Programme (WP); the UK Government's main return to work (RTW) initiative. It supports two main groups of welfare benefit claimants - JSA, for people who are unemployed but capable of work; ESA, for people with a disability that makes it more difficult to work.

Methods The data were from the SOPIE cohort (13 461 unemployed clients aged 18–64, who entered the WP in Scotland between April 2013 and July 2014). For clients who started a job, unemployment and employment spells during their two-year period in the WP were determined and sequence index plots produced using Stata version 14. These visualisations were explored by age and benefit type.

Results Job start rates were: 'JSA clients under-50', 65%; 'JSA clients over-50', 49%; 'ESA clients under-50', 23%; 'ESA clients over-50', 14%. Despite the lower numbers of ESA clients with a job start the visualisations revealed that these clients (both under and over-50) were as likely to sustain employment as JSA clients. Analyses also investigated employment by Standard Occupational Classification and full versus part-time.

Conclusions Visualising longitudinal employment data provides new insight into the relationship between age, health and the RTW process. Although people receiving health-related benefits (ESA) enter employment at lower rates, they can sustain employment similarly to JSA clients, suggesting support for policies aiming to reduce the disability employment gap.

Oral Presentation

Shift Work

0261 | **THE EFFECTS OF NIGHT WORK AND LIGHT EXPOSURE ON SALIVARY MELATONIN CONCENTRATION DURING WORK DAYS AND DAYS OFF**

[1]Stine Daugaard*, [2,3]Anne Helene Garde, [3,4]Jens Peter Bonde, [5]Jens Christoffersen, [3]Aase Marie Hansen, [6]Jakob Markvart, [2,7]Vivi Schlünssen, [8]Debra Skene, [1]Helene Tilma Vistisen, [1]Henrik Kolstad. [1]*Department of Occupational Medicine, Danish Ramazinni Centre, Aarhus University Hospital, Aarhus, Denmark; [2]National Research Centre for the Working Environment, Copenhagen, Denmark; [3]Institute of Public Health, Copenhagen University, Copenhagen, Denmark; [4]Department of Occupational Medicine, Bispebjerg Hospital, Copenhagen, Denmark; [5]Stakeholder Communications and Sustainability, VELUX, Hørsholm, Denmark; [6]Department of Energy Performance, Indoor Environment and Sustainability of Buildings, Danish Building Research Institute, Aalborg University, Copenhagen, Denmark; [7]Department of Public Health, Aarhus University, Aarhus, Denmark; [8]Chronobiology, Faculty of Health and Medical Sciences, University of Surrey, Guildford, UK*

Objective We aimed to examine the effects of night work on salivary melatonin concentrations during and subsequent to night work and the mediating role of light.

Methods We included 254 day workers and 87 night workers that were followed during 322 work days and 301 days off work. Each day was defined as the 24 hour period starting from the beginning of a night shift or awakening in mornings with daytime work and days off. Light levels were recorded and synchronised with diary information on start and end of sleep and work. On average, participants provided four saliva samples per day, and these were analysed for melatonin concentration. Differences between day and night workers on work days and days off were assessed with multilevel regression models with melatonin concentrations as outcome. All models were stratified or adjusted by time of the day. For light exposure, we estimated the total, direct, and indirect effects of night work on melatonin concentrations obtaining 95% confidence intervals trough bootstrapping.

Results On work days, night workers showed 16.5% (95% CI 0.2; 30.5) lower salivary melatonin concentration compared with day workers. Light exposure seemed to mediate about 40% of the melatonin suppression seen during night, but no mediating effect of light was seen during day time. On days off, we observed no difference in melatonin concentration between day and night workers.

Conclusion These findings are in accordance with a transient and partly light mediated effect of night work on melatonin concentration.

Oral Presentation

Reproductive Effects

0262   RISK OF MISCARRIAGE IN ASSOCIATION TO WORK AT NIGHT: A PROSPECTIVE PAYROLL DATA STUDY

[1]Luise Mølenberg Begtrup*, [2]Ina Olmer Specht, [1]Paula Edeusa Christina Hammer, [3]Anne Helene Garde, [4]Johnni Hansen, [1]Jens Peter Ellekilde Bonde. [1]*Department of Occupational Medicine, Bispebjerg University Hospital, Copenhagen, Denmark*; [2]*Parker Institute, Bispebjerg and Frederiksberg University Hospital, Copenhagen, Denmark*; [3]*National Research Institute for the working environment., Copenhagen, Denmark*; [4]*The Danish Cancer Society Research Centre., Copenhagen, Denmark*

Withdrawn at the author's request

Oral Presentation

Risk Assessment

0263   DETERMINANTS OF OCCUPATIONAL DISEASES IN THE NETHERLANDS: RISKS AT THE INDIVIDUAL AND THE POPULATION LEVEL

Romy Steenbeek, Liza van Dam*, Ernest de Vroome. *The Netherlands Organisation for Applied Scientific Research (TNO), Leiden, The Netherlands*

Objective To identify the main determinants of occupational diseases at both the individual and the population level.

Methods This study used data from the Dutch National Working Conditions Survey (NWCS 2014; occupational disease confirmed by a doctor, self-reported, employees).

Multivariate regression analyses were performed to assess the independent association at the individual level (OR) between each determinant and the presence of at least one occupational disease. Additionally, the Population Attributable Risk (PAR) was calculated for each determinant in order to assess the risk at the population level as well.

Results The top three determinants that may be influenced and also contributed most to *musculoskeletal* occupational diseases, were the same at the individual and the population level: 'Repetitive movements' (PAR=40.0%; OR=2.25), 'Working in uncomfortable positions/bad posture' (PAR=17.7%; OR=1.62), and 'High job demands' (PAR=17.6%; OR=1.57).

Determinants that contributed most to *psychological* occupational diseases were also the same on the individual and population level: 'Low engagement' (PAR=33.6%; OR=2.27), 'Conflict with supervisor' (PAR=16.7%; OR=1.51), and 'High emotional demands' (PAR=14.4%; OR=2.85).

Conclusion These determinants may be influenced through education, measures and/or policies at the workplace or on higher levels, in order to decrease the prevalence of occupational diseases in the working population.

Poster Presentation

Exposure Assessment

0264   PROBE: HAZARDOUS CHEMICAL PRODUCTS REGISTER FOR OCCUPATIONAL USE IN BELGIUM

[1,2]Lode Godderis*, [1]Sara Pauwels, [3,4]Anne-Marie Temmerman, [2]Steven Ronsmans, [2,5]Antoon De Schryver, [6,7]Dorina Rusu, [3]Lutgart Braeckman. [1]*KU Leuven- University of Leuven, Department of Public Health and Primary Care, Environment and Health, Kapucijnenvoer 35 blok D box 7001, 3000 Leuven, Belgium*; [2]*IDEWE, External Service for Prevention and Protection at Work, Interleuvenlaan 58, 3001 Heverlee, Belgium*; [3]*UGent-Ghent University, Department of Public Health, De Pintelaan 185, 4K3, 9000 Gent, Belgium*; [4]*OCMW Brugge- Public Social Welfare Centre Bruges, Ruddershove 4, 8000 Brugge, Belgium*; [5]*University of Antwerpen, Epidemiology and Social Medicine, Universiteitsplein 1, 2610 Antwerpen, Belgium*; [6]*University of Liège, Department of Public Health, Avenue Hippocrate 13, 4000 Liège, Belgium*; [7]*SPMT-ARISTA, External Service for Prevention and Protection at Work, Rue Royale 196, 1000 Bruxelles, Belgium*

During their job, workers are exposed to a wide variety of working conditions including chemical substances that are potentially detrimental to employees' health. Today, Belgian data on occupational exposure to dangerous chemicals are collected by Occupational Health Services (OHS) merely for the purpose of assuring the appropriate health screening. This makes these data of little use for epidemiological research and exposure surveillance on one hand and for policy development by competent authorities on the other hand. The **PROBE** (Hazardous chemical **P**roducts **R**egister for **O**ccupational use in **Be**lgium) study is set up to investigate the exposure of Belgian workers to dangerous chemical products, including type, duration and frequency of exposure. PROBE consists of a systematic collection and analysis of occupational chemical exposure data. A trained, motivated, and representative sample of occupational physicians from both internal and external OHS will

be invited to participate. The data will be collected on a regular basis over a period of 5 months. Besides demographics, exposure measurements and health related data will be collected. First, a pilot will be kicked off in a limited sample of occupational physicians, testing the feasibility of the program. The final goal of the project is to register in a comprehensive but easy way the exposure to dangerous chemicals in order to improve preventive measures, to ensure workers' health and to develop a national surveillance policy.

Oral Presentation

Specific Occupations

| 0265 | RESPIRATOR FIT AND FACE SIZES OF SOUTH AFRICAN MEDICAL LABORATORY WORKERS: A FALSE SENSE OF PROTECTION |

[1,2]Kerry Wilson*, [1,2]Jeanneth Manganyi, [1,2]David Rees. [1]National Institute for Occupational Health, Johannesburg , Gauteng, South Africa; [2]University of the Witwatersrand, Johannesburg , Gauteng, South Africa

Introduction Medical laboratory workers (MLWs) are exposed hazardous biological agents; some of which are airborne such as tuberculosis. Respirators despite being a recommended last resort are often the only means of control of exposure to tuberculosis.

Aims the study assessed the adequacy of respirator fit of MLWs and investigated determinants of fit.

Methods 562 medical laboratory workers using respirators underwent quantitative respirator fit testing using the Portacount fit testing machine and their currently supplied respirator. Four facial characteristics were measured on these users by a trained occupational hygienist using callipers and a tape measure. The effect of the independent variables including face dimensions, ethnicity, smoking, respirator make and size, and age group was explored using multiple logistic regressions stratified by sex.

Results A large proportion (78%) of workers failed the fit test. Respirator fit was found to be significantly associated with face length (OR1.04, 95% CI 1.00–1.09), nasal root breadth(OR1.16, 95% CI 1.06–1.28), and respirator shape (cup) (OR0.56, 95% CI 0.39–0.78). Gender was found to be an effect modifier.

Discussion Fit testing and supply of different respirator sizes and types is necessary to protect MLW from airborne hazards. This is particularly important in high incidence tuberculosis settings. Affordable strategies for respirator fit testing and supply of appropriate sizes and types need to be identified for resource-constrained settings.

Poster Presentation

Intervention Studies

| 0266 | DESIGNING OF NEW LOW COST SIMULATOR FOR TRAINING ERGONOMIC LAPAROSCOPIC SKILLS |

Riin Raimla*, Eda Merisalu, Märt Reinvee. Estonian University of Life Sciences, Tartu, Tartu County, Estonia

Medical students can learn new knowledge and train technical skills by using simulations. Because the most of simulators are expensive the use of them is limited. The aim of this study is to design new low cost simulator for young veterinarians and surgeons. The simulator corpus has been designed based on the Solid Edge software and printed out with the 3D printer. For monitoring of the results we designed and programmed four exercises using the Arduino software. The monitoring of results is important for students to control the results. Needle suture, camera navigation, hand-hand coordination and tissue cutting are the main exercises for training of student skills. The purpose of simulation training also to increase the pace of skilled movements during simulation sessions, although the duration of every exercise is different. It is important to pay attention to ergonomics too in the designing process. The new simulator has mobile stand for different exercises to train technical skills in different ergonomic postures.

Oral Presentation

Ageing Workforce

| 0267 | SOCIOECONOMIC INEQUALITIES IN UNEMPLOYMENT AS A PREDICTOR OF DISABILITY RETIREMENT: A RETROSPECTIVE CASE-CONTROL STUDY |

[1]Mikko Laaksonen*, [2]Jenni Blomgren. [1]The Finnish Centre for Pensions, Helsinki, Finland; [2]The Social Insurance Institution of Finland, Helsinki, Finland

Background Unemployment is known to be associated with poor health and disability. The aim of this study was to examine the risk of disability retirement by past unemployment in different socioeconomic groups.

Method Disability retirees aged 25–64 years were drawn from the years 2011–2015 (n=74.460) to trace back their unemployment histories during the 6 preceding years. Conditional logistic regression was used to compare the risk for disability retirement by pre-retirement unemployment (lasting 90+ days

per year) among the retirees and sex-age matched controls drawn from the non-retired population.

Results Unemployment increased during the six years preceding disability retirement but collapsed during the last pre-retirement year as the persons applying for pension moved on to disability benefits (i.e. sickness allowance). Unemployment increased also among the controls as the study population grew older during the follow up. However, there was no temporal trend in the level of pre-retirement unemployment among those who retired during the study years 2011–2015. Among manual workers, unemployment was more common than lower or upper non-manual employees or the self-employed in all years preceding disability retirement. However, unemployment was more common in the respective groups also among the matched controls. Among upper non-manual employees and the self-employed, unemployment more than doubled the risk of disability retirement whereas among manual workers and lower non-manual employees unemployment was only weakly related to disability retirement.

Conclusions Unemployment is most common among manual workers but among upper-non manual employees and self-employed who experience unemployment have an increased risk of disability retirement.

Poster Presentation

Other

| 0268 | SOCIO-ECONOMIC DIFFERENCES IN USE OF OCCUPATIONAL, PUBLIC AND PRIVATE HEALTH CARE IN WORKING-AGE POPULATION IN FINLAND |

Jenni Blomgren. *The Social Insurance Institution of Finland, Helsinki, Finland*

Introduction Timely access to healthcare is crucial in order to tackle problems of work ability in the workforce. However, studies have shown that in many countries, e.g. in Finland, use of healthcare is unequally distributed across the socio-economic groups. Primary healthcare in Finland is organised at three different sectors (free occupational healthcare, costly private healthcare, and scarcely available public healthcare) that practically service different population segments. More knowledge is needed on use of healthcare at different sectors by socio-economic groups in order to advance more equal access to care.

Data and methods Register data on use of occupational, public and private healthcare during 2013 and on socio-demographic covariates were linked for the total working-age population (age 25–64) of the city of Oulu, Finland (n=105 000). Concurrent and exclusive use of healthcare at different sectors by socio-economic status was analysed with descriptive methods and multinomial logistic regression.

Results Use and non-use of healthcare at different sectors was strongly associated with socio-economic status. The majority of the employed used some type of healthcare, and the users mostly utilised only occupational healthcare. Use of occupational healthcare also increased use of private healthcare. Those in disadvantaged socio-economic positions - also within the employees - were more likely to use only public healthcare or no care at all.

Conclusion Socio-economic position affects the availability and use of healthcare since different types of services, with varying costs and waiting times, are accessible to different groups. Access to healthcare of those in disadvantaged socio-economic positions should be improved.

Poster Presentation

Working Conditions

| 0269 | OCCUPATIONAL RISKS AND HEALTH PROBLEMS OF ANAESTHESIA TECHNICIANS AND DOCTORS IN OPERATING ROOM, A UNIVERSITY HOSPITAL STUDY |

[1]Elif Aylin Yuce*, [1]Meral Turk, [1]Hediye Asli Davas, [2]Aslihan Esra Yuksel. *[1]EGE University Faculty of Medicine Department of Public Health, Izmir, Turkey; [2]EGE University Faculty of Medicine Department of Anesthesiology and Reanimation, Izmir, Turkey*

Health effects caused by occupational risks are commonly ignored. We aimed to find out relation between working conditions and health problems. Cross-sectional study targeted anesthesiologists (114) working in Ege University Faculty of Medicine Hospital between 2016 October –2017 January. 81,5%(93) of anesthesiologists accepted to join this study.For data collection we use questionnaire (89 question) and periodical examination for 2016. Participants were divided into 41 anaesthesia technicians, 52 doctors according to their profession. The average age of the study group is 34. Anesthesiologists(63 person) have an average of 4 night shifts per month. Only 28% of employees use their annual leave regularly. 69.9% of the employees have used leave for 5 days or less annually. 61% of the employees are free overtime. The average time spent in daily operations is 7.9 ± 2 hours.There were 16 'abortion x persons' in the study group. There are 4 people who have infertility treatment. In the study group, there were 76.3% (71) presence of any disease, 66.7% (62) of work related disease, 45.2% (42) of work related psychiatric problem, 25.8% (24) of work related musculoskeletal problem expressed. Immature granulocyte levels were high in 29 (35.8%) workers. There are 81 people who have periodic hemogram examinations;%38,3 of them was anaemic. Haemoglobin values determined lower in women, in less than two hours a day sitting workers, those had high levels of exposure to chemical and psychosocial risks($p < 0,05$).Anesthesiologists face risks often. Annual periodic examinations are very important in terms of protection and improvement of employee health.

Poster Presentation

Burden of Disease

0270   MORTALITY FROM LUNG CANCER IN OCCUPATIONS
        WITH EXPOSURE TO ASBESTOS AMONG MEN IN
        ENGLAND AND WALES (1979–2010)

[1]E Clare Harris*, [1]Stefania D'Angelo, [1]Keith T Palmer, [1]Vanessa Cox, [2]Andrew Darnton, [1]David Coggon. [1]*MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK*; [2]*Statistics and Epidemiology Unit, Health and Safety Executive, Bootle, UK*

Background Estimating national burdens of lung cancer from occupational exposure to asbestos is challenging because of the potential for confounding by smoking.

Methods To generate a refined estimate, we analysed data on underlying cause of death and last full-time occupation for 3,688,916 deaths among men aged 20–74 years in England and Wales during 1979–2010, calculating proportional mortality ratios (PMRs) standardised for age and social class. We compared observed and expected deaths from lung cancer in 28 occupations with excess mortality from mesothelioma or asbestosis. To reduce the confounding effects of smoking, we adjusted the expected number of lung cancers in each occupation, according to its PMR for chronic obstructive pulmonary disease (COPD) in an analysis that excluded jobs with a known hazard of COPD.

Results Adjusted PMRs for lung cancer were elevated in all but one of the 28 asbestos-exposed occupations, but did not correlate with those for cancer of the pleura (Spearman correlation coefficient=−0.3). The total excess of deaths from lung cancer across the 28 occupations over the 31 years of study was 9561 (as compared with 3164 when no adjustment was made).

Conclusions Asbestos appeared to account for some 300 excess lung cancer deaths per year in England and Wales, which is approximately 70% of the annual number of deaths from mesothelioma. The lack of correlation between PMRs for the two diseases may reflect different exposure-response relationships.

Oral Presentation

Cardiovascular Disease

0271   ADVERSE EFFECTS ON SPECIFIC MARKERS OF
        CARDIOVASCULAR RISK AMONG WORKERS EXPOSED
        TO MULTI-WALLED CARBON NANOTUBES

[1,2]Eelco Kuijpers*, [2]Anjoeka Pronk, [3]Robert Kleemann, [1]Jelle Vlaanderen, [4]Nathaniel Rothman, [4]Debra Silverman, [4]Qing Lan, [5]Peter Hoet, [5,6]Lode Godderis, [1]Roel Vermeulen. [1]*Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht, The Netherlands*; [2]*TNO RAPID, Zeist, The Netherlands*; [3]*TNO MHR, Leiden, The Netherlands*; [4]*Occupational and Environmental Epidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda MD, USA*; [5]*Katholieke Universiteit Leuven – Centre for Environment and Health, Leuven, Belgium*; [6]*IDEWE, External Service for Prevention and Protection at Work, Heverlee, Belgium*

The increase in production of Multi-Walled Carbon Nanotubes (MWCNTs) goes along with growing concerns about health risks. Few, rather small, studies have reported biological effects of MWCNTs in humans including increased concentrations of cardiovascular markers fibrinogen, ICAM1 and IL-6, but findings are largely inconsistent. The objective of this study was to assess the association between occupational exposure to MWCNTs and biomarkers of cardiovascular risk.

A cross-sectional biomarker study was performed among workers of a company commercially producing flexible MWCNTs and a matched unexposed population. 12 cardiovascular markers were measured in participants' blood (phase 1). In a sub-population these measures were repeated after 5 months (phase 2). We analysed associations between MWCNT exposure and biomarkers of cardiovascular risk, corrected for age, BMI, sex and smoking.

22 exposed and 42 unexposed workers were included in phase 1 and a subgroup of 13 exposed workers and 6 unexposed workers in phase 2 of the study. Both in phase 1 and phase 2 we observed an upward trend in the concentration of endothelial damage marker ICAM-1, with increasing exposure to MWCNTs. This finding is supported by significantly elevated monocyte counts among the same workers. No significant associations were found between exposure to MWCNTs and the other cardiovascular markers tPA, Fibrinogen, VCAM-1, IL-6, E selectin, TNF-α and D-Dimer.

The results of the present study should be viewed as explorative and requires confirmation in larger studies. Our results for ICAM-1 point towards a potential for endothelial damage due to exposure to MWCNT.

Oral Presentation

Specific Occupations

0272   FINDING A SPACE FOR HEALTH WITHIN THE CONTEXT
        OF 'OCCUPATIONAL RISK' AND FARM POLICY:
        IRELAND'S 'FARMERS HAVE HEARTS' WORKPLACE
        CARDIOVASCULAR SCREENING PROGRAMME

[1]Diana van Doorn*, [1]Noel Richardson, [2]Aoife Osborne. [1]*Institute of Technology Carlow, Carlow, Ireland*; [2]*University College Dublin, Dublin, Ireland*

Background Irish farmers are a 'high risk' group in terms of CVD mortality compared to other occupation groups. Despite CVD being recognised as a work-related condition, the focus of farmers' occupational health policy remains firmly fixed on safety rather than health. The aim of this study was to investigate the cardiovascular health status of a sub-group of Irish livestock farmers who participated in a workplace screening programme , with a view to leveraging support for an increased focus on health within the context of 'occupational risk' and farm policy.

Methods In total, 310 farmers participated in this cross-sectional study. Consent included permission to analyse farmers' cardiovascular screening results, which included cholesterol and blood glucose levels, blood pressure, and anthropometric measurements. All data were entered into the SPSS (v22) for both in-depth descriptive and inferential statistical analysis.

Results Almost one in two farmers had high blood pressure (46%; n=140) and/or raised cholesterol (46%; n=140). Four in five farmers were overweight/obese based on body mass index (86%; n=267) and waist circumference (80%; n=244) measurements. The majority of farmers were found to have at least four risk factors for CVD (83%; n=255) increasing risk of a cardiac event by 3.2 times.

Discussion This prevalence of multiple risk factors for CVD among farmers is a particular cause of concern, and sheds light on the excess burden of CVD mortality among farmers in Ireland. There is an urgent need for a broader focus on health within the context of 'occupational risk' and farm policy.

Poster Presentation

Ageing Workforce

0273 | TEACHERS' WELL-BEING AT WORK AND QUALITY OF LIFE: ANY DIFFERENCES ACCORDING TO YEARS OF EXPERIENCE?

Laurent Zavidovique*, Fabien Gilbert, Marie-Noël Vercambre. *Fondation d'entreprise MGEN pour la santé publique, Paris, France*

Objectives In a context of ageing workforce, this study aimed to evaluate, among teachers, differences of work and general well-being according to years of experience, and to suggest recommendations.

Methods In the population-based postal survey "Teacher's Quality of Life" (MGEN Foundation/Ministry of education), 2320 primary and secondary teachers were asked about their well-being at work (professional experience satisfaction, teaching experience evolution over the past five years, three dimensions of the Maslach Burnout Inventory) and general well-being (quality of life, perceived health, four scores of the WHOQOL-BREF questionnaire). These indicators were analysed in multivariate regression models adjusted on sociodemographic and occupational factors, according to the categories of years of experience:≤5, 6–29,≥30.

Results Compared to more experienced teachers, early-career teachers had less favourable work conditions and a lower environmental health score (-3 points 95%IC=[(−5.1)-(−1.0)]; p=0.005). Senior teachers were more likely than mid-career teachers to judge their work as becoming "more and more difficult" (OR=2.6 [2.0–3.4], p<0.001). They also tended to show more burnout symptomatology. They were less satisfied with their quality of life (OR=0.7 [0.5–0.9]; p=0.009) and their health (OR=0.7 [0.5–0.9]; p=0.002), especially from a physical and social relationship's point of view (-5.4 points [(−7.1)-(−3.8)]; p<0.001 and -3.0 points [(−4.8)-(−1.3)]; p=0.001 respectively).

Conclusion This study adds further evidence towards the hypothesis of a decrease in teachers' well-being at the end of their career, and supports the interest of carrying out targeted support and preventive actions. Attention should also be paid to early-career teachers who may face particularly difficult work conditions.

Poster Presentation

Ageing Workforce

0274 | THE PROFILE OF INFORMAL CARERS IN A COHORT OF 50–64 YEAR-OLDS: RESULTS FROM THE HEALTH AND EMPLOYMENT AFTER FIFTY (HEAF) STUDY

[1,2]E Clare Harris*, [1,2]Stefania D'Angelo, [1]Holly Syddall, [1,2]Cathy Linaker, [1,2]David Coggon, [1,2]Karen Walker-Bone, [1,2]Keith T Palmer. *[1]MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK; [2]Arthritis Research UK/MRC Centre for Musculoskeletal Health and Work, University of Southampton, Southampton, UK*

Background With increases in the UK pensionable age, people are now expected to work to older ages, but they may also have caring responsibilities which constrain their capacity to work and could affect their health. To explore the extent of the problem, we assessed the profile of unpaid carers in the HEAF study.

Methods 8134 men and women aged 50–64 were recruited from 24 English general practices. Socio-demographic, lifestyle and health characteristics were elicited by postal questionnaire, along with weekly hours giving personal care to someone in the home or family.

Results 644 (17.4%) men and 1153 (26.0%) women had caring responsibilities; of these, 93 (14%) and 199 (17%) reported caring for ≥20 hours/week respectively. Participants with low levels of education or social class, non-homeowners, and those struggling to manage financially were more likely to be carers. Carers of both sexes were less likely to be working and, if working, more likely to be part-time or often working shifts. Carers, and particularly those caring for ≥20 hours/week, reported worse health (self-rated, depression and sleep problems). Prevalence of chronic musculoskeletal pain was 32% and 44% respectively among men and women who cared ≥20 hours/week, in comparison with 25% and 27% amongst non-carers.

Conclusions The requirement to be a carer is common in the HEAF cohort. Those affected are less likely to be in full-time employment and more likely to be in worse health. There is a need for further research on how older workers with caring responsibilities can be better supported.

Poster Presentation

Burden of Disease

0276 | PREDICTORS OF RETURN TO WORK 12 MONTHS AFTER SOLID ORGAN TRANSPLANTATION: RESULTS FROM A COHORT STUDY IN SWITZERLAND

[1]Laure Vieux*, [1]Amira Simcox, [1,2]Zakia Mediouni, [1]Pascal Wild, [3]Michael Koller, [1]Regina Studer, [1]Brigitta Danuser. *[1]Institut universitaire romand de Santé au Travail, Epalinges – Lausanne, Vaud, Switzerland; [2]Inserm, population-based epidemiological cohorts unit, UMS 011, Villejuif, Ile-de-France, France; [3]Basel Institute for Clinical Epidemiology and Biostatistics, University Hospital Basel, Basel, Basel, Switzerland*

Background Return to work with or after a chronic disease is not a very well understood process, influenced by a variety of personal, professional, societal and medical factors. The aim of this study is to identify predictors for return to work 12 months after a solid organ transplant, applying a bio-psycho-social model.

Methods Explorative study based on patients included in the Transplant Cohort Study, a national, prospective, multicentric cohort, who underwent a first solid organ transplant (kidney, liver, heart, lung). Bio-psychosocial factors were tested and predictors of return to work identified using logistical regression models.

Results Among the 636 patients included in the study, 49.8% (317) were employed 12 months post transplant. The major predictor for returning to work 12 months post transplant was pre-transplant employment status (OR: 10.8). Accordingly, the population was stratified in employed and unemployed pre transplant groups. Age, self-perceived health (SPH, six months post-transplant) and the transplanted organ were significantly associated with post transplantation employment status in both groups. Additionally, return to work was influenced by education, depression (six month post-transplant) and waiting time in the employed pre transplant group and by invalidity pension in the unemployed pre transplant group.

Conclusion Employment rate pre transplant being highly associated with employment status post transplant, the process promoting return to work should be started well before surgery.

Poster Presentation

Respiratory

0277	SENSITIVITY AND SPECIFICITY OF OCCUPATIONAL HEALTH DOCTORS READING OF EARLY STAGE PNEUMOCONIOSIS RADIOGRAPHS

[1]Phanumas Krisorn*, [1]Naesinee Chaiear, [2]Ponglada Subhannachart, [3]Narongpon Dumavibhat, [2]Sutarat Tungsagunwattana, [0]Krittin Silanun. [1]Division of Occupational Medicine, Department of Community Medicine, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand; [2]Central Chest Institute of Thailand, Department of Medical Services, Ministry of Public Health, Nonthaburi, Thailand; [3]Department of Preventive and Social Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand; [4]Department of Community Medicine and Family Medicine, Faculty of Medicine, Thammasat University, Pathum Thani, Thailand

Objective This study was aimed to find out the sensitivity and specificity in reading early stage pneumoconiosis radiographs by Occupational Health Doctors (OHDs).

Materials and method A screening test was applied. Thirty three of OHD consented to join the study. The test radiographs consisted of 67 normal and early stage pneumoconiosis films. Before testing, all participants were introduced to basic ILO reading for 65 min by 3 B-reader ILO pneumoconiosis experts. The cut-point for disease was set at profusion 0/1 and 1/0. Mean sensitivity and specificity for small opacities detection was analysed.

Results The median sensitivity of ILO profusion 0/1 or above was 88% (IQR 10.3), the median sensitivity of 1/0 cut-point film was slightly increase at 90% (IQR 10.3), while the mean specificity for ILO profusion 0/1 or above was 43.3% (SD 21.1). When stepping the cut-point to profusion 1/0, the mean specificity increased to 47.0% (SD 20.9).

Conclusion This study showed that OHDs were able to interpret chest radiographs of workers who have had early stage pneumoconiotic radiographs. Therefore, chest X-ray reading skill development for OHDs has value for the surveillance system in this country.

Poster Presentation

Disease Surveillance

0278	WORK RELATED CHARACTERISTICS OF LUNG CANCERS AMONG MALE CONSTRUCTION WORKERS: FOCUSING ON OCCUPATIONAL CANCER SURVEILLANCE DATA IN KOREA, 2011–2016

[1]Bo Reum Seo, [1]Yoon-Ji Kim*, [1,2]Dongmug Kang, [2]Jong-Eun Kim, [1,2]Young-Ki Kim. [1]Preventive and Occupational Medicine, School of Medicine, Yangsan-si, Gyeongsangnam-do, Republic of Korea; [2]Occupational and Environmental Medicine, Pusan National University Yangsan Hospital, Yangsan-si, Gyeongsangnam-do, Republic of Korea

The aim of this study is to examine occupational characteristics, hazardous work types and exposed substances in lung cancer in the construction industry by using data of occupational cancer surveillance at the national level in Korea.

From 2011 to 2016, there were 6418 patients with lung cancer were registered through the Occupational Cancer Surveillance. Among them, the F class of the Korean Standard Industrial Classification and male sex were a total of 580 patients. Work relatedness was divided into 'High' and 'Low'.

Focusing on work relatedness, 19.0% were high and 81.0% were low. There was no difference in the distribution of work relatedness and age groups (p=0.525) and total smoking amount (p=0.903) in lung cancers. There was a significant difference in the distribution of work relatedness and latency (p=0.019). The high prevalent 30 work types and 9 exposures high work relatedness in lung cancer. Painter of Painters (18.2%) were the most common hazardous material and job of followed by Crystalline silica in Elementary Workers (7.2%), and Crystalline silica in Stonemason (5.4%) in order.

Lung cancer occurred at younger ages in construction workers compared to non-construction workers. Smoking has no relation with the work relatedness of lung cancer. It is necessary to manage work type and risk factors that are highly related to cancer in the construction industry.

Poster Presentation

Other

0279   OCCUPATIONAL EXPOSURE TO DUST COMPONENTS
       AND ALTERATIONS IN IMMUNE/INFLAMMATION
       MARKERS AMONG TACONITE WORKERS IN MINNESOTA

[1]Rony F Arauz*, [1]Jeffrey H Mandel, [2]Bin Ma, [2]Bruce Lindgren, [1,2]Irina Stepanov. [1]*Division of Environmental Health Sciences, University of Minnesota, Minneapolis, Minnesota, USA;* [2]*Masonic Cancer Centre, University of Minnesota, Minneapolis, Minnesota, USA*

Background Occupational exposure to airborne silica, dust containing silica (total dust), and dust without silica (mostly iron oxide) have been known to cause cardio-respiratory disease. However, with dust exposure in general, disease detection usually occurs in advanced stages of the disease process, in part due to the lack of sensitivity of current diagnostic tools that would allow for earlier detection of the disease.

Methods Using a multiplexed bead-based assay, we measured plasma levels of 11 immune/inflammation markers in a cross-sectional study of 134 current workers employed in various operations in mining and processing of taconite (a low grade iron ore). These are markers previously demonstrated to be related to silica exposure and/or restrictive/obstructive lung disease in other settings. We used linear regression models to examine the associations between quartiles of silica, total dust, and dust without silica with levels of markers adjusting for age, BMI, gender, and smoking.

Results In adjusted models, of the 11 markers selected, C-reactive protein (CRP) had the strongest association and showed a graded response across quartiles of silica. Total dust and dust without silica had little association with these markers.

Conclusions This study suggests that exposure to silica, total dust, and dust without silica may be associated with alterations in CRP. Total dust and dust containing iron oxide, in general, do not demonstrate associations with other markers in our study. Further research is needed to understand the potential utility of CRP as a marker linking occupational exposures and health outcomes in taconite workers.

Poster Presentation

Injuries

0280   FACTORS ASSOCIATED WITH THE SEVERITY OF WORK
       INJURIES IN THE FORMAL SECTOR IN PIRACICABA, SÃO
       PAULO STATE, BRAZIL

[1]Mariana Tavares Guimarães, [1]Ana Paula Sacone da Silva Ferreira, [2]Alessandro José Nunes da Silva, [2]Sandra Renata Duracenko, [1]Stela Verzinhasse Peres, [1]Rodolfo Andrade de Gouveia Vilela, [1]Maria Regina Alves Cardoso*. [1]*School of Public Health, University of São Paulo, São Paulo, SP, Brazil;* [2]*CEREST Piracicaba, Piracicaba, SP, Brazil*

Introduction Work injuries represent a relevant public health issue. Evaluation of associated factors is an important tool for occupational health surveillance. We aimed to identify factors associated with the severity of work injuries in Piracicaba from 2004–2013.

Methods This is a cross-sectional study and is part of "Work Accident: from socio-technical analysis towards the social construction of changes" supported by the São Paulo Research Foundation. Work injuries data were retrieved from the Work Accident Surveillance System (SIVAT) for formal workers with at least 18 years old for the period 2004–2013. Using a multiple logistic regression model, odds ratios (OR) and their 95% confidence intervals (CI95%) were calculated considering the severity of the injury (severe or fatal versus moderate and light) and selected variables (injury type, sex, age group). All analyses were done using STATA 13.1.

Results In the period 2004–2013, 78 198 work injuries occurred with formal workers in Piracicaba, being 1522 (1.92%) severe or fatal accident. In severe or fatal accident, the frequency was higher among workers from manufacturing industry (750;49%), followed by services (389;26%). Increased risk for severe and fatal injuries was found for men (OR=1.16 CI95%:1.01–1.33), route accident (OR=2.0; CI95%:1.77–2.26), and an upward trend in risk with increasing age (trend test:p<0.001).

Conclusion Action plans to prevent workplace injuries and deaths should be designed considering that men at older ages working in manufacturing industry and in the service sectors are at increased risk. SIVAT represents an important tool to assess worker's health in the Piracicaba region and guide occupational health surveillance.

Oral Presentation

Disease Surveillance

0281   EVALUATING THE COMPLETENESS OF COMPULSORY
       WORK-RELATED DISEASES/INJURIES NOTIFICATIONS
       RECORDED BY THREE CITIES IN SOUTHEAST BRAZIL

[1]Mariana Tavares Guimarães*, [1]Ana Paula Sacone da Silva Ferreira, [2]Alessandro José Nunes da Silva, [2]Sandra Renata Duracenko, [3]Simone Alves dos Santos, [3]José Carlos do Carmo, [1]Rodolfo Andrade de Gouveia Vilela, [1]Maria Regina Alves Cardoso. [1]*School of Public Health, University of São Paulo, São Paulo, SP, Brazil;* [2]*CEREST Piracicaba, Piracicaba, SP, Brazil;* [3]*Health Surveillance Centre, Sao Paulo State Health Secretariat, São Paulo, SP, Brazil*

Introduction The Brazilian Notifiable Diseases Information System (SINAN) includes eleven work-related diseases and injuries (in nine forms), which communication is mandatory. As a way to evaluate the quality of this database, this study aimed to rate the completeness of information reported by three cities of the São Paulo State from 2007–2016.

Methods Descriptive study as part of 'Work Accident: from Socio-technical analysis towards the social construction of changes' supported by the Sao Paulo Research Foundation. Data from the work-related diseases and injuries forms were retrieved from SINAN for Araraquara, Campinas and Piracicaba for the period 2007-2016(16 094 files). Completeness was assessed by the percentage of filled variables by form and city, and it were categorised as: excellent (<5% unfilled), good (≥5,<10% unfilled), regular (≥10,<20% unfilled), poor (≥20,<50% unfilled), and very poor (≥50% unfilled). Analyses

were done using STATA 13.1.

Results 669 variables were analysed, one of them is a compulsory field (occupation) and its completeness was very high (≥97%) for all cities. Araraquara had 71.63% variables with excellent completeness, but the occupational dermatosis file had 34.29% variables classified as very poor. Piracicaba showed 56.24% variables classified as excellent, and the occupational dermatosis and cancer files had 41.46% and 55.07% filled very poorly, respectively. Campinas had 40.80% variables filled as excellent, and more than 30% of variables were classified as poor or very poor in all files.

Conclusion There are differences in the completeness among the cities. Routine quality data assessments are crucial to ensure information quality used by health surveillance agents.

Oral Presentation

Burden of Disease

QUANTIFYING THE IMPACT OF SHIFT WORK ON BREAST CANCER: RESULTS FROM THE BURDEN OF OCCUPATIONAL CANCER IN CANADA STUDY

[1]Manisha Pahwa, [2,3]France Labrèche*, [1,4]Joanne Kim, [1,5]Anne Harris, [1]Chaojie Song, [1,6]Paul Demers. [1]Occupational Cancer Research Centre, Cancer Care Ontario, Toronto, Ontario, Canada; [2]Institut de recherche Robert-Sauvé en santé et en Sécurité du travail, Montréal, Québec, Canada; [3]School of Public Health, Université de Montréal, Montréal, Québec, Canada; [4]Department of Epidemiology, Biostatistics and Occupational Health, McGill University, Montréal, Québec, Canada; [5]School of Occupational and Public Health, Ryerson University, Toronto, Ontario, Canada; [6]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada

Objectives To estimate the proportion and number of annual incident female breast cancer cases in Canada attributed to shift work, a probable carcinogen.

Methods Levin's equation, which contains exposure and relative risk (RR) parameters, was used to calculate an attributable fraction (AF) range. The proportion of Canadian women who ever worked night or rotating shifts between 1961 and 2001 was retrospectively assessed based on data from the 1996 Survey of Labour and Income Dynamics. Low and high RR values, selected from a comprehensive review and quality assessment of recently published meta-analyses, were used to represent the probable association between shift work and breast cancer risk. The AF range calculated from these data were applied to 2011 Canadian breast cancer incidence statistics to obtain the number of attributable cases.

Results Approximately 11%, or 1.5 million, Canadian women ever worked night or rotating shifts during 1961–2001. Combined with low and high RR values of 1.15 and 1.40 from a high-quality meta-analysis published in 2013, the AF for breast cancer ranged from 2.04% to 5.23%. This corresponds to an estimated 460–1180 newly diagnosed breast cancers each year in Canada probably due to shift work. A large number, approximately 200–510, of these cancers occur among women in the health care and social assistance sector.

Conclusions The burden of occupational breast cancer in Canada could be substantial, reflecting the high prevalence of shift work and incidence of breast cancer. Although more research is needed on unravelling this probable association, preventive approaches should be widely considered.

Oral Presentation

Exposure Assessment

EXAMINING EXPOSURE ASSESSMENT IN SHIFT WORK RESEARCH: A STUDY ON DEPRESSION AMONG NURSES

[1]Mieke Koehoorn, [2]Renee-Louise Franche, [1]Amy Hall*. [1]University of British Columbia, Vancouver, Canada; [2]WorkSafeBC, Vancouver, Canada

Objectives Exposure misclassification is a common challenge in shift-work epidemiology. This study used a large national survey of Canadian nurses to examine shift-work's effects on depression; multiple exposure definitions with varying levels of specificity were applied to illustrate the impacts of exposure assessment.

Methods The analytic sample (n=11,450) was obtained from the 2005 National Survey of the Work and Health of Nurses. Logistic regression was used to assess relationships between shift-work and depression for high, moderate, and low specificity definitions of shift-work exposure. The low and moderate specificity definitions described shift timing (day/shift and day/evening/night/rotating, respectively); the high specificity definition described both shift timing (day/evening/night/rotating) and frequency of rotation (slow/medium/rapid/undefined). All model estimates were bootstrapped and adjusted for the potential confounding effects of sociodemographic, health, and work variables.

Results The high specificity shift-work definition model showed the strongest relationships, with increased odds of depression in the rapid rotating shift group (OR=1.51, 95% CI=0.91–2.51) and in the undefined rotating group (OR=1.67, CI=0.92–3.02), relative to the regular day group. Odds of depression were decreased in the slow rotating group (OR=0.79, 95% CI=0.57–1.08). For the low and moderate specificity exposure definition models, weak relationships were observed for all shift categories (OR range 0.95 to 0.99).

Conclusions This study's findings support associations between shift-work and depression, and the need for specific and hypothesis-driven exposure assessment in future studies to correctly identify exposure-response relationships and to appropriately target health interventions.

Oral Presentation

Exposure Assessment

CAREX: AN OCCUPATIONAL EXPOSURE SURVEILLANCE SYSTEM OVERVIEW

[1,2]Cheryl Peters*, [3]Manisha Pahwa, [3]Paul Demers. [1]Carleton University, Ottawa, Canada; [2]CAREX Canada, Vancouver, Canada; [3]Occupational Cancer Research Centre, Toronto, Canada

The CAREX system for occupational carcinogen exposure surveillance was developed by the Finnish Institute of Occupational Health in collaboration with IARC and European exposure experts in the early 1990s, and was shortly thereafter adapted for use in approximately 15 other countries in the European

Union. The original platform (developed for Microsoft Access) allowed for assignment of exposure proportions by 55 industry categories, but was a breakthrough at the time in terms of amalgamating exposure measurement data and occupational hygiene knowledge surrounding carcinogen exposure. Recognising the importance of CAREX in occupational cancer prevention, several other countries around the world have since adapted the original system for use in their own countries, with a few making large improvements to the model. A notable example is Costa Rica, with their TICAREX adaptation that estimated pesticide exposure for the first time, and considered sex as an exposure-defining feature in workplaces. In Canada, the system was expanded further to consider exposure by hundreds of detailed industry and occupation codes, sex, sub-geographical regions within a country, and level of exposure where possible. In addition, an entirely new system for considering community environmental carcinogen exposures was added. The Canadian team has been working with the Pan American Health Organisation and other partners to expand the use of the enhanced CAREX to other countries, in particular those of lower and middle income, where capacity for new research and data structures may be difficult. After 25 years, the CAREX model continues to evolve and improve to meet current needs.

Oral Presentation

Intervention Studies

0285   ASSESSING THE IMPACT OF A GROUP RANDOMISED CONTROLLED INTERVENTION STUDY IN SUPERMARKET BAKERIES WITH A HIGH BAKER'S ALLERGY AND ASTHMA BURDEN

[1,2]Roslynn Baatjies, [1]Mohamed Jeebhay*. [1]*Division of Occupational Medicine and Centre for Environmental and Occupational Health Research, School of Public Health and Family Medicine, University of Cape Town, Cape Town, South Africa*; [2]*Department of Environmental and Occupational Studies, Faculty of Applied Sciences, Cape Peninsula University of Technology, Cape Town, South Africa*

Introduction Previous studies of supermarket bakery workers in South Africa demonstrated a high prevalence (13%) of baker's allergy/asthma and a 50% decrease in mean flour dust levels after an intervention. This study reports on the incidence of baker's allergy/asthma one year after the intervention.
Methods A group-randomised design assigned 31 bakeries to two intervention groups (IG) (bakery mixer lid and training) (n=244) and a control group (CG) (n=93). Health data prior to and after the intervention included symptom questionnaires; serum wheat IgE; and FeNO during the work shift using NIOX MINO.
Results Overall, the prevalence of work-related chest symptoms in the pre (25%) and post (27%) IGs were similar, but a 13% increase in the CG. Wheat sensitisation prevalence in IG (2% decrease) compared to the CG (3% increase). FeNO (geometric mean) in the IG decreased from 17.7±2.3 ppb to 16.5±2.2 ppb. There was a lower incidence of chest symptoms in IG (16%) compared to CG (23%). IG also had

significantly higher (14%) conversion to negative wheat sensitisation status compared to CG (0%). The mean FeNO decline in IG (−2.2ppb) was similar to CG (−1.7ppb). FeNO decline was greater in IG (−25.2ppb) compared to CG (−13.6ppb) when baseline FeNO >25 ppb. In a multivariate model for >10% FeNO decline, significant predictors included FeNO >25 ppb (OR:2.9) and atopic status (OR:2.0).
Conclusion This study demonstrates some evidence of an intervention effect one year after the intervention. The lack of a demonstrably strong effect can be attributable to the short follow up period.

Oral Presentation

Cancer

0286   OCCUPATIONAL EXPOSURE TO GASOLINE AND DIESEL EXHAUSTS AND THE RISK OF KIDNEY CANCER IN CANADIAN MEN

[1]Cheryl Peters*, [2]Marie-Elise Parent, [3,4]Shelley Harris, [3,4]Lidija Latifovic, [3,4]Linda Kachuri, [4]Laura Bogaert, [1]Canadian Cancer Registries Group, [1]Paul Villeneuve. [1]*Carleton University, Ottawa, Canada*; [2]*Institut Armand-Frappier, Institut national de la recherche scientifique, Montreal, Canada*; [3]*Cancer Care Ontario, Toronto, Canada*; [4]*University of Toronto, Toronto, Canada*

Objectives The objective of this study was to investigate whether occupational gasoline and/or diesel exhaust exposure contribute to kidney cancer risk.
Methods The National Enhanced Cancer Surveillance System is a population-based case-control study conducted from 1994–1997 in Canada. Incident kidney cancer cases were identified using provincial registries, while the control series were identified through random digit dialling, or provincial datasets. Self-reported questionnaires obtained information on lifetime occupational history and cancer risk factors. Hygienists coded occupational histories for diesel and gasoline exhaust exposures using concentration, frequency, duration and reliability. Logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals separately by exhaust type. Models were adjusted for age, province, BMI, and cigarette smoking.
Results Complete occupational data were available for 652 cases and 2368 controls. The majority of workers had been exposed to diesel (53%) or gasoline (55%) exhausts, respectively; most exposures were at low concentrations. Workers who had ever been exposed were significantly more likely to have kidney cancer than those who were never exposed (OR diesel: 1.4;1.1–1.6, OR gasoline: 1.7;1.4–2.1). When examining duration of exposure and tertiles of cumulative exposure, diesel and gasoline exposures were both linked to a significantly increased risk of kidney cancer (p<0.05), but no exposure-response pattern was evident. Exposure to gasoline exhaust showed stronger positive relationships with kidney cancer than diesel.
Conclusions This study provides evidence that occupational gasoline and to a lesser extent, diesel exhaust exposure increases the risk of kidney cancer.

Poster Presentation

Exposure Assessment

DEVELOPMENT OF QUANTITATIVE ESTIMATES OF WOOD DUST EXPOSURE IN A CANADIAN GENERAL POPULATION JOB-EXPOSURE MATRIX BASED ON PAST EXPERT ASSESSMENTS

[1,2]Jean-François Sauvé*, [3,4]Hugh W Davies, [5]Marie-Élise Parent, [3,4]Cheryl E Peters, [1,2]Jack Siemiatycki, [1,2]Marie-Pierre Sylvestre, [1,2]Jérôme Lavoué. [1]*University of Montreal, School of Public Health, Montreal, Canada; [2]CRCHUM, Montreal, Canada; [3]University of British Columbia, Vancouver, Canada; [4]CAREX Canada, Vancouver, Canada; [5]INRS-Institut Armand-Frappier, Laval, Canada; [6]Carleton University, Ottawa, Canada*

Objectives The CANJEM general population job-exposure matrix summarises expert evaluations of 31 673 jobs from four population-based case-control studies of cancer conducted in Montreal, Canada. Intensity in each CANJEM cell is represented as relative distributions of the ordinal (low, medium, high) ratings of jobs assigned by the experts. We aimed to estimate quantitative concentrations for CANJEM cells using Canadian historical measurements, taking exposure to wood dust as an example.

Methods Wood dust measurements came from the Canadian Workplace Exposure Database (CWED). We selected personal and area samples in occupations (2011 Canadian National Occupational Classification) with a non-zero exposure probability in CANJEM in period 1930–2005 (minimum 10 samples/occupation in CWED). Concentrations were modelled with sampling duration, year and type, source database and proportion of jobs at medium and high intensity in cells (fixed effects), and occupations (random effects).

Results 5170 samples from 31 occupations spanning 1981–2003 were retained. Estimated geometric mean (GM) concentrations for a cell with all jobs at medium or high intensity were respectively 1.3 and 2.3 times higher than a cell with all jobs at low intensity. An overall trend of -5%/year in exposure was observed. Predicted GMs for 8 hours, breathing zone and year 1989 for CANJEM cells associated with exposure ranged 0.49–1.67 mg/m3.

Conclusions The model provided estimates of wood dust concentrations for any CANJEM cell with exposure, even for those without measurements by using the calibrated intensity ratings. This framework could be implemented for other agents represented in both CANJEM and CWED.

Poster Presentation

Exposure Assessment

"DAVID'S CHEESE BREAD" METHOD: WORKLOAD QUANTITATIVE EXPOSURE THRESHOLDS DETECTION USING ADJUSTED HAZARD MULTIVARIATE PARAMETRIC MODELLING, USEFUL IN CUMULATIVE-TRAUMA DISORDERS PREVENTION AND WITHIN THEIR CAUSAL ASSESSMENT

[2,3]David Alvarez Rincon*, [4]Luisa Perez. [1]*ICOH membership, Milano, Italy*; [2]*EPICOH member, Utrecht, The Netherlands*; [3]*Provincial Workers' Compensation Board, Cali, Colombia*; [4]*University of Alberta OHandS postgraduate certificate, Edmonton, Canada*

Background Qualitative methods are frequently used for workload assessment due to their relative low-cost but their evidence lack, high subjectivity and inaccurate conclusions lead to develop quantitative evidence-based methods for Cumulative Trauma Disorders evaluation. This research aims to generate robust and reliable evidence useful in prevention systems and within workers' compensation processes (causal assessment) by measuring cumulative effective working time to define suitable exposure thresholds.

Methods A retrospective cohort study was assembled with workers from different positions. Inclusion/exclusion criteria were rigorously applied to finally accept 328 workers (656 shoulders). Entire clinic history was analysed towards obtaining important clinical variables. Each shoulder workload was assessed independently getting cumulative exposure time to movement angles, repetitive motions, load lifting, exertion and vibration, adjusting by rest/break periods and other important covariates, controlling confusing effects. The exposure thresholds were obtained using an adjusted multivariate Weibull regression modelling. Huber's M-estimator was used warranting robust estimators to correct both shoulders non-completely independent measures. Final model was built according with Hosmer-Lemeshow-May's covariates purposeful selection principles.

