Challenges for Occupational Epidemiology in the 21st Century

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Oral presentation

0012  A HOLISTIC APPROACH TO CALCULATING A MULTIMORBIDITY SCORE: THE USEFULNESS OF MULTI-CORRESPONDENCE ANALYSIS

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Objectives
Most frequently, multimorbidity measures available in the literature are heavily dependent on one outcome. We propose a method to construct a global multimorbidity score that incorporates chronic and non-chronic health conditions as well as health-related behaviours and symptoms, regardless of any specific outcome.

Method
Cross-sectional study of 373 905 Spanish workers who underwent a standardised medical evaluation in 2006. By applying an algorithm based on the results of a multi-correspondence analysis we computed a multimorbidity score separated by sex. The score distribution was described by age groups and occupational social class for both sexes.

Results
Two dimensions were generated by the multi-correspondence analysis that explained around 80% of the total variability in both sexes. The main dimension was related to cardiovascular chronic conditions and personal habits, whereas the second dimension included symptoms, in addition to sleep disturbances in women. As compared to women, men showed a higher prevalence of multimorbidity (78% vs 17%), a rising trend with age. No differences were found by occupational social class.

Conclusions
Multimorbidity can reflect clustering of health-related conditions, providing information on its burden and distribution in a specific population. By calculating a multimorbidity score that considers both health-related conditions and symptoms, we provide a more holistic approach to multimorbidity, applicable to any database.

0018  VALIDATION OF A WEARABLE REAL-TIME MONITOR TO EXPOSURE TO NAPHTHALENE

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Objectives
Direct reading instruments are valuable tools for assessing exposure in the workplace. Adaptation of such instruments to serve as valid and efficient tools to provide personal exposure data for environmental surveillance and occupational epidemiology studies fulfils a critical research need.

Method
A project is underway to validate new sensor technology that utilises native fluorescence of molecules excited by ultraviolet light with the goal of delivering laboratory-quality data for qualitative and quantitative analyses. The initial chemical focus of this technology is naphthalene. The project is proceeding in two stages: independent laboratory validation and an exposure assessment field study, which is being conducted in two phases: Phase I examines the degree to which the instrument serves as a sensor of naphthalene by assessing the concordance between measured personal air levels and those measured with conventional technologies e.g. active samplers; Phase II evaluates the validity of the instrument to serve as a dosimeter, correlating instrument-measured naphthalene levels in air with biological markers of exposure from skin, urine and exhaled breath.

Results
Independent laboratory evaluations indicate the instrument is accurate within accepted laboratory guidelines, when compared to standard gas chromatography methods. Results from the Phase I field study with US military personnel working with jet propulsion fuels (e.g., JP8 and jet A) as part of their regular work responsibilities support laboratory validation findings. Phase II data efforts are in progress.

Conclusions
This technology permits real-time evaluation of task-specific variations in personal naphthalene exposure levels, data that are currently not available with conventional active sampling processes.

0019  THE OCCUPATIONAL JP8 EXPOSURE NEUROEPIDEMIOLOGY STUDY; EVALUATION OF NEUROPSYCHOLOGICAL EFFECTS

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Objectives
One of the most prevalent workplace chemical exposures historically and currently confronting the global military and civilian workforce is jet propellant (JP) fuel. To date, numerous protective and preventive strategies have been put in place to minimise acutely toxic exposure levels. However, questions remain regarding the effect of repeated exposures at lower (than regulated) levels. The Occupational JP8 Exposure Neuroepidemiology Study was designed to examine the relationships between repeated-workday occupational JP8 exposure among Air Force (AF) personnel and specific aspects of central nervous system function, including neuropsychological task performances.

Method
Seventy-four AF personnel consented to participate in the 6-day study and were administered two distinct neuropsychological task batteries (labelled ‘Day 1’ and multi-day ‘Repeated Day’). JP8 exposure was measured by personal breathing zone total hydrocarbons, naphthalene, benzene, toluene, ethylbenzene, and xylene and urinary biomarkers (e.g., 1- and 2-naphthol). Multivariate linear regression analyses were conducted to examine relationships between current and historical levels of JP8 exposure and neuropsychological performances. Linear mixed effects analyses were conducted to examine relationships between workday JP8 exposure on neuropsychological functioning over a work week.

Results
Reduced proficiency of tasks involving verbal memory and attention was demonstrated among those with higher versus lower JP8 exposure. No apparent differences were found on tasks involving executive function.
lower, current JP8 exposure. Significant associations were not observed between repeated-workday exposure to JP8 and neuropsychological performances.

**Conclusions** Results suggest that repeated JP8 exposure, at levels not exceeding regulatory limits, does not significantly contribute to reduced neuropsychological proficiencies. We discuss potential explanations and implications for these findings.

**0028 MULTI-SITE MUSCULOSKELETAL PAIN AND PHYSICAL WORKING CONDITIONS AS PREDICTORS OF SICKNESS ABSENCE DUE TO MUSCULOSKELETAL DIAGNOSES**

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**Objectives** To investigate the importance of multi-site musculoskeletal pain as a predictor of sickness absence days due to musculoskeletal disorders (MSD) among blue-collar employees, and to study what extent such a relationship might be confounded by physical loading at work.

**Method** Survey responses from 901 employees were linked to a food industry company’s record of sickness absence due to MSD (≥ four days). Generalised Linear Models (GLM) with negative binomial distribution assumption was used in order to determine associations between the occurrence of multi-site pain (no pain, one-site and multi-site pain), individual variables, work related variables and sickness absence days due to MSD during a four-year follow-up.

**Results** The high exposure group had about 92 and the low exposure about 72 all-cause sickness absence days yearly, and corresponding figures for absence due to MSD were 36 and 28. The share of MSD absence is about 40% irrespective of the exposure. Single site pain did not predict absence, whereas multi-site pain turned out as an independent predictor. Multi-site pain predicts absence in the group with low biomechanical exposure, but not in the group with high exposure. The p-values for interaction show that the groups differ significantly both in case of repetitive movements and in case of awkward postures.

**Conclusions** This prospective cohort study revealed very high level of sickness absence in biomechanically strenuous work, represented by manual work in food industry. On average, the employees were absent over 80 calendar days, i.e. almost three months, yearly.
LUNG FUNCTION IMPROVEMENT IS SUSTAINED AFTER WORK CESSATION IN SHANGHAI COTTON AND SILK TEXTILE WORKERS

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Objectives Whether cessation of exposure to endotoxin containing organic dusts leads to transient vs. sustained improvement of lung function is unknown.

Method The Shanghai Textile Workers study is a 30-year prospective cohort study of 447 cotton workers exposed to endotoxin containing cotton dust and 472 control silk workers unexposed to endotoxin. Spirometry and questionnaires were administered at 5 year intervals, and endotoxin sampling was performed to estimate individual cumulative exposures. The effect of work cessation on FEV1 was modelled with a generalised additive mixed effects (GAMM) model.

Results When cessation was modelled as a smoothed term, adjusting for age, gender, height, and smoking history, cessation was associated with a significant FEV1 improvement in both cotton and silk workers. Work cessation displayed a non-linear quadratic effect on FEV1, with an average adjusted +38.1, +220, +316 ml effect in silk and +26.3, +184.1, +264.1 ml effect in cotton workers at 10, 20, and 25 years of work cessation. In a model allowing for a quadratic effect of cessation years as suggested by the GAMM model, the linear component of the interaction suggested that cessation of cotton work was associated with less FEV1 improvement than silk work (cotton*cessation year interaction $\beta = -2.6$ ml, $p = 0.025$).

Conclusions Lung function improvement after work cessation was observed in both cotton and silk workers, suggesting that non-endotoxin containing organic dust exposure has adverse respiratory effects. The greater improvement in FEV1 in silk compared to cotton textile workers suggests that the endotoxin component of cotton dust is associated with additional detrimental effects.

ASSOCIATIONS OF STRESS, ANXIETY, AND RESILIENCE IN POLICE WORK

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Objectives Police work is an occupation replete with stress. The present study examined associations between specific police stressors (overall, administrative pressure, physical threat, and lack of support) and anxiety symptoms, and whether these associations were modified by hardiness, a dimension of resiliency.

Method The Spielberger Police Stress Survey, Beck Anxiety Scale, and Dispositional Resilience scale were utilised in this study. A total of 373 police officers with complete data from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) study were included. Linear regression and analysis of covariance were used to examine mean anxiety levels across quartiles of stress. Associations were adjusted for age, sex, race, alcohol, smoking, and anxiety medication, and stratified by hardiness scores.

Results The mean age of officers was 41.4 years and 27% were female. Adjusted mean anxiety symptoms increased significantly with increasing stress quartiles overall (4.23, 4.99, 6.74 and 9.95 for quartiles 1-4, respectively, $p < 0.001$) and for all three types of stressors ($p < 0.001$). Hardiness did not significantly modify these associations. However, officers with hardiness scores above the median had generally lower anxiety scores than those below the median.

Conclusions Specific types of stress in police work are significantly associated with symptoms of anxiety. Further research is needed for individual and organisational factors which protect officers from anxiety and for policies to reduce work stress.

CORRECTION FOR REPORTING BIAS: THE IMPORTANCE OF STRATUM SPECIFIC ESTIMATES

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Objectives To examine whether reporting bias was responsible for increasing rates of self reported heart disease (SRHD) with exposure to phenoxy herbicides in a cohort of elderly grain farmers in Alberta.

Method We estimated exposure to chemical ingredients from named pesticides reported at interview after a lifetime of farming. Phenoxy exposure was grouped by tertiles as none, 1-22 yrs, 23-34 yrs and 35 yrs or greater. Six years after interview consent was sought from surviving farmers to link questionnaire data to provincial physician billing records. Sensitivity (Se) and specificity (Sp) were estimated for SRHD, overall and within exposure stratum, and adjusted odds ratios (ORs) calculated.

Results Among the cohort of 2426, 373 had SRHD: ORs, adjusted for confounding, were estimated for phenoxy tertile exposure stratum, and adjusted odds ratios (ORs) calculated. Se and Sp estimates. Differences were seen in stratum specific ORs before adjustment or correction were 1.25, 1.43, 2.69. Comparing SRHD to physician billing diagnoses of heart disease gave an overall Se 0.49 and Sp 0.98. ORs were increased to 1.37, 1.65, 4.01 when corrected by these specific correction reduced ORs in all three categories (0.55, 1.25, 1.43, 2.69). Comparing SRHD to physician billing diagnoses of heart disease gave an overall Se 0.49 and Sp 0.98. ORs were increased to 1.37, 1.65, 4.01 when corrected by these specific correction reduced ORs in all three categories (0.55, 1.25, 1.43, 2.69). Comparing SRHD to physician billing diagnoses of heart disease gave an overall Se 0.49 and Sp 0.98. ORs were increased to 1.37, 1.65, 4.01 when corrected by these specific correction reduced ORs in all three categories (0.55, 1.25, 1.43, 2.69). Comparing SRHD to physician billing diagnoses of heart disease gave an overall Se 0.49 and Sp 0.98. ORs were increased to 1.37, 1.65, 4.01 when corrected by these specific correction reduced ORs in all three categories (0.55, 1.25, 1.43, 2.69). Comparing SRHD to physician billing diagnoses of heart disease gave an overall Se 0.49 and Sp 0.98. ORs were increased to 1.37, 1.65, 4.01 when corrected by these specific correction reduced ORs in all three categories (0.55, 1.25, 1.43, 2.69).

Conclusions The correction approach used, which demonstrated the importance of stratum specific estimates, assumed no error in the validation data. Sensitivity analyses to explore this limitation will also be presented.

UPPER AIRWAYS CANCER, MYELOID LEUKAEMIA AND OTHER CANCERS IN CHEMICAL WORKERS EXPOSED TO FORMALDEHYDE

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Objectives The International Agency for Research on Cancer controversially has classified formaldehyde as a cause of...
nasopharyngeal carcinoma and myeloid leukaemia. To provide further information on the risks of cancer from formaldehyde, we extended follow-up of 14 008 male chemical workers at six factories in England and Wales.

**Method** The cohort was identified from employment records, and exposures to formaldehyde were classified on the basis of job title. Subjects were traced through health service records, and their mortality was compared with national death rates by the person-years method. Associations of exposure with incident upper airways cancer and leukaemia were further explored in nested case-control analyses.

**Results** More than 2000 additional deaths had occurred since last follow-up of the cohort. Excess deaths were observed from cancers of the oesophagus (100 v 93.2 expected), stomach (182 v 141.1), rectum (107 v 86.8), liver (35 v 26.9) and lung (813 v 645.6), but none of these tumours exhibited a clear exposure-response relationship. In nested case-control analyses of 115 men with upper airways cancer (including one nasopharyngeal cancer), 92 with leukaemia, and 45 with myeloid leukaemia, there were no elevations of risk in the highest exposure category (>2 ppm for ≥1 year). When the two highest exposure categories were combined, the odds ratio for myeloid leukaemia was 1.26 (95% CI 0.39–4.08).

**Conclusions** Our results provide no support for a hazard of myeloid leukaemia, nasopharyngeal carcinoma or other upper airways cancer from formaldehyde, and indicate that any excess risk of these diseases, even from relatively high exposures, is at most small.

**ORAL PRESENTATION**

**0048** Joint Association of Smoking and Silica Dust with Lung Cancer Risk: A Population-Based Case-Referent Study in Hong Kong Men

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**Objectives** To examine the joint association of smoking and silica dust exposure with lung cancer risk.

**Method** This is a population-based case-referent study among Hong Kong Chinese males. We consecutively recruited 1208 newly diagnosed lung cancer cases and 1069 age-matched community referents during the period 2004–2006. We obtained each participant’s lifelong smoking data, occupational history, and other important information including family cancer history. Unconditional multiple logistic regression analysis was performed to estimate the odds ratio (OR) and the 95% confidence interval (95% CI). We examined the joint association and tested potential interaction under multiplicative or additive risk model.

**Results** A total of 132 (10.9%) lung cancers and 536 (50.1%) community referents were never smokers. The prevalence of silica dust exposure among ever smokers was higher than the never smokers for both the lung cancers (13.5% vs. 7.6%) and community referents (6.4% vs. 3.7%). A 2.4-fold (95% CI: 1.05–5.52) risk of lung cancer for silica dust exposure was observed in never smokers, whilst it increased sharply to 12-fold (95% CI: 7.59–18.95) if the dust exposed workers were also smokers. A possible additive interaction was indicated between these two exposures but power is limited (synergy index = 1.61, 95% CI: 0.95–2.73), particularly for the adenocarcinoma (synergy index = 1.25, 95% CI: 0.52–3.01).

**Conclusions** Our findings supports the conclusion of IARC that workers exposed to silica dust increase lung cancer risk but adds new evidence on a positive additive interaction between silica and smoking. [Research Grants Council (Project CUHK4460/03M), Hong Kong].

**0051** Work Intensity, Injury, Stress and Pain among Commercial Janitors

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**Objectives** Commercial janitors are a relatively unseen and understudied segment of the workforce. Janitors report increasing work pressures over the past few years. We conducted a cross-sectional survey among janitors to evaluate the association of changes in work intensity and other aspects of work organisation on injury, musculoskeletal pain, disability, and stress.

**Method** We conducted a cross-sectional survey among commercial janitors, including both union and non-union workers, and a comparison group of union security guards using peer interviewers and electronic data collection. Work intensity was measured using a 10-point scale and outcomes including injury, musculoskeletal pain, disability, and stress were assessed for the current year, and two previous years. The association between work intensity and each outcome was evaluated, controlling for group and demographics.

**Results** Surveys were collected among 276 union and 78 non-union janitors, and 76 security guards, 76% of whom were immigrants. An increase in work intensity among union janitors, and strong trend of increasing injury, pain, upper extremity disability and stress associated with work intensity was observed. Union janitors report an increase in injury over the past 3 years from 6.3 to 13.5%. Multi-variable models further explore the impact of demographics and work characteristics on the increase in risk.

**Conclusions** Anecdotal reports of increased workload among janitors are substantiated by the reported increase in work pressure over the past three years and its association with stress, pain and injury among janitors.

**0054** Time of Exposure and Risk of Asbestos Related Lung Cancer

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**Objectives** It is well known that the risk of lung cancer decrease in ex-smokers some years after exposure have stopped and some studies indicate that the risk of asbestos related lung cancer decrease some years after the exposure had stopped. We have studied how the time after stop of exposure has influenced the risk of asbestos related lung cancer.

**Method** The incidence of lung cancer was studied in Swedish construction workers who had participated in health controls. The exposure to asbestos was estimated through the occupational titles. Occupational groups with highest risk of malignant mesothelioma were considered to be highly exposed to asbestos and the group with the lowest risk of malignant mesothelioma was considered to have the lowest exposure to asbestos.
Results There were 600 cases of lung cancer in the highest exposed group and 668 in the lowest exposed group. The relative risk comparing high and low exposed decreased the years after exposure had stopped. It was 1.8 during the decade when the exposure come to an end, decreased to 1.5 (95% CI 1.3–1.9) the next decade, to 1.2 (95% CI 1.0–1.5) the decade later and finally to 1.0 (95% CI 0.8–1.2) three decades after the exposure to asbestos had stopped.

Conclusions The time pattern of asbestos related lung cancer seem to follow a similar pattern as the risk of lung cancer in ex-smokers.

0055 ASSOCIATION OF OCCUPATIONAL TRAJECTORIES WITH ALCOHOL USE DISORDERS IN A LONGITUDINAL NATIONAL SURVEY

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Objectives We posited mutually-reinforcing longitudinal pathways between occupation and alcohol use disorders (AUD).

Method Longitudinal trajectories of work substantive complexity were constructed by growth mixture modelling (GMM) of occupational data from the National Longitudinal Survey of Youth 1979 and O*NET work variables. AUD was determined using a set of 25 questions that map onto 9 criteria for alcohol dependence. Prevalent AUD was one occurred at or before the first alcohol questionnaire in 1989; an incident AUD was a new case between 1989 and the 1994 survey. The association between work trajectories and AUD was modelled using Poisson regression in a generalised linear model adjusting for covariates.

Results Lower work trajectories were associated with higher AUD prevalence (prevalence ratio 1.41; 95% confidence interval 1.04–1.91 for lowest versus highest class). Incident AUDs were associated with risk of a decline in work trajectory class in both high (OR=2.68; 95% CI 1.34–5.35) and low (OR=1.62 95% CI 1.01–2.60) initial classes. Interval educational attainment was not associated with AUD within a specific occupational trajectory class.

Conclusions Low occupational trajectories are associated with increased AUD prevalence. Incident AUDs may be followed by a decline in work SC. These findings suggest self-reinforcing relations between the development of AUD and both prior and subsequent work.

0056 PATTERNS OF SITE-EMPLOYMENT OF CONSTRUCTION WORKERS ON AND OFF COMMERCIAL CONSTRUCTION SITES IN NEW ENGLAND AND THE RELATIONSHIP TO MUSCULOSKELETAL PAIN

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Objectives Construction workers who work on multiple jobsites have a high prevalence of musculoskeletal disorders. Yet, scant quantitative information exists in the scientific literature on the relationship between worksite mobility patterns and musculoskeletal disorders.

Method Self-reported musculoskeletal pain, as defined as pain experienced in one of seven body areas in the past month, work history, and demographics were collected from 776 Boston area workers on their first day at one of seven commercial construction projects. Workers were classified as long-term workers (on-site greater than or equal to 30 days) or short-term workers (less than 30 days). Bivariate and multiple logistic regression analyses tested the relationship between term length and prevalence of self-reported musculoskeletal pain, adjusting for relevant covariates.

Results Of the 776 new workers, 344 (44%) were on-site after one month, 164 (21%) remained after two months, and only 74 (10%) remained after three months. Thirty-three percent of workers reported musculoskeletal pain at baseline. Short-term workers were 2.02 times (95% CI: 1.32, 3.08) more likely to report any musculoskeletal pain at baseline than long-term workers, when controlling for trade and tenure. Reporting of single- and multi-site pain was also associated with term length, with statistically significant adjusted odds ratios of 2.00 and 2.35, respectively.

Conclusions The observed excess of self-reported pain in short-term workers when compared to long-term workers mirrors disparities between temporary and non-temporary workers in other industries. This observed effect highlights the need to consider worksite mobility when analysing and interpreting data aimed at improving construction worker health and safety.
LONGITUDINAL MEASUREMENT OF WORK STRESSORS IN PREGNANCY

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Objectives Pregnancy represents a dynamic period when both work conditions and worker assessment of occupational psychosocial stressors may change. We undertook longitudinal repeated measurements of job control, efforts, reward, and overcommitment in pregnant working women to assess direction and magnitude of change across pregnancy.

Method The Job Content and Effort-Reward Imbalance (ERI) Questionnaires were given to 61 working pregnant women recruited at 8–12 weeks gestation and repeated 3 more times across the pregnancy. Demographic data, self-rated (SR) health and stress measures, and blood pressure (BP) data were also collected at each visit. Results were analysed using multilevel linear regression models and generalised estimating equations.

Results 56 subjects (91%) completed at least two waves; 42 (69%) completed all four. Progressive declines in job efforts, rewards, and overcommitment were noted across pregnancy; ERI remained stable. Black subjects showed evidence of lower job control but also lower effort-reward imbalance across pregnancy, contrasted with Whites/Hispanics. Overcommitment showed the strongest negative association with indices of maternal health, including BP, and SR stress and health. The strongest associations of job constructs with indices of maternal health, including BP, and SR stress and health were noted at mid-second trimester (20–24 weeks) with a decline thereafter.

Conclusions Correlations between occupational psychosocial stressors and intermediate pregnancy-related outcome variables are greatest in early-to-mid-pregnancy. Declining effort and increased control across pregnancy suggest that, in this group, work conditions may be improved, either by the employer or worker, as pregnancy progresses. The possibility of a critical period when associations between work stressors and pregnancy outcomes is also suggested by these results.

INCIDENCE OF KNEE PAIN AND ITS WORK-RELATED RISK FACTORS IN A LARGE WORKING POPULATION

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Objectives This study aims to estimate the incidence of knee pain and its risk factors in a general French working population, representative of the work force.

Method Of 3710 workers of a French region included in a study in 2002–2005 with a self-administered questionnaire, 2332 completed a follow-up questionnaire in 2007–2011. The questionnaires included musculoskeletal symptoms, individual and occupational exposures, and physical limitations (at follow-up only). Incident knee pain in 2007–2011 (i.e. subjects not suffering of knee pain at baseline and suffering of knee pain at follow-up) was dichotomized into sub-chronic knee pain (1–29 days) and chronic knee pain (>30 days). Associations between the incident knee pains and individual and work-related risk factors at baseline were studied separately by gender, using multinomial logistic regressions.

Results Of the 1616 respondents without knee pain at baseline, 122 (7.5%) reported chronic knee pain and 243 (15.0%) reported sub-chronic knee pain; 43% of workers with incident chronic knee pain and 30% of workers with incident sub-chronic knee pain had other chronic pains at baseline, and respectively 51% and 28% reported limitations in climbing stairs. After adjustment for age and BMI, significant associations were found between incident knee pain and handling loads >4 kg (Odds-Ratio (OR) 2.1 (1.2–3.6) among men, OR 2.3 (1.1–5.0) among...
women) and kneeling for more than 2 h per day among men (OR 1.8 (1.0–3.0)).

Conclusions This study, conducted in a large representative working population, highlights the relation between incident knee pain and occupational risk factors such as handling loads and kneeling.

Objectives To assess the role of sensory impairments and disorders of balance in occupational injury.

Method The Clinical Practice Research Datalink records all medical consultations, referrals and diagnoses in primary care for 6% of the British population. Using this register we identified 1348 working-aged patients who had consulted medical services over a 20-year period for workplace injury (cases) and 6652 matched controls. Risks were assessed in relation to visual impairment, common eye diseases, hearing loss, perforated ear drum, non-acute otitis media, and disorders of balance, using conditional logistic regression.

Results In all, 173 subjects had had an eye problem before the date of injury consultation (index date), 793 an ear problem (including 336 with impaired hearing and 482 with non-acute otitis media), and 266 a disorder of balance. No associations were found with specific eye diseases or perforation of the ear drum, but odds ratios (ORs) were moderately elevated for eye conditions such as eye injury, eye irritation, cataracts, macular degeneration, glaucoma, or detached retina in the previous week, with adjustment for age, smoking status, social class and manual activities.

Results Full information on the study variables was available for 4969 eligible men, including 72 men with a history of Dupuytren’s contracture, 2287 with occupational exposure to HTV, and 409 with A(8) >2.8 ms\(^{-2}\) in the past week. RRs from occupational exposure were elevated 1.5-fold, and were higher still for A(8) >2.8 ms\(^{-2}\) (adjusted RR 2.85, (95% CI 1.3–5.97).

Conclusions Our findings suggest that risk of Dupuytren’s contracture is importantly elevated in men with high levels of weekly exposure to HTV.
Objectives To report updated results on long-term nightshift work and breast cancer risk in Hong Kong women.

