As part of a proposed symposium on the importance of exposure assessment in epidemiology for hazard identification and risk characterization, this presentation will summarize progress to date in the adoption of stronger exposure assessment methodologies in epidemiological studies of shift work, and offer ideas for next steps. A particular focus will be placed on the refinement of measurement techniques to assess long-term exposure to shift work (e.g., roster-based assessment and validity studies), and on quantitative considerations of important co-exposures (e.g., light-at-night).

Occupational Respiratory Disease

03A.1 ASSESSING THE UNDER-ESTIMATION OF OCCUPATIONAL RESPIRATORY DISEASES IN TAIWAN: ANALYSES OF DISEASE BURDENS AND HEALTHCARE COSTS

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Background Respiratory diseases, including pneumoconiosis, asthma, chronic obstructive pulmonary disease (COPD) and respiratory malignancies, are featured by their multi-etiological nature and long latency periods, adding to the difficulties in recognizing their work-relatedness. Due to their heavy overall disease burdens and high healthcare spending, examining the fraction of respiratory diseases attributable to occupational factors is helpful in understanding the magnitude of under-estimation of occupational injuries and diseases.

Methods Prevalence rates of various occupational exposures were assessed retrospectively with self-reported surveys or job-exposure matrices. Relative risks of these exposures were drawn from international epidemiological literatures. The above two parameters were used to calculate population attributable risk percentages (PAR%), and with that the numbers of visiting and amounts of payment attributable to occupational factors were estimated based on the claim data of the National Health Insurance (NHI). The estimates were compared with the data of actual payment by the Workers' Compensation Insurance (WCI).

Results We estimated that around 15 000 patients visited medical facilities for occupational respiratory diseases in 2015, costing a total of 10 million USD. In contrast, less than 200 cases were approved by WCI in the same year. A 100-fold gap between the estimated and actual payment was also noted. Estimation analyses further indicated that 9.6% of cases and 48.1% of healthcare costs were asbestos-related.

Conclusion For occupational respiratory diseases with long latency periods and great causal complexity, the scope of under-estimation was substantial, and their medical expenses had been largely paid by NHI rather than WCI. To increase the visibility of occupational respiratory diseases, workplace exposure assessment and disease surveillance should be improved and public awareness of occupational diseases should be raised.

03A.3 DO AIRWAY INFLAMMATION AND AIRWAY RESPONSIVENESS MARKERS AT START OF APPRENTICESHIP PREDICT THEIR EVOLUTION DURING INITIAL TRAINING? A LONGITUDINAL STUDY

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The natural history of airway inflammation and symptoms in occupations at risk of asthma is still not fully understood. We aimed to study the evolution during apprenticeship of inflammation markers, bronchial hyperresponsiveness (BHR) and symptoms in at-risk subgroups as defined from measurements of markers made shortly after the start of training.

Respiratory symptoms, FEV₁ and airway resistance post-bronchial challenge (MBC) test results, fractional exhaled nitric oxide (FeNO) measurements, and eosinophils in nasal lavage fluid were longitudinally investigated in apprentice bakers, pastry-makers and hairdressers. Four baseline risk groups were defined, based on, (i) a high level of FeNO (NO), (ii) eosinophils > 1% (Eosino), (iii) a ≥ 15% decrease in FEV₁ during the MBC test (HR), and (iv) a ≥ 50% increase in the resistance (Resist). The statistical analysis relied on mixed models.

At baseline, the inflammation markers were related to the MBC markers. There was no evidence to suggest that the baseline risk groups predict a differential evolution of the airway inflammation and bronchial responsiveness markers, or the asthma-like symptoms considered. The baseline risk groups defined from MBC test predicted the levels of MBC markers. Similarly, the baseline risk groups based on eosinophilic inflammation predicted the levels of markers for eosinophilia. Twelve possible new asthma cases were identified, only the HR risk group predicted their occurrence.

Among this young population, at-risk groups based on initial high levels of inflammation markers did not experience any worsening during the follow-up. Initial BHR predicted consistently high levels of all markers considered and occurrence of possible asthma. These results have been published in BMC Pulmonary Medicine (Demange *et al.* *BMC Pulm Med.* 2018 July 11;18(1):113).

03A.4 ABSTRACT WITHDRAWN

03A.5 ENVIRONMENTAL DUST EXPOSURE FROM GOLD MINE WASTE DUMPS AND RESPIRATORY HEALTH EFFECTS IN JOHANNESBURG, SOUTH AFRICA

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Background Thousands of people living in close proximity to gold mine waste dumps (GMWDs), are exposed to wind-

swept, silica-rich dust. The effects on respiratory health consequent on this exposure are largely unknown.