Findings/conclusions Within the adjusted multivariate final model, we could set hazard rate ratio (HRR) into five different clusters across cohort exposure time-line: "D" or baseline hazard zone; "a" zone (HRR≈1;p-value≥0.05); "v" or risk zone (HRR >1;p-value<0.05); "i" or survivors zone (HRR≈1; p-value≥0.05); and "d" or super-survivors zone (HRR <1;p-value<0.05). Shortest cumulative times within "v" zone were selected as exposure thresholds. For workload factors, we were able to clearly define zones and thresholds. We've also named "v" cluster as "cheese" zone and others as "no-cheese" areas.

Oral Presentation

Molecular epidemiology

0290   **INVESTIGATING THE REPRODUCIBILITY OF METABOLOMICS PROFILES OF WASHINGTON STATE METAL WORKERS**

Marissa Baker*, Christopher Simpson, Yvonne Lin, Noah Seixas. *University of Washington, Seattle, WA, USA*

Manganese (Mn) is a known neurotoxicant, and given its health effects and ubiquitous nature in metal-working settings, identification of a valid and reproducible biomarker of exposure is of interest. Global metabolomics were previously utilised to determine metabolites that differ between occupational groups defined by Mn exposure status, in hopes of informing a biomarker of exposure. Nine metabolites were found to differ between exposure groups in urine samples collected October 2014. To test the reproducibility of these metabolites, these nine metabolites were investigated in a second set of urine samples collected January 2015 from the same workers.

Levels of the nine metabolites found in October 2014 were compared to the January 2015 data using principal components analysis and descriptive measures. Also, an elastic net regression was fit using the nine metabolites from the October 2014 data; this model was tested in the January 2015 data.

Four of the nine ions remained significantly different between exposed and unexposed workers in the January data, though levels of most ions also exhibited regression to the mean. The elastic net model was able to correctly classify exposure status in 66% of the January samples; slightly better than classification by chance alone.

Metabolomics is a novel technique for exposure assessment, but few studies have looked at the reproducibility of metabolomics data by collecting repeat samples from the same workers. This analysis found several ions that do seem to remain stable over time, and identification of these ions should be pursued as potential biomarkers of Mn exposure.

Oral Presentation

Musculoskeletal

0292   **INTERNATIONAL JOB-EXPOSURE MATRIX ON PHYSICAL WORKLOAD: A SECOND STEP ABOUT AN UTOPIA?**

[1]Alexis Descatha*, [2]Johan H Andersen, [3]Skye Buckner-Petty, [2]Susanne W Svendsen, [4]Annett Dalbøge, [5]Tine S Rubak, [4]Poul Frost, [3]Ann-Marie Dale, [3]Bradley A Evanoff. [1]*UVSQ Inserm AP-HP, Garches, France;* [2]*University Research Clinic, Herning, Denmark;* [3]*Washington University in St Louis, St-Louis,MO, USA;* [4]*Aarhus University Hospital, Aarhus, Denmark;* [5]*Bisbebjerg University Hospital, Slagelse, Denmark*

Introduction Job-exposure matrixes (JEM) approaches have been recently developed on physical workload in US, Denmark and France. A comparison between US and Danish JEMs revealed substantial reliability and concordance. We aimed to describe correlation between French, US and Danish JEMs, in order to confirm that some variable of physical workload JEMs may be internationally generalizable.

Methods US "O*NET" variables, two Danish expert based JEMs (Lower Body and Shoulder), were compared to variables of "MADE", French expert based JEM. The Danish JEMs were based on occupational titles in the Danish version of the International Standard Classification of Occupations 1988 (ISCO88). Exposure estimates for Danish ISCO88 codes had been connected to "O*NET" exposure estimates through ISCO08 and Standard Occupational Classification (SOC) codes. "MADE" is available on French coding system (PCS03) and ISC08. Crosswalk from ISCO08 to SOC and Danish ISCO 88 has been performed, to allow building a matrix of correlations based on Pearson correlation coefficients.

Results The cross-walk included 337 Danish ISCO 88 common used codes for upper extremity and 372 for lower upper extremity, O*Net, more than 800 occupational titles and "MADE JEM" 673 ISCO08 codes. Information was unique for 379 for "MADE"-"O*NET" couples, 333 for "MADE"-upper Danish JEM, and 165 for "MADE"-lower Danish JEM. Correlation of relevant variables found good associations (rho >0.7) for force, computer work, and kneeling, fair for repetitiveness and vibrations (rho 0.5–0.6). Handling loads was heterogeneous.

Conclusion These results seem to confirm the possibility of international job-exposure matrixes on physical workload.

Poster Presentation

Other

0293   **CURRENT RESEARCH PRIORITIES FOR UK OCCUPATIONAL PHYSICIANS AND OCCUPATIONAL HEALTH RESEARCHERS– A MODIFIED DELPHI STUDY**

[1]Drushca Lalloo*, [2]Evangelia Demou, [3]Julia Smedley, [4]Ira Madan, [5]Kaveh Asanati, [1]Ewan B Macdonald. [1]*Healthy Working Lives Group, Institute of Health and Wellbeing, College of Medical, Veterinary and Life Sciences, University of Glasgow, G12 8RZ, Glasgow, UK;* [2]*MRC/CSO Social and Public Health Sciences Unit, Institute of Health and Wellbeing, College of Medical, Veterinary and Life Sciences, University of Glasgow, G2 3QB, Glasgow, UK;* [3]*Occupational Health Department, University Hospital Southampton NHS Foundation Trust, Residence Block 4, MP100, Southampton General Hospital, Tremona Rd, SO16 3YD, * on behalf of the FOM, Southampton, UK;* [4]*Guy's and St Thomas' NHS Foundation Trust and King's College London. Occupational Health Department, The Education Centre, St Thomas' Hospital, Westminster Bridge Road, SE1 7EH, * on behalf of the FOM, London, UK;* [5]*Imperial College London, National Heart and Lung Institute, Respiratory Epidemiology, Occupational Medicine and Public Health, Emmanuel Kaye Building, 1b Manresa Road, SW3 6LR, London, UK*

Objectives Studies identifying occupational health (OH) research priorities have been conducted in several countries, to establish where OH research should be focusing and where funding should be targeted. The UK findings however, are now over 20 years old. OH practice is continuously evolving, with advances in technology, changes in work practices and customer/workforce needs.

Aims To identify the current research priorities for UK occupational physicians (OPs) and occupational health researchers (OHRs).

Methods A modified Delphi study of current research priorities for UK OPs and OHRs, is being undertaken. It will be

conducted in two Rounds ('rating' and 'ranking') using a developed questionnaire based on expert panel discussions and key research topics identified from the medical literature, including similar studies.

Questionnaires will be circulated using a survey link electronically. Contacts have been established with the UK Faculty and Society of Occupational Medicine and academic OH institutions and agreement gained to participate.

Results The first 'rating' round was completed between September - November 2016 and the second 'ranking' round has recently been commenced. This survey will remain open until mid-April 2017, with reminders to increase response rate. The results will be collated and written up by June 2017.

Conclusions By achieving consensus on current research priorities, this work will inform the future direction of national OH research strategy and support and encourage research that addresses important knowledge gaps within the specialty. It will facilitate maximum gain for all key stakeholders by establishing where OH research funding ought to be focusing.

Oral Presentation

Exposure Assessment

| 0294 | JOB-EXPOSURE MATRIX ADDRESSING SMOKING IN THE NATIONWIDE DANISH OCCUPATIONAL COHORT, DOC*X |

[1]Sesilje Bondo Petersen*, [1]Esben M Flachs, [2]Ebbe Villadsen, [3]Eva Prescott, [4]Anne Tjønneland, [5]Merete Osler, [6]Ingelise Andersen, [7]Knud Juel, [8]Esben Budtz-Jørgensen, [9]Henrik A Kolstad, [2]Vivi Schlünssen, [1]Jens Peter Bonde. [1]Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen, Denmark; [2]National Research Centre for Working Environment, Copenhagen, Denmark; [3]Department of Cardiology, Bispebjerg University Hospital, Copenhagen, Denmark; [4]Danish Cancer Society Research Centre, Copenhagen, Denmark; [5]Research Centre for Prevention and Health, Glostrup, Denmark; [6]Section of Social Medicine, Institute of Public Health, University of Copenhagen, Copenhagen, Denmark; [7]National Institute of Public Health, University of Southern Denmark, Copenhagen, Denmark; [8]Section of Biostatistics, University of Copenhagen, Copenhagen, Denmark; [9]Department of Occupational Medicine, Aarhus University Hospital, Aarhus, Denmark

Objectives To develop a job-exposure matrix (JEM) addressing smoking to allow for confounder adjustment in register-based occupational health studies.

Methods We combined and harmonised questionnaire and interview data on smoking from several Danish cohort studies and surveys in the time-period 1981–2013 for 2 64 054 employees registered with a DISCO-88 code (the Danish version of ISCO-88) in the Danish nationwide JEM database, DOC*X. We modelled the probability of being a smoker, and the amount of smoking (g/d) among smokers. In mixed models, age and sex were included as fixed effects and DISCO as random effect for six different time-periods.

Results The proportion of smokers decreased linearly from 56% in 1981–90% to 19% after 2010, whereas the amount increased from 15.9 g/d in 1981 to 16.5 g/d in 1991–95, and then declined to 13.2 g/d after 2010. In general, the quality of the JEM increased by calendar year, as 23% and 71% of

the DISCO-codes were represented in the first and latest time-period, respectively, on the most detailed 4 digit DISCO-level. This was also reflected in the calculated interclass correlation coefficient (ICC), which increased by calendar year. The within job-group variation was large relative to the between jobs variation, but the range between jobs was in general high, as the probability ranged from 6% to 40% and the amount from 8.0 to 19.5 g/d after 2010.

Conclusions We succeeded addressing a smoking JEM with substantial variability between jobs, which may prove a useful tool for confounder adjustment in register-based occupational studies.

Oral Presentation

Cancer

| 0295 | URINARY CADMIUM CONCENTRATION AND MAMMOGRAPHIC VOLUMETRIC DENSITY – PRELIMINARY RESULTS |

Beata Peplonska*, Beata Janasik, Pawel Kaluzny, Paulina Nowak. Nofer Institute of Occupational Medicine, Lodz, Poland

Cadmium (Cd) is a heavy metal with widespread occurrence in the environment. Occupational exposure to cadmium occurs in many occupational settings, such as pigment and batteries production, galvanization and recycling of electric tools. Environmental contamination with Cd comes from industry and agriculture. The interest of the researchers and stakeholders in cadmium as potential risk factor for breast cancer has been increasing over the recent years.

The objective of our ongoing project is to assess the association between Cd and mammographic density - a strong risk factor for breast cancer. Our research hypothesis assumes that Cd, as metalloestrogen, modifies mammographic density therefore affecting breast cancer risk.

The cross sectional study will include, in total, 500 women undergoing screening mammography at the mammography centres in Lodz (Poland). The study procedures include personal interview, anthropometric measurements, blood and urine collection and mammography. Cd is determined in spot urine sample (by ICP-MS technique). Digital mammography is performed according to the standards for screening mammography and volumetric mammographic density is analysed by Volpara software. The potential associations are examined with linear regression model, age and BMI adjusted.

During the first phase of the study we collected data from 200 women of mean age 54 years. The mean Cd concentration was 0.54 µg/L, and mean volumetric density 7.6% (left breast, cranio-caudal view). The preliminary analysis showed an inverse association of the volumetric density with age (p<0.01) and BMI (p<0.001). We did not observe association between cadmium concentration in urine and volumetric density.

Poster Presentation
Policy/Impact

0296   GRADUAL RETURN TO WORK AMONG WORK-DISABLED EMPLOYEES IN BELGIUM: BARRIERS AND POSSIBILITIES FOR IMPROVEMENT

Miriam van Dick*, Marc Du Bois. *KU Leuven, Leuven, Belgium*

Introduction To provide for a fast and safe return-to-work, it is important to take early measures during work incapacity. In Belgium, one of these measures includes the system of gradual work resumption while on sickness benefits. The barriers and possibilities for improvement within this system have barely been examined scientifically. The purpose of the present study is to explore these barriers and facilitators among work-incapacitated employees. Policy recommendations regarding partial return to work will be formulated for this study. When the barriers of gradual work resumption are addressed, the application of the system is expected to be easier and more effective.

Methods A qualitative study is conducted to obtain the experiences of various stakeholders (employees/patients, employers, occupational physicians, social security physicians and general practitioners) with gradual return to work. Discussions and conversations are held in the form of respectively focus group interviews (duration about two hours) and individual interviews (duration about one hour) about barriers and possibilities for improvement within this system. Qualitative thematic analysis will be used to analyse the data.

Results and discussion The current research is still ongoing (expected end date: July 30th, 2017). Therefore, results will be presented later as analyses are still being conducted. Until now, three interviews and one focus group (n=3) have been conducted with employees/patients, one interview and one focus group (n=11) have been conducted with occupational physicians, two interviews have been conducted with social security physicians and one focus group (n=2) has been conducted with general practitioners.

Oral Presentation
Dusts and Fibres

0297   OCCUPATIONAL EXPOSURE TO ORGANIC DUST AND RISK OF DEVELOPING RHEUMATOID ARTHRITIS

[1]Anna Ilar*, [1]Per Gustavsson, [1]Pernilla Wiebert, [1]Camilla Bengtsson, [2]Lars Klareskog, [1]Lars Alfredsson. *[1]The Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; [2]Department of Medicine, Rheumatology Unit, Karolinska Institutet, Stockholm, Sweden*

Objective Airborne exposure to inorganic dust is a contributor to rheumatoid arthritis (RA). We therefore wanted to investigate potential risks from exposure to organic dust.

Methods This population-based case-control study consisted of individuals living in Sweden during 1968–2012. RA patients were enrolled from the Swedish Rheumatology Quality Register. To each case we matched ten controls from the population register on sex, parish and age. We collected the participants' job titles from national population and housing censuses carried out 1960, 1970, 1975, 1980 and 1990. Job-exposure matrices were applied to the job titles to estimate ever exposure to oil mist/cutting fluids, wood-, animal-, paper-, textile-, flour- and other organic dust from 1955–1995. We used conditional logistic regression to calculate odds ratios (ORs) and 95% confidence intervals (CIs) for ever exposure vs. never exposure in relation to seropositive or seronegative RA.

Results In total, 237 243 women and 98 136 men were included in the analysis. Men exposed to animal dust (OR: 1.3, 95% CI: 1.2–1.5), oil mist/cutting fluids (OR: 1.1, 95% CI: 1.1–1.2) and other organic dusts (OR: 1.3, 95% CI: 1.2–1.4) had an increased risk of seropositive RA, whereas wood dust (OR: 1.2, 95% CI: 1.1–1.4), animal dust (OR: 1.3, 95% CI: 1.1–1.6) and other organic dusts (OR: 1.2, 95% CI: 1.1–1.4) increased the risk of seronegative RA. Women had no significantly increased risk of RA from organic dust exposure.

Conclusions Certain organic dusts are associated with increased risks of RA in men.

Poster Presentation
Exposure Assessment

0303   EVALUATING DIFFERENCES IN EXPERT AGREEMENT BETWEEN SUBGROUPS TO IDENTIFY WHERE TO PRIORITISE USE OF MULTIPLE RATERS

[1]Pamela Dopart, [2]Hormuzd Katki, [1]Bu-Tian Ji, [1,3]Patricia Stewart, [1]Melissa Friesen*. *[1]Occupational and Environmental Epidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, MD, USA; [2]Biostatistics Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, MD, USA; [3]Formerly of the National Cancer Institute; currently Stewart Exposure Assessments, LLC, Arlington, VA, USA*

The validity and reliability of expert-based assessments can be improved by using multiple raters. However, to maximise scarce resources, use of multiple raters should focus on jobs for which experts are more likely to disagree. For comparisons of agreement across subgroups, the standard metric Kappa must be used cautiously because it is sensitive to the ratings' marginal distribution. As an alternative, we used Kappa's numerator: the difference between observed and expected agreement. This value equals the Mean Risk Stratification (MRS), a novel metric also used to evaluate the predictiveness of risk models. MRS is interpreted as the number of observations (per 100) that raters will agree on beyond chance. For subgroups of jobs in three industries stratified based on 4 characteristics, we evaluated quadratically-weighted MRS from six experts' ordinal, 4-category exposure ratings (67–74 workers per industry). For all industries, MRS was consistently lower for jobs in far vs. near proximity to an exposure source and for jobs with multiple vs. one work locations, with experts agreeing on 2–8 fewer jobs (per 100) for far proximity jobs and 0.4–12 fewer jobs with multiple work locations. MRS was also lower for jobs with subject-reported non-visible vs. visible dust accumulation in two industries (difference: 1–6 jobs) and for non-production vs. production jobs in one

industry (difference: 9 jobs). The use of MRS allowed us to identify job characteristics that are associated with lower agreement between experts and to quantify the potential benefit of using multiple raters.

Poster Presentation

Cancer

0304   TEMPORO-SPATIAL ANALYSIS OF MORTALITY FROM PLEURAL MESOTHELIOMA FROM 1975 TO 2012 IN ÎLE-DE-FRANCE

[1,2]Philippe Bouvet de la Maisonneuve*, [1]Florian Pontin, [1]Adrien Saunal, [1]Maylis Telle-Lamberton. [1]Observatoire Régional de Santé d'Île-de-France, Paris, France; [2]Université Pierre et Marie Curie, Paris, France

Context Pleural mesothelioma surveillance, a marker of asbestos exposure, improves early detection and helps improving compensation of the disease. Few epidemiological data exist at a sub-district level in France.
Objectives This study presents an analysis of mortality in Île-de-France region from pleural mesothelioma from 1975 to 2012, by sex, district and "cantons-villes" residence.
Material and methods Pleural mesothelioma deaths from 1975 to 2012 were provided by the CepiDc and the corresponding population numbers by INSEE. Mortality rates stratified by age were reported for the region and its districts. Standardised mortality ratios were calculated using the Île-de-France population as a reference at "canton-villes" level. A ranking algorithm to order the mortality by "canton-ville" over the period was developed and applied.
Results The epidemic peaked in the mid-90s. Among men the lowest standardised rate was observed for Paris (3.4 per 100,000) and the highest in Seine-et-Marne and Seine-Saint-Denis (5.1 per 100,000). Among women the lowest mortality was observed in Paris and in the Val d'Oise (1.3 per 100,000) and the higher in the Seine-Saint-Denis (1.8 per 100,000). The temporo-spatial representation shows high mortality areas consisting of neighbouring "cantons-villes" in Seine-et-Marne (Perthes) and Seine-Saint-Denis (Aulnay-sous-Bois), in contrast with areas of low mortality localised mainly in Paris and the Val-d'Oise. The epidemic timeline differed among "canton-ville".
Conclusion Epidemic of pleural mesothelioma can be characterised at a fine scale over a long period. This territorial knowledge can be an aid to targeted education of health professionals and the populations concerned.

Oral Presentation

Cardiovascular Disease

0305   OCCUPATIONAL EXPOSURE TO RESPIRABLE QUARTZ AND RADON AND THE RISK OF ACUTE MYOCARDIAL INFARCTION

Johannes Gellissen, Dagmar Pattloch, Norbert Kersten, Matthias Möhner*. Federal Institute for Occupational Safety and Health, Berlin, Germany

Objectives The aim of this study is to investigate the effect of occupational exposure to radon and respirable quartz (RQ) on the risk of acute myocardial infarction.
Methods This individually matched case-control-study is nested into the Wismut cohort of former uranium miners. Acute myocardial infarction (AMI) was ascertained from hospital discharge diagnoses coded in ICD-10 and validated according to WHO criteria (1979) by patient records. Exposure to RQ, radon, long-lived radionuclides, Gamma-radiation, and arsenic was estimated by a corresponding job-exposure-matrix. Information on silicosis was included in the dataset to reduce a possible Healthy-worker-effect. To exclude effects of possible exposures before hire in uranium mining, a second analysis was performed limited to miners born after 1930. Conditional logistic regression was used for risk modelling.
Results In total, 467 cases of AMI and 467 controls, matched by year of birth, were ascertained. The analysis of the full dataset shows only a weak increase of AMI-risk with increasing exposure to RQ. But the second analysis, based on 126 matched pairs, revealed a positive dose-response relationship with RQ. The odds ratio for the highest quintile (>15 mg/m^3·year) was 4.91 (95%CI: 1.43–16.8). Including RQ as a linear term yields OR=1.05 per mg/m^3·year. The analysis of the cumulative radon exposure produced similar findings.
Conclusions This study shows elevated risk of AMI due to radon and RQ exposure. Because of the high correlation between both exposures, a differentiation between the corresponding effects is not possible.

Oral Presentation

Exposure Assessment

0306   USING DATA FROM EXPOSURE DATABANKS: COMPARING MEASUREMENT LEVELS IN LIMS (QUEBEC, CANADA) AND IMIS (USA)

[1]Philippe Sarazin*, [1]France Labrèche, [3]Jacques Lesage, [2]Jérôme Lavoué. [1]Institut de recherche Robert-Sauvé en santé et en sécurité du travail, Montréal, Québec, Canada; [2]Université de Montréal, Montréal, Québec, Canada; [3]Université du Québec à Montréal, Montréal, Québec, Canada

Objectives The LIMS databank stores all occupational exposure measurements collected by public health teams in Quebec. The IMIS databank contains exposure measurements collected by the U.S. Occupational Safety and Health Administration inspectors to verify compliance. We investigated differences/similarities between both databanks.

Methods Personal exposure measurements from 1994–2011 were abstracted, and industry from both databanks was recoded according to the Canadian Standard Industrial Classification. Logistic regression was used to explore differences between exposure levels in both databanks for 27 chemicals in common industries, taking into account the type of exposure (short-term or long-term), year, and industry. Ratios of the predicted odds of exposure above the threshold limit value (O_ER) for IMIS compared to LIMS were calculated for each chemical for years 1997 and 2008.

Results Our analysis was based on 64,938 LIMS and 53,078 IMIS measurements. Exposure levels were significantly lower in IMIS compared to LIMS for metals (O_ER estimated in 1997: 0.43 across agents, 95% confidence interval (CI): 0.30–0.62; O_ER 2008: 0.57, 95% CI: 0.42–0.77), and they became similar in recent years for solvents (O_ER 1997: 1.47, 95% CI: 0.91–2.38; O_ER 2008: 0.99, 95% CI: 0.58–1.69). Short-term exposure levels were on average 3 times higher than long-term ones across the two databanks. Results were unchanged when industry from both databanks was recoded according to the U.S Standard Industrial Classification or the North American Industry Classification System.

Conclusions Differences between exposure levels in the two databanks may reflect distinct sampling strategies or prevention policies between the two countries.

Poster Presentation

Musculoskeletal

| 0307 | DETERMINANTS OF MODIFIED WORK AS PART OF THE RETURN-TO-WORK PROCESS FOR INJURED WORKERS WITH MUSCULOSKELETAL INJURIES IN BRITISH COLUMBIA, CANADA |

Mieke Koehoorn*, Christopher B McLeod, Lillian Tamburic, Esther Maas. *University of British Columbia, Vancouver, British Columbia, Canada*

Introduction The longer an injured worker is off work the less likely they are to return to work and modified work is associated with shorter recovery durations. However, low rates of modified work have been found in Canadian compensation jurisdictions. This study investigated the determinants of modified work among workers with musculoskeletal injury compensation claims in British Columbia.

Methods Three cohorts of injured workers were identified from compensation claims for back strain, limb fractures and connective tissue injuries. The effect of age, sex, occupation, wage quintile and prior claim on at least one modified day (yes/no) within the first four weeks of claim was analysed using Poisson regression.

Results In multivariable models, female gender was associated with an increased likelihood of modified work (back strains: IRR 1.15 [95%CI 1.06, 1.25]; limb fractures: 1.22 [0.91, 1.64]; connective tissue injuries: 1.14 [0.85, 1.52]), while older age (e.g. 55 to 65 years) was associated with a decreased likelihood (back strains: IRR 0.69 [95%CI 0.63, 0.76]; limb fractures; connective tissue injuries: 0.59 [0.43, 0.81]). Higher income was associated with an increased likelihood of modified work for limb fractures (highest quintile: IRR 1.84 [1.27, 2.67]). The effect of occupation was variable on modified work by injury type.

Discussion Unmeasured injury severity may have resulted in residual confounding of disability duration by gender and age. The offer of modified work may be dependent on occupation and the flexibility of higher paying occupations. The overall low rate of modified work for musculoskeletal injuries (<30%) warrants further investigation.

Poster Presentation

Other

| 0308 | A BRAZILIAN LOOK AT OCCUPATIONAL HEALTH AND SAFETY IN THE USA: OBSERVATION AND LEARNING WITH COSH GROUPS |

[1]Sandra Cavalcante*, [1]Rodolfo Vilela, [2]Carlos Siqueira. *[1]School of Public Health – University of São Paulo, São Paulo/SP, Brazil; [2]College of Public and Community Service – University of Massachusetts, Boston/MA, USA*

Labour laws in the United States of America are less protective than the norms of most countries, including Brazilian ones. However, there is a strong militant movement for occupational safety and health in USA, organised in an articulated network that includes university professors and students, trade unionists, community leaders, public agents and various sectors workers.

The successful experience of the social activism of the Committees on Occupational Safety and Health (COSH) groups, which have been advocating for the safety and health of workers in the United States for 45 years, deserves propagation and study because it can inspire similar initiatives in Brazil and in other countries .

This exploratory research collected data through open interviews with workers, lawyers, teachers, researchers and activists heard between October/2013 and March/2014, as well as directed observation and interviews made during three events held in Boston and Baltimore (COSH Network, APHA 2013 and National Worker Safety and Health Conference).

The results show that COSHs are alliances that promote education and advocacy for workers' health and safety. They articulate a national agenda to improve health and safety conditions for immigrant workers under the prevention bias, providing information and support in Spanish and other languages, as well as advocating for just compensation for workers who are ill or injured at work. They also carry out activities to integrate health and safety activism into organised campaigns, as well as advocate for the respect of existing health and safety laws and fight for new protections for workers.

Poster Presentation

Exposure Assessment

0309   REAL-TIME FINE AEROSOL EXPOSURES IN TACONITE MINING OPERATIONS

[1]Tran Huynh*, [2]Gurumurthy Ramachandran, [1]Harrison Quick, [3]Peter Raynor, [3]Bruce Alexander, [3]Jeff Mandel. [1]Drexel University, Philadelphia, PA, USA; [2]Johns Hopkins University, Baltimore, MD, USA; [3]University of Minnesota, Minneapolis, MN, USA

Recent studies have shown that taconite workers may be at increased risk for mortality from lung cancer, mesothelioma, and cardiovascular diseases (CVD). The relationship between CVD and occupational dust exposures at these mines has not been well-studied. We conducted an air monitoring campaign to characterise fine aerosol concentrations at 91 locations across six taconite mines using direct-reading instruments to obtain measurements of mass concentrations ($PM_{2.5}$ or particles with aerodynamic diameter less than 2.5 μm, and respirable particulate matters or RPM), surface area (SA), particle number (PN), and particle size distributions. We fit a Bayesian model with an AR (1) (autoregressive order 1) correlation structure to estimate exposure while accounting for temporal correlation. The highest estimated geometric means (GMs) were observed in the pelletizing and concentrating departments (pelletizing maintenance, balling drum operator, and concentrator operator) for $PM_{2.5}$ and RPM. SA and PN generally had highest GMs in the pelletizing department that processed powder-like particles into iron pellets. Between-location variability estimates were generally higher than within-location, indicating larger differences in exposure levels at different locations between mines. Ranking between $PM_{2.5}$ and RPM generally agree with each other, whereas SA and PN were more consistent with each other, with some overlap with $PM_{2.5}$ and RPM. Differences in ranking these groups may have potential implication for occupational epidemiological studies that rely on exposure information to detect an exposure-response relationship. Future occupational epidemiological studies investigating fine aerosols exposures and health risk are encouraged to consider multiple metrics to see how they influence health outcomes risk.

Poster Presentation

Policy/Impact

0310   MEDICAL REHABILITATION BEFORE THE OCCURRENCE OF EARLY RETIREMENT IN GERMANY - PREVALENCE AND SOCIODEMOGRAPHIC DETERMINANTS OF NON-UTILISATION.

Maria Weyermann. Niederrhein University of Applied Sciences, Krefeld, Germany

Introduction In Germany the statutory pension insurance fund covers the cost of rehabilitation treatment for employees whose working capacity is endangered due to health problems. The underlying principle called "rehabilitation over retirement" is the concept to avoid early retirement due to health problems by rehabilitation.

Purpose To describe the utilisation of medical rehabilitation before the occurrence of early retirement in Germany from 2003 to 2014 and to investigate potential sociodemographic determinants.

Methods Analysis based on 20% random samples of administrative pension records from the Research Data Centre of the German Federal Pension Insurance. We used logistic regression models to investigate the risk for non-utilisation of medical rehabilitation during five years before the occurrence of early retirement. Age, sex, non-German citizenship, marital status, school and vocational education, annual income and diagnoses were considered as potential risk factors. Analyses were run with SAS software for statistical analyses (version 9.4).

Results Among all early-retired patients 47.9% (153.990 out of 321.275) did not utilised medical rehabilitation. Risk factors for non-utilisation were to be unmarried or widowed (vs. married, adjusted OR: 1.27; 95% CI: 1.25–1.29), non-German citizenship (vs. German citizenship, 1.28 [1.25–1.32]), unknown or low educational level (vs. median educational level, 1.51 [1.48–1.54]), as well as low annual income (1 st quartile vs. 4th quartile; 3.90 [3.81–3.99]). Also, risk was higher among men compared to women (1.35; 95% CI: 1.33–1.37).

Conclusions Among all early-retired patients almost 50% obtained no medical rehabilitation. Worst affected were deprived persons.

Poster Presentation

Shift Work

0311   CAN SMOKING RESEARCH FROM THE 1950S INFORM TODAY'S SHIFTWORK RESEARCH? APPROACHES TO ASSESS HYPOTHESISED CIRCADIAN DISRUPTION AT AND OFF WORK

Thomas C Erren*, Philip Lewis. University of Cologne, Cologne, Germany

Background In 1950, landmark epidemiology contributed to identifying smoking as a key carcinogen [Wynder and Graham; Doll and Hill]. In 2007, IARC classified shiftwork involving circadian disruption [CD] as probably carcinogenic; however, epidemiological evidence in regards to the carcinogenicity of shift-work that involves nightwork is conflicting.

Objective To compare smoking research from the 1950's to shiftwork research for exploring the hypothesis that today's shiftwork epidemiology is lacking chronobiological and methodological rigour and to develop metrics to facilitate improvement.

Methods Comparing smoking and chronobiological insights and deriving CD metrics.

Results If doses had been limited to number of cigarettes smoked at work rather than over 24 hours, smoking insights could have been delayed or disallowed. Similarly, restricting exposures to, let alone doses of, CD from work at night may prove insufficient to elucidate effects of cumulative CD. CD doses may be obtained by comparing how activities overlap with individuals' biological nights (BNs: predicted by

chronotype), yielding CD$_{BN}$hours. Total CDhours may be obtained by summing up CD$_{BN}$hours due to activities at and off work. As a more easily applicable metric, how much sleep overlaps with the individual biological day (BD) may yield CD$_{BD}$hours.

Conclusions Epistemologically, shiftwork epidemiology is lacking chronobiological and methodological rigour. CD - like smoking - must be assessed at and off work to consider cumulative doses in studies of carcinogenicity. Epidemiological research before and after IARC 2007, based on (night)shifts alone, may have delayed or disallowed detection/measurement of the existence/magnitude of possibly carcinogenic effects of cumulative CD.

Oral Presentation

Cardiovascular Disease

0313   MORTALITY AMONG NORWEGIAN SMELTER INDUSTRY WORKERS – A 55 YEAR FOLLOW-UP

Merete D Bugge*, Bente Ulvestad, Balazs Berlinger, Dag G Ellingsen. *STAMI, National Institute of Occupational Health, Oslo, Norway*

Ambient air pollution is associated with increased incidence and mortality of cardiovascular disease. Time-series studies have shown that a 10 μg/m3 increase in mean 24 hour PM2 concentration increases the relative risk for daily cardiovascular mortality by 0.4% to 1.0%. In recent years, increasing concerns have been levelled at the ultrafine component of PM. Ultrafine particles are formed during combustion of materials, and are therefore abundant in the furnace area of metal smelter plants.

In connexion with an ongoing project concerning occupational exposure to fine and ultrafine particles and risk of cardiovascular disease, an update of two large smelter worker cohorts has been performed. Mortality data were received from the Norwegian Causes of Death register for the period 1960–2014. The combined cohort consisted of 19 660 men, with nearly 650 000 person-years of follow-up. Preliminary analyses showed that both total mortality (SMR 1.09, 95% CI 1.07–1.11) and mortality from all cardiovascular diseases (SMR 1.03, 95% CI 1.00–1.06) were significantly increased compared to the Norwegian general male population. Workers with employment in furnace work had total mortality SMR 1.18 (95% CI 1.15–1.21) and cardiovascular mortality SMR 1.09 (95% CI 1.04–1.14). Smelter workers with no furnace work had total mortality SMR 1.01 (95% CI 0.99–1.04) and cardiovascular SMR 0.99 (95% CI 0.95–1.02). The further data analyses are currently in progress.

Oral Presentation

Musculoskeletal

0315   EFFECT OF MULTISITE MUSCULOSKELETAL PAIN ON HEALTH RELATED JOB LOSS: FINDINGS FROM THE HEALTH AND EMPLOYMENT AFTER FIFTY (HEAF) STUDY

Georgia Ntani*, Stefania D'Angelo, Clare Harris, Karen Walker-Bone, David Coggon, Keith Palmer. *MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK*

Background Musculoskeletal pain (MSP) at multiple anatomical sites differs from single site pain both in its risk factors and prognosis. Multisite MSP is more likely to cause sickness absence from work, but knowledge about its effect on health-related job loss (HRJL) is limited. To explore this association we analysed longitudinal data from participants aged 50–64 recruited to the Health and Employment After Fifty (HEAF) study.

Method Baseline information collected by postal questionnaire from 4333 employed participants included questions about MSP in the past year at three anatomical sites (spine, upper, and lower limb). Subsequent HRJL was ascertained through a follow-up questionnaire after one year. Associations between multisite MSP (pain at ≥2 anatomical sites) and HRJL were explored using Poisson regression with robust variance and summarised by prevalence rate ratios (PRRs).

Results Among 437 participants with multisite MSP at baseline, 7% left their job due to ill health, compared to 3% in 547 with single-site pain and 2% in 3349 without MSP. After accounting for potential confounders, the risk of HRJL was higher among those with multisite MSP than in those with single-site MSP (fully-adjusted PRRs 1.9 (95%CI 1.1–3.2) and 1.6 (95%CI 0.9–2.7) compared with no MSP). The population attributable fraction for single-site pain was 7%, while that of multi-site pain was 15%.

Conclusions This analysis suggests that multisite MSP carries a higher risk of HRJL than single-site pain. To develop future preventive strategies, efforts should focus on understanding the drivers of multisite MSP rather than concentrating on site-specific risk factors.

Poster Presentation

Injuries

0316   OBSTRUCTIVE SLEEP APNEA SYNDROME (OSAS) IN ROAD TRAFFIC ACCIDENTS OF COMMERCIAL BUS AND TRUCK DRIVERS IN CENTRAL IRAN

[1,2]Mehrzad Ebrahemzadih*, [2]Gholam Hossein Halvani. [1]*Environmental Health Research Centre, Kurdistan University of Medical Sciences, Sanandaj, Iran*; [2]*Department of Occupational Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran*

The aim of this study assessment of OSAS role in occurrence of road traffic accidents in sleeping drivers of commercial heavy vehicles such bus and truck driver. This cross-sectional and case-control study was carried out on 760 truck and bus drivers that were involved in a road accident between 2009 and 2011 in Yazd - Iran. In this study we used the Polysomnography method for assessing patients with suspected sleep disorders, including sleep apnea. The stage of sleep is assessed by electroencephalography. The findings indicated that among 760 drivers, 91 drivers had more than 10 EES score. Among 91 drivers, 35 drivers involved in one accident and 38 drivers had no history of accident in study period. Driving in the night time had significant association with road accident occurrence in participated drivers ($p=0.01$). Drivers who have sleepiness and especially OSAS had more chance to involve an accident. But OSAS was not independent predictor of road accident.

Poster Presentation
Risk Assessment

0317   **APPLICATION OF FAILURE MODE AND EFFECT ANALYSIS (FMEA) TO ASSESS OCCUPATIONAL RISKS IN OIL REFINERY**

[1,2]Mehrzad Ebrahemzadih*, [2]Gholam Hossein Halvani. [1]*Environmental Health Research Centre, KurdistanUniversity of Medical Sciences, Sanandaj, Iran; [2]Department of Occupational Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran*

Abstract Failure Modes and Effect Analysis (FMEA) is a systematic method for identifying the factors that a product or process encounter with them, and identifying their results and effects. The aim of this study is to evaluate the potential occupational risks in different parts of the one of oil refinery in central Iran by using risk assessment techniques. This cross-sectional study was conducted in Shiraz Refinery and relationship RPN(Risk Priority Number) with tasks e.g. milling, welding, transportation handling and etc. were studied in this company. The findings showed that transportation and handling and then external surface scraping achieved the highest of RPN before and after corrective measures (200,210) and (72, 84) respectively. While RPN for welding and drilling (punching the external surfaces) before and after corrective measures are (144,120) and (24, 36) respectively. But hazard severity curve show tasks with lower RPN in comparison with those have higher RPN are more important of injury severity. some of tasks e.g. handling, transportation and milling have high RPN and by using effective control measures can eliminate or control hazards. Then Failure Modes and Effect Analysis is a useful and efficient for hazard assessment.

Oral Presentation
Other

0318   **OCCUPATIONAL EPIDEMIOLOGY RESEARCH IN THE NEW "LOW-CARBON" ECONOMY.**

Jonathan Patz. *University of Wisconsin, Madison, WI, USA*

p.p1 {margin: 0.0px 0.0px 0.0px 0.0px; font: 16.0px 'Courier New'; -webkit-text-stroke: #000000} span.s1 {font-kerning: none}

Occupational health risks posed by climate change have focused on heat-related illness and mortality, and a growing body of evidence shows substantial risks to health and economic productivity for many countries. Since the 2015 Paris Agreement on climate change, the shift away from fossil fuel-based economies has accelerated. Potential population health benefits from improved air quality, more physically active urban communitng and reduced future heating of the planet are substantial. However, unquantified is the extent that technologies in renewable energy sources pose risks to workers. A comparision between fossil fuel-related job risks and those stemming from renewable energy-related jobs will be presented. Gaps in knowledge will be identified to help guide the safest path for workers in our evolving low-carbon society.

Note this abstract is part of the Mini-Symposium, **Climate Change impacts on Occupational Health via workplace heat (Tord Kjellstrom, organiser).**

p.p1 {margin: 0.0px 0.0px 0.0px 0.0px; font: 16.0px 'Courier New'; -webkit-text-stroke: #000000} span.s1 {font-kerning: none}

Poster Presentation
Pesticides

0320   **INDIRECT PARENT-MEDIATED PATHWAYS OF CHILD EXPOSURE TO 2,4-D AND CHLORPYRIFOS IN FARM FAMILIES**

[1]Ashley Hernandez*, [1]Timothy Church, [2]Jack Mandel, [1]Bruce Alexander. [1]*University of Minnesota School of Public Health, Minneapolis, MN, USA;* [2]*Exponent Inc., Oakland, CA, USA*

Background To reduce children's exposure to pesticides used on farms, identifying and interrupting exposure pathways is critical. We evaluated applicator (parent) exposure as a determinant of

children's paraoccupational exposure to chlorpyrifos or 2,4-Dichlorophenoxyacetic Acid (2,4-D) in a study of farm families who used one of these pesticides as part of their usual practice.

Methods The sample included 34 applicators applying 2,4-D (n=53 children) or chlorpyrifos (n=50 children). Sequential 24 hour urine samples were collected on the day preceding application through the third day after application of chlorpyrifos or 2,4-D. Maximum post-application urine concentrations of 3,5,6-trichloropyridinol (TCP), a chlorpyrifos metabolite, and 2,4-D (log-transformed) were used to examine the association of children's exposure with applicator exposure using mixed model regression including a random intercept for farm to account for correlation. The final adjusted model included children's age, gender, and presence during the application as covariates. Separate models were fit based on children's presence or absence during the application.

Results Adjusted models revealed positive associations between children's exposure with applicators' exposure (TCP: β=0.257; 95% CI=0.052, 0.462; 2,4-D: β=0.593, 95% CI=0.364, 0.822). The association persisted among children who were absent during the application process (TCP: β=0.218, 95% CI=−0.029, 0.466; 2,4-D: β=0.547, 95% CI=0.283, 0.811).

Conclusions Specific pesticide exposure pathways to children living on farms are difficult to identify, but these data indicate that applicator exposure is associated with exposures to their children absent any known direct exposure to the children. Applicators protecting themselves from exposures may also protect their children.

Oral Presentation

Cancer

| 0321 | ASSOCIATION BETWEEN OCCUPATIONAL EXPOSURE TO ASBESTOS AND CHOLANGIOCARCINOMA: A POPULATION-BASED NESTED CASE–CONTROL STUDY |

[1]Andrea Farioli*, [2]Kurt Straif, [3]Giovanni Brandi, [1]Stefania Curti, [4]Kristina Kjaerheim, [4]Jan Ivar Martinsen, [5]Pär Sparen, [6,7]Laufey Laufey Tryggvadottir, [5]Elisabete Weiderpass, [3]Guido Biasco, [1]Francesco Saverio Violante, [1]Stefano Mattioli, [8,9]Eero Pukkala. [1]*Department of Medical and Surgical Sciences (DIMEC), University of Bologna, Bologna, Italy*; [2]*International Agency for Research on Cancer, Lyon, France*; [3]*Department of Experimental, Diagnostic, and Specialty Medicine, S. Orsola-Malpighi University Hospital, Bologna, Italy*; [4]*Department of Research, Cancer Registry of Norway, Institute of Population-Based Cancer Research, Oslo, Norway*; [5]*Department of Medical Epidemiology and Biostatistics, Karolinska Institutet, Stockholm, Sweden*; [6]*Icelandic Cancer Registry, Reykjavik, Iceland*; [7]*Faculty of Medicine, University of Iceland, Reykjavik, Iceland*; [8]*Faculty of Social Sciences, University of Tampere, Tampere, Finland*; [9]*Finnish Cancer Registry, Institute for Statistical and Epidemiological Cancer Research, Helsinki, Finland*

Objective To investigate the association between occupational exposure to asbestos and the risk of cholangiocarcinoma (CC) using data from the Nordic Occupational Cancer (NOCCA) cohort.

Methods We conducted a nested case-control study of 1458 intrahepatic CC (ICC) and 3972 extrahepatic (ECC) cholangiocarcinoma cases registered among subjects born 1920 or later in Finland, Iceland, Norway and Sweden. Five population controls were individually matched by birth year, gender, and country to each case. We applied the NOCCA job exposure matrix to job titles from national population censuses

(1960, 1970, 1980/81, and 1990) to estimate the cumulative exposure to asbestos. We estimated odds ratios (OR) and 95% confidence intervals (CI) by conditional logistic regression models adjusted by printing industry work.

Results The risk of ICC was increased among workers with high cumulative exposure to asbestos: never exposed, OR=1.0 (reference category); 0.1–4.9 f/ml * years, OR=1.1 (95%CI 0.9–1.3); 5.0–9.9 f/ml * years, OR=1.3 (95%CI 0.9–2.1); 10.0–14.9 f/ml * years, OR=1.6 (95%CI 1.0–2.5);≥15.0 f/ml * years, OR 1.7 (95%CI 1.1–2.6). We did not observe an association between cumulative asbestos exposure and ECC.

Conclusions Our study supports the hypothesis that occupational exposure to asbestos is a risk factor for ICC, while we did not observe evidence of an association between exposure to asbestos and ECC. Further studies, such as pooled analysis of asbestos cohorts, are necessary to assess the strength of the association between asbestos and ICC and clarify the observed differences between ICC and ECC.

Oral Presentation

Cancer

| 0322 | CANCER INCIDENCE IN FIREFIGHTERS IN SWEDEN – PRELIMINARY FINDINGS FROM AN UPDATED COHORT STUDY |

[1]Cecilia Kullberg, [1]Tomas Andersson, [1]Per Gustavsson, [1]Jenny Selander, [2]Göran Tornling, [1]Annika Gustavsson, [1]Carolina Bigert*. [1]*Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden*; [2]*Respiratory Medicine Unit, Department of Medicine Solna and CMM, Karolinska Institutet and Karolinska University Hospital Solna, Stockholm, Sweden*

Objectives Firefighters are potentially exposed to carcinogens during work, such as benzene, benso(a)pyrene, arsenic, asbestos and silica dust. There are previous studies indicating an increased cancer risk among firefighters. The aim was to study risk of cancer in Swedish firefighters.

Methods We updated a previous cohort study of firefighters in Stockholm, comprising 1 080 men who worked at least 1 year as a firefighter during 1931–1983. They were followed regarding cancer incidence (in the National Cancer Register) from 1958–2012, adding 26 years of follow-up compared to the previous study. We also updated the information of employment duration, by annual records at the fire stations. We calculated standardised incidence ratios (SIR) with the male population in Stockholm as reference.

Results The overall cancer incidence was low (SIR=0.81, 95% CI=0.71–0.91), but there was a trend of increasing cancer incidence with increasing employment duration (p=0.03). There was an increased incidence of stomach cancer (SIR=1.89, 95% CI=1.25–2.75). The risk was significantly low for prostate cancer (SIR=0.68, 95% CI=0.52–0.87) and for malignant melanoma of the skin (SIR=0.30, 95% CI=0.06–0.88).

Conclusions We found no increased cancer incidence overall in Swedish firefighters, although the increasing incidence with increasing work duration indicates a possible carcinogenic effect of exposures at work. The cause of the increased incidence of stomach cancer is uncertain but could possibly be due to exposure to asbestos or silica dust, although this is quite speculative.

Oral Presentation

Cancer

0323   **OCCUPATIONAL EXPOSURE TO BENZENE, TOLUENE, XYLENE AND STYRENE, AND RISK OF PROSTATE CANCER**

Audrey Blanc-Lapierre, Mounia Senhaji Rhazi, Hugues Richard, Marie-Élise Parent*. *INRS – Institut Armand-Frappier, Laval, Quebec, Canada*

Little data exist on prostate cancer (PCa) risk associated with exposure to monocyclic aromatic hydrocarbons (MAHs), although several of them are classified as definite or possible carcinogens to humans. We examined PCa risk in relation to lifetime occupational exposure to benzene, toluene, xylene and styrene in a population-based case-control study in Montreal, Canada.

Incident cases diagnosed with PCa between 2005 and 2009 (n=1902, aged ≤75 years) and population controls frequency-matched on age (n=1958) provided detailed work histories during in-person interviews. Chemists evaluated the certainty, frequency and concentration of exposure to chemical agents in each job held using semi-quantitative indicators. Logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (CI) for PCa risk, adjusting for several potential confounders.

Applying a 5 year lag, the proportions of subjects ever exposed to MAHs (any), benzene, toluene, xylene and styrene were 31%, 11%, 12%, 10% and 2%, respectively. The risk of aggressive PCa (Gleason score >7 or [4+3]) was not increased with greater duration of exposure or with cumulative exposure to any of the MAHs. However, the risk of non-aggressive PCa was increased with ≥25 years of exposure to any (OR=1.59, 95% CI:1.09–2.34) or substantial (OR=2.34, 95% CI:1.22–4.50) level of benzene, to substantial level of styrene (OR=2.44,95%CI:1.16–5.13), and with high cumulative exposure to benzene (OR=1.68,95%CI:1.16–2.44] or xylene (OR=1.51,95%CI:1.01–2.25). Similar results were observed in the subset of subjects recently screened for PCa.

Our results suggest that high duration and level of exposure to benzene, xylene or styrene may increase the risk of non-aggressive PCa.

Poster Presentation

Injuries

0324   **MISCLASSIFICATION OF ANIMAL HANDLING INJURIES TO SWINE WORKERS**

Jessica Evanson, Deirdre Green, Bruce Alexander*, Jeff Bender. *University of Minnesota, Minneapolis, MN, USA*

Background Injuries resulting from animal handling are the most frequent, serious, and costly injuries to swine workers. Characterising injury burden related to animal handling and developing and evaluating appropriate prevention measures requires correct identification of injury cause. We examined the occurrence and consequences of animal handling injury misclassification in two large swine production companies in the U.S.

Methods Records for all potential animal related injuries and the injury event narratives were reviewed and independently coded based on the Occupational Injury and Illness Classification System (OIICS) coding tree. The original and re-coded data were evaluated for agreement in source and injury event for all injuries caused by animals. The resulting frequency of misclassified injuries and the potential cost burden were summarised based on medical and indemnity payments.

Results From a total of 1573 reported injuries, 331 were reported to be caused by animals. The re-coded data increased the number to 435. Re-coded data from companies accounted for an additional 104 injuries. It was more common for companies to under-ascertain animals as the source of injury (26%, 114/435) than it was to incorrectly assign animals as the source of injury (2%, 8/435). Costs related to the originally reported animal handling injuries totaled $1,537,163, and an additional $1 82 580 (12%) was added to the total with the re-classified injuries.

Conclusion Misclassification of cause of injury may result in an underestimate of total injury burden from animal related injuries and would hamper evaluation of the evaluation of strategies to prevent animal handling injuries.

Oral Presentation

Neurological Effects

0325   **FUTURE DIRECTIONS FOR OCCUPATIONAL EPIDEMIOLOGICAL RESEARCH ON NEURODEGENERATIVE DISORDERS**

[1,2]Susan Peters*, [2]Leonard van den berg, [2]Jan Veldink, [1]Roel Vermeulen. *[1]Utrecht University, Utrecht, The Netherlands; [2]University Medical Centre Utrecht, Utrecht, The Netherlands*

Associations between occupational exposures and neurodegenerative disorders (including amyotrophic lateral sclerosis (ALS), Parkinson's and Alzheimer's diseases) have not been studied as extensively as cancer and respiratory diseases and their causes remain largely unknown.

Due to complicated clinical diagnosis and lack of registries, case ascertainment is a limiting factor when studying neurodegenerative disorders. Case-control studies are best suited for inclusion of incident cases, but prone to recall bias. Studies on neurodegenerative disorders may additionally suffer from lack of recall because of disease characteristics. Cohort studies are free from recall bias and offer opportunities to study associations with occupational exposures. Moreover, baseline blood may be informative about exposures (e.g. lead) well before disease onset. Although occupational information collected in most cohorts is limited, successful studies in cancer and respiratory epidemiology have shown that occupational studies in general populations can be informative.

For ALS, several efforts are being conducted to tackle the aforementioned challenges. Examples are: an ongoing nationwide case-control study in the Netherlands (PAN:

currently ~2300 cases and ~4200 controls), to study risk factors and possible gene-environment interactions; international pooling of case-control studies; using existing cohorts (e.g. EPIC) ; and aiming to register all Dutch ALS cases. Consistent positive associations between smoking and ALS were observed within PAN and EPIC, indicating that a similar approach for occupational risk factors would be informative.

Because each study design has its advantages and disadvantages, neurodegenerative disorders should be looked at more in a range of (occupational) studies to gain better understanding of the aetiology.