Method This ongoing case-control study involves three hospitals in Hong Kong. By 31/03/2013, we’ve consecutively recruited 443 newly diagnosed breast cancer cases and 335 age-matched controls from the hospital that the cases came from, with a response rate of 90%. We expect to collect 1000 cases and 1000 controls by 31/12/2013. We obtained each participant’s lifetime occupational history and shift work, exposure to light-at-night and other important risk factors including family cancer history. We performed unconditional logistic regression analyses to calculate odds ratio (OR) after adjusting for potential confounders.

Results The age at diagnosis (interview) between cases and controls is comparable (55.1 ± 11.9 vs. 54.2 ± 14.6 years). More cases than controls were non-parity and non-breast feeding, but gave first birth slightly late. A significantly elevated (adjusted OR=1.90, 95% CI: 1.24–2.89) breast cancer risk was observed in never employed women. Among those ever employed, 19.8% of breast cancers had ever worked at nightshift at least once per month for ≥ 1 year and it was 21.7% for the controls. Further analyses revealed that nightshift work for ≥15 years resulted in an adjusted OR of 1.55 (95% CI: 0.76–3.14) but power is limited. There is no excess breast cancer risk for women with nightshift work for <15 years.

Conclusions This ongoing study provides supportive evidence on a positive association between long-term nightshift work and breast cancer risk. [Research Grants Council (Project no.: 474811) and Direct Grant (Project no.: 2041788), shelly@cuhk.edu.hk].

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Results The age at diagnosis (interview) between cases and controls is comparable (55.1 ± 11.9 vs. 54.2 ± 14.6 years). More cases than controls were non-parity and non-breast feeding, but gave first birth slightly late. A significantly elevated (adjusted OR=1.90, 95% CI: 1.24–2.89) breast cancer risk was observed in never employed women. Among those ever employed, 19.8% of breast cancers had ever worked at nightshift at least once per month for ≥ 1 year and it was 21.7% for the controls. Further analyses revealed that nightshift work for ≥15 years resulted in an adjusted OR of 1.55 (95% CI: 0.76–3.14) but power is limited. There is no excess breast cancer risk for women with nightshift work for <15 years.

Conclusions This ongoing study provides supportive evidence on a positive association between long-term nightshift work and breast cancer risk. [Research Grants Council (Project no.: 474811) and Direct Grant (Project no.: 2041788), shelly@cuhk.edu.hk].

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Method Using medical surveillance data, hospital admission of nervous system disease (G00-G99) from 2000 to 2005 was analysed in cohort contained manganese exposed male workers (438,693 person years). Also, 2% of Korean men was randomly selected and analysed their hospital admission data. Standardised Admission Ratios (SAR) of nervous disease among manganese exposed workers was estimated reference to Korean men.

Results For 6 years, 500 admissions with nervous system diseases (G00-G99) were observed in solvents exposed workers. SARs for overall nervous diseases (G00-G09) (SAR=2.06, 95% CI 1.20–3.47), inflammatory disease of CNS (G00-G09) (SAR=1.92, 95% CI 1.52–2.39), other degenerative diseases of nervous system (G31) (SAR=2.60, 95% CI 1.16–5.20) and nerve, nerve root and plexus disorders (G50-G59) (SAR=1.66, 95% CI 1.36–2.00) were significantly higher than those of Korean men. SAR of extrapyramidal and movement disorders (G20-G26) was significantly high (SAR=2.03, 95% CI=1.05–3.53) among workers with 10 and more years employment duration.

Conclusions This manganese exposed workers’ cohort with short follow-up periods exhibits significantly elevated admission with overall and some kinds of nervous disease comparing to Korean men. Especially, increased SAR of extrapyramidal and movement disorder suggests relatedness of manganese exposure.
registry catchment areas was determined. Standardised incidence ratios (SIR) and standardised rate ratios for bladder cancer were calculated by exposure category and cumulative rank quartiles for different lag periods. Cox regression was used to model bladder cancer incidence with estimated cumulative rank, adjusting for confounders. Indirect methods were used to control for smoking.

**Results** Excess bladder cancer was observed compared to the New York State population (SIR=2.87, 95% confidence interval [CI] 2.02–3.96), with higher elevations among workers definitely exposed (moderate/high) (SIR=3.90, 95% CI 2.57–5.68) and in the highest cumulative rank quartile (SIR=6.13, 95% CI 2.80–11.6, 10-year lag). Bladder cancer rates increased significantly with estimated cumulative rank (10-year lag). Smoking only accounted for an estimated 8% elevation in bladder cancer incidence.

**Conclusions** Bladder cancer incidence remains elevated in this cohort and significantly associated with estimated cumulative exposure. Results are consistent with earlier findings in this and other cohorts. Despite other concurrent chemical exposures, we consider o-toluidine most likely responsible for the bladder cancer incidence elevation and recommend a reexamination of occupational exposure limits.

**0095 MULTIMORBIDITY AND PREVIOUS SICKNESS ABSENCE EPISODES ARE DETERMINANTS OF INCIDENCE AND DURATION OF FUTURE EPISODES**

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**Objectives** While sociodemographic and work-related factors are frequently studied as determinants of sickness absence (SA), health-related determinants have surprisingly received little attention. We examined the effect of multimorbidity and previous SA on the incidence and duration of future SA.

**Method** A retrospective (2004–2008) cohort of 373,905 workers who underwent a standardised medical evaluation in 2006 from which information on chronic conditions, health-related symptoms and behaviours was used to construct a sex-specific multimorbidity score (MMBS). Information on SA episodes occurring during the two years prior to the examination came from the employment history. We estimated the effect of the MMBS and prior SA on the 2-year incidence and duration of SA post-examination using a Cox model adjusted for age and occupational social class. Effects on SA duration were also adjusted for diagnosis.

**Results** Men, but not women, showed an effect with a trend of higher SA incidence risk from low (HR=1.06; 95% CI: 1.01–1.11) to high MMBS (HR=1.22; 95% CI: 1.18–1.28). Having five or more prior episodes was related to higher SA incidence risk, both in men (HR=2.19 95% CI: 2.11–2.28) and in women (HR=2.47; 95% CI: 2.35–2.61). Women, but not men, had longer SA duration from low (HR=0.91; 95% CI: 0.83–0.99) to high MMBS (HR=0.88; 95% CI: 0.78–0.99). Having 5 or more prior SA episodes was associated with shorter duration in men (HR=1.67; 95% CI: 1.30–2.16) and women (HR=2.12; 95% CI: 1.56–2.89).

**Conclusions** Multimorbidity increases the risk of higher SA incidence and duration while the effect of prior SA episodes is more complex.
Objectives To examine gender and racial disparities in heart disease mortality related to metalworking fluid exposures and in the healthy worker survivor effect.

Method We examined ischaemic heart disease (IHD) mortality from 1941 to 1995 in a cohort of autoworkers with quantitative exposure to respirable particulate matter from water-based metalworking fluids. Cox models were used to estimate the exposure-response to soluble and synthetic fluids separately in white men, black men, and white women. In separate analyses, we used g-estimation to adjust for the healthy worker survivor effect.

Results The risk of IHD was increased among black men (295 deaths) exposed to synthetic fluid with a hazard ratio (HR) of 3.47 (95% CI: 1.52, 7.92) in the highest cumulative exposure category. White women (119 deaths) had increased risk of IHD with increased soluble fluid (HR: 2.44 (0.93, 6.38)) in the second to highest category. However, Cox models show no increased risk in white men (2246 deaths). In contrast, g-estimation results indicate that if white men had been always unexposed to soluble and synthetic fluid, then on average for each case, 2.99 and 2.77 years of life would have been saved, respectively.

Conclusions We found increased risk of IHD for black men and white women exposed to metalworking fluids using Cox regression. After adjusting for the healthy worker survivor effect, increased risk was observed for white men. The ability to leave work for health related reasons may be an option more available to white male workers.

Objectives Exposure to allergens and microorganisms in the agricultural environment has been linked to altered immune response. Studies in the general population have reported reduced risks of non-Hodgkin lymphoma (NHL) among those with a history of atopic conditions, although results are inconsistent. To evaluate the allergy-NHL association in the context of farm exposures, we conducted an investigation in the Agricultural Health Study, a prospective cohort of farmers and spouses from North Carolina and Iowa.

Method Our study included 49,656 farmers and spouses with crop and animal exposures and allergy symptoms reported at baseline (1993–1997). We identified 418 incident cases of NHL (including chronic lymphocytic leukaemia and multiple myeloma) during follow-up through 2010 in North Carolina and 2011 in Iowa. Hazard ratios (HR) and 95% confidence intervals (CI) were calculated using multivariable-adjusted proportional hazards models.

Results At enrollment, over 80% of the study participants lived on farms growing grains or hay and 64% on farms raising livestock. Compared to individuals without allergy symptoms, those with symptoms had a reduced risk of NHL (HR=0.61, 95% CI=0.50–0.74). We observed a slightly greater reduction in NHL risk among participants whose allergy symptoms worsened after working with grains and hay (HR=0.53, 95% CI=0.41–0.69). The association between livestock and NHL was borderline significant overall (HR=0.82, 95% CI=0.66–1.01), and significant among those without allergy symptoms (HR=0.70, 95% CI=0.51–0.96).

Conclusions Our findings suggest that among individuals working and living on farms, allergy symptoms are associated with a reduced risk of developing NHL, and that risk may be influenced by particular farm characteristics.
with Certain Functional Impairments (LSI) and require PA with their basic daily needs for more than 20 h a week. The aim of the study was to investigate how the LSS Act provides possibilities to work for people entitled to measures for special support and special service.

**Method** Cross-sectional analysis based on data from the Swedish Social Insurance Agency and from a questionnaire survey of a sample of people entitled to PA (total of 15515). The response rate was 67%.

**Results** Generally more men (27%) than women (21%) considered that PA is a prerequisite for their ability to work. Among those who were mentally retarded, were autistic or had a condition resembling autism (group 1), 33% responded positively. Persons belonging to the group with considerable and permanent intellectual functional impairment after brain damage in adulthood (group 2), experienced least possibilities to work (11%). Among those with other lasting physical or mental functional impairments (group 3), 22% experienced that PA gave them a possibility to work. Of those who had responded positively, 25% were born in Sweden and 22% were born abroad.

**Conclusions** Personal assistance seems to provide possibilities of active participation in the labour market for persons with substantial and permanent disability.

**CHARACTERISATION OF WET WORK AND GLOVE USE IN HEALTHCARE OCCUPATIONS**

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**Objectives** Wet work (contact and/or use of liquids) could lead to skin exposures to chemical irritants and sensitizers among healthcare workers. The objective of this study was to characterise the frequency and duration of glove use when wet work was performed by healthcare workers.

**Method** Direct observational studies were conducted from 2009 to 2011 at five hospitals on selected healthcare occupations. Information on tasks, chemical product use, and glove use was collected at five-minute intervals by trained research technicians using a standardised data collection form.

**Results** Between five and 51 person-days were observed for each occupation. Any glove use during wet work ranged from 10% to 90% of person-days for occupations with more than 10 person-days observed. Endoscopy technicians had the highest proportion of time of glove use when wet work was observed (1045/2055 min = 90%), followed by medical equipment preparers, dental assistants, and housekeepers (1645/1950 min = 84%, 315/395 min = 80%, and 6090/7720 min = 79% respectively). Floor strippers/waxers (585/1225 min = 48%), respirators (65/160 min = 41%), and clinical laboratory technicians (10/60 min = 17%) had lower proportions of time of glove use. When a sensitizer was used during wet work, the proportion of time of glove use increased among all healthcare occupations with adequate data.

**Conclusions** This analysis demonstrates that the duration of wet work and glove use vary by healthcare occupation. This assessment will be valuable for developing health and safety training programs and identifying possible avenues for intervention.

**MORTALITY STUDY AMONG PARIS SEWAGE WORKERS**

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**Objectives** To describe the mortality of sewage workers from Paris (France).

**Method** The cohort of 1594 Paris sewage workers since 1970 was set up in 2010 and followed-up on mortality from 1970 to 2010. Vital status and causes of death were determined by matching with national databases. Standardised Mortality Ratios (SMRs) were computed using local death rates by causes of death and 10-year employment duration classes. Data are currently analysed using relative survival techniques. This study was approved by the national ethic comity.

**Results** Statistically significant mortality excess was observed for all causes (SMR=1.34, 778 cases) and for cancer (SMR=1.49, 337 cases). SMRs were also statistically greater than 1 for malignant (SMR=1.74, 22 cases) and non-malignant (SMR=1.77, 43 cases) liver diseases, lung cancer (SMR=1.59, 97 cases), oesophageal cancer (SMR=2.35, 28 cases), all alcohol-related diseases (SMR=1.78, 128 cases), and suicide (SMR=3.64, 22 cases). Greater than 1 but not statistically significant SMRs were observed for infectious diseases and respiratory infectious diseases. The mortality from several diseases (all causes, all cancer, oesophageal cancer, lung cancer, chronic liver diseases, all alcohol-related diseases, and infectious diseases) increased with employment duration as a sewer worker. Except for lung cancer, the SMR for smoking-related diseases was not statistically greater than 1. Results of survival analysis are in progress.

**Conclusions** The increase mortality observed for lung cancer and infectious diseases with employment duration suggests possible occupational health effect among sewer workers. Conclusions will be completed from the survival analysis.

**OCCUPATIONAL RISK FACTORS FOR ENDOMETRIOSIS AMONG FLIGHT ATTENDANTS**

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**Objectives** Previous studies suggest that flight attendants could have a higher risk for endometriosis than women in other occupations. Our objectives were to compare the rate of endometriosis among flight attendants to the rate in a comparison group of teachers, and to investigate occupational risk factors for endometriosis among flight attendants.

**Method** We included 1780 flight attendants and 240 teachers aged 18–45 at enrollment. Endometriosis diagnosis was self-reported via telephone interview, and records of individual flights were retrieved from airlines to obtain work schedules and assess exposures for flight attendants. Cox regression was used to estimate odds ratios (OR) and 95% confidence intervals (CI) for associations between exposures and endometriosis, adjusting for body mass index at interview and using age as time scale.

**Results** Flight attendants were no more likely to report endometriosis than teachers (adjusted OR 1.3, 95% CI 0.7–2.3). Among flight attendants, there were no clear trends between yearly costs, flight attendants, and other occupations. Our objectives were to compare the rate of endometriosis among flight attendants to the rate in a comparison group of teachers, and to investigate occupational risk factors for endometriosis among flight attendants.

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number of flights per day (adjusted OR 2.0, 95% CI 1.2–3.3 for 3+ versus 1 flights/day, p trend = 0.007) and fewer time zones crossed per flight (adjusted OR 2.0, 95% CI 1.0–3.7 for 0 vs. 2 + time zones/flight, p trend = 0.04) were associated with a higher rate of endometriosis.

Conclusions The rate of endometriosis increased with number of flights and decreased with time zones crossed, which might be surrogates for exposures specific to flying a series of short flights during the workday.

Method Cross-sectional data were collected in 2010–2012 from 6309 nurses aged 21 to 45 from the Nurses’ Health Study 3. We used multivariable regression modelling to analyse the associations between occupational exposures and prevalence of irregular cycles and long and short cycle lengths.

Results Cycle length was recorded as <21 days (1.5%), 21–25 days (15.6%), 26–31 days (69.7%), and 32–50 days (13.2%). In addition, 19% of participants reported irregular cycles. Working more than 41 h/week was associated with a 16% [95% confidence interval (CI): 4–29%] higher prevalence of irregular cycles and a higher prevalence of very short (<21) days [prevalence odds ratio (OR) 1.93, 95% CI: 1.24–3.01]. Irregular menstrual cycles were more prevalent among women working nights only (32% higher) or rotating nights (27% higher), and their prevalence was associated with the number of night shifts per month (p for trend <0.0001). Rotating night shift was also associated with long (32–50) day cycles (OR 1.28, 95% CI 1.03–1.61). In addition, heavy lifting was associated with a higher prevalence of irregular cycles (34% higher), and the prevalence of <21 days and 21–25 days cycles increased with increasing amount of heavy lifting at work (p for trend <0.02 for each endpoint).

Conclusions Night work, long working hours, and occupational physical labour might play a role in menstrual function disturbances.

Objectives To further evaluate the association of styrene, fibreglass, and wood dust exposure with non-malignant diseases, we extended follow-up through 2008 for 5203 workers exposed to styrene, fibreglass, and wood dust between 1959 and 1978 at two boat building plants.

Method We used a person-years analysis program, LTAS.NET to compute standardised mortality ratios (SMRs) using Washington State and U.S. rates, standardised rate ratios (SRRs), and 95% confidence intervals. SMRs were stratified by exposure category (low or high) and duration of employment category (≤1 year, 1+ years).

Results Overall, 1206 nonmalignant deaths occurred (WA SMR 1.14, CI 1.08–1.21), with excess mortality for chronic obstructive pulmonary disease (COPD) overall (n = 112, WA SMR 1.61, CI 1.32–1.93), and among 2063 workers highly exposed to styrene and fibreglass (n = 39, WA SMR 2.37, CI 1.69–3.25). Results were similar using U.S. mortality rates. Workers employed for less than one year had statistically significant increased mortality from several lifestyle-related outcomes (alcoholism, ischaemic heart disease, cirrhosis, accidental poisoning and homicide).

Conclusions The excess COPD mortality in this cohort is difficult to interpret. Recent reports associate styrene/fibreglass reinforced plastic manufacturing with another respiratory disease - bronchiolitis obliterans. Based on a review of COPD death certificates, bronchiolitis obliterans does not appear to be a contributing factor for excess COPD mortality. The COPD excess in this study points to a need for an in-depth investigation of respiratory disease and occupational styrene exposure. Short term worker results are consistent with other occupational cohort studies.

Objectives As part of a larger study investigating the transition from traditional to green cleaners, we sought to investigate the relationships between cleaning tasks and respiratory, dermatological and musculoskeletal symptoms among a population of custodians.

Method State-employed custodians completed a questionnaire to assess cleaning tasks and health symptoms using standardised questions when available. Associations between health outcomes and cleaning tasks were investigated using logistic regression after controlling for age, gender, and smoking status. Each health outcome was modelled individually and trends with increasing exposures were reported.

Results Questionnaires were completed by 329 custodians from three universities and one university health centre. Participants were 59% female, 53% reported English as their primary language, and 18% were current smokers. Health symptoms within the last month included dermatitis (26%), lower-respiratory complaints (30%), upper-respiratory complaints (43%), pain or discomfort in back (32%) and pain or discomfort in neck, shoulders or arms (44%). An increasing number of toilets cleaned was associated with increased odds of dermatitis (p for trend = 0.0005), lower-respiratory symptoms (p = 0.007), and pain or discomfort in shoulders (p = 0.04). Increasing daily hours spent floor stripping was associated with increased odds of dermatitis (p = 0.02), lower- (p = 0.01) and upper- (p = 0.01) respiratory symptoms as well as pain or discomfort in back.
Oral presentation

(p = 0.006). Increasing daily hours of vacuuming was associated with increased odds of lower- (p = 0.03) and upper- (0.003) respiratory symptoms.

Conclusions Custodian dermatological, respiratory, and musculoskeletal symptoms are consistent with task related exposures and follow a dose-related pattern with increasing odds of symptoms related to increased exposure duration.

0122 APPROACHES TO DEVELOPING EXPOSURE ESTIMATES THAT REFLECT TEMPORAL TRENDS IN TOTAL PARTICULATE MATTER IN ALUMINIUM SMELTERS

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Objectives To evaluate different approaches for including time trends in quantitative exposures to total particulate matter (TPM) in an aluminium smelter for use in epidemiologic evaluation of incident heart disease, we compared the use of regression modelling to discrete modelling of changes in the workplace environment.

Method We used an industrial hygiene database containing results for sampling conducted over 30 years and information on workplace environment (e.g. personal protective equipment policy, ventilation modifications, changes to materials or work organisation). The effects of these changes were tested with an analysis of variance model using log-transformed TPM concentrations. We compared the outcome of this approach to the use of a regression model for TPM concentrations over time.

Results Time trends in 57 jobs in an aluminium smelter were evaluated by using 1123 TPM samples collected from 1984–2012. There was an overall decline in median TPM concentrations (mg/m³) at the smelter (3.7% per year). The trend was not observed in the majority individual jobs. The decreasing trend was concentrated in 14% of the jobs. The majority of jobs (61%) had no change over the time period, 19% had no consistent pattern of change, and 5% increased in TPM concentrations.

Conclusions Applying a global trend to worker exposures would result in misclassification error in epidemiologic evaluations. When possible, process changes should be used to define changes in worker exposures rather than using a facility- or industry-wide time trend. Future work will explore regression modelling as a way to explain any remaining time trends in TPM.

0124 PM2.5 AND HEART DISEASE IN A COHORT OF ALUMINIUM WORKERS: AN APPLICATION OF LONGITUDINAL TARGETED MAXIMUM LIKELIHOOD-BASED ESTIMATION (TMLE)

Daniel Brown, 1Maya Petersen, 1Mark van der Laan, 1Sadie Costello, 1Elizabeth Noth, 1Katherine Hammond, 1Mark Cullen, 1Ellen Eisen, 1UC Berkeley, Berkeley, CA, USA; 2Stanford University, Palo Alto, CA, USA

Objectives We estimated the effect of cumulative exposure to PM2.5 on the incidence of ischaemic heart disease (IHD) in aluminium workers followed for 15 years, adjusting for the healthy worker survivor effect. In previous analyses, higher cumulative exposure was found to be associated with lower mortality in this population.

Method We used longitudinal TMLE to estimate the cumulative risk of ischaemic heart disease in the cohort if constantly exposed above an exposure cut-off and compared it to the risk if constantly exposed below. We stratified all analyses by work process because exposures were an order of magnitude higher in smelters than fabrication facilities.

Results We selected cut-offs a priori at the median and 10th percentile exposure within each sub-cohort. Among the smelter workers, we estimated an increase in IHD risk of 2.1% (p = 0.22) after 15 years, comparing the always exposed to never exposed cohort using the median cut-off of 1.77 mg/m³. The difference was 2.9% (p = 0.01) using the 10th percentile cutoff of 0.10 mg/m³. For the fabrication workers, the differences were 0.1% (p = 0.47) using the median cut-off of 0.20 mg/m³ and 2.5% (p < 0.01) for the 10th percentile cut-off of 0.06 mg/m³.

Results are presented as adjusted survival curves, describing the estimated cumulative risk for each cohort under each exposure regimen.

Conclusions The TMLE estimator allows us to observe an association between cumulative PM2.5 exposure and heart disease that was not visible using standard analytical techniques. This work represents the first application of longitudinal TMLE to the field of occupational epidemiology.
cancer risk in epidemiological and/or animal studies. Consistent with our finding, shorter RTL with 2,4-D use was previously observed in an analysis of buccal cells in the AHS.

Objectives One in four of the Australian population is born abroad, with skilled migration encouraged since the mid-1990s. The shift from an industrial to a service based economy has seen a decline in recent decades of work-related injuries (WRIs) and related mortality in Australia. We examine deaths and hospital admissions from WRI, among foreign and Australian-born workers.

Method Work-related mortality and hospital admission rates were derived from tabulated data from the 1991 to 2011 censuses, 1991–2002 national deaths and hospital admissions for 2001–2010. Comparisons across country of birth groups were conducted using incidence rate ratios (IRRs). Gender specific mortality and hospital admission rates were directly standardised (DSRs) using the World Standard Population. Negative binomial regression models compared the country-specific mortality and hospital admission rates of the foreign-born workers with those of Australian-born workers.

Results DSRs and IRRs were generally higher for Australian-born than foreign-born workers. A notable exception was New Zealand born men, among whom there was a 10% (95% CI 9.1–13.1) excess mortality and 24% (95% CI 12.2–12.6) excess hospital admissions. Adjusting for age, gender, year and skill level removed the differences in risk of WRI death between Australian and foreign-born workers.

Conclusions These findings show a reversal of the historic trend of foreign-born workers being at higher risk than the local-born. They signal a need to promote healthy work environments in all industries to further reduce the risk of WRI to all workers in Australia.

Objectives Higher rates of work-related injuries (WRI) have been reported among foreign-born workers in many countries, but little is known about the situation in Australia. The aim of the study was to examine WRI among foreign-born workers in Australia.

Method This was a two phase mixed methods study. The first stage used the 2005/6 and 2009/10 Australian national Multi-Purpose Household Survey (MPHS) information on WRI occurring in the previous year (N = 36 702). Logistic regression examined the relationship between WRI and region of birth (Australia born = baseline), and whether the effect varied by period of arrival in Australia, age, sex, industry and working conditions. In the second stage, purposively sampled foreign-born workers and stakeholders from 22 countries took part in individual interviews (n = 17) or focus groups (n = 75). A concurrent thematic analysis was conducted.

Results In the MPHS, more WRI were reported by workers in agriculture, manufacturing, construction, hospitality and transport industries than in the service industry, and by those in unfavourable working conditions (e.g. unpaid leave). Migrant status, regardless of region of birth, was generally not associated with higher WRI reporting. Qualitative interviews suggested that understanding and practice of Occupational Health and Safety (OH&S) was influenced by education, skill level, job security, dependent relatives in home countries and by social ties in communities.

