

recreation workers (1.8 SED) had the highest mean exposures. Job title, dosimeter placement, forecast, and hours spent outside were predictors of daily SED. At work, wearing a sleeved shirt (81% often/always) and hat (73%) were most prevalent, while seeking shade (12%) and applying sunscreen (36%) were least prevalent. Sun protection scores were higher at work than leisure. Hours spent outdoors was a strong determinant for the work and leisure models. Additional leisure model predictors were eye colour, sex, skin type, and job group.

Conclusion Outdoor workers are exposed to high solar UVR levels and use different sun protective behaviours at work and leisure. These findings can inform future monitoring studies and exposure reduction initiatives.

O-296

RADON EXPOSURE AND RISK OF DEATH FROM CIRCULATORY SYSTEM DISEASES AMONG A LARGE COHORT OF URANIUM MINERS – THE PUMA STUDY

¹Estelle Rage - de Moissy, David B Richardson, Paul Demers, Minh Do, Nathan DeBono, Nora Fenske, Veronika Deffner, Michaela Kreuzer, Jonathan Samet, Stephen Bertke, Kaitlin Kelly-Reif, Mary Schubauer-Berigan, Ladislav Tomasek, Lydia Zablotska, Charles Wigg. ¹Institute for Radiological Protection and Nuclear Safety (IRSN), France

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Introduction Numerous studies highlighted the association between radon exposure and lung cancer risk. Nevertheless the question of radon-related risks for non-cancer diseases, and more specifically circulatory system diseases (CSD) have received limited investigation. Among uranium miners, only one cohort observed an association between radon exposure and CSD.

Objectives To investigate the relationship between cumulative radon exposure and CSD mortality in the PUMA study (Pooled Uranium Miners Analysis), a large international pooled set of cohorts of uranium miners.

Methods The PUMA study includes seven cohorts of uranium miners from Czechia, France, Germany, Canada and USA. Annual radon exposure has been estimated individually and expressed in Working Level Months (WLM). The relationship between cumulative radon exposure, applying a 5-years lag, and CSD death, and more specifically ischemic heart disease and cerebrovascular disease, was assessed with an internal Poisson regression model integrating a linear excess relative risk (ERR) structure, expressed per 100 WLM.

Results The PUMA study includes 119,709 male uranium miners hired between 1942 and 1996. The follow-up duration was between 30–39 years in each of the cohorts, contributing to 4.3 million person-years. The mean value of cumulative radon exposure in individual cohorts ranged between 31 and 580 WLM. At the end of follow-up, 52,450 miners were dead (44% of the cohort), and among them 17,494 deaths from CSD were recorded. The exposure-risk relationship did not show any increase in CSD risk associated with cumulative radon exposure (ERR/100 WLM=2.3.10–4; 95% confidence interval [-0.0033; 0.0042]). No increase in risk was observed for ischemic heart disease or cerebrovascular disease death.

Conclusion The PUMA study has a large study population and a high level of statistical power. These preliminary results did not show any increased risk for CSD mortality among uranium miners.

O-312

OCCUPATIONAL EXPOSURE LEVELS OF SOLAR ULTRAVIOLET RADIATION: AN EPHOR REVIEW

¹Else Toft Würtz, Mark Cherrie, Calvin Ge, Kasper Grandahl, Johnni Hansen, Anna Dahlman-Höglund, Ingrid Sivesind Mehlum, Alberto Modenese, Hilde Notö, Cheryl Peters, Jenny Selander, Svetlana Solovieva, Vivi Schlünssen, Marc Wittlich, Henrik Albert Kolstad. ¹Aarhus University Hospital, Denmark

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Introduction Exposure to solar ultraviolet radiation (UVR) is the main cause of malignant melanoma, squamous cell carcinoma, and basal cell carcinoma of the skin, a risk factor of cataract, and the primary predictor of Vitamin-D levels. The UVR exposure level depends on several factors such as time of day, season, latitude and altitude, activity, and vary across occupations, with high levels reported in various outdoor jobs. Personal measurements are typically reported as full shift cumulative Standard Erythema Dose (SED).