Oral Presentation

Exposure Assessment

0326   A SWEDISH JOB EXPOSURE MATRIX FOR PHYSICAL WORKLOAD

[1,2]Katarina Kjellberg*, [1,2]Gun Johansson, [2]Magnus Alderling, [1,3]Tomas Hemmingsson. [1]Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; [2]Centre for Occupational and Environmental Medicine, Stockholm County Council, Stockholm, Sweden; [3]Centre for Social Research on Alcohol and Drugs, Stockholm University, Stockholm, Sweden

Background To study associations between physical workload and health outcomes, valid and feasible exposure assessment methods are needed. Physical workload can be assessed by technical measurements, observations and questionnaires. Measurements and observations are often too costly in large epidemiological studies. Response rates to surveys are decreasing. Also, self-reported exposure is prone to bias since it may be influenced by e.g. health. Alternatives are to use job exposure matrices (JEM) where each job is attributed exposure measures. This enables large epidemiological studies to be conducted on registers and cohorts that include job titles. The aim was to construct a Swedish JEM for physical workload.
Methods Data from the Swedish Work Environment Surveys conducted every second year 1997–2013, including 90 077 working Swedes, were used. The JEM was based on eight questions concerning heavy lifting, strenuous work postures, repetitive work and physical strenuous work. The response scales specifiy the proportion of working time with the exposure. Occupational titles were coded on 4-digit level according to the 1996 version of the Swedish Standard Classification of Occupations.
Results The JEM provides information on physical exposures in 355 occupations, divided into men and women. Each occupation has been assigned mean values for specific exposures, e.g. heavy lifting, and overall physical exposure, as well as the proportion of workers exposed. Analyses will be presented on the predictive validity of JEM estimates on musculoskeletal disorders in a Swedish cohort.
Conclusions If the JEM is considered valid it will be a valuable tool in epidemiological studies of physical workload.

Oral Presentation

Exposure Assessment

0327   EXPOSURE ASSESSMENT FOR U.S. CASE-CONTROL STUDY ON OCCUPATIONAL LIFTING AND RETINAL DETACHMENT: A COMPARISON OF METHODS. (TO BE PRESENTED IN AN ACCEPTED MINI-SYMPOSIUM)

[1]Rebecca DeVries*, [2]Bradley Daines, [1]Lauren Gosnell, [1]Rebecca Gore, [1]Susan Sama, [1]David Kriebel. [1]Department of Public Health, University of Massachusetts Lowell, Lowell, MA, USA; [2]Reliant Medical Group, Worcester, MA, USA

Objectives To support a case-control study investigating the association between occupational lifting and retinal detachment (RD) in Massachusetts, we estimated and compared self-reported lifting exposures to those documented in O*NET, a government database that characterises physical exposures such as manual material handling and vibration for hundreds of U.S. job titles.
Methods Cases of RD were identified based on recent surgical treatment and controls based on a recent routine eye exam. All recruited participants were mailed a questionnaire including questions on the magnitude and frequency of lifting, pushing and pulling in all previous jobs. To help patients recall physical exertion across their lives, photos of lifting common objects were included. Participant responses were used to estimate occupational lifting exposures in three ways: 1) self-reports; 2) a job exposure matrix (JEM) linking job titles with O*NET exposure data; and 3) combining 1 and 2 with Empirical Bayes Estimators (EBE).
Results Study recruitment will continue through 2017, enrolling at least 150 cases and 250 controls. Preliminary analyses from half of the participants indicate an average of four jobs/person. Self-reports and job-title based exposures from O*NET were moderately correlated for lifting (Spearman rank correlation=0.48, p<0.0001). Frequent reports of whole body vibration exposures were uncommon (<5% of all jobs), suggesting the study will have less power to evaluate this exposure.
Conclusions By combining strengths of JEMs with personal recall, this study sought to improve on previous investigations. EBE provide a formal method for optimising the two types of data.

Oral Presentation

Cancer

0328   EXTENDED MORTALITY FOLLOW-UP OF A COHORT OF WORKERS EXPOSED TO ACRYLONITRILE

[1]Stella Koutros*, [1]Aaron Blair, [1]Barry Graubard, [1]Jay Lubin, [2]Patricia Stewart, LauraE. [1]Beane Freeman, [1]Debra T Silverman. [1]US National Cancer Institute, Bethesda, MD, USA; [2]Stewart Exposure Assessments, LLC, Arlington, VA, USA

Background/Objectives We extended the mortality follow-up of a cohort of 25 460 workers employed at eight acrylonitrile-producing or using facilities in the U.S by 21 years. Based on 8124 deaths and 1,023,921 person-years of follow-up, we evaluated the relationship between occupational exposure to acrylonitrile and mortality.

Methods Standardised mortality ratios using deaths through December 31, 2012 were calculated. Personnel records, work histories, and monitoring data were used to develop quantitative estimates of exposure to acrylonitrile. Adjusted hazard ratios (HR) were estimated by Cox proportional hazards regression.

Results All-cause mortality and mortality from all cancer was significantly less than expected compared with the general population. Internal analyses by cumulative and average exposure revealed elevated risk of cancer of the lung and bronchus (n=808 deaths) and bladder (n=55 deaths). The HR for lung cancer was significantly elevated in the highest quintile of cumulative exposure (1.40, 95% CI 1.11–1.78, p-trend=0.09) compared to unexposed workers, peaking at ≥20 years since first exposure/hire HR=1.49, 95% CI 1.17–1.91); average exposure was associated with a small non-significant increased risk (HR=1.20, 95% CI 0.95–1.52). Average exposure was associated with a significantly elevated risk of bladder cancer; workers in the top tertile had an HR=2.89, 95% CI 1.35–6.18, p-trend=<0.01 compared to the unexposed, while there was non-significant increase between cumulative exposure and risk (HR=1.37, 95% CI 0.65–2.90). Significant HRs were not observed for other smoking-related outcomes.

Conclusions Extended mortality follow-up of the largest cohort of acrylonitrile exposed workers provides some evidence of a possible association between high exposure to acrylonitrile and lung and bladder cancer.

Oral Presentation

Cancer

0329 OCCUPATIONAL EXPOSURE TO METALS AND WELDING FUMES, AND RISK OF GLIOMA IN THE INTEROCC STUDY

[1,4]Marie-Elise Parent*, [2,3]Michelle C Turner, [4,6]Jérôme Lavoué, [1]Hugues Richard, [2,3]Jordi Figuerola, [5]Laurel Kincl, [6]Lesley Richardson, [7]Geza Benke, [8]Maria Blettner, [9]Sarah Fleming, [10]Martine Hours, [11]Daniel Krewski, [12]David McLean, [13,14]Siegal Sadetzki, [15]Klaus Schlaefer, [15]Brigitte Schlehofer, [16]Joachim Schüz, [4,6]Jack Siemiatycki, [17,18]Martie van Tongeren. [1]INRS-Institut Armand-Frappier, Laval, Quebec, Canada; [2]Barcelona Institute for Global Health (ISGlobal), Barcelona, Spain; [3]Universitat Pompeu Fabra (UPF), Barcelona, Spain; [4]University of Montreal, Montreal, Quebec, Canada; [5]Oregon State University, Corvallis, Oregon, USA; [6]University of Montreal Hospital Research Centre, Montreal, Quebec, Canada; [7]Monash University, Melbourne, Australia; [8]Johannes-Gutenberg University Mainz, Mainz, Germany; [9]University of Leeds, Leeds, UK; [10]Université de Lyon, Lyon, France; [11]University of Ottawa, Ottawa, Ontario, Canada; [12]Massey University, Wellington, New Zealand; [13]Chaim Sheba Medical Centre, Tel Aviv, Israel; [14]Tel-Aviv University, Tel Aviv, Israel; [15]German Cancer Research Centre (DKFZ), Heidelberg, Germany; [16]International Agency for Research on Cancer, Lyon, France; [17]Institute of Occupational Medicine, Edinburgh, UK; [18]University of Manchester, Manchester, UK

Background Brain tumouraetiology is poorly understood. Based on their ability to pass through the blood-brain barrier, it has been hypothesised that exposure to metals may increase the risk of brain cancer. Results from the few epidemiological studies on this issue are inconsistent.

Methods We investigated the relationship between glioma risk and occupational exposure to five metals - lead, cadmium, nickel, chromium and iron- as well as to welding fumes, using data from the seven-country INTEROCC study. A total of 1800 incident glioma cases and 5160 controls aged 30–69 years were included in the analysis. Lifetime occupational exposure to the agents was assessed using the INTEROCC JEM, a modified version of the Finnish job exposure matrix FINJEM.

Results In general, cases had a slightly higher prevalence of exposure to the various metals and welding fumes than did controls, with the prevalence of ever exposed ranging from 1.7% and 2.2% for cadmium up to 10.2% and 13.6% for iron among controls and cases, respectively. However, in multivariable logistic regression analyses, there was no association between ever exposure to any of the agents and risk of glioma with odds ratios (95% confidence intervals) ranging from 0.8 (0.7–1.0) for lead to 1.1 (0.7–1.6) for cadmium. Results were consistent across models considering cumulative exposure or duration, as well as in all sensitivity analyses conducted.

Conclusions Findings from this large-scale international study provide no evidence for an association between occupational exposure to any of the metals under scrutiny or welding fumes, and risk of glioma.

Oral Presentation

Other

0330 INCORPORATING PRE-EXISTING KNOWLEDGE OF WITHIN, BETWEEN-WORKER, AND BETWEEN-GROUP VARIABILITY INTO EXPOSURE ASSESSMENT USING A BAYESIAN APPROACH

Harrison Quick*, Tran Huynh, Igor Burstyn. *Drexel University, Philadelphia, PA, USA*

Occupational exposures can vary substantially within- and between- workers in an exposure group, as well as between groups. In prospective studies, due to resource constraints, it can be difficult to estimate these sources of variation reliably through repeated measurements on individuals from all groups. In retrospective exposure reconstructions, measurements required for evaluation of these sources of variability may be highly imbalanced or missing. To help address these issues, we propose a Bayesian statistical modelling framework for incorporating historical information for occupational exposure assessment studies with repeated measurements. More specifically, we provide guidance for constructing informative prior distributions for the within- and between-worker, as well as between-group geometric standard deviations. These priors can be anchored in either historical data or expert judgments, are intuitive to specify, and transparent in their underlying assumptions. Our approach accommodates unequal numbers of samples per worker, varying numbers of workers per group, and situations where some workers do not have repeated measurements. In addition to yielding standard output such as posterior distributions of the variance components, our approach can yield posterior distributions of

quantities such as differences in contrasts to compare different grouping schemes for applications in epidemiology. We illustrate the approach via simulation study based on a representative range of settings found in occupational epidemiology.

Oral Presentation

Psychosocial

0331   PROLONGED PERCEIVED STRESS AND SALIVA CORTISOL IN A LARGE COHORT OF DANISH PUBLIC SERVICE EMPLOYEES: CROSS-SECTIONAL AND LONGITUDINAL ASSOCIATIONS

[1]Sigurd Mikkelsen*, [2]Julie Lyng Forman, [1]Samuel Fink, [1]Marianne Agergaard Vammen, [1]Jane Frølund Thomsen, [3]Matias Brødsgaard Grynderup, [3,4]Åse Marie Hansen, [5,6]Linda Kaerlev, [7]Henrik Albert Kolstad, [3,4]Rugulies Reiner, [1]Jens Peter Bonde. [1]*Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen, Denmark*; [2]*Section of Biostatistics, Department of Public Health, University of Copenhagen, Copenhagen, Denmark*; [3]*Department of Public Health, University of Copenhagen, Copenhagen, Denmark*; [4]*National Research Centre for the Working Environment, Copenhagen, Denmark*; [5]*Research Unit of Clinical Epidemiology, Institute of Clinical Research, University of Southern Denmark, Odense, Denmark*; [6]*Center for Clinical Epidemiology, Odense University Hospital, Odense, Denmark*; [7]*Department of Occupational Medicine, Danish Ramazzini Centre, Aarhus University Hospital, Aarhus, Denmark*

Objectives The effects of prolonged stress on cortisol secretion is uncertain. This study examines the cross-sectional and longitudinal associations between prolonged perceived stress and salivary cortisol.
Methods In 2007, 4,467 Danish public service employees participated in a study of stress and mental health, and 3,217 participated in a follow-up in 2009. Perceived stress during the past four weeks was assessed by Cohen's four item Perceived Stress Scale. Participants were asked to collect saliva 30 minutes after awakening and at approximately 20:00 in the evening. The cortisol dependence on perceived stress was examined in regression analyses adjusted for effects of potential confounders. We adjusted for a large variation in saliva sampling times by modelling the time trajectory of cortisol concentrations in the morning and in the evening and examined if they were influenced by perceived stress.
Results Perceived stress had no statistically significant effects on the level or time trajectory of morning or evening cortisol, neither cross-sectionally nor longitudinally. The one month prevalence of frequently perceived stress was low, approximately 2.5%.
Conclusions Our results did not support the hypothesis that prolonged perceived stress is associated with the level or time trajectory of morning or evening salivary cortisol.

Oral Presentation

Psychosocial

0332   THE IMPACT OF ORGANISATIONAL CHANGE ON SICKNESS ABSENCE: HOW MUCH OF THE EFFECTS ARE MEDIATED BY WORKPLACE SOCIAL CAPITAL?

[1]Johan Høy Jensen*, [2,3]Theis Lange, [1]Esben Meulengracht Flachs, [4]Janne Skakon, [5]Naja Hulvej Rod, [1]Jens Peter Ellekilde Bonde. [1]*Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen, Denmark*; [2]*Department of Biostatistics, University of Copenhagen, Copenhagen, Denmark*; [3]*The Centre for Statistical Science, Peking University, Peking, China*; [4]*Department of Psychology, University of Copenhagen, Copenhagen, Denmark*; [5]*Department of Public Health, University of Copenhagen, Copenhagen, Denmark*

Objective Organisational change may negatively affect employees' health and social capital. This study examined the magnitude of mediated effects from organisational change through social capital on long-term sickness absence (LSA) among public hospital workers.
Method In March 2014, 26.209 workers employed through January-December 2013 in the Capital Region of Denmark received a work-environment survey assessing social capital (84% responded). Social capital, measured using 8 self-reported items (collaboration, trust, and organisational justice) ranging 0-5/0-7 (low-high), was aggregated on work-unit level and categorised into quartiles. Organisational change (e.g., merger, layoff(s), and relocation) during July-December 2013 were recorded via surveys sent to all managers (58% responded). Monthly sickness-absence data of 2014 were obtained from regional salary registries (LSA:>28 days). Mediation was assessed using natural effects models nested on January-September 2014 and estimated the natural direct, indirect, and total effects from organisational change on LSA via social capital adjusting for age, gender, work-unit size, occupation, child- and health-proxies.
Results Exposure to merger or layoff(s) yielded significant adverse direct effects (OR 1.33, 95% CI 1.12–1.58 and OR 1.15, 95% CI 1.01–1.30, respectively) and adverse indirect effects via social capital (OR 1.04, 95% CI 1.02–1.06 and OR 1.04, 95% CI 1.03–1.05, respectively) on LSA (total effects: OR 1.38, 95% CI 1.17–1.64 and OR 1.19, 95% CI 1.05–1.36, respectively).

Surprisingly, exposure to relocation showed a *protective* direct effect (OR 0.73, 95% CI 0.58–0.91), but a significant adverse *indirect* effect (OR 1.01, 95% CI 1.00–1.03) on LSA (total effect: OR 0.74, 95% CI 0.52–0.92).
Conclusion Social capital potentially mediates adverse effects from organisational change on LSA.

Oral Presentation

Shift Work

0333 NIGHT SHIFT WORK AND BREAST CANCER RISK: A COMBINED ANALYSIS OF POPULATION-BASED CASE-CONTROL STUDIES WITH COMPLETE WORK HISTORIES

[1]Emilie Cordina-Duverger*, [1]Florence Menegaux, [1]Aboubakari Nambiema, [2]Sylvia Rabstein, [3]Volker Harth, [2]Beate Pesch, [2]Thomas Brüning, [4]Lin Fritschi, [5]Deborah Glass, [6]Jane Heyworth, [7]Thomas Erren, [8,10]Gemma Castaño-Vinyals, [9,10]Kyriaki Papantoniou, [8,10]Ana Espinosa, [8,10]Manolis Kogevinas, [13]Anne Grundy, [11]John J Spinelli, [12]Kristan J Aronson, [1]Pascal Guenel. [1]INSERM, CESP (UMRS 1018) Paris-Saclay University, Paris Sud University, Villejuif, France; [2]Research Institute of Occupational Medicine of the German Social Accident Insurance (BGFA), Ruhr University Bochum, Bochum, Germany; [3]Institute for Occupational and Maritime Medicine (ZfAM) , University Medical Centre Hamburg-Eppendorf (UKE), Hamburg, Germany; [4]Western Australian Institute for Medical Research, University of Western Australia, Perth, Australia; [5]Department of Epidemiology and Preventive Medicine, School of Public health and Preventive medicine. Monash University, Melbourne, Australia; [6]School of Population Health, The University of Western Australia, Nedlands, Australia; [7]Institute and Policlinic for Prevention Research, University of Cologne, Cologne, Germany; [8]ISGlobal, Centre for Research in Environmental Epidemiology, IMIM (Hospital del Mar Medical Research Institute), Barcelona, Spain; [9]Department of Epidemiology, Medical University of Vienna, Vienna, Austria; [10]Universitat Pompeu Fabra (UPF), Barcelona, CIBER Epidemiología y Salud Pública (CIBERESP), Madrid, Spain; [11]Department of Cancer Control Research, Cancer Agency; School of Population and Public Health, University of British Columbia, Vancouver, British Columbia, Canada; [12]Department of Public Health Sciences and Queen's Cancer Research Institute, Queen's University, Kingston, Ontario, Canada; [13]Department of Social and Preventive Medicine, Université de Montréal, Montreal, Canada

In 2007, IARC classified "shift work that involves circadian disruption" as probably carcinogenic to humans. To date, the evidence that night shift work increases the risk of breast cancer remains limited, partly because exposure to night work is defined differently across studies. To overcome this limitation, we created a single harmonised dataset using a common definition of night work from 5 major population-based case-control studies on breast cancer in Australia, Canada, France, Germany, and Spain.

The dataset included 6000 breast cancer cases and 7000 population controls. Any job held during work history that included at least 3 hours between midnight and 5 am was classified as night work. Lifetime duration of night work, frequency (nights/week), and night shift length (hours) were used as the main exposure variables.

In pre-menopausal women who ever worked at night the pooled OR was 1.23 [1.03–1.47]. The OR increased to 1.75 [1.17–2.62] in premenopausal women who worked at least 3 nights/week and 1.33 [1.05–1.70] for night shifts≥10 hours. The OR did not increase with the number of years of night work, but women who worked ≥3 nights/week for ≥10 years had an OR of 2.58 [1.05–6.36]. No association emerged from the data in post-menopausal women. No statistically significant heterogeneity between studies was observed.

Our results support the hypothesis that night work increases breast cancer risk, particularly in pre-menopausal who worked at least 3 nights per week. The absence of an association in post-menopausal women needs further scrutiny.

Poster Presentation

Chemicals

0335 TNF-α GENE POLYMORPHISMS MAY BE ASSOCIATED WITH INTERACTIVE EFFECTS OF BLOOD MULTI-ELEMENTS IN METAL INDUSTRIAL WORKERS

[1,2]Hung-Yi Chuang*, [2,3]Tzu-Hua Chen, [2,4]Joh-Jong Huang. [1]Department of Occupational and Environmental Medicine in Kaohsiung Medical University Hospital, Kaohsiung, Taiwan; [2]Kaohsiung Medical University, Kaohsiung, Taiwan; [3]Department of Family Medicine in Kaohsiung Municipal Ta-Tung Hospital, Kaohsiung, Taiwan; [4]Department of Family Medicine in Kaohsiung Medical University Hospital, Kaohsiung, Taiwan

Chronic exposure to metals or toxic elements may contribute to many diseases. Lead (Pb), cadmium (Cd), and arsenic (As) were toxic agents in the environment. Selenium (Se), cobalt (Co), copper (Cu), and zinc (Zn) are essential trace elements for human, but they may do harm to health beyond normal concentrations. The interactions among multiple elements are complicated and remain unclear. Toxic elements may cause a threat through inflammation. Tumour necrosis factor-α (TNF-α) is an important mediator of inflammation, and several single nucleotide polymorphisms (SNPs) have been identified in the human TNF gene promoter. Our aim is to analyse how TNF-α gene polymorphisms and multi-elements interaction influence serum TNF-α level. A total of 462 metal industrial workers who have received health examination in Kaohsiung Medical University Hospital were recruited. The blood samples were sent for biochemical analyses, TNF-α genotype analyses ($-238G>A$, $-308G>A$, $-857C>T$, $-863C>A$, $-1031T>C$), and measurement of blood multi-elements concentrations (Pb, Cd, As, Se, Co, Cu, Zn) and serum TNF-α level. Mixed-effect models were used for analysing complex interactions of multi-elements and multiple TNF-α SNPs. All elements have positive correlation with serum TNF-α level, and the effects may be modified by TNF-α gene polymorphisms. Interactions between TNF-α gene polymorphisms and multi-elements may influence serum TNF-α level. We suggest that the workers with susceptible TNF-α genotypes which may induce higher serum TNF-α level should pay more attention to metal toxicity.

Oral Presentation

Ageing Workforce

0336 IMPACT OF JOB GROUP ON RISK OF RETIREMENT IN DENMARK 1980–2012

[1]Esben Meulengracht Flachs Flachs*, [2]Johnni Hansen, [3]Esben Budtz Jørgensen, [4]Henrik Albert Kolstad, [1]Sesilje Elise Bondo Petersen, [5]Vivi Schlünssen, [6]Susanne Wulff Svendsen, [1]Jens Peter Ellekilde Bonde. [1]Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen, Denmark; [2]The Danish Cancer Society, Copenhagen, Denmark; [3]Department of Biostatistics, Copenhagen University, Copenhagen, Denmark; [4]Department of Occupational Medicine, Aarhus University Hospital, Aarhus, Denmark; [5]The Danish National Research Centre for the Working Environment, Copenhagen, Denmark; [6]Department of Occupational Medicine, Herning Hospital, Herning, Denmark

Objectives Age at permanent retirement is of interest both from an occupational health perspective as an indicator of health risks and from a societal perspective, where keeping an ageing population at work is a priority. The Danish nation-wide individual level database DOC*X includes labour market affiliation and job type for employed residents in Denmark in the years 1970–2012. The aim of this study is to investigate differences in retirement between job titles.

Methods Data on permanent retirement was obtained from administrative registries for the years 1980–1990 and 1994–2012. Each job title was coded by the Danish version of the International Standard Classification of Occupations (DISCO-88). We calculated mean age at retirement in years (MAR) and age-and-sex standardised retirement risk ratios (SRR) according to five year periods and DISCO-88 groups (first digit).

Results The number of employed persons varied between 2.0 and 2.7 million yearly, whereof job title was identified for around 75%.

MAR was substantially higher among persons with non-manual compared to manual jobs (men: 64.6 versus 61.6 years) and (women: 63.3 versus 60.8 years). In 2011–2012 SRR was between 0.44 and 1.55 for women and 0.40 and 1.12 for men. Manual jobs had consistently increased SSR throughout the study period, but the relative difference between manual and non-manual jobs increased from 2.0 in the early 1980'ties to 5.4 in the mid-1990'ties and decreased to 1.9 in the latest years.

Conclusion Manual jobs have an increased standardised retirement risk and a lower mean age of retirement compared to non-manual jobs.

Oral Presentation

Exposure Assessment

MODELLING OF OCCUPATIONAL EXPOSURE TO INHALABLE NICKEL

[1]Benjamin Kendzia*, [1]Beate Pesch, [2]Dorothea Koppisch, [2]Rainer Van Gelder, [2]Katrin Pitzke, [1]Wolfgang Zschiesche, [1]Tobias Weiss, [1]Thomas Behrens, [0]Thomas Brüning. [1]Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Institute of the Ruhr-Universität Bochum (IPA), Bochum, Germany; [2]Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA), Sankt Augustin, Germany

Objectives Exposure to nickel (Ni) is widely distributed in the production and processing of steel or alloys. We compiled concentrations of inhalable Ni together with information about the duration of the measurement, analytical method, and workplace characteristics in the MEGA database.

Methods This analysis was based on 8052 personal measurements of inhalable Ni collected between 1990 and 2009. Mixed-effects models were applied to the log-transformed Ni concentrations with imputed non-detects to assess the geometric means (GMs) of exposure to Ni in the various occupational settings adjusted by duration of sampling and calendar year.

Results Most of measurements (38%) were collected in welders, which we further detailed by welding technique. Major predictor of the concentration was the technique and material in welding-related tasks. Highest exposure levels were estimated for welding materials of high Ni content with gas metal arc welding (48 $\mu g/m^3$; 95% CI 32–72 $\mu g/m^3$) and shielded metal arc welding (37 $\mu g/m^3$; 95% CI 24–57 $\mu g/m^3$). Furthermore, high GMs were estimated in metal sprayers (33 $\mu g/m^3$), in the manufacture of batteries (27 $\mu g/m^3$) and in forging-press operators (25 $\mu g/m^3$). We did not observe time trends of exposure to Ni in this period.

Conclusion Ni concentrations varied considerably between occupations and were influenced by process and Ni content of consumables in welders. In order to assess exposure to Ni in community-based studies, supplemental information on job tasks, processes and materials is essential in addition to job titles.

Oral Presentation

Cancer

OCCUPATION AND RISK OF PROSTATE CANCER IN A NATIONAL POPULATION-BASED COHORT STUDY: THE CANADIAN CENSUS HEALTH AND ENVIRONMENT COHORT

[1,2]Jeavana Sritharan*, [1]Jill MacLeod, [1,3]Shelley Harris, [3]Donald Cole, [1,4]Anne Harris, [5]Michael Tjepkema, [6]Paul Peters, [1,3]Paul Demers. [1]Occupational Cancer Research Centre, Cancer Care Ontario, Toronto, Ontario, Canada; [2]Institute of Medical Science, University of Toronto, Toronto, Ontario, Canada; [3]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada; [4]School of Occupational and Public Health, Ryerson University, Toronto, Ontario, Canada; [5]Health Analysis Division, Statistics Canada, Ottawa, Ontario, Canada; [6]Department of Sociology and Economics, University of New Brunswick, Fredericton, New Brunswick, Canada

Prostate cancer is one of the most commonly diagnosed cancers in men and further evidence is needed on preventable risk factors. This study investigated the relationship between prostate cancer risk and occupation using a large Canadian cohort.

The Canadian Census Health and Environment Cohort was established by linking the 1991 Canadian Census Cohort to the Canadian Cancer Database (1969–2010), Canadian Mortality Database (1991–2011) and the Tax Summary Files (1981–2011). A total of 37 695 prostate cancer cases were identified based on age at diagnosis. Cox proportional hazards models were used to estimate hazards ratios (HR) and 95% confidence intervals (CI).

Overall, age standardised prostate cancer rates were observed to be highest in white collar workers and lowest in construction/transportation workers. In men aged 50–74 years, elevated risks were observed in agriculture management (HR=1.11, 95% CI 1.06–1.17), farm work (HR=1.12, 95% CI 1.02–1.23), firefighting (HR=1.16, 95% CI 1.00–1.35), military (HR=1.14, 95% CI 1.00–1.32), police (HR=1.28, 95% CI 1.14–1.42), senior management (HR=1.09, 95% CI 1.02–1.17), office (HR=1.16, 95% CI 1.08–1.24), and finance (HR=1.08, 95% CI 1.03–1.13). Similar findings were observed in men aged 25–49 years, with additional elevated risks in office management (HR=1.19, 95% CI 1.11–1.27) and education (HR=1.05, 95% CI 1.00–1.11). Decreased risks were observed in construction and transportation occupations in both age groups.

Findings across agriculture and protective services were consistent with previous studies. Some findings, particularly

among management occupations, may be due to screening. Further investigation is needed on job-specific exposures with better understanding on differences in rates across occupations.

Poster Presentation
Risk Assessment

| 0340 | INSIGHT INTO MEASLES EPIDEMICS |

[2]Paola Altrudo*, [2]Serena Carovillano, [2]Caterina Bianchi, [2]Daniele Palumbo, [2]Francesco Giuffrida, [2]Antonella Carbone, [1]Francesco Bussu, [1]Giovanni Delogu. [1]*Università Cattolica del Sacro Cuore, Rome, Italy*; [2]*Cooperativa Operatori Sanitari Associati, Rome, Italy*

In March 2017, 8 cases of measles appear (5 nurses, 2 students, 1 doctor) in the Emergency Department of a big Italian hospital in a national context of one of the worst measles epidemics in the post-vaccination era. How can we stop quickly the epidemics? Stopping measles in ED is what we verified.

Oral Presentation
Cancer

| 0341 | WELDING FUMES AND LUNG CANCER: A META-ANALYSIS BY IARC WORKING GROUP |

[1]Neela Guha*, [1,2]Manoj Kumar Honaryar, [3]Ruth M Lunn, [4]Danièle Luce, [5]Wolfgang Ahrens, [6]Leslie Stayner, [7]Andrea 't Mannetje, [8]Johnni Hansen, [1]Dana Loomis, [1]Nadia Vilahur. [1]*International Agency for Research on Cancer (IARC), Lyon, France*; [2]*École des hautes études en santé publique (EHESP), Paris/Rennes, France*; [3]*National Institute of Environmental Health Sciences (NIEHS), New York, USA*; [4]*National Institute of Health and Medical Research (INSERM), Guadeloupe, French Southern Territories*; [5]*University of Bremen, Bremen, Germany*; [6]*University of Illinois, Chicago, USA*; [7]*Massey University, Palmerston North, New Zealand*; [8]*Danish Cancer Society, Copenhagen, Denmark*

Background An estimated ~110 million workers are exposed to welding fumes worldwide. An IARC working group (WG) re-evaluated the carcinogenicity of welding fumes in 2017, previously classified as possibly carcinogenic to humans (Group 2B) in 1990, based on limited evidence for lung cancer in humans. The WG conducted a meta-analysis of peer-reviewed epidemiologic studies reporting a relative risk for welding (fumes) and lung cancer, accounting for confounding by exposure to asbestos and tobacco smoking.
Methodology After comprehensive searches in PubMed, Web of Science and Google Scholar databases and reference lists of relevant publications, 23 case-control and 36 cohort and nested case-control studies met our inclusion criteria. We attempted to remove overlapping populations for calculating summary-RRs.

Results The summary-RRs were 1.29 (95% CI: 1.24–1.34; $I^2=47.5\%$) for "ever" compared with "never" being a welder or being exposed to welding fumes, 1.27 (95% CI: 1.22–1.32; $I^2=44.7\%$) among cohort and nested case-control studies, 1.50 (95% CI: 1.34–1.67; $I^2=39.9\%$) for case-control studies, 1.09 (95% CI: 0.98–1.20; $I^2=23\%$) adjusted for smoking and asbestos exposure, 1.15 (95% CI: 1.02–1.28), among "shipyard welders", 1.00 (95% CI: 0.84–1.17) among "stainless-steel welders" and 1.31 (95% CI: 1.03–1.60) among "mild steel welders". The summary-RR was higher for "gas welders" compared to "arc welders", but not statistically significant. Increased risks were observed over time periods, occupational settings and geographic locations support an evaluation for an increased risk of lung cancer among welders, independent of exposure to asbestos and tobacco smoking.

Poster Presentation
Psychosocial

| 0342 | PERCEPTION OF PSYCHOSOCIAL FACTORS AT WORK ACCORDING TO AGE |

Régis Colin*, Stéphanie Boini, Michel Grzebyk. *INRS, Vandoeuvre-les-Nancy, France*

The objective was to explore the effects of age on the perception of psychosocial factors (PSF)

SUMER, a cross-sectional survey, was designed to characterise occupational exposures in a large representative sample of French employees. In 2010, 26 762 males and 20 019 females, aged 18 to 65, filled in the Karasek (skill discretion and decision authority, job demands, social support from colleagues and supervisors) and Siegrist (esteem, job security, job promotion) questionnaires. Additionally, participants were interviewed by occupational physicians about their work situation and occupational exposures. Graphical representations were used to characterise the PSF scores according to age. Then, breakpoints were identified using multiple change-point models. Finally, seniority, and working conditions were included as dependent factors in piecewise linear models with age, separately in men and women.

The graphical representations highlighted that perceptions were different for young and old workers compared to the middle-range age in both genders. These trends were confirmed statistically for young (breakpoint at 30 years) and for older workers (breakpoint at 55 years) mostly for the Siegrist scores. When seniority was taken into account, the effect of age on PSF scores was intensified for young newly hired (less than 3 years of experience) for the Karasek scores.

Results confirmed that young, and to a lesser extent, senior workers have different perceptions of PSF compared to middle-age group. Particularly, the effect of age was strengthened in young newly hired workers. Given the well-known impact of the PSF on health, OSH prevention should pay attention to these groups of workers.

Oral Presentation

Cardiovascular Disease

0344 | ISCHAEMIC HEART DISEASE MORTALITY, DIESEL EXHAUST, AND RESPIRABLE PARTICULATE MATTER EXPOSURE IN THE DIESEL EXHAUST IN MINERS STUDY (DEMS)

[1]Sadie Costello*, [2]Michael Attfield, [3]Jay Lubin, [1]Andreas Neophytou, [3]Aaron Blair, [1]Daniel Brown, [3]Patricia Stewart, [3,4]Roel Vermeulen, [1]Ellen Eisen, [3]Debra Silverman. [1]Division of Environmental Health Sciences, School of Public Health, University of California, Berkeley, Berkeley, CA, USA; [2]Division of Respiratory Disease Studies, National Institute for Occupational Safety and Health, Morgantown, WV, USA; [3]Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, MD, USA; [4]Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands

We examined the impact of exposure among non-metal miners to respirable elemental carbon (REC), a diesel exhaust surrogate, and respirable particulate matter from mine and ore dust (RPM), on ischaemic heart disease (IHD) mortality in the Diesel Exhaust in Miners Study (DEMS). DEMS was conducted by National Cancer Institute and National Institute for Occupational Safety and Health. Among males at 8 US mines, we estimated IHD mortality hazard ratios (HR) for cumulative exposure and for average intensity to REC and RPM among the 10 070 miners hired since dieselization. In addition, we employed the parametric g-formula to assess the impact of hypothetical REC and RPM interventions on IHD mortality adjusting for time-varying employment status to address healthy worker survivor bias. The HR (95% confidence interval (CI)) for the highest category versus lowest category of exposure were 1.18 (0.56, 2.24) for cumulative REC, 1.25 (0.78, 2.01) for cumulative RPM, 0.75 (0.39, 1.44) for average REC, and 2.58 (1.26, 5.28) for average RPM. Using the parametric g-formula, we estimated the cumulative risk under a hypothetical intervention where annual average daily exposures to REC is set to 0 and a joint intervention consistent with REC and RPM exposure limits of 0 and 0.5 mg/m^3 respectively. The ratios comparing the risk under the intervention on REC alone and for the joint intervention, each compared to the observed risk, were 0.86 (0.62, 1.17) and 0.84 (0.71, 0.98) respectively. Our study indicates that exposure to REC and PM may increase IHD mortality among workers in this cohort.

Poster Presentation

Methodology

0345 | THE ROLE OF THE OCCUPATIONAL PHYSICIAN IN THE DIAGNOSIS AND PREVENTION OF OCCUPATIONAL DISEASESIN THE 21THE CENTURY

[1,2]Bieke Claesen*, [1,2]Antoon De Schryver. [1]University of Antwerp, Antwerp, Belgium; [2]IDEWE, Heverlee, Belgium

One of the most important tasks of the occupational physician in Belgium is the prevention of primary and secondary health damage related to the job.

An occupational disease (OD) is a disease that at least partially is caused by risk factors at work or in which the evolution is caused by risk factors in the working environment.

In different countries, the scientific literature about OD and the several registration systems in occupational health generates data about those risk factors responsible for the development of OD.

That data and the legislative framework can lead to preventive measures that can prevent OD, a task for the occupational physician.

In Belgium, the available data about OD, coming from occupational health context, appear to be rare. So to find out more about the incidence and the diagnosis of OD, we will use other existing systems of surveillance in Belgium.

We'll use two sentinel surveillance systems in primary care and one general health care surveillance system. With the use of specific questionnaires about the chosen OD, we search for the risk factors recorded by the attending physicians.

This poster presents you how we used the existing methods in the context of occupational health and explains how the OD and the search for the risk factors are questioned in the general health care surveillance systems.

Dr Bieke Claesen, PhD student University of Antwerp, Occupational Physician at IDEWE.

Prof Dr A De Schryver, Faculty of Medicine and Health Sciences, Epidemiology and Social Medicine (ESOC) University of Antwerp.

Poster Presentation

Psychosocial

0346 | RELATIONSHIP BETWEEN PSYCHOLOGICAL STRESS-JOB SATISFACTION AND WEIGHT CHANGE IN EMPLOYEES AT A GLOBAL OIL AND GAS COMPANY

April Clark*, Delya Sommerville, Richard Heron. BP Plc, Houston, Texas, USA

In an era of uncertainty and falling oil prices, addressing work-related stress plays a vital role in maintaining safe operations, productivity, and decreasing turnover.

Employees have access to a confidential assessment which considers their lifestyle, health status, work and life outside of work. One section of the assessment measures psychological stress and job satisfaction. Psychological stress has been implicated as a risk factor for cardiovascular disease, cancer and weight changes.

This cross-sectional analysis aimed to examine the association between psychological stress, job satisfaction, and weight gain.

Self-administered health risk assessments from over 6000 employees were assessed. Questions about satisfaction with work decisions, job effort reward, time pressures at work, stress from mental fatigue at work were used to create a stress satisfaction score. Prevalence of stress was calculated and multivariate regression analyses, stratified by sex and age groups, were conducted.

Over 70% of respondents who reported stress assigned the cause of stress to be work-related. Female respondents indicated more stress than satisfaction in the workplace (p

value=0.00). Respondents who identified as morbidly obese were 36% more likely to report more stress than satisfaction (p value=0.00); those who identified as underweight were 40% more likely to report more stress than satisfaction at work (p value=0.03).

This analysis shows that certain groups are at higher risk of experiencing more stress than satisfaction at work. This can serve as a baseline to monitor stress levels and changes in employees' weight over time and can help target wellness interventions at the appropriate groups.

Oral Presentation
Risk Assessment

0347 ANALYSIS OF MORTALITY IN A POOLED COHORT OF CANADIAN AND GERMAN URANIUM PROCESSING WORKERS WITH NO MINING EXPERIENCE

[1]Lydia Zablotska*, [2]Nora Fenske, [2]Maria Schnelzer, [3]Sergey Zhivin, [4]Dominique Laurier, [2]Michaela Kreuzer. [1]*University of California, San Francisco, San Francisco, CA, USA*; [2]*Federal Office for Radiation Protection, Department of Radiation Protection and Health, Neuherberg, Germany*; [3]*French National Institute of Health and Medical Research, INSERM, Paris, France*; [4]*Institute for Radiological Protection and Nuclear Safety, IRSN, Fontenay-aux-Roses, France*

Purpose Long-term health risks of occupational exposures to uranium processing were examined to better understand potential differences with uranium underground miners and nuclear reactor workers.
Methods Two cohort studies of workers from Port Hope, Canada (1950–1999) and Wismut, Germany (1946–2008) employed in uranium milling, refining, and processing were pooled. Poisson regression was used to evaluate the association between cumulative exposures to radon decay products (RDP) and gamma-rays and causes of death potentially related to uranium processing.
Results The pooled cohort included 7431 workers (2 70 201 person-years of follow-up). Mean RDP exposures were lower than in miners while gamma-ray doses were higher than in reactor workers. Both exposures were highly correlated (weighted r=0.89). Risks of lung cancer and cardiovascular diseases (CVD) in males were increased but not significant and compatible with risks estimated for miners and reactor workers, respectively. Higher RDP-associated CVD risks were observed for exposures 5–14 years prior to diagnosis compared to later exposures and among those employed <5 years. Risks of solid cancers excluding lung cancer were increased, but not significant, both for males and females, while all other causes of death were not associated with exposures.
Conclusions In the largest study of uranium processing workers to systematically examine radiation risks of multiple outcomes from RDP exposures and gamma-rays, estimated radiation risks were compatible with risks reported for uranium miners and nuclear reactor workers. Continued follow-up and pooling with other cohorts of uranium processing workers are necessary for future comparisons with other workers of the nuclear fuel cycle.

Poster Presentation
Working Conditions

0350 RETURN-TO-WORK FOR MULTIPLE JOBHOLDERS WITH A WORK-RELATED MUSCULOSKELETAL DISORDER: A POPULATION-BASED, MATCHED COHORT IN BRITISH COLUMBIA

Esther Maas*, Mieke Koehoorn, Christopher McLeod. *University of British Columbia, Vancouver, BC, Canada*

The objective of this study is to examine the association between multiple jobholding and return-to-work (RTW) for workers with a work-related musculoskeletal disorder (MSD). We hypothesise that multiple jobholders (MJHs) are less likely to RTW compared to single jobholders (SJHs), due to their higher sickness absence threshold, more unstable employment contracts, and higher workload.

We used administrative workers' compensation data to identify workers with accepted MSD lost-time claims and an injury date between 2010–2014 in British Columbia, Canada (n=125,639 SJHs and 9,029 MJHs). The outcome was time until RTW within one year following the first time-loss day. The MJH and SJH cohorts were balanced using coarsened exact matching, which yielded a matched cohort of 8,992 MJHs and 8,992 SJHs. The outcome was estimated using cox proportional hazard models.

MJHs were less likely to RTW within one year after the first time-loss day compared to SJHs (Hazard Ratio (HR) 0.78; 95% confidence interval (CI) 0.76–0.81). This applied to men and women, but the reduced likelihood to RTW was larger for male MJHs (HR 0.73; 95% CI 0.70–0.77) than for female (HR 0.83; 95% CI 0.79–0.87). Furthermore, this result was stronger for those with $\leq$ five pre-injury weekly workdays (HR 0.76; 95% CI 0.73–0.79), compared to those with six or seven days pre-injury weekly workdays (HR 0.94; 95% CI 0.86–1.02).

MJHs are disadvantaged compared to SJHs in terms of RTW following a work-related MSD. Identifying differences between MJHs and SJHs is the first step to improve RTW outcomes for this vulnerable segment of the workforce.

Poster Presentation
Other

0351 NATIONAL PREVALENCE OF OCCUPATIONAL NOISE EXPOSURE

[1]Lin Fritschi*, [1]Katherine Lewkowski, [2]Jane Heyworth, [2]Ian Li, [1]Kahlia McCausland, [3]Warwick Williams. [1]*Curtin University, Perth, Australia*; [2]*University of Western Australia, Perth, Australia*; [3]*National Acoustic Laboratories, Sydney, Australia*

Noise-induced hearing loss (NIHL) is common and is one of the major costs to occupational compensation schemes. NIHL can

also result in reduced quality of life and employment opportunities for the worker. Despite this considerable burden, there is little understanding of occupational noise exposure on a national scale. Recognition of occupational noise exposure is particularly important for small businesses which employ the majority of workers, and are less likely to monitor occupational health concerns.

We undertook a national phone survey of nearly 5000 workers in Australia using our validated online application, OccIDEAS. In order to mirror a dosimeter survey, each person was asked about their last working day. Each worker was allocated one of 52 job-specific modules which contained questions about relevant tools, tasks and the time spent on each tool/task. The answers were linked to a custom database containing typical noise levels for each tool/task. Partial noise exposures were calculated, added and normalised to an eight hour shift.

On their previous working day, 16% of respondents (23% of males and 7% of females) had an estimated exposure (LAeq,8h) equal to or over the recommended exposure limit of 85 dB. Of those exposed above the limit, 80% were males. A substantial proportion of those exposed above the exposure limit reported that they did not wear hearing protection at all during the day.

These results can be used to target interventions at particular occupational and demographic groups to reduce the incidence of NIHL in the future.

Oral Presentation

Exposure Assessment

0352 | DOES THE SIZE OF A COMPANY MAKE A DIFFERENCE TO THE PREVALENCE OF EXPOSURE?

[1]Lin Fritschi*, [1]Sonia El-Zaemey, [1]Ellie Darcey, [1]Alison Reid, [2]Lesley Rushton, [3]Damien McElvenny. [1]*Curtin University, Perth, Australia*; [2]*Imperial College, London, UK*; [3]*Institute of Occupational Medicine, Edinburgh, UK*

About two-thirds of workers in high-income countries work in micro (<5 employees) small (5–20 employees) and medium (20–200 employees) sized companies. Nevertheless, regulatory bodies and many research projects predominantly work with large companies (>200 employees) perhaps because they are more convenient to study. For example, a survey of exposure to silica in the UK undertook 44 site visits, with none of the visits involving sole-trader or micro companies.

We undertook a national population-based survey of nearly 5000 Australian workers to examine the occupational prevalence of exposure to 27 asthmagen groups. Seventy percent worked in companies with <200 workers and nearly 20% worked in micro-companies. The overall prevalence of any exposure showed no trend with company size. However, there was considerable variation by agent. For example, flour exposure was most common in medium and small companies,

while epoxy and isocyanate exposures were most common in micro companies. The prevalence of exposure was highest in large companies for only 5/27 asthmagen groups and, except for industrial cleaning and sterilising agents, these were relatively rare exposures (medications, ethylene oxide, reactive dyes, and flowers).

Our study shows that taking a population-based approach in studies describing exposure is likely to give a better overall picture of where the majority of people are exposed to the hazards. This approach permits the targeting of prevention to the places where we can benefit the greatest number of workers. Nationally-representative studies are needed to ensure that our understanding of occupational exposure is based on evidence, not convenience.

Poster Presentation

Cancer

0353 | NAVIGATING CANCER AT SEA – AN EXTENDED FOLLOW-UP ON CANCER INCIDENCE IN A DANISH COHORT OF SEAFARERS

Kajsa Petersen*, Julie Volk, Johnni Hansen. *The Danish Cancer Society Research Centre, Copenhagen, Denmark*

Objective As the traditional perils at sea counting shipwrecks, accidents, piracy and infectious diseases have subsided at least for ships embarking from the Western world, the burden of cancer among seafarers has emerged as a focus point for further health improvements. Even aboard modern ships, occupational hazards are numerous and the aim of this study is to offer updated information on the incidence of specific cancers among both male and female Danish seafarers.

Method All seafarers employed on Danish ships during 1986–1999 were identified through records from the Danish Seafarer Registry providing a cohort of 33 340 men and 11 291 women. Using the unique Danish personal identification number, information on cancer and vital status was linked to cohort members from the Danish Cancer Registry and the Danish Civil Registration System. Standardised incidence ratios for specific cancers were estimated using national rates.

Results Compared to the general population, the overall incidence of cancer was increased for both male and female seafarers (SIR 1.16, 95% CI 1.13–1.20 and SIR 1.12, 95% CI 1.05–1.20). This excess was primarily driven by increases in gastrointestinal, respiratory and urinary cancers among the men, while the women also had increases in cervical and ovarian cancer. The SIR for melanoma of the skin and lip cancer was increased for women and men respectively, while an excess of pleural cancer only affected the men.

Conclusion Cancer among Danish seafarers continue to be primarily lifestyle-related. However, occupational exposure to UV-radiation, asbestos and other chemicals may affect the morbidity pattern as well.

Oral Presentation

Cardiovascular Disease

0354   INCIDENCE OF CARDIOVASCULAR DISEASE AMONG
        DANISH FIREFIGHTERS – A COHORT STUDY

[1]Julie Elbæk Pedersen*, [2]Kajsa Petersen, [1]Niels Ebbehøj, [1]Jens Peter Bonde, [2]Johnni Hansen. [1]Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen, Denmark; [2]The Danish Cancer Society Research Centre, Copenhagen, Denmark

Objectives To explore the incidence of selected diagnoses of cardiovascular diseases (CVD) among 11.691 male Danish firefighters, including the relative risk among different exposure groups.

Methods Trade unions, with firefighter membership records, Danish municipalities and private companies covering firefighting assignments supplied historical employment records to this study. The Supplementary Pension Fund Register, with information on all employees in Denmark, was used to establish two occupational reference groups: a) a random sample from the employed male population and b) the military. Information on CVD, 1977–2014, was retrieved from the Danish National Patient Registry. Age and calendar standardised incidence rates (SIR) were estimated using reference group rates.

Results The number of observed cases significantly exceeded the expected number for all cardiovascular diseases combined when firefighters were compared with both references. Significantly increased SIRs were also observed for angina pectoris (1.16, 95% CI=1.08–1.24), acute myocardial infarction (1.16, 95% CI=1.06–1.26), chronic ischaemic heart disease (1.15, 95% CI=1.06–1.24) and atrial fibrillation/flutter (1.25, 95% CI=1.14–1.36) compared with the general working population sample. When comparing the firefighters with the military, results reflected the same pattern. In subgroup analyses, the risk of CVD was elevated for full-time employed firefighters, but decreased with increasing duration of employment.

Conclusion Our study indicates a modest elevated CVD incidence among Danish firefighters. This study is the first large cohort study exploring the association between firefighting and CVD incidence, and more studies including more detailed information on "dose" of firefighting and potential confounding factors are warranted.

Poster Presentation

Specific Occupations

0355   MORTALITY IN A COHORT OF DANISH FIREFIGHTERS

[1]Kajsa Petersen*, [1]Julie Elbæk Pedersen, [2]Jens Peter Bonde, [2]Niels Ebbehøj, [1]Johnni Hansen. [1]The Danish Cancer Society Research Centre, Copenhagen, Denmark; [2]Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen, Denmark

Objective Firefighters are exposed occupationally to a complex range of potential health threats including toxic chemicals, shift work, excessive heat, physical and emotional strain. The aim of this study is to examine the resulting pattern of mortality among Danish firefighters.

Method Past and present male Danish firefighters were identified through systematic collection of personnel and membership records from employers and trade unions from the entire country (n=11,529). Using the unique Danish personal identification number, information on additional employment, vital status and cause of death was linked to each member of the cohort from the Supplementary Pension Fund Register, the Danish Civil Registration System and the Danish Register of Causes of Death. Standardised mortality ratios (SMRs) were calculated for specific causes of death using rates for two selected reference groups, a sample of the working population and military employees respectively.

Results Compared to both the sample of the working population and the military, overall mortality was significantly reduced among the firefighters (SMR 0.74, 95% CI 0.69–0.78 and SMR 0.87, 95% CI 0.82–0.93). In addition, the SMRs for mental disorders, endocrine disorders, suicides, accidents and other external causes were significantly reduced against both reference groups.

Conclusion Despite possible exposure to numerous occupational hazards, male Danish firefighters have a significantly lower mortality compared to both a sample of the Danish working population and the military.

Poster Presentation

Psychosocial

0356   JOB STRAIN IN MANAGERS AND WORKPLACE SOCIAL
        CAPITAL: A CROSS-SECTIONAL STUDY FROM THE
        DANISH PUBLIC SECTOR

Line Leonhardt Laursen*, Søren Grove Vejlstrup, Jens Peter Bonde, Johan Høy Jensen. Department of Occupational and Environmental Medicine, Copenhagen University Hospital, Bispebjerg, Copenhagen, Denmark

Background Research indicates that stressed managers could be harmful for employee wellbeing. Social capital is a construct to address the psychosocial work environment. To our knowledge no study has investigated the relationship between stressed managers and workplace social capital.

Objective This study examines the association between managers' perceived job strain and workplace social capital.

Methods Population includes all employees in the Capital Region of Denmark in 2014 (n=37.720) nested within work units (n=2499). Information on the psychosocial work environment was obtained by a web-based questionnaire (response rate 84%). Work unit mangers reported job strain (high job demands/low job control) on a 7-item 5-point Likert scale. Social capital was reported by employees on an 8-item 5–7 point Likert scale and computed to an aggregated work unit score. The risk of employee rated social capital (lowest quartile) according to managers' perceived job strain was examined by logistic regression adjusting for characteristics of managers (gender, age, occupation, seniority) and work units (size (weighted), gender ratio, mean age).