Conclusions Whereas the MPHS point to higher risks related to area of work rather than migrant status, qualitative interviews suggest under-reporting of WRI among low income migrants mainly due to fear of losing their jobs.
**Oral presentation**

0134 PREVALENCE OF EXPOSURE TO OCCUPATIONAL CARCINOGENS AMONG ETHNIC MINORITY WORKERS IN AUSTRALIA

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**Objectives** Although several studies have estimated the prevalence of occupational carcinogens in the general population, little is known about exposure to occupational carcinogens among ethnic minority workers. The aims of this study were to: estimate the prevalence of occupational exposure to carcinogens among ethnic minority workers in Australia; and compare their exposure prevalence to that of the general Australian-born working population (‘Australian workers’).

**Method** This was a cross-sectional telephone-based survey conducted in Australia in 2013. Participants were aged 18 to 65 years, of Arabic, Chinese or Vietnamese ancestry, and currently employed. Assessment of occupational exposures classified participants as unexposed, possibly exposed or probably exposed to each of 38 occupational carcinogens. Modified Poisson regression determined whether the workers in this study were more likely to be exposed to carcinogens than Australian workers.

**Results** Of the 749 participants, 31.6% were assessed as being probably exposed to at least one carcinogen. Controlling for confounders, ethnic minority workers were less likely to be exposed to occupational carcinogens than Australian workers (RR=0.88, 95% CI=0.80–0.96). For specific carcinogens, compared with Australian workers, overseas-born Chinese workers were significantly more likely to be exposed to PAHs, Australian-born Arab workers were significantly more likely to be exposed to silica, and all Arab workers were significantly more likely to be exposed to environmental tobacco smoke, and all Arab workers were significantly more likely to be exposed to silica.

**Conclusions** Approximately one-third of the ethnic minority workers in this study were exposed to carcinogens. They were less likely to be exposed than Australian workers overall; however, for specific carcinogens exposure was more likely, depending on country of birth.

0135 PREVALENCE OF EXPOSURE TO SOME OCCUPATIONAL CARCINOGENS IN FRANCE: EVOLUTION BETWEEN 1999 AND 2007

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10.1136/oemed-2014-102362.50

**Objectives** To use job-exposure matrices (JEM), as a tool to describe trends of occupational exposure to carcinogenic chemicals present in the French workplace.

**Method** MATGÉNÉ JEMs assess for each job and a given period in France, several exposure indices such as probability, intensity and frequency of exposure. Linking these matrices with job information data coming from French population allow to estimate the prevalence of workers exposed to several chemicals for a given year. To study the evolution of exposure to carcinogens, prevalence of exposure in France for the years 1999 and 2007 were estimated from the population census of 1999 and from a representative sample of the population in 2007.

**Results** French available JEMs assess the exposure of workers since the 1950s for various occupational carcinogens: crystalline silica, benzene, trichlorethylene, perchlorethylene, leather dust, asbestos and refractory ceramic fibres (RCF). A significant decrease in the prevalence of exposure between 1999 and 2007 was observed among men for silica with 7.4% and 5.6% respectively, asbestos with 6.3% and 1.1% and RCF with 0.3% and 0.3%. For women, a significant decrease was also noticed for exposure to asbestos and leather dust. For solvents, the prevalence of exposure remained stable in both men and women.

**Conclusions** The proportion of workers exposed to carcinogens, particularly to asbestos, has decreased in France since 1999. However a substantial number of workers are still exposed. As complete occupational histories are available in the 2007 population sample, the JEMs will also be used to estimate lifetime exposure prevalence and the associated disease burden.

0137 ACUTE COGNITIVE EFFECTS OF MRI RELATED MAGNETIC FIELDS: THE ROLE OF VESTIBULAR SENSITIVITY

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10.1136/oemed-2014-102362.51

**Objectives** Movement in the magnetic fields around MRI systems showed acute negative effects on concentration, memory, visuo-spatial orientation and postural body sway. A crucial role of the vestibular system has been hypothesised. We aimed to gain more insight whether subjects with a relatively (un)sensitive vestibular system performed differently on cognitive tasks when (moving) in a the static magnetic field of an MRI scanner.

**Method** In a double blind randomised cross over experiment 36 healthy volunteers underwent several cognitive tasks in 4 experimental sessions. Two were exposure conditions near a 7 Tesla (T) MRI system with personal exposure of 1.0 T. In one of these conditions additional time-varying magnetic fields of 2.4 T/s were induced by making standardised head movements. Of the two sham conditions (0 T) one was with and the other without such head movements. Vestibular sensitivity of each subject was assessed by the rotary chair test, the caloric reflex test and self-reported sensitivity to motion sickness.

**Results** Linear mixed models are currently in progress to test cognitive performance in a magnetic field for subjects with a low, normal and high sensitive vestibular organ. Preliminary results seem to suggest some differential cognitive effects of magnetic field exposure according to relative vestibular sensitivity. Further results will be presented at the conference.

**Conclusions** These findings are important to better understand a possible working mechanism evoking these cognitive effects. Moreover, these findings can form a basis for the design of relevant protective and precautionary control measures for employees working close to an MRI system.
0139 OCCUPATIONAL EXPOSURE TO CHLORINATED SOLVENTS AND LUNG CANCER: RESULTS FROM THE ICARE STUDY

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Objectives We aimed to investigate the role of occupational exposure to chlorinated solvents in the aetiology of lung cancer.

Method ICARE is a multicenter population-based case-control study conducted in France between 2001 and 2006. Information on subjects' lifelong work history was collected by face-to-face interviews using standardized questionnaires. Occupational exposures were assessed using job-exposure matrices (JEM) relative to five chlorinated solvents including trichloroethylene (TCE), methylene chloride, perchloroethylene (PER), chlorofluor and carbon tetrachloride. Solvents were studied separately and since overlapping among exposures analyses for combined solvents exposure were performed. In the questionnaire, subjects also had to report if they were exposed to TCE or other substances (PER was among them). Odds ratios (ORs) were computed using unconditional logistic regression models adjusted for classical risk factors.

Results A total of 2926 cases (2276 men and 650 women) and 3555 controls (2780 men and 775 women) were included. A statistically significant positive association for lung cancer risk was observed in both men (OR 1.47, 95% CI: 1.00–2.17) and in women (OR 3.86, 95% CI: 1.36–11.01) exposed to PER combined with TCE and/or methylene chloride. In contrast, no statistically significant associations were found for TCE or other solvent combinations. Finally for subjects, who reported the exposure to PER, the ORs were 3.25 (95% CI: 1.23, 8.59) and 3.12 (95% CI: 0.50, 19.28) among men and women respectively.

Conclusions The results of this study suggest that PER alone or in combination with TCE and/or methylene chloride may increase the risk of lung cancer.

0140 RISK OF TOTAL HIP REPLACEMENT IN RELATIONSHIP TO CUMULATIVE EXPOSURES IN THE WORK ENVIRONMENT

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Objectives To investigate the risk of total hip replacement (THR) due to primary osteoarthritis (OA) in relation to cumulative occupational mechanical exposures and lifestyle factors.

Method In a population of Danish employees, we identified first-time THR cases in the National Patient Register. For each case, two age- and sex-matched controls were drawn. In total 2500 randomly selected case-control sets were mailed a questionnaire entailing job history, weight (present and at age 25), height, smoking and sports activities at age 25. We used a job exposure matrix to calculate cumulative exposures in the work environment. Exposure estimates were expressed according to the pack-year concept of smoking (cumulative lifting = tons-years). We used conditional logistic regression.

Results 71% of case-control sets contributed to the study. The adjusted odds ratio for exposure to at least 20 ton-years was 1.35 (95% CI 1.05–1.74) for men. When analysing frequent lifting as risk factor, the adjusted OR reached 1.26 (95% CI 0.99–1.61). There were no such increases for women. We controlled for body mass index, sports participation at age 25 and previous trauma towards the knees.

Conclusions When using a job exposure matrix we found a modest increased risk of THR in relation to cumulative lifting for men. For women no increased risk was seen.

0141 MEDIATING EFFECTS OF HEALTH ON THE ASSOCIATION BETWEEN NEGATIVE LIFE EVENTS IN CHILDHOOD ON FUTURE LABOUR MARKET PARTICIPATION. A 7-YEAR FOLLOW-UP STUDY

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Objectives The aim of this study was to investigate if effects of multiple negative life events in childhood on future labour market participation were mediated through 3 measures of mental, general, and psychosomatic health.

Method Of a cohort of 3681 born in 1989 in the county of Ringkjobing, Denmark, 3058 (83%) completed a questionnaire in 2004. They were followed in a register on social benefits for 12 months in 2010–2011. Logistic regression analyses were used to investigate associations between negative life events in early childhood and future labour market participation at age 21–22. Sobel-Goodman test for mediating effects was used to determine, if part of the effects were mediated through mental, general and psychosomatic health at age 14/15.

Results Labour market participation decreased with increase in negative life events, especially for females. However, for females, only a small proportion of this effect was mediated through health: 1% through psychosomatic symptoms, 4% through general self-rated health, and 4% through mental health. For males, a larger proportion of the effects were mediated through health: 1% through psychosomatic symptoms, 8% through general self-rated health, and 14% through mental health.

Conclusions Information on childhood conditions may increase the understanding of determinants of labour market participation for young adults. Only a small proportion of the negative effects of childhood adversities were mediated through health among females. For males, the results suggest that childhood adversities affect especially mental health to a degree where it threatens future labour market status.

0142 MENTAL HEALTH IN CHILDHOOD AS RISK INDICATOR OF LABOUR MARKET PARTICIPATION IN YOUNG ADULTHOOD. A PROSPECTIVE BIRTH COHORT STUDY

Thomas Lund, Johan Hvid Andersen, Merete Labriola, 1Danish Ramazzini Centre, Department of Occupational Medicine, Regional Hospital Herne, Herne, Denmark; 2National Centre for Occupational Rehabilitation, Rauland, Norway; MarselsborgCentret, Research and Development Public Health and Quality Improvement Central Denmark Region, Aarhus, Denmark

Objectives To investigate the risk of total hip replacement (THR) due to primary osteoarthritis (OA) in relation to cumulative occupational mechanical exposures and lifestyle factors.
Objectives The aim of this study was to investigate if mental health status in childhood determined future labour market participation, and to identify if effects varied across gender and social strata.

Method Of a cohort of 3681 born in 1989 in the county of Ringkøbing, Denmark, 3058 (83%) completed a questionnaire in 2004. They were followed in a register on social benefits for 12 months in 2010–2011. Logistic regression was used to investigate associations between mental health in childhood measured with The Centre for Epidemiological Studies Depression Scale for Children (CES-DC) and future labour market participation, taking into account effects of socio-economic position, school performance, educational plans and vocational expectations.

Results A total of 17.1% (19.9% males, 14.4% females) received social benefits for at least 4 weeks during follow-up. Girls scored significantly lower on mental health than did boys. Labour market participation in early adulthood decreased with poor mental health in childhood, but only for boys: Boys with a baseline CES-DC score in the lowest quartile had a 70 % excess risk of low labour market participation after 7 years of follow-up. The association persisted when taking into account socio-economic position, but became borderline significant when adjusting for school performance, educational plans and vocational expectations. The negative effect was even across social strata.

Conclusions Despite girls scoring significantly lower on mental health than do boys, the effects on future labour market participation was only present among boys. The effect of poor mental health on future labour market participation did not vary across social strata.

Oral presentation

SURVEILLANCE OF MORTALITY BY SUICIDE AMONG FRENCH FARMERS
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Objectives An excessive risk of suicide among agriculture workers has been observed in several studies in France and abroad. Accordingly, French Institute for Public Health Surveillance and Social Insurance in agriculture sector launched collaboration with aim at producing indicators of suicide mortality among agriculture workers population on a regular basis.

Method The study population included all active farmers and their collaborating spouses. The study covered tree consecutive years: 2007 to 2009. Mortality data by cause from death registries were used to calculate standardised mortality ratios (SMRs) for both men and women.

Results The annual study population was around 500 000 subjects in average, including 68% of men. During the 3-year study period, 2769 men and 997 women were deceased. From these deaths, 417 deaths were due to suicide among men and 68 deaths among women. Suicides represented the third most important cause of death. The comparison of mortality among male study population with that of French national male population revealed a 28%-excess in mortality by suicide in 2008 and 22%-excess in 2009. This excess was particularly high among the 45–64 year age category and in cattle breeding-dairy and meat -sectors. These sectors presented the highest over mortality due to suicide in 2008 and 2009.

Conclusions The first results of this study confirm the necessity to continue the surveillance in this population. Especially, further analysis could provide more information to document risk factors of this excess.
**Results** FEV1 decreased significantly with the cumulative exposure and mean exposure levels. The estimated decrease was close to 200 mL per year of high exposure, which corresponds roughly to levels of wheat dust higher than 10 mg/m³. Peak expiratory flow and several acute symptoms correlate with recent exposure level. Recovery of the respiratory function six months after exposure to wheat dust and evolution of exposure indicators in workers blood (IgG and IgE) will be discussed.

**Conclusions** These results show a chronic effect of exposure to wheat dust on bronchial obstruction. Short term effects and reversibility will be assessed using the full study results.

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**Objective** To estimate prevalence and risk of current asthma among affiliates to the health insurance for self-employed workers according to economic activities.

**Method** We defined current asthma using a prediction model developed in a study conducted in 2006 among workers aged between 18 to 65, affiliated to the Régime Social des Indépendants (RSI) in three French regions. The model used as predictors antiasthma drug claims data and the prescriber’s medical speciality. In 2013, we obtained from the RSI, economic sectors and drug claims data of all French affiliates on whom we applied our prediction model. We used logistic regression to estimate asthma risk of each economic sector versus all others.

**Results** The population comprised 967391 workers. In men, the asthma prevalence was 5.6%. Elevated odds-ratios were observed in the production of food products (OR=1.70 [95% CI 1.63–1.78]), recycling (OR=1.44 [95% CI 1.23–1.70]), health and social work (OR=1.34 [95% CI 1.16–1.54]) and land transport (OR=1.08 [95% CI 1.03–1.13]). In women, the asthma prevalence was 7%, High odds-ratios were observed in education (OR=1.27 [95% CI 1.08–1.50]), manufacture of medical and precision instruments (OR=1.25 [95% CI 0.99–1.58]), land transport (OR=1.11 [95% CI 0.98–1.25]) and hotel/restaurants (OR=1.10 [95% CI 1.05–1.15]).

**Conclusions** Prevalence estimated by the model was close to that observed among self-employed workers within a national survey conducted in 2003. Elevated risks were observed in several industries known to be at risk but also in those not expected. Prediction model approach will allow asthma surveillance in workers without interview with health insurance organisation data when occupational data are available.
**Oral presentation**

**Results** Mean age of the participants was 30.5 years, 46% were nulliparous, 6.3% received fertility treatment, mean BMI was 23.6 kg/m². Prevalence of sickness absence until pregnancy week 30 was 36%. Preliminary results indicate that sickness absence is related to fertility treatment and obesity. Women receiving fertility treatment had increased odds of sickness absence in pregnancy week 30; OR: 1.31 (95% CI: 1.21–1.42). Obese women had increased odds of sickness absence compared to normal weight women; OR: 1.37 (95% CI: 1.28–1.48). More statistical analyses will be conducted.

**Conclusions** Final results and conclusions will be presented at the conference.

**Objective** To estimate the annual costs of coronary heart diseases (CHD) and mental disorders (MD) attributable to job strain exposure according to Karasek’s model in France for the year 2003 from a societal perspective.

**Method** We produced attributable fraction estimates which were applied to the number of cases (morbidity and mortality) and the costs of CHD and MD. Relative risk estimates came from a systematic literature review of prospective studies. We conducted meta-analyses based on this selection of studies. Prevalence of exposure to job strain came from the national SUMER survey conducted in France in 2003.

**Results** Between 8.8 and 10.2% of CHD morbidity and between 9.4 and 11.2% of CHD mortality was attributable to job strain for men. Between 15.2 and 19.8% of MD was attributable to job strain for men, and between 14.3 and 27.1% for women. The total costs of CHD and MD attributable to job strain exposure ranged from 1.8 to 3 billion euros for the year 2003 (0.12–0.19% GDP). Medical costs accounted for 11% of the total costs, value of lost work accounts for 13% to 15% and sick leave costs for 74% to 77%. The cost of CHD was estimated at 113–133 million euros and the cost of MD was between 1.7–2.8 billion euros in 2003.

**Conclusions** This study on the economic burden of diseases attributable to job strain in France provides relevant insights for policy-makers when defining public health priorities for prevention policies.

**Objective** To determine the prevalence of work-related exposure to lead, the main circumstances of work-related exposure to lead in the general workforce, and the use of workplace control measures designed to decrease exposure to lead, in Australia.

**Method** The information came from the Australian Work Exposures Study (AWES) project, a nationwide survey which investigated the current prevalence of work-related exposure to 38 known or suspected carcinogens, including lead, among Australian workers, based on reported job tasks. Only those persons designated as having probable work-related exposure to lead were included in the analysis. Assessments were extrapolated to the national workforce with reference to the 2011 Census.

**Results** The results suggest approximately 6.6% of Australian workers were occupationally exposed to lead. Almost all exposed workers were male, about half workers worked in technical occupations and almost half worked in the construction industry. The main tasks associated with probable exposures were, in decreasing order, soldering, painting, old houses, ships or bridges; plumbing work; cleaning up or sifting through the remains of a fire; radiator repair work; machining metals or alloys containing lead; mining; and welding leaded steel. The use of appropriate respiratory control measures was inconsistent. Exposure levels were assessed as being high or medium in most cases, taking into account information on work tasks and the controls being used by workers.

**Conclusions** The study suggests exposure to lead in the Australian workforce is higher than expected based on estimates from other countries. There is considerable scope for better use of exposure control measures.

**Objective** To assess job strain and burnout status among female nurses working in primary clinics, secondary referral hospitals, and public health units in Taiwan.

**Method** Study participants included female nurses from (1) all primary clinics (PC) hiring more than two registered nurses; (2) a nation-wide representative sample of secondary referral hospitals (SRH), selected using stratified random sampling; and (3) all public health units (PHU) hiring more than two registered nurses. To candidate participants, a structured, self-administered questionnaire was disseminated, which included demographic information, work conditions, the Chinese Job Content Questionnaire, and the modified Chinese Copenhagen Burnout Inventory.

**Results** A total of 6087 questionnaires were sent, and 4046 (66.5%) were satisfactorily completed. Compared with PC nurses, nurses working in SRHs and PHUs had higher job strain (adjusted odds ratio, aOR=1.7, 95% confidence interval, CI=1.3–2.1 for SRH; aOR=2.4, 95% CI=1.7–3.4 for PHU), personal burnout (aOR=2.6, 95% CI=1.8–3.6 for SRH; aOR=3.4, 95% CI=2.1–5.7 for PHU), work-related burnout

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(aOR=2.4, 95% CI=1.8–3.1 for SRH; aOR=3.0, 95% CI=2.0–4.5 for PHU), and client-related burnout (aOR=1.6, 95% CI=1.2–2.3 for SRH; aOR=2.1, 95% CI=1.2–3.5 for PHU) while adjusted for significant variables.

Conclusions We concluded that nurses worked in public health units and secondary referral hospitals had higher job strain and work-related burnout as compared to primary clinics. Further study should examine the stressors from these workplaces and follow up the health effects of high strain and burnout status.

0164 METAGENOMIC DETECTION OF BACTERIA IN AEROSOL SAMPLES IN ANIMAL SLAUGHTERHOUSES TO DEVELOP EXPOSURE PROFILES FOR AN EPIDEMIOLOGICAL ANALYSIS

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Objectives Significant excess risks of lung cancer and haematologic neoplasms have been observed in slaughterhouse workers in eight New Zealand studies, and numerous studies conducted elsewhere. No specific causal agents have been identified, although a biological aetiology is suggested as the risk is highest in those areas where workers are exposed to live animals or to biological material containing animal urine, faeces or blood. This study aimed to assess the airborne bacterial microflora in the slaughterhouse environment in order to develop exposure categories for reanalysis of a meat workers’ cohort.

Method Bulk air samples (n = 31) were collected for between 5 and 8 h in five areas in both sheep and beef slaughterhouses using a SASS3100 sampler (fitted with a proprietary SASS filter) located between 0.5 and 2 metres from the worker. Nucleic acid was extracted from each filter and amplified using commercially available kits, then sequenced on an Illumina MiSeq instrument. Bioinformatics analyses conducted included comparative taxonomic analyses, gene function (including virulence factor) analyses, and principal component analyses to compare profiles in samples taken in different areas.

Results Of the bacteria identified over 95% were in the classes Actinobacteria, Firmicutes and Proteobacteria. Clear differences in all parameters were apparent in the different areas, however, and the full results of the comparative analyses and the development of exposure profiles will be presented.

Conclusions Metagenomic analysis of bioaerosol samples represents a promising method for the development of exposure categories for the epidemiological analysis of the effect of biological exposures in an occupational environment.

0168 SOMATISING TENDENCY, OCCUPATIONAL STRAIN AND MUSCULOSKELETAL SYMPTOMS: RESULTS FROM A LONGITUDINAL STUDY AMONG ITALIAN NURSES

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Objectives Musculoskeletal symptoms are a common cause of disability, with major impact on workforce wellbeing, absenteeism and productivity. Several, mainly cross-sectional, studies have linked such symptoms to physical workload, and also to psychological and socio-cultural factors.

We investigated whether prolonged or increasing job strain, tendency to somatise and other individual characteristics, are associated with worsening musculoskeletal pain.

Method As part of the CUPID study, we investigated a cohort of nurses employed on medical wards at the Varese University Hospitals (Italy). Participants were asked, at baseline and after one year of follow-up, about individual and occupational risk factors, psychological characteristics (including tendency to somatise), occupational strain (by Siegrist’s Effort/Reward Imbalance Questionnaire-ERI), and musculoskeletal symptoms. Associations of worsening musculoskeletal pain with perceived job strain were assessed by multivariate log-binomial regression.

Results Occupational stress was associated with pain in the lower back (LBP) and neck/shoulder (NSP) in both cross-sectional questionnaires.

Comparing baseline and follow-ups, workers who reported an increase in perceived stress showed more frequent worsening of both LBP (prevalence of worsening symptoms=41%, OR when compared with not stressed=1.7, 95% CI=1.1–2.7) and NSP (prevalence of worsening=51%, OR=1.2, 95% CI=0.8–3.2 for NSP).

This relationship persisted after adjustment for gender, age and BMI, and exposure to physical workload, and was more evident among subjects with a tendency to somatise (OR=2.8, 95% CI=1.0–7.4 for LBP; OR=1.6, 95% CI=0.8–3.2 for NSP).

Conclusions Our observation suggests that tendency to somatise modifies individual responses to “triggering exposures”, such as psychological workload, with important implications for the health, and productivity of workers.

0169 SINONASAL CANCERS: IS INTESTINAL TYPE ADENOCARCINOMA THE ONLY RELATED TO OCCUPATIONAL EXPOSURES? RESULTS FROM AN ITALIAN CASE-CONTROL STUDY

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Objectives Epithelial sinonasal cancers (SNC) are rare, severe diseases associated to the exposure to several well-established carcinogens (IARC). The etiologic role of these carcinogens in different histological subtypes is still disputed, with several studies focusing on intestinal-type adenocarcinoma (ITAC) as the most (and maybe the only) occupational-related subtype. To assess the role of occupational exposures in SNC aetiology we designed a case control study, in which occupational exposures prevalence in two group of ITAC cases and non-ITAC were compared to controls.

Method In a large Italian hospital we enrolled 50 consecutive surgical non-ITAC cases (mainly squamous-cell carcinoma), 50 consecutive ITAC cases and 50 non-neoplastic patients (controls). Previous occupational exposures to wood and leather dust, solvents, metals, formaldehyde were investigated through a
Results: Considering all tumours together, we observed large increased risks for wood exposure (OR=6.9; 95% CI=3.0–16.3) and leather (prevalence 24% in tumours, 0% among controls) only. Compared to controls, we observed an increased risk for wood exposure (OR=7.7; 95% CI=2.6–22.5) in ITAC cases, but not in non-ITAC cases (OR=0.8; 95% CI=0.2–3.1). Prevalence of leather exposure was 42% among ITAC and 6% in non-ITAC.

Conclusions: Our case control study confirmed that ITAC cases but not other histotypes were strongly related to occupational exposures, and in particular to leather and wood dusts. Grouping together all SNC types reduce the causal role of occupation exposures. Larger samples size are needed to investigate other work-related carcinogens.

Objectives: To describe the work environment of Danish 20/21 year olds and to investigate the influence of family socioeconomic background or individual characteristics at age 14/15 on later experience of physical and psychosocial work environment.

Method: The study population consisted of 695 young people with primary work affiliation at age 20/21 who were derived from a prospective youth cohort. Outcome information from the questionnaire in 2010 consisted of six questions about psychosocial work environment and two questions about physical work environment. Exposure information about school performance, vulnerability, health and parental socioeconomic status was derived from the questionnaire in 2004 and from registers.