Objective To conduct a systematic review of occupational solar UVR exposure levels.

Methods We performed a PubMed search for literature presenting personal solar UVR exposure levels measured by wearable UVR sensors during work and added papers identified from reference lists. We screened title and abstract of 1,005 papers, full text reviewed 113 papers, and extracted data from 42 included studies. Job descriptions were coded according to the International Standard Classification of Occupations (ISCO-88) on the 4-digit level.

Results In total, UVR exposure levels of 35,345 personal workday measurements of mainly construction workers, farmers, seamen, teachers, expeditioners, and athletes were included. They covered all year, 6am - 6pm working hours, latitudes from 20–75° north and 10–68° south, and altitudes in the 0–8000 m range. Repeated measurements were included in 76% of the studies. Eleven different polysulphone film, UV-sensitive spore, or electronic irradiance sensors placed on head, neck, shoulder, chest, back, arm, or wrist were used. Exposure levels varied between 0.4 SED for laboratory workers and 28.6 SED for construction workers.

Conclusion The established measurement database will be used in the development of a general population quantitative job exposure matrix (JEM) as part of the European Exposome Project for Health and Occupational Research (EPHOR). The UV-JEM will be applied in multi-centre European occupational cohort studies of adverse and beneficial effects of exposure to UVR.

Respiratory Effects

O-39

LIFETIME OCCUPATIONAL EXPOSURES AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) RISK IN THE UK BIOBANK COHORT

¹Sara De Matteis, Debbie Jarvis, Lucy Darnton, Dario Consonni, Hans Kromhout, Sally Hutchings, Steven Sadhra, David Fishwick, Roel Vermeulen, Lesley Rushton, Paul Cullinan. ¹Imperial College London, United Kingdom

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Introduction Occupational exposures are important, preventable causes of chronic obstructive pulmonary disease (COPD). We previously found an increased COPD risk among six occupations by analysing lifetime job-histories and lung function data in the population-based UK Biobank cohort.

Objectives We aimed to build upon these findings and elucidate the underlying potential causal agents.

Methods We applied the ALOHA+ job-exposure matrix (JEM) based on ISCO-88 codes in which exposure to 12 selected agents was rated as 0 (no exposure), 1 (low), and 2 (high). Agents highly correlated (>85%) were combined. COPD was spirometrically-defined as forced expiratory volume in 1 s (FEV1)/forced vital capacity (FVC) < lower limit of normal (LLN). We calculated semi-quantitative cumulative exposure (CE) estimates for each agent by multiplying duration of exposure and squared intensity. Prevalence ratios (PR) and 95% confidence intervals (CI) for COPD were estimated using robust Poisson regression adjusted for centre, sex, age, smoking, and co-exposure to the other JEM agents. Only associations confirmed among never-smokers and never-asthmatics were considered reliable.

Results Out of 116,375 participants with complete job-histories, 94,514 had acceptable/repeatable spirometry data and smoking information and were included in the analysis. Pesticides exposure showed increased COPD risks (PR=1.00, 95% CI 0.85–1.17 for low CE, PR=1.32, 95% CI 1.12–1.56 for high CE; P-trend=0.004), that were confirmed among never-smokers (P-trend=0.005) and never-asthmatics (P-trend=0.001). Results remained unchanged when never-exposed to any of the JEM agents were used as reference category.

Conclusion Focussed preventive strategies in workers exposed to pesticides are warranted to prevent the associated occupational COPD burden.

0-71 OCCUPATIONAL INHALANT EXPOSURES AND LONGITUDINAL LUNG FUNCTION DECLINE

¹Stinna Skaaby, Jens Peter Ellekilde Bonde, Esben Meulengracht Flachs, Peter Lange, Vivi Schlünssen, Jacob Louis Marott, Charlotte Brauer, Yunus Çolak, Shoab Afzal, Børge G Nordestgaard, Steven Sadhra, Om Kurmi. ¹Department of Occupational Medicine, Denmark

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Background Airborne exposures at the workplace are believed to be associated with lung function decline. However, results from longitudinal studies are conflicting.