Preliminary results The risk of low work unit social capital increased when the manager reported higher levels of job strain: for each unit increase of job strain (scale 1–5), the

adjusted risk of low work unit social capital increased by OR=1.72, CI 95% 1.65–1.79.

Conclusion Managers' perception of job strain was strongly associated with independently measured workplace social capital. The direction of the causal pathway, if any, may be either way which points to a need for prospective studies and analyses of mediating and/or moderating factors.

Poster Presentation

Musculoskeletal

0357 **MULTI-SITE MUSCULOSKELETAL PAIN IN SWEDISH POLICE AND ITS ASSOCIATION WITH USE OF MANDATORY EQUIPMENT**

[1]Louise Bæk Larsen*, [1]Elisabeth Elgmark Andersson, [2]Roy Tranberg, [1]Nerrolyn Ramstrand. [1]Department of rehabilitation, School of Health and Welfare, Jönköping University, Jönköping, Sweden; [2]Department of Orthopaedics, Institute of Clinical Sciences, University of Gothenburg, Gothenburg, Sweden

Background Musculoskeletal disorders are a common problem among uniformed police with lower back pain being most frequently reported (Gyi and Porter, 1998). Wearing mandatory equipment (duty belt and body armour) and sitting for long periods of time in fleet vehicles are characteristic workload factors linked to musculoskeletal disorders in police (Filtness et al., 2014, Holmes et al., 2013).

Aim The aim of this study was to determine the prevalence of multi-site musculoskeletal pain among Swedish police and to explore the possible association to physical workload factors with a special focus on mandatory equipment.

Method A cross-sectional study was carried out with responses from 4185 uniformed police. Data was collected through a self-administered online survey including questions about work environment, physical workload factors, mandatory equipment and musculoskeletal pain. Multi-site musculoskeletal pain was determined by summing pain sites from four body regions. Binomial logistic regression was performed to explore the association between multi-site musculoskeletal pain and 1) use of mandatory equipment and 2) sitting for long periods in fleet vehicles.

Result The prevalence of multi-site musculoskeletal pain at least one day per week within the previous three months was 41.3%. A statistically significant association was found between multi-site musculoskeletal pain and mandatory equipment whereas sitting for long periods of time in fleet vehicles was not found to be significantly associated to multi-site musculoskeletal pain.

Conclusion Multi-site musculoskeletal pain is a considerable problem among Swedish police and the association to mandatory equipment should therefore be further investigated including psychosocial factors.

Poster Presentation

Exposure Assessment

0358 **RHINITIS SYMPTOMS AND IMMUNOLOGICAL RESPONSE AFTER OCCUPATIONAL EXPOSURE TO SHRIMP SHELL POWDER**

[1,2]Bjørg Eli Hollund*, [1,2]Jorunn Kirkeleit, [1,2]Cecilie Svanes, [1]Morten Langeland, [1,2]Randi Bertelsen. [1]Department of Occupational Medicine, Bergen, Norway; [2]University of Bergen, Bergen, Norway

Occupational bioaerosol exposure may cause a range of temporary or permanent health effects , depending on host factors and the type and duration of exposure.

In the present study, we investigated rhinitis and immunological markers in all employees in a shrimp shell powder production factory, before and after exposure to shrimp shell powder.

Material and methods The study population comprised 11 employees. Personal exposure to inhalable dust (fullshift) was measured in the breathing zone of the employees during production of shrimp shell powder. All employees answered a self-administered questionnaire before and after exposure, about working tasks, airways symptoms, and smoking habits. Blood samples were collected before and after the work shift, and analysed for leukocyte counts, tryptase, total IgE, IgA, IgM, IgG.

Results Shirmp shell powder workers were exposed to 12 mg/m^3 inhalable dust (mean 11,8 mg/m^3, median 8.2 mg/m3, n=16), the exposure level for unexposed group was less than 1 mg/m3 inhalable dust (mean 0.4 mg/m^3, median 0.4 mg/m^3, n=10).

Employees working with shrimp shell powder had more rhinitis symptoms (stuffy nose and runny nose) than employees working with fish.

Although not statistically significant, the peripheral levels of tryptase, leucocytes and neutrophils in peripheral blood appeared to be highest among exposed workers, increasing after exposure.

Conclusions Shrimp shell powder workers are exposed to high level of inhalable dust compared to the occupational exposure limit of organic dust (5 mg/m^3).

Exposure was related to more rhinitis symptoms and indicated (non-significantly) higher immunological parameters

Follow-up of this industry and more study is needed.

Oral Presentation

Other

0359 **SYSTEMATIC REVIEW OF OCCUPATIONAL CHEMICAL EXPOSURES AND CARDIOVASCULAR DISEASES**

[1]Christer Hogstedt*, [1]Maria Albin, [2]Charlotte Hall, [1]Bengt Sjögren, [1,3]Töres Theorell. [1]Karolinska Institutet, Stockholm, Sweden; [2]SBU, Stockholm, Sweden; [3]Stockholm University, Stockholm, Sweden

Background A systematic review of the associations between occupational chemical exposures and cardiovascular diseases has been performed under management of Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU).

Methods Inclusion criteria: (i) epidemiology publication in English in peer-reviewed journal between 1970 and 2016, (ii) cohort studies with at least 50 exposed participants or case-control studies with at least 50+50 participants. Relevance and quality were assessed using predefined criteria. Level of evidence was assessed using the GRADE system. Consistency of findings was examined for a number of confounders and regarding the healthy worker effect when possible.

Results More than 8000 abstracts were screened. 162 articles of high or medium high scientific quality were finally included. There was moderately strong evidence (grade 3 out of 4) for a relationship between silica dust, engine exhaust and welding and IHD incidence. Limited evidence (grade 2) was found for arsenic, benz(a)pyrene, lead, dynamite, carbon disulphide, carbon monoxide, cutting fluids, TCDD, asbestos and tobacco smoke in the work environment. Results for stroke, cor pulmonale and high blood pressure will also be reported.

Conclusions This review identified several established associations, some less established and many knowledge gaps including lack of studies on women. Many chemical exposures have not been studied epidemiologically and there is often a shortage of exposure estimates, particularly concerning intensity and long-term exposure. A comprehensive risk analysis of chemical exposures must use social, environmental and experimental results as well.

Oral Presentation

Cardiovascular Disease

0360   OCCUPATIONAL EXPOSURE TO RESPIRABLE SILICA DUST IN MEN AND WOMEN AND RISK FOR ACUTE MYOCARDIAL INFARCTION

[1,2]Pernilla Wiebert*, [1]Nils Plato, [1]Maria Feychting, [1]Bengt Sjögren, [1,2]Annika Gustavsson, [1,2]Tomas Andersson, [1]Per Gustavsson. [1]*Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; [2]Centre for Occupational and Environmental Medicine, Stockholm County Council, Stockholm, Sweden*

Respirable silica dust is a common and serious occupational hazard to workers´ health. Inhalation causes inflammation which is a risk factor for cardiovascular disease, but few studies have confirmed a relationship. In the present study, we have investigated the risk of myocardial infarction in workers exposed to respirable silica dust, as well as differences in sensitivity based on gender.

The cohort consists of manual workers in the Swedish National Census in 1980 with information on demography and occupation (1960–1990). Information on hospital admissions for acute myocardial infarction and cause of death were obtained from nation-wide registers. A job-exposure matrix was used to assess lifetime occupational exposure. No smoking data was available.

Among manual workers ever exposed to respirable silica dust, the hazard ratio (HR) for acute myocardial infarction was 1.29 (95% Confidence Interval (CI) 1.15–1.46) for women, and 1.02 (95% CI 1.00–1.04) for men, respectively. In the highest quartile of cumulative exposure the HR was 1.66 (95% CI 1.27–2.18) for women, and 1.06 (95% CI 1.03–1.10) for men, respectively. We found a dose-response relationship between exposure and disease. The population etiologic fraction of disease for women was 11%. In absolute numbers this corresponds to 7 extra cases/10000 person years among exposed women in the highest exposed group.

In conclusion, occupational exposure to respirable silica dust was in this study related to an increased risk for acute myocardial infarction in women, indicating a slightly increased sensitivity of the exposed women.

Oral Presentation

Cancer

0361   A 49 YEAR FOLLOW-UP OF MORTALITY IN THE BRITISH RUBBER INDUSTRY

[1]Will Mueller*, [1]Damien McElvenny, [1]Peter Ritchie, [1,2]John Cherrie, [3]Mira Hidajat, [4]Raymond Agius, [5]Andrew Darnton, [3]Frank de Vocht. [1]*Institute of Occupational Medicine, Edinburgh, UK; [2]Heriot Watt University, Edinburgh, UK; [3]University of Bristol, Bristol, UK; [4]University of Manchester, Manchester, UK; [5]Health and Safety Executive, Bootle, UK*

Rubber workers in Great Britain were historically exposed to various carcinogenic substances, including β-naphthylamine, which was removed from industrial processes in 1949. The Health and Safety Executive (HSE) initiated in 1967 a prospective occupational cohort study of British rubber industry workers, including men 35 years of age and older, to examine cancer mortality (n=40 867, representing 381 factories). Findings from a 10 year follow-up of that cohort suggested excess mortality from cancers of the bladder, lung, and stomach, which differed by exposure to naphthylamines, as well as by industry sector and job code.

The purpose of this analysis is to extend mortality follow-up through to 2015, allowing an assessment of cancers in older ages and with longer latency periods. As well as headline Standardised Mortality Ratios (SMRs) for the cancer subtypes previously investigated, we will present mortality risks for a range of causes including leukaemia, multiple myeloma, circulatory and respiratory diseases. We will use England and Wales reference rates to compare mortality by employment duration and sector in the rubber industry. Preliminary analysis of a majority subset of the cohort (n=34,595) to 2015 identified an elevated all cause SMR of 1.11 (95%CI 1.10–1.12). More detailed results from this multi-decade follow-up of workers from rubber manufacturing will provide valuable insights into cancer mortality risks for exposed occupational populations, both in the UK and elsewhere.

Oral Presentation
Risk Assessment

RISK OF PLEURAL MM AND RESIDUAL ASBESTOS BURDEN IN THE LUNG: A RETROSPECTIVE CASE-CONTROL STUDY

[1,2]Paolo Girardi*, [4]Anna Somigliana, [5]Pietro Gino Barbieri, [3]Enzo Merler. [1]Venetian Mesothelioma Registry, Occupational Health Unit, Padua, Italy; [2]SER Epidemiological Department, Veneto Region, Padua, Italy; [3]Promotion and Development of Hygiene and Public Health, Venice, Italy; [4]Lombardy Environmental Protection Agency (ARPA), Centre of Electronic Microscopy, Milan, Italy; [5]Mesothelioma Register of Brescia, Occupational Health Unit, Local Health Authority, Brescia, Italy

Introduction Results of Malignant Pleural Mesothelioma (MPM) occurrence (mortality and incidence) by cumulative exposure dose clearly showed a proportional relation of MPM risk with dose, confirmed among studies by fibre burden. We evaluated the association between residual fibre content and MPM risk by circumstance of asbestos exposure.

Methods and materials Lung samples obtained from pleuro-pneumonectomies or autopsies (349 MPMs, and 41 controls) among subjects investigated for probability and circumstance of asbestos exposure were examined through Scanning Electron Microscopy; 291 cases had an occupational asbestos exposure, 38 MPMs a non-occupational exposure (familiar or environmental), whereas among 20 MPM an asbestos exposure was not identified. The MPM risk was evaluated by means of Odds Ratio (OR).

Results The residual asbestos fibre burden was higher among MPMs occupationally exposed (Geometric Mean:2.10 Million fibres/gram of dried tissue; 95% CI:1.5–2.58) in comparison with non-occupational (GM:0.66 Mff/gdt; 95% CI:0.47–0.95) or with unknown exposures (GM:0.59 Mff/gdt; 95% CI:0.34–1.03) and controls (GM:0.26 Mff/gdt; 95% CI:0.20–0.34). Among occupationally exposed, the MPM risk increased according to the asbestos fibre burden reaching an OR of 36.8 (95%CI:11.9–113.5) for concentrations higher than 1 Mff/g dt, compared to the reference level (<0.25 Mff/gdt). Higher ORs were observed at any concentration of amphibole fibres in comparison those for chrysotile fibres.

Conclusions The MPM risk was strongly associated to the residual asbestos fibre lung burden. The MPM risk due to non-occupational exposure shows a magnitude comparable with that with unknown asbestos exposures. The residual lung burden of chrysotile is strongly influenced by clearance and time since exposures ceased.

Oral Presentation
Other

OCCUPATIONAL EXPOSURE TO HIGH FREQUENCY ELECTROMAGNETIC FIELDS AND RISK OF BRAIN TUMOURS IN THE INTEROCC STUDY

[1,3]Javier Vila*, [1,4]Michelle C Turner, [1,2]Esther Gracia-Lavedan, [1,2]Jordi Figuerola, [5]Joseph D Bowman, [6]Laurel Kincl, [7]Lesley Richardson, [8]Geza Benke, [9]Sarah Fleming, [10]Martine Hours, [4]Daniel Krewski, [11]Dave McLean, [12]Marie-Elise Parent, [13,14]Siegal Sadetzki, [15]Klaus Schlaefer, [15]Brigitte Schlehofer, [16]Joachim Schüz, [7]Jack Siemiatycki, [17,18]Martie van Tongeren, [1,3]Elisabeth Cardis. [1]Barcelona Institute for Global Health (ISGlobal), Barcelona, Spain; [2]Universitat Pompeu Fabra (UPF), Barcelona, Spain; [3]CIBER Epidemiología y Salud Pública (CIBERESP), Madrid, Spain; [4]McLaughlin Centre for Population Health Risk Assessment, University of Ottawa, Ottawa, Canada; [5]National Institute for Occupational Safety and Health (NIOSH), Ohio, USA; [6]Oregon State University (OSU), Corvallis, Oregon, USA; [7]University of Montreal Hospital Research Centre (CRCHUM), Montreal, Canada; [8]School of Public Health and Preventive Medicine, Monash University, Melbourne, Australia; [9]Faculty of Medicine and Health, University of Leeds, Leeds, UK; [10]Université de Lyon, Institut national de Veille Sanitaire, Unité Mixte de Recherche Épidémiologique et de Surveillance Transports Travail Environnement, Lyon, France; [11]Massey University, Wellington, New Zealand; [12]INRS-Institut Armand-Frappier, Université du Québec, Laval, Canada; [13]Cancer and Radiation Epidemiology Unit, Gertner Institute, Chaim Sheba Medical Centre, Tel-Hashomer, Israel; [14]Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel; [15]German Cancer Research Centre, Heidelberg, Germany; [16]International Agency for Research on Cancer (IARC), Section of Environment and Radiation, Lyon, France; [17]Institute of Occupational Medicine (IOM), Edinburgh, UK; [18]Centre for Occupational and Environmental Health, Centre for Epidemiology, University of Manchester, Manchester, UK; [19]INTEROCC Study Group, Barcelona, Spain

Introduction The International Agency for Research on Cancer classified radiofrequency (RF) electromagnetic fields (EMF) as *possibly carcinogenic* based on limited evidence in human studies of cell phone use and in animal experiments, while occupational evidence was found *inadequate* due in part to limitations in exposure assessment. This study assesses possible associations between occupational exposure to RF or intermediate frequency (IF) EMF in INTEROCC participants using novel exposure assessment methodologies.

Methods A plausible index of cumulative exposure to RF and IF EMF was calculated using a source-exposure matrix and detailed interviews on work with or nearby EMF sources, both overall and in specific exposure time windows. Conditional logistic regression was used to investigate associations with glioma and meningioma risk.

Results Only ~10% (n=769) of participants (n=7,330) were ever exposed to RF and ~1% (n=44) to IF EMF sources. Overall, there was no positive association between exposure to

RF or IF EMF and glioma or meningioma risk, and the majority of odds ratios (ORs) were <1.0. Some elevated ORs were observed in the highest exposure quantile (90th) for both RF electric fields and IF magnetic fields in the 1–4 year exposure time window for glioma, but were not statistically significant.

Conclusions Lifetime occupational RF and IF exposures based on our index were not associated with the risk of glioma or meningioma. Further work should include more exposed participants and examine alternative exposure or dose indices such as those incorporating thresholds on biological effects or combinations of static and RF magnetic fields.

Oral Presentation

Cancer

0364 RISK OF PROSTATE CANCER IN FIREFIGHTERS: A META-ANALYSIS

[1,2]Jeavana Sritharan*, [3]Marie-Elise Parent, [1]Manisha Pahwa, [1,4]Shelley Harris, [4]Donald Cole, [1,4]Paul Demers. [1]Occupational Cancer Research Centre, Cancer Care Ontario, Toronto, Ontario, Canada; [2]Institute of Medical Science, University of Toronto, Toronto, Ontario, Canada; [3]INRS-Institut Armand-Frappier, University of Quebec, Laval, Quebec, Canada; [4]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada

Objectives Although epidemiological studies have generally shown inconsistent findings for prostate cancer risk and occupation, some associations with firefighting have been observed. Firefighters are exposed to harmful substances that include known carcinogens. This meta-analysis aimed to synthesise the available published evidence on prostate cancer risk in firefighters.

Methods A comprehensive search of PubMed and Web of Science was conducted for all epidemiological studies on firefighting and prostate cancer published in English from 1980–2017. Studies that reported on risk estimates for incidence and/or mortality with corresponding ever/never employment were extracted from included studies. Meta risk estimates (mRE) were determined in a random effects model and between-study heterogeneity was evaluated based on I^2 values.

Results Of the 101 studies retrieved, 25 firefighter studies were included in this analysis. Ever employment as a firefighter, based on results from all studies, was associated with a 15% increase in prostate cancer risk (95% CI 1.04–1.27, I^2=71%). By study design, the mRE was 1.14 (95% CI 1.03–1.26, I^2=67%) for 18 cohort studies and 1.22 (95% CI 0.90–1.67, I^2=82%) for 5 case-control studies. Incidence studies had an mRE of 1.17 (95% CI 1.07–1.28, I^2=74%) and mortality studies had an mRE of 1.12 (95% CI 0.92–1.36, I^2=50%). For linkage and registry-based studies, an mRE of 1.19 (95% CI 1.05–1.33, I^2=61%) was observed. Estimates showed moderate to substantial heterogeneity.

Conclusions This analysis showed evidence of a small excess risk of prostate cancer in firefighters across study designs. Further evaluation of heterogeneity, potential biases, and quality assessment are currently underway.

Poster Presentation

Burden of Disease

0365 ESTIMATION OF THE BURDEN OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE DUE TO OCCUPATION IN GREAT BRITAIN

[1]Sally Hutchings*, [1]Lesley Rushton, [2]Steven Sadhra, [3,4]David Fishwick. [1]Imperial College London, Department of Epidemiology and Biostatistics, London, UK; [2]Occupational and Environmental Medicine, College of Medical and Dental Sciences, University of Birmingham, Birmingham, UK; [3]Health and Safety Laboratory, Buxton, UK; [4]Infection, Immunity and Cardiovascular Disease, University of Sheffield, Sheffield, UK

Introduction We have estimated the burden of COPD for deaths and prevalence due to occupational exposures in Britain using published literature and available national data plus a population based job exposure matrix (ACEJEM). The prevalence estimate avoids underestimation of the burden as estimates of COPD deaths, or hospitalisations, only account for the most serious cases.

Methods We used population attributable fractions (PAFs), requiring estimates of the population exposed to airborne pollutants at work, derived from 2001 Census data by job code matched to a JEM giving proportions exposed and average levels of exposure to pollutants including vapours, gases, dusts, fumes (VGDF) by UK SOC2000 job code. Exposures were matched to the best currently available population-based risk estimates. We estimated prevalent COPD PAFs using a novel age-time window approach to estimate prevalent numbers exposed, and deaths from COPD which requires numbers ever exposed were estimated using a risk exposure period methodology, taking into account age.

Results The PAF for prevalent COPD due to occupational exposure to VGDF was 18.7% for men, 8.0% for women and 11.5% overall giving 22 700 cases in men and 13 400 in women. Equivalent PAFs for COPD deaths, based on exposure 30+ years before 2010, were 18.3%/6.1%/12.3% (2,480 deaths in men, 790 in women). Prevalent PAF estimates which included a 30 year onset lag and mortality PAFs assuming 0–80 year latencies produced very similar results.

Conclusions The novel approach, making best use of available data, provides burden estimates which may inform strategies for reducing workplace COPD risks.

Oral Presentation

Burden of Disease

0366 COMPARING ALTERNATIVE METHODS OF ESTIMATING FUTURE DISEASE BURDEN DUE TO OCCUPATION

[1]Sally Hutchings*, [1]Lesley Rushton, [2]Martie van Tongeren, [3]Damien McElvenny. [1]Imperial College London, Department of Epidemiology and Biostatistics, London, UK; [2]University of Manchester, Manchester, UK; [3]Institute of Occupational Medicine, Edinburgh, UK

Occupational burden of disease studies to identify priorities for regulatory interventions, and to estimate the impact of these interventions, are becoming more frequent. There are various ways to estimate burden of disease in a population, each method's appropriateness depends on available data and the research question to be answered. We review the available methods, and assess their usefulness for predicting future occupational disease burden and for testing population-level interventions.

There are several approaches to disease burden estimation: Population Attributable Fraction (PAF) applied to incident or prevalent disease cases, Lifetime Risk/Future Excess Fraction and Disease Projection (Age-Period-Cohort and structural model/'g' formula) approaches. The PAF takes into account past exposures, with intervention effects estimated from the point of intervention onwards. Lifetime risk estimates disease that workers, currently exposed to a disease-causing agent, will contract in their lifetimes; no latency assumptions are required, with interventions assumed to take effect immediately. Disease projection methods use current and past disease rates to predict rates into the future. The 'g-formula', a generalised regression model, is used to estimate the joint distribution of outcome and risk factors; Monte Carlo methods can then simulate disease risk following intervention, compared to no intervention. The methods are tested on examples of occupational disease/exposure pairings, including lung cancer from respirable crystalline silica exposure and COPD from vapour, gases, dust and fume exposure, and results are compared.

The results will provide critical information on the sensitivity of some examples of occupational burden of disease and health impact studies on the modelling approach.

Poster Presentation

Respiratory

| 0367 | THE DIAGNOSIS OF PNEUMOCONIOSIS USING GAS CHROMATOGRAPHY/MASS SPECTROMETRY |

[1,2]Hsiao-Yu Yang*, [3]Ruei-Hao Shie, [1]Che-Jui Chang, [1,2]Pau-Chung Chen. [1]*Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University College of Public Health, Taipei, Taiwan*; [2]*Department of Environmental and Occupational Medicine, National Taiwan University Hospital, Taipei, Taiwan*; [3]*Green Energy and Environmental Research Laboratories, Industrial Technology Research Institute, Hsinchu, Taiwan*

Breath metabolites could reflect pathogenic events at the respiratory level and might be used to screen for the presence of occupational environmental lung diseases. The objective of this study was to estimate the accuracy of breath analysis for the diagnosis of pneumoconiosis using gas chromatography/mass spectrometry (GC/MS). A prospective study was design. We screened 200 subjects from a cohort of stone workers and their family members. Diagnosis of pneumoconiosis was made based on occupational history, the presence of abnormal pulmonary function, and parenchymal abnormalities consistent with pneumoconiosis on chest X-rays. After excluding subjects with asthma and those using steroids or taking nonsteroidal anti-inflammatory drugs on the examination day, we conducted a case-control study that enrolled 25 cases of pneumoconiosis and 154 controls. Breath and environmental air samples were collected and analysed by GC/MS. After subtraction of environmental volatile organic compounds (VOCs), the concentrations of VOCs in breath were used to discriminate between pneumoconiosis and controls. The discrimination accuracy was validated by both leave-one-out cross-validation and 5-fold cross-validation. The results showed that 94.4% of subjects were accurately classified and the cross-validated accuracy was 88.8%. The area under curve (AUC) for the diagnosis of pneumoconiosis was 0.9 (95% CI=0.8—1.0). Mean AUC of 5-fold cross-validation was 0.9. Breath test might have potential in the screening for pneumoconiosis; however, a multi-centre study is warranted to establish a reliable model and all procedures must be standardised before clinical application.

Oral Presentation

Methodology

| 0368 | IMPROVING INCIDENCE RATES OF WORK-RELATED ILL-HEALTH CALCULATED FROM GENERAL PRACTICE |

Louise Hussey*, Matthew Gittins, Roseanne McNamee, Raymond Agius. *The University of Manchester, Manchester, UK*

Introduction The calculation of incidence rates of work-related ill-health (WRIH) is essential when assessing employment sectors at risk. The Health and Occupational Reporting network in General Practice (THOR-GP) collects information on WRIH from approximately 250 GPs. To calculate rates, GP numerator data has to be divided by a compatible denominator.

Aims To formulate the best methods of determining incidence rates from THOR-GP data

Methods The THOR-GP denominator is the registered population of all participating GPs' practices. Census data linked to practice postcodes were used to establish how the population was employed; practice list data were used to estimate the size of the population and adjusted for GP participation. Numerator data (incidence cases of WRIH) from 2006–2015 were adjusted for response rates and time sampling frequency. Numerator data were then divided by the denominator and rates calculated per 1 00 000 persons employed per annum

Results The incidence rate of WRIH (from 6491 numerator cases) was 1350 per 1 00 000 persons employed per annum. Musculoskeletal disorders had the highest rates (640) followed by mental ill-health (516). Rates for musculoskeletal disorders were highest in agriculture (2232) and construction (1048) and for mental ill-health, in financial services (1113) and public administration/defense (1124).

Conclusion All employed persons have access to a GP therefore calculating incidence rates from GP data allow identification of industries/occupations at higher risk of WRIH Using postcode-based census data to characterise the denominator (therefore specifically related to the numerator) enables rates to be calculated with greater accuracy compared with using national employment data.

Oral Presentation
Chemicals

| 0370 | SYSTEMATIC REVIEW AND META-ANALYSIS OF OCCUPATIONAL EXPOSURE TO STYRENE AND LUNG CANCER |

[1,2]Nilmara de Oliveira Alves, [1]Dana Loomis*, [1]Neela Guha. [1]IARC, Lyon, France; [2]University of São Paulo, São Paulo, Brazil

Styrene is widely used in industrial settings, leading to important occupational exposure. Currently it is classified by IARC as "possibly carcinogenic to humans" based on limited evidence of an association with lymphohaematopoietic cancers. Several recent studies suggest increased risk of lung cancer may be associated with exposure to styrene. We conducted a systematic search and a meta-analysis of epidemiologic studies of exposure to styrene and incidence or mortality of lung cancer. Of 167 papers retrieved, 50 were found to provide pertinent data after screening the abstracts; 42 of these were occupational cohort studies conducted in 3 main work settings: chemical production, reinforced plastics manufacturing, and styrene-butadiene rubber production. There was significant overlap in the populations among published papers, which reported data from 7 separate cohorts and one pooled international cohort, some parts of which were also published separately. Meta-analysis showed an excess risk of lung cancer among workers ever exposed to styrene (RR 1.14, 95% CI 1.04–1.24, $I^2$63%). The association was stronger when the analysis was limited to the reinforced plastics industry, where co-exposures are less important than in other industries (RR 1.20, 95% CI 1.10–1.31, $I^2$72%). Meta-analysis of exposure-response relations in the subset of studies that reported quantitative or categorical exposure data are ongoing and will be reported.

Oral Presentation
Shift Work

| 0371 | NIGHT SHIFT WORK AND PROSTATE CANCER RISK: RESULTS FROM THE EPICAP STUDY |

[1]Gaëlle Wendeu-Foyet*, [1]Sylvie Cénée, [1]Soumaya BenKhedher, [2]Xavier Rébillard, [3]Brigitte Trétarre, [4]Virginie Bayon, [4]Damien Léger, [1]Marie Sanchez, Florence Menegaux1[1]. [1]Université Paris-Saclay, Université Paris-Sud, CESP (Centre for Research in Epidemiology and Population Health), Inserm, Team Cancer and Environment, Villejuif, Ile-de-France, France; [2]Service Urologie, Clinique Beau Soleil, Montpellier, Occitanie, France; [3]Registre des Tumeurs de l'Hérault, Montpellier, Occitanie, France; [4]Centre du Sommeil et de la Vigilance, Hôtel Dieu, APHP, Université Paris Descartes, Sorbonne Paris Cité, Paris, France; VIFASOM, équipe d'accueil Vigilance Fatigue et Sommeil, Université Paris Descart, Paris, Ile-de-France, France

Background In 2007, the International Agency for Research on Cancer classified "shift work leading to a disruption of circadian rhythm" as probably carcinogenic to humans based on sufficient evidence from experimental animal models but limited evidence from epidemiological studies in humans. In this context, we investigated the role of night shift work in prostate cancer based on data from the EPICAP study.

Methods EPICAP is a French population-based case-control study including 819 incident prostate cancer cases and 879 frequency matched controls. Cases and controls were face-to-face interviewed on their lifetime occupational history with details on work schedules for each job held for ≥6 months. Night work was defined as having performed permanent or rotating night shifts for at least 270 hours/year or 3 nights/month during ≥1 year.

Results Permanent and rotating night work were not associated with prostate cancer (OR=0.99 [0.78–1.26], OR=0.89 [0.66–1.20], respectively]). However, permanent night work was associated with aggressive prostate cancer (OR=1.40 [0.97–2.03]), especially for a duration greater than 25 years (1.89 [1.15–3.11]). Interestingly, an association between night work and prostate cancer risk was observed for men with an evening chronotype (OR=1.82 [1.01–3.28]), especially for rotating night work (OR=2.34 [1.02–5.35]).

Conclusion Our results suggest that night work may be associated with prostate cancer, particularly in men with aggressive prostate cancer or with an evening chronotype. Further investigations are needed to confirm our findings and to take into account a potential influence of an individual susceptibility to circadian genes in this association.

Oral Presentation
Cancer

| 0372 | OCCUPATIONAL EXPOSURE TO PAH AND LUNG CANCER RISK IN THE SYNERGY PROJECT |

[1]Neela Guha*, [1]Ann Olsson, [2]Roel Vermeulen, [2]Hans Kromhout, [2]Lutzen Portengen, [1]Kurt Straif, [1]on behalf of The SYNERGY Study Group. [1]IARC, Lyon, France; [2]Utrecht University, Utrecht, The Netherlands

Objective Using data from the SYNERGY project, we evaluated the association between occupational exposure to polycyclic aromatic hydrocarbons (PAH) and the risk of lung cancer, adjusted for tobacco smoking.

Methods For 16 901 lung cancer cases and 20 965 matched population or hospital controls, PAH exposure was estimated using a quantitative general population job-exposure matrix ('SYNJEM') based on five-digit ISCO-68 codes (4639 cases, 4713 controls ever exposed). Odds ratios (ORs) and 95% confidence intervals (95% CI) were estimated using unconditional logistic regression models adjusted for age, sex, study centre, smoking behaviour, and ever employment in an occupation with known lung cancer risk.

Results We observed a modest increased risk of lung cancer associated with occupational exposure to PAHs according to various exposure metrics (ever/never, duration, cumulative dose, time since last exposure). The ORs for ever exposure to PAH were 1.09 (95%CI, 1.04–1.15) overall, 1.08 (95%CI, 1.02–1.15) in men, 1.20 (95%CI, 1.05–1.38) in women, and 1.04 (95%CI, 0.88–1.22) in never smokers. These results are further supported by significant exposure response-relationships (p-value for trend <0.05 for years of employment and cumulative exposure [(BaP) μg/m3-years]). When stratified by

histological subtype, increased risks and positive exposure response-relationships were apparent only for squamous cell carcinoma and small cell lung cancer.

Conclusions Our pooled analysis suggests that occupational exposure to PAH is associated with a modest increase in the risk of lung cancer, after adjustment for tobacco smoking and exposure to other occupational lung carcinogens.

Oral Presentation

Risk Assessment

| 0373 | ASSESSING CANCER HAZARDS THROUGH EVIDENCE INTEGRATION - WHY IS IT IMPORTANT? |

Neela Guha. *IARC, Lyon, France*

Hazard identification involves the qualitative evaluation of scientific evidence on the association between environmental and occupational exposures and human cancer. Important policy decisions to reduce exposure to carcinogens in the workplace have resulted from hazard assessments conducted by authoritative bodies worldwide. Occupational cancer hazards have been successfully identified using published guidelines that integrate published evidence from studies with observational epidemiologic as well as experimental designs. This talk will describe methods for prioritising and integrating evidence across disciplines for hazard assessment and highlight examples where this has been important for protecting the health of workers.

Oral Presentation

Pesticides

| 0374 | MULTI-CRITERIA DECISION ANALYSIS (MCDA) COMPARING AGRICULTURAL PRODUCTION METHODS: PROTOCOL FOR ANALYSING BRITISH COLUMBIA (BC) BLUEBERRIES AND ECUADOR BANANAS |

Rami El-Sayegh*, Jerry Spiegel, Craig Mitton. *University of British Columbia, Vancouver, Canada*

Background Expansion of agro-industrial approaches has raised concerns over occupational and environmental exposures, for example through intensive agrochemical use. Agricultural production decisions are influenced by assumptions regarding unit-specific criteria of 'productive efficiency' (revenues and yields), with limited attention to the association between costs and consequences and broader health determinants (sustainability and health effects). This study applies a population health perspective to investigate the occupational and environmental consequences of production options by incorporating a *comprehensive* range of criteria. Specifically we investigate, in partnership with producers: what is the "best" agricultural production method for producing bananas in Ecuador and blueberries in BC?

Methods Two MCDAs per jurisdiction (Ecuador and BC) are used to calculate aggregate scores to rank production methods (agro-industrial, agro-ecological, and mixed-methods). The first MCDA is an 'actual' model, representing real-world decisions (constrained producer choices). The second MCDA is a 'preference' model representing no constraints (producer preferences). Additionally, discrete choice modelling is used to simulate hypothetical scenarios of components (e.g. policy instruments) that would sway producers towards their preferences, with sensitivity analyses to consider the implications.

Results If agro-industrial production is *not* the highest rank, a case can be made for more sustainable agriculture. The sensitivity of how decisions could move towards sustainable solutions that produce less health consequences and policies to facilitate such pursuit are assessed.

Conclusions As producers express greater concern for sustainability and certification that recognise that "good practices" are applied, MCDA suggests a way that evidence can be collected and analysed to support decision-making, transparently and comprehensively.

Oral Presentation

Policy/Impact

| 0375 | EPIDEMIOLOGIC EVIDENCE FOR RISK ASSESSMENT – HOW SUCCESSFUL HAVE WE BEEN? |

Dana Loomis. *IARC, Lyon, France*

Studies of workers have played a central role in identifying human carcinogens. For more than a third of the approximately 100 agents classified as carcinogenic (Group 1) by IARC with sufficient evidence in humans, the critical evidence was provided by occupational epidemiologic studies. Data from occupational studies has also contributed important evidence to identifying over 300 possibly or probably carcinogenic agents. Nevertheless, the contribution of occupational epidemiology could be improved. Beyond clear reporting of methods and results, the greatest need is for quantitative assessment of exposure and analysis of exposure-response relations. The political context of carcinogen assessment imposes barriers of a different kind. Actions by actors with vested interests to intimidate scientists, stifle debate and derail risk assessment are well documented. Recent evaluations of the herbicide glyphosate will be discussed as a case example.

Poster Presentation
Respiratory

Thomas Winski*, Will Mueller, Richard Graveling. *The Institute of Occupational Medicine, Edinburgh, UK*

Certain respiratory protective equipment (RPE) must fit tightly to the face of the wearer to provide effective protection, yet it is still unclear to what extent facial features affect mask performance. This study aimed to assess how facial dimensions affect the efficacy of a given RPE.

We tested a single RPE (3M 8835+) on participants (n=262) who consistently wear RPE at work. Three facial dimensions were measured to limit the demands placed on test participants: face length, face width, and jaw width. Mask test and facial measurements were conducted by the same researcher using the HSE standardised face fit testing protocol. The participants represented 22 different industries, the majority (90%) of whom were male. Fit factor (FF), representing the ratio of the exposure concentration outside to inside a mask, used to assess mask fit, with FF >100 constituting a successful fit.

Although 94.7% (n=248) of the study population achieved a successful fit, there was considerable variation among test results: FF median=415; Interquartile Range (IQR)=294–604. FF was log-transformed for regression analyses, which identified FF increases of 11.9% (p<0.05) and 18.3% (p<0.005) per 10% increase in the ratio of face length to jaw width and face width to jaw width, respectively.

These results help understand the impact face shape can have on the effective seal achieved by RPE and could help inform mask design to maximise impacts for respiratory health. Further analysis of the data may expand on the impact of face shape on RPE seal during the specific face fit test exercises.

Poster Presentation
Methodology

[1]Andreas Neophytou*, [1]Sadie Costello, [1]Daniel Brown, [1]Elizabeth Noth, [1]Sa Liu, S. [1]Katharine Hammond, [2]Mark Cullen, [1]Ellen Eisen. *[1]Division of Environmental Health Sciences, School of Public Health, University of California, Berkeley, Berkeley, CA, USA; [2]Department of Medicine, Stanford University, Palo Alto, CA, USA*

Workers in the aluminium industry are widely exposed to particulate matter (PM) during several stages in the manufacturing process at exposure concentrations several orders of magnitude higher than environmental standards. In this study we investigate the relationship between occupational exposures to fine particulate matter (with an aerodynamic diameter less than 2.5 μm PM$_{2.5}$) in a cohort of aluminium workers, while adjusting for the time varying confounding by underlying health status, characteristic of the healthy worker survivor effect. To address this time-varying confounding, we applied the parametric g-formula to longitudinal pulmonary function data from 5271 actively employed aluminium workers in the United States followed between 1996 and 2013. We adjusted for time-varying health status using a composite risk score based on health insurance claims. We simulated values for forced expiratory volume in one second (FEV$_1$) between ages 18 and 63, under hypothetical interventions on exposures to PM$_{2.5}$; we then compared the trajectory of FEV1 decline with age under each intervention to the observed natural course (that was actually observed). Under a hypothetical intervention limit for annual average daily exposures to PM2.5 of 175 μg/m^3 (corresponding to the 25th percentile of observed exposures), the average FEV$_1$ at age 63 was 37.1 mL higher (95% confidence interval (CI): 1.8, 72.4) than that actually observed, corresponding to 1.2% of the average predicted FEV$_1$. Our results suggest that occupational PM$_{2.5}$ exposure in the aluminium industry accelerates FEV$_1$ decline. Regulatory measures may mitigate loss of pulmonary function over time in the industry.

Oral Presentation
Cancer

[1,2]France Labrèche*, [3]Chaojie Song, [3]Manisha Pahwa, [4,5]Cheryl E Peters, [3,6]Victoria H Arrandale, [7,10]Chris B McLeod, [7,5]Hugh W Davies, [2,8]Jérôme Lavoué, [3,9]Joanne Kim, [3,6]Paul A Demers. *[1]Institut de recherche Robert-Sauvé en santé et en sécurité du travail, Montreal, QC, Canada; [2]School of Public Health, Université de Montréal, Montreal, QC, Canada; [3]Occupational Cancer Research Centre, Cancer Care Ontario, Toronto, ON, Canada; [4]Department of Health Sciences, Carleton University, Ottawa, ON, Canada; [5]CAREX Canada, Simon Fraser University, Vancouver, BC, Canada; [6]Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada; [7]School of Population and Public Health, University of British Columbia, Vancouver, BC, Canada; [8]Centre de recherche du Centre hospitalier de l'Université de Montréal, Montreal, QC, Canada; [9]Department of Epidemiology and Biostatistics, McGill University, Montreal, QC, Canada; [10]Institute for Work and Health, Totonto, ON, Canada*

Objective To estimate the attributable fraction (AF) and number of annual incident cancers among women due to occupational exposures, as part of the Canadian Burden of Occupational Cancer study.
Methods Attributable fractions, calculated with Levin's equation, used estimates of proportions of workers ever exposed (PrE) 10–50 years before diagnosis, and point/range estimates of the exposure-cancer association from the epidemiologic literature. Numbers of attributable cancers were calculated by applying AFs to 2011 Canadian Cancer Registry data. Historical exposure was derived from CAREX Canada estimates of prevalence and level of exposure. PrE was estimated from the Canadian census, labour force survey and survival probabilities. Analyses focused on 12 carcinogens with ≥5000 exposed women.
Results The highest AF among women was for mesothelioma (AF=40%); 1.6% of lung and 2.6% of ovarian cancers were also attributed to asbestos. The largest number of attributable cancers was due to shift work, a probable cause of breast

cancer (AF=2.0%–5.2%, 460–1180 cases), followed by solar radiation, with 415 skin cancers (AF=1.3%). Workplace exposure to environmental tobacco smoke (ETS) was associated with 5.8% (~60 cases) of lung cancers among never-smoking women, and radon exposure in buildings resulted in almost 80 lung cancers (AF=0.7%). AFs were overall higher for men, but similar between men and women for radon and ETS among never smokers.

Conclusion In burden studies, assessing the impact of uncertainty in exposure and risk estimates is a challenge. The impact is, however, amplified among women because estimates are derived from studies primarily on male workers.

Oral Presentation

Dusts and Fibres

0380 | **MESOTHELIOMA MORTALITY IN GREAT BRITAIN: AN UPDATED ANALYSIS OF TRENDS BY GEOGRAPHICAL AREA AND OCCUPATION 1981–2014**

[1]Kevin Shepherd, [2]Damien McElvenny, [1]Andrew Darnton*. [1]Health and Safety Executive, Bootle, UK; [2]Institute of Occupational Medicine, Edinburgh, UK

Background mesothelioma mortality rates in GB have increased tenfold over the last four decades and are currently the highest of any country worldwide. The mesothelioma register contains all deaths mentioning mesothelioma and includes area of residence and occupation of the deceased.

Aim to update descriptive analyses of mortality trends by geographical area and last occupation of the deceased to provide evidence about past sources of mesothelioma risk in the GB population.

Methods Standardised Mortality Ratios (SMRs) were calculated for local and unitary authority areas; Proportional Mortality Ratios (PMRs) were calculated for categories derived from Standard Occupation Classification coding of job titles from death certificates. Temporal trends in SMRs and PMRs over the period 1981–2014 were examined using Generalised Additive Models (GAMs).

Results the influence of geographically-specific sources of past asbestos exposure is still seen in recent mesothelioma mortality rates; areas with the highest SMRs in males tend to be those known to contain large industrial sites that used asbestos such as shipyards. However, the strong effect of asbestos exposures in jobs associated with construction work – which would have been geographically less heterogeneous – is seen in analyses by occupation, and temporal trends suggest that such exposures continued for longer than those associated with specific locations.

Conclusions these results reflect the legacy of widespread industrial asbestos use in GB and particularly emphasise the effect of exposures within the building industry which are likely to have continued after those in specific industries such as shipbuilding and manufacturing were substantially reduced.

Oral Presentation

Working Conditions

0381 | **THE POTENTIAL IMPACT OF THREE WORKPLACE ACTIONS ON RETURN TO WORK AFTER A WORK-RELATED MUSCULOSKELETAL OR PSYCHOLOGICAL INJURY**

[1,2]Peter Smith*, [2]Malcom Sim, [3]Anthony LaMontagne, [4]Rebbecca Lilley, [1]Sheilah Hogg-Johnson. [1]Institute for Work and Health, Toronto, Ontario, Canada; [2]Monash University, Melbourne, Victoria, Australia; [3]Deakin University, Melbourne, Victoria, Australia; [4]University of Otago, Otago, New Zealand

The objective of this study was to examine the impact of three workplace actions on return to work (RTW) following a musculoskeletal (MSK) or psychological injury. The three workplace actions were: a positive supervisor or co-worker response at the time of injury; a low stress interaction with the workplace RTW coordinator; and an offer of modified duties. We used a longitudinal cohort of 869 Victorian workers' compensation claimants. Respondents were interviewed at baseline (approximately 4 months after injury), and again 6 and 12 months later. Our analytical sample was 703 respondents who had complete information on all workplace factors and potential covariates. Of our sample, 40% of respondents reported all three positive workplace actions and 12% reported none of the positive actions. Using a potential outcomes modelling approach, we estimated difference in RTW rates at baseline, 6 months and 12 months if all respondents received all positive actions, versus all respondents received no positive actions. Inverse probability weights were used to balance the sample in relation to covariates including respondent age, sex, injury time, time since injury, workplace size, pre-injury job autonomy and pre-injury physical demands at work. At baseline, if all respondents received all three workplace actions, 51% of respondents would have sustained RTW compared to 22% if all respondents received none of the actions. At 6 months the comparable rates were 73% versus 46%, and 67% versus 50% at 12 months. Our study demonstrates the importance of the workplace actions on RTW rates at multiple points following injury.

Oral Presentation

Injuries

0382 | **INCREASING MALE/FEMALE INEQUALITIES IN RATES OF WORKPLACE VIOLENCE IN ONTARIO BETWEEN 2002 AND 2014: A COMPARISON OF TWO DATA SOURCES**

[1,2]Peter Smith*, [1]Cynthia Chen. [1]Institute for Work and Health, Toronto, Ontario, Canada; [2]Monash University, Melbourne, Victoria, Australia

Literature examining male/female differences in rates of workplace violence has produced mixed findings. This study examined trends in rates of workplace violence using two population level data sources. These were: workers' compensation claims for assaults that required time off work; and emergency department visits for assaults or accidental contact from another person, where the treating physician determined that the payer should be workers' compensation. For both data sources, denominator information of the population at risk was generated by sex, age groups and time period using the Labour Force Survey.

Over the period 2002 to 2014 rates of assault among men remained stable, from 31.5 per 100,000 FTEs to 32.5 per 100,000 FTEs. Conversely among women rates of lost-time claims due to workplace violence increased from 38.9 per 100,000 FTEs to 59.1 per 100,000 FTEs - an absolute increase of 20.2 assaults per 100,000 FTEs, and a relative increase of 52%. These divergent trends were mirrored in the emergency department records, with rates of ED presentations among men remaining stable between 2004 and 2014 (38.2 to 39.8 per 100,000 FTEs); while among women rates of presentation increased from 34.9 per 100,000 FTEs to 52.9 per 100,000 FTEs - a relative increase of over 50%. In both time periods rates of assaults were relatively stable for men and women up till about 2008/09, after which point rates diverged between men and women. Using two data sources this study demonstrates increasing male/female inequalities in workplace violence in Ontario.

Poster Presentation

Specific Occupations

0383   **CARING FOR CARE-GIVERS: TESTING THE IMPACT OF A MANAGEMENT-DRIVEN HEALTH INTERVENTIONS ON JOB SATISFACTION AND RETENTION OF ELDER-CARE EMPLOYEES**

[1]Catherine Babcanec, [1]Christina Rosebush*, [1]Patricia McGovern, [2]Jean Bey, [1]Hyun Kim. [1]University of Minnesota School of Public Health, Minneapolis, MN, USA; [2]Vista Prairie Communities, Hopkins, MN, USA

In the United States, the dramatic growth in the ageing population is predicted to place increased demand on long-term care facilities in the coming decades. The work of employees providing direct care to the elderly in these facilities is characterised by long or variable work shifts, physical and emotional strain from caring for the aged, and low wages. An important challenge facing long-term care employers is focused on increasing retention among employees. Researchers at the University of Minnesota are collaborating with leadership at a non-profit elder care organisation with facilities in Minnesota and Iowa to implement and evaluate management-led interventions to 1) improve employees' health behaviours, and 2) increase workplace social and managerial support with the intended outcome of improved job satisfaction and retention.

Components of the intervention include provision of Fitbits to participating employees and initiation of management driven health activities. The study will evaluate effects of the intervention on health behaviours, perceptions of organisational support, and job satisfaction. Baseline survey results indicate that management differs from other direct care workers in the measures of organisational support and job satisfaction, but does not differ in health behaviours. Upon completion of the 9 month intervention, the influences of change in health behaviours and change in perceptions of organisational support will be evaluated in association with measurements of job satisfaction and compared to job retention information. Findings will be used to inform internally sustainable, management-driven interventions to maintain a healthy and happy workplace. Preliminary results will be presented.

Poster Presentation

Respiratory

0384   **ENDOTOXIN EXPOSURE AND LUNG DISEASE IN SAWMILL WORKERS: A COHORT STUDY**

[1,2]Hanchen Chen, [1]George Astrakianakis, [3]Paul Demers, [1]Hugh Davies*. [1]University of British Columbia, Vancouver, British Columbia, Canada; [2]Interior Health Authority, Kelowna, British Columbia, Canada; [3]Occupational Cancer Research Centre, Toronto, Ontario, Canada

Objectives Previous studies have linked endotoxin exposure with increased risk of COPD, but a decreased risk for lung cancer. We examined these associations in a cohort of British Columbia (BC) sawmill workers followed between 1950 and 1995.

Methods The cohort comprised all male production and maintenance workers (n=25,685) at 14 BC sawmills employed for at least one year between 1950 and 1995. Lung cancer cases were identified through the provincial cancer registry, and COPD cases through the provincial hospital discharge data. We assigned cumulative endotoxin exposure for each subject based using a job-exposure matrix built on measurement data obtained at 4 of the study mills. Subjects were assigned to exposure quintile groups for analysis (groups between <1.5 ng/m^3 and >14.7 ng/m^3), and adjusted risk estimates for each group were calculated using Poisson regression, controlling for potential confounders (smoking that was indirectly addressed).

Results Relative risk of lung cancer for highest exposed group was 0.73 (95% CI 0.55–0.98) compared to the reference group, with a slight trend of decreasing risk with increasing endotoxin exposure. Relative risk for COPD in the highest exposed group was 1.9 (95% CI of 0.95–3.70) compared to the reference group, with a slightly increasing trend with increasing endotoxin exposure. Results did not change when different lag times were examined.

Conclusion Our findings of a protective effect for endotoxin exposure and lung cancer, and a positive association between endotoxin and COPD are consistent with previous studies, but at lower exposure levels.

Poster Presentation

Cancer

0385 OCCUPATIONAL EXPOSURE TO DIESEL MOTOR EXHAUST AND THE RISK OF CANCER OF THE ORAL CAVITY, PHARYNX AND LARYNX: THE ICARE STUDY

[1]Aurélie Gérazime, [1]Christine Barul*, [2]Gwenn Menvielle, [3]Isabelle Stücker, [1]Danièle Luce. [1]INSERM U1085 – IRSET, Pointe-à-Pitre, France; [2]Sorbonne Universités, UPMC Univ Paris 06, INSERM, IPLESP UMRS 1136), Paris, France; [3]INSERM U1018 – CESP, VIllejuif, France

Background Diesel motor exhaust is a recognised risk factor for lung cancer, but few studies have investigated the effect of diesel emissions on other parts of the respiratory tract. We used data from the ICARE study, a French population-based case-control study, to investigate the associations between exposure to diesel motor exhaust and the risk of cancer of the oral cavity, pharynx and larynx.

Methods The analysis was restricted to men and included cases of squamous cell carcinomas of the oral cavity, oropharynx, hypopharynx and larynx (350, 543, 383 and 454 cases, respectively) and 2780 controls. Detailed information on life-time occupational history, tobacco smoking and alcohol drinking was collected by interview. We assessed occupational exposure to diesel motor exhaust from questionnaire responses. We used logistic regression to estimate odds ratios (OR) and their 95% confidence intervals (CI), adjusted for age, residence area, smoking, alcohol drinking and asbestos exposure.