Results: Overall, the psychosocial work environment of the young people was good but they experienced more repetitive movements and hard physical work than older workers. Individual as well as family factors in late childhood all together only had limited impact on how young people report later work environment. Low self-esteem at age 14/15 was associated with experiencing high demands, low trust and low fairness at work. In girls low self-esteem and low sense of meaningfulness were associated with experiencing low influence at work. Low parental socioeconomic status was associated with poor physical work environment.

Conclusions: This study showed a social gradient in experiencing poor physical work environment at age 20/21. The psychosocial work environment in young people was on average good, but it seems that vulnerable young people need special intention in order to prevent them from being selected into psychosocial demanding job functions later in life.

Objectives: Individual response style, mood, expectations, and health status may affect reporting of the psychosocial work environment, and bias associations with outcomes. Reporting bias may be avoided by aggregating individual responses, ideally preserving exposure contrast. In this study, we examined the degree of exposure contrast yielded by different grouping strategies.

Method: In 2007, we enrolled 4489 public employees from Aarhus, Denmark in the PRISME-cohort, with follow-up in 2009. From pay-roll registers we grouped workers at 2 organisational levels: department (n = 22) and work unit (n = 751), and 3 occupational levels: sector (n = 7), profession (n = 46), and job title (n = 77). Exposures, calculated as means of items scored on 5-point Likert scales, included psychological demands, decision latitude, social support, effort, reward, and procedural and relational justice. To assess variance components, we fitted linear mixed effect models with exposures as dependent variables, and id and grouping variables as random effects. Results are reported as the contrast in mean exposure levels e.g. between-group variance/ (between-group variance + within-group variance).

Results: Within each hierarchy contrasts rose with increasing group-level detail. Grouping by either work unit (wu) or by job title (jt) contrasts were: psychological demands: 0.28(wu); 0.26(jt), decision latitude: 0.24(wu); 0.32(jt), social support: 0.24(wu); 0.06(jt), effort: 0.23(wu); 0.16(jt), reward: 0.19(wu); 0.12(jt), procedural justice: 0.24(wu); 0.14(jt), and relational justice: 0.29(wu); 0.04(jt).

Conclusions: Grouping by work unit gave the most consistent contrasts (0.19–0.29), while grouping by job title varied considerably (0.04–0.32). These preliminary findings suggest that grouping by work unit provided better exposure contrasts than grouping by job title for all exposures, but decision latitude.
Method Using the WSIB administrative database, we acquired a random sample of 6665 injured workers who reported an uncomplicated back injury (strain or sprain) with a date of injury between January 1, 2005 and June 30, 2005. We selected, a priori, 11 variables from the database that we judged may be associated with claim closure and predicted the direction of anticipated effects. We performed a time-to-event analysis using Cox proportional hazards regression to assess the association between time to claim closure and the independent variables. Receipt of WSIB-reimbursed chiropractic care or physiotherapy were treated as a time-dependent covariate to account for when treatment was initiated during the course of the disability claim.

Results Our adjusted regression analysis showed that older age and opioid prescription (adjusted hazard ratio [HR]=0.69; 99% CI=0.53, 0.89) in the first 4 weeks of claim reimbursed by the WSIB were associated with prolonged claim closure, whereas working for an employer that had a return-to-work program (HR=1.73; CI=1.42, 2.12). Neither reimbursement for chiropractic or physiotherapy were associated time to claim closure.

Conclusions Our analysis suggests that commonly reimbursed treatment for Workers’ Compensation LBP claimants may be ineffective or even harmful.

0183 FACE VALIDITY AND INTER-RATER AGREEMENT BETWEEN EXPERT ASSESSMENTS OF OCCUPATIONAL MECHANICAL EXPOSURES IN A LOWER BODY JOB EXPOSURE MATRIX

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Objectives We constructed a lower body job exposure matrix (JEM) based on five experts’ assessments of occupational mechanical exposures. The aim of this study was to evaluate the face validity of the rankings of the job groups and the inter-rater agreement between the experts’ rankings.

Method The JEM cross tabulates the mean of five experts’ assessments of daily duration (hours/day) of standing/walking, kneeling/squatting, and whole-body vibration as well as total load lifted (kg/day), and frequency of lifting loads weighing ≥20 kg (times/day) in 121 job groups comprising occupational titles with expected homogeneous exposure patterns. The JEM covers 689 occupational titles, which were considered more than minimally exposed, out of 2227 in the Danish version of the International Standard Classification of Occupations. Weighted kappa statistics were used to evaluate inter-rater agreement on rankings of the job groups for four of these exposures. Two external experts checked the face validity of the rankings of the experts’ mean values.

Results The experts’ ratings showed fair to moderate agreement (mean weighted kappa values between 0.36 and 0.49). The external experts agreed on 586 of the 605 rankings.

Conclusions Experts agreed on rankings of the job groups, and rankings based on mean values had good face validity. However, further validation is warranted based on technical measurements or observations. The lower body JEM, which provides exposure estimates free of recall bias, has been applicable in exposure response studies of hip and knee osteoarthritis, inguinal hernia repair, varicose veins, and lumbar disc disorders.

0184 MORTALITY PROFILE OF THE FRENCH COHORT OF URANIUM PROCESSING WORKERS

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Objectives A cancer cohort of nuclear workers employed in the fuel processing cycle was set up in France in 2009 to assess the risk of cancer and non-cancer mortality related to uranium, in a context of occupational multi-exposure. Vital status and causes of death are now available.

Method The cohort includes workers employed at least 6 months between 1958 and 2006 by AREVA and CEA (French Atomic Energy Commission). Exposure assessment was realised by a dual approach combining individual monitoring data and specific job-exposure matrices, considering radiation exposures, chemical agents and physical stresses (heat and noise). Additional information like tobacco consumption and various clinical parameters (Body Mass Index, blood pressure, lipid profile etc.) was also collected from the Occupational Health Services. Vital status and causes of death were collected from French national registries.

Results The cohort includes 12 739 workers (88% men) with an average duration of employment of 17 years. The median year of birth is 1944. At the end of follow-up (31/12/2010), 19% are deceased and 96% of the causes of death are identified. Cancers (mainly lung, prostate and lymphatic and haematopoietic tissue cancers) represent 43% of all causes of death, non-cancers (mainly diseases of the circulatory system) 48% and external causes 9%. The analyses using French national mortality rates as reference will be presented.

Conclusions The observed mortality is that of an even young population and at this stage no further conclusions can be drawn. This cohort, with this wealth of data, will be very informative for the investigation of uranium related risks.

0187 ALCOHOL CONSUMPTION AS A CONFOUNDER IN NEUROBEHAVIORAL STUDIES OF NEUROTOXICANTS

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Objectives To study the effects of manganese (Mn) exposure and alcohol consumption on tremor.

Method Tremor was measured in 137 shipyard welders (age 39.9) and 137 referents (turner/fitters) (age 40.1) with the Catsys TREMOR. Alcohol consumption was assessed by measuring serum carbohydrate deficient transferrin (sCDT).

Results The geometric mean (GM) of Mn air concentration was 214µg/m³ (range 1–3230). The GM concentrations of Mn in whole blood (B-Mn) and urine (U-Mn) were 12.8µg/L and 0.36µg/g creatinine versus 8.0µg/L and 0.07µg/g creatinine in the referents. Concentration of sCDT (%) was 0.71 in welders and 0.65 in referents.
No significant differences in tremor measures were found when all welders were compared with all referents. Altogether twenty-five subjects had sCDT above the pathological level 1.7%.

The subjects with high sCDT had increased tremor. Dominant hand: Tremor Intensity 0.21 m/s², compared to 0.15 m/s² (p < 0.001) for subjects with sCDT < 1.7%. Non-dominant hand: Tremor Intensity 0.22 m/s² vs 0.15 m/s²; (p < 0.001).

The same pattern was found when the 16 welders with sCDT ≥ 1.7% were compared with welders with sCDT values < 1.7%. The concentrations of the biological exposure indicators were similar in the welders with sCDT ≥ 1.7% compared to the other welders (B-Mn 12.8 vs 12.7 µg/g cr.; U-Mn 0.34 vs 0.36 µg/g cr.; S-Mn 1.3 vs 1.0 µg/L).

Conclusions No effect of manganese exposure on tremor was observed, in contrast to a large effect from alcohol consumption. The results suggest that alcohol consumption can operate as a serious confounder in epidemiological studies of neurotoxicants.

Objectives Prevalence studies of thoracic spinal pain (TSP) in the working population are scarce. The epidemiological surveillance of musculoskeletal disorders (MSDs), implemented in 2002 by the French Institute for Public Health Surveillance, allows the study of the prevalence of TSP in a large sample of workers. The aim of this study is to present the prevalence of TSP during the preceding 7 days in the Pays de la Loire region’s workforce according to age, combination with low back pain and neck pain, occupational category and industry sector, separately in men and women.

Method A random sample of 3710 workers (58% of men) aged 20–59 years, representative of the regional workforce, was constituted between 2002 and 2005. Medical and occupational data were gathered by questionnaire.

Results The prevalence of TSP was higher among women (17.4%) than men (9.2%), without age difference. Only 15.2% of TSP in men and 15.7% in women was declared without low back pain or/and neck pain. Among men, lower-grade white-collar workers were more likely to report TSP (16.6%) than other occupational categories workers (upper white-collar and professionals: 7.2%), technicians/associate professionals: 6.5%, blue-collar workers: 9.7%). Among women, upper white-collar and professionals were more likely to report TSP (25.6%) than the others (technicians/associate professionals: 17.0%, lower-grade white-collar workers: 17.1%, blue-collar workers: 16.7%). The study did not suggest a significant difference in the prevalence of TSP according to sectors in either men or women.

Conclusions This study shows that, among workers, TSP is frequent and often combined with low back pain or neck pain.
nested case-control study was performed to collect individual information concerning classical CSD risk factors (weight, height, smoking status, blood pressure, blood glucose and cholesterolemia) from medical files for 76 cases of death from CSD (including 26 from IHD and 16 from CVD) and 237 controls, matched for attained age and birth date and counter-matched for cumulative radon exposure.

Results In the whole cohort, a significant association with cumulative radon exposure was observed for CVD mortality, but not for CSD or IHD mortality. In the case-control study, no significant unadjusted Odds-Ratio for cumulative radon exposure was observed for any endpoint. Analyses adjusted on CSD risk factors, for which missing data do not exceed 25%, are ongoing.

Conclusions The issue of CSD associated to ionising radiation is crucial for radiation protection. The present study, allowing to consider individual data on major classical CSD risk factors, will contribute to improve knowledge on the effects of low dose exposure.
time periods at the calendar cut point, the 9992 job/time periods were assigned their relevant expert/group/time period estimate. Classification and regression tree (CART) models were developed to predict each expert’s expected assignment, based on previous decisions, to assign estimates for jobs in groups that expert had not assessed and for jobs requiring further review.

Results In preliminary analyses, CART models predicted 91–96% of the experts’ pre-1995 estimates and 77–96% of ≥1995 estimates. CART estimates were assigned to 3–48% of the job/time periods, varying by expert. Overall, 92% of the job/time periods were assigned the same estimate by at least two experts.

Conclusions Our framework reduced the number of exposure decisions needed from each expert compared to job-by-job assessment. Future work will use CART models to identify differences between experts to be resolved and incorporate frequency and intensity of lead exposure estimates.

0200 NIGHT SHIFTWORK AND BREAST CANCER SURVIVAL IN DANISH WOMEN

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Objectives There is mounting evidence that night shiftwork may increase the incidence of female breast cancer. The influence of night shift work on survival of breast cancer has, however, not been reported. The aim of the present study is to elucidate breast cancer survival in different types of former non-day shift workers compared to day-workers.

Method In total 1157 women (23% nurses), aged less than 75 years, diagnosed with breast cancer (2000–2004) participated in two independent nationwide case-control studies on night shift work. Information on the entire work life, including night shift work and potential risk factors for breast cancer (e.g. reproduction, BMI, alcohol, HRT, heredity and diurnal preference) was obtained by telephone interviews. All study subjects were followed up for death in the National Cause of Death Register until end of 2011. Cox proportional hazard models and Kaplan-Meier survival plots were used to perform time-to-event analyses.

Results In total 127 breast cancer cases (11.0%) had died from this disease at end of follow-up (median follow-up 12.6 years). There was a significant tendency of decreasing survival of breast cancer among both fixed and rotating nightshift workers compared to daytime shiftworkers and by increasing years of prior non-day time work (p = 0.04). Evening workers had about same survival as day workers. The results were only slightly affected by confounders.

Conclusions These data suggest that night shift work prior to breast cancer seems to decrease survival. The association was not strongly modified by lifestyle factors.

0202 THE IMPACT OF RESPIRABLE DUST AND RESPIRABLE QUARTZ ON PULMONARY FUNCTION - RESULTS OF A LONGITUDINAL STUDY

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Objectives The present study sought to examine the long-term effects of exposure to respirable dust, in particular of respirable quartz on pulmonary function.

Method The study is based on the Wismut cohort of former uranium miners. Spirometric data, including forced expiratory volume in 1s (FEV1) and forced vital capacity (FVC) were ascertained together with quantitative estimates of cumulative exposure to respirable dust and respirable quartz for each of the 1421 study subjects born between 1954 and 1956. Linear mixed regression models were fitted to identify significant determinants of longitudinal changes in lung function parameters. Point estimators and confidence intervals for the exposure concentration threshold value were fitted by partial likelihood profiles of the corresponding models.

Results Overall, 7122 data records were included in the analysis - on average five spirometries for each miner. The mean annual exposure concentration to respirable quartz was 0.072 mg/m³. It was shown that cumulative exposure to 1 mg/m³-year respirable quartz leads, on average, to a relative reduction in FEV1 of 2.07% and in the quotient of FEV1/FVC of 2.75% (p < 0.001). The analysis of the whole respirable dust shows, that the fraction of quartz in the dust is the decisive determinant for the impact of dust. A significant improvement of model fit by applying threshold models could not be observed.

Conclusions This study adds further evidence on the long-term effects of exposure to respirable quartz. Current exposure limits for respirable quartz require a critical review.

0203 THE LUNG BURDEN OF ASBESTOS FIBRES (AF) AND ASBESTOS BODIES (AB) AND THE RISK OF MESOTHELIOMA (MM) FOR EXPOSURES CEASED 30 YEARS AGO

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Objectives To estimate the risk of MM according to AF and AB in the lungs.

Method Freezed dried lung samples from 309 MM and 41 controls have been analysed for AF (Scanning Electronic Microscopy) and AB (Optical Microscopy) from subjects investigated and classified for probability and circumstances of asbestos exposure. Odds Ratios (OR) were obtained using logistic regression.

Results 234 (82%) MMs have been classified as occupationally and 23 (8%) as non-occupationally exposed: Geometric Mean (GM) for AB burden was 1 950 000 and 608 000 ffg/dlt, respectively; and 39 300 and 3300 for AB of 75% and 58% of the AF respectively were amphibole.

Controls reported a GM of 269 000 AF and 28 of AB g/dlt.

For any increase of 100.000 ffg/dlt, we computed an OR of 1.7 (1.3–2.3) for amphibole, 1.1 (1.0–1.3) for chrysotile, among occupational MMs; an OR of 1.3 (1.0–1.7) and 1.1 (1.0–1.1) among non-occupational MMs.

The 1997 Helsinki criteria for attribution to occupational exposure would have excluded more than 30% of MMs under study: here occupational exposures ceased on average 26 years before the disease, and therefore clearance and time since last exposure must be taken into account because are relevant determinants of the retained amount of fibres.

Conclusions The risk of MM increases with the amount of retained amphibole, and to a lesser extent, of chrysotile fibres. Because occupational and non-occupation asbestos exposures have been to mixture of fibres, the lungs of MM patients are still loaded with amphibole AF.

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Objectives To characterise geographical distribution and time trends of chronic kidney disease (CKD) mortality in the context of the epidemic of Mesoamerican nephropathy (MeN), likely related to occupational heat stress and other, unknown, factors.

Method Vital statistics (1970–2012) provided deaths from CKD and unspecified renal failure. Data of four censuses were extrapolated to derive person-years by sex and 10-year age groups for the seven provinces and 81 counties. SMRs were compared for three time periods between provinces and between counties, with national rates as reference. To assess time trends, age-specific and age-standardised mortality rates were computed for 5-year periods.

Results During 1970–2012, 3,843 men and 2,452 women died from CKD. In the Guanacaste province, the SMR for 1979–2012 was four-fold in men and two-fold in women. In Guanacaste, CKD mortality increased from the mid-1970s in men, and mid-1980s in women. Age-standardised rates per 100,000 in men aged ≥30 increased from 5.8 in the early seventies to 7.50 in 2007–2012, compared to 5.9 to 16.2 in the rest of Costa Rica. For women, rates increased from 4.5 to 20.7 in Guanacaste versus 4.2 to 9.7 in the rest of the country. Within Guanacaste, there was marked spatial variation in mortality between counties, with patterns being consistent between time periods but different for men and women.

Conclusions Guanacaste is a heterogeneous CKD “hot spot,” affecting mostly men, but to lesser extent also women. CKD seemed high already four decades ago in the province. These findings are pertinent for etiologic research.

Lung Cancer Risk Among Bricklayers in a Pooled Analysis of Case-Control Studies

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Objectives Bricklayers may be exposed to several lung carcinogens, including crystalline silica and asbestos. Previous studies reported an excess of lung cancer among these workers. We examined lung cancer risk among bricklayers within SYNERGY, a large international pooled analysis of case-control studies on lung cancer and the joint effects of occupational carcinogens (http://SYNERGY.iarc.fr).

Method The pooled dataset included 15,608 cases and 18,531 controls from 22 centres in Europe, Canada, Hong Kong, and New Zealand. For men ever employed as bricklayers we estimated odds ratios (ORs) and 95% confidence intervals (CIs) adjusted for study centre, age, lifetime cigarette smoking history, and employment in occupations with exposures to known or suspected lung carcinogens.

Results We found 1322 cases and 1004 controls who had ever worked as bricklayers (OR: 1.35; 95% CI: 1.22–1.49). There was a clear positive trend with length of employment (P < 0.0001). The relative risk was higher for squamous (OR: 1.44, 95% CI: 1.28–1.63, 578 cases) and small cell carcinomas (OR: 1.60, 95% CI: 1.36–1.87, 248 cases), than for adenocarcinoma (OR: 1.14, 95% CI: 0.98–1.32, 289 cases) (P-value for homogeneity: 0.0007). ORs were still elevated after additional adjustment for education and in analyses using blue collar workers as referents.

Conclusions This study provided additional evidence of increased lung cancer risk in bricklayers. Although non-causal explanations cannot be completely ruled out, the association is plausible in view of the potential for exposure to several carcinogens, notably crystalline silica and to a lesser extent asbestos.

Solar Ultraviolet Radiation (UVR) Exposure Levels and Sun Protection Behaviours in Outdoor Workers in British Columbia, Canada

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Objectives “Traditional” occupational health research has focused on hazard identification in the work environment and the effects on health. Young adults represent 13% of the UK working population, yet little is known about whether pre-existing conditions are associated with their job choice.

Method The study was based on data from the Avon Longitudinal Study of Parents and Children (ALSPAC). At 16 and 18 years, participants were asked to report their current employment. Information on pre-existing asthma was obtained from previous questionnaires. Multivariate analysis was applied to determine the relationship between previous illness and current occupations.

Results A total of 5087 and 3347 participants responded to the 16 and 18 years questionnaires, respectively. At 16, 4.3% left full time education for employment and 26.0% at 18. Perceived overall health was slightly better among those still in education at 16 years, although such difference was no longer observed at 18. Those with a previous diagnosis of asthma were less likely to be employed in jobs associated with high risk of adult onset asthma (OR = 0.78; 95% CI 0.59–1.02). On the other hand, those who reported to have asthma at 16 but not at 18 were more likely to be engaged in high risk jobs (OR = 2.20; 1.35–3.58).

Conclusions Results of this prospective study suggest a possible “healthy hire effect” among young people with asthma, although such avoidance might be modulated by the time of diagnosis.
EPIDEMIOLOGICAL SURVEILLANCE OF WORK-RELATED INJURIES IN NORWAY: AN ENDURING CHALLENGE

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Objectives The goal of this study was to measure outdoor workers’ exposure to solar UVR in a Canadian setting, and to examine their sun protection behaviours at work and leisure.

Method Participants were recruited via trade unions and companies with outdoor operations. Workers wore an electronic dosimeter that measured UVR intensity once/minute for 5 working days and completed a questionnaire on skin cancer risk factors, sun protection behaviours, and job characteristics. Dosimeter data was converted to UVIndex and Standard Erythemal Dose (SED), an indicator for the potential for sunburn.

Results Seventy-eight outdoor workers were recruited. The workers were largely male (95%), with a mean age of 38 years. Workers that reported the most outdoor working hours had the highest measured UVR exposure (mean SED of 2.6, 8 times the level of those reporting ≥1 outdoor hour). Workers who reported the most outdoor hours at work also reported the most outdoor hours at leisure. Over 70% of workers reported using sleeved shirts, hats, and sunglasses at work ‘often or always’. Sunscreen and shade-seeking were low, with 29% and 8% reporting these behaviours at work, respectively. Despite reasonable protective behaviours, 70% of workers reported ≥1 sunburn last summer; this climbed to 80% among those who worked outside all day.

Conclusions Outdoor workers in Canada are at risk of high solar UVR exposure during the summer. They participate selectively in sun protective behaviours, opting more often for clothing protection than sunscreen or shade protection. Most experience acute damage from exposure (i.e. sunburn) despite attempting to protect themselves.
States. Studies of underground miners, who often were exposed to high concentrations of radon, have been used to estimate public health impacts of domestic radon exposure. The healthy worker survivor bias - a condition resulting when individuals in relatively good health tend to work longer and thus become more exposed than individuals in relatively poor health - may be influencing estimates of occupational radon impacts on lung cancer, but this bias has not been thoroughly explored.

**Method** We implement G-estimation of a structural nested accelerated failure time model to adjust for time-varying confounding by employment history to partially control the healthy worker survivor bias in the Colorado Plateau uranium miners cohort.

**Results** 615 miners in our cohort died of lung cancer. Assuming no time-varying confounding, we estimate a time ratio (95% confidence intervals) per 1000 working level months of exposure of 1.55 (1.53, 1.58), and 1.95 (1.86, 2.04) when to control healthy worker survivor bias, a relative increase of 126%. Estimates of the radon-associated excess cases were 118 under standard methods and 179 when we controlled for the healthy worker survivor bias.

**Conclusions** There is evidence of a healthy worker survivor bias in standard analyses of the radon-lung cancer association in this cohort. The findings suggest need for further consideration of current estimates of the health impact of radon in occupational and environmental settings.

**THE NIEHS GULF STUDY: MENTAL HEALTH SYMPTOMS AMONG PARTICIPANTS INVOLVED IN THE DEEPWATER HORIZON OIL SPILL CLEAN-UP**

**Objectives** Workers and communities impacted by previous oil spills have shown increases in adverse mental health outcomes. The GuLF STUDY is investigating potential health effects among workers involved in the Deepwater Horizon oil spill clean-up response. Participants confronted physical and psychosocial stressors including exposures to oil and dispersants, income uncertainties, and challenges of family and community disruption.

**Method** Information on demographics, health, and clean-up experience was collected by telephone. Standardised surveys administered to 11 210 participants during home visits captured mental health outcomes including depression, anxiety, PTSD, resiliency, and perceived stress. A summary measure of adverse mental health was defined as having a poor outcome on at least one of the five standardised scales. Mental health outcomes were evaluated in relation to clean-up jobs in models that excluded one of the five standardised scales. Mental health outcomes including depression, anxiety, PTSD, resiliency, and perceived stress. A summary measure of adverse mental health outcomes including depression, anxiety, PTSD, resiliency, and perceived stress. A summary measure of adverse mental health outcomes including depression, anxiety, PTSD, resiliency, and perceived stress.

**Conclusions** Adverse mental health outcomes were found among individuals in the GuLF STUDY population but further work is necessary to clarify the factors leading to these outcomes.

**PRESSURE PAIN SENSITIVITY AND STRESS**

**Objectives** During clinical observations of patients with heart diseases and stress related disorders, it has been observed increased pain sensitivity on specific locations on the skin of the sternum.

**Method** This sensitivity was measured as the pressure pain sensitivity (PPS) by UlM Metre instrument. Measured PPS values 60 or more indicate high PPS, values below 40 indicate low PPS.