Objective To examine associations between environmental GMWD dust exposure and respiratory health effects in adults.

Methods This was a cross-sectional study of 93, 133 and 84 people in high (home <500 m from GMWD), moderate (500 m–1 km) and low (>20 km) exposure groups respectively. We calculated a cumulative exposure index (CEI) based on exposure groups and years of residence. Participants were interviewed for respiratory symptoms, had chest X-rays (read by three experienced readers for tuberculosis and silicosis) and spirometry. We used multivariate logistic regression to examine the effect of dust exposure on respiratory health, and multiple linear regression to determine if CEI was associated with % predicted FEV1 and FVC. We adjusted for socioeconomic status, smoking and occupational and biomass fuel exposure.

Results Being in the high exposure group versus the low was associated with elevated adjusted odds ratios (aORs) for upper respiratory (aOR: 2.76, 95% CI: 1.28–5.97) and ocular symptoms (aOR: 4.68; 95% CI: 1.87–11.68), chest wheezing (aOR: 3.78; 95% CI: 1.60–8.96) and spirometry-diagnosed COPD (aOR: 8.17; 95% CI: 1.01–65.85). We found similar associations for the high versus medium exposure groups, but no significant associations in the medium relative to the low group. Exposure had no significant effect on the risks of chronic bronchitis and tuberculosis. We found similar significant results for CEI as for the exposure groups analyses. On linear regression, CEI was not associated with % predicted FEV1, but, surprisingly, FVC was positively associated with CEI. No participant had radiological features of silicosis.

Conclusion Residents residing <500 m from GMWDs had elevated aORs for respiratory health effects. Both exposure measures (exposure groups and CEI) yielded similar results.

03A.6 RECENT ORGANIC DUST EXPOSURE AND PROGNOSIS OF ASTHMA AND CHRONIC OBSTRUCTIVE LUNG DISEASE (COPD). A NATIONWIDE REGISTER BASED FOLLOW-UP STUDY

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Background Air pollutants at work can contribute to onset of asthma and COPD. How occupational air pollutants affect the prognosis of asthma or COPD among exposed workers is not well established.

Objective We aimed, among individuals with a hospital diagnosis of asthma or COPD, to study the association between recent exposure to organic dust, and hospital readmission and overall mortality.

Methods The study population comprised individuals ever employed in farming or wood industry with asthma (n=4002) or COPD (n=2429) identified in the Danish national patient register of individuals born 1933–1977. Subjects were included the year immediately following their first asthma or COPD hospital contact (earliest in 1998) and followed until first asthma or COPD readmission, death, or December 31 st 2007. Exposure data was obtained through register-based industry codes from 1997–2007 combined with time-dependent farming and wood industry-specific exposure matrices. We used logistic regression analysis with discrete survival function adjusted for age, calendar year, sex, mineral dust exposure, socioeconomic status, and labour-force participation.

Results Among individuals with asthma, the risk of hospital readmission was slightly increased among the exposed vs. the non-exposed, RRadj 1.17 (0.91–1.50), but with no exposure trend. A non-significant decrease in mortality was seen for organic dust exposure and mortality for those individuals, RRadj 0.71 (0.24–2.06).

The risk of a COPD readmission among individuals with COPD was decreased among exposed vs. non-exposed individuals, RRadj 0.67 (0.46–0.98), but with no exposure trend. Mortality was non-significantly increased for exposed vs. non-exposed individuals with COPD, RRadj 1.59 (0.82–3.08).

Conclusion We did not observe significant associations between recent exposure to organic dust and readmission for COPD/asthma or overall mortality except for a decreased risk for COPD readmission. Selection effects are presumably playing a role. We did adjust for socioeconomic position and labour-force participation but not for smoking which is a limitation.

Burden of Occupational Disease and Injury

03B.1 BURDEN OF WORK ABSENCE DUE TO COMPENSABLE ROAD TRAFFIC CRASHES IN VICTORIA, AUSTRALIA

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Background The burden of road traffic crashes (RTC) is commonly reported using fatalities and hospital admissions. Disruption to regular activities, such as work, is rarely reported, yet known to have significant economic and human costs. In the state of Victoria, Australia, people injured and unable to work due to RTC may have treatment and income support provided either through the RTC compensation system or through workers' compensation. By examining data from both systems, this study sought to determine the rate (per 1 00 000 working population) of RTC injury resulting in work absence, and to quantify the amount of working time lost to RTC injury.

Methods Data from each compensation system were harmonised. Analysis included claims from RTCs that occurred between July 1 2003 and June 30 2013 by 15–65 year olds who received at least one day of income support. Fatalities and rejected claims were excluded. Time lost was calculated as the total weeks of income support. Non-parametric tests were