Results No association was found between exposure to diesel motor exhaust and cancer of the oral cavity (OR=0.88, CI=0.65–1.18), oropharynx (OR=0.83, CI=0.65–1.10), hypopharynx (OR=0.84, CI=0.65–1.18) or larynx (OR=1.11, CI=0.86–1.43). There was no indication of increasing risk with increasing duration of exposure, for any of the cancer sites.

Conclusion These findings do not provide evidence that occupational exposure to diesel motor exhaust increases the risk of oral, pharyngeal or laryngeal cancer.

Oral Presentation

Cardiovascular Disease

0386 OCCUPATIONAL NOISE EXPOSURE AND AMBULATORY BLOOD PRESSURE: THE EXPOSURE RESPONSE RELATION WITH ACUTE AND LAGGED EXPOSURE

[1]Zara Ann Stokholm*, [2]Kent Lodberg Christensen, [1]Thomas W Frederiksen, [1]Jesper M Vestergaard, [3,5]Åse Marie Hansen, [4]Jens Peter Bonde, [5]Jesper Kristiansen, [5]Søren Peter Lund, [1]Henrik A Kolstad. [1]Department of Occupational Medicine, Danish Ramazzini Centre, Aarhus University Hospital, Aarhus, Denmark; [2]Department of Internal Medicine and Cardiology A, Aarhus University Hospital, Aarhus, Denmark; [3]Faculty of Health, University of Copenhagen, Copenhagen, Denmark; [4]Department of Occupational and Environmental Medicine, Bispebjerg Hospital, Copenhagen, Denmark; [5]National Research Centre for the Working Environment, Copenhagen, Denmark

Background Long-term environmental noise exposure has repeatedly been related to increased risk of cardiovascular disease at exposure levels as low as 35 dB(A). Occupational exposure levels are orders of magnitude higher than the environmental levels. We examined if blood pressure was increased during and subsequent to occupational noise exposure.

Methods We studied 483 industrial, finance, and service workers selected as a random sample from 10 industrial trades and financial services between 2009 and 2010. For 24 hours, we recorded noise exposure levels every 5 s by personal dosimeters and measured ambulatory blood pressure and heart rate every 20–30 min. In mixed linear regression models, we assessed the acute and lagged effects of ambient noise exposure (LAEq)) on blood pressure and heart rate for work, leisure and night hours. For 319 workers, we estimated these effects for noise exposure at the ear accounting for hearing protection use.

Results Full-shift occupational noise exposure levels ranged between 59–97 dB(A). Results of the regression models adjusted for sex, age, income, BMI, alcohol, tobacco, salt intake, and family history of hypertension suggest no relation between acute or lagged occupational noise exposure level and blood pressure levels for the industrial workers.

Conclusion Occupational noise exposure showed no acute or lagged effects on blood pressure in industrial workers.

Oral Presentation

Cancer

0387 WELDING AND THE RISK OF HEAD AND NECK CANCER: RESULTS FROM THE ICARE STUDY

[1]Christine Barul*, [2]Mireille Matrat, [2]Isabelle Stücker, [1]Danièle Luce. [1]INSERM U1085-IRSET, Pointe-à-Pitre, France; [2]INSERM U1018 – CESP, Villejuif, France

Objective We used data from the ICARE study, a French population-based case-control study, to investigate the associations between welding and the risk of head and cancer.

Methods The analysis was restricted to men and included 1857 cases of squamous cell carcinomas of the oral cavity, pharynx and larynx and 2780 controls, with detailed information on lifetime occupational history, tobacco smoking and alcohol drinking. A supplementary questionnaire was used to describe welding activities for those welding more than 5% of their working time. Odds-ratios (OR) and 95% confidence intervals (CI) associated with regular and occasional welding were estimated with logistic regression, with adjustment for age, residence area, smoking, alcohol drinking and asbestos exposure.

Results Regular welding was associated with an increased risk of cancer of the larynx (OR=2.68, CI=1.52–4.75), oral cavity (OR=2.30, CI=1.17–4.53) and hypopharynx (OR=1.66, CI=0.83–3.30). No association was found with oropharyngeal cancer (OR=1.05, CI=0.57–1.95). For laryngeal cancer, the OR increased for longer duration of welding (for >10 years: OR=3.13, CI=1.42–6.90). No relationship with duration was observed for the other cancer sites. Preliminary analyses did not reveal marked differences according to the type of metal welded or to welding processes. Occasional welding for more than 10 years was associated with a slight, non-significant elevated risk of oral, laryngeal and hypopharyngeal cancer.

Conclusion Our findings suggest that welding may increase the risk of laryngeal cancer. The evidence is weaker for oral and hypopharyngeal cancer, and we found no evidence of an association with oropharyngeal cancer.

Oral Presentation

Exposure Assessment

0388   **POULTRY WORKER TASKS ASSOCIATED WITH CAMPYLOBACTERIOSIS IN MINNESOTA, 2012–2016**

[1]Evan J Sorley*, [2]Carrie A Klumb, [2]Joni M Scheftel, [1]Bruce H Alexander, [1]Jeff B Bender, [2]Kirk E Smith. [1]*Division of Environmental Health Sciences, University of Minnesota, Minneapolis, MN, USA*; [2]*Minnesota Department of Health, St. Paul, MN, USA*

Background Campylobacteriosis is typically considered a foodborne disease. Poultry workers, however, may be at higher risk due to their close contact with the primary reservoir of *Campylobacter*. The objective of this study was to evaluate whether occupational poultry exposures are associated with campylobacteriosis in Minnesota.

Methods *Campylobacter*, *Salmonella*, *Cryptosporidium*, Shiga toxin-producing *E. coli*, and *Yersinia* infections are reportable to the Minnesota Department of Health. Cases reported during 2012–2016 were interviewed with a standard questionnaire to ascertain potential agriculture exposures. Using the population exposed to agricultural animals, we conducted a case-case comparison study comparing *Campylobacter* infections (cases) to *Cryptosporidium*, Shiga toxin-producing *E. coli*, and *Yersinia* infections (control-cases). These control pathogens were selected because poultry are not their primary reservoir, and thus infections likely came from non-poultry sources.

We determined whether campylobacteriosis was associated with working with poultry, and then if so, with what specific tasks. Odds ratios (OR) with 95% confidence intervals (CI) were calculated as measures of association.

Results Among all animal agriculture workers exposed (504 campylobacteriosis cases and 228 control-cases), campylobacteriosis was associated with working with poultry (OR=2.0; 95% CI: 1.5–2.8). Among poultry workers (276 cases and 86 control-cases), tasks associated with campylobacteriosis included slaughtering (OR=7.4; 95% CI: 1.0–55.4), removing dead birds (OR=7.5; 95% CI: 1.8–31.8), handling manure (OR=4.0; 95% CI: 1.2–13.4), and handling birds' water (OR=2.1; 95% CI: 1.2–3.5).

Conclusions These results support the hypothesis that occupational exposure to poultry increases the risk of campylobacteriosis, and certain poultry-related tasks pose a higher risk of infection than others.

Oral Presentation

Shift Work

0391   **ARE WOMEN DOING SHIFT WORK IN PAPER MILLS AT INCREASED RISK FOR MYOCARDIAL INFARCTION?**

[1]Eva Andersson*, [1]Helena Eriksson, [1]Marianne Andersson, [2]Ing-Liss Bryngelsson, [1]Kjell Torén, [3]Richard Neitzel. [1]*Occupational and Environmental Medicine, Sahlgrenska University Hospital, Göteborg, Sweden*; [2]*Occupational and Environmental Medicine, Örebro University Hospital, Örebro, Sweden*; [3]*Environmental Health Sciences, University of Michigan, Ann Arbour, Michigan, USA*

Introduction Nurses with long durations of rotating night shifts appear to be at increased risk for coronary heart disease. But industrial shift work among women has not been well-studied.

Methods Women employed more than one year from cohorts of soft paper mills (n=3354) and pulp and paper mills (n=2278) were evaluated in this study. Mill-specific job exposure matrices for shift work and noise exposure were developed at department and job levels. Every worked year was classified for shift work as probable, possible (including shift with no nights) or not likely. Similarly, noise was classified into seven 5 dBA bins<75 dBA to >100 dBA. Here we present the cohort mortality from myocardial infarction for 1969–2013 as standardised mortality ratios (SMRs) with 95% confidence intervals (CI) compared to the general population in Sweden.

Results Fatal myocardial infarctions (n=186) were increased in the cohort of women (SMR 123, 95% CI 106–142). Those classified as probable shift work (n=2399) had an SMR of 129 (98-166) and possible shift work (n=2060) had an SMR of 118 (93-146). Women with >10 years exposure to noise >90 dBA (n=602) had an SMR of 142 (103-192). SMRs declined with lower noise and shorter duration of noise, similar for both types of paper mills.

Conclusions Shift working women in paper mills have an increased mortality from myocardial infarction, but the effect of shift work is difficult to separate from noise exposure. Probable shift work and shorter durations of noise exposure >85 dBA were still associated with elevated SMRs.

Invited

Other

0392   **INVITED KEYNOTE: FAST FORWARD EXPOSURE ASSESSMENT: UNDERSTANDING PRECARITY AS A WORK-RELATED RISK IN THE NEW ECONOMY**

Noah Seixas*, Trevor Peckham, Anjum Hajat. *University of Washington, Seattle, WA, USA*

The organisation of work is undergoing rapid change making our traditional definitions and methods of exposure assessment less applicable or effective in understanding work-related risks. In a keynote address at EPICOH in 1995 I discussed concepts of measurement error and argued for use of statistical methods which explicitly linked exposure concepts with the outcomes. These concepts are now widely understood and we have moved beyond them using mixed models and a variety of more advanced statistical methods which were new at the time.

However, our framework for that work is less and less relevant in current and future occupational settings. Non-standard employment arrangements and increasing disparities in income, often associated with other demographic characteristics, compel an increasing focus on the health of working populations, rather than individual diseases or conditions. However, the ways in which the work context is defined and implemented in research is highly variable. While many of the terms used have overlapping attributes, and each have been associated with changes in work exposures and health risk, their lack of clear conceptual definitions hampers our ability to explain the apparent health risks with which they are associated.

This paper describes the various concepts and labels associated with precarious work and suggests that precarity requires integration of concepts of work organisation with worker vulnerability. By doing so, we can better understand the relationships between job content, working conditions and power dynamics within the workplace and its social context. Thus, we identify work as a social determinant of health, and can better assess the health implications of precarious work.

These concepts are implemented using a multidimensional approach to job quality which incorporates both work organisation and workplace power dynamics, based on latent class cluster analysis, to define an integrated typology for defining contemporary employment conditions, as developed by Van Aerden, et al, in a European dataset. We adopt this approach within the US based General Social Survey, and compare the clusters identified in the EU with those observed in the US. This typological approach overcomes the limitations of characterising work organisation or social determinants on single dimensional characteristics, such as contract-type or demographic factors, and offers a new framework for understanding the implications of precarity.

While the 'exposure,' health outcomes, and methods differ substantially than those relevant in the 1990s, we again argue that a clear conceptual definition, measurement methods, and linkage with outcomes of importance in the 21 st century, are required to continue understanding the impact of working conditions on health.

Poster Presentation

Pesticides

0393 A SYSTEMATIC LITERATURE REVIEW: ORGANOPHOSPHATE (OP) PESTICIDE EXPOSURE AND SEMEN QUALITY

[1]Zulkhairul Naim Bin Sidek Ahmad*, [2]Daniel Brison, [1]Andrew Povey. [1]*Centre for Occupational and Environmental Health, School of Health Sciences, Faculty of Biology, Medicine and Health, University of Manchester, Manchester, M13 9PL., UK*; [2]*Department of Reproductive Medicine, St Mary's Hospital, Central Manchester University Hospitals NHS Foundation Trust, Manchester Academic Health Sciences Centre,, Oxford Road, Manchester M13 9WL, UK*

Introduction Organophosphate (OP) pesticides exposure has been linked to various health effects but the association between exposure and semen quality is unclear. This systematic review aimed to investigate the association between OP exposure and semen quality.

Methods Electronic databases including Ovid-Medline, PubMed and Website of Science were searched for studies on OP and semen quality published between 2000 and 2016. Terms representing population, exposure and outcome were used in combination. Relevant articles were extracted and critically appraised using the Newcastle Ottawa Scale.

Results 12 epidemiological studies were identified of which 10 were cross- sectional and two case-control studies. Eight studies were of occupationally exposed workers with exposure assessed by self-report in four studies or inferred in three studies or by the use of urinary dialkylphosphates in five studies. Sperm concentration or motility or morphology was altered in eight studies. Concentration was reduced in one study of which assessed exposure by self-report, one by inference and three by biomarkers. Motility was reduced in four studies of which assessed exposure by self-report, one by inference and two by biomarkers. Morphology was reduced in three studies of which assessed exposure by self-report and one by inference. More fundamentally only one study examined the relationship between time of exposure and outcome assessment.

Conclusion There was a lack of consistency in the reported associations and hence there is limited evidence to support a causal association between OP exposure and semen quality. This could be due to heterogeneity in study populations and different in exposure assessment

Oral Presentation

Musculoskeletal

ARE GENDER DIFFERENCES IN DISABILITY DURATION FOR WORK-RELATED MUSCULOSKELETAL INJURIES EXPLAINED BY HEALTH CARE UTILISATION?

[1,2]Mieke Koehoorn*, [1]Lillian Tamburic, [2]Sheilah Hogg-Johnson, [3]Katherine Lippel, [1,2]Christopher McLeod. [1]University of British Columbia, Vancouver, British Columbia, Canada; [2]Institute for Work and Health, Toronto, Ontario, Canada; [3]University of Ottawa, Ottawa, Ontario, Canada

Introduction In British Columbia, Canada, women have longer work disability durations for musculoskeletal injuries than men, even after adjustment for confounders. This study investigated if different types of health care utilisation in the first four weeks of injury explain differences in disability duration. **Methods** Three cohorts were identified from compensation claims for back strain, limb fractures and connective tissue injuries. Claims were restricted to at least four-weeks disability for a standard health care utilisation window. Quantile regression investigated the effect of physician visits (log count), physical therapies and prescriptions (yes/no), on disability days (censored at 365) at the 25th, 50th and 75th percentile by gender. **Results** In multivariable models, physician visits were associated with shorter disability durations for both genders across injury cohorts. For example, for connective tissue injuries, an increase of one physician visit was associated with 44 fewer days [95% CI-64.8,–23.9] for women and 56 fewer days for men [−74.2,–37.5], at the 75th percentile. Opiate prescriptions were associated with longer disability durations for factures only, with 39 more days [95% CI 16.1, 61.3] for women and 46 more days [32.1, 59.3] for men, at the 75th percentile. The effect of physical therapies varied by injury and gender. **Discussion** Physician visits in the first weeks of a compensation claim may be part of return-to-work procedures associated with shorter disability. Opiate prescriptions in the first weeks of a fracture may be a measure of severity associated with longer disability. Health care utilisation did not readily explain longer disability durations for women.

Poster Presentation

Disease Surveillance

DETECTION OF OCCUPATION INJURY AND ILLNESS THROUGH SURVEILLANCE AT EMERGENCY ROOM AT A MEDICAL CENTRE IN TAINAN, TAIWAN

[1]Ting-Chia Weng*, [2,3]I-Lin Hsu, [2]Chia-Chang Chuang, [1]Heng-Hao Chang, [1,4]Chen-Long Wu, [1,3]Jung-Der Wang, [1,4]How-Ran Guo, [1,4]Yau-Chang Kuo. [1]Department of Occupational and Environmental Medicine, National Cheng Kung University Hospital, Tainan, Taiwan; [2]Department of Emergency Medicine, National Cheng Kung University Hospital, Tainan, Taiwan; [3]Department of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan; [4]Department of Environmental and Occupational Health, National Cheng Kung University, Tainan, Taiwan

Underreporting of occupational injury and illness has been an important issue in Taiwan. We tried to implement an integrated surveillance system in the emergency services of National Cheng Kung University Hospital to screen work-related accidents. The system mobilised staffs of triage, registration and doctors to report occupational causes. A total of 4097 events were identified from Feb 2015 to Feb 2017, among which 2722 were work-related, and 1375 commuting injuries. Work-related events were predominant males (71.7%), but equally in commuting injuries. 1532 events were sent by ambulance, 498 cases hospitalised in the first month, and 4 patients died within 30 days after emergency services and all fatal cases were work-related injuries. The majority of diagnoses were contusions, abrasions and lacerations, totally accounting for 43.1%. However, significant proportion of head injuries (n=751, 18.3%), fractures (n=351, 8.6%), burns (n=264, 6.4%) including 62 cases (1.5%) of chemical burns, and 106 cases (4.4%) of amputations were found. The results were different from the government funded reporting system where most frequently reported were chronic musculoskeletal diseases. The total medical costs were about 2.9 million USD, based on a conservative estimation accounting 90 days from the first encounter. This study revealed the fact of underestimation of occupational injuries and illness resulting in significant health and societal impacts. The emergency room based surveillance system can augment the conventional reporting system. Furthermore, cluster analysis and work associated disability should be investigated to improve occupational safety and labour right.

Oral Presentation

Working Conditions

CLIMATE CHANGE THREATS TO OCCUPATIONAL HEALTH AND PRODUCTIVITY AT POPULATION LEVEL

[2]Lauren Lines*, [3,2]Tord Kjellstrom, [1,2]Mattias Otto, [1,2]Bruno Lemke. [1]Nelson Marlborough Institute of Technology, Nelson, New Zealand; [2]Ruby Coast Research Centre, Nelson, New Zealand; [3]Lund University, Lund, Sweden

Climate change will cause increasing environmental heat levels in large parts of the world. The heat levels for millions of people working outdoors or indoors without air conditioning, particularly in tropical areas, are already so high that physiological limits are exceeded and health risks and productivity loss occurs.

Using data on climate and working population size for 67,000 geographic grid cells (size = 0.5×0.5 degrees) based on internationally refereed sources we produced global heat stress maps for different calendar months and time periods. We combine these estimates with exposure-response relationships for heat stress indices to calculate heat strain risks and work capacity loss at global, regional and country level. The physiological laboratory evidence concerning heat impacts on workers is extensive, but more quantitative epidemiological studies are needed to improve risk assessments of occupational health risks due to climate change.

For example, we calculated that the global number of people subjected to extremely high monthly average heat levels (WBGT > 30°C, when even moderate work is restrained)

during the hottest month may rise to over 400 million at the end of this century from the current value of less than 1 million. At country level we find up to 2–4% of current daylight work hours are too hot for almost any work at moderate intensity. Our impact assessment model incorporates climate conditions, location of work (in sun, in shade or indoors), work intensity, and age distribution of the local population. Further developments of the model will be discussed.

Poster Presentation

Occupational Medicine (SCOM/Modernet)

0399 INDIVIDUAL SENSITIVITY. HOW SHOULD OCCUPATIONAL HEALTH RESPOND? (SUBMITTED FOR THE SCOM DAY)

Chris Kalman. *NHS Forth Valley, Scotland, UK*

The requirement for occupational radiation doses to be As Low As Reasonably Achievable (ALARA), promulgated by the International Commission on Radiation Protection in 1977, transformed radiation protection practice. It also led the way to develop similar standards for a range of occupational hazards.

The radiation world is now increasingly recognising the relevance of individual sensitivity to ionising radiations, with the real prospect that this will be incorporated into future occupational protection standards. The key drivers are;

- a. Known genetic sensitivity, and gene testing is feasible.
- b. Radiation risk relates to general cancer risk, including lifestyle.
- c. Some specific risks may be much higher in human subgroups.

Individual sensitivity to other occupational hazards is well established, but little acknowledged. Genetic factors are linked to a wide range of occupational diseases, including those from physical, chemical, biological and even psychological exposures. In relation to lifestyle, there is a synergy between the more than additive effects of radon and asbestos when either is linked with cigarette smoke. We are also aware high occupational risk in subgroups, for example; Type 1 hypersensitivity to Latex being almost exclusively restricted to the strongly atopic.

The ethical, scientific and practical difficulties of standards based on individual sensitivity are huge, with the strong possibility that restricting consideration to radiation induced cancer would not provide a model that is relevant throughout occupational health. It is suggested that ICOH should seek to join with ICRP in setting up a system to look at the issue in its entirety.

Oral Presentation

Cancer

0400 OCCUPATIONAL AND ENVIRONMENTAL RISK FACTORS FOR PROSTATE CANCER IN HONG KONG

[1]Lap Ah Tse*, [1]Priscilla Ming Yi Lee, [2]Wing Ming Ho, [7]Augustine Tsan Lam, [7]Man Kei Lee Lee, [3]Simon Siu Man Ng, [8]Yonghua He, [4]Ka-sing Leung, [5]Jennifer C. Hartle, [1]Feng Wang, [6]Chi Fai Ng. [1]*Division of Occupational and Environmental Health, JC School of Public Health and Primary Care, The Chinese University of Hong Kong, Shatin, Hong Kong;* [2]*Department of Clinical Oncology, Prince of Wales Hospital, Hong Kong SAR, China 3 Family Medicine Training Centre, Prince of Wales Hospital, Shtin, Hong Kong;* [3]*Department of Surgery, Prince of Wales Hospital, Hong Kong SAR, China 5 Guilin Medical College, Shatin, Hong Kong;* [4]*Department of Applied Biology and Chemical Technology, Hong Kong Polytechnic University, Kowlong, Hong Kong;* [5]*Department of Health Science and Recreation, San Jose State University, USA;* [6]*SH Ho Urology Centre, Department of Surgery, The Chinese University of Hong Kong, Shtin, Hong Kong;* [7]*Family Medicine Training Centre, Prince of Wales Hospital, Shatin, Hong Kong;* [8]*Guilin Medical College, Guilin, China*

Objectives Influence of environmental exposures on prostate cancer remains largely unclear. We aimed to document the associations of occupational and environmental risk factors with prostate cancer in Hong Kong using a case-control study. **Methods** We consecutively recruited 431 incident prostate cancer cases and 402 controls to obtain information on occupational and environmental exposures using a standard questionnaire, including smoking, dietary habits, family cancer history, night shift work, use of detergents and pesticide, and lifetime usage of food containers. We developed a new assessment tool of environmental BPA exposure and created a novel cumulative BPA exposure index (CBPAI). Odds ratio and 95% confidence interval (95% CI) was performed using multiple logistic regression analysis. **Results** Family history of prostate cancer was more common in cases (9.5%) than controls (3.0%), showing an adjusted OR of 3.68 (95% CI: 1.85–7.34). Weekly consumption of deep fried food and picked vegetable was associated with an excessive prostate cancer risk by 85% (95% CI: 15%–195%) and 87% (7%–228%). Night shift work was hazardous (OR=1.76, 95% CI: 1.07–2.89) but habitual green tea drinking was protective (OR=0.56, 95% CI: 0.34–0.91). A positive exposure-response relationship with CPBAI and prostate cancer was observed. **Conclusions** This study demonstrated an overall picture of occupational and environmental risk factors to prostate cancer among Hong Kong Chinese men. Furthermore, this study provided the first epidemiological evidence on carcinogenicity of BPA on human prostate thus added breakthrough data into the literature. **Funding** Health and Medical Research Fund (Ref. No. 11121091), Hong Kong Special Administrative Region, China.

Oral Presentation
Dusts and Fibres

0402   DOES LUNG CANCER INCIDENCE AND MORTALITY DIFFER WITH THE TYPE OF ASBESTOS FIBRE? : EVIDENCE FROM WESTERN AUSTRALIA

[1]Nita Sodhi, [1,2]Nick deKlerk*, [1]Peter Franklin, [1,3]Fraser Brims, [4]Susan Peters, [1]Nola Olsen, [1,3]Bill Musk. [1]The University of Western Australia, Perth, WA, Australia; [2]Telethon Kids Institute, Perth, WA, Australia; [3]Sir Charles Gairdner Hospital, Perth, WA, Australia; [4]Utrecht University, Utrecht, The Netherlands

Background Crocidolite is known to be the most carcinogenic form of asbestos for mesothelioma. This study aimed to assess if there was a difference between crocidolite and mixed asbestos fibre exposure for rates of lung cancer incidence and mortality after adjusting for smoking.

Methods Administrative datasets were used to identify lung cancer incidence and deaths in three Western Australian cohorts of people exposed to: crocidolite as miners and millers at Wittenoom; crocidolite as residents of Wittenoom; and mixed asbestos fibres occupationally. Multivariable Poisson regression models were used to compare the 5 year incidence and mortality rates between these cohorts after starting a health surveillance program. Explanatory variables included radiological evidence of asbestosis and cumulative asbestos exposures as determined through our Asbestos Job-Exposure Matrix (AsbJEM) after adjusting for smoking pack years, time since smoking cessation, age and sex.

Results The 5 year lung cancer incidence (n=176) and mortality (n=125) rates increased with radiological evidence of asbestosis (2.4-fold), increasing cumulative asbestos exposure and smoking pack-years. Compared with crocidolite miners and millers, Wittenoom ex-residents had the lowest rates (Incidence Rate Ratio (RR): 0.31, 95% CI: 0.15–0.67; and Mortality RR: 0.39 95% CI: 0.17–0.88). However, there were no significant differences identified between people occupationally exposed to mixed asbestos fibres (Incidence Rate Ratio (RR): 0.92, 95% CI: 0.61–1.39; and Mortality RR: 1.07 95% CI: 0.66–1.73) and Wittenoom workers.

Conclusion Mixed asbestos fibre exposure seems to be an equally potent cause of lung cancer as crocidolite after adjusting for smoking history.

Oral Presentation
Occupational Medicine (SCOM/Modernet)

0403   FINDINGS FROM THE FIRST YEAR OF MAREL: THE ITALIAN NETWORK ON WORK-RELATED DISEASES

[1]Stefania Curti*, [1]Stefano Mattioli, [2]Pierluigi Cocco, [3]Alfonso Cristaudo, [4]Marco dell'Omo, [5]Giovanni Mosconi, [6]Giuseppe Campo. [1]Department of Medical and Surgical Sciences, University of Bologna, Bologna, Italy; [2]Department of Public Health, Clinical and Molecular Medicine, University of Cagliari, Cagliari, Italy; [3]Unit of Occupational Medicine, University of Pisa, Pisa, Italy; [4]Unit of Occupational and Environmental Medicine, Department of Medicine, University of Perugia, Perugia, Italy; [5]Unit of Occupational Medicine, Azienda Ospedaliera Papa Giovanni XXIII, Bergamo, Italy; [6]Department of Work and Environmental Medicine, Epidemiology and Hygiene, National Institute for Insurance against Accidents at Work (INAIL), Rome, Italy

Background Detecting new disease-exposure associations is an important public health issue. We created a pilot network (MAREL - MAlattie e Rischi Emergenti sul Lavoro) of occupational disease consultation centres of Italian university hospitals to which patients are referred for potentially work-related diseases.

Methods The MAREL network currently includes five occupational disease consultation centres of university hospitals located in central-northern Italy. Patients are referred to these consultation centres by their general practitioners, occupational physicians or other specialists for the investigation of the putative occupational origin of the disease. Each centre collects cases of putative occupational origin through a structured and standardised data collection form. We collect data on: diagnosis; personal habits; occupational history; exposure assessment for potentially associated risk factors; physician's opinion on the possible causal relationship between disease and occupation. Data are coded according to national and international classifications.

Results The data collection started in 2016. We collected 1516 cases of putative occupational diseases. Intervertebral lumbar disc degeneration was the most represented condition (n=170, 11.2%). Apart from musculoskeletal disorders, cases of asthma were the most frequently reported (n=59, 3.9%). About 11% of patients were construction workers. The most frequently reported exposures were: manual material handling (29.5%, out of 1811), hand-arm vibrations (13.9%), and repetitive movements of the upper limb (10.9%).

Discussion The MAREL network will be expanded to other occupational disease consultation centres in 2017 with the aim to contribute to already existing surveillance systems (i.e. MALPROF) by the detection of new and emerging occupational diseases and risks.

Poster Presentation

Disease Surveillance

0404 SURVEILLANCE OF OCCUPATIONAL EYE INJURY
THROUGH EMERGENCY SERVICES: TWO-YEAR
EXPERIENCES IN A MEDICAL CENTRE OF TAIWAN

[1]Ting-Chia Weng*, [2,3]I-Lin Hsu, [2]Chia-Chang Chuang, [1,3]Jung-Der Wang, [1,4]How-Ran Guo, [1,4]Yau-Chang Kuo. [1]Department of Occupational and Environmental Medicine, National Cheng Kung University Hospital, Tainan, Taiwan; [2]Department of Emergency Medicine, National Cheng Kung University Hospital, Tainan, Taiwan; [3]Department of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan; [4]Department of Environmental and Occupational Health, National Cheng Kung University, Tainan, Taiwan

Ocular trauma in the workplace is a worldwide cause of visual morbidity, but is largely preventable. We established a pilot surveillance system of occupational eye injuries at emergency service of National Cheng Kung University Hospital (NCKUH) from Feb 2015 to Feb 2017. During the study period, 114 events of occupational eye injuries were collected with 22 patients further hospitalised. Among them, 3 cases of severe ocular trauma were accompanied with other injuries resulting in an Injury Severity Score of more than 16. Foreign body injury (28%, n=32) and chemical burn (21%, n=24) were the most frequent eye injuries. Notably, 12 cases (10.5%) eyeball rupture were identified. The total medical costs charged through the NCKUH were about 66,000 USD for these ocular trauma patients, counting emergency and hospitalisation fees within 90 days after the first encounter. Eyeball ruptures accounted for 57.5% of the total medical charges. Only about 18% of occupational ocular trauma cases were reported to the National Labour Insurance and would usually be compensated. This study highlights the urgent needs of comprehensive compulsory regulations of recognition and report, compensation, and prevention and control of occupational eye injuries in the workplace of Taiwan.

Oral Presentation

Occupational Medicine (SCOM/Modernet)

0405 PREDICTING THE IMPACT OF THE EU VIBRATION
DIRECTIVE ON THE PREVALENCE OF VIBRATION WHITE
FINGER (VWF), CARPAL TUNNEL SYNDROME (CTS) AND
SENSORINEURAL SYMPTOMS ACROSS EUROPE

[1]S Jill Stocks*, [2]Begoña Martinez-Jarreta, [3]Riitta Sauni, [1]David A Berk. [1]University of Manchester, Manchester, UK; [2]University of Zaragoza, Zaragoza, Spain; [3]Ministry of Social Affairs and Health, Tampere, Finland

Objectives EU directives can lend themselves to evaluation through natural experiments because of the freedom regarding their implementation within individual countries. Natural experiments may be criticised because of the lack of direct casual evidence for a relationship between the intervention and the exposure or disease outcome. Such experimental designs could be strengthened by an a priori estimate of the impact of an intervention. Here we aim to predict the impact

of EU Directive 2002/44/EC on VWF, CTS and sensorineural symptoms (HAVS).

Methods Previously we described the development of a Markov chain Monte Carlo accelerated failure time model to predict the incidence and prevalence of HAVS. The model was developed using longitudinal data from Italian workers and validated using published data for Swedish and UK workers, and compensation data from the Czech Republic. For the next step we have used the exposure data from the Eurofound European Working Conditions Survey from 2000 to 2015 and population level demographic data to predict the impact of the directive on HAVS in Europe.

Results The model predicted that a reduction in vibration exposure to 5 m/s2 (i.e. complete success of the directive) would result in a reduction in lifetime prevalence of VWF of around 25% in the UK. Predictions of the variation in impact according to differing reductions in exposure and across different age groups will be presented for the UK and other countries.

Conclusion Future work will compare these estimates of the impact of the directive using routinely collected data in European countries.

Poster Presentation

Cancer

0406 ANALYSIS OF INFECTIOUS DISEASE PREVALENCE
AMONG SEMICONDUCTOR MANUFACTURING WORKERS
WITH NON-HODGKIN'S LYMPHOMA

Jung-min Sung*, Sang-gil Lee, Eun-A Kim. KOSHA, Ulsan, Republic of Korea

Introduction The Occupational Safety and Health Research Institute (OSHRI) established a cohort of former and current workers in six semiconductor-manufacturing companies in South Korea, to determine the incidence of occupational cancer. This study compared the prevalence and incidence of general illnesses between patients with non-Hodgkin lymphoma (NHL) and a control group.

Research Methods After identifying 43 workers with NHL, OSHRI established a sex- and age-matched control group. The NHL cohort and control groups were compared for the prevalence of infectious diseases before and after diagnosis. The prevalence of infectious diseases was based on diagnostic data collected from National Health Insurance information. Disease names were determined by the ICD-10 disease code.

Outcomes Prior to the diagnosis of NHL, there was no significant difference in the prevalence of bacterial and viral diseases between the groups. However, following the diagnosis of NHL, the prevalence rates of viral and bacterial infections were significantly higher in the NHL group. Significant differences were found in the prevalence of herpes zoster, cytomegalovirus, and tuberculosis.

Conclusion Prior to the diagnosis of NHL, there were no significant underlying diseases in the NHL cohort group when compared to the control group. Therefore, we concluded there is no relationship between underlying infectious disease and NHL development. However, the probability of contracting opportunistic infections was higher in the NHL group

after diagnosis. Presumably, cancer progression and treatment may cause opportunistic infections. Further evaluation is necessary to support this result.

Poster Presentation

Exposure Assessment

0407   **RESPIRATORY IRRITANT EXPOSURES DURING CLEANING AND DISINFECTING IN HOME CARE: PRELIMINARY RESULTS FROM THE SAFE HOME CARE STUDY**

Margaret Quinn*, Catherine Galligan, John Lindberg, Pia Markkanen, Susan Sama, Rebecca Gore, Noor Sheikh, Nicole Karlsson, David Kriebel, Nancy Goodyear. *University of Massachusetts, Lowell, MA, USA*

Objectives While there is evidence of asthma and other respiratory illness among workers performing cleaning and disinfecting (C and D) of environmental surfaces in healthcare and in residential and institutional settings, quantitative measurements of C and D exposures are limited. Previously, we found that 80% of home care (HC) aide visits to clients' homes involve C and D; commonly-used C and D products contain bleach, a respiratory irritant. Objectives of this study were to measure quantitatively airborne exposures generated during C and D tasks performed by HC aides using a bleach-containing product. The work reported here is part of a larger evaluation of exposures and respiratory effects of a range of C and D products and practices and their efficacy in reducing pathogens in HC.

Methods A bathroom was constructed in a laboratory according to home building construction specifications. Twenty HC aides were recruited from employer agencies to perform C and D tasks for 20 min sessions in the bathroom following typical HC practices using a C and D spray product containing bleach (1%–5% by weight sodium hypochlorite). Aides wore a vest holding a direct-reading instrument to measure chlorine breathing-zone concentrations as they performed C and D on tub/shower, toilet, and sink.

Results Maximum chlorine concentrations generated during the 20 min sessions ranged from 0.35ppm to 3.40ppm. The tub/shower C and D task produced the highest exposures. The US Occupational Safety and Health Administration ceiling limit for chlorine is 1 ppm; nearly 70% of the aides conducted a C and D session exceeding this value.

Conclusions C and D in HC using a product containing bleach can produce over-exposure to chlorine, a respiratory irritant.

Poster Presentation

Chemicals

0408   **WORKERS' EXPOSURE TO BROMINATED FLAME RETARDANTS: A GLANCE AT AMERICAN AND CANADIAN POPULATION DATABASES**

[1,2]Sabrina Gravel*, [1,3]Jérôme Lavoué, [1,2]France Labrèche. *[1]School of Public Health, Université de Montréal, Montreal, Qc, Canada; [2]Institut de recherche Robert-Sauvé en santé et en sécurité du travail, Montreal, Qc, Canada; [3]Centre de recherche du Centre hospitalier de l'Université de Montréal, Montreal, Qc, Canada*

We aim to determine biological concentrations of four congeners of brominated flame retardants, which have no occupational exposure limits, in American and Canadian workers.

Serum concentrations of four polybrominated diphenyl ethers congeners (BDE47, 99, 100 and 153) were obtained from the American National Health And Nutrition Examination Survey (NHANES) 2003–2004 and the Canadian Health Measures Survey (CHMS) 2007–2009 databases. Data from participants aged 16–65 were classified by industry and occupational group. Values below the detection limit ($< LOD$) were replaced by $LOD/\sqrt{2}$. Descriptive statistics are presented.

A total of 813 and 1100 serum samples were respectively available in NHANES and CHMS. Proportions of values $<$ LOD varied by survey: BDE47 (NHANES, 1.4%; CHMS, 22.7%), BDE99 (32.3%; 73.9%), BDE100 (4.7%; 72.9%), BDE153 (5.7%; 55.9%). BDE47 was the congener with the highest lipid-adjusted mean concentrations (NHANES, 44.5 ng/g; CHMS, 22.8 ng/g). Higher BDE47 means were found in Agriculture, Forestry and Fishing industries (61.9 ng/g) and in Protective Services and Armed Forces occupations (48.5 ng/g) for NHANES, whereas in CHMS they were higher in Manufacturing of Durable Goods industries (40.3 ng/g) and in Construction and Extraction occupations (44.7 ng/g). BDE153 means were higher for men than for women in both databases (NHANES-men: 16.8 ng/g, NHANES-women: 11.4 ng/g; CHMS-men: 11.0 ng/g, CHMS-women: 7.8 ng/g). In NHANES, non-working men had higher mean concentrations than workers for all congeners.

In the absence of occupational exposure limits, population surveys can be useful to establish reference levels, but careful interpretation is required for chemicals such as flame retardants that are ubiquitous in both the general and work environments.

Poster Presentation

Other

0409 INDUSTRY, OCCUPATION AND SEX DIFFERENCES IN WORKERS' EXPOSURE TO ENDOCRINE DISRUPTING METALS IN AN AMERICAN AND A CANADIAN SURVEY

[1,2]Sabrina Gravel*, [1,3]Jérôme Lavoué, [1,2]France Labrèche. [1]*School of Public Health, Université de Montréal, Montreal, Qc, Canada;* [2]*Institut de recherche Robert-Sauvé en santé et en sécurité du travail, Montreal, Qc, Canada;* [3]*Centre de recherche du Centre hospitalier de l'Université de Montréal, Montreal, Qc, Canada*

These analyses explore whether a gradient of exposure to four potential endocrine disrupting metals can be detected in workers of different occupational groups and industries, in two national population surveys.

Blood levels of lead (PbB), cadmium (CdB) and mercury (HgB), as well as urinary levels of arsenic (AsU) were measured in the National Health And Nutrition Examination Survey (NHANES) 2003–2010 and the Canadian Health Measures Survey (CHMS) 2007–2013. Data from participants aged 16–65 were analysed to identify industries and occupational groups with higher levels. T-tests and one-way ANOVAs were performed to explore differences in the biomarkers' levels according to industry, occupation and sex.

Geometric means (GMs) in NHANES and CHMS were respectively 1.24 and 1.13 µg/dL for PbB, 0.32 and 0.34 µg/L for CdB, 0.96 and 0.78 µg/L for HgB, and 9.96 and 10.61 µg/L for AsU. In NHANES, men had higher levels of PbB (mean difference (MD)=0.75 µg/L, 95% CI:0.70–0.81) and HgB (MD=0.27; 95% CI:0.18–0.36), and there were no differences between men and women for CdB and AsU. In both surveys, the Utilities and Construction industry group had higher GMs of PbB (NHANES: 1.98 µg/dL; CHMS: 1.54 µg/dL) and CdB (NHANES: 0.35 µg/L; CHMS: 0.45 µg/L), and occupations in Health Care and Social Services had the highest HgB GMs (NHANES: 1.16 µg/L; CHMS: 0.97 µg/L).

Results show that certain occupational groups may incur higher exposures to potential endocrine disrupting metals. This should raise attention on workers, considering increasing evidence on the possible effects of such exposures in the general population.

Oral Presentation

Pesticides

0410 OCCUPATIONAL EXPOSURE TO PESTICIDES AND HEALTH EFFECTS IN MALE BANANA PLANTATION WORKERS IN ECUADOR

[1,2]Hans-Peter Hutter*, [1]Hanns Moshammer, [1,3]Peter Wallner, [1]Shifra Shahrakisanavi, [2]Helmut Ludwig, [1]Michael Kundi. [1]*Department of Environmental Health, Medical University Vienna, Vienna, Austria;* [2]*International Society of Doctors for the Environment – Section Austria, Vienna, Austria;* [3]*Medicine and Environmental Protection, Vienna, Austria*

Introduction Intensive agrochemical application in banana production has been documented in Ecuador, world's largest *exporter of bananas*. This study assessed working conditions, wellbeing and health of farmworkers in conventional farming using biocides and in organic farming.

Methods In a cross-sectional epidemiological study exposed and non-exposed male farmworkers were interviewed based on standardised questionnaires about, inter alia, exposure history, pesticide application practices, health and wellbeing. Furthermore, swab samples of buccal cells were taken (Buccal Micronucleus Cytome Assay, BMCA), fixed, stained and later in the laboratory blindly evaluated for nuclear anomalies indicative of cytotoxic and genotoxic effects, according to standard protocols.

Results In total, 68 farmworker participated (provinces Los Rios, El Oro). 87% resp. 78% of the pesticide exposed respondents did not use masks/gloves at all; 10% resp. 19% used masks/gloves all the time. Pesticide workers (n=31) showed significantly more often symptoms such as dizziness (OR=4.80), nausea/vomiting (OR=7.50), diarrhoea (OR=6.43), burning eyes (OR=4.10), skin irritation (OR=3.58). Furthermore, eight out of nine biomarkers of the BMCA were significantly more frequent among exposed workers (p<0.001) (micronucleited cells: OR=2.55; total micronuclei: OR=2.45; nuclear buds: OR=1.84; binucleated cells: OR=1.33; condensed chromatin: OR=1.38; karyorrhectic cells: OR=1.30; karyolytic cells: OR=1.19; broken eggs: OR=1.20).

Discussion Our findings indicate that the impact of pesticide use is not restricted to acute effects on health and wellbeing, but also point to long-term health risks. BMCA results suggest that pesticide users have a higher risk of developing cancer. There is an urgent need for safety training and minimising application of pesticides.

Poster Presentation

Neurological Effects

0411 EXPOSURE TO DIESEL ENGINE EXHAUST AND THE RISK OF ALS

[1,2]Susan Peters*, [2]Calvin Ge, [1]Jan Veldink, [1]Leonard van den Berg, [2]Roel Vermeulen. [1]*University Medical Centre Utrecht, Utrecht, The Netherlands;* [2]*Utrecht University, Utrecht, The Netherlands*

Background Only few risk factors have been identified for amyotrophic lateral sclerosis (ALS). Higher risks were reported for various occupations (e.g. farmers, construction workers), but responsible exposures remain largely unknown. We investigated the association between occupational exposure to diesel engine exhaust and sporadic ALS in a population-based study with detailed information on possible confounders.

Methods An ongoing ALS case-control study is being conducted in the Netherlands since 2006, and we here present data for 2006–2014. Lifetime occupational histories and lifestyle factors were collected via questionnaires. A general population job-exposure matrix was assigned to estimate exposure to diesel engine exhaust. All exposure variables were estimated up to two years before survey to account for any changes due

to disease onset. Odds ratios were estimated by logistic regression models, adjusted for age, sex, smoking and alcohol.

Results Data were available for 1040 sporadic ALS cases (63.6% male) and 2050 controls (60.2% male). Ever occupational exposure to diesel engine exhaust was not associated with risk of ALS (OR=1.06, 95% CI 0.87–1.28). No exposure-response relation was observed for either cumulative exposure or exposure duration on a continuous scale.

Conclusion Our analysis suggests that exposure to diesel engine exhaust is not associated with an increased risk of ALS.

Oral Presentation

Other

0412   **CLIMATE CHANGE IMPACTS ON OCCUPATIONAL HEALTH VIA WORKPLACE HEAT**

[1]Tord Kjellstrom*, [2]David Wegman, [3]Lars Nybo, [4]Andreas Fluoris, [5]Lucka Kajfez-Bogataj. [1]Center for Technology Research and Innovation Ltd, Limassol, Cyprus; [2]University of Massachusetts, Lowell, MA, USA; [3]University of Copenhagen, Copenhagen, Denmark; [4]University of Thessaly, Trikala, Greece; [5]University of Ljubljana, Ljubljana, Slovenia

Climate changes will markedly affect working people as increased heat and extreme weather may directly affect health and indirectly via reduced food access and spread of vector-borne diseases among outdoor workers. The effects will primarily affect low income people in tropical and sub-tropical areas, but occupational health authorities in all countries need to consider the emerging challenges. A recent EU project (www.HEAT-SHIELD.eu) is dedicated to improving heat resilience in workers, and NIOSH/USA recently (2016) published new guidelines.

Considering the theme **Eliminating Occupational Disease**, a widespread occupational health threat from climate change will be excessive heat exposure causing "**workplace heat related illnesses**". This is already a major problem in large parts of the world. A number of aspects of the occupational health challenges will be presented during this Mini-Symposium.

Translating research into action involves broadening existing research/analysis to produce improved "heat exposure evaluation" and "occupational health impact assessment" related to climate change. Research needs to identify remediable conditions and solutions/interventions. This requires a major increase in occupational epidemiology studies (including intervention studies), focusing on hot parts of the world. The detrimental health and economic impacts should encourage global and national policies to address climate change mitigation.

The Mini-Symposium will consider how to address these needs, and encourage networking among scientists in different fields for future studies. It also aims to engage young scientists in a field which has been overlooked in climate change impact analysis. The HEAT-SHIELD project welcomes cooperation in specific studies and sharing of methodologies.

Poster Presentation

Specific Occupations

0414   **RETROSPECTIVE CHANGES IN LUNG FUNCTION OF SERVING SCOTTISH FIREFIGHTERS DURING THEIR CAREERS**

[1,2]Christopher Ide*. [1]Health Management Ltd, Altrincham, UK; [2]Healthy Working Lives Group, University of Glasgow, Glasgow, UK

Background Firefighters are exposed to a wide range of respiratory hazards during their careers, and respiratory disorders can sometimes result in ill-health retirement (IHR) or death. While papers have reported findings from many countries, most originate from North America and/or are in response to specific incidents (eg '9/11'). This is the first report regarding specifically Scottish firefighters

Aim To observe the changes in lung function in a group of male Scottish firefighters during the course of their service, and to determine any differences between firefighters who took IHR, or completed maximum service (MS)

Method Retrospective data from routine 'over-40' medical examinations of firefighters who retired on the grounds of IHR or MS between 1985 and 1994 which included lung function data such as Peak Expiratory Flow Rate, (PEFR), Forced Expiratory Volume in one second(FEV1), and Forced Vital Capacity(FVC) were gathered and divided into two groups - those who took IHR, and those who completed MS. The results were expressed as a percentage of predicted values for age, height and male sex.

Results Peak expiratory flow rate

Total Number	no with usable PEFR data	% range of predicted value	Mean (+/- SD)	Median (IQR)	No of reduced PEFR (%)
IHR 505	235	−46 -+65	+3.7 (16.8)	1(−6- +9)	104(44)
MS 209	181	−31 -+79	+5.2 (14.9)	3(−3.5- +13)	61(34)

Discussion Both those taking IHR and MS showed a slight improvement in this aspect of lung function during the course of their careers, generally supporting earlier findings of West Sussex and London firefighters.

Declaration of potential conflict of interest: Author was previously Medical Adviser to the Fire and Rescue Service whose data is the subject of this project.

Oral Presentation

Shift Work

0415   **WORKING AROUND THE CLOCK: AN EXPOSURE RESPONSE RELATIONSHIP BETWEEN NIGHT WORK AND INCIDENT HYPERTENSION**

[1]Jacqueline Ferguson*, [1]Sadie Costello, [2]Mark Cullen, [1]Ellen Eisen. [1]University of California, Berkeley, Berkeley, California, USA; [2]Stanford University, Stanford, California, USA

Night work, or work outside of 7am to 6pm, causes chronobiologic rhythm disruption which may cause an increase in hypertension risk. To study this question, we assessed the association between night work and incident hypertension using three exposure metrics.

A cohort of 2941 new hires at 9 aluminium smelter and fabrication facilities were followed from 2003 through 2013 for incident hypertension defined by insurance claim's ICD-9 codes. Night shifts were classified as shifts with ≥ 3 hours between 12am-5am using time-registry data. Night work exposure in the previous year was defined three ways; two binary metrics adapted from previous studies: 1) Ever/Never, 2) Working $\geq$ or $<$36 night shifts; and a quantitative metric 3) Percentage of night shifts.

The association between hypertension and each exposure metric was estimated in separate Cox proportional hazards models, adjusting for age, sex, gender, facility, smoking history, annual BMI, annual health claims based risk score, and duration of past night work.

The rate of incident hypertension among workers with night work in the previous year was 1.88 (95% CI [1.16–3.05]) and 1.40 (1.00–1.96) times the rate among workers with no recent night work using metric 1 and 2 respectively. Compared with workers with no recent night work exposure, the hazard ratio among workers with >0-<5%, 5-<25%, 25-<50%, and $\geq$50% night shifts in the previous year were 1.62 (.93–2.83), 1.83 (1.05–3.20), 2.20 (1.29–3.78) and 2.29 (1.24–4.20) respectively (P_{Trend}=0.004).

Our results suggest recent degree of night shift exposure may be associated with higher rates of hypertension.

Poster Presentation

Exposure Assessment

0416   **RELATIONSHIP BETWEEN EXTRACELLULAR IRON AND CIRCULATING INFLAMMATION MARKERS IN PLASMA OF MINNESOTA TACONITE WORKERS**

Shannon M Sullivan*, Bin Ma, Bruce H Alexander, Jeffrey H Mandel, Irina Stepanov. University of Minnesota, Minneapolis, Minnesota, USA

Background Higher rates of mesothelioma, pneumoconiosis, lung cancer, and heart disease mortality have been reported in Minnesota taconite (iron ore) workers compared to the rest of the state population. Oxidative stress and inflammation are important underlying mechanisms in cancer and cardiovascular disease, and exposure to silica containing dust with a high iron content may play a key role in the observed elevated health risks.

Methods In this study, we compared ICP-MS-measured plasma iron concentrations to levels of circulating inflammatory markers (cytokines and chemokines) in 130 taconite workers using linear regression analysis adjusting for covariates.

Results Plasma iron levels varied substantially, ranging from 49 to 636 µg/dL, with a mean of 107 ($\pm$60) µg/dL. After adjusting for age, body mass index, gender and smoking status, plasma iron levels were positively associated with the levels of chemokines RANTES (p=0.06), TARC (p=0.04), and MDC (p=0.02).

Discussion These findings lend some support to the hypothesis that exposure to iron in taconite dust may lead to elevated levels of extracellular iron both in the lung and in the general circulation, producing reactive oxygen species and catalysing oxidative stress. Given that TARC and MDC have been prospectively associated with lung cancer risk in other research, there is a need to better understand the relationship between extracellular iron levels and these biomarkers in taconite workers. Further analyses to assess other metrics of iron exposure from taconite dust components on plasma iron concentrations and measures of oxidative stress are warranted.

Poster Presentation

Injuries

0418   **VIOLENCE IN HEALTHCARE: HOW DOES IT AFFECT RETURN-TO-WORK AFTER WORK INJURY?**

Kelvin Choi*, Esther Maas, Mieke Koehoorn, Chris McLeod. University of British Columbia, Vancouver, British Columbia, Canada

Objectives Research suggests an association between violence towards healthcare workers and poor return-to-work (RTW) outcomes. This association may be due to healthcare specific factors such as care setting and injury type. The aim of the study is to investigate RTW outcomes after injuries due to violence compared to other injuries in the British Columbia health and social services sector.

Methods The study used data on 42 080 time-loss workers' compensation claims from the health care and social services sector in British Columbia during 2009–2014. Cox regression and quantile regression were used for time-to-event analysis and final RTW status was assessed at one year.