**Results** There are presented results of PPS measurements in 371 men (av. age 43.6 + 10.4 years, 19–66 years); 345 of them were without diagnosis of disease. Average PPS values (whole group) were 36.6 + 9.5 (1. measurement) and 36.7 + 8.5 (2. measurement) (r = 0.89). Road drivers (177 men, PPS values 35.7 + 9.4, resp. 36.4 + 10.9) were not significantly different against other occupations (194 men, PPS values 36.5 + 9.5, resp. 37.8 + 11.4). Men with neuropsychological disorders were statistically significantly different against asymptomatic men (PPS values 50.8 + 14.8, resp. 67.3 + 11.4 vs. 38.8 + 13.3, resp. 35.5 + 5.9, p = 0.002, resp. less than 0.001) and also against men with different diagnosis (PPS values 50.8 + 14.8, resp. 67.3 + 11.4 vs. 38.8 + 13.3, resp. 43.4 + 19.7, p = 0.015, resp. 0.001). Men with other than neuropsychological symptoms doesn’t differ significantly in PPS values against asymptomatic men.

**Conclusions** Method of measurement of PPS could be helpful in medical fitness assessment to work in safety related occupations and is useful for health promotion intervention program. Supported by research project of Charles University in Prague PVIUK P25/LF1/2.

**IDENTIFICATION OF SHORT-TERM, LONG-TERM AND LIFELONG DNA METHYLATION MARKERS OF EXPOSURE TO TOBACCO SMOKE: EVIDENCE FROM EPIC AND NOWAC STUDIES**

**Objectives** The aim of our study is to validate and complement recently reported epigenetic biomarkers of exposure to tobacco smoke based on data from two cohorts and to characterise their prospective nature.

**Method** We used case-control data from studies nested in two prospective cohorts: the Italian component of the European Prospective Investigation into Cancer and Nutrition study (N = 620) and the Norwegian Women and Cancer study (N = 382) as a validation dataset. For each of the participant, genome wide methylation dataset. For each of the participant, genome wide methylation profile was acquired from blood samples collected at enrolment using the Illumina HM450 DNA methylation array. We performed epigenome wide association studies within each dataset to assess the relation between methylation levels and smoking-related variables, controlling for technical variation (batch effects) and confounding factors (including white blood cell composition).
Oral presentation

Results We found 8 and 897 CpG sites differentially methylated in former and current smokers, while compared to never smokers, respectively. The 8 candidate markers of former smoking showed a gradual reversion of their methylation levels from those typical of current smokers to those of never smokers. Further analyses using cumulative (over varying time windows) smoking intensities, highlighted three classes of biomarkers: short and long term biomarkers (measuring the effect of smoking in the past 10, and in the past 10 to 30 years respectively), and lifelong biomarkers detected more than 30 years after quitting smoking.

Conclusions Genome-wide DNA methylation profiles show promising abilities to detect short-term to lifelong biomarkers of tobacco smoke exposure and, more generally, to potentially identify time-varying biomarkers of exposure.

Objectives To apply Marginal Structural Models (MSM) to address healthy workers survivor effect in a cohort study of active workers when time varying variables on health status and exposure are measured.

Method We used Cox MSMs and inverse probability weighting to assess the effect of PM$_{2.5}$ exposure on incident ischaemic heart disease (IHD) in an active cohort of 11 966 US aluminium workers. The outcome was assessed using medical claims data from 1998 to 2012. Quantitative exposure metrics of current exposure to PM$_{2.5}$ were dichotomized using different cutoffs and effects were assessed separately for smelters and fabrication. Risk score based on insurance claims was available as a time varying health status variable.

Results Defining binary PM$_{2.5}$ exposure by the 10th percentile cut-off, health status was affected by past exposure and predicted subsequent exposure in smelters, but not in fabrication. A Traditional cox model was appropriate for fabricators; the hazard ratio was 1.51 (95% CI: 1.12 – 2.06) and was attenuated when considering higher exposure cutoffs. In smelters, Cox MSM Hazard Ratios for IHD comparing the effect of exposure in a population had everyone always been exposed to everyone always unexposed, using the 10th percentile exposure cutoff was 1.83 (95% CI: 1.14 – 2.94). Higher exposure cutoffs also resulted in attenuated effects.

Conclusions Marginal Structural Models can be used in active employment occupational cohorts to address time varying confounding. Results from the current study suggest that occupational exposure to PM$_{2.5}$ in the aluminium industry increases the risk of IHD in both smelters and fabrication.

Objectives Exposure to metalworking fluid (MWF) causes respiratory outcomes such as asthma and chronic bronchitis, as well as symptoms including phlegm and wheezing. Chronic obstructive pulmonary disease (COPD) encompasses these outcomes, and so is a potential result of MWF exposure. Recent evidence based on g-estimation suggests that reducing exposure to MWF would substantially decrease years of life lost due to COPD. The objective of this analysis is to examine the exposure-response relationship between direct exposure to MWF and COPD mortality in a large occupational cohort.

Method Hazard ratios were estimated using Cox proportional hazards models for the association between cumulative exposure to the thoracic fraction (PM$_{9.8}$) of straight, synthetic, or soluble MWF and COPD mortality. Subjects directly exposed to each fluid type were compared to those who were never directly exposed (assembly workers).

Results Hazard ratios for exposure quartiles increased in a non-monotonic fashion, with a maximum of 1.6 for straight, 1.4 for soluble, and 1.5 for synthetic, reflecting an increased risk of COPD for exposed subjects. However, none of the HRs were significant at the 95% confidence level. Indirect adjustment for...
cigarette smoking (based on smoking rates in a cross-sectional survey) did not influence the estimates.

**Conclusions** While the results of this analysis did not reach statistical significance, they provide evidence supporting previous studies showing a risk of COPD associated with MWF exposure. The hazards presented are likely to be underestimates of the true association between COPD and MWF, due to the healthy worker effect.

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**0225 CANCER, MORTALITY AND ACUTE MYOCARDIAL INFARCTION IN WORKERS EXPOSED TO RESPIRABLE CRYSTALLINE SILICA DUST AT A SWEDISH PORCELAIN FACTORY**

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**Objectives** Exposure to silica dust is a health hazard in the ceramic industry. We studied cancer, mortality and acute myocardial infarction (AMI) among workers at a Swedish porcelain factory.

**Method** Annual average of exposure levels were estimated from 436 personal measurements of respirable crystalline silica dust (RCS) from 1971–2006. We investigated mortality, incidence of cancer, and first time event of AMI in men and women employed for at least one year at the factory in 1958–2009. We also studied the effect of latency, duration and cumulative exposure.

**Results** RCS-levels among highly exposed workers were five times higher than the OEL and ten times higher in the early 1970s as in 2000.

We found a non-significant elevated risk for lung cancer, (SIR 1.39; 95 % CI 0.79–2.25) and a significant elevated risk of squamous cell carcinoma in men (SIR 2.37; 1.02–4.66).

Mortality from respiratory diseases was increased (SMR 1.75; 1.22–2.44), especially in men (SMR 1.86; 1.22–2.70). Among women, the risk for mortality from diseases of the circulatory system and incidence of AMI was elevated but not statistically significant. We found no dose-response relationship. There were eight cases of silicosis, and seven appeared with more than 30 years latency.

**Conclusions** The increased risk for lung cancer and mortality from respiratory diseases was expected in view of the well-documented harmful effects of RCS. The tendency among women for increased mortality from diseases of the circulatory system and an increase in the incidence of AMI should be investigated in further studies.

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**0228 PERCEIVED WORKPLACE DISCRIMINATION AND SELF RATED HEALTH IN THE CHILEAN WORKFORCE**

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10.1136/oemed-2014-102362.97

**Objectives** Increased research shows that perceived discrimination adversely affects physical and psychological health. Even though discrimination or concealed racism is an important characteristic of the Chilean society, which can be confirmed historically, it is not perceived as an important social problem for mainstream Chile. This paper aims to estimate the prevalence of workplace perceived discriminatory experience (WPDE) and its association with self-rated health status in the Chilean workforce.

**Method** Data from the first national survey on employment, work, and health in Chile. Study population of 9720 selected by multistage random sampling drawn to be representative of the entire working population. Study participants were asked about their WPDE (multiple questions) and general self rated health status (one question). Adjusting by demographic and socioeconomic factors, multivariable Poisson-log generalised linear mixed models were used to estimate the association between WPDE and self-rated health.

**Results** Approximately 17% reported being a victim of WPDE. Age, income, education, and minority (nine ethnicities) were strongly associated with WPDE. Female workers showed higher rate (19.6%) of WPDE than male workers (15.6%). After simultaneously controlling for potential confounders, WPDE was positively associated with poor self-rated health (PR = 2.12, CI = 1.46–3.05).

**Conclusions** There is positive association between WPDE and poor self-rated health in Chile. These results may be used to emphasise the importance of enacting preventive and protective workplace discrimination policies. Further research is required to study the causal mechanism of the link and best preventive and protective measures.

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**0231 ACUTE INFLAMMATORY RESPONSE TO SECONDHAND SMOKE EXPOSURE AMONG NON-SMOKING CONSTRUCTION WORKERS: A REPEATED MEASURES STUDY**

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10.1136/oemed-2014-102362.98

**Objectives** This study aimed to characterise the cardiovascular inflammatory response to secondhand smoke (SHS) exposure among non-smoking construction workers.

**Method** Non-smoking workers (n = 27) were recruited from a local union and monitored inside a union hall while exposed to SHS over approximately 6 h. Using a repeated measures study design, blood samples were taken before SHS exposure (baseline), immediately following SHS exposure (post) and the morning following SHS exposure (next morning). Inflammatory markers including acute phase proteins (SAA, CRP), adhesion molecules (s-ICAM, s-VCAM), and inflammatory cytokines (IL-1, IL-2, IL-6, IL-8, IL-10, TNF-alpha, VEGF) were analysed. Linear mixed effects regression models were used to examine within-person changes in inflammatory markers at post and next morning compared to baseline. Exposure-response relationships with TWA PM2.5 were also examined using mixed effects models. All models were adjusted for age, BMI and circadian variation.

**Results** There was a decrease in SAA (baseline = 2322 ng/ml, post = 1949 ng/ml, p = 0.04) and TNF-alpha (baseline = 9.6 pg/ml, post = 8.4 pg/ml, p < 0.01) post exposure, as compared to baseline. There was a decrease in IL-10 (baseline = 5.9 pg/ml, next morning = 6.5 pg/ml, p < 0.01) next morning compared to
BARRIERS AND FACILITATORS OF SUPPLYING A TREADMILL WORKSTATION TO OFFICE WORKERS: USABILITY, SAFETY, COMFORT, AND PRODUCTIVITY. A QUANTITATIVE STUDY

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10.1136/oemed-2014-102362.99

Objectives Characterise usability, safety, comfort, and impact on productivity of treadmill workstations in real worksites.

Method Office workers volunteered to try out for six months a treadmill workstation consisting of a height-adjustable electric desk, a walking treadmill, and their own sitting device (chair or “sitting ball”). They were instructed to set up and use the workstation at will. Monthly individual and group meetings were performed to gather qualitative data.

Results USABILITY: Difficult set up of the workstation, which demanded use of wireless mouse and keyboards and generated creative arrangements. Unanimous love for the adjustable electric desk. Difficult to talk to people while walking (disrespectful, “On the treadmill we are taller” - affect hierarchies). SAFETY: There was no event of either trips or falls. COMFORT: An important difficulty was during the first weeks to get used to “standing desk”. Usability continued to improve over the six months. An increase in the mean walking speed of 2.5 mph was the most used and comfortable speed. Walking on the treadmill was not compatible with drawing or working with spreadsheets.

Conclusions Treadmill workstation did not meet workers’ expectations but the electric adjustable desk exceeded those expectations. Guiding and external motivation to increase use would have been accepted and expected. DESIGN RECOMMENDATIONS: Reduce maximum speed. Even 2.0 mph is too much. Additional design study needed to improve global workstation setup without decreasing flexibility and adaptation of the station.

HAIRDRESSERS ARE OCCUPATIONALLY EXPOSED TO ORTHO- AND META- TOLUIDINE

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10.1136/oemed-2014-102362.101

Objectives Hairdressing work is classified as carcinogenic based on excess risk for bladder cancer. We aimed at evaluating if current hairdressers are exposed to established/suspected bladder carcinogens (aromatic amines) and indicate possible sources of exposure.

Method Hairdressing salons listed in the telephone book were contacted for personal visits, 295 hairdressers were recruited (an estimated half of the eligible invited subjects). For comparison we included 32 consumers and 60 controls employed at our hospital. The study was restricted to female non-smokers. Questionnaires including frequency of performed work tasks were filled in by the hairdressers, and all subjects reported personal hair dye use, and exposure to environmental tobacco smoke. Blood samples were taken for analysis (gas chromatography-tandem mass spectrometry; GC-MS/MS) of ortho (o)-, meta (m)-, and para (p)-toluidine; 2-, 3-, and 4-ethylaniline, 2,3- and 3,4-dimethylamine as haemoglobin adducts.

Results Adduct concentrations did not differ significantly between hairdressers, consumers and controls. However, for hairdressers, o- and m-toluidine concentrations increased with the weekly performed number of permanent hair dyeings (p = 0.026), and hair waving treatments (p = 0.020). o- and m-Toluidine concentrations also tended (p = 0.076 and 0.080, respectively) to increase with the frequency of light colour permanent
hair dyeings. The results were not driven by personal hair dye use, or smoking (key subjects additionally evaluated for cotinine). Analysis of a randomly chosen hair waving product confirmed the presence of o- and m-toluidine.

Conclusions Our observations indicate that hairdressers are currently exposed to an established (o-toluidine), and a suspected (m-toluidine), human carcinogen from permanent hair dyes (including light colours) and unexpectedly also from hair waving.

Method The study is based on data from the Musculoskeletal Research Database at the Danish Ramazzini Centre, comprising nine previous studies on musculoskeletal symptoms in working populations, performed from 1993 to 2005. The study was limited to participants aged 18–65, yielding 39 258 individuals, 22 669 women (58%) and 16 589 men (42%). Mean age at baseline was 42.9 years. Occupational mechanical exposures were assessed by a job exposure matrix linking job title to expert ratings of e.g. lifting, which was divided into three groups based on daily lifting: 0 kg (representing minimal exposure), 1–1000 kg, and >1000 kg. Cases of first time surgery for herniated lumbar disc (n = 1025) or lumbar fusion (n = 447) until 2012 were identified in the Danish National Patient Register. In preliminary analyses, risk estimates were obtained by logistic regression analysis, adjusting for age, gender, and study.

Results An exposure response relationship was seen for herniated lumbar disc: OR=1.2 (95% CI 1.0–1.4) for 1–1000 kg/day, and OR=2.2 (1.9–2.6) for >1000 kg/day. For lumbar fusion: OR=1.5 (1.2–2.0) for 1–1000 kg/day, and OR=2.8 (2.4–3.5) for >1000 kg/day.

Conclusions Lifting was associated with later operations for both herniated lumbar disc and lumbar fusion. In further analyses, lifestyle factors and occupational psychosocial exposures will be addressed.

Method Most burden of disease estimates require considerable assumptions or methodological decisions about factors concerning exposure, the appropriate relative risk to match with the exposure, and/or the size of the exposed population. These assumptions usually arise from a lack of data and could be largely overcome by the provision of better data. It is reasonable to expect that for some areas these data will improve with time, but for other areas the required data will probably never be available.

Other assumptions or methodological approaches vary depending primarily on theoretical considerations that are arguable and unlikely to ever be definitively solved by better data availability. Modelling may sometimes be of use but may not always be appropriate or practical and is still likely to involve some assumptions.

Results For example, some countries have reasonable estimates of asbestos exposure and some have good data on at least one asbestos-related outcome (mesothelioma incidence/mortality).

How can this information be validly used for burden estimates where such data are poor?

Conclusions It is helpful to consider the extent to which burden estimates vary depending on the assumptions and methodologies involved when assessing the validity of estimates and their usefulness. Consideration of the potential for future improvements in data and better understanding of theoretical aspects should be an important input into the planning of future burden of disease work.

Method Most burden of disease estimates require considerable assumptions or methodological decisions about factors concerning exposure, the appropriate relative risk to match with the exposure, and/or the size of the exposed population. These assumptions usually arise from a lack of data and could be largely overcome by the provision of better data. It is reasonable to expect that for some areas these data will improve with time, but for other areas the required data will probably never be available.

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Corresponding values above the WHO threshold of 20 µg/m³ would be 51.73 attributable deaths (12.58 cardiovascular and 4.17 respiratory) 13.60 cardiac, 5.37 cerebrovascular and 49.13 respiratory hospital admissions.

Conclusions The expected exposure appears to have a limited impact on health. Future monitoring of the actual exposure levels during the progress of the works will allow evaluating the accuracy of those estimates.

**0259** INTERACTION BETWEEN GENETIC AND OCCUPATIONAL FACTORS IN LUNG CANCER AETIOLOGY. A POPULATION-BASED CASE-CONTROL STUDY

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Objectives Genetic susceptibility in work-related lung cancer aetiology could have an important public health impact. Few studies have previously evaluated this issue, with inconsistent results. We aimed to investigate interactions between exposure to occupational carcinogens and genetic polymorphisms in lung cancer aetiology, adopting a systematic integrated approach.

Method EAGLE, a population-based case-control study, enrolled 2100 lung cancer cases and 2120 controls (Italy, 2002–2005). Lifetime work histories were collected for 4059 subjects and translated into exposure to six occupational carcinogens (asbestos, silica, polycyclic aromatic hydrocarbons, diesel exhausts, chromium, and nickel) using a job-exposure matrix. We selected 298 tagging single nucleotide polymorphisms (SNPs) in lung cancer aetiology, adopting a systematic integrated approach. We tested for interaction within smoking-adjusted logistic regressions where SNPs were modelled individually, by gene group (using gene scores), and by pathways. False discovery rate (FDR) was used to account for multiple testing. Gene expression changes in lung tissues were studied for SNPs-carcinogens significant interactions.

Results Asbestos had the highest impact on lung cancer burden, we restricted interaction tests to this carcinogen. GSTM4 polymorphisms consistently showed positive interactions across different analysis levels, especially by SNP group score (FDR-adjusted p-value for interaction < 0.0001). No significant genetic “signal” by asbestos exposure was found at lung tissue level.

Conclusions GSTM4 polymorphisms may play a role in asbestos-related lung cancer aetiology. These findings are biologically plausible and have never previously been reported; they should therefore be validated in further studies.

**0260** MORTALITY IN THE FRENCH COHORT OF NUCLEAR WORKERS MONITORED FOR EXTERNAL RADIATION EXPOSURE

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Objectives Estimates of burden of disease are generally based on population attributable fractions (PAFs) calculated for a whole population. However, the age structure of an exposed group has an impact on these estimates, because disease rates vary by age and the exposed population may be younger than the national population in the estimation year.

Method To account for this, PAFs can be calculated by age, and applied separately by age to national incidence data. We have adapted our risk period methodology, which takes account of latency to estimate numbers exposed to a causative agent using Levin’s formula for PAF, to estimate a workforce turnover factor by age group, which accounts for the age structure of an exposed population. To estimate age-specific RRs from unit relative risks per year of exposure, the link between age and duration of exposure can be modelled using Monte-Carlo methods.

Results We show the effect of estimating the burden of lung cancer due to occupational exposure to respirable crystalline silica for Britain using PAF estimates which do or do not take age into account. Taking account of age and assuming recruitment between ages 15–44, there were 1188 lung cancer registrations in males in 2010, or 798 without accounting for age, or 636 vs. 804 assuming recruitment between ages 15–24. The extension to using age-specific RRs is demonstrated for occupational asbestos-related lung cancers.

Conclusions Given the above results, and although highly dependent on assumptions made about workforce ages, there is clearly a case to be made to estimate PAFs by age.

**0261** ESTIMATING THE BURDEN OF OCCUPATIONAL CANCER TAKING INTO ACCOUNT AGE

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Objectives Understanding the effect of chronic low dose radiation exposure is crucial for radiation protection. This study analyses mortality of workers monitored for external radiation exposure while employed at three major French nuclear companies.

Method The cohort includes all workers employed at least one year by CEA, AREVA NC or EDF between 1950 and 1994, monitored for radiation exposure and alive on 1 January 1968. The mortality follow-up was to 2004. Vital status and causes of death were obtained from national registries. Standardised mortality ratios were assessed using national rates as the reference.

Results A total of 59 004 workers were followed-up for an average of 25 years. Mean age at end of follow-up was 56 years. Less than 1% of workers were lost to follow-up. 6310 deaths occurred between 1968 and 2004 including 2547 cancer deaths. A strong healthy worker effect was observed (all-cause SMR = 0.61, 95%-CI: 0.60–0.63). Significant excess mortality was observed for pleura cancer (SMR= 1.71, 95%-CI: 1.24–2.30) and for melanoma (SMR= 1.43, 95%-CI: 1.04–1.92), with no significant trend in SMRs for these outcomes across categories of cumulative radiation exposure.

Conclusions This analysis of French nuclear workers confirms a healthy worker effect but also an excess risk of death...
from pleura cancer and melanoma. This cohort study is the most informative ever conducted in France among nuclear workers.

**THE PESTIMAT PROGRAM: DEVELOPMENT OF A CROP EXPOSURE MATRIX FOR PESTICIDE EXPOSURE ASSESSMENT IN AGRICULTURE**

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**Objectives** Pesticides include ~1000 chemicals with various toxicological properties. Pesticide exposure assessment represents a crucial methodological issue for epidemiological studies. A reconstitution of pesticides used in entire professional careers based only on the memory is questionable. PESTIMAT is a crop exposure matrix, which intends to reconstitute parameters of pesticide exposure in France.

**Method** PESTIMAT is made of tables crossing crops and active ingredients (a.i.) by year from 1950 to 2010 and providing the following exposure parameters: 1) probability corresponding to the proportion of farmers having used the a.i. (in%), 2) frequency expressed as the number of treatment days, 3) intensity documented by the application rate of the a.i. (in kg/ha). Parameters were obtained by the combination of six complementary sources: i) registrations and withdrawals from the Agriculture Ministry, ii) information from ACTA^a_ on products marketed iii) agricultural recommendations by the Plant Health Protection body, iv) treatment calendars provided by farmers, v) information from professional associations of farmers, vi) data from the industry.

**Results** To date, 529 a.i. usable between 1950 and 2010 on 4 crops are included in PESTIMAT, corresponding to 160 fungi- cides (30%), 160 herbicides (30%) and 209 insecticides (40%). The total numbers were comparable on wheat/barley (N = 293), vineyards (N = 280), and apple-growing (N = 267) but lower on corn (N = 196). We will present an illustration with data obtained for dithiocarbamates fungicides, and examples of use in vineyards (N = 280), and apple-growing (N = 267) but lower on corn (N = 196). We will present an illustration with data obtained for dithiocarbamates fungicides, and examples of use in

**Conclusions** We observed some indications of early immunological health effects in a pilot study conducted among workers exposed to CNTs. Further analyses are planned, including assessment of lung function, heart rate variability, oxidative stress, and blood coagulation markers. Extensive exposure measurements were conducted in the CNT production factory as well and additional analyses will use these individual exposure measurements to more thoroughly explore exposure dependent effects.

**DEVELOPMENT OF A SOURCE-BASED APPROACH TO ASSESSING OCCUPATIONAL EXPOSURE TO ELECTROMAGNETIC FIELDS IN THE INTEROCC STUDY**

1Javier Vila, 2Joseph D Bowman, 3Laurel Kincl, 4Dave L Conover, 5Jordi Figuerola, 6Lesley Richardson, 3Elisabeth Cardis, 6on behalf of the INTEROCC Study Group. 1Centre for Research in Environmental Health (CREAL), Barcelona, Spain; 2The National Institute for Occupational Safety and Health (NIOSH), Cincinnati, OH, USA; 3Oregon State University (OSU), Corvallis, OR, USA; 4Institute of Occupational Medicine (IOM), Edinburgh, UK; 5University of Montreal Hospital Research Centre (CRCHUM), Montreal, Canada; 6Institute of Occupational Medicine (IOM), Edinburgh, Spain.

**Objectives** Exposure to electromagnetic fields (EMF) has become ubiquitous in modern life and concern has increased regarding possible associated health effects. To date, assessment of occupational exposure has relied on job-exposure matrices, with exposure estimates for very broad occupational categories. To move EMF research forward, a new approach was necessary. A source-based strategy, incorporating detailed information on tasks, equipment used and work organisation could allow a more individualised exposure assessment.

**Method** Information on occupational histories and sources of EMF was collected as part of the INTERPHONE-INTEROCC study, providing an opportunity to assess occupational EMF exposure by assigning exposure to each source used. A source-exposure matrix (SEM) was developed based on measurements identified in the literature and estimates obtained through experts’ elicitation, for sources with available measurements. This paper focuses on the SEM development methodology to ensure the quality and representativeness of the estimates.
Oral presentation

Results Estimates of exposure for 138 EMF sources were obtained from measurements (1424 aggregated records) extracted from 71 papers and hygiene reports (1974–2013). For each source, exposure was calculated by frequency band and dosimetry type, as the arithmetic and geometric means of all measurements identified. Standard deviations were included in order to characterise the variability of the estimates.

Conclusions A source-exposure matrix has been constructed for the most common sources of EMF in the workplace, based on the responses to the INTERPHONE-INTEROCC study questionnaire. This database currently represents the most comprehensive source of information on occupational EMF exposure and is available on request to researchers.