Methods Participants from two general population-based cohorts, the Copenhagen City Heart Study and the Copenhagen General Population Study, with at least two lung function measurements were followed for an average of 9 years, range 3–27 years. Occupational exposure was assigned to each year of follow-up between two lung function measurements by a job exposure matrix. Associations between mean occupational exposure per year and mean annual decline in forced expiratory volume in 1 second (FEV1) were investigated using linear mixed effects models according to cohort and time period (1976–1990 and 2003–2015). We adjusted for sex, height, weight, education, baseline FEV1, and pack-years of smoking per year during follow-up.

Results A total of 16,144 individuals were included (mean age 48 years and 43% male). Occupational exposure to mineral dusts, biological dusts, gases & fumes, and a composite category were not associated with FEV1 decline in analyses with dichotomized exposure. In analyses with an indexed measure of exposure, gases & fumes were associated with a FEV1 change of -5.8 mL/unit/year (95% confidence interval:-10.8; -2.3) during 1976–1990, but not during 2001–2015.

Conclusion In two cohorts from the Danish general population, occupational exposure to dusts, gases, and fumes was not associated with excess lung function decline in recent years but might have been of importance decades ago.

0-133 STYRENE ASSOCIATED RESPIRATORY OUTCOMES AMONG REINFORCED PLASTIC INDUSTRY WORKERS.

¹Zanele Zulu, Rajen N Naidoo. ¹Mangosuthu University of Technology, South Africa

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Introduction Fibreglass reinforcement industry employees are exposed to both fibreglass and the agents used in the reinforcing process. Adverse respiratory outcomes have been associated with fibreglass resins and agents in the reinforced plastic workplace.

Objectives The aim of this study was to determine the exposure-related adverse respiratory outcomes among employees in the reinforced plastic workplace.

Methods A cross-sectional study was conducted in the fibreglass reinforcement industry based in KwaZulu-Natal, South Africa. Personal monitoring of styrene and spirometry were conducted. Total cumulative exposure was calculated for each participant's lifetime of employment in the company. The 254 employees were interviewed by completing a detailed questionnaire based on respiratory health and occupational exposures. Lung function tests were conducted for all employees according to South African Thoracic Society (SATS) standards.

Results The geometric mean of styrene exposure level for the General Laminating Department was 48.2 mg/m³ (95% CI 36.3–64.1 mg/m³) and the Fitting Department was 20.7 mg/m³ (95% CI: 15.6–27.5 mg/m³). The total styrene cumulative exposure odds ratios for chronic cough, phlegm, wheezing and breathlessness in the high exposure category was 3.1 (95% CI 1.1- 8.6), 5.3 (95% CI 1.7- 16.6), 3.3 (95% CI 1.2- 9.1) and 5.5 (95% CI 1.15–26.4), respectively. The cumulative exposure associated reduction, adjusted for smoking and doctor-diagnosed TB, in FEV1/FVC ratio, percent predicted FEV1 and FVC was 0.01, 0.04% and 0.05%, respectively.

Conclusion Styrene exposure increases the risk of respiratory symptoms and is associated with reduced lung function.

0-266 CHRONIC RESPIRATORY DISEASE IN THE ONTARIO MINING INDUSTRY

¹Colin Berriault, Victoria H Arrandale, Nancy E Lightfoot, Paul Demers. ¹Ontario Health, Canada

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Introduction Mining involves many exposures associated with increased respiratory disease risk, including crystalline silica, diesel engine exhaust, arsenic, nickel, and other metal compounds.

Objectives To investigate the risk of non-malignant respiratory disease (NMRD) in a cohort of Ontario mixed-ore miners.

Methods The Ontario Mining Master File (MMF) contains 90,000 work histories collected during mandatory annual medical exams from 1928 to 1988. Record linkages with provincial hospital and outpatient databases (1999–2017) were performed to ascertain respiratory disease incidence. Incidence