Results The final cohort had 3173 violence-related claims (14.8%). Residential Social Services had the highest proportion of violence-related claims (34.2%). The effect of violence on RTW was greatest for counsellors and social workers, where 15.1% of workers with violence-related claims did not RTW compared to 8.0% with non-violent claims. For nurses, the largest occupation, 8.7% of workers with violence-related claims and 8.2% with non-violent claims did not RTW. Among injury types, violence is the strongest predictor for non-RTW for those with a mental illness. Among workers with a mental illness claim, 24.6% of those associated with violence did not RTW, whereas for those not associated with violence 15.0% did not RTW.

Conclusion Findings suggest that violence is associated with poorer RTW outcomes in certain care settings and injury types. Future work will use matched analysis and number of disability days paid to investigate this association in more detail.

Poster Presentation

Musculoskeletal

[1]Andrea Marie Jones*, [1]Mieke Koehoorn, [2]Ute Bultmann, [1]Christopher McLeod. [1]University of British Columbia, Vancouver, Canada; [2]University of Groningen, Groningen, The Netherlands

Background Evidence suggests that the prevalence of mental disorders is elevated following work-related physical injury, and that these disorders may contribute to disability outcomes. The objective of this study was to examine the prevalence of anxiety and depressive disorders by gender and injury type before and after work-related musculoskeletal injury.

Methods Accepted workers' compensation lost time claims for back strain/sprain or upper body connective tissue injury were extracted for workers in the Canadian province of British Columbia from 2000 to 2013. One-year period prevalence was measured using diagnoses from physician and hospital data. Workers with at least two diagnoses for anxiety or depression, or one of each, within 365 days were considered a case.

Results The prevalence of anxiety and/or depression was 13.2% before and 14.9% after injury. The prevalence in women was approximately twice that of men. Women with back strain/sprain had a slightly higher prevalence (19.0% before and 21.8% after injury) than women with connective tissue injuries (17.3% before and 18.5% after injury), while men had no difference in prevalence by injury.

Conclusion A greater difference in the prevalence before and after injury was expected. These findings indicate that many anxiety and depressive disorders may precede work-related musculoskeletal injury. The higher prevalence for women with back strain/sprain compared to women with connective tissue injury was surprising given that return-to-work outcomes are better for back strain/sprain. The next analysis will investigate associations between demographic, clinical, and workplace characteristics and new-onset anxiety and depressive disorders following work-related musculoskeletal injury.

Oral Presentation

Other

Tim Driscoll. Sydney School of Public Health, University of Sydney, NSW, Australia

Exposure to asbestos in occupational circumstances has decreased considerably in most developed countries over the last three decades, with improved exposure control and monitoring in most work situations and the prohibition on the use of asbestos in most occupational circumstances. Unfortunately, occupational exposures do still occur through renovation, repair and demolition of buildings, either with asbestos removal being a specific focus of the work or asbestos exposure being incidental to the main purpose of the work. Focus has also increased in recent years on exposure in non-occupational circumstances to *in-situ* asbestos, particularly through "Do-It-Yourself" (DIY) home renovations. These occupational and non-occupational circumstances are the so-called "third wave" of exposure to asbestos.

Despite considerable efforts in terms of occupational education and training, and broader publicity, there appears to be a lack of awareness by many workers of the potential for asbestos exposure and the circumstances in which such exposures can be expected. This leads to potential exposures not being appropriately controlled and probably to workers being inadvertently exposed or exposed at levels higher than is necessary or considered acceptable. Although many of the high-risk situations are known or can be reasonably anticipated, there is a lack of information on the frequency and levels of exposures associated with many of these third wave exposure situations, making it difficult to develop appropriate guidance regarding preventing and controlling the exposures.

This presentation will consider these issues as part of the overall symposium on "In situ asbestos and the risks of exposure for workers".

Poster Presentation

Injuries

0421 | INJURY SEVERITY, RETURN TO WORK, AND OUTCOMES IN COLLECTIVELY-BARGAINED ALTERNATIVE WORKERS' COMPENSATION ARRANGEMENTS

[1]Katherine Schofield*, [1]Kim Dauner, [2]Andrew Ryan. *[1]University of Minnesota Duluth, Duluth, MN, USA*; *[2]University of Minnesota, Minneapolis, MN, USA*

Introduction The construction industry experiences severe injuries. When an employee is injured, the goal is to minimise long-term disability and efficiently return the employee to work. The Union Construction Workers Compensation Program (UCWCP) of Minnesota provides an alternative, collectively-bargained system administered by workers' compensation insurance providers. The program includes exclusive provider network for medical care and access to alternative dispute resolution process. The goal of this study is to determine injury outcome differences for UCWCP members.

Methods Workers' compensation claims were examined over a ten year period. UCWCP membership and date of enrollment were determined. Claims were stratified by medical or lost-time status. Multiple measures of severity and outcome were examined, including claim rate and duration, time to return-to-work, and permanent partial disability status. We calculated rates and comparative risk based on UCWCP. A logistic model will estimate rate ratios (RR) and 95% confidence intervals (CI) as a function of claim rate. Time-to-event models will assess differences in duration of disability based on UCWCP. Proportional hazards regression estimated hazard ratios (HR) and 95% CI.

Results UCWCP employers had a lower rate of lost-time claims. Compared to non-UCWCP employers, UCWCP-membership was associated with a 9% increased likelihood of claim closure for both medical and lost-time claims (HR=1.09, CI=1.05–1.13; HR=1.09, CI=1.02–1.17). Most differences occurred in the first 90 days. Return-to-work likelihood and reduced permanent disability appeared to be related to UCWCP.

Conclusions Alternative workers' compensation arrangements may include elements that collectively protect workers' interests, reduce injury severity, and are cost-effective for insurers.

Oral Presentation

Specific Occupations

0422 | A TOTAL WORKPLACE SAFETY AND HEALTH PROJECT FOR SECURITY OFFICERS IN A SINGAPORE UNIVERSITY – FROM NEEDS ASSESSMENT TO INTERVENTIONS AND EVALUATION

Jeff Yi-Fu Hwang*, Sin Eng Chia, Wagner Norbert, Vivian Ng, Kah Wai Leong, Pang Tong Tan. *National University of Singapore, Singapore, Singapore*

Objectives To implement and evaluate a Total Workplace Safety and Health Project (Total WSH) at a security office in a Singapore university.

Methods Total WSH is an integrated approach to the management of health and safety in the workplace. In the first phase of our project, we evaluated the gaps and challenges of the safety and health management system within the department, and gained understanding of the health status of the security officers, through assessment tools including a Basic Health Survey, workplace visits and semistructured interviews. Recommendations were subsequently discussed with the senior management for implementation in the intervention phase, with evaluation of process and outcome measures thereafter.

Results Strong communication among all staff in the security office was noted, and this is related to the openness of staff across different management levels. All staff took part in the Basic Health Survey, which found that 91% have a "Good" or "Excellent" Work Ability Index. There is a high proportion of employees with chronic diseases and obesity. In addition, 36% of employees consume sweet drinks daily, while only 16% and 37% consume two servings of fruits and vegetables a day respectively. Recommendations were made related to the safety and health management system, and health promotion such as improving access to healthy food, facilitating physical activity during work, and implementing a chronic disease management system. These recommendations would be implemented from January 2017 onwards.

Conclusion Total WSH is effective in enabling the holistic management of safety and health in the workplace.

Oral Presentation

Injuries

0423 | GEOSPATIAL TRENDS IN OCCUPATIONAL INJURY AND WORKERS' COMPENSATION UTILISATION

Katherine Schofield*, Laure Charleux. *University of Minnesota Duluth, Duluth, MN, USA*

Introduction Workers' compensation data provide a source of information on occupational injuries and their burden on workers and the workplace. Injured workers utilise healthcare systems for treatment of their injuries and various factors may influence access to care and the ultimate outcome of the claim. Some factors may be dependent wholly, or in part, on geographical access to care and the communities in which employees live. We explored a new injury surveillance and analysis technique by coupling of geographical information systems (GIS) and workers' compensation data.

Methods Employee addresses were geocoded using Esri Street Map to determine spatial trends. Time/distance (accessibility) to health care providers were calculated. Geographic masking maintained individual-level confidentiality. We calculated rates and comparative risk of severity and disability duration of workers' compensation claims based on accessibility. Using a negative binomial model, we estimated rate ratios (RR) and 95% confidence intervals (CI) as a function of claim rate. Cox proportional hazards regression assessed differences in duration of disability benefit levels based on accessibility to

healthcare and estimated hazard ratios (HR) and 95% confidence intervals (CI).

Results Multiple atlases of occupational injuries was constructed to visualise trends in location, industry, injury characteristics, and severity. Accessibility to healthcare, specifically specialty health care, affected risk of increased severity, claim duration, and disability.

Conclusions This innovative way of combining and visualising data may identify risk factors for occupational injury, including those that may be spatially or community-based. It may provide new strategies for proactive injury prevention or severity reduction efforts

Oral Presentation

Other

0424 RISK OF MESOTHELIOMA AND RISK OF EXPOSURE TO ASBESTOS IN PEOPLE SUPPOSEDLY UNEXPOSED TO ASBESTOS

[1]Nicholas de Klerk*, [2]Len Gordon, [3]Helman Alfonso, [3]Alison Reid, [1]Nola Olsen, [1]Robin Mina, [1]Peter Franklin, [1]Susan Peters, [3]Fraser Brims, [4]Jennie Hui, [1]Bill Musk. [1]*University of Western Australia, Perth, Australia*; [2]*Caltex Australia, Perth, Australia*; [3]*Curtin University, Perth, Australia*; [4]*PathWest Laboratory Medicine, Nedlands, Australia*

Objectives Malignant mesothelioma (MM) is a rare and generally fatal cancer, usually caused by asbestos, although about 5%–10% of cases report no asbestos exposure. This study aimed to identify sources whereby people in Western Australia (WA) may be unknowingly exposed to asbestos or to other exposures which may cause MM.

Methods Cases with no known asbestos exposure were selected from the WA Mesothelioma Register. Matched controls were selected from hospital patients admitted for conditions unrelated to asbestos. Occupational histories were coded by an industrial hygienist. Data were analysed using conditional logistic regression.

Results Eligible cases were far fewer than anticipated. After 9 years there were 38 MM cases (from a total of more than 400 reported cases of MM over the same time period), 65 other cancer controls and 69 medical controls recruited. Odds ratios did not differ by type of control so both sets of controls were combined. Thirty-eight MM participants and 134 controls were recruited. Risk of MM was increased (OR=3.1, 95% CI 1.0–9.6) after no known, but likely, exposure to asbestos at work.

Conclusions Because of its widespread use, very few people in WA have never been exposed to asbestos and careful elucidation of occupational and environmental histories usually uncovers likely exposures sufficient to cause MM. This study suggests that most cases of MM in people with apparently no known exposure to asbestos occur, at a low rate, among the large numbers of people who have had small amounts of incidental asbestos exposure.

Oral Presentation

Risk Assessment

0425 AN OCCUPATIONAL EPIDEMIOLOGY MODEL FOR CLIMATE CHANGE IMPACT ASSESSMENT

[1,2]Tord Kjellstrom*, [3]Matthias Otto, [3]Bruno Lemke, [4]Chris Freyberg, [5]David Briggs, [6]Lauren Lines. [1]*Centre for Technology Research and Innovation, Limassol, Cyprus*; [2]*Australian National University, Canberra, Australia*; [3]*Nelson-Marlborough Institute of Technology, Nelson, New Zealand*; [4]*Massey University, Palmerston North, New Zealand*; [5]*Imperial College, London, UK*; [6]*Canterbury University, Christchurch, New Zealand*

Thermal physiology science shows the health threats to workers caused by exposure to heat when doing heavy physical labour. Climate change increases environmental heat levels in most of the world and it is a key issue for climate change and health research. Our model links climate and workforce data (current and predicted) and estimates work capacity loss at individual and population level and related economic loss. The model incorporates climate conditions, population estimates, workforce distributions, heat exposure estimates, exposure-response relationships, and socio-economic impact functions. The basis of the model is occupational epidemiology.

Much of the data upon which heat stress health risk functions are based comes from thermal physiology laboratory research. While this research has provided valuable information about human function at different heat exposures, the individuals studied are generally not the same mix of ages and physical conditions of typical working populations. Very few published studies have included the quantitative occupational epidemiology analysis needed for climate change related health risk assessments. For example, different model settings produce annual moderate intensity work hours lost due to heat (in the shade) by the 2050s at 0.7%–1.6% for USA and 1.1%–3.0% for China. Many of these lost hours will reduce the annual GDP, estimated at 34 trillion USD in the USA and 58 trillion in China (2050). Even a small loss creates many billion USD of economic losses. Our model can identify evidence missing for reducing the uncertainties in impact estimates, which can guide decisions about climate change mitigation and adaptation.

Poster Presentation

Chemicals

0426 CHRONIC CADMIUM INTOXICATION WITH RENAL INJURY AMONG WORKERS IN A SMALL-SCALE SILVER SOLDERING COMPANY

Won-Jun Choi*, Seong-Kyu Kang. *Gachon University Gil Medical Centre, Incheon, Republic of Korea*

Background/Aim Cadmium exposure may induce chronic intoxication with renal damage. Silver soldering may be a source of cadmium exposure.

Methods We analysed working environment measurement data and periodic health screening data from a small silver soldering company with ten workers. Concentrations of cadmium in air from working environment measurement data were obtained. Concentrations of blood and urinary cadmium, urine protein and urine beta2-microglobulin (B2M) were obtained. We used generalised linear model to identify the association between blood and urine cadmium and urine B2M . Clinical features of chronic cadmium intoxication focused with toxicological renal effects were described.

Results Mean duration of work was 9.7 years (range 3~20 years). Cadmium concentrations in air were ranged from 0.006 to 0.015 mg/m3. Blood cadmium was elevated in all ten workers with highest level of 34.5 µg/dL. Urinary cadmium was elevated in nine workers with highest level of 63.0 µg/g Cr. Urine B2M was elevated in three workers. Urinary cadmium was positively associated with urine protein (beta coefficient 10.27, 95% confidence interval [CI] 4.36, 16.18), while blood cadmium was not significantly associated with urine protein (beta coefficient −1.37, 95% CI −10.00, 7.28). Electron microscopic findings and other clinical parameters were compatible with renal tubular damage.

Conclusions Cadmium intoxication may occur at quite low air concentrations. Exposure limit may be needed to be lowered.

Poster Presentation

Exposure Assessment

0427   OCCUPATIONAL EXPOSURES AMONG HOME-BASED INFORMAL WORKERS IN A POOR URBAN AREA OF BRAZIL

[1,2]Eduardo Marinho Barbosa*, [2]Vilma Sousa Santana, [3,2]Sílvia Ferrite, [2]Felipe Campos, [2]Gisella Cristina de Oliveira Silva, [3,2]Milena Maria Cordeiro Almeida. [1]Federal Institute of Bahia – IFBA, Health Technology Nucleus – NTS, Salvador, Bahia, Brazil; [2]Federal University of Bahia – UFBA, Institute of Collective Health – ISC, Program of Environmental and Workers' Health – PISAT, Salvador, Bahia, Brazil; [3]Federal University of Bahia – UFBA, Institute of Health Sciences – ICS, Salvador, Bahia, Brazil

Background In Brazil, the National Health System provides primary health care, PHC, in which interdisciplinary teams support community health agents, CHA, responsible for families living in catchment areas.

Objectives To describe occupational exposures among informal home-based workers, HBW, in order to integrate occupational health and safety into PHC.

Methods Based on PHC families' files, home-based informal workers were listed and recruited. Trained interviewers and CHAs visited worksites to identify hazards using a checklist, assessing levels of noise and formaldehyde in the air, and other self-reported threats to health. Tablets with ODK Collect software were used.

Results There were 450 worksites and 468 invited workers agreed to participate. The majority comprises women (77.1%), of black skin colour (92.5%), 18–50 years of age (54.7%), 6–9 school years (65.4%), and an average US$300.00 income per month (75.4%). Prevailing trades were retail (35.3%), food (25.8%) and personal beauty care (17.1%). Almost all workers reported to be self-employed (92.5%), had no resting days (45%) and 45 to 135 work hours per week (48.5%). All worksites had occupational exposures of interest for health. From 19.6 hours continuous assessment, the noise level was 77 dB(A), and formaldehyde exposure over threshold limit value was detected in five beauty salons out of 10 investigated.

Conclusions Home-based businesses is a mainly women survivorship strategy, who work for long journeys, in poor urban areas of Brazil. The integration of workers' health into PHC can identify, in this context, situations of health problems and support planning of preventive measures.

Oral Presentation

Occupational Medicine (SCOM/Modernet)

0429   DAYTIME WORKPLACE NOISE EXPOSURES LOWER THAN OCCUPATIONAL CRITERIA CAN DISTURB NIGHTTIME SLEEP

[1,2]Leon Guo*, [3,4]Cheng-Yu Lin, [1,5]Perng-Jy Tsai, [6]Kuei-Yi Lin, [6]Chih-Yong Chen, [6]Lin-Hui Chung, [3]Jiunn-Liang Wu. [1]National Institute of Environmental Health Sciences, National Health Research Institutes, Zhunan, Taiwan; [2]Environmental and Occupational Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan; [3]Otolaryngology, National Cheng Kung University (NCKU) College of Medicine and NCKU Hospital, Tainan, Taiwan; [4]Otolaryngology, Ministry of Health and Welfare Tainan Hospital, Tainan, Taiwan; [5]Environmental and Occupational Health, National Cheng Kung University College of Medicine, Tainan, Taiwan; [6]Institute of Labour, Occupational Safety and Health, Ministry of Labour, Executive Yuan, New Taipei City, Taiwan

Background Nighttime noise exposure has been shown to affect sleep quality. However, effects of daytime noise exposure on nighttime sleep have been inconclusive. A quasi-experimental study was carried out using crossover design to determine daytime occupational noise exposure on polysomnography (PSG)-documented sleep quality.

Methods From two hospital cafeterias, 48 employees were recruited to participate in this study. Each participant was randomly assigned to expose to high noise level areas for 8 hours and, on a separate occasion, low noise level areas for 8 hours. The high and low noise periods were separated by a washout period of 14 days. Personal noise exposure, pure tone audiometry, autonomic nerve system (ANS) function tests, and overnight PSG were measured.

Results A total of 20 men and 20 women completed the study, with average tenure of 10.0 years. Average daily noise exposure (time-weighted average in 8 hours, TWA-8 hours) was 73.5 dBA during the high noise exposure day, and 64.4 dBA during the lower noise day (p=0.001). Subjective sleep quality was not different between nights after higher and lower noise days. Comparing to nights after low noise days, deep sleep by PSG was significantly shorter, sleep efficiency worse, resting heart beats and blood pressure after cold pressor test (CPT) higher after high noise days, after adjusting for covariates.

Conclusions Daytime noise exposure had a sustained effect on nighttime sleep, including shorter deep sleep and lower sleep efficiency. The sleep disturbance could be partially explained by post-shift ANS activity.

Poster Presentation

Psychosocial

[1]Judith Shiao*, [2,3]Wei-Shan Chin, [3]Sherri Yeh, [2,3]Leon Guo. [1]*Nursing, National Taiwan University (NTU) College of Medicine and NTU Hospital, Taipei, Taiwan;* [2]*National Institute of Environmental Health Sciences, National Health Research Institutes, Zhunan, Taiwan;* [3]*Environmental and Occupational Medicine, National Taiwan University (NTU) and NTU Hospital, Taipei, Taiwan*

Introduction This study aimed to examine the prevalence rates of psychological symptoms and risk factors between female and male workers at 12 months after their sustaining occupational injurie. Demographic and injury-related risk factors for psychological symptoms were evaluated.

Methods Our study candidates were injured workers in Taiwan who were hospitalised for 3 days or longer and received hospitalisation benefits from the Labour Insurance program. A self-reported questionnaire including the Brief Symptom Rating Scale was sent to workers at 12 months after injury.

Results A total of 1233 workers (response rate 28.0%) completed the questionnaire, including 356 women and 877 men. A higher percentage (30.1%) of women had elevated BSRS-5 score of 6 or higher than men (22.5%). The risk factors for elevated psychological symptom scores for female workers were lower education level (odds ratio, OR=1.8, 95% confidence interval, CI=1.1–3.0), main income contributor of the household (OR=1.8, CI=1.1–3.0), severely affected physical appearance due to injury (OR=2.8, CI=1.3–5.9), and having adverse life event after injury (OR=2.0, CI=1.1–3.6) after mutual adjustment. Whereas the risk factors for elevated psychological symptom scores for female workers were loss of consciousness after the injury (OR=2.0, CI=1.3–3.1), severely affected physical appearance due to injury (OR=3.7, CI=2.3–6.0), having adverse life event after injury (OR=2.5, CI=1.6–3.8), not return-to-work (OR=3.2, CI=2.0–5.1), and reduced salary as compared to that before injury (OR=2.4, CI=1.3–4.1).

Conclusions After occupational injury, women suffered from higher rate of psychological symptoms. Risk factors were different between men and women who sustained occupational injuries.

Poster Presentation

Methodology

[1,2]Charlotte Maugard*, [3]Christophe Cancé, [1]Pauline Achard, [2]Olivier François, [1,4]Vincent Bonneterre, [1,2]Delphine Bosson-Rieutort. [1]*Grenoble-Alpes University (UGA)/TIMC-IMAG Laboratory (UMR CNRS 5525)/EPSP Team (Environment and Health Prediction of Populations), Grenoble, France;* [2]*Grenoble-Alpes University (UGA)/TIMC-IMAG Laboratory (UMR CNRS 5525)/BCM Team (Computational and Mathematical Biology), Grenoble, France;* [3]*Grenoble-Alpes University (UGA)/UMS GRICAD, Grenoble, France;* [4]*Grenoble-Alpes Teaching Hospital ("CHU Grenoble-Alpes")/Occupational Medicine and Health Department, Grenoble, France*

In order to look for relevant signals for detection of emerging occupational diseases among agricultural workers, we developed a data-mining approach applied on health-insurance data (see C. Maugard communication). Applied on the databases of the French dedicated social security system (MSA), this approach first aims to look for associations between chronic diseases and occupational activities (recorded as activity sector codes in the MSA contributors database).

To avoid re-identification, workers location has not been provided, although it is recognised as closely related to cultural practices. Therefore, it was not possible to directly estimate individuals involvement in specific cultures (through existing parcel register and agricultural census for instance) and finally use cultures x pesticides to estimate pesticides exposures.

To deal with this issue, we used an innovative approach to cut off the national territory into "meshes", to obtain a geographical variable accurate enough to assess cultures types while respecting a sufficient number of agricultural workers per meshes to avoid re-identification. This approach consists of an iterative process dividing each geographical unit into 4 parts while respecting a minimum threshold of workers in each mesh. The process continues until each mesh contains a homogeneous number of individuals. Taking into account the prevalence of the chronic diseases of interest, and typology of cultures, we defined a minimum number of individuals per mesh (n=1500). This methodological development allows us to get indirect information about location by MSA at a level interesting to identify cultures (proxy for pesticides use), but restricting the possibilities of individuals re-identification.

Poster Presentation

Cancer

0432   PARENTAL EXPOSURE TO PAINTS AND RISK OF CHILDHOOD CANCER

[3]Julie Volk*, [3]Johnni Hansen, [2]Julia Heck, [1]Kjeld Schmiegelow. [1]*Department of Paediatrics and Adolescent Medicine, University Hospital Rigshospitalet, Copenhagen, Denmark; [2]Department of Epidemiology, UCLA School of Public Health, California, USA; [3]Department of Diet, Genes and Environment, Danish Cancer Society Research Centre, Copenhagen, Denmark*

Objective Even though childhood cancer is a rare disease, it is one of the main causes of death among children in the Western world. Not much is known about the causes of childhood cancers but parental occupational exposures have been suggested by a number of epidemiological studies, including exposure to paints.

Methods and materials All childhood cancer cases (0–15 years) in Denmark from 1968–2012 (n=5,711) were retrieved from the Danish Cancer Registry and population controls (1:100) were randomly selected and matched by age and sex. Maternal and paternal occupational history was retrieved by the Supplementary Pension Fund. Potential confounders were retrieved through the Medical Birth Registry. Register linkages were conducted using the unique identification number assigned to all Danish residents.

Results Preliminary results for cancer of all sites show an OR of 0.89 (95% CI: 0,71–1.01) and 0.86 (95% CI: 0.73–1.01) for maternal and paternal exposure to paint, respectively, after controlling for potential confounders, including SES, maternal smoking, birth order, previous miscarriage, malformation and parental age. Increased but insignificant ORs were found for acute lymphatic leukaemia, non-Hodgkin lymphoma, ependymoma, astrocytoma, Burkitt lymphoma, central nervous system cancers, Ewing sarcoma, melanoma and hepatoblastoma for maternal exposure and acute myeloid leukaemia, glioma, melanoma, neuroblastoma and hepatoblastoma for paternal exposure.

Conclusion Preliminary results have shown little and insignificant effect of parental paint exposure in relation to childhood cancer risk.

Poster Presentation

Disease Surveillance

0433   TOWARDS AN IDEAL NATIONAL WORK-RELATED ILL HEALTH SURVEILLANCE SYSTEM IN GREAT BRITAIN

Yiqun Chen*, David Fishwick, Andrew Curran. *Health and Safety Executive, Buxton, UK*

Population-based occupational health surveillance includes work-related ill health surveillance and workplace health risk exposure surveillance. It is an important intelligence gathering system at the national level, which supports the planning, monitoring and evaluation of measures to prevent work-related ill health. The intelligence is essential for targeted intervention, prioritisation, tracking progress and evaluation of impact.

To make best use of resources for intelligence gathering, the approaches used should be regularly assessed and monitored to ensure they remain fit-for-purpose, cost-effective and forward looking. In the context of the strategic approach for research planning and prioritisation in the Health and Safety Executive (HSE), a series of workshops were developed.

One of the HSE internal workshops was organised in January 2017. Some, 26 (90%) of the 29 invited stakeholders have participated to develop a common vision for a population-based work-related ill health surveillance system that will continue to meet HSE's intelligence needs now and in the future;

Following detailed assessments of the gaps in the current system, a wide range of innovative approaches were explored. Some practical first steps to improve the system were recommended with an emphasis on more systematic and strategic data collection. The key characteristics of an ideal system were also identified, including new features on case investigation and detecting new/emerging work-related ill health risks to inform timely preventative actions. The outputs of the workshop are presented. They have informed HSE priorities in the continued development of the system to support its mission to prevent work-related ill health.

Oral Presentation

Dusts and Fibres

0434   A META-ANALYSIS OF OCCUPATIONAL SILICA EXPOSURE AND RISK OF AUTOIMMUNE RHEUMATIC DISEASES: DOES STUDY QUALITY MATTER?

[1]Henrik A Kolstad*, [2]Christiane Beer, [3]David Sherson, [4]Anne Troldborg, [4]Berit Dalsgaard Nielsen, [5]Anne Braae Olesen, [6]Gitte Jacobsen, [4]Søndergaard Klaus, [2,7]Schlünssen Vivi. [1]*Department of Occupational Medicine, Danish Ramazzini Centre, Aarhus University Hospital, Aarhus, Denmark; [2]Department of Public Health, Danish Ramazzini Centre, Aarhus, Denmark; [3]Department of Occupational and Environmental Medicine, University of Southern Denmark, Odense, Denmark; [4]Department of Rheumatology, Aarhus University Hospital, Aarhus, Denmark; [5]Department of Dermatology, Aarhus University Hospital, Aarhus, Denmark; [6]Department of Occupational Medicine, Danish Ramazzini Centre, Hospital Region Vest, Herning, Denmark; [7]National Research Centre for the Working Environment, Copenhagen, Denmark*

Objectives Increased risks of rheumatoid arthritis, small vessel vasculitis, systemic lupus erythematosus, and systemic sclerosis have been observed following crystalline silica exposure. Our aims are to estimate pooled risk estimates and assess the impact of study quality.

Methods We followed the PRISMA criteria, identified 1162 articles, and included 21 studies that we classified according to eight quality parameters (high vs. low). We estimated pooled overall and disease specific odds ratios (ORs) with random effects meta-regressions.

Results We observed an increased overall OR of 2.3 (1.7–3.1, 21 studies) and for rheumatoid arthritis (OR 1.7, 95% CI 0.8–3.41, 6 studies), small vessel vasculitis (OR 2.4, 95% CI 1.2–4.7, 6 studies), systemic lupus erythematosus (OR 2.8, 95% CI 0.5–14.7, 3 studies), and systemic sclerosis (OR) 2.9, 1.7–4.9, 6 studies). The following high-quality characteristics

were associated with decreased ORs: appropriate control group, high response rate, appropriate confounder control, independent exposure information, and many participants; and with increased ORs: quantitative or semi-quantitative exposure measure, hospital based diagnosis, and well-defined diagnostic criteria. Only the latter was statistically significant ($p < 0.05$). When we consecutively excluded low quality studies, the overall OR value decreased to 1.3 (0.4–4.2, 3 studies) but this exercise was sensitive to the order. Egger's test of no small study effect was highly statistically significant ($p < 0.01$).

Conclusion This review provides some evidence that crystalline silica is associated with systemic sclerosis, systemic lupus erythematosus, rheumatoid arthritis, and small vessel vasculitis. However, more high-quality studies are needed to confirm or refute if this represents causal associations.

Poster Presentation

Exposure Assessment

0435   **PIGEON BREEDING AND THE RISK OF INTERSTITIAL LUNG DISEASE, DOES NUMBER OF PIGEONS MATTER?**

[1]Christine Cramer*, [2,3]Vivi Schlünssen, [4]Elisabeth Bendstrup, [1]Zara Ann Stokholm, [1]Jesper Medom Vestergaard, [5]Morten Frydenberg, [1]Henrik Albert Kolstad. [1]*Department of Occupational Medicine, Danish Ramazzini Centre, Aarhus University Hospital, Aarhus, Denmark*; [2]*Department of Public Health, Danish Ramazzini Centre, Aarhus University, Aarhus, Denmark*; [3]*National Research Centre for the Working Environment, Copenhagen, Denmark*; [4]*Department of Respiratory Diseases and Allergy, Aarhus University Hospital, Aarhus, Denmark*; [5]*Section for Biostatistics, Department of Public Health, Aarhus University, Aarhus, Denmark*

Objective We recently showed an increased risk of interstitial lung disease (ILD) among pigeon breeders. The current study aims to explore this finding further by investigating the relation between the duration and intensity of the pigeon exposure and the risk of ILD.

Methods This is a retrospective follow-up study from 1980 to 2013 of pigeon breeders identified in the records of the Danish Racing Pigeon Association. Since 2000 the association has kept annual records on the number of pigeon leg bands purchased by each breeder. From this information and the average pigeon life expectancy we will calculate number of pigeons kept. Dates of enrolment and resignation in the association are used to assess duration of pigeon breeding. Hospital based diagnoses of ILD are identified by linkage with the National Patient Registry 1977–2013.

We will calculate hazard ratios with Cox regression analyses and censor participants at date of death, emigration, disappearance, diagnosis of connective tissue disease, or end of study by December 31 2013.

Results We have obtained information on number of pigeon leg bands and duration of membership for 2085 and 2656 pigeon breeders, respectively. Average number of pigeons kept is 132.73 per year and mean membership duration is 11.35 years. A total of 19 members are diagnosed with ILD. Statistical analyses are still pending but will be concluded before the conference, where results will be presented.

Conclusion This data provides a unique opportunity for investigating a possible exposure-response relation between pigeon related exposures and the risk of ILD.

Poster Presentation

Policy/Impact

0436   **COMPARISON OF OCCUPATIONAL PHYSICIANS WITH ATTENDING PHYSICIANS FOR OPINIONS ON COLLABORATION WITH THEIR COUNTERPARTS. HOW TO SUPPORT OF FITNESS FOR WORK OF EMPLOYEES WITH DISEASES**

[1]Go Muto*, [1]Kazuhito Yokoyama, [1]Fumihiko Kitamura, [2]Motoki Endo. [1]*Department of Epidemiology and Environmental health, Graduate school of Medicine, Juntendo University, Tokyo, Japan*; [2]*Department of Public health, Tokyo Womens' Medical University, Tokyo, Japan*

Objectives To compare occupational physicians (OPs) with attending physicians (APs) for opinions on collaboration with their counterparts. Another purpose is to estimate the determinants of success of the collaboration.

Methods A questionnaire was mailed to both OPs belonging to the subcommittee of Japan Society for Occupational Health and APs belonging to Japan Medical Association. The questionnaire assessed demographics, opinions regarding collaboration such as medical information exchange with their counterparts, and successful or failed cases of cooperation.

Results A total of 94 OPs and 150 APs responded. Each of them offered 212 and 222 collaboration cases, respectively. From the analysis of successful cases, both groups showed mental disorder had the highest necessity of collaboration although APs showed relatively lower percentage (37%) compared with that of OPs (52%). From the perspective of situation of collaboration, approximately 60% cases occupied return-to-work and 35% cases showed the prevention of diseases exacerbation, which was the similar tendencies on both groups. However, 95% cases on OPs groups started from OPs side although only 48% cases on APs groups started from OPs side. OPs may like to start collaboration with APs but are unwilling to respond to APs letters. Furthermore, from the analysis of successful and failed cases of collaboration in mental disorders using chi-square test, the factors such as strong understanding of attending physicians ($p = 0.007$) and superiors of the employees ($p = 0.041$) for the collaboration, and controlled severity of diseases ($p < 0.001$) were suggested to be significantly important in successful cooperative support for employees.

Poster Presentation

Risk Assessment

0437   **EFFECT OF AGE AND BODY MASS INDEX AS RISK FACTOR FOR OCCUPATIONAL CONTINGENCIES IN HEALTHCARE WORKERS**

Gonzalo Aicardi*, Jonathan Alvarez, Fatima Cotobal, Marta Hernandez, Mercedes Cumplido, Lourdes Barrueco. *SACYL, Salamanca, Castile and leon, Spain*

Objective To determine whether overweight and obesity and age are associated with a higher risk of accidents at work and occupational disease.

Background Data During recent years, professional contingencies have been increasing at work, a change that coincides with a higher prevalence of obesity and older work population.

Methods This cross-sectional study was carried out among 1489 workers in healthcare industry. This study identified the prevalence of obesity and overweight in a hospital and its associations with occupational diseases and accidents at work over a 4 years' period. With and without absences from work and the length of the absences were recorded. Body mass index (BMI) and demographic details were recorded.

Results At baseline, 48,3% had normal-weight (BMI [body mass index]: 18.5–24.99 kg/m 2), 34,3% were overweight (BMI: 25–29.99 kg/m 2), 14,8% were obese (BMI $\geq$30 kg/m 2), and 2,6% were underweight (BMI <18.5 kg/m 2). During the 4 years' period, with a mean of 46 years, 263 participants were diagnosed with a professional contingency (accident at work or occupational disease). Compared with normal-weight individuals, there was no statistically significant difference having an occupational contingency between overweight and obese workers (p-value 0,161). Although, we found that the age is a risk factor of having an accident at work.

Conclusion Obese and overweight persons are not at a higher risk of developing an occupational contingency. Furthermore, our results indicate that the age might be a novel explanation for the increased number of workers with accidents at work.

Poster Presentation

Methodology

0438 **FIELD STUDY POTENTIAL IN INDIA FOR OCCUPATIONAL HEAT STRESS – CHALLENGES AND OPPORTUNITIES**

Vidhya Venugopal*, Jeremiah Chinnadurai, S Rekha, K Manikandan, S Krishnan, K Latha, K Kumaravel. *Sri Ramachandra University, Chennai, Tamilnadu, India*

Collecting information about health and productivity implications of occupational heat exposures directly from workers can have its own challenges but not impossible to accomplish. This is presented based on experiences from prior work in occupational setting-based participatory research with workers. Permissions from industries to conduct research and the initial lack of trust and scepticism from the workers is a major challenge. Lack of mutual understanding between the workers and the researchers' expectation, lack of understanding of the study objectives both by the untrained interviewer and workers, cognitive limitations and busy schedule of the workers create barriers to reliable and complete data collection. Apart from these, research logistics and procedures such as recruitment, travel and compensation for the research personnel, quality and interpretation of data, including issues of validity and reliability are other challenges. Strategic planning, consultation with employers, ethical and careful development of trust between the researcher, employer and the worker have been key to the success of the field study that

requires investment and deployment of time and resources. A well-thought through and validated questionnaire structured with contextual approaches, trained interviewers and conducting cohort studies in the same workplaces have also been successful methods in developing trust for eliciting reliable data from the workers. Collecting less structured data from workers is potentially very productive but requires the anticipation, avoidance, or negotiation of the challenges. Future work is necessary to better understand these challenges across different methods and settings, as well as to test and identify strategies to address them.

Poster Presentation

Musculoskeletal

0440 **SHOULDER REPETITIVENESS EXPOSURE THRESHOLD DETECTION USING ADJUSTED HAZARD MULTIVARIATE PARAMETRIC MODELLING FOR CUMULATIVE TRAUMA DISORDERS (CTD) PREVENTION AND CAUSAL ASSESSMENT**

[2,3]David Alvarez Rincon*, [4]Luisa Perez. [1]*ICOH member, Milano, Italy;* [2]*EPICOH member, Utrecht, The Netherlands;* [3]*Provincial Workers' Compensation Board, Cali, Colombia;* [4]*University of Alberta OHS certificate, Edmonton, Canada*

Background Cumulative-Trauma Disorders are major loss causes in labour environments through the world, but few is known about quantitative workload exposure limits. The aim of this research was to define shoulder repetitiveness exposure threshold by assessing the risk of rotator cuff, biceps and bursal injuries in a cohort of workers.

Methods A retrospective cohort study was assembled with workers from different positions. Inclusion/exclusion criteria were rigorously applied. Clinical variables were extracted from each worker clinic history; dependent variable was obtained using NMR, ultrasound and/or surgical reports. Shoulders workload was assessed independently getting cumulative exposure time to repetitive motions adjusting by rest/break periods and other covariates, controlling confusing effects. The exposure threshold was acquired using the "David's cheese bread" method with an adjusted multivariate Weibull regression modelling, previously adopting Akaike Criterion. A Huber's M-estimator was performed warranting robust estimators for correcting both shoulders non-completely independent measures (two shoulders by worker). Final model was built according with Hosmer-Lemeshow-May's covariates purposeful selection principles.

Findings/conclusions 328 workers (656 shoulders) were included (95,8% sample power). At following-end, following span median was 21.6 years, age median was 42 years, 60% were women, 85% had non-university academic level and 77% had non-administrative positions. Age, handedness, academic level, work type and mood disorders were proved as significant or as confounding covariates within the final model. Cumulative 4×10^3 effective working hours for shoulder repetitiveness exposure was established as threshold with adjusted HRR=1.93 (95%CI 1.04–3.59). No worker should be exposed more than that threshold in order to eliminate shoulder's CTD.

Oral Presentation

Pesticides

0441 EXPOSURE TO DINITROANILINES AND RISK OF LUNG CANCER (LC) BY SUBTYPES: RESULTS FROM THE AGRICAN COHORT

[1,2]Mathilde Boulanger*, [1,4]Séverine Tual, [1,4]Clémentine Lemarchand,. [7]Francim-Agrican group, [5,6]Isabelle Baldi, [1,2]Bénédicte Clin, [1,2]Pierre Lebailly. [1]INSERM U1086, Caen, France; [2]Université de Caen Normandie, Caen, France; [3]Service de Pathologie professionnelle, CHU de Caen, Caen, France; [4]Centre François Baclesse, Caen, France; [5]ISPED, Laboratoire Santeí Travail Environnement, Universiteí de Bordeaux, Bordeaux, France; [6]INSERM, ISPED, Centre INSERM U897 – Epideímiologie- Biostatistique, Bordeaux, France; [7]Francim-Agrican group, ., France

Introduction 2,6-Dinitroanilines included 15 herbicides, some of which are still used on a wide range of crops worldwide and in France, especially pendimethalin which was given special attention by the IARC. The aim of our analyses was to estimate the associations between LC and exposure to pendimethalin, benfluralin, butralin, ethalfluralin, nitralin, oryzalin, trifluralin -all once or still authorised in France-, in the French AGRIculture and CANcer (AGRICAN) cohort.

Methods More than 1 80 000 people affiliated for at least 3 years to the agricultural health insurance scheme were enrolled between 2005 and 2007. A total of 563 incident LC were identified from enrollment to 2011. Data on crop exposure during lifetime (13 crops, specific tasks including pesticide use) were collected. The evaluation of potential exposure to each dinitroaniline relied on a specific crop-exposure matrix, PESTIMAT. Analyses were adjusted on smoking history, involvement in cattle and horse breeding, peas growing, exposure to farming activities during childhood.

Results In the population, 16 533 people (11.2% of the cohort) were potentially exposed to one or more dinitroanillines. Pendimethalin and trifluralin were the most frequently used, but not associated to any increased risk of LC, nor was exposure to dinitroanillines in general. We observed an increased risk of adenocarcinoma for oryzalin exposure (HR=2.93[1.13–7.59], n=5 exposed cases), but with no linear effect with duration.

Conclusion We did not found any increased risk of LC among pendimethalin users. Our results suggest a possible association of lung adenocarcinoma with oryzalin, currently authorised in France, especially on the vineyard.

Poster Presentation

Neurological Effects

0442 OCCUPATIONAL EXPOSURES AND PARKINSONISM AMONG WOMEN TEXTILE WORKERS IN SHANGHAI, CHINA

[1,2]Sindana Ilango, [3]Wenjin Li, [4]Caroline Tanner, [5]Shu-Ching Hu, [3]Roberta Ray, [6]Susan Searles Nielsen, [7]Dao Li Gao, [7]Xin Wang, [8]Sadie Costello*, [3]David B Thomas, [1]Harvey Checkoway. [1]University of California, San Diego, San Diego, CA, USA; [2]San Diego State University, San Diego, CA, USA; [3]Fred Hutchinson Cancer Research Centre, Seattle, WA, USA; [4]University of California, San Francisco, San Francisco, CA, USA; [5]University of Washington, Seattle, WA, USA; [6]Washington University in St. Louis, St. Louis, MO, USA; [7]Zhong Shan Hospital Cancer Centre, Shanghai, China; [8]University of California, Department of Environmental Health Sciences, Berkeley, CA, USA

Objective To examine the association of endotoxin and other occupational exposures with parkinsonism (PS) severity and progression of PS signs.

Methods Movement disorder specialists examined 823 retired female textile workers ages 51–86 in Shanghai, China for PS prevalence and assessment of Unified Parkinson Disease Rating Scale motor subsection part 3 (UPDRS3). Most (n=669) were re-evaluated two years later. Occupational exposures to endotoxin, metals, solvents, magnetic fields, and shiftwork during a mean of 24 years working in the textile industry were assessed from detailed work histories and a job exposure matrix. We examined the association between each exposure and PS, severity (UPDRS3 score), and progression (annual change in UPDRS3) with multivariable regression models adjusting for age, smoking, and examiner.

Results We observed 39 prevalent PS cases and 784 non-cases. No association was observed between endotoxin and PS prevalence, disease severity, or disease progression. The other chemical occupational exposures and magnetic fields also had had no associations with PS prevalence or disease severity. Shiftwork was marginally positively associated with disease progression. For each year of shiftwork as of the baseline exam, UPDRS3 score increased annually by an additional 0.047 (95% CI: −0.003, 0.097).

Conclusions We observed little evidence for an association between endotoxin and other occupational exposures with PS in this cohort of textile industry workers, although we are unable to rule out the possibility of clinically modest increases in progression among workers who had experienced several years of shiftwork.

Poster Presentation
Respiratory

0443   SANDSTONE MINING: PERIL OF SILICOSIS

[1]Ashish Mittal*, [2]Mohit Gupta. [1]OHS-MCS, Faridabad, Haryana, India; [2]OEHNI, New Delhi, India

Approximately 25 000 workers are engaged in mining of sandstone in a small district of Madhya Pradesh, in the centre of India. Most of the quarry are small, unregistered, and unorganised, mining soft stone where silica content can be as high as 70%. 88 workers of average age of 25 years, minimum age being 13 years and maximum being 70 years were examined during a screening camp. 77 male workers and 11 female workers are engaged in the process of stone breaking, cutting, cleaning, loading and unloading for an average of 8 years of work, with minimum 1 month of work to 30 year of maximum work. These workers work under precarious conditions of high silica exposure and high risk of accidents and injuries. These workers, mostly malnourished live in very unhygienic conditions. 50% of the workers have normal pulmonary function test, and rest of the 50% workers have varying degrees of abnormal pulmonary function test, the most common being mild obstruction in 15 workers. Only one female out of 11 female workers have normal pulmonary function test. Based on detailed occupational history, clinical examination and X-ray reading as per ILO standards and their pulmonary function test outcome, 19 workers were diagnosed of Silicosis, 6 of Silico-tuberculosis. These 25 workers have a varying degrees of respiratory disability based on pulmonary function test recordings, mainly 12 having 20%, 3 having 30% disability, maximum being 100% in one of the 14 year old female worker of 1 year working history in stone quarry.

Poster Presentation
Burden of Disease

0445   A REVIEW OF AUDIOMETRIC CRITERIA FOR IDENTIFYING NOISE-INDUCED HEARING LOSS AMONG WORKING ADULT POPULATIONS

[1,2]Laura Bogaert*, [1,2]Jonathan Fan, [2,1]Peter Smith, [2,1]Cameron Mustard. [1]University of Toronto, Toronto, ON, Canada; [2]Institute for Work and Health, Toronto, ON, Canada

Objectives Noise-induced hearing loss (NIHL) remains one of the most prevalent occupational diseases worldwide, despite widely adopted workplace hearing conservation efforts. There are no universally accepted criteria for NIHL, hampering epidemiologic comparisons. The primary objective of this review was to characterise audiometric criteria for NIHL in occupational health literature.
Method We searched Medline, Embase, Scopus, and ProQuest's Environmental Science and Pollution Management and Biological Sciences databases for primary studies published through to March 2017 that described NIHL in working adult populations using audiometric measures. Titles and abstracts were screened against eligibility criteria. From the eligible studies, we extracted NIHL definitions, country/region, population/setting, and study purpose (e.g., surveillance, compensation adjudication).
Results Our search resulted in 1303 unique citations. After title and abstract review 461 studies were deemed potentially relevant, including 137 published in languages other than English. A total of 129 English studies were eligible and included in the final synthesis. Generally, history of work-related noise exposure and either hearing loss at high frequencies or an audiometric notch at 4 kHz constituted NIHL in the included studies. However, the specific threshold in decibels for "hearing loss" and "notch" varied across studies, as did the range of sound frequencies used to calculate pure-tone averages to indicate NIHL.
Conclusions NIHL is a major global occupational health issue of our time. Our review of occupational literature highlights the variability in definitions of NIHL. Without a common definition of NIHL, comparisons between different populations will remain a challenge and inhibit progress in this area of research.

Oral Presentation
Cancer

0446   RISK OF CANCER IN A PROSPECTIVE COHORT OF DANISH METAL WELDERS

Johnni Hansen. Danish Cancer Society Research Centre, Copenhagen, Denmark

Objectives Over 110 million workers are worldwide estimated as exposed to welding fumes, including a complex mixture of nano-sized particles with a carcinogenic potential. The aim of the present study is to investigate cancer risks with a special focus on lung cancer in a large group of Danish welders.
Methods In 1986, 5866 welders completed a comprehensive questionnaire on lifetime exposures, including years with different types of welding. Information on employments after baseline (1986) was obtained from the Supplementary Pension Fund. Life-long exposure to welding particles was estimated based on a Danish job-exposure matrix based on p1200 welding specific measurements of welding particles. Based on the unique central person number assigned to all residents in Denmark welders were followed-up for cancer (1987–2015) in the nationwide Danish Cancer Registry. Similarly, information on vital status was obtained from the Central Person Register. Relative risks were estimated both by comparison with cancer incidence in the standardised general population and by internal analyses by use of Cox-regression.
Results Overall, significantly increased relative risks were seen for cancer of the pharynx (1.8; 1.0–3.0), lung (1.7; 1.4–2.2), testis (2.5; 1.2–4.9) and multiple myeloma (2.1; 1.0–4.4). Trends with increasing relative risk of lung cancer by increasing cumulative exposure to particles was observed (p<0.01) after adjustments for exposure to asbestos and tobacco smoking.
Conclusion This study supports that exposure to welding processed particles increases the risk for lung cancer. The increased of testicular cancer and multiple myeloma warrants further attention

Oral Presentation

Shift Work

0447 NIGHT SHIFT-WORK AND RISK OF PROSTATE CANCER IN THE DANISH MILITARY

Johnni Hansen*, Christina Lassen. *Danish Cancer Society Research Centre, Copenhagen, Denmark*

Objective The majority of studies on night shift work and cancer have only involved women due to the focus on breast cancer. It has been suggested that mechanisms similar to those for breast cancer may occur for prostate cancer. However, only few studies have been reported for this cancer, which is the most frequent cancer in men.

Methods We conducted a nested case-control study within a historical cohort of 238.068 men employed in the Danish Military at the earliest in 1964 or later. Study subjects were obtained from the Supplementary Pension Fund database, including a unique personal ID provided to all residents in Denmark. We linked based on this ID with the files of the nationwide Danish Cancer Registry, and men aged less than 75 years old with first primary prostate cancer were retrieved for the period 1990 to 2003 (n=157). For each case, we randomly selected 10 cancer free controls frequency matched based on the age distribution of the cohort cases. Study subjects returned a structured questionnaire or were interviewed about their entire work history, including night work, diurnal preference and potential confounders, e.g. education and physical activity. We estimated odds ratios (RR) by logistic regression conditional on age.

Results The overall adjusted RR for prostate cancer after ever having night shifts was 1.3 (0.8–2.1). The RR for the subgroup with longest duration of night shifts ($\geq$15 years) was 2.2 (1.1–3.4).

Conclusion We add further evidence to the association between night shift work and prostate cancer.

Poster Presentation

Psychosocial

0448 EFFECTS OF ORGANISATIONAL CHANGE ON WORKPLACE SOCIAL CAPITAL: A LONGITUDINAL STUDY OF HOSPITAL WORK UNITS

Søren Grove Vejlstrup*, Line Leonhardt Laursen, Jens Peter Bonde, Johan Høy Jensen. *Copenhagen University Hospital Bispebjerg, Copenhagen, Denmark*

Background Organisational change is associated with adverse health outcomes for employees. The association may be mediated by changes in the psychosocial work environment. Workplace social capital (WSC) is a recent construct, which has been shown predictive of health outcomes when studying the psychosocial work environment. Currently, there is no epidemiological evidence concerning the impact of organisational change on WSC. This study examines the impact of organisational change on WSC in public hospitals in Denmark.

Method An open cohort-study of hospital employees in the Capital Region of Denmark provided longitudinal data on 1639 work units within 11 hospitals. WSC was assessed by employees during workplace evaluations in 2011 and 2014 (41.710 responses, 81% response rate). WSC was rated on 8 items using 5–7 point Likert-scales, and then transformed to a 0–100 scale. Exposure data were provided by work unit leaders, recollecting four types of organisational change from 2011 to 2014; mergers, layoffs, relocations and downsizing. A multilevel model was used to analyses the change of WSC-scores within each work unit. The model estimated the effect of organisational change and adjusted for changes in the size of the work unit and the vocation, age, gender and seniority of the employees.

Preliminary results In work units exposed to one or more organisational changes in the three year period, WSC decreased by 1.5 points (95% CI: (−2.2; −0.7)). Mergers had the biggest impact, decreasing WSC by 1.9 points (95% CI: (−2.8; −1.0).

Conclusion Organisational changes adversely impacted the workplace social capital, possibly mediating the effect on employee health.