0286 OCCUPATIONAL USE OF INSECTICIDES, FUNGICIDES AND FUMIGANTS AND RISK OF NON-HODGKIN LYMPHOMA AND MULTIPLE MYELOMA IN THE AGRICULTURAL HEALTH STUDY

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Objectives Farming and exposure to pesticides have been linked to non-Hodgkin lymphoma (NHL), and multiple myeloma (MM) in previous studies. We evaluated use of insecticides, fungicides and fumigants and risk of NHL, including MM and other NHL sub-types in the Agricultural Health Study, a US-based prospective cohort study.

Method A total of 527 cases occurred among 55 875 pesticide applicators from enrollment (1993–1997) through 2011 in Iowa and 2010 in North Carolina. Information on pesticide use, other agricultural exposures and other factors was obtained from questionnaires at enrollment and follow-up approximately five years later (1999–2005). Information from these questionnaires was used to create lifetime-days and intensity-weighted lifetime-days of pesticide use. Poisson regression and polytomous logit models were used to calculate relative risks (RR) and 95% confidence intervals (CI) to evaluate associations between 26 pesticides and NHL and five NHL-subtypes including multiple myeloma, while adjusting for potential confounding factors.

Results Statistically significant positive exposure-response trends occurred between overall NHL risk and lindane (p-trend = 0.004) and DDT (p-trend = 0.02). In addition, ever use of terbufos was associated with NHL overall (RR=1.2; CI=1.0–1.5), but with no exposure-response trend. In sub-type analyses, terbufos and DDT were associated with small cell lymphoma/chronic lymphocytic leukaemia/marginal cell lymphoma. In addition, lindane and diazinon were associated with follicular lymphoma and permethrin with MM although tests of homogeneity did not show significant differences in exposure-response among NHL-subtypes for any chemical.

Conclusions These findings are among the first to suggest links between DDT, lindane, permethrin, diazinon and terbufos and specific NHL subtypes.

0288 GENE-SPECIFIC DNA METHYLATION AS A VALUABLE TOOL FOR RISK ASSESSMENT: THE CASE OF OCCUPATIONAL EXPOSURE TO DIFFERENT VOC’S IN MEXICAN WORKERS

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Objectives To determine gene-specific methylation levels (promoter region) on genes from critical cellular pathways in persons occupationally exposed to a single volatile organic compound (VOC) or to a mixture of them

Method Workers from two tanneries, two shoe factories, and two gas stations were included (exposed groups to VOC’s). We also included administrative workers (reference group), all of them from the city of León Guanajuato, México. In tannery workers we measured individual exposure levels to three different VOC’s; for the rest of the groups we measured up to 7 VOC’s. After exposure characterisation, we took blood samples and extracted DNA in order to determine, by PCR-pyrosequencing, methylation levels in genes involved in inflammation, DNA repair, oxidative stress and xenobiotic metabolism pathways.

Results Only toluene environmental levels were higher in tannery workers. Workers from the leather shoe factory showed the highest exposure levels for up to five different VOC’s. There was no statistical significant difference in gene-specific methylation for tannery workers when compared to the control group. For the leather shoe factory workers, we found hypermethylation in the TNFa, SOD1 and TOP2A promoter regions compared to the control group or to other exposed groups. Gas station attendants showed hypermethylation for the IL6 gene compared to controls

Conclusions Occupational exposure to a mixture of VOC’s has important effects on the methylation status of genes involved in inflammation, DNA repair and oxidative stress. These epigenetic changes, detectable at a pre-clinical stage, represent a valuable tool for performing an early risk assessment in these populations.

0289 PREVENTING NEEDLESTICKS AND OTHER SHARPS INJURIES TO HOME CARE AIDES: RESULTS OF A SURVEY TO IDENTIFY HAZARDS DURING HOME VISITS

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Objectives To follow up on our previous finding that home care (HC) aides have a substantial risk of injury with used sharp medical devices, this study’s goal was to identify modifiable aspects of aide-client encounters during HC visits that increase risk of sharps injuries (SI).

Method A survey of 1249 HC aides was conducted in eastern Massachusetts. Approximately half the participants (634) were employed by HC agencies, and half (615) directly by HC clients and their families. A questionnaire gathered data on aides’ most recent home visits, enabling quantification of hazardous working conditions. The specific investigation described here focused on understanding determinants of hazardous conditions likely to increase the risk of SI including: the aide finding used sharps
lying around the house; assisting a client with using a sharp; and disposing of sharps. Poisson regression modelling was used to identify important predictors of handling or encountering used sharps. By linking these results to national data on HC visits and clients, we estimated the frequency with which these hazardous conditions occur to HC aides nationwide.

Results Although not authorised to do so, 7% of aides assisted clients to use a sharp. Aides were much more likely to encounter sharps if they were employed directly by clients/families than if employed through an agency. Other important determinants of sharps exposure included client medical conditions like diabetes, and aide characteristics including professional certification.

Conclusions The results are being investigated further through focus groups of HC aides and used to develop preventive interventions.

**0309 BURDEN OF CANCER ATTRIBUTABLE TO OCCUPATIONAL DIESEL ENGINE EXHAUST EXPOSURE IN CANADA**

**Objectives** To estimate the number of new lung cancer cases in Canada attributable to occupational diesel engine exhaust (DEE), which IARC classified as a definite human carcinogen in 2012. This is part of a larger effort to estimate the current burden of occupational cancers in Canada.

**Method** Relative risks were selected from two recent studies of miners and truckers with quantitative exposure-response. CAREX Canada estimates of exposure prevalence and level by detailed industry and occupation were supplemented by a literature search for DEE measurement data. For each exposure group, RR s were assigned based upon the estimated mean exposure. Employment trends of industries and occupations were based upon census data from multiple years. Annual Labour Force Survey data were used to attribute age- and tenure-distribution, as well as short-term turnover characteristics. Survival was adjusted to age at entry into the exposed cohort during the risk exposure period 1961–2001. The attributable fraction (AF) for DEE-related lung cancers will be calculated by province, sex, industry and occupation.

**Results** Approximately 1.4 million workers were exposed to DEE during the risk exposure period. The initial estimated AF s for DEE-related lung cancers are: 4.92% for males, 0.29% for females, and 2.70% overall.

**Conclusions** These burden estimates are somewhat higher than recent estimates from other groups (1.3–1.8%). They account for the most recent evidence for the risk of lung cancer from occupational DEE exposure, as well as detailed historical exposure assessment and labour force trends. Sensitivity analyses are underway to determine the influential assumptions.
high leverage in order to provide resistant (stable) results in the presence of outliers and high leverage.

**Results** Based on 8949 employments records, dosimetric measurements of gamma radiation were significantly correlated with radon exposure ($r = 0.499$), duration of employment ($r = 0.429$), year of exposure ($r = 0.239$), and ore production ($r = 0.230$). Age was inversely related to gamma dose. Regression analysis showed that individual dosimetric readings can be modestly predicted by individual work history and geological characteristics of Ontario uranium mines ($p < 0.001$, $R^2 = 0.374$). Additional sources of variation are likely related to individual variability that could not be accounted for in this ecological assessment.

**Conclusions** Reconstructed gamma dose provides modest agreement with individual dosimetric readings.

**AN ASSESSMENT OF THE IMPACT OF MISCLASSIFICATION ERROR ON AN ESTIMATE OF EFFECT FOR OCCUPATIONAL EXPOSURE TO TCDD-CONTAMINATED CHEMICALS AND ISCHAEMIC HEART DISEASE**

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**Objectives** To quantify the effect of exposure and disease misclassification on the odds ratio (OR) for ischaemic heart disease (IHD) mortality in a retrospective cohort study of trichlorophenol workers exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).

**Method** Exposure and disease classification parameters were defined using specificity and sensitivity values either reported in the peer-reviewed literature or calculated from available published data. The distribution shapes for each parameter were constructed based on expert judgment and were varied to address the lack of published information on the parameter distributions. Probabilistic uncertainty analysis, which uses Monte Carlo simulation techniques, was then used to sample each parameter distribution, calculating ORs corrected for outcome and exposure misclassification.

**Results** Correction for exposure and disease misclassification produced lognormal probability distributions of ORs for IHD with a wider range of possible values than calculated in the traditional epidemiological analysis. The median OR_corrected was larger than the OR_observed of 3.05 for all seven scenarios evaluated and ranged from 5.34 to 11.86. Between 70% and 99% of the simulation trials yielded corrected ORs greater than the OR_observed.

**Conclusions** The application of uncertainty analysis to a mortality study of workers occupationally exposed to TCDD-contaminated chemicals provides valuable insight into the magnitude and direction of misclassification error and the impact on an estimate of effect. Further refinement of the parameter distributions and adjustment of the OR_observed for other study limitations will be necessary to determine whether a true causal relationship between exposure and disease exists or if the effect observed in these workers is an artefact of systematic error.

**ESTIMATING PERSONAL EXPOSURE TO TRAFFIC-RELATED AIR POLLUTANTS AMONG ON-ROAD WORKERS**

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**Objectives** To present extensions to the International Agency for Research on Cancer (IARC) Monographs process, providing examples of application of meta-data to identifying carcinogenic hazard identifications and research gaps, and the potential use for guiding cancer control efforts. Qualitative and quantitative approaches will be contrasted.

**Method** The IARC evaluation process typically employs summary-level meta-data, in the form of systematic reviews, and pooled- and meta-analyses.

**Results** IARC has heavily relied on published occupational epidemiological studies to identify specific carcinogens in the workplace and to form a scientific basis for the protection of workers worldwide. The evaluations of carcinogenic risk are made by international working groups of independent scientists and are qualitative in nature. Meta-analyses prepared for IARC working groups can supplement the qualitative process and have been crucial in several instances; for example, in identifying sufficient evidence for lung and bladder cancer in painters and limited evidence for increased risk of bladder cancer among dry cleaners exposed to tetrachloroethylene and among professional drivers (bus, taxi, truck) with high exposure to outdoor air pollution. Since IARC does not provide recommendations for regulation or legislation, meta-relative risks can also be used to calculate attributable fractions to guide cancer control efforts, for agents in which a causal association is assumed and exposure prevalence has been well-characterised.

**Conclusions** The IARC Monographs Programme is an authoritative source for the identification of carcinogenic hazards in the environment. Applying meta-analyses to the IARC process can be a useful tool for informing hazard identification and providing guidance for cancer control efforts.
mobile. While there is considerable time and route variation in air pollutant measurement, the levels of air pollutants measured in this study may have serious health implications for those who perform physically demanding activities near or on roadways in the City of Chicago.

0317 QUANTIFYING HAZARDOUS OCCUPATIONAL EXPOSURES AND INJURIES IN HOME CARE: RESULTS FROM THE SAFE HOME CARE SURVEY

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Objectives In countries with ageing populations, home care (HC) aides are among the fastest growing jobs. There are few quantitative studies of HC occupational safety and health (OSH) hazards. The objectives of this study were to quantify a range of OSH exposures and injuries among HC aides and to evaluate the variability across job categories.

Method HC aides were recruited for a survey via agencies that employ aides and schedule their visits with clients and through a labour union of aides employed directly by clients/families. The innovative questionnaire design included detailed questions about the most recent home visits, as well as about the individual aides’ OSH experiences.

Results The final population included 1249 HC aides (634 agency-employed, 615 client-employed) contributing information on 3484 HC visits. Among aides, in the past 12 months, 2% had a needlestick or other sharps injury; 7% reported physical aggression and 19% verbal aggression; 11% had a job-related injury resulting in lost work time or need for medical care; 33% reported back pain: of these, 59% experienced pain once a week or more and 68% took medication for it. Among visits, in the past month, 62% involved patient handling while only 25% involved a patient handling device; 80% involved cleaning, 10% indoor cigarette smoke. Agency-employed versus client-employed aides differed by amount of client handling, use of sharps, and characteristics of clients.

Conclusions Aides experience substantial OSH exposures and injuries. Quantification of hazards is useful to prioritise resources for the development of preventive interventions and to provide a foundation for etiologic research.

0320 EVALUATION OF CUMULATIVE EXPOSURE TO CARBON BLACK AND LUNG CANCER RISK AMONG US CARBON BLACK WORKERS

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Objectives To evaluate lung cancer mortality in relation to quantitative estimates of cumulative inhalable carbon black exposure among carbon black manufacturing workers.

Method Standardised mortality ratios (SMRs) were calculated for 5675 workers employed ≥ 1 year since 1940 at 18 plants. Cox proportional hazards models were used to evaluate the association between cumulative inhalable carbon black exposure and lung cancer mortality risk for the “exposure” sub-cohort of 2099 men with complete work history records that allowed individual quantitative estimation of cumulative exposure.

Results All-cause SMR=0.80 (95% confidence interval [CI] =0.76–0.84), all-cancer SMR=0.80 (95% CI=0.73–0.88) and lung cancer mortality SMR=0.80 (95% CI=0.68–0.94) showed significant deficits. In the exposure sub-cohort, lung cancer mortality was not increased (SMR=0.68, 95% CI=0.44–1.00, n = 20). Time-dependent Cox analyses of the exposure sub-cohort showed no positive associations: Hazards Ratio [HR]=0.20 (95% CI=0.04–0.9) for 20 to < 50 mg/m³-years; HR=0.7 (95% CI=0.20–2.0) for 50 to <99 mg/m³-years; and HR=0.5 (95% CI=0.1–1.7) for ≥100 mg/m³-years, compared with those with < 20 mg/m³-years.

Conclusions No excess lung cancer mortality or association between lung cancer mortality and time-dependent cumulative inhalable carbon black exposure were observed. However, few lung cancer deaths occurred among the exposure sub-cohort. Nevertheless, lung cancer mortality among the older, full cohort was also not increased using duration of employment as a surrogate of cumulative carbon black exposure.

0321 NEUROLOGIC AND REPRODUCTIVE EFFECTS OF SOLVENTS ON AUTOMOTIVE REPAIR WORKERS: ASSESSMENT OF EXPOSURE FOR THE BAY AREA SOLVENT STUDY (BASS)

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Objectives To evaluate solvent exposures of automotive repair workers and investigate associated neurologic and reproductive effects.

Method Industrial hygienists conducted site-visits, air measurements, and interviews to prepare questions about task frequency, work practices, and products. Participants were recruited from IAMAW. Clinical exams evaluated peripheral neuropathy, neuro-cognition, colour discrimination, time to pregnancy, and urinary reproductive hormonal metabolites.

Results The 835 participants examined at the BASS clinic had worked over 3000 jobs at 1952 shops. Algorithms were developed to estimate individual solvent exposures in each year by integrating self-reported task frequency with MSDs, measured and modelled airborne concentrations and dermal absorption. Major temporal changes occurred in source of exposures, e.g., solvent tanks accounted for 71% of solvent exposures in the 1960s, 30% in 2000–04, but only 7% in 2005–2012; concomitantly, exposures from aerosol cans rose from 23% to 64% then 84%, while composition changed dramatically, notably for hexane and perchloroethylene. Hexane was not used prior to 1989 and was eliminated from most products after 2000, when peripheral neuropathy was reported among automechanics. 52% of the automechanics were exposed to hexane for a mean of 5.3 (0.1–12) years, and 80% of these had concomitant exposure to acetone, which potentiates neurologic effects of hexane in rodents. Cumulative hexane exposures were low: mean= 78.1 mg/m³·years (TLV = 176 mg/m³).

Conclusions Work histories were more complex than indicated in the pilot of 39 mechanics. Exposures were significantly affected by temporal trends in cleaning methods, composition of materials, and work practices. Epidemiologic studies must account for these changes.
0322 THE USEFULNESS OF COMPENSATION STATISTICS TO DETECT HEAT-RELATED HEALTH OUTCOMES IN A TEMPERATE CLIMATE: THE EXPERIENCE OF QUEBEC

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Objectives To explore relationships between summer outdoor temperatures in Quebec (Canada) and occupational compensation statistics for heat-related illnesses.

Method Daily compensation counts of heat-related illnesses (heat strain, heatstroke, loss of consciousness, etc.), occurring between May and September, were obtained from the workers’ compensation board of Quebec for each health region between 1998 and 2010. Regional daily maximum outdoor temperatures were obtained from Environment Canada. Associations between daily compensation counts and temperature were estimated using negative binomial or Poisson regression models for each region and were adjusted for relative humidity and temporal trends.

Results In an average population of 3.7 million workers, 259 illnesses classified as heat-related were compensated between 1998 and 2010, giving an average annual rate of 0.11 case per 100 000 workers per summer month. During the study period, 63.0% of heat-related outcomes occurred on days with a maximum daily average temperature below 30°C. Occupations with the largest number of compensations were those of labourers (32%), firefighters (11%) and truck drivers (4%). The pooled incidence rate ratio (IRR) was 1.41 (95% CI 1.35–1.46) per 1°C increase in daily maximum temperature. Effects of barometric pressure and lag will be explored.

Conclusions Heat-related illnesses do occur in temperate climates. Our results suggest that compensation statistics, albeit crude indicators of health effects, can be useful to identify industry sectors and occupations that would benefit from preventive interventions aimed at high risk workers.

0323 WORKPLACE PSYCHOSOCIAL RISK FACTORS FOR CARPAL TUNNEL SYNDROME: A POOLED PROSPECTIVE STUDY

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Objectives Seven research groups conducted coordinated studies of carpal tunnel syndrome (CTS). In this analysis of the pooled cohort, we estimate associations of workplace psychosocial factors and CTS incidence with adjustment for biomechanical factors.

Method 3515 workers were followed up to 7 years. Case criteria included symptoms consistent with CTS and an abnormal electrodiagnostic study. Psychosocial exposure was measured using the Job Content Questionnaire to assess risk among those with high job strain measures. Individual level occupational biomechanical exposures included the%time spent >30° wrist extension, %time in >30° wrist flexion, total repetition rate, and the%time spent in forceful exertion (>1kg-pinch; >4kg-grip). A sub-cohort of 1091 participants had both psychosocial and biomechanical exposure data. Adjusted hazard ratios were estimated using Cox proportional hazards models.

Results After adjustment for gender, age and BMI in the sub-cohort, high job strain (HR=1.40; 95% CI:0.86–2.28) and high psychological demand (HR=1.25; 95% CI:0.79–1.98) showed statistically non-significant elevation in risk of CTS, and high decision latitude (HR=0.70; 95% CI:0.44–1.13) showed non-significant decrease in risk. When the same models were adjusted for biomechanical exposures, confounding was not evident; the primary exposure effect estimates changed between 1–7% for high job strain (HR=1.30; 95% CI:0.81–2.17), high psychological demand (HR=1.17; 95% CI:0.74–1.83), and high decision latitude (HR=0.71; 95% CI:0.43–1.18).

Conclusions For this sub-cohort analysis, adjustment for biomechanical exposures did not alter the associations between workplace psychosocial factors and incident CTS. The findings suggest that workplace psychosocial risk is independent of workplace biomechanical risk.
Results Women ever exposed to benzene had a significantly elevated risk of NHL (Hazard Ratio (HR) = 1.87, 95% CI = 1.19–2.96). Compared to unexposed women, significant trends in NHL risk were observed for increasing years of benzene exposure (p_{trend} = 0.009) and increasing cumulative exposure levels (p_{trend} = 0.01), with women in the highest duration and cumulative exposure tertiles having a significantly elevated association with NHL (HR = 2.07, 95% CI = 1.07–4.01 and HR = 2.16, 95% CI = 1.17–3.98, respectively).

Conclusions Our study is the first to our knowledge to evaluate this association in the context of a population-based prospective cohort of all women with diverse occupational histories. Our findings add to the evidence that benzene is associated with risk of NHL.

Method The contribution of occupational studies to the IARC monographs is reviewed.

Results Occupational epidemiology has made important contributions beyond developing knowledge to protect workers’ health, notably in identifying carcinogens of concern for the general population. The IARC Monographs have evaluated many carcinogens for which occupational studies have provided key evidence. The recent classifications of diesel engine exhaust, trichloroethylene and polychlorinated biphenyls (PCBs) as human carcinogens, which depended heavily on data from occupational studies, are illustrative. In the evaluation of PCBs, for example, occupational cohort studies showing an exposure-related increase in the risk of malignant melanoma were pivotal for the conclusion of sufficient evidence of carcinogenicity. Despite such noteworthy contributions, the number of occupational studies that are ultimately informative tends to be relatively small relative to the number reviewed. The most informative studies tend to have common features, including clear reporting of methods and results, well-defined outcomes, quantitative estimates of exposure, adequate control of major confounders, and state of the art analytical methods, often with internal analyses of exposure-response. In contrast, studies that are too broadly focused and those with crude classifications of exposure or outcome, analyses by external comparisons alone or poor reporting of the methods and results are often less informative in the final evaluation.

Conclusions While occupational studies are important for carcinogen identification, their relevance could be further enhanced with improvements in study design, methods and reporting.
PESTICIDE EXPOSURE DURING RE-ENTRY TASKS AND HARVESTING IN VINEYARDS: RESULTS OF THE PESTEXPO PROGRAM

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Objectives Physical contact with treated crops, animals or other surfaces is responsible for the transfer of pesticides to the worker’s skin in agricultural tasks and makes their cutaneous absorption possible. In the Bordeaux area (France), the PESTEXPO study described levels of pesticide exposure and identified their determinants during re-entry and harvesting in vineyards.

Method Between 2002 and 2007, 46 days of work involving re-entry tasks and 48 harvesting days were observed to analyse exposures to dithiocarbamates or folpet. The potential determinants were generated from the following parameters collected on standardised forms during field observations: i) general conditions of the task, ii) operator characteristics, iii) estate characteristics, iv) task conditions and v) characteristics of the last treatment involving folpet or dithiocarbamates, including delay since treatment. Dermal contamination was assessed using patches placed on the skin and hand-washing at the end of each working phase.

Results Daily median contamination was 1.967.7 µl of mixture during re-entry (90% percentile: 5.045.3 µl) and 18.7 µl during harvesting (90% percentile: 911.4 µl). Contamination level was strongly correlated to the type of task. For re-entry, the highest contaminations were observed during raising of wires and cutting of branches. During the harvest, the contamination was maximal for grape-picking. The delay since the last treatment and the rate of active ingredient per hectare played a role, together with meteorological factors, crop and farm characteristics, gloves and clothes.

Conclusions Our results underline the necessity to take into account exposures during re-entry and harvest when considering pesticide exposure, both for epidemiological research and preventive action.

Objectives Epidemiologic studies of occupational lead exposure have suggested increased risks of cancers of the brain, kidney, lung, meninges, and stomach; however, the totality of the evidence is inconsistent. To clarify whether lead is a carcinogen, we investigated the relationship between occupational lead exposure and risks of these five cancer sites in two prospective cohort studies in Shanghai, China.

Method Annual job/industry-specific estimates of lead fume and lead dust exposure were derived from a statistical model that combined expert ratings of lead intensity with inspection measurements collected by the Shanghai Centre for Disease Control and Prevention. The job/industry estimates were applied to the lifetime work histories of subjects from the Shanghai Women’s Health Study (73,363 participants) and the Shanghai Men’s Health Study (61,379 participants) to estimate cumulative exposure to lead dust and lead fume. Cohort-specific relative hazard rate ratios (RRs) and 95% confidence intervals (CI) were estimated using Cox proportional hazards regression models and then pooled using a random effects meta-analysis model.

Results We observed a statistically significant increased risk of meningioma among individuals with estimated occupational exposure to lead dust or fumes (RR=2.4, 95% CI: 1.1–5.0), and in particular among those with an above-median cumulative exposure to dust or fumes (RR=3.1, 95% CI: 1.3–7.4). We observed suggestive associations with lead exposure for cancers of the kidney (RR=1.4, 95% CI:0.9–2.3) and brain (RR=1.8, 95% CI:0.7–4.8), and null findings for cancers of the lung and stomach.

Conclusions Our findings provide additional evidence that occupational lead exposure increases risk of meningioma.

Objectives To examine further the association between endotoxin and risk of lung cancer among Shanghai women textile workers in an extended follow-up of the cohort. The initial follow-up indicated an inverse exposure-response relation.

Method We updated a case-cohort study nested within a cohort of 267,400 women. We compared exposure histories of 1456 incident lung cancers cases diagnosed during 1989–2006 with those of a reference subcohort of 3022 workers who were free of lung cancer at the end of follow-up. Endotoxin exposures were based on a quantitative job/exposure matrix. Relative risks (hazard ratios [HR]) associated with cumulative exposure, adjusted for age and smoking history, were estimated by Cox proportional hazards modelling adapted for the case-cohort design. We conducted exposure-response trend analyses for cumulative exposures lagged by 0, 10, and 20 years, and separately for time windows of <15 and >15 years since first exposure.

Results Overall, we observed no associations between cumulative exposure and lung cancer. In contrast, analyses by exposure

OCCUPATIONAL EXPOSURE TO LEAD AND CANCER IN TWO COHORT STUDIES OF MEN AND WOMEN IN SHANGHAI, CHINA

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Objectives To examine the association between endotoxin and lung cancer among Shanghai women textile workers in an extended follow-up of the cohort. The initial follow-up indicated an inverse exposure-response relation.

Method We updated a case-cohort study nested within a cohort of 267,400 women. We compared exposure histories of 1456 incident lung cancers cases diagnosed during 1989–2006 with those of a reference subcohort of 3022 workers who were free of lung cancer at the end of follow-up. Endotoxin exposures were based on a quantitative job/exposure matrix. Relative risks (hazard ratios [HR]) associated with cumulative exposure, adjusted for age and smoking history, were estimated by Cox proportional hazards modelling adapted for the case-cohort design. We conducted exposure-response trend analyses for cumulative exposures lagged by 0, 10, and 20 years, and separately for time windows of <15 and >15 years since first exposure.

Results Overall, we observed no associations between cumulative exposure and lung cancer. In contrast, analyses by exposure

POSSIBLE PRO-CARCINOGENIC EFFECT OF ENDOTOXIN ON LUNG CANCER IN AN EXTENDED FOLLOW-UP OF SHANGHAI WOMEN TEXTILE WORKERS

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time windows revealed a modestly elevated risk at the highest 3 exposure quintiles for exposures that occurred >15 years since first exposure; HR=1.28 (95% CI 0.90–1.82), HR=1.27 (95% CI 0.93–1.73), and HR=1.27 (95% CI 0.91–1.77), respectively; p-trend = 0.13.

Conclusions Exposures to endotoxin with long-term, relatively intense exposures were at most weakly associated with lung cancer risk in this cohort. The findings do not support a protective effect of endotoxin, but are suggestive of possible lung cancer promotion with increasing time since first exposure.

Objectives Risk associated with dioxin-like chemicals (DLCs) can be estimated using cancer slope factor (SF) derived from epidemiology data, and lifetime average daily dose (LADD). However, for shorter term exposure, such analysis has not been done. We propose a method to estimate cancer risk using internal exposure dose.

Method In 1979, approximately 2000 people in central Taiwan accidentally consumed rice oil contaminated by dioxin-like chemicals polychlorinated biphenyls (PCBs)- and dibenzofurans (PCDFs). Blood samples were collected between 1994 and 2003. Serum toxic equivalency (TEQ) was back-extrapolated to the time at the beginning of the exposure by using half-life of 8.7 years. The LADD of the background population was estimated by serum level, and the excess cancer risk of the background population was estimated by multiplying LADD by the cancer SF. Thereafter, the LADD and excess cancer risk of the Yucheng population was estimated correspondingly by the ratio of serum TEQ area under curve (AUC) between the exposed and the background population.

Results The average serum concentration of 245 exposed people in 1994–2003 and the estimated serum concentration in 1979 were 424 (SD=334) and 1602 (SD=1135) pg-TEQ/g-lipid, respectively. The estimated LADD of DLCs in background population was 2.18 pg-TEQ/kg-body weight/day, and the lifetime excess cancer risk caused by background exposure to DLCs is 3.4×10–4. The average value of exposed people’s serum TEQ AUC and the risk (i.e., 5.7×10–3) are 16.8 times higher than those of the background population.

Conclusions Based on this method, individual risk can be estimated when serum concentration of DLCs are available.

Objectives The objective was to estimate the agriculture injury rate in the United States. The Bureau of Labour Statistics conducts Census of Fatal Occupational Injuries and Survey of Occupational Injuries and Illness but it excludes workplaces with 10 or fewer employees or self-owned farm operations and may underestimate the agricultural injury rate.

Method The Central States Centre of Agricultural Safety and Health partnered with National Agricultural Statistics Service to annually administer agricultural injury survey. In 2012, 6953 surveys were administered to a stratified random sample of 2007 Census of agriculture respondents in seven Midwestern States. The survey included questions on demographics, type, location and source of injury, body part injured, lost work time, and cost. The data were linked to Census of agriculture for farm level attributes. Univariate and multivariate logistic regressions were used to evaluate factors associated with adult operator injuries.

Results The cumulative incidence was 60.6 injuries per 1000 farm operators. Injury incidence was significantly higher in part-time compared to full-time farmers (79.3 vs 42.6 per 1000, p < 0.0001); farm size 1000 or more acres compared to 180–999 and 1–179 acres (91.6 vs 60.5 and 45.4 per 1000, p = 0.002); at least one livestock compared to none (77.1 vs. 44.3 per 1000, p = 0.0004); and having a tractor with 100 or more horsepower (71.8 per 1000, p = 0.006).

Conclusions There were substantial differences in injury incidence by individual and farm attributes. These results may be used to develop targeted interventions to reduce agricultural injuries in the Midwestern United States.
TRANSITIONS BETWEEN UPPER EXTREMITY MUSCULOSKELETAL SYMPTOMS AND WORK LIMITATION OUTCOMES: A PROSPECTIVE STUDY

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Conclusions The results demonstrated that construction interventions should be developed to address preventable risk factors. Young construction workers could benefit not only from enhanced work-place injury preventions, but also health behaviour interventions.

Method From July 2004 to October 2006, 1107 newly hired workers were recruited to participate in the study. Subjects completed self-reported questionnaires including demographics, medical and work history, and current symptom and work status, nerve conduction studies, and a physical exam. Surveys were repeated at 6, 18, and 36 month follow-up; 827 subjects (75%) completed all follow-ups and were included in the analysis. The outcomes of interest were presence of upper extremity symptoms and limitations in work abilities, productivity, job restrictions, lost time, and job changes due to these symptoms.

Results A majority of workers (72%) reported symptoms at least once during the study, yet less than half (44–46%) reported symptoms within any single follow-up period. Similarly, 31% of workers reported work limitations due to their symptoms at least once during the study, but only 15–16% within any single follow-up period.

Conclusions These results provide evidence for the dynamic nature of both MSD symptoms and work abilities over time, which has been theorised but with few explicit studies. If the risk factors for these outcomes differ, this may explain some of the lack of clarity in the current literature on work-related risk factors and MSD.

THE LIFETIME RISK APPROACH TO ESTIMATING THE BURDEN OF OCCUPATIONAL CANCER

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Objectives The main approaches to estimating the burden of occupational cancer are attributable risk and lifetime risk. In this presentation we will explain why we used the lifetime risk approach.

Method The lifetime risk of cancer is an estimation of an individual’s risk of being diagnosed with cancer during their life (without considering occupational exposure). The lifetime risk for the general population (LR_{gp}) is estimated by multiplying cohort person-years-at-risk (from life table data) by age-sex specific incidence rates. The excess lifetime risk of cancer in a cohort of workers exposed to the carcinogen of interest (LR_{exposed}) is a product of the LR_{gp} and the excess relative risk of developing cancer associated with that exposure. LR_{exposed} is multiplied by the prevalence of exposure to obtain the number of cancers attributable to the exposure in the general working population.

Results The lifetime risk approach estimates the number of cancers which would occur over a number of years in the future, due to exposures in a specific year. In contrast, the attributable risk approach estimates the number of cancers which would occur in a specific year due to exposures over a number of years in the past. Because we had exposure prevalence information for a specific year based on a national survey, we determined that the lifetime risk approach was more applicable in our case.

Conclusions The lifetime risk approach is an alternative method for calculating burden of disease when exposure prevalence information is available.

OBTAINING POPULATION ESTIMATES OF THE PREVALENCE OF OCCUPATIONAL EXPOSURE

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Objectives Good occupational health policy requires an overall understanding of the proportion of the working population who are exposed to hazards at work. This is difficult to estimate when nearly three-quarters of the workforce are in small and medium sized companies and so not easily surveyed or monitored. We are undertaking a series of national surveys of the workforce to estimate how many people are exposed to hazards, where those people work, and to identify areas where controls could be used more effectively.

Method A random sample of the working population were invited to participate in a telephone interview regarding carcinogens at work using a web-based application (OccIDEAS). Participants were asked about their job tasks and predefined algorithms were used to automatically assign exposures.

Results Overall, 40.3% of the working population were estimated to be exposed to at least one of the 38 carcinogens we were interested in. Farmers, heavy vehicle drivers and miners were the most likely to be exposed. The most common exposures were solar radiation, diesel engine exhaust and environmental tobacco smoke. We are now undertaking similar surveys to estimate the prevalence of occupational exposure to asthmagens, noise and ototoxic chemicals. We are also examining whether migrant workers are more likely to be exposed than the Australian born population.

Conclusions This study demonstrates a practical, web-based approach to collecting population information on occupational exposure prevalence.

CANCER MORBIDITY AND MORTALITY OF INORGANIC LEAD EXPOSED WORKERS IN KOREA

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Objectives The main approaches to estimating the burden of occupational cancer are attributable risk and lifetime risk. In this presentation we will explain why we used the lifetime risk approach.

Method The lifetime risk of cancer is an estimation of an individual’s risk of being diagnosed with cancer during their life (without considering occupational exposure). The lifetime risk for the general population (LR_{gp}) is estimated by multiplying
RENAL DISEASE INCIDENCE AMONG 58 000 MALE CANCER INCIDENCE AND MORTALITY IN AN OCCUPATIONAL POPULATION

Objectives This study was conducted to compare the cancer incidence in inorganic lead exposed workers with the Korean general population, and to explore the relationship between cancer mortality and blood lead levels.

Method Using the Korean annual medical surveillance for exposure to lead, a cohort comprising 74 659 inorganic lead exposed workers working between January 1st, 2000 and December 31st, 2004 was compiled. This cohort was merged with the Korea National Central Cancer Registry (KNCCR) and death registry of the Korea National Statistical Office (KNSO) in order to evaluate the cancer morbidity for these workers between 2000 and 2008.

Results There were 793 cases cancer and, the incidence of stomach cancer (SIR 1.17, 95% CI=1.01–1.36) was found to be elevated in lead chromate workers. Excesses were observed for kidney (2.15, 1.19–3.88) and bladder cancers (2.29, 1.149–4.58) in lead exposed workers ≥20 years of job duration., kidney cancer (2.23, 1.21–4.18) in workers with ≥10 ug/dl of blood lead level and lung cancer in female workers with ≥10 ug/dl. Workers with ≥40 ug/dl of blood lead levels had a significantly higher risk of overall cancer mortality (RR: 2.75; 95% CI: 1.06–1.98) compared with workers who had less than 10 ug/dl.

Conclusions Our study showed incidence excess of lung cancer in female workers, stomach cancer in lead chromate exposed workers and a possible dose-response relationship between d kidney cancers and lead exposure. Also overall cancer mortality excess was observed in high lead exposed workers.

CANCER INCIDENCE AND MORTALITY IN AN AUSTRALIAN COHORT OF LEAD WORKERS WITH HISTORICALLY COLLECTED BLOOD LEAD DATA

Objectives To measure cancer incidence and mortality in a retrospective cohort of Australian lead-exposed workers.

Method The cohort comprised male lead workers who had been participants in state government occupational blood lead surveillance programs conducted since the 1970s. Historically collected blood lead level data were accessed from surveillance records. Linkage was undertaken to the National Death Index and the Australian Cancer Database to identify causes of death and incident cancers.

Results 4114 male subjects were followed for an average of 16.2 years, giving 68 172 person years. All incident cancers were lower than expected (SIR 83, 95% CI: 73–95). The incidence of liver cancer was elevated (SIR 217, 95% CI 103–454), as was the incidence of oesophageal cancer (SIR 240, 95% CI: 129–447). Among those cohort members with at least one blood lead result in excess of 30µg/dl, oesophageal cancer incidence was elevated (SIR 755; 95% CI 314–1813). Other cancer types were not found to occur in excess. All cause mortality was greater than expected (SMR 111; 95% CI 101–123) based on 406 deaths. Non-malignant digestive system deaths (SMR 167; 95% CI 110–250) and deaths from external causes (SMR 135; 95% CI 105–174) were also elevated.

Conclusions The increase in gastrointestinal strict cancers is consistent with some previous studies of lead workers. Con founding from lifestyle factors, such as alcohol, could not be examined. It is planned to include this cohort in an international pooling study of lead exposed workers.

CHALLENGES TO OCCUPATIONAL CANCER EPIDEMIOLOGY IN QATAR

Objectives Assess exposures to occupational carcinogens in Qatar.

Method IARC conducted a review of environmental carcinogens (IARC Group 1 and 2A) in Qatar 2013. Information was ascertained from ministries and a survey among Qatar Petroleum associated companies.

Results Major parts of the population are migrant workers; male migrant workers are primarily recruited for the construction and the oil-and gas industry, while female migrant workers mostly do domestic work. The predominant material for construction is lime stone with increasing use of gabbro containing low silica levels compared to quartz. Only small quantities of asbestos have been used. The technologies used for natural gas extraction in Qatar are mostly closed processes.

Conclusions Workers in construction and in the oil and gas sector are mainly migrant workers who remain in the country for short durations.
periods. Migrant workers are a particularly healthy group from within their home countries and if they develop cancer, it is likely to occur when they are older and have left Qatar. The impact of occupational exposures on cancer risk among industrial workers in Qatar can therefore not be estimated. It is however possible to measure exposures in these settings and establish adequate national regulations. Information on carcinogenic exposures in occupational settings from the European CAREX database is likely of limited use in Qatar and other Middle Eastern countries, due to use of different materials, processes and technologies.

**0369** BREAST CANCER INCIDENCE AMONG FLIGHT ATTENDANTS

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Objectives Previous studies suggest that flight attendants have a higher incidence of breast cancer than the general population; however, the reason remains unclear. We evaluated the relation of breast cancer incidence with estimates of cosmic radiation dose and metrics of circadian rhythm disruption among a cohort of 6092 female former US flight attendants.

Method Cohort members (or their proxy) completed a computer assisted telephone interview that collected data on incident cancers and non-occupational risk factors for breast cancer. Incident cancers were also identified through linkage with state cancer registries. Life table analyses were conducted to compare breast cancer incidence among the cohort to that in the general population and to evaluate exposure-response relations.

Results Breast cancer incidence increased compared to the general population (observed 343; standardised incidence ratio 1.37; 95% confidence interval 1.23, 1.52). Among flight attendants, breast cancer was not significantly associated with ten-year lagged cumulative estimates of absorbed cosmic radiation dose, time spent working during normal sleep hours, or time zones crossed in the cohort overall or in women who gave birth two or fewer times. A significant positive association was observed between breast cancer incidence and these exposures only in the small subset of women who gave birth three or more times.

Conclusions Our data suggest that the effect of occupational exposures on breast cancer risk among flight attendants may be modified by non-occupational risk factors for breast cancer. Future modelling analyses will further evaluate the role of occupational exposures and non-occupational risk factors.

**0370** THE RELATIONSHIP BETWEEN WELDING FUME EXPOSURE AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN SHIPYARD WELDERS IN KOREA

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Objectives Welding fume is suspected to accelerate the decline of lung function and development of chronic obstructive pulmonary disease (COPD). The aim of this study was to examine the relationship between welding fume exposure and COPD in Korean shipyard welders.

Method 240 male welders who were working at two shipyards and took the annual health examination including pulmonary function test in 2010 participated in this study. A questionnaire about smoking habits and occupational history was administered. PFT was carried out with strict quality control measures. Exposed fume concentrations were estimated using 884 welding fume measurements taken 2002–2009 in one of the shipyards. Linear multiple regression was employed to evaluate the association between cumulative fume exposure and lung function parameters. Logistic regression was employed to test the excess risk of COPD by cumulative fume exposure. Age, height, the smoking amount, and cumulative fume exposure were incorporated as independent variables in those models.

Results Mean age was 48, and mean work duration was 18 years. The mean cumulative fume exposure was 7.7 mg/m³. The prevalence of COPD was 14.6%. FEV₁ and FVC showed negative correlations with cumulative fume exposure, but statistically non-significant. Odds ratios of COPD were significantly elevated for middle (5.02, 95% CI:1.27–33.55) and high exposure group (6.20, 95% CI:1.41–44.98) compared to the low fume exposure group.

Conclusions Our findings suggest a potential association between metal fume exposure and COPD. Further study with a prospective design is needed to investigate the excessive decline of lung function by welding fume exposure.

**0373** POOLING CASE-CONTROL STUDIES FOR ENHANCED EVIDENCE ON OCCUPATIONAL RISK FACTORS IN LUNG CANCER RESEARCH – THE SYNERGY PROJECT

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Objectives Explore quantitative exposure-response association for exposure to asbestos, crystalline silica, nickel, chromium and polycyclic aromatic hydrocarbons in the general population; further study effects on specific cell types and potential interaction with smoking and co-occurring occupational exposures.

Method Fourteen studies from Europe and Canada were pooled including 17 700 lung cancer cases and 21 800 controls with detailed information on tobacco habits and lifetime occupations. A quantitative job-exposure-matrix (SYN-JEM) was developed based on more than 350,000 exposure measurements from the participating countries. Different model specifications were compared to predict historical job-, time-, and region-specific exposure levels. Individual exposure levels were calculated for each subject by linking the SYN-JEM with the individual occupational histories. Unconditional logistic regression models were fitted to estimate odds ratios, 95% confidence intervals, and trends.

Results We observed exposure-response relationships with increasing duration and cumulative exposure for all agents and
Generally saw a stronger effect for squamous- and small cell lung carcinomas than for adenocarcinomas. Smoking and simultaneous exposure to other occupational exposures exerted a minor confounding effect on the risk estimates. The effect modifications with smoking tended to be supra-additive.

Conclusions SYNERGY adds valuable knowledge to the field of occupational cancer epidemiology, and underlines the importance to collect data on histology, and lifelong information on occupational exposures and smoking.

**Method**

We conducted a meta-regression of lung cancer mortality and cumulative exposure to elemental carbon (EC), a proxy measure of DEE, based on relative risk (RR) estimates reported by three large occupational cohort studies. Based on the derived risk function, we calculated ELRs for several lifetime occupational and environmental exposure scenarios, and also calculated the fractions of annual lung cancer deaths attributable to DEE.

**Results**

We estimated a lnRR of 0.00098 (95% CI: 0.00055, 0.0014) for lung cancer mortality with each 1-µg/m 3-year increase in cumulative EC. Estimated numbers of excess lung cancer deaths through age 80 for lifetime occupational exposures of 1, 10, and 25 µg/m 3 EC were 17, 200, and 689 per 10 000, respectively. For lifetime environmental exposure to 0.8 µg/m 3 EC, we estimated 21 excess lung cancer deaths per 10 000. Based on broad assumptions regarding past exposures we estimate that approximately 6% of annual lung cancer deaths may be due to DEE exposure.

**Conclusions**

Combined data from three US occupational cohort studies suggest that DEE at levels common in the workplace and in outdoor air appear to pose substantial extra lifetime risks of lung cancer, above usually acceptable limits in the US and Europe, which are generally set at 1/1000 and 1/100 000 based on lifetime exposure for the occupational and general population, respectively.

**Method**

As an alternative to mean and maximum blood lead levels, we carried out an exposure assessment that assigned workers to high, medium or low exposure to lead. We additionally assessed whether workers would be exposed to an important level of relevant co-carcinogens.

**Results**

3466 deaths were observed among 7770 men and 1352 women. The SMRs for all causes (109, 95% CI 105–112) and all malignant neoplasms (113,107–120) were significantly raised. SMRs for oesophageal, stomach, bladder, brain and kidney cancer and non-malignant kidney disease were not raised, but were raised for lung cancer (142,129–157). The SMR for circulatory diseases (105,99–100) was of borderline significance. No trends were observed for mean or maximum blood lead level or assessed lead exposure for any of the cancers of a priori interest, but a significant association was found for circulatory diseases (ischaemic heart disease) with mean and maximum blood lead level.

**Conclusions**

The excess of lung cancer is possibly to be due to tobacco smoking. This study provides strong evidence to support an association between increased lead exposure and increased risk of ischaemic heart disease mortality. The study is, however, limited by the lack of complete occupational histories for the included participants.

**Objectives**

To derive a meta-exposure-response curve (ERC) for DEE and lung cancer mortality and estimate lifetime excess risks (ELRs) of lung cancer mortality based on assumed occupational and environmental exposure scenarios.

**Method**

We conducted a meta-regression of lung cancer mortality and cumulative exposure to elemental carbon (EC), a proxy measure of DEE, based on relative risk (RR) estimates reported by three large occupational cohort studies. Based on the derived risk function, we calculated ELRs for several lifetime occupational and environmental exposure scenarios, and also calculated the fractions of annual lung cancer deaths attributable to DEE.

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Combined data from three US occupational cohort studies suggest that DEE at levels common in the workplace and in outdoor air appear to pose substantial extra lifetime risks of lung cancer, above usually acceptable limits in the US and Europe, which are generally set at 1/1000 and 1/100 000 based on lifetime exposure for the occupational and general population, respectively.

**Objectives**

We report on the first ever analysis of a UK cohort of workers with blood lead level measurements that was assembled in the late 1970s.

**Method**

As an alternative to mean and maximum blood lead levels, we carried out an exposure assessment that assigned workers to high, medium or low exposure to lead. We additionally assessed whether workers would be exposed to an important level of relevant co-carcinogens.

**Results**

3466 deaths were observed among 7770 men and 1352 women. The SMRs for all causes (109, 95% CI 105–112) and all malignant neoplasms (113,107–120) were significantly raised. SMRs for oesophageal, stomach, bladder, brain and kidney cancer and non-malignant kidney disease were not raised, but were raised for lung cancer (142,129–157). The SMR for circulatory diseases (105,99–100) was of borderline significance. No trends were observed for mean or maximum blood lead level or assessed lead exposure for any of the cancers of a priori interest, but a significant association was found for circulatory diseases (ischaemic heart disease) with mean and maximum blood lead level.

**Conclusions**

The excess of lung cancer is possibly to be due to tobacco smoking. This study provides strong evidence to support an association between increased lead exposure and increased risk of ischaemic heart disease mortality. The study is, however, limited by the lack of complete occupational histories for the included participants.
SHOULD WE TAKE MAJOR MACRO-ECONOMIC AND POLITICAL DEVELOPMENTS INTO ACCOUNT WHEN ASSESSING LONG-TERM OCCUPATIONAL EXPOSURES FOR EPIDEMIOLOGICAL RESEARCH?

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Objectives Recent analyses of long-term trends in respirable dust and quartz concentrations from the long term monitoring program of the European Industrial Minerals Association (IMA-Europe) Dust Monitoring Program (covering the years 2000–2013) showed striking downward temporal trends in exposure which came to a halt at around the year 2009. Careful analyses and discussion with occupational health and safety representatives pointed at a direct detrimental effect of the current economic crisis on measured concentrations. This observation led us to hypothesise that similar disruptions of downward temporal trends in occupational exposures might also be visible in other large databases with longitudinal exposure measurements.

Method Temporal time trends were estimated in two additional databases (ExpoSYN and URALASBEST) each covering more than 50 years of occupational exposure monitoring. More flexible spline analyses rather than standard log linear (multiplicative) models were used to look for reversed trends.

Results In all three databases macro-economic and political developments seemed to influence downward trends in occupational exposure concentrations. Effects of economic crises like those of the early 1980s, early 1990s and the most recent one as well as the period of political and economic reform in Russia were clearly visible as reduced downward or even reversed temporal trends in occupational exposure concentrations.

Conclusions In exposure assessment for occupational epidemiological studies long term exposures are often modelled as log linear trends. Approaches allowing for disruptions of these trends by macro-economic and/or political developments are needed for more accurate and precise estimations of long-term exposure and will result in more reliable quantitative risk estimates.

CANJEM: A GENERAL POPULATION JOB EXPOSURE MATRIX BASED ON PAST EXPERT ASSESSMENTS OF EXPOSURE TO OVER 250 AGENTS

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Objectives To create a general population job-exposure matrix (JEM) from a database of expert assessments performed during four community-based case-control studies of cancer (lung, breast, brain, and multisite) conducted in Montreal since the 1980s.

Method The expert assessments were performed by the same team of chemists, who assigned exposure to a predefined list of agents to each job held by subjects based on job histories and descriptions of tasks and work environment obtained through interview. The estimated metrics include measures of intensity, frequency and likelihood of exposure. The JEM dimensions include agent, occupation (Canadian, U.S., and international classifications) and era. For each cell, probability of exposure was computed as the proportion of individual jobs exposed. Among the exposed within a cell, CANJEM provides median frequency of exposure, the mode of exposure intensity categories and median time weighted intensity.

Results CANJEM includes information from 6222 men and 2563 women, totalling 31 780 individual jobs held between 1921 and 2005, representing approximately 50 expert-years of exposure assessment. Well known agents among the most frequently encountered include carbon monoxide (22% of individual jobs exposed), organic solvents (17.5%), and formaldehyde (10.6%). The JEM covers 303 occupations, 280 agents, and 4 eras (<1950, 1950–1969, 1970–1984, >1984). Overall, 20% of the cells have a non-null proportion of jobs exposed, 12% with a proportion greater than 5%.

Conclusions CANJEM constitutes one of the largest current sources of retrospective occupational exposure information in North America, useable to support exposure assessment efforts in epidemiology and estimate populations of workers exposed to harmful agents.