Poster Presentation

Policy/Impact

0449 LEADING AND LAGGING INDICATORS FOR THE PREVENTION OF VIOLENCE TOWARDS WORKERS IN HEALTH CARE

[1,2]Christopher McLeod*, [1]Sharon Provost, [1]Kelvin Choi, [2,3]Benjamin Amick, [0]George Astrakianakis. [1]*School of Population and Public Health, The University of British Columbia, Vancouver, British Columbia, Canada*; [2]*Institute for Work and Health, Toronto, Ontario, Canada*; [3]*Florida International University, Miami, Florida, USA*

Objectives Violence towards health care workers is a pressing occupational health concern internationally. There are few frameworks and metrics developed to monitor and track the effectiveness of violence prevention activities. This study's aim was to develop leading and lagging indicators to be used in violence prevention activities in the health care sector in British Columbia, Canada.

Methods A systems framework identifying potential leading and lagging indicators was developed from a review of quantitative and quantitative research literature and from focus groups and key informant interviews with managers and front-line staff in two large health authorities. Evidence was synthesised using a realist review approach and priority indicators were developed in consultation with an employer/labour advisory panel. Data sources for potential indicators were identified and selected indicators were validated using incidence data on violence.

Results Indicators were identified across socio-political, organisational, environmental, patient and caregiver domains. The research literature tended to emphasise patient and caregiver factors, while manager and staff interviews emphasised organisational and environmental factors. Priority indicators were identified in areas of hazard identification and management, staffing and staff mix, communications, and education and training.

Conclusions Indicators for risk of violence need to be sensitive to context. While there is a considerable amount of data available for the development of leading and lagging indicators, challenges exist in coordinating data across multiple data stewards and little data is collected in some domains relevant to effective violence prevention. Future research will focus on validating indicators based on currently available data.

Poster Presentation

Exposure Assessment

0451 PERCEIVED HEAT EXPOSURE WHILE AT WORK. A QUESTIONNAIRE STUDY IN WEST JAVA, INDONESIA

Ida Karlsson*, Vidhya Venogupal, Anna Suraya, Kristina Jakobsson. *Institution of Public Health and Community Medicine, Gothenburg, Sweden*

Background Heat stress is a well-known occupational health concern. Heavy work under extreme heat exposure has been linked to several illnesses and premature death. In Indonesia, chronic kidney disease (CKD) is the ninth deadliest disease and the treatment for CKD tops the list of the health care spending´s.

Objectives o Evaluate the heat exposure for industry workers in West Java, Indonesia

o Demonstrate the workers´ perceptions of the heat situation

Methods A pilot study was conducted on two industries in February 2017, winter season in West Java. Heat measures were taken using wet bulb globe temperature (WBGT). Interviews were conducted using HOTHAPS questionnaire with 54 male workers. Medical records from the occupational health unit were also available.

Result The pilot study showed that workers were exposed to heat above threshold limit value (28°) in 48% of the WBGT measurements. 54% of the workers interviewed were uncomfortable with the ambient temperature. 8% of the workers had abnormal creatinine levels ($\geq 1,2$ mg/dl) indicating a severe problem with heat exposure. An extended data collection is planned for July to investigate the heat impacts of the summer season, and to include female workers.

Conclusion Heat exposure at work leads to negative health outcomes for the industry workers. Further investigations on the workers´ perceptions of heat is necessary for refining, creating and implementing heat prevention strategies.

Oral Presentation

Other

0452 USES OF CAREX SYSTEMS FOR INDIVIDUAL COUNTRIES AND INTERNATIONAL CONTEXTS

[1,2]Paul A Demers*, [3,4]Cheryl Peters, [1]Manisha Pahwa, [1]Jill MacLeod, [5,1]Joanne Kim. *[1]Occupational Cancer Research Centre, Toronto, Ontario, Canada; [2]University of Toronto, Toronto, Ontario, Canada; [3]Carleton University, Ottawa, Ontario, Canada; [4]CAREX Canada, Simon Fraser University, Vancouver, BC, Canada; [5]McGill University, Montreal, Quebec, Canada*

CAREX was designed to promote prevention through raising awareness and targeting high risk populations. CAREX was designed as a system that could be applied to other countries and its use internationally has been broadened to include national burden of occupational cancer projects in specific countries, as well as in the Global Burden of Disease project. CAREX Canada is based on a combination of occupation and industry and, when possible, estimates level of exposure as well as prevalence. This has allowed it application as a job exposure matrix for use in other applications. The Occupational Cancer Research Centre, in collaboration with its partners, has used it successfully with both its Occupational Disease Surveillance System and Burden of Occupational Cancer projects. In applying CAREX to other applications, it is important to recognise that it is based on the concept of hazard rather than risk, which is appropriate for primary prevention. Thus, in burden of disease projects it is important to choose relative risks that are appropriate for exposure based on broadly defined groups. In applications to disease surveillance, prevalence rates less than 100% can lead to non-differential misclassification and low levels of exposure can mute associations, especially when added to the existing limitations of data typically used for surveillance. Addressing these limitations can facilitate the successful application of CAREX in wider applications.

Oral Presentation

Shift Work

0453 SHIFT WORK AND OVERALL AND CAUSE-SPECIFIC MORTALITY IN THE DANISH NURSE COHORT

[1]Jeanette T Jørgensen*, [1]Sashia Karlsen, [2,3]Leslie Stayner, [4]Johnny Hansen, [1]Zorana J Andersen. *[1]Center for Epidemiology and Screening, Department of Public Health, University of Copenhagen, Copenhagen, Denmark; [2]Division of Epidemiology and Biostatistics, University of Illinois at Chicago School of Public Health, Chicago, IL, USA; [3]Research unit of Environmental Medicine, Department of Public Health, University of Southern Denmark, Odense, Denmark; [4]Danish Cancer Research Centre, Danish Cancer Society, Copenhagen, Denmark*

Withdrawn at the author's request

Results We observed a negative interaction between occupational exposure to nickel and asbestos. The interaction effect was largest for the subtype of squamous cell carcinoma: ratio of odds ratios: 0.76 (95% CI 0.65–0.88), odds ratio of the joint effect: 1.40 (95% CI 1.26–1.56). No other interaction effects were statistically significant after correction for multiple testing. Analyses in which one of the exposures was included on a continuous scale resulted in similar results.

Conclusion We observed little evidence for a statistical multiplicative interaction between most of the occupational carcinogens. The negative multiplicative interaction between asbestos and nickel was not explained by a high correlation between these exposures. Ignoring specific study specific matching criteria might have introduced some bias in the results.

Oral Presentation

Disease Surveillance

| 0456 | INITIAL RESULTS FROM A NEW CANADIAN OCCUPATIONAL DISEASE SURVEILLANCE SYSTEM |

[1,2]Paul A Demers*, [1]Jill MacLeod, [4]Alice Peter, [1]Saul Feinstein, [1]Luis Palma Lazgare, [3]Chris McLeod. [1]*Occupational Cancer Research Centre, Toronto, Ontario, Canada*; [2]*University of Toronto, Toronto, Ontario, Canada*; [3]*University of British Columbia, Vancouver, BC, Canada*; [4]*Cancer Care Ontario, Toronto, Ontario, Canada*

Large scale occupational disease surveillance has been challenging in many countries, with a few notable exceptions, such as the Nordic countries with their substantial record linkage abilities. We present initial results for lung cancer from a new Canadian Occupational Disease Surveillance System.

The surveillance cohort was created using data from Ontario, Canada time-loss workers' compensation claims 1983–2016 (96% for injuries) linked to cancer registry records. Follow-up was from first claim date until diagnosis, death, loss-to-follow-up or 2016. Hazard ratios (HRs) were calculated for each industry/occupation using Cox Proportional Hazard models, adjusted for year of birth and stratified on gender.

The study population was 7 40 000 women and 1,430,000 men. Significant excess risks were observed in many of the a priori suspected occupations and industries, particularly in construction, mining, and transportation occupations. In addition, other relevant associations were observed among both women and men, such as for janitors and cleaners (men: HR=1.22, 95% CI=1.16–1.29, women: HR=1.22, 95% CI=1.13–1.32) and primary metals industry (men: HR=1.18, 95% CI=1.11–1.25, women: HR=1.20, 95% CI=0.89–1.60). Many sex-specific associations were also observed, particularly in women (such as printing and publishing industries: HR=1.42, 95% CI=1.23–1.65 and chemical, rubber and plastic processing occupations HR=1.31, 95% CI=1.15–1.51), which will need further investigation.

The excess risks observed in many a priori suspected groups provides a good confirmation that this study can produce valid results and identify new associations. Triage methods are being developed to target new associations in need of further investigation. Future analyses will use hospital discharge data and outpatient visits.

Oral Presentation

Other

| 0454 | MULTIPLICATIVE TWO-WAY INTERACTIONS BETWEEN OCCUPATIONAL LUNG CARCINOGENS IN THE SYNERGY PROJECT |

[1]Roel Vermeulen*, [1]Jelle Vlaanderen, [2]Ann Olsson, [1]Hans Kromhout, [1]Lützen Portengen, [2]Kurt Straif, [3]On behalf of the SYNERGY study group. [1]*Utrecht University, Utrecht, The Netherlands*; [2]*International Agency for Research on Cancer, Lyon, France*

Objective The Synergy project derived quantitative exposure-response associations for five occupational lung carcinogens (asbestos, chromium-VI, nickel, polycyclic aromatic hydrocarbons, and respirable crystalline silica) and lung cancer in a pooled analysis of population based case-control studies. Considering a proportion of workers were exposed to more than one of these carcinogens, a joint effect on lung cancer risk is possible.

Methods We estimated joint effects by including an interaction term between two occupational carcinogens in the logistic regression models that were developed for the Synergy project. Analyses were conducted with either both exposures dichotomized (ever vs. never exposed), or with one exposure on a continuous scale (cumulative exposure), and the other dichotomized. Analyses were conducted for all lung cancer subtypes combined and stratified by subtype. We applied a Bonferroni correction.

Poster Presentation

Respiratory

0457 CONSEQUENCES OF ASTHMA ON OCCUPATIONAL AND SOCIO-ECONOMIC CHARACTERISTICS IN THE SIP STUDY

[1]Dorothée Provost*, [3]Jean-Francois Chastang, [1]Marie-Christine Delmas, [2]Chantal Raherison, [1]Yuriko Iwatsubo. [1]Santé publique France, Saint Maurice, France; [2]INSERM U219, Bordeaux, France; [3]INSERM UMRS 1136, Paris, France

Objective To study the employment and financial characteristics among asthmatics.

Methods This study was based on the data from the prospective French national representative SIP (Santé et Itinéraire Professionnel) survey. In 2006, 13 648 individuals aged between 20 to 74 years living in metropolitan France were interviewed. In 2010, 11 221 of those who had participated in 2006 accepted to be re-interviewed. The 2006 questionnaire collected occupational and medical histories. Asthma cases were identified by the statement of the subjects at different moments of their medical and occupational histories. The 2010 questionnaire collected the duration of unemployment and that of sickness absences between 2006 and 2010 and the annual income in 2010. The analyses considered the individuals who had completed occupational history. Asthmatic subjects identified in 2006 were compared to the subjects without asthma for employment and financial outcomes between 2006 and 2010.

Results A total of 426 asthmatic subjects were identified in 2006. Due to lost to follow-up, analyses were conducted with 362 asthmatics (138 men and 224 women) and 10 858 non asthmatics. Between 2006 and 2010, the female asthmatics experienced more frequently a period of unemployment and that of sickness absences compared to non asthmatics. They presented lower annual income in 2010. Among males, no significant association was observed.

Conclusions These results suggest that asthmatic women experience rather negative work life events and lower income than non asthmatics. In contrast, no such results were observed in men. These results must be confirmed in future prospective cohort studies.

Poster Presentation

Methodology

0458 SHOULD OCCUPATIONAL EPIDEMIOLOGISTS CONSIDER A NEW PARADIGM? THE OCCUPATIONAL CANCER CASE

[1,2]Charles-Olivier Betansedi*. [1]Paris-Saclay/Paris-Sud University, Kremlin Bicetre, France; [2]INSERM CESP U1018, Kremlin Bicetre, France

The past decades have been the theatre of intellectual movements in epidemiology. The early 1990s in particular were marked by lively debates about the nature of the discipline and the role it should play in society. In addition to the importance of theory, two major points of controversy concerned on one hand the role denied, assumed or criticised of politics or more generally of ideology in research, on the other hand the nature of the causal determinism for a disease. Did these controversies have any impact in the occupational health domain?

We review these debates in the light of the current state of research in occupational cancer epidemiology. We aim to illustrate, the questioning, the practices of occupational epidemiologists when inscribed in different in views of the discipline.

We found that research conducted tend to primarily use "reductionist" paradigms and prioritise a deontological ethic (as opposed consequentialist). Occupational health is an issue of power: social, economic and political, crossed by many social dimensions such as social class or gender. Therefore, can occupational epidemiologists afford to neglect work as a social construction? Would it be beneficial for occupational epidemiologists, as suggested in other domains, to move towards a new paradigm or a new ethic?

Oral Presentation

Methodology

0459 PRODUCTIVITY ESTIMATION IN ECONOMIC EVALUATIONS OF OCCUPATIONAL HEALTH AND SAFETY INTERVENTIONS: A SYSTEMATIC REVIEW

[1]Jonas Steel*, [2]Lode Godderis, [1,3]Jeroen Luyten. [1]Leuven Institute for Healthcare Policy, KULeuven, Leuven, Belgium; [2]Environment and Health, KULeuven, Leuven, Belgium; [3]Department of Social Policy, London School of Economics and Political Science, Leuven, Belgium

Background OHS interventions increasingly have to demonstrate that they offer good value-for-money. The intervention's effect on productivity gains is thereby essential. However, productivity is not easily measured nor valued, possibly causing employers to underestimate the benefits of OHS programs.

Objectives A systematic review of the measurement and valuation of productivity in economic evaluations of occupational health and safety was conducted, to assess the methodological quality of productivity estimation and the consistency of perspectives used.

Methods Searches were conducted in EMBASE, PUBMED and Cochrane's CENTRAL, between 2007 and December 2016. Two researchers independently reviewed the studies for inclusion. Articles had to be economic evaluations or cost analyses, OHS interventions, aimed at an employed (or return-to-work) population >16 years old and written in English, French, or Dutch. From the included studies, information regarding the general characteristics, inclusion of productivity costs and effects, and methodology of productivity estimation was extracted and analysed.

Results Ninety-two studies were retained. Ninety percent of the studies contrasted intervention costs with absenteeism effects, a third included presenteeism. About half of the studies valued these effects using the human capital approach, twenty-five percent used the friction cost approach. The methodological characteristics were of poor quality in many studies, resulting in a considerable risk of bias. The diversity of studies was also apparent, with studies differing in ten different characteristics concerning the measurement and valuation of productivity. Finally, a new method came into view - direct productivity estimation - that holds a promising alternative to the current standard methods.

Poster Presentation

Cancer

| 0460 | SMOKING ADJUSTED OCCUPATIONAL RISK OF BLADDER CANCER USING PROXY SMOKING FROM LUNG CANCER IN NORDIC MALES |

[1]Kishor Hadkhale*, [2]Jan Ivar Martinsen, [2,5]Elisabete Weiderpass, [2]Kristina Kjaerheim, [6]Elsebeth Lynge, [5]Pär Sparen, [7,8]Laufey Tryggvadottir, [1,9]Eero Pukkala. [1]University of Tampere, Faculty of Social Sciences, Tampere, Finland; [2]Cancer Registry of Norway, Institute of Population-Based Cancer Research, Oslo, Norway; [3]University of Tromsø, Faculty of Health Sciences, The Arctic University of Norway, Tromsø, Norway; [4]Folkhälsan Research Centre, Genetic epidemiology group, Helsinki, Finland; [5]Karolinska Institutet, Department of Medical Epidemiology and Biostatistics, Stockholm, Sweden; [6]University of Copenhagen, Institute of Public Health, Copenhagen, Denmark; [7]Icelandic Cancer Registry, Reykjavik, Iceland; [8]University of Iceland, Faculty of Medicine, Reykjavik, Iceland; [9]Finnish Cancer Registry, Institute for Statistical and Epidemiological Cancer Research, Helsinki, Finland

Withdrawn at the author's request

Oral Presentation

Intervention Studies

| 0461 | CAN A WATER.REST.SHADE INTERVENTION REDUCE THE RISK OF CHRONIC KIDNEY DISEASE AMONG SUGARCANE WORKERS? |

[1]David Wegman*, [2]Jenny Apelqvist, [3]Theo Bodin, [3]Matteo Bottai, [2]Ulf Ekström, Ramón Garcia-Trabanino[4], [5]Jason Glaser, [3]Christer Hogstedt, [6,10]Kristina Jakobsson, [7]Emmanuel Jarquín, [8]Rebekah Lucas, [9]Sandra Peraza, [5]Ilana Weiss, [3]Catharina Wesseling. [1]University of Massachusetts Lowell, Lowell, Massachusetts, USA; [2]Department of Laboratory Medicine, Division of Clinical Chemistry and Pharmacology, Lund University, Lund, Sweden; [3]Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; [4]Centro de Hemodiálisis, San Salvador, El Salvador; [5]La Isla Network, Ada, Michigan, USA; [6]Section of Occupational and Environmental Medicine, University of Gothenburg, Gothenburg, Sweden; [7]Agencia para el Desarrollo y la Salud Agropecuaria (AGDYSA), San Salvador, El Salvador; [8]School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Birmingham, UK; [9]Faculty of Chemistry and Pharmacy, University of El Salvador, Ciudad Universitaria, San Salvador, El Salvador; [10]Division of Occupational and Environmental Medicine, Institute of Laboratory Medicine, Lund University, Lund, Sweden

Background The Central American kidney disease epidemic persists despite efforts to identify cause(s) and introduce clear, evidence-based interventions to protect workers. Evidence suggests that chronic dehydration during heavy work in hot environments contributes to morbidity. An intervention was introduced to determine if risk could be reduced in sugarcane workers.

Objective To assess efforts to implement a Water.Rest.Shade intervention in one setting where sugarcane cutting was believed to increase CKDu in the workforce.

Methods The intervention was introduced mid-way through the harvest in one of two work groups. The intervention group received water throughout the day with scheduled rest breaks in shaded settings. Health data (anthropometric and questionnaires), blood and urine were collected four times over a-six-month harvest. Daily wet bulb globe temperatures (WBGT) were recorded.

Results There were significant changes in biomarkers across-shift and across-harvest that reduced the markers of dehydration (changes of urine osmolality and serum albumin) and reduced rate of loss in estimated glomerular filtration rate (eGFR). Cross-shift change in eGFR was reduced in the group receiving the intervention. Significant decreased eGFR over the harvest appeared to stop after the intervention in those receiving the Water.Rest.Shade program.

Conclusion Preliminary evidence indicates a Water.Rest.Shade intervention program reduces the impact of heat stress on acute and over-harvest biomarkers of kidney function. Potential long-term benefits of such an intervention need to be confirmed in long-term follow-up and in other settings. Further research is needed to determine whether biomarker changes predict reduced risk of CKDu in this type of work.

Poster Presentation

Exposure Assessment

0462 | A COMPARISON OF DISTAL UPPER LIMB PHYSICAL EXPOSURE QUANTIFICATION TOOLS: THE STRAIN INDEX, ACGIH TLV FOR HAL, AND THE RECENTLY DEVELOPED REVISED STRAIN INDEX

Jay Kapellusch*, Arun Garg. *University of Wisconsin – Milwaukee, Milwaukee, Wisconsin, USA*

Introduction There are several questionnaires and observational measurement tools to quantify distal upper limb (DUL) physical exposures. Perhaps the most commonly used observational methods are the Strain Index (SI) and the ACGIH TLV for HAL. However, there is currently no "gold standard" observational tool.

Methods Data from recently conducted prospective cohort studies of DUL musculoskeletal disorders (MSDs) were used to compare the SI, TLV for HAL, and the newly developed Revised Strain Index (RSI). A total of 3647 tasks performed by 710 workers were evaluated. When a tool lacked specific guidance, generally accepted techniques (e.g., time-weighted-averaging) were used to handle task complexity and multi-task jobs.

Results the SI, RSI, and TLV for HAL provide inconsistent estimates of physical exposure and predicted risk of DUL MSDs. Correlations and weighted kappa scores between the model's ranged from poor to good (e.g., weighted-kappa range: 0.16 to 0.82).

Conclusions Neither the TLV for HAL nor the SI were designed to assess multi-task jobs with complex tasks; whereas the RSI was. Assumptions made in order to use the SI and TLV for HAL for complex and multi-task analysis may contribute to the large differences between their physical exposure estimates. In this regard the RSI would appear to be a superior tool and one that has promising utility, at least for design and ergonomics intervention of complex and multi-task jobs. However, more research is needed to establish a "gold standard" DUL observational measurement tool.

Poster Presentation

Neurological Effects

0463 | OCCUPATIONAL INTOXICATION BY MERCURY AND NEUROTOXICITY: PROFESSIONAL DISEASE

Marita Del Pilar Asmat Inostrosa*, Javier Valdés Valdazo, Jose Manuel De La Torre Robles, Maria Victoria Casares Del Rio, Luis Enrrique Alonso Herrero. *Leon Hospital, Leon, Spain*

Introduction Mercury is a heavy metal found naturally in the environment. Mercury poisoning of occupational origin is widely identified as occupational disease. The industries where cases have been described are those dedicated to the manufacture of thermometers, barometers, as well as in gold mines and metal refineries such as zinc.

Methodology The case of a 30-year-old male, a boilermaker (welder assembler) who is part of one of the teams responsible for replacing the carbon steel tubes of the exchanger through which sulphurous gases circulate with mercury remains is described. The initial symptoms were diarrhoea with mucus and blood and gum inflammation, initially presenting a blood mercury concentration of 475.9mcg/L (NV=<10 mcg/L) and urine mercury concentration 939mcg/L (NV=<30 Mcg/L) (BAL INSHT <5 mcg/g creatinine), not receiving treatment until after 6 months with DMPS twice seeing a reduction in urinary values from 1830.47 to 7.38 mcg/L. As a clinical result of mercury poisoning he had severe mercurial erethism with dysthymia and aggressive behaviour, as well as a secondary complex visual disorder and a diarrheal syndrome due to secondary autonomic neuropathy.

Conclusion This paper aims to warn about the consequences of prolonged exposure to mercury especially for the central nervous system, as well as early diagnosis and timely treatment. On the other hand, note the importance of adopting an adequate and effective preventive system to protect the health of workers exposed to mercury.

Oral Presentation

Other

0464 | HOW DO GENDER AND JURISDICTION INTERACT WITH WORK DISABILITY DURATION?

[1]Robert Macpherson*, [1]Mieke Koehoorn, [1]William Quirke, [1,2]Jonathan Fan, [2]Benjamin Amick, [2]Cameron Mustard, [2]Sheilah Hogg-Johnson, [3]Allen Kraut, [1,2]Christopher McLeod. [1]*University of British Columbia, Vancouver, British Columbia, Canada;* [2]*Institute for Work and Health, Toronto, Ontario, Canada;* [3]*University of Manitoba, Winnipeg, Manitoba, Canada*

Objectives We examine whether gender differences in work disability duration were consistent across Canadian provinces and by length of work disability duration.

Methods Cohorts of injured workers in British Columbia (BC), Manitoba (MB) and Ontario (ON) were analysed using claim-level data for injuries occurring between 2007 and 2011. Work disability duration was measured using cumulative days that claims received work disability benefits during one-year post-injury. Extended Cox models provided hazard ratios (HR) and 95% confidence intervals (95% CI) to examine differences between women compared to men transitioning off work disability benefits and how this varied by length of work disability duration in each jurisdiction, adjusting for confounders.

Results In all three provinces, women transitioned off disability benefits slower initially (at 1 day, BC: HR: 0.90 [95% CI: 0.89–0.91], MB: HR: 0.89 [95% CI: 0.87–0.91], and ON: HR: 0.96 [95% CI: 0.95–0.97]) but in longer claims women transitioned off disability benefits faster (at 9 months, BC: HR: 1.10 [95% CI: 1.07–1.13]; MB: HR 1.14 [95% CI 1.08–1.21], and ON: HR: 1.03 [95% CI: 1.01–1.06]. This finding was consistent across different models by province and injury type.

Conclusions The persistent differences in work disability duration suggest that there may be underlying gender or sex differences in terms of recovery from work-related injury. Policies for the prevention and management of work injuries

should be tailored to men's and women's specific needs and barriers. The timing of such interventions should be considered given the time-varying differences observed between men and women.

Poster Presentation

Other

| 0465 | GENDER, AGE, AND THE CHANGING BURDEN OF WORK-RELATED DISABILITY IN CANADA AND AUSTRALIA |

[1]Robert Macpherson*, [2]Tyler Lane, [2]Alex Collie, [1]Mieke Koehoorn, [2,3]Peter Smith, [3]Benjamin Amick, [3]Sheilah Hogg-Johnson, [1,3]Christopher McLeod. [1]University of British Columbia, Vancouver, British Columbia, Canada; [2]Monash University, Clayton, Victoria, Australia; [3]Institute for Work and Health, Toronto, Ontario, Canada

Objectives This research investigates the changing burden of work-related disability in Canada and Australia and how this varies by gender and age. The secondary objective is to demonstrate a means of comparing work disability data internationally.

Methods Workers' compensation data from Canada and Australia were used to analyse the relative disability burden of workers injured between 2004 and 2010. The two measures used were the number of claims with compensated time-loss and the corresponding time-loss years accrued, indexed to 2004. Gender and age-stratified analyses were conducted using descriptive statistics.

Results Male workers had more claims and cumulative time-loss in both countries. They also had steeper reductions in claim volumes and cumulative time-loss over time, indicating a narrowing in overall gender differences. Age-stratified analysis showed that differences between men and women were smaller among younger workers compared to older workers. In Canada, the proportion of claims attributable to females grew at the same rate as the proportion of time loss until 2007–08 when a gap emerged. In Australia, the proportion of claims and time loss attributable to females grew closer over time.

Conclusions While the volume of claims and cumulative time-loss has decreased in Canada and Australia, and the largest proportion is attributable to workers who are male and aged 35–54, a growing proportion is attributable to female and older workers. These changes have been driven by demographic factors (growth of females in the workforce, ageing workforce) and structural factors (economic recession and policy changes), particularly in Canada.

Oral Presentation

Working Conditions

| 0466 | LABOUR MARKET AND HEALTH TRAJECTORIES DURING PERIODS OF ECONOMIC RECESSION AND EXPANSION IN THE UNITED STATES, 1988–2011 |

[1,2]Jonathan Fan, [2]Benjamin Amick, [3]Lindsay Richardson, [1]Heather Scott-Marshall, [2,3]Chris McLeod*. [1]University of Toronto, Toronto, Canada; [2]Institute for Work and Health, Toronto, Canada; [3]University of British Columbia, Vancouver, Canada

Objectives Negative labour market experiences are associated with worse health outcomes, although little research has examined health effects of trajectories over time. This study examined associations between labour market and health (LMH) trajectories in the US between 1988 and 2011 and and whether associations differed across four macroeconomic periods defined by contraction or expansion.

Methods Working-age cohorts were derived for each period using data from the Panel Study of Income Dynamics. Cohorts started from a baseline state of employment/good health, and were followed over time to characterise LMH trajectories. Modified Poisson regression provided relative risks (RR) with robust 95% CIs for the association between trajectories.

Results LM trajectories ending in unemployment (RRs 1.7–2.5 across periods) or inactivity (RRs 2.3–3.2) had a greater risk of worse health trajectories, compared to stable employment. Individuals recovering into employment following a period of inactivity experienced a greater risk of worse health (RR s 1.6–2.1). There were persistent health-gradients across trajectories, with stable-employed individuals having the highest probability of remaining in good health, and 'LM exit' trajectories having the lowest probability. Overall relationships were consistent across the four periods.

Conclusions The increased likelihood of having worse health among unemployed/inactive individuals, yet attenuated risk among those recovering into employment following these intermediary states, suggests that health outcomes are not only dependent on the LM end-state, but also on the distinct pattern over time. Findings suggest that the contextual economic period has limited impact on these overall relationships, although future research might incorporate methodological frameworks with direct measures of the social-economic context.

Oral Presentation

Burden of Disease

0470 COMPARISON OF OCCUPATIONAL CANCER BURDEN ESTIMATES

[1,2]Joanne Kim*, [3,4]France Labrèche, [5,6]Cheryl E Peters, [6,7]Hugh Davies, [7]Chris McLeod, [4,8]Jérôme Lavoué, [2,9]Victoria H Arrandale, [2]Manisha Pahwa, [2,9]Paul A Demers. [1]Department of Epidemiology and Biostatistics, McGill University, Montréal, Canada; [2]Occupational Cancer Research Centre, Toronto, Canada; [3]Institut de recherche Robert-Sauvé en santé et en sécurité du travail, Montréal, Canada; [4]School of Public Health, Université de Montréal, Montréal, Canada; [5]Department of Health Sciences, Carleton University, Ottawa, Canada; [6]CAREX Canada, Simon Fraser University, Vancouver, Canada; [7]School of Population and Public Health, University of British Columbia, Vancouver, Canada; [8]Centre de recherche du Centre hospitalier de l'Université de Montréal, Montréal, Canada; [9]Dalla Lana School of Public Health, University of Toronto, Toronto, Canada

The lung is the most common target for workplace carcinogens and burden of cancer projects have produced a range of attributable fraction (AF) estimates (6%–14.5%). Various approaches, available data, and contexts of these different studies contribute to sometimes incongruent final estimates.

We recently completed a Canadian burden project (CBD) and compared its results to burden studies from UK (UKBD), US (USBD), Finland (FinBD), and the Global Burden of Disease (GBD) to illustrate the impact of new epidemiologic data, availability of exposure data, differences in industry composition, inclusion of a broader set of carcinogens and/or cancer sites, and differences in the overall methodological approach on AF estimates.

The number of lung carcinogens considered by the different studies ranged from 8 in the GBD to 21 in the CBD and UKBD. More well-established carcinogens such as silica, which are driven by similar patterns of exposure (especially in construction) across countries, have more consistent estimates (2.4% in both the CBD and UKBD). Others such as asbestos have significant challenges in historical exposure assessment, as well as differences in exposure context between countries, leading to variability between estimates (5.9%–8.0%). Differing methods and assumptions regarding radon also led to variable estimates (0.6%–1.3%). Relatively recent epidemiologic evidence for diesel exhaust and lung cancer incorporated into the Canadian estimates led to higher AFs than previous estimates.

Changing evidence, differences in context, and variability in methods mean that burden estimates are not strictly comparable across projects, and continuing to assess the burden for different countries remains relevant.

Poster Presentation

Exposure Assessment

0471 EVALUATION OF AIRBORNE CHEMICAL EXPOSURES TO ALUMINIUM WORKERS

[1]Elizabeth M Noth*, [1]Sa Liu, [1]Daniel M. Brown, [1]Andreas M Neophytou, [1]Sadie Costello, [1]Ellen A Eisen, [2]Mark R Cullen, [1]S Katharine Hammond. [1]University of California, Berkeley, Berkeley, CA, USA; [2]Stanford University, Palo Alto, CA, USA

Aluminium workers are exposed to a complex mixture of airborne chemicals. Workers in different stages of aluminium manufacturing are exposed to different mixtures of chemicals. At twelve US aluminium facilities, we used information from an industrial hygiene database containing 30 years of sampling results for 227 separate chemical agents to build job exposure matrices (JEMs). We selected chemicals that represented major exposures in the workplace (e.g., oil mist and fluorides) and those that have been associated with heart disease [e.g., polycyclic aromatic hydrocarbons (PAHs) and welding-related metals]. We used cluster analysis to empirically group the chemical agents and establish exposure profiles by job. For PAHs and welding-related metal exposures, we also built quantitative JEMs. There were 21 PAH chemical agents, including individual PAHs (e.g. benzo[a]pyrene) and groups of PAHs (e.g. coal tar pitch volatiles). For metals, there were 54 different chemical agents associated with welding tasks. The categorical JEMs have three categories of exposure: unmeasured, very low exposure, and moderate or higher exposure. The stage of the manufacturing process made a large impact on the distribution of exposures. While 62% of jobs in smelters involved PAH exposures, only 2% of jobs in fabrication facilities did. Conversely, oil mist exposure is more common in fabrication facilities, compared with smelters (24% and 7% of jobs exposed, respectively). We observed that the exposure profiles in smelters was very different to those observed in fabrication facilities or refineries. These chemical exposure JEMs will help clarify the role chemicals play in heart disease.

Poster Presentation

Cardiovascular Disease

0472 A GLOBAL PERSPECTIVE ON COAL-FIRED POWER PLANTS AND CARDIOVASCULAR DISEASES

Bibhaw Pokharel*, David C Christiani, Chen-Kuan Lin. Harvard TH Chan School of Public Health, Boston, MA, USA

Background Cardiovascular disease (CVD)accounts for 31% of all global deaths. Some CVD mortalities can be attributed to environmental factors such as particulate matters(PMs). Coal fired power plant is one of the major contributors of PM. However, the short-term effect of coal fired power plant on cardiovascular disease is not well studied. In this study, we investigate an association between coal capacity and CVD mortality from a global perspective.

Method Age and Sex-adjusted CVD mortalities of 111 countries were followed from 1998 to 2012.Coal capacity was defined as total capacity of coal fired power plants in a given country in a given year, from Utility Data Institute World Electric Power Plants(UDI WEPP)Database while CVD mortality were obtained from WHO mortality data. We applied mix model and adjusted other risk factors for analysis.

Results The average coal capacity around the world is increasing globally, but coal percentage used has been fairly constant (8555.18 MW(15.99%) in 1998–2002,12071.11 MW(16.71%) in 2003–2007 and 16394.05 MW(16.58%) in 2008–2012. One log coal capacity (unit: log MW) was associated with an increase in CVD mortality by 22.98(p=0.076) to 55.74 (p<0.0001) per million males and 4.83(p=0.373)to 28.71 (p<0.0001)per million females, during 1998–2002 in different regions.

Conclusion The result of the current study indicated that after adjusting for commonly known risk factors of cardiovascular disease, coal fired power plants emission is correlated with country specific short term cardiovascular mortality.

Oral Presentation

Cancer

0473 SINONASAL CANCERS AND OCCUPATIONAL EXPOSURES, A POPULATION-BASED CASE-CONTROL STUDY

[1]Carolina Mensi, [2]Michele Carugno*, [2,1]Angela Cecilia Pesatori, [1]Barbara Dallari, [1]Luciano Riboldi, [1]Consonni Dario. [1]*Department of Preventive Medicine, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy*; [2]*Department of Clinical Sciences and Community Health, Università degli Studi di Milano, Milan, Italy*

Carcinogenic agents for nasal cavity and paranasal sinuses cancers (hereafter sinonasal cancers, SNC) with sufficient evidence in humans include nickel compounds and wood and leather dusts. Still limited evidence is available for carpentry and joinery, hexavalent chromium compounds, formaldehyde, and textile manufacturing. We studied occupational risk factors for SNC in a population-based case-control study nested in the SNC Registry of the Lombardy Region (10 million people), North-West Italy. SNC cases (or their next-of-kin) were interviewed using a standardised questionnaire. Controls (141 men, 64 women), taken form a recent population-based case-control study on mesothelioma, had been sampled among Lombardy residents (2014) and interviewed with the same questionnaire. We calculated odds ratios (OR) adjusted for the matching factors, smoking, and history of nasal polyps. We identified 386 SNC cases (2008–2014) with interview (256 men, 130 women). Among 105 adenocarcinoma cases we found ORs>30 for wood and leather dusts. Among 108 cases with mixed morphologies, we found elevated risks for wood (OR=2.2) and leather (OR=6.0) dusts. For both morphologies ORs for nickel, chromium, and formaldehyde were high but based on a few cases. Relative risks of adenocarcinoma and mixed morphologies were high in several sectors, including textile, construction, metal-mechanics, motor vehicle production, and agriculture and livestock. ORs for squamous cell carcinoma were elevated in agriculture and livestock only. In conclusion, we confirmed the strong associations between adenocarcinoma and wood and leather dusts, found elevated risk for mixed morphologies, and identified risk excesses in several sectors.

Oral Presentation

Other

0474 RISK ASSESSMENT FOR NON-CANCER OUTCOMES

Roel Vermeulen. *Utrecht University, Utrecht, The Netherlands*

Objective Risk assessment for non-cancer outcomes is often based on a synthesis of epidemiological and toxicological data. As with carcinogens a decision has to be made if these effects occur via a stochastic mechanism of action or if a 'safe' occupational exposure limit can be derived based on observed lower of no effect levels within the experimental or observational data. If a stochastic mechanism is assumed (e.g. allergens) than it is assumed that every level of exposure to such substances, no matter how low, entails a certain risk of developing an adverse outcome and risk-based limits could be calculated.

Results Within the Dutch Expert Committee on Occupational Standards (DECOS), and other similar bodies in the EU, more and more evaluations are based on epidemiological data indicating the importance of the field of occupational epidemiology. While in 1995 0% of the evaluations of the Dutch DECOS were based on epidemiological evidence, currently this is more than 30%.

Discussion In this presentation, we will discuss recent evaluations on benzene (based on a non-cancer outcome), and wheat and other cereal flour dusts as to explore how occupational epidemiologic studies provide important information about the risks associated with exposures encountered by workers and the public at large.

Oral Presentation

Other

0475 OCCUPATIONAL EXPOSURE TO RESPIRABLE CRYSTALLINE SILICA AND LUNG CANCER RISK IN THE SYNERGY PROJECT

[1]Roel Vermeulen*, [2]Ann Olsson, [1]Susan Peters, [1]Lutzen Portengen, [1]Hans Kromhout, [2]Kurt Straif. [1]*Utrecht University, Utrecht, The Netherlands*; [2]*IARC, Lyon, France*

Objective Within the SYNERGY project, we evaluated the exposure-response relation between occupational exposure to

respirable crystalline silica (RCS) and the risk of lung cancer in pooled analyses of community-based studies.

Methods RCS was estimated using a quantitative general population job-exposure matrix ('SYNJEM') for 16 786 lung cancer cases and 20 818 matched population or hospital controls. 34.2% of the men were ever exposed to RCS, while 8.6% of the women were ever exposed. Odds ratios (ORs) and 95% confidence intervals (95% CI) were estimated stratified by gender using unconditional logistic regression models adjusted for age, study centre, cigarette pack-years, time-since-quitting smoking, and ever employment in an occupation with known lung cancer risk.

Results We observed a monotonic increase in risk of lung cancer associated with occupational exposure to RCS among men (unexposed versus 4th quartile among exposed 1.45 (95%CI, 1.31–1.60). Result did not differ by smoking status and remained significantly elevated among non-smokers. The association was stronger in squamous cell carcinoma and small cell lung cancer as compared to adenocarcinoma of the lung especially among former and current smokers. The effect of RCS on lung cancer in women was not detectable likely related to small numbers.

Conclusions The SYNERGY results show that occupational silica exposure is associated with an increased risks of all lung cancer types in a pooled analyses of community-based studies.

Poster Presentation
Cancer

0476 THE BRAZIL-ITALY PROJECT ON ASBESTOS-RELATED DISEASES IN CURITIBA

[1]Dario Consonni*, [2]Luciana Puchalski Kalinke, [3]Marco Aurélio Kalinke, [2]Fernanda Moura D'Almeida Miranda, [2]Larissa Marcondes, [2]Tatiana Hallfeld, [2]Christiane Brey, [2]Shirley Boller, [4,1]Angela Cecilia Pesatori, [1]Carolina Mensi, [2]Leila Maria Mansano Sarquis. [1]Department of Preventive Medicine, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy; [2]Universidade Federal do Paraná, Curitiba, Brazil; [3]Universidade Tecnológica Federal do Paraná, Curitiba, Brazil; [4]Department of Clinical Sciences and Community Health, Università degli Studi di Milano, Milan, Italy

Brazil is one of the major producers of chrysotile worldwide, but few studies evaluated its effects on the health of Brazilians. Moreover, there are concerns of miscoding of mesothelioma cases. A joint project was started between the Federal University of Paraná (UFPR), Curitiba, Brazil, and the Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy to evaluate effect of chrysotile exposure. The project, supported by CAPES, Brasilia, include two main areas of research. The first is a cohort mortality study among asbestos-cement workers. From the Ministerio Publlico do Trabalho, Curitiba, we recently received lists of about 10 000 workers employed since the beginning of production (1974, 1974, and 1993) in three asbestos-cement factories in Curitiba and its Metropolitan Region. Data editing and evaluation of sources of information to perform the mortality follow-up are in progress. The second area involves the implementation of a registry of malignant mesothelioma cases in Curitiba based on the Italian model. For this reason, two post-docs are in Milan to study procedures of the Italian and Lombardy Region Mesothelioma Registry, to translate the Italian standardised questionnaire on asbestos exposure, and to

adapt the database. As a complementary study, we are analysing the records (1998–2012) related to mesothelioma of the Curitiba Population-Based Cancer Registry. Clinical documentation of 269 adult subjects with ICD-10 codes C45 (mesothelioma), C38 (mediastinal and pleural cancers), and C48 (peritoneal cancers) will be examined to identify potential false negatives (i.e., primary pleural/peritoneal cancers classified under incorrect cancer sites like mediastinum and retroperitoneum).

Poster Presentation
Exposure Assessment

0478 INHALATION AND DERMAL EXPOSURE TO TOLUENE AMONG PRINTING WORKERS IN A PLASTIC BAG FACTORY

[1]Wantanee Phanprasit*, [2]Kanchanok Songpek, [1]Vorakamol Boonyayothin, [1]Dusit Sujirarat. [1]Mahidol University, Bangkok, Thailand; [2]Reckitt Benckiser Healthcare Manufacturing (Thailand) Ltd, Bangkok, Thailand

Introduction The study was conducted in a plastic bag factory to explore the inhalation and dermal exposure to toluene of the printing workers who wore no PPE and the potential of a charcoal cloth pad (CCP) as a dermal sampler to assess the skin permeation of liquid toluene.

Methods Twenty-seven stationary air samples were collected on the same 9 days with the urine and dermal samples from 11 printing workers. The CCPs were wrapped on each of the workers' fingers. Air samples were collected and analysed according to NIOSH # 1501 and 65 post-shift urine samples were collected and analysed for toluene using GC-HS/FID. Multiple linear regression was employed to analyse the association of the variables.

Result T three urine samples contained toluene exceeding the BEI of 30 mg/L. Toluene on the CCP (TolCCP) is a meaningful predictor for the UTol (p-value=0.027), with r and r^2 of 0.441 and 0.195 respectively. The absorbed dose of toluene determined from TolCCP ranging in between 1.05–91.94 mg and counting for the maximum of 12.3% TLV.

Discussion The mean of TWA was above the TLV while that of the UTol was well below the BEI. This indicated that the TWA concentrations could be overestimated due to the size of the room and good general ventilation. The dermal exposure was not significant if the workers wear respirators, but if not the dermal absorption could contribute to the overall uptake and may cause the exposure above the TLV.

Oral Presentation
Dusts and Fibres

0480 MEASUREMENT OF ASBESTOS FIBRE RELEASE DURING REMOVAL WORKS IN A VARIETY OF DIY ASBESTOS REMOVAL SCENARIOS

[1]Geza Benke*, [2]Jeremy Trotman. [1]Monash University, VIC, Australia; [2]JTA Health, Safety and Noise Specialists, VIC, Australia

Background/Aim In Australia the source of non-occupational mesothelioma cases is poorly described. Although some cases are due to living with former asbestos industry workers or living near former asbestos industries, many cases are not exposed to these risk factors. The incidence of cases due to do-it-yourself (DIY) home renovation or maintenance is unknown, primarily due to lack of exposure data. The aim of this simulation study was to measure asbestos fibre release during removal in a variety of DIY asbestos removal scenarios. **Methodology** Nine different exposure scenarios commonly undertaken in DIY home renovation were simulated. Asbestos fibre exposure was monitored for each location with static samplers located in the work area together with personal samples, using high flow rate pumps operating at 6 to 7 Litres per minute, with the analysis of filters undertaken by SEM and PCM. Simulations were designed to be representative of worst case exposure scenarios.

Results Personal sampling resulted in higher fibre release levels compared to static sampling in all nine scenarios. All static sample scenarios were below 0.15 f/ml. However, for personal sampling removal of asbestos cement (AC) sections (as would be required to accommodate a domestic air-conditioning unit) using an angle grinder, resulted in exposure of 13.23 f/ml. Dry cutting of holes for installation of flues in AC roofing was 2.79 f/ml.

Conclusions Exposure levels in DIY removal were found to be low for most scenarios. Use of power tools without wetting in a confined area was found to be the most exposed scenario.

Oral Presentation

Cancer

0482 EXPOSURE TO HEXAVALENT CHROMIUM AND NICKEL AND LUNG CANCER RISK: A POOLED ANALYSIS OF CASE-CONTROL STUDIES FROM EUROPE AND CANADA

[1]Thomas Behrens*, [1]Beate Pesch, [2]Roel Vermeulen, [3]Ann Olsson, [3]Joachin Schüz, [2]Lützen Portengen, [1]Benjamin Kendzia, [2]Hans Kromhout, [3]Kurt Straif, [1]Thomas Brüning, [1]on behalf of The SYNERGY Study Group. [1]*Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA), Institute of the Ruhr-Universität, Bochum, Germany*; [2]*Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands*; [3]*International Agency for Research on Cancer (IARC), Lyon, France*

Background There is limited evidence regarding the exposure-effect relationship of exposure to hexavalent chromium (CrVI) and nickel (Ni) with lung cancer. We estimated the cumulative exposure for CrVI and Ni and assessed exposure-effect relationships for lung cancer risk by sex, smoking status, and histological subtypes.

Methods Fourteen case-control studies (1985–2010) from Europe and Canada were pooled, including 16 901 lung cancer cases (80% men) and 20 965 controls (78% men). Cumulative exposure to CrVI and Ni were estimated. Unconditional logistic regression models were fitted to estimate odds ratios (OR), 95% confidence intervals (CI), and exposure-effect trends adjusted for smoking and occupations with recognised lung cancer risk.

Results The OR for the highest quartile (>98.95 μg/m^3-years) of cumulative CrVI-exposure was 1.33 (95% CI 1.20–1.48) in men and 1.04 (95% CI 0.48–2.23) in women. In never smokers, the OR for ever CrVI-exposure was 1.37 (95% CI 1.09–1.73) in men, and OR=1.09; 95% CI 0.70–1.69 in women.

The OR for the highest quartile of cumulative Ni-exposure (>77.53 μg/m^3-years) was 1.30 (95% CI 1.16–1.45) in men and 1.29 (95% CI 0.59–2.81) in women. The OR for ever Ni-exposure was 1.22 in never smokers for both sexes.

Conclusions Our results showed an exposure-dependent excess risk of lung cancer by occupational exposure to Ni in both sexes, and for CrVI in men. The pattern for CrVI in women was less clear. Analysis of an interaction between Cr- and Ni-exposure was impaired by a high correlation of these agents in metal fumes.

Invited

Methodology

0483 INVITED KEYNOTE: SIFTING THE WHEAT FROM THE CHAFF IN OCCUPATIONAL EPIDEMIOLOGY – NOVEL APPROACHES TO CAUSAL UNDERSTANDING

Debbie Lawlor. *University of Bristol, Bristol, UK*

A key aim of epidemiology is aetiology – determining causal effects of variation in population health and wellbeing. However, the ability to distinguish causal effects from non-causal association in all branches of epidemiology, including occupational epidemiology, is difficult. In this talk I will outline some novel approaches to testing causality, including using genetic instrumental variables (Mendelian randomization) and negative control studies, and how these can be integrated with more conventional approaches (multivariable regression analyses in observational data, randomised controlled trials and natural experiments) in a triangulation framework. I will used examples from perinatal and cardio-metabolic health (the main area in which I work) but also from occupational health to illustrate how these can be used to improve causal understanding of how occupational exposures affect health.

Oral Presentation

Cancer

0484 EXPOSURE TO IONISING RADIATION AND RISK OF LYMPHOMA SUBTYPES: ANALYSIS OF THE EPILYMPH RESULTS

[1]Pierluigi Cocco*, [2]Matteo Ioi, [1]Qi Zhi, [1]G Satta, [1]Maris G Enna, [3]Nickolaus Becker, [4]Yolanda Benavente, [4]Sylvia De Sanjosé, [5]Lenka Foretova, [6]Anthony Staines, [7]Marc Maynadié, [8]Alexander Nieters, [2]Lydia Zablotska. [1]*University of Cagliari, Cagliari, Italy*; [2]*University of California, San Francisco, USA*; [3]*German Cancer Research Centre, Heidelberg, Germany*; [4]*Catalan Institute of Oncology, Barcelona, Spain*; [5]*Department of Cancer Epidemiology and Genetics, Brno, Czech Republic*; [6]*Dublin City University, Dublin, Ireland*; [7]*Dijon University Hospital, Dijon, France*; [8]*University of Freiburg, Freiburg, Germany*

Introduction The association between ionising radiation and risk of solid tumours and leukaemia is well established;

however, the role of low dose radiation exposure in the aetiology of lymphoma is still uncertain. We investigated the role of occupational exposure to internal and external ionising radiation in the aetiology of lymphoma and its major subtypes.

Methods Between 1998 and 2004, 2348 cases and 2465 controls from six different European countries participated in the multicentre EpiLymph case-control study. A detailed occupational history was collected by questionnaire in all participants a coded using the ISCO68 occupational and NACE industrial coding systems. Based on the same coding systems, we developed a Job Exposure Matrix (JEM) to assess probability and intensity of exposure to internal and external ionising radiation. We used unconditional logistic regression to calculate Odds Ratios and their 95% Confidence Intervals for lymphoma and its major subtypes associated with the ionising radiation exposure metrics, adjusting by age, gender, education and country.

Results Risk of lymphoma overall did not show an association with exposure to radiation either internal or external. Risk of Diffuse Large B-Cell Lymphoma (DLBCL) was elevated and did show an upward trend with intensity of exposure to external radiation (Low Intensity OR=2.1, $_{95\%}$CI=0.97–4.46 and High Intensity OR=2.5, $_{95\%}$CI=1.21–5.08). We did not observe any risk increase associated with internal exposure to ionising radiation.

Conclusions Our results provide limited support to the relation between external sources of ionising radiation and risk of DLBCL. We cannot exclude the possibility of bias due to the multiple comparisons we made.

Poster Presentation

Cancer

0485   ENVIRONMENTAL EXPOSURE TO RADIOFREQUENCY AND RISK OF LYMPHOMA SUBTYPES

[1]P Cocco*, [1]G Satta, [2]A Salis, [2]L Saba, [1]S Sanna, [3]E Angelucci, [1]A Gabbas, [3]F Culurgioni, [3]P Pili, [3]E Mura, [4]M Cappai, [1]Maris G Ennas. [1]University of Cagliari, Cagliari, Italy; [2]EPICOOP, Cagliari, Italy; [3]A. Businco Oncology Hospital, Cagliari, Italy; [4]Regional Agency for Environmental Protection of Sardinia (ARPAS), Cagliari, Italy

Introduction Conflicting results have been published on the association between occupational and environmental exposure to radiofrequency (RF) and cancer risk Information bias might have played a role in some instances.

Methods We geocoded fixed radio-tv transmitters and mobile phone base stations, as well as the residence of 451 cases and 603 controls who participated in a case-control study on the aetiology of lymphoma in Sardinia, Italy. A detailed residential history was available for all cases and controls, including the perceived distance from fixed radio-tv transmitters and mobile phone base stations. We applied the models used by the Regional Agency for Environmental Protection, and conducted RF measurements to estimate the RF field at the door of study subjects. We used unconditional logistic regression to calculate Odds Ratios and their 95% confidence intervals for lymphoma and its major subtypes associated with the RF exposure metrics, adjusting by age, gender, and education.

Results Based on questionnaire data, risk of lymphoma overall was elevated for a cumulative exposure to fixed radio-tv transmitters above the median (OR=2.7, 95% CI=1.5–4.6). Risk was likewise elevated for all lymphoma subtypes. With reference to mobile phone base stations, we only observed a non significant excess risk of diffuse large B-cell lymphoma (DLBCL, OR=2.5, 95% CI=0.7–8.3). Such associations disappeared when we considered exposure based on the models, or the measurements. By comparing the reported distance to the geocoded data, we found out that the cases tended to underestimated the distance from the source of RF emission.

Conclusions Our results do not support the hypothesis of a link between environmental exposure to RF and risk of lymphoma subtypes.

Conflict of Interest statement: None of the coauthors declare any conflict of interest related to the matters discussed in this paper.

Invited

Policy/Impact

0489   INVITED KEYNOTE: DOES EPIDEMIOLOGY COUNT?

Anthony Newman Taylor. Imperial College, London, UK

Epidemiology is largely a practical discipline whose findings are used to inform health policy and clinical practice. Occupational epidemiology should address important and tractable questions, generating new information with the potential to influence decisions, even where policy makers encounter strong competing opinions and interests. Priorities for research should include:

1. Exposures in the workplace which may contribute importantly to the burden of illness at population level, but where uncertainty remains about causation or levels of risk (e. g. shift work and breast cancer, chronic kidney disease in sugar cane workers in Central America and parts of Asia).

2. Exposures which although not widespread, could carry a high attributable risk in individual workers. A past example would be haemangiosarcoma of the liver in VCM workers, a contemporary example hypersensitivity pneumonitis in those exposed to metal working fluids (MWF), probably attributable to Mycobacterial infection of MWF.

3. Studies to evaluate the effectiveness of interventions. Such research, while difficult and expensive, can provide critical evidence about both causation and the process of prevention. The challenge is to apply limited resources most efficiently through optimal choice of study questions and methods (randomised controlled trials are not always the best approach).

4. Descriptive epidemiology, both to identify possible unrecognised hazards (including from new technologies), and to check that known hazards are being adequately controlled.

At the same time, it is important to recognise where further research is not needed. In developing countries, studies on affordable methods of reducing hazardous exposures may be more useful than investigations to confirm risks that are already well known.

Oral Presentation

Intervention Studies

0490 | **A RANDOMISED CONTROL CROSSOVER TRIAL OF A THEORY BASED INTERVENTION TO IMPROVE SUN-SAFE AND HEALTHY BEHAVIOURS IN CONSTRUCTION WORKERS: STUDY PROTOCOL**

Amanda Nioi*, Charlotte Wendelboe-Nelson, John Cherrie. *School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh, UK*

Exposure to sunlight can have both positive and negative health impacts. Excessive exposure to ultra-violet (UV) radiation from the sun can cause skin cancer, however, insufficient exposure to sunlight has a detrimental effect on the production of Vitamin D. In the construction industry there are already proactive behaviours for safety onsite, but sun-safety and health remains a low priority. There is limited research in understanding the barriers to adopting sun-safe behaviours and the association this may have with Vitamin D production. This paper reports the study protocol for a text messaging (SMS) and supportive smartphone app intervention, which aims to reduced UV exposure and promote appropriate dietary changes to boost Vitamin D intake. Approximately 60 adult construction workers will be recruited across Scotland and southern England. Randomisation to the intervention will occur at site level and participants will receive both the control (no text service) and intervention (daily text message and supportive app). The intervention messages will be delivered daily to participant's smartphone; they will also be sent a link to download the supportive app. There will be three waves of data collection across the year, each study epoch lasting 21 days (intervention messages sent on workdays only). The primary outcome measure is Vitamin D level (using blood spot sampling) this will be taken at the start and end of each 21 day cycle (control and intervention). This study will provide important information about the effectiveness of a technology-based intervention to promote sun-safe and healthy behaviours amongst outdoor construction workers.

Oral Presentation

Neurological Effects

0491 | **BRAIN HEALTH AND AGEING IN RETIRED RUGBY PLAYERS, THE BRAIN STUDY**

[1]Damien McElvenny*, [2]Valentina Gallo, [3]Catherine Hobbs, [4]Seb Crutch, [4]Huw Morris, [4]Nick Fox, [4]Henrik Zetterberg, [5]Matt Cross, [5]Simon Kemp, [2]Andrea Malaspina, [6]Nigel Arden, [6]Madeline Davies, [3]Neil Pearce. [1]*Institute of Occupational Medicine, Edinburgh, UK*; [2]*Queen Mary, University of London, London, UK*; [3]*London School of Hygiene and Tropical Medicine, London, UK*; [4]*University College, University of London, London, UK*; [5]*Rugby Football Union, London, UK*; [6]*University of Oxford, Oxford, UK*

Evidence is accumulating on the possible increased risks of neurodegenerative diseases in former contact sport athletes. Each contact sport – with different protections and different playing dynamics – exposes its players to different types of potential traumas. Evidence suggest that these are not necessarily comparable in terms of pathophysiology, and hence in terms of their potential long-term adverse effects on health. Increasing evidence on poorer general and neurological health among professional sportsmen exposed to repetitive concussions is accumulating; however there is little evidence from rugby players specifically.

This study is designed to assess the associations between history of concussion and general and neurological health in retired elite rugby players aged 50 years or more. We are recruiting a sample of approximately 200 retired rugby players aged 50 years or more and collecting a number of general and neurological health-related outcome measures via validated tests, in addition to biomarkers of neurodegeneration (neurofilaments and tau). We will also carry out a GWAS. This study will investigate the associations between concussion during the rugby career and subsequent measures of healthy ageing and subtle neurological and cognitive impairment. This evidence will be further explored using biomarkers and genetic characteristics of the participants, and investigating which playing history characteristics may be more relevant.

Thus, the study will estimate the burden of physical and neurological health of retired rugby players and will provide initial evidence on possible associations between rugby-related concussion and subsequent general and neurological health. This will both inform current policy, and inform the design of in-depth prospective studies if required.

Oral Presentation

Exposure Assessment

0492 | **ASSESSMENT OF EXPOSURE TO SUB-CONCUSSIVE HEAD IMPACTS IN FORMER PROFESSIONAL SOCCER PLAYERS**

[1]John Cherrie*, [1]Ioannis Basinas, [2]Martie van Tongeren, [1]Damien McElvenny, [3]Valentina Gallo, [4]Neil Pearce. [1]*Institute of Occupational Medicine, Edinburgh, UK*; [2]*University of Manchester, Manchester, UK*; [3]*Queen Mary, University of London, London, UK*; [4]*London School of Hygiene and Tropical Medicine, London, UK*

There is a lack of information on the most appropriate way to assess exposure to sub-concussive head impacts from heading footballs In terms of relevance for future potential cognitive effects amongst former professional footballers. Reliable quantification of exposure is key to undertaking informative epidemiological studies of cognitive function or neurodegenerative effects amongst former players and is a prerequisite for the design of appropriate interventions to prevent risk of disease. We propose to identify the potential determinants of exposure of chronic sub-concussive head impacts due to heading a football, and how these might relate to the putative disease processes of interest. Information about frequency and intensity of impacts will be collected retrospectively using interviews with subjects, consultation with a panel of former players, analysis of available records, and archive video of games. Important changes that may have affected exposure over time, such as the weight of balls and the pattern of play, will be identified. We will integrate these data into one or more metrics for energy transfer and/or acceleration from head impacts, based on a biomechanical model of the impact process.

Oral Presentation

Pesticides

0493 IMPROVING EXPOSURE ASSESSMENT METHODOLOGIES FOR OCCUPATIONAL EPIDEMIOLOGICAL STUDIES ON PESTICIDES

[1,2]John Cherrie*. [1]*Institute of Occupational Medicine, Edinburgh, UK*; [2]*Institute of Biological Chemistry, Biophysics and Bioengineering, Heriot Watt University, Edinburgh, UK*

Retrospective assessment of occupational exposure to pesticides in epidemiological studies is challenging. The exposures are complex and may occur by skin contact, inadvertent ingestion and by inhalation. There is considerable variation in exposure within and between persons from use of pesticides, with weather, season and crops all affecting use. Product formulation and the type of application equipment may change over time. The use of personal protective equipment, which may have variable efficacy, has also changes over time. The general lack of historic environmental and biological monitoring measurements forces epidemiological researchers to rely on self-reports and exposure models. This presentation will briefly introduce the topics for discussion along with the questions for the panel and delegates so that they can consider these during the session presentations.

These questions are as follows:
• What methods have you successfully used epidemiological studies?
• What were the difficulties/weaknesses you encountered?
• What improvements could be made, both in methodologies and in data availability?
• How should the planned research best interact with the occupational epidemiology community?

* Authors reserve the right to update the discussion questions

Oral Presentation

Pesticides

0494 A REGULATORY PERSPECTIVE ON THE NEED FOR IMPROVING EXPOSURE ASSESSMENT FOR EPIDEMIOLOGICAL STUDIES ON PESTICIDES

Paul Hamey. *Health and Safety Executive, York, UK*

Manufacturers intending to market pesticides are required to perform and submit extensive toxicology studies in animals to support risk assessments which demonstrate an absence of harm to human health in order to gain authorisation to supply their products. While such data provides necessary reassurance it is acknowledged that there are uncertainties in extrapolating from animal models to humans and in addition some human diseases lack appropriate models.

Epidemiological studies therefore are regarded as an important alternative source of information that may either support animal data based risk assessments or indicate potential concerns not previously identified. For this reason within the UK the epidemiological literature has for some time been routinely considered with the aim of identifying any emerging concerns. More recently EU data requirements for pesticides have been amended to require applicants to conduct literature searches and to formally evaluate relevant epidemiology data. An additional recent action by the EFSA has been the commissioning of a systematic review of pesticide epidemiology published 2006–2012.

A large and growing database of epidemiology relating to pesticides exists. However, despite the regulatory efforts mentioned above the impact of such data on regulatory outcomes is negligible. Identification of specific pesticides and levels of exposure are often cited as significant limitations of studies. The regulatory requirements, limitations in the existing data, and suggestions for potential improvements will be discussed.

Oral Presentation

Pesticides

0495 OVERVIEW OF THE EXPOSURE ASSESSMENT METHODOLOGICAL ISSUES FOR EPIDEMIOLOGICAL STUDIES ON PESTICIDES

Hans Kromhout. *Institute for Risk Assessment Science (IRAS), Utrecht University, Utrecht, The Netherlands*

Accurate assessment of (occupational) exposure to pesticides is hard to achieve. Applicators often apply multiple products and active ingredients over the course of a growing season. Which active ingredient is applied will also depend heavily about the pest at hand. Exposure to pesticides is therefore often to a mixture of active ingredients when assessed at annual or lifetime scale. Recollection of this information can become rather problematic when it covers multiple decades especially in the absence of spraying calendars or other recorded data. Also, applicators might have reasonable knowledge of tradenames and active ingredients, but farmworkers exposed via re-entry tasks like harvesting, pruning etc. in treated crops might only remember a pungent smell of a particular active ingredient or the crop they worked in. In middle- and low-income countries this might even become more problematic given that considerable proportions of applied pesticides may originate from unauthorised sources and sometimes reach local retailers via illegal cross-country trade. Re-packaging, lack of information in local languages and illiteracy will enhance these problems. In epidemiological studies several exposure assessment approaches have been applied including self-reports by farmers and applicators, crop-exposure matrices, semi-quantitative algorithms based on detailed information provided by study subjects and less frequently by measuring exposure and biomonitoring. In this presentation an overview of and trends in methods for assessment of exposure to pesticides in agricultural cohort and cross-sectional studies as well as community-based (case-control) studies will be presented. The (lack of) validity of different methods and approaches will be considered.

Oral Presentation

Pesticides

0496   IMPROVING OCCUPATIONAL EXPOSURE ASSESSMENT METHODOLOGIES FOR EPIDEMIOLOGICAL STUDIES ON PLANT PROTECTION PRODUCTS

Karen Galea. *Institute of Occupational Medicine, Edinburgh, UK*

This presentation will introduce and describe the rationale for a new comprehensive study which aims to better understand the reliability of assessment of human exposure to pesticides in previous occupational epidemiological investigations, and to use this information to recommend improvements in scientific practice for the future. This is to be achieved by assessing the reliability and external validity of the surrogate measures used to assign exposure within individuals or groups of individuals, which are frequently based on self-reported data on exposure determinants like spraying methods and frequency of spraying or job/crop exposure matrices. In addition we will evaluate the size and effects of recall bias on misclassification of exposure to pesticides and associated health effects. The presentation will introduce the methodology that the project will use to achieve these aims and objectives. Existing and newly collected (biological) monitoring exposure data from several existing epidemiological studies and historical records, along with new studies in various working populations in Europe and elsewhere will be used to examine the performance of exposure assessment approaches. Urinary metabolites of pesticides will be selected with due consideration on the extent of use within the study populations, validity of biomonitoring methods etc. The performance of the various exposure assessment methods will be compared and contrasted within existing epidemiological studies. Discussion on the proposed methodology will be invited as part of the symposium panel and delegate discussion session.

Oral Presentation

Neurological Effects

0497   HEAD TRAUMA IN SPORT AND NEURODEGENERATIVE DISEASE: AN INTRODUCTION AND REVIEW OF THE EPIDEMIOLOGICAL EVIDENCE

[1,2]Neil Pearce*, [3]Valentina Gallo, [4]Damien McElvenny. [1]*London School of Hygiene and Tropical Medicine, London, UK;* [2]*Centre for Public Health Research, Massey University, Wellington, New Zealand;* [3]*Queen Mary, University of London, London, UK;* [4]*Institute of Occupational Medicine, Edinburgh, UK*

A number of small studies and anecdotal reports have been suggested that sports involving repeated head trauma may have long-term risks of neurodegenerative disease. There are now plausible mechanisms for these effects, and a recognition that these problems do not just occur in former boxers, but in a variety of sports involving repeated concussions, and possibly also in sports in which low-level head trauma is common. These neurodegenerative effects potentially include increased risks of impaired cognitive function and dementia, Parkinson's Disease, and amyotrophic lateral sclerosis. Many would argue for taking a precautionary approach and immediately banning or restricting sports such as boxing. However, there are important public health issues in terms of how wide the net should be cast in terms of other sports, and what remedial measures could be taken. This in turn requires a major research effort involving both clinical and basic research to understand the underlying mechanisms leading from head trauma to neurodegenerative disease, and epidemiological studies to assess the long-term consequences.

Oral Presentation

Neurological Effects

0498   BIOMARKERS OF CONCUSSION

[1,3]Valentina Gallo*, [2]Damien McElvenny, [3]Neil Pearce. [1]*Queen Mary, University of London, London, UK;* [2]*Institute of Occupational Medicine, Edinburgh, UK;* [3]*London School of Hygiene and Tropical Medicine, London, UK*

Concussion is a frequent occurrence in many contact sports and among soldiers, but also a possible inevitably consequence of accidents. Currently, the diagnosis of concussion is based on clinical symptoms, and it is difficult to predict prognosis. Biomarkers could be of invaluable help in informing the neuropathological events underlying concussive episodes. Specifically, they could contribute defining the diagnosis, the recovery process, and the long-term effect in presence or absence of chronic traumatic encephalopathy. For diagnosis and recovery, the neurofilaments and tau protein are promising biomarkers. No markers for CTE have been developed to date. The identification of biomarkers of diagnosis and recovery is particular important as most current research suggests that the risk of long-term symptoms following concussion is highest in individuals who have received repetitive concussions before the brain has recovered properly.

Oral Presentation

Neurological Effects

0499   LONG-TERM HEALTH OUTCOMES AFTER EXPOSURE TO REPEATED CONCUSSION IN ELITE LEVEL RUGBY UNION PLAYERS

[1]Tom McMillan*, [2]P McSkimming, [1]J Wainman-Lefley, [1]LM Maclean, [3]J Hay, [1]A McConnachie, [3,4]W Srewart. [1]*Institute for Health and Wellbeing, University of Glasgow, Glasgow, UK;* [2]*Robertson Centre for Biostatistics, University of Glasgow, Glasgow, UK;* [3]*Department of Neuropathology, Queen Elizabeth University Hospital, Glasgow, UK;* [4]*Institute of Neuroscience and Psychology, University of Glasgow, Glasgow, UK*

Interest and concern about late effects of concussion in contact sports has been growing, although research on long-term health outcome is limited. There has been particular concern with regard to neurodegenerative changes that might become evident

very late after injury. In this presentation studies on late health outcome will be briefly reviewed and a recently published study on long term outcome in rugby union players will be presented. In this study, outcome in relation to exposure to repeated head injury was investigated in retired Scottish international rugby players and controls in relation to general and mental health, life stress, persisting complaints, cognitive function, disability and markers of chronic life stress (allostatic load).

Although the estimated number of concussions was high in the retired rugby players (median=7; IQR 5–40), and subtle group differences were detected on two of the cognitive tests (verbal learning and fine co-ordination of the dominant hand), group differences in mental health, social or work functioning were not found late after injury, and there were not associations between the number of concussions and cognitive function.

There is a need for prospective group comparison studies on representative cohorts.

Invited

Occupational Medicine (SCOM/Modernet)

0500   INVITED KEYNOTE: WHO WOULD HAVE THOUGHT IT? THE UNFORESEEN PROBLEMS OF DISRUPTIVE TECHNOLOGIES

[1,2]Anthony Seaton*. [1]University of Aberdeen, Aberdeen, UK; [2]Institute of Occupational Medicine, Edinburgh, UK

Increasing exploitation of Britain's coal resources and the manufacture of steel in the 18th century led to the invention of the steam engine, liberating factories from dependence on water power and enabling transport by railway and steam ships. The application of these technologies and the ideas of Adam Smith on the use of capital led to the Industrial Revolution and Britain's dominance in world trade through the 18th and 19th centuries. However, in large part this was based on gross exploitation of human and other resources throughout Britain and its Empire.

The most obvious health consequences of coal affected miners; accidental deaths and lung disease. The latter became a matter of intense medical dispute right through to the late 20th century. Less obvious at first were the health consequences of air pollution, which made an impact on medical thinking only in the mid-20th century. Even less obvious were more subtle consequences of coal exploitation. The production of coke for making steel was found to cause lung cancer in coke oven workers. Secondary use of the volatile derivatives from coke and coal gas manufacture led to the organic chemical, rubber and plastics industries, from which mankind has derived enormous benefits but which in turn have led to health hazards among workers, from bladder cancers to leukaemias and neurological diseases.

Most serious of all have been the ecological consequences of the use of coal and its successor, oil, to which similar effects on workers can be ascribed. Of these, the most important is climate change which threatens the end of civilisation. This was not foreseen until the very late 20th century. Now we are facing similar threats from other disruptive and primarily beneficial technologies – the world-wide web, robotics,

artificial intelligence, genetic engineering and nanotechnology. Can we foresee these problems and act to reduce the risks?

Invited

Musculoskeletal

0501   LIFETIME ACHIEVEMENT AWARD – INVITED KEYNOTE: WHY HAVE WE FAILED TO PREVENT BACK PAIN IN WORKING POPULATIONS?

David Coggon. MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK

Low back pain (LBP) is a major cause of disability globally, and has been linked consistently with occupational activities that load the spine mechanically. However, randomised controlled trials of ergonomic interventions have failed to produce expected reductions in the disorder. Moreover, social security statistics from Britain reveal an eightfold rise in incapacity for work attributed to LBP during 1950–95 at a time when the physical demands of work were reducing.

To shed further light on this apparent paradox, a study (CUPID) was set up to assess differences in the prevalence of musculoskeletal pain and associated disability among workers carrying out similar occupational tasks in different cultural environments, and to explore explanations for any variation. Data were collected by questionnaire from 47 occupational groups (nurses, office workers and others) in 18 countries, with a follow-up survey after a mean interval of 14 months in 45 of the groups.

Analysis of baseline data indicated major variation in the prevalence of disabling LBP, with somewhat higher rates in nurses than office workers, but much larger differences between similar occupations in different countries. The variation was not explained by established risk factors, but correlated strongly with differences in the prevalence of disabling wrist/hand pain. Moreover, baseline extent of regional pain at anatomical sites outside the low back strongly predicted the prevalence of disabling LBP and associated sickness absence at follow-up, explaining much of the variation between occupational groups. These observations, which accord with findings from successive European Working Conditions Surveys, suggest that large international differences in the prevalence of LBP do not depend on causes specific to the spine, but are driven by factors that increase propensity to musculoskeletal pain more generally. Furthermore, a study of migrants from South Asia to the UK indicates that such propensity is environmentally determined, and can increase soon after moving to a new country where rates of pain are higher.

Based on current evidence, it can be hypothesised that while mechanical loading may cause minor strains that trigger episodes of LBP, the severity and persistence of symptoms is driven more by culturally-determined psychosocial factors that affect musculoskeletal pain more generally. If so, while ergonomics has an important role in enabling people to work more comfortably and to remain productive when limited by back pain, the key to reducing the continuing high burden of LBP may lie in understanding what drives differences in general propensity to musculoskeletal pain.

Invited

Cancer

0503 | **INVITED KEYNOTE: OCCUPATIONAL CANCER THE 21ST CENTURY**

Manolis Kogevinas. *IS Global, Barcelona, Spain*

Occupational health research has identified numerous carcinogens particularly before the 1990s. Most occupational carcinogens were first identified through clinical observations and epidemiological studies rather than experimental studies. The most frequently quoted estimate of cancers due to workplace exposures is 4% and was estimated nearly 40 years earlier. There is a lack of current valid estimates at a global scale. There are significant trends in exposure to occupational carcinogens with a reduction of exposed workers and exposure levels in high income countries and increase in prevalence and high exposure levels in newly developed countries. New technologies and changing employment patterns are posing new challenges in the identification and control of occupational carcinogens. Working time and particularly shift work are among the major new areas for research and prevention. Epidemiological research in recent years has had significant difficulties in providing strong evidences on new carcinogens. This has been particularly the case in complex exposure scenarios such as exposure to pesticides. Different phases in epidemiological research can be identified. Case series and later SMR studies dominated in early periods. These were followed by the development of advanced exposure assessment methods and JEMs and their application in both cohort and case-control studies. In recent years studies in the wider area of molecular epidemiology have developed incorporating mechanistic information. Overall, the most productive studies in identifying carcinogens were the early and relative simple SMR studies that were done in a context of high exposures and limited work mobility. Use of classical epidemiological designs and particularly large cohort studies with advanced exposure assessment methods and the combination with new research approaches using powerful tools for exposure assessment, biomarkers and omic technologies will provide new evidence and allow quantitative risk assessment. Conduct of 'big data' type studies without advanced exposure assessment methods are unlikely to identify new occupational carcinogens. Occupational cancer research has been seriously underfunded and has been inefficient in promoting prevention of occupational carcinogens globally. This is a consequence of factors both within the occupational health community (repetitive non-innovative research; lack of efficient coordination in the occupational health community) but mostly due to wider factors and particularly the general hostile wider political environment concerning work conditions. Occupational exposure to carcinogens continues being in the 21st century a major cause of preventable disease and in many parts of the world the prevalence of these exposures is increasing.

0139 | **MORTALITY AND MESOTHELIOMA INCIDENCE AMONG CHRYSOTILE ASBESTOS MINERS IN BALANGERO, ITALY: A COHORT STUDY**

[1]Daniela Ferrante, [2,3]Dario Mirabelli, [4]Andrea Giovannini, [4]Patrizia Tribaudino, [1,3]Corrado Magnani. [1]*Department of Translational Medicine – Unit of Medical Statistics and Cancer Epidemiology, CPO Piemonte and University of Piemonte Orientale, Novara, Italy*; [2]*Unit of Cancer Epidemiology, CPO Piemonte and University of Turin, Turin, Italy*; [3]*Interdepartmental Centre G. Scansetti for Studies on Asbestos and other Toxic Particulates, University of Turin, Turin, Italy*; [4]*Centre for surveillance on occupational diseases, Public Prosecution Office, Turin, Italy*

Chrysotile asbestos causes an increased risk of mesothelioma (MM), but the extent of this risk and the carcinogenic potency of chrysotile fibers is in discussion. We studied mortality and MM incidence among workers employed at the Balangero mine (Italy), the largest chrysotile mine in Western Europe, active from 1917 to 1985. The cohort included 974 male workers employed for at least 6 months and active on January 1st, 1946 or subsequently hired. Vital status and causes of death were ascertained. Past exposure to asbestos by working area and calendar period was estimated, based on historical measurements of fibre concentrations, and individual cumulative exposure was assessed by applying these estimates to the job history of cohort members.

Local reference rates were used to compute expected deaths from selected diseases and expected incident MM cases. Observed to expected ratios were calculated along with 95% confidence intervals.

Mortality was increased for all causes (SMR=1.28; CI95% 1.17–1.40), pleural cancer (SMR=4.30; CI95% 1.58–9.37) and asbestosis (SMR=375.06; CI95% 262.68–519.23). SMRs for lung cancer (SMR=1.14; CI95% 0.81–1.55) and peritoneal cancer (SMR=3.25; CI95% 0.39–11.75) showed a non-statistically significant increase. Six cases of pleural MM were observed and the SIR was 6.3 (CI95% 2.3–13.7). The analysis by duration and latency for pleural cancer showed an increased risk with increasing duration of exposure and the risk flattened out for latency greater than 40 years. Further analyses based on quantitative exposure indices are being conducted to contribute to the debate on chrysotile potency.

Oral Presentation

Intervention studies

0021 | **EXERCISE PROTECTS AGAINST LOW BACK PAIN: SYSTEMATIC REVIEW AND META-ANALYSIS OF CONTROLLED TRIALS**

[1]Rahman Shiri*, [2,3]David Coggon, [4]Kobra Falah-Hassani. [1]*Finnish Institute of Occupational Health, Helsinki, Finland*; [2]*Arthritis Research UK/MRC Centre for Musculoskeletal Health and Work, University of Southampton, Southampton, UK*; [3]*MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, UK*; [4]*Western University, London, Canada*

Background The effect of exercise to prevent low back pain (LBP) and associated disability is uncertain. We carried out a meta-analysis to address this question.

Methods Literature searches were conducted in PubMed, Embase, Cochrane Library, Google Scholar, and Research Gate from their inception through September 2016. Randomized controlled trials (RCT) and clinical controlled trials (CCT) were eligible for inclusion in the review if they compared an exercise intervention with usual daily activities and at least some of the participants were free from LBP at baseline.

Results Sixteen controlled trials including 13 RCTs and 3 CCTs qualified for meta-analyses. Exercise alone reduced the risk of LBP by 33% (risk ratio (RR)=0.67, CI: 0.53 to 0.85, I^2=23%, 8 RCTs, N=1634) and exercise combined with education by 27% (RR=0.73, CI: 0.59 to 0.91, I^2=6%, 6 trials, N=1381). The severity of LBP and disability due to LBP were also lower in the exercise than control groups. Moreover, results were not changed by excluding the CCTs, or by adjustment for publication bias. There were few trials on healthcare consultation or sick leave for LBP, and meta-analyses of these trials did not show statistically significant protective effects of exercise.

Conclusions Exercise reduces the risk of LBP and associated disability, and a combination of strengthening with either stretching or aerobic exercises performed 2–3 times/week can reasonably be recommended for prevention of LBP in the general population. However, education about back disorders, ergonomic principles or exercise effects appears to have no additional beneficial effect on LBP.

Poster Presentation

Musculoskeletal

0057	A NOVEL RISK PREDICTION TOOL FOR DISABILITY PENSION DUE TO MUSCULOSKELETAL DISORDERS

[1]Raman Shiri*, [2]Markku Heliövaara, [1]Kirsi Ahola, [1]Leena Kaila-Kangas, [1]Eija Haukka, [1]Johanna Kausto, [3]Peppiina Saastamoinen, [1]Päivi Leino-Arjas, [1,3]Tea Lallukka. [1]*Work disability prevention, Finnish Institute of Occupational Health, Helsinki, Finland*; [2]*Department of Health, National institute for Health and Welfare, Helsinki, Finland*; [3]*Department of Public Health, University of Helsinki, Helsinki, Finland*

Background It is important to identify individuals at high risk of work disability and target healthcare interventions at the high risk group. The objective of this study was to develop and validate a novel risk prediction tool using a points system to predict the risk of future disability pension due to musculoskeletal disorders (MSDs).

Methods The development population, the Health 2000 Survey, consisted of a representative sample of employees aged 30–60 years (N=3676) and the validation population, the Helsinki Health Study, consisted of employees of the City of Helsinki aged 40–60 years (N=6391) living in Finland. Both survey data sources were linked to disability pension due to MSDs and mortality data from national registers for 11 years follow-up.

Results The discriminative ability of the model with six predictors was good (Gönen and Heller's K concordance statistic=0.821). We gave easy-to-use points to six predictors: sex-dependent age, high level of education, pain limiting daily activities, multisite musculoskeletal pain, arthritis, and a surgery for a spinal disorder or carpal tunnel syndrome. A score 3 or higher out of 7 (top 30% of the index) had good sensitivity (83%) and specificity (70%). Individuals at the top 30% of the risk index were at 29 (CI: 15–55) times higher risk of disability pension due to MSDs than those at the bottom 40%.

Conclusion This easy-to-use screening tool based on self-reported risk factor profiles can help to identify individuals at high risk for disability pension due to MSDs.

Poster Presentation

Musculoskeletal

0075	DETERMINANTS OF INTERNATIONAL DIFFERENCES IN THE PREVALENCE OF MULTISITE MUSCULOSKELETAL PAIN IN WORKING POPULATION

[1]Emanuele Rizzello*, [2]Georgia Ntani, [3]Ira Madan, [2]David Coggon. [1]*Department of Medical and Surgical Sciences (DIMEC), University of Bologna, Bologna, Italy*; [2]*MRC, Life course Epidemiology Unit, University of Southampton, Southampton, UK*; [3]*Guy's and St Thomas' NHS Foundation Trust, London, UK*

Background The prevalence of disabling regional pain varies widely between countries, even among people with similar jobs. It appears that the factors driving this variation predispose to musculoskeletal pain in general rather than being specific to any one anatomical site. To explore at what age they act, and whether they might be amenable to intervention, we analysed previously collected data from a cross-sectional survey.

Methods Information about musculoskeletal pain and risk factors was elicited at interview from six groups of workers (N=855, response rate 95.4%) defined by the nature of their work (non-manual or manual) and their country of residence and ethnicity (UK white, UK of Indian subcontinental origin and Indian in India). We compared the 12 month prevalence of multisite pain across the six occupational groups with adjustment for potential confounders.

Results Overall, 200 participants (23%) reported pain at ≥3 sites, which was much less frequent in Indian manual and non-manual workers than among white non-manual workers in the UK (adjusted ORs 0.04, 95% CI: 0.01 to 0.2, and 0.2, 95% CI: 0.1 to 0.6). However, rates in UK workers of Indian subcontinental origin were very similar to those in white UK workers. This pattern was maintained when analysis was restricted to participants aged <35 years, and when second and later generation migrants were excluded.

Conclusions Large differences in pain prevalence between the UK and India are attributable to environmentally-determined factors which influence pain at multiple anatomical sites, impact by early in adult life, and act soon after moving from India to the UK.

Poster Presentation

Exposure assessment

0211   OCCUPATIONAL HEAT STRESS AND HEAT STRAIN ASSESSMENT USING CLIMATE SERVICE INFORMATION

[1]Chuansi Gao*, [1]Kalev Kuklane, [2]Per-Olof Östergren, [3]Tord Kjellstrom. [1]Thermal Environment Laboratory, Division of Ergonomics and Aerosol Technology, Department of Design Sciences, Faculty of Engineering, Lund University, Lund, Sweden; [2]Social Medicine and Global Health, Department of Clinical Sciences in Malmö, Lund University, Lund, Sweden; [3]Centre for Technology Research and Innovation (CETRI Ltd), Lemesos, Cyprus

Global warming will unquestionably increase the impact of heat on individuals. The increasing prevalence of this environmental health risk requires the improvement of exposure assessment linked to meteorological data. Reliable assessments of heat stress and heat strain will help to reveal the size of the problem and design appropriate interventions at individual, workplace and societal level. However, it is common that air temperature is widely used as a single parameter in epidemiological studies on the effect of health. The evaluation of occupational heat stress requires measurement of four thermal climate factors (air temperature, humidity, air velocity and heat radiation); available weather station data may serve this purpose. However, the use of meteorological data for such assessment is limited because weather stations do not traditionally and directly measure some important climate factors, e.g. solar radiation. In addition, local workplace environmental conditions such as local heat sources, physical workload related metabolic heat production within the human body, and clothing properties, all affect the exchange of heat between the body and the environment. A robust occupational heat stress and heat strain index should properly address all these factors. This article reviews and highlights a number of selected indices, indicating their strengths and weaknesses in relation to meteorological data, local workplace environments, body heat production and the use of protective clothing. These heat stress and heat strain indices include Wet Bulb Globe Temperature, Discomfort Index, Predicted Heat Strain index, and Universal Thermal Climate Index. Relevant preventive strategies for alleviating heat strain are proposed.

Oral Presentation

Exposure assessment

0289   'DAVID'S CHEESE BREAD' METHOD: WORKLOAD QUANTITATIVEEXPOSURETHRESHOLDS DETECTION USING ADJUSTED HAZARDMULTIVARIATE PARAMETRIC MODELLING, USEFUL INCUMULATIVE-TRAUMA DISORDERS PREVENTION AND WITHIN THEIR CAUSAL ASSESSMENT

[1,2,3]David Alvarez Rincón*, [4]Luisa Perez. [1]ICOH membership, Milano, Italy; [2]EPICOH member, Utrecht, The Netherlands; [3]Provincial Workers' Compensation Board, Cali, Colombia; [4]University of Alberta OH&S postgraduate certificate, Edmonton, Canada

Background Qualitative methods are frequently used for workload assessment due to their relative low-cost but their evidence lack, high subjectivity and inaccurate conclusions lead to develop quantitative evidence-based methods for Cumulative Trauma Disorders evaluation. This research aims to generate robust and reliable evidence useful in prevention systems and within workers' compensation processes (causal assessment) by measuring cumulative effective working time to define suitable exposure thresholds.

Methods A retrospective cohort study was assembled with workers from different positions. Inclusion/exclusion criteria were rigorously applied to finally accept 328 workers (656 shoulders). Entire clinic history was analyzed towards obtaining important clinical variables. Each shoulder workload was assessed independently getting cumulative exposure time to movement angles, repetitive motions, load lifting, exertion and vibration, adjusting by rest/break periods and other important covariates, controlling confusing effects. The exposure thresholds were obtained using an adjusted multivariate Weibull regression modeling. Huber's M-estimator was used warranting robustestimators to correct both shoulders non-completely independent measures. Final model was built according with Hosmer-Lemeshow-May's covariates purposeful selection principles.

Findings/conclusions Within the adjusted multivariate final model, we could set hazard rate ratio (HRR) into five different clusters across cohort exposure time-line: 'D' or baseline hazard zone; 'a' zone (HRR≈1; p-value≥0.05); 'v' or risk zone (HRR>1; p-value<0.05); 'i' or survivors zone (HRR≈1; p-value≥0.05); and 'd' or super-survivors zone (HRR<1; p-value<0.05). Shortest cumulative times within 'v' zone were selected as exposure thresholds. For workload factors, we were able to clearly define zones and thresholds. We've also named 'v' cluster as 'cheese' zone and others as 'no-cheese' areas.

Oral Presentation

Respiratory

0413   SHORT-TERM AND SUB-CHRONIC EFFECTS OF TRAFFIC-RELATED BLACK CARBON ON SMALL AIRWAY OBSTRUCTION IN METRO MANILA TRAFFIC ENFORCERS

[1,2]Emmanuel S Baja*, [1,3]Godofreda V Dalmacion, [4]Antonio D Ligsay, [5]Nover Edward P Duarte, [6]Melvin A Pasay. [1]Institute of Clinical Epidemiology, National Institutes of Health, University of the Philippines-Manila, Manila, The Philippines; [2]Department of Clinical Epidemiology, College of Medicine, University of the Philippines-Manila, Manila, The Philippines; [3]Department of Pharmacology and Toxicology, College of Medicine, University of the Philippines-Manila, Manila, The Philippines; [4]Clinical Research Section, St. Luke's College of Medicine, Quezon City, The Philippines; [5]Microbiology Section, Department of Laboratories, University of the Philippines-Philippine General Hospital, Manila, The Philippines; [6]St. Luke's Medical Center, Quezon City, The Philippines

Introduction Exposure to traffic-related black carbon (BC) has been linked to decreased forced expiratory flow (FEF25–75%) and Tiffeneau-Pinelli Index (FEV1/FVC), markers of airway obstruction, in several epidemiological studies. We evaluated whether short-term and sub-chronic exposures to BC on the road is linked with markers of airway obstruction in a cohort of traffic enforcers.

Methods We studied repeated measurements of FEF25–75% and FEV1/FVC on 158 traffic enforcers from the Metropolitan Manila Development Authority (MMDA) Health Study using mixed-effects models with random intercepts. We fitted a quadratic

constrained distributed lag model to estimate the cumulative effect on FEV1/FVC and FEF25–75% of ambient BC concentration during the 7 days before the visit. We also evaluated effect modification by participant characteristics using separated regression models and interaction terms.

Results BC was related to decreased FEF25–75% and FEV1/FVC. A 10 ug/m^3 change in BC cumulative during the 7 days before the visit was associated with decreased FEF25–75% [4.2% change; 95% confidence interval (CI): -6.9 to -1.6] and decreased FEV1/FVC (3.0% change; 95% CI: -3.9 to -2.0), respectively. Correspondingly, we found similar associations with FEF25–75% and FEV1/FVC for a 10 ug/m^3 change in BC that occurred 1 day before the visit (1.5% change and 0.5% change). Associations between BC and FEF25–75% and FEV1/FVC were stronger among traffic enforcers who were male, who were never smokers, or who were obese.

Conclusions Traffic-related BC may decrease FEF25–75% and FEV1/FVC among traffic enforcers who are obese, or non-smoking individuals; a male traffic enforcer increases this effect.

Poster Presentation

Exposure assessment

0416   **RELATIONSHIP BETWEEN EXTRACELLULAR IRON AND CIRCULATING INFLAMMATION MARKERS IN PLASMA OF MINNESOTA TACONITE WORKERS**

Shannon M Sullivan*, Bin Ma, Bruce H Alexander, Jeffrey H Mandel, Irina Stepanov. *University of Minnesota, Minneapolis, Minnesota, USA*

Background Higher rates of mesothelioma, pneumoconiosis, lung cancer, and heart disease mortality have been reported in Minnesota taconite (iron ore) workers compared to the rest of the state population. Oxidative stress and inflammation are important underlying mechanisms in cancer and cardiovascular disease, and exposure to silica containing dust with a high iron content may play a key role in the observed elevated health risks.

Methods In this study, we compared ICP-MS-measured plasma iron concentrations to levels of circulating inflammatory markers (cytokines and chemokines) in 130 taconite workers using linear regression analysis adjusting for covariates.

Results Plasma iron levels varied substantially, ranging from 49 to 636 µg/dL, with a mean of 107 (±60) µg/dL. After adjusting for age, body mass index, gender and smoking status, plasma iron levels were positively associated with the levels of chemokines RANTES (p=0.06), TARC (p=0.04), and MDC (p=0.02).

Discussion These findings lend some support to the hypothesis that exposure to iron in taconite dust may lead to elevated levels of extracellular iron both in the lung and in the general circulation, producing reactive oxygen species and catalyzing oxidative stress. Given that TARC and MDC have been prospectively associated with lung cancer risk in other research, there is a need to better understand the relationship between extracellular iron levels and these biomarkers in taconite workers. Further analyses to assess other metrics of iron exposure from taconite dust components on plasma iron concentrations and measures of oxidative stress are warranted.

Poster Presentation

Intervention studies

0450   **PREVENTING AND PROMOTING MUSCULOSKELETAL HEALTH AT THE WORKPLACE THROUGH THE DESIGN AND EVALUATION OF AN INNOVATIVE MULTICOMPONENT INTERVENTION: THE INTEVAL_SPAIN PROJECT**

[1,2]Consol Serra*, [3,4]Sergio Vargas-Prada, [2,3]Mercé Soler, [1,5]Jose Maria Ramada, [6]Pilar Peña, [2]Anna Amat, [7]Ewan B Macdonald, [8]Antoni Merelles, [9]Ana Maria Garcia. [1]*Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain;* [2]*CIBER in Epidemiology and Public Health (CIBERESP), Spain, Spain;* [3]*CiSAL-Centre of Research in Occupational Health, University Pompeu Fabra, Barcelona, Spain;* [4]*Unidad Central de Contingencias Comunes, Mutua Asepeyo, Barcelona, Spain;* [5]*Occupational Health Service, Parc de Salut Mar, Barcelona, Spain;* [6]*Occupational Health Service. Corporació Parc Taulí, Sabadell, Spain;* [7]*Healthy Working Lives Group, University of Glasgow, Glasgow, UK;* [8]*d'Infermeria. Facultat d'Infermeria i Podologia. Universitat de Valéncia, Valencia, Spain;* [9]*Direcció General de Salut Pública. Conselleria de Sanitat Universal i Salut Pública. Generalitat Valenciana, Valencia, Spain*

Objectives Musculoskeletal disorders (MSD) are main cause of work absence, reducing sustainability of working trajectories. The objective of INTEVAL_Spain project is to assess the effectiveness of a multifactorial intervention at the workplace to prevent MSD.

Methods The intervention comprises evidence-based primary (participatory ergonomics-PE), secondary and tertiary prevention (case management-CM), and health promotion targeted to MSD. All components are integrated and require full coordination. A cluster randomized trial with a late intervention control group is being implemented to evaluate its effectiveness. Quantitative and qualitative information is being obtained from databases of participating companies, questionnaires, pre-post learning tests, satisfaction surveys, project records and focus groups.

Results Eight clusters of nurses and aides (n=473) employed at two hospitals were selected and randomly distributed into intervention (n=4) and control (n=4). A prevalence of 80% of back and/or neck pain and 70% of high physical demands at baseline were observed. A champion was recruited, together with 8 managers, 33 referent workers and 3 workers' representatives who volunteered to be clusters leaders. A total of 105 proposals for ergonomic improvements are being managed by operational groups. CM is based on the Scottish EASY model, and five main services are offered, combined with health promotion activities: rehabilitation, MSD health beliefs counseling, targeted cognitive behavioral therapy, Nordic walking, Mediterranean diet, emotional training and mindfulness.

Conclusions The intervention is being implemented with high levels of participation and acceptance. If it proves to be cost-effective, it will provide updated, relevant and innovative evidence for MSD preventive strategies at the workplace.

Oral Presentation

Neurological effects

| 0491 | BRAIN HEALTH AND AGEING IN RETIRED RUGBY PLAYERS, THE BRAIN STUDY |

[1]Damien McElvenny*, [2]Valentina Gallo, [3]Catherine Hobbs, [4]Seb Crutch, [4]Huw Morris, [4]Nick Fox, [4]Henrik Zetterberg, [5]Matt Cross, [5]Simon Kemp, [2]Andrea Malaspina, [6]Nigel Arden, [6]Madeline Davies, [3]Neil Pearce. [1]*Institute of Occupational Medicine, Edinburgh, UK*; [2]*Queen Mary, University of London, London, UK*; [3]*London School of Hygiene and Tropical Medicine, London, UK*; [4]*University College, University of London, London, UK*; [5]*Rugby Football Union, London, UK*; [6]*University of Oxford, Oxford, UK*

Evidence is accumulating on the possible increased risks of neurodegenerative diseases in former contact sport athletes. Each contact sport – with different protections and different playing dynamics – exposes its players to different types of potential traumas. Evidence suggest that these are not necessarily comparable in terms of pathophysiology, and hence in terms of their potential long-term adverse effects on health. Increasing evidence on poorer general and neurological health among professional sportsmen exposed to repetitive concussions is accumulating; however there is little evidence from rugby players specifically.

This study is designed to assess the associations between history of concussion and general and neurological health in retired elite rugby players aged 50 years or more. We are recruiting a sample of approximately 200 retired rugby players aged 50 years or more and collecting a number of general and neurological health-related outcome measures via validated tests, in addition to biomarkers of neurodegeneration (neurofilaments and tau). We will also carry out a GWAS. This study will investigate the associations between concussion during the rugby career and subsequent measures of healthy ageing and subtle neurological and cognitive impairment. This evidence will be further explored using biomarkers and genetic characteristics of the participants, and investigating which playing history characteristics may be more relevant.

Thus, the study will estimate the burden of physical and neurological health of retired rugby players and will provide initial evidence on possible associations between rugby-related concussion and subsequent general and neurological health. This will both inform current policy, and inform the design of in-depth prospective studies if required.

The number next to the author indicates the page number, not the abstract number.

Flachs Esben M, A62, A92
Flachs Esben Meulengracht, A51, A103
Flachs Flachs Esben Meulengracht, A104
Fleming Sarah, A102, A113
Fluoris Andreas, A130
Forbes Andrew, A41
Forbes Patricia, A13
Foresti Chiara, A8, A64
Foretova Lenka, A152
Forman Julie Lyng, A103
Fournier Lucie, A35
Fox Nick, A154
François Olivier, A74, A136
Franche Renee-Louise, A88
Francim-Agrican group , A140
Frank John, A80
Franklin Peter, A126, A134
Frederiksen Thomas W, A121
Freeman Beane, A101
Freyberg Chris, A134
Friesen Melissa, A93
Frings-Dresen Monique, A8, A19
Fritschi Lin, A23, A104, A108, A109
Frost Poul, A75, A91
Frydenberg Morten, A138
Fuglsang-Frederiksen Anders, A75
Furu Heidi, A55

Gérazime Aurélie, A121
Gül Hülya, A4
Gabbas A, A153
Gaffney Mairi, A32
Gallagher Lisa E, A57
Galligan Catherine, A128
Gallo Valentina, A154, A156
Gammon Marilie, A42
Gao Dao Li, A140
Garcia Erika, A41
Garde Anne H, A62
Garde Anne Helene, A61, A80, A81
Garg Arun, A27, A147
Ge Calvin, A129
Gelder Rainer Van, A105
Gellissen Johannes, A94
Georgia Ntani, 159
Geuskens Goedele, A24, A61
Gianicolo Emilio AL, A30
Gilbert Fabien, A85
Giovannini Andrea, A158
Girardi Paolo, A12, A113
Gittins Matthew, A10, A115
Giuffrida Francesco, A106
Gjertsen Bjørn Tore, A18
Glaser Jason, A47, A63
Glass Deborah, A23, A104
Glass Tracy, A34
Glenn Barbara, A25
Godderis Lode, A34, A53, A54, A58, A64, A81, A84, A145
Godofreda V Dalmacion, 160
Goodyear Nancy, A128
Goorts Kaat, A34
Gordon Len, A134
Gore Rebecca, A38, A101, A128
Gosnell Lauren, A101
Govorko Matthew, A19
Gracia-Lavedan Esther, A113
Graff Pål, A47
Gran Jon Michael, A74
Graubard Barry, A101

Gravel Sabrina, A128, A129
Graveling Richard, A118
Gray Shannon, A49
Green Deirdre, A100
Griep Rosane, A7
Grimby-Ekman Anna, A7
Grime Paul, A60
Groß Valèrie, A23
Grundy Anne, A104
Grynderup Matias Brødsgaard, A103
Grzebyk Michel, A106
Gudding Inger Helene, A76
Guenel Pascal, A104
Guha Neela, A106, A116
Guichard Yves, A19
Guimarães Mariana Tavares, A87
Guiochon-Mantel Anne, A56
Guo How-Ran, A124, A127
Guo Leon, A135, A136
Guo Yue Leon, A30
Guo Yue Liang, A13
Guo Yue-Leon, A28, A79
Guo Yue-Liang, A31
Guo Yue-Liang Leon, A27, A50, A51
Gupta Mohit, A141
Gurcan Iklim, A25
Gustavsson Annika, A99, A112
Gustavsson Per, A93, A99, A112
Guzel Rengin, A14
Gwini Stella, A41

Håkon Låstad Lygre Stein, A14
Høy Jensen Johan, A110, A142
Habib Rima, A9
Hadkhale Kishor, A146
Hagberg Mats, A7
Hajat Anjum, A122
Hall Amy, A88
Hall Charlotte, A111
Hallfeld Tatiana, A151
Halvani Gholam Hossein, A97, A98
Hami Hinde, A9
Hammer Paula EC, A62
Hammond Katharine S, A118
Hannerz Harald, A47
Hans Bay, A63
Hans Kromhout, A155
Hansen Åse M, A62
Hansen Åse Marie, A8, A103, A121
Hansen Aase Marie, A80
Hansen Johnni, A62, A74, A81, A104, A106, A109, A110, A137, A142
Hansen Johnny, A143
Hansson Gert-Åke, A75
Hanvold Therese, A74
Hanvold Therese N, A55
Hanvold Therese Nordberg, A63
Harris Anne, A88, A105
Harris Clare, A26, A97
Harris Mark, A4
Harris Shelley, A89, A105, A114
Harrison Quick Tran Huynh Igor Burstyn, A102
Harth Volker, A104
Hartle Jennifer C, A125
Hassani-Mahmooei Behrooz, A49
Hay J, A156
He Yonghua, A125
Heck Julia, A137
Hegmann Kurt, A27
Hemmingsson Tomas, A52, A101

Henrik Zetterberg, 162
Herdman David, A59
Hermanns Robbert, A2
Hernandez Ashley, A98
Hernandez Marta, A138
Heron Richard, A107
Heyworth Jane, A23, A104, A108
Hidajat Mira, A75, A78, A112
Hien Le, A49
Hmimou Soumaia, A9
Ho Jiune-Jye, A27, A31
Ho Shu-Chen, A60
Ho Wing Ming, A125
Hobbs Catherine, A154
Hoet Peter, A84
Hoff Rune, A55, A63, A74
Hogg-Johnson Sheilah, A5, A119, A124, A147, A148
Hogstedt Christer, A111, A146
Hollund Bjørg Eli, A14, A18, A111
Holtermann Andreas, A3, A17
Holtman Zelda, A34
Honaryar Manoj Kumar, A106
Hong Jungyeon, A69
Hong Yun-Chul, A42
Hopf Nancy, A19
Horn Rikke, A74
Hougaard Karin S, A62
Hours Martine, A102, A113
Hsu I-Lin, A124, A127
Hu Pei-Yi, A27
Hu Shu-Ching, A140
Huang Ching-Chun, A50
Huang Cunrui, A29
Huang Joh-Jong, A104
Hui Jennie, A134
Huisman Martijn, A24
Hulo Sébastien, A19
Hulsegge Gerben, A36
Husgafvel-Pursiainen Kirsti, A71, A78
Hussey Louise, A115
Hutchings Sally, A114
Hutter Hans-Peter, A129
Huw Morris, 162
Huynh Tran, A96
Huysmans Maaike, A3, A46
Hwang Ensong, A20
Hwang Eun-Song, A21
Hwang Jeff Yi-Fu, A133
Hwang Seung-sik, A77
Hwang Yaw-Huei, A64
Hwanraruen Wantanee, A9
Hyvärinen Hanna-Kaisa, A55

Ibraev Serik, A54
Ide Christopher, A130
Ikegami Kazunori, A41
Ikin Jillian, A41
Ilango Sindana, A140
Ilar Anna, A93
Inamine Rosemairy, A65
Inchit Wanida, A9
Ira Madan, 159
Irina Stepanov, 161
Issever Halim, A25
Iversen Inge Brosbøl, A53
Iwatsubo Yuriko, A145
Izdenov Asset, A54

Järvholm Bengt, A42