USE OF AN O*NET BASED JOB EXPOSURE MATRIX TO PREDICT PREVALENCE OF CARPAL TUNNEL SYNDROME IN A LARGE POOLED COHORT

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Objectives To determine if job title based physical exposure measures predicted prevalent carpal tunnel syndrome (CTS) in a large pooled cohort of workers.

Method We pooled baseline examination data from six prospective cohort studies, restricting analyses to those employed at least 1 year. CTS was defined as median neuropathy plus typical symptoms. Physical exposure estimates for static strength, dynamic strength, time spent making repetitive motions, and time handling objects were extracted from the Occupational Network (O*NET) database using Standard Occupational Classification codes based on reported job title. Three exposure categories of high force/ high repetition, low force/ low repetition, and mixed high and low exposures were entered into logistic regression models adjusting for age, gender, body mass index (BMI), diabetes, rheumatoid arthritis, employed time and study site.

Results Of 3562 in the pooled cohort, 7.6% met a prevalent CTS definition with mean employed time of 7.9 years (SD 8.2). Compared to subjects with low job requirements for dynamic strength and repetitive motion, those with mixed exposures or high exposures showed increased prevalence of CTS (OR 1.46; 95% CI: 1.01–2.11 and OR 2.32; 95% CI: 1.15–4.67, respectively). Similar dose dependent associations of combined exposures were shown for all exposure combinations tested, with high/high
BIAS IN EXPOSURE ASSESSMENT FROM WORST-CASE SELECTION OF WORKPLACES IN OSHA’S INTEGRATED MANAGEMENT INFORMATION SYSTEM DATABASE

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Objectives The Integrated Management Information System (IMIS), with over 1M measurements taken by inspectors of the Occupational Safety and Health Administration, is an important source of information for occupational epidemiology. We assessed the association of the reason for conducting inspection with the reported levels of chemical exposure in IMIS.

Method Time weighted averaged measurements made during each of the un-programmed inspection types (employee complaint, referral by safety officer, follow-up, monitoring) were compared to those made during programmed inspections for 50 chemicals. Ratios of the median of detected results (dM), and differences in the proportion of non-detects (dPr) for each category compared to the programmed inspections were calculated for each chemical.

Results The analysis included 218 916 measurement records. 32% were collected during programmed inspections, 48% – complaints, 13% – referral, 5% – follow-up, and 2% – monitoring. The detected concentrations were similar for complaint (dM = 0.98, interquartile range across chemicals, IQR=[0.83;1.11]) and referral (dM = 0.91, IQR=[0.76;1.08]) inspections and greater for follow-up (dM = 2.18, IQR=[1.38;3.13]) and monitoring (dM = 1.59, IQR=[1.24;2.44]) inspections relative to the presumed representative inspections. Similarly, the proportion of non-detects were similar to programmed inspections during complaint-driven (dPr = 3%, IQR=[-1;3]) and referrals (dPr = 0%, IQR=[-6;5]) and lower during follow-up (dPr = -11%, IQR=[-19;-2]) and monitoring (dPr = -8%, IQR=[-12;3]) inspections.

Conclusions Despite the absence of consistent differences across chemicals for the most frequent categories, exposure levels during non-programmed surveys can be significantly higher than those obtained during presumably representative measurement campaigns. Great care has to be taken in determining typical exposure distributions from OSHA’s IMIS data.

EXPOSURE REGISTRIES AS A TOOL FOR EPIDEMIOLOGY

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Objectives In Canada, there is growing interest in the use of registries for hazard and disease surveillance because they provide an opportunity for primary prevention. Registry data can also be a valuable tool for epidemiology. Here we report the strengths and limitations of using exposure registry data for epidemiology.

Method Eight exposure registries were reviewed: five from Canada, two from the USA and one from Finland. They were compared based on overall goals, exposure information, registration, recruitment, and health information collected. The potential use of registry data in epidemiology was evaluated. Key considerations for designing a registry that facilitates secondary data use were identified.

Results The eight registries varied significantly. Data from four had been previously used in epidemiology. In three cases exposure measurements were available within the registry; in one, health information was also collected. Registries that have mandatory registration are more likely to contain sufficient data for use in epidemiological studies in contrast to voluntary registries that may fail to capture a large or representative portion of the exposed population. In order to permit later linkage of registry data with health information, consent must be obtained in advance and privacy legislation must be taken into consideration.

Conclusions Most exposure registries are not designed with secondary data uses in mind and, as a result, the use of exposure registry data in epidemiological studies can be problematic. Given the large investment involved in launching a new registry, opportunities to leverage the data for epidemiological purposes should be explored in the planning stages.

SPONTANEOUS ABORTION IN FLIGHT ATTENDANTS

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Objectives Flight attendant occupational exposures include cosmic ionising radiation and circadian disruption. We wanted to determine whether these and other occupational exposures were associated with spontaneous abortion among female flight attendants.

Method Female flight attendants from three US airlines in three cities were interviewed. Company records of over 1.9 million individual flights during the study period were assessed for exposure to galactic cosmic radiation, solar particle event radiation, and circadian disruption. Measures of physical job demands and other occupational factors were obtained from the interview. Cox proportional hazards regression models were adjusted for age, parity, and nonflying status.

Results Among 2273 women interviewed, 840 pregnancies among 673 women met inclusion criteria. There was evidence to suggest that cosmic radiation exposure of 0.1 mGy or more may be associated with increased risk of spontaneous abortion in weeks 9–13 of the first trimester (odds ratio (OR)=1.74; 95% confidence interval (CI) 0.95–3.20). The risk of a first trimester spontaneous abortion was significantly increased with 15 h or more of flying during home base normal sleep hours (OR=1.54; 95% CI 1.07–2.21) and with high physical job demands (OR=2.49; 95% CI 1.49–4.16).

Conclusions Spontaneous abortion was associated with several flight attendant occupational exposures. This is the first report of these flight attendant occupational exposures. This is the first report of these flight attendant occupational exposures.
MUSCULOSKELETAL COMPLAINTS AMONG DENTAL PRACTITIONERS

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Objectives To describe the prevalence and risk factors of musculoskeletal disorders among dental practitioners.

Method In 2012, 965 dental practitioners attending the American Dental Association Annual Session filled out surveys on individual characteristics and symptoms, then were clinically examined using the McKenzie evaluation method. Chi-square tests and linear regression were used to statistically compare associations between dental practitioner characteristics with musculoskeletal complaints.

Results 76.0% of practitioners regularly experienced pain, tingling, or numbness in their fingers, wrists, hands, forearms, shoulders, neck, back and chest during or at the end of a workday. Repetitive action during work was the most commonly reported origin of symptoms, reported in 37.9% of cases. 68.3% of practitioners reported that symptoms had prevented them from working. Symptoms located in the back were the most common, reported by 51.2%. Location of symptoms was not related to gender, dominant hand, or age, but was related to specialty: dental hygienists and endodontists had significantly higher rates of back and hand symptoms than those in other dental fields (Chi-square p-values: 0.02, 0.002).

Years spent in practice was a significant predictor of the degree of symptoms (all F-test p-values <0.05). Equipment used during the workday affected complaints: magnifier use was associated with increased musculoskeletal symptoms, as were different operator chair types. Other significant predictors were exercising or stretching during the workday and self-reported working posture (Chi-square p-values: 0.002, 0.002).

Conclusions The dental profession experiences a high rate of musculoskeletal complaints. Ergonomic and educational interventions can prevent musculoskeletal complaints, and are clearly necessary for dental practitioners.

SERUM HEME OXYGENASE-1 LEVEL IN SILICOSIS PATIENTS AND STONE MORTAR AND PESTLE PRODUCTION WORKERS

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Objectives Silicosis is a chronic lung disease caused by silica dust exposure and is a significant health problem in industry involving stone crushing process such as mortar and pestle production industry. We proposed a use of Heme Oxygenase-1 (HO-1) to detect an early stage of silicosis. HO-1 is a lung inflammation and oxidative stress biomarker which has a potential to indicate silicosis. In this study, the serum level of HO-1 in exposed subjects (stone mortar and pestle production workers) was compared to a non-silica exposed subjects.

Method Total crystalline silica was quantified by ultraviolet visible spectrometry. A chest radiograph was performed in a General Hospital by a trained radiologist to detect silicosis according to International Labour Organisation guideline. The serum HO-1 level was determined by sandwich enzyme immunoassay.

Results There were 19 silicosis subjects in the exposed group which was categorised into the silicosis group. The process in stone mortar and pestle production industry produced high level of silica dust in the air ranging between 3.97–21.12 mg/m3. The level of HO-1 increased as the level of silica exposure increased even after adjusted for smoking and employment duration. The level of serum HO-1 level was, however, not significantly different between silicosis, exposed, and non-exposed groups, nor was the relationship between HO-1 and pulmonary function.

Conclusions We propose that HO-1 reflects the lung inflammation caused by silica exposure although it is not specific to silicosis. HO-1 may be a useful parameter for monitoring lung inflammation in silica exposed population.

OCCUPATIONAL EXPOSURE TO EXTREMELY LOW FREQUENCY MAGNETIC FIELDS OR ELECTRIC SHOCKS AND CANCER INCIDENCE IN FOUR NORDIC COUNTRIES

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Objectives To evaluate the association between occupational exposure to extremely low frequency magnetic fields (ELF-MF) or electric shocks and brain cancer, haemopoietic and lymphatic malignancies, and breast cancer incidence in the Nordic Occupational Cancer cohort.

Method The cohort was set up by linking occupational information from national censuses held in 1960, 1970, 1980–1, and/or 1990 to national cancer registry data in Finland, Iceland, Norway, and Sweden. All subjects aged 30–64 years who participated in a census were followed-up for cancer incidence until 2003–2005. Occupational exposure to ELF-MF or electric shocks was assigned to each subject based on census reported jobs using job-exposure matrices. For each case, five controls were randomly selected by matching for country, age, and sex. Conditional logistic regression models were performed adjusting for social class and occupational exposure to solvents.

Results A total of 68 770 brain cancer cases, 65 609 non-hodgkin lymphoma cases, 83 088 leukaemia cases, 33 791 multiple myeloma cases, 1827 male breast cancer cases, and 297,283 female breast cancer cases were included. Thirty-five percent of the population was ever exposed to ELF-MF and 7% to high levels, whereas 19% was ever exposed to a medium risk of electric shocks and 13% to a high risk. No associations were found between occupational exposure to ELF-MF or electric shocks and any of the cancer outcomes.

Conclusions In this very large census cohort we found no evidence of increased risk of several cancers in relation with occupational exposure to ELF-MF or electric shocks.
REPEATED PRE AND POST-SHIFT URINALYSES SHOW KIDNEY DYSFUNCTION AMONG COSTA RICAN SUGARCANE CUTTERS EXPOSED TO HEAT STRESS

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Objectives Sugarcane harvesters in Costa Rica are exposed to heat stress, a likely major risk factor in the Mesoamerican nephropathy epidemic. Routine urinalyses provide important information about kidney function, but have not been reported in detail for this population.

Method Sugarcane cutters (n = 48) provided six spot urine samples, pre- and post-workshift for three days during one week in mid-harvest. Chemical analyses with dipstick and microscopic examinations of sediment were performed. Changes over the workday in markers for hydration status and kidney responses to heat stress were evaluated with McNemar test on paired proportions.

Results Preliminary results indicate percentages of workers with specific parameters in at least one morning versus in at least one afternoon sample were with dipstick: pH ≤ 5 30% vs 82%, specific gravity ≥ 1.025 30% vs 51%, proteinuria (1+ and up) 86% vs 8%, and blood (traces and up) 28% vs 12%; and in sediment: >5 leucocytes 76% vs 57%, >3 erythrocytes 50% vs 37%, and casts (granular, leucocyte and some erythrocyte) 75% vs 39%. Except for erythrocytes in sediment, these differences were statistically significant.

Conclusions Concentration and acidification of urine over the workday indicate insufficient hydration. Positive blood on dipstick may be a sign of low-grade hematuria or mild rhabdomyolysis. Predominance of proteinuria, leucocytes, erythrocytes and casts in morning urine was unexpected but may reflect improvement in glomerular filtration with hydration overnight or, alternatively, effects from vasopressin at night. This study adds to an increasing body of evidence of kidney dysfunction among heat stress exposed sugarcane workers.

INCORPORATING MORE DETAILED EXPOSURE ASSESSMENT WITH QUANTITATIVE ESTIMATES IS ASSESSING THE BURDEN OF OCCUPATIONAL CANCER

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Objectives In recent years, several new burden projects have been initiated with increased methodological sophistication. Previous studies have varied with respect to methods used to identify the prevalence and relevant levels of exposure, but many have relied on CAREX estimates. In this presentation, we will focus on the impact of incorporating more detailed exposure assessments with quantitative estimates as part of the Canadian burden of cancer project.

Method The Canadian exposure estimation process relies on data from CAREX Canada, taking into account industry and occupation at a more detailed level than previously. For many common carcinogens, the Canadian Workplace Exposure Database is used to account for changes in exposure levels over time and quantitative exposure-response relationships from the literature are used to assign relative risks relevant to the mean level of each exposure group. Historical employment trends are based upon census data at multiple time-points with province, sex, industry, and occupation detail.

Results Developing estimates for approximately 300 industries, as well as by occupation, and the need for estimating the age and gender characteristics of predicted cases to estimate economic burden, has also increased the complexity of estimating historic labour force dynamics. Annual labour force data 1976–2010 is used to attribute age- and tenure-distribution characteristics by province, sex, and industry.

Conclusions Although our main objective was to increase the validity of the burden estimation process, the more detailed exposure estimates allow us to calculated cancer burden for much more specific industry sectors and occupations, allowing for detailed risk reduction strategies.
0406  PROSPECTIVE MONITORING OF EXPOSURE AND LUNG FUNCTION AMONG CEMENT PRODUCTION WORKERS – IS DROP OUT FROM THE STUDY ASSOCIATED WITH RESPIRATORY HEALTH AT INCLUSION?


10.1136/oemed-2014-102362.160

Objectives In this study we aimed to estimate the associations between respiratory health at inclusion and drop-out from a 4-year longitudinal study of lung function among cement production workers in Europe and Turkey.

Method Non-administration workers (n = 3203) aged 17–54 yrs in 22 cement production plants in eight countries were included. Geometric mean (GM) exposure to the thoracic fraction of the workplace aerosol was allocated individually by job type and plant from a database of 6111 measurements from the follow-up study. Drop out was analysed in logistic regression with year of hire, exposure level, airway symptoms, chronic obstructive pulmonary disease (COPD) and use of airway protection at inclusion as explanatory variables. COPD was defined as FEV1/FVC < 0.7.

Results COPD at inclusion was associated with drop out, but only among those hired 6–10 years before inclusion (OR 2.4 [CI 95% 1.1–5.5]). GM exposure exceeding a level of 1.61 mg/m³ was associated with drop out (OR= 1.9; CI 95% 1.3–2.7) compared to exposure below 0.42 mg/m³. The use of respiratory protection at inclusion was inversely associated with drop out (OR 0.6 [CI 95% 0.4–0.9]). Age, sex, allergy, asthma and previous occupational exposure to dust and gases did not confound the associations.

Conclusions Workers in the highest exposed group had increased risk, while those who reported using a respiratory mask had reduced risk of dropping out. Participants classified with COPD at inclusion were to some extent depleted from the study, but only among those hired 6–10 years before their inclusion.

0412  THE MANAGEMENT OF PATIENT/VISITOR (TYPE II) VIOLENCE BY THE HOSPITAL UNIT NURSE MANAGERS AND STAFF

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10.1136/oemed-2014-102362.162

Objectives To examine the management of workplace violent events (type II) by hospital unit nurse managers and staff.

Method Cross-sectional surveys, telephone interviews, and semi-structured focus groups were employed among nurse managers and nursing unit staff in two large hospital systems.

Results Nurse managers and staff perceived an increase in type II violence in recent years which they attributed to an increase in financial needs of patients/families, and drug seeking behaviour. Both groups expressed sometimes feeling unsupported by their institutions with regard to their safety in the context of these events due to their organisation’s focus on maximising patient/visitor satisfaction, poorly defined/enforced visitor policies, and movement away from physical/chemical patient restraints. Nurse managers perceived themselves as the designated person on their unit responsible for de-escalation of violent situations, with security called only in extreme situations. Security involvement was not consistently considered an option for managing violent events. Unit staff concurred that they relied on their managers to assist, but were left to handle this in their absence. Managers expressed feeling torn between having to consider patient satisfaction versus worker safety at times. They sometimes resorted to rotating patients, known to be violent, between hospital units for purposes of relieving staff from overlap exposure to violent behaviour.

Conclusions Poorly defined and/or enforced hospital level policies results in nurse managers and staff being left to determine how violent events are managed, which sometimes occurs at the expense of their safety. Efforts at identifying effective institutional and unit level violence prevention policies and strategies are needed.
0413 VIOLENCE PERPETRATED BY HOSPITAL PATIENTS AND VISITORS (TYPE II) AGAINST “SITTERS”

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Objectives Hospital sitters provide continuous observation of patients at risk of harming themselves or others. This study examined violence perpetrated by patients/visitors (type II) against hospital sitters in two US healthcare systems.

Method Anonymous, cross-sectional survey data were collected from staff, including 41 sitters, across six hospitals to characterise the magnitude of and circumstances surrounding type II violence. Focus groups and interviews (n = 17) provided contextual details.

Results Unit/float pool aides, patient care attendants, unit secretaries, and contract employees served as sitters. Compared to other staff, sitters had higher 12-month prevalences of physical assault (61%;11%), physical threat (63%;18%), and verbal abuse (73%;37%). Sitters were more likely to experience a patient (rather than visitor) perpetrator (94%;76%), have a weapon (s) used against them (72%;31%), be alone with the perpetrator (65%;40%), perceive intent to harm (33%;17%), and feel frightened about their personal safety (61%;38%). Sitters often reported events verbally to unit staff and rarely through official channels (e.g., first report of injury). In focus groups and interviews, sitters and staff indicated their need for clarification of sitter roles and violence prevention training – supported by hospital and unit management – are needed. Continued efforts to describe the safety and health of this workgroup are warranted.

0416 CAREX CANADA’S EWORK: DEVELOPING INNOVATIVE TOOLS FOR STATISTICS ON CANADIANS’ OCCUPATIONAL EXPOSURE TO CARCINOGENS

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Objectives To enhance access to CAREX Canada’s occupational exposure estimates by creating and demonstrating two electronic tools, eWORK Excel and eWORK Online. Both tools allow users to explore CAREX results by occupation, industry, exposure level, and carcinogen. Results generated by the tools are dynamic, customizable, and tailored to the user’s interest.

Method eWORK Excel was developed in Microsoft Excel with the PowerPivot add-on. eWORK Online was developed using a data visualisation software called Tableau Public. Data inputs (prevalence and level of exposure estimates to known and suspected carcinogens) were developed using CAREX methods established in the European Union and enhanced for the Canadian context.

Results Two functional tools, eWORK Excel and eWORK Online, are already completed and beta testing is underway. Future deliverables include upgrading the tools with additional data and capabilities, and refining tool features based on testing feedback. Target audiences differ for our two eWORK tools. eWORK Excel is aimed at savvy data users such as researchers in occupational hygiene and epidemiology. eWORK Online is for users who prefer quick, simple, yet high quality statistics on occupational exposures to various carcinogens. Target groups for eWORK Online include physicians, policymakers, occupational health and safety professionals, and labour organisations.

Conclusions The overall goal of the CAREX Canada project is to help reduce exposure to carcinogens in Canadian workplaces by providing scientific evidence on exposure patterns and concentrations for policymakers and other important stakeholders. eWORK Excel and eWORK Online are innovative tools which play a key role in effective communication of our research results.

0418 EVALUATION OF AN AUDIT-BASED OCCUPATIONAL HEALTH AND SAFETY RECOGNITION PROGRAM ON FIRM WORK-INJURY RATES IN BRITISH COLUMBIA, CANADA

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Objectives In 2003 British Columbia’s occupational health and safety (OHS) regulator implemented a voluntary audit-based OHS recognition program in select industrial sectors. Firms achieving OHS certification received a rebate on workers’ compensation premiums. This study evaluated the effect of OHS certification on firm work-injury rates for the years 2004 to 2011.

Method A cohort of certified (intervention) and non-certified (control) firms was derived from workers’ compensation claims records from 2000 to 2011. Firms were drawn from the industrial sectors covered by the OHS program and had to have paid workers’ compensation premiums for at least three years during the study period. A difference-in-difference evaluation approach using random-effects Poisson regression was implemented that accounted for the difference in baseline injury risk and the change in injury risk over time between the intervention and control group. Estimates were adjusted for industrial sector, firm size, firm tenure and industrial sector average injury risk. Outcomes investigated were loss-time injuries and a subset of more serious work injuries.

Results The intervention group included 4392 firms who achieved OHS certification between 2003 and 2010. These firms had similar baseline loss-time (IRR: 1.04 95% CI: 1.00–1.08) and serious injury rates (IRR: 0.99 95% CI: 0.94–1.04) compared to controls. Safety certification was associated with a decline in the loss-time (IRR: 0.92 95% CI: 0.90–0.94) and serious injury rate (IRR: 0.88 95% CI: 0.85–0.92).

Conclusions Voluntary audit-based OHS certification was associated with a 8% and 12% reduction in loss-time and serious injuries British Columbia between 2004 and 2011.
0419  OCCUPATIONAL INJURIES AMONG CHILD LABOURERS: PRELIMINARY RESULTS FROM A STUDY OF THE BRICK MANUFACTURING INDUSTRY IN FOUR COUNTRIES

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Objectives Internationally, brick kilns employ tens of thousands of children. Due to the extreme poverty facing families who work in this industry, child labour in this sector has been challenging to eliminate. This study assesses the association between brick kiln work and self-reported injuries among children working in brick kilns in Afghanistan, Bangladesh, Nepal, and Pakistan.

Method A mixed-methods approach developed by an international team was translated and tailored for each country. Working children (aged 11–17) were identified from 1–3 brick kiln sites. Non-working controls, matched for age, sex, and socioeconomic status were identified from nearby communities. Trained interviewers administered semi-structured questionnaires to all consenting respondents.

Results 917 working children and 788 controls participated in the study. Overall, 65.1% of cases and 29.3% of controls reported experiencing a minor cut or bruises in the last month. The estimated odds ratio (OR) of recent injury was 3.60 (95% CI: 2.84–4.56) comparing working children to community controls. Nearly half (48.8%) of cases and 30.5% of controls reported a “bad cut”, broken bone, sprain, or burn in the last year, resulting in an adjusted OR of 2.44 (95% CI: 1.97–3.03) comparing working children to controls.

Conclusions While the hazardous nature of brick kiln work may be evident, this study was designed to provide evidence for parents, brick kiln operators, and policy-makers who seek to remove children from this work. Additionally, this work demonstrates a model for action-oriented, occupational health and safety research in challenging environments.

0421  NOISE-INDUCED STRESS AMONG PRIMARY CARE WORKERS IN LONG TERM CARE FACILITIES IN BRITISH COLUMBIA, CANADA

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Objectives Sound environments in healthcare facilities are characterised and reported to be poor, and suggest adverse effects on patients and health care workers. This research aimed to examine the acoustical characteristics of long-term care facilities and evaluate the association between noise conditions and stress among residential care workers.

Method We recruited from long-term care facilities in Greater Vancouver, representing a range of building characteristics that influence background noise levels, reverberation time, and speech intelligibility index. Repeated measurements of noise (personal dosimeters and area assessments) and stress (heart rate variability (HRV) and salivary cortisol levels) were collected along with self-reported measures of stress for modelling.

Results Ninety-nine residential care workers participated, most of which were female (89%) and registered care aides (RCAs) (58.8%). Each participant contributed four days of measurements, on two consecutive days followed by another two consecutive days at least 2 weeks later, for a total of 392 person-days of measurements. Participants were exposed to mean A-weighted average sound pressure level of 74.8 dBA (range: 60.3–90.2 dBA) with RCAs and evening shift workers experiencing the highest mean personal exposure levels at 75.3 and 75.8 dBA, respectively.

Licensed practical nurses (LPNs) and those working the evening shift had the highest perceived stress scores, while RCAs were found to be the most stressed group of participants, with the lowest HRV and the lowest diurnal cortisol values.

Conclusions These results suggest that noise levels experienced by residential care workers induce an autonomic stress response capable of contributing to burnout, job dissatisfaction and increased absenteeism.

0424  THE INJURY PREVENTION EFFECTS OF REGULATORY WORKPLACE SAFETY INSPECTIONS IN BRITISH COLUMBIA, CANADA FROM 2001 TO 2011

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10.1136/oemed-2014-102362.168

Objectives To determine if inspections by the workplace safety regulator (WorkSafeBC) in the Canadian Province of British Columbia are associated with a reduction in firm injury rates.

Method Injury, inspection, and claims data collected by WorkSafeBC were analysed to determine the lost-time rates for all single-location firms that had been in operation in British Columbia for at least four years between the years of 2001 and 2011. Log-linear generalised estimating equations analyses were conducted to examine the effect of a workplace inspection on the change in injury rates between the year of inspection and the following year. Models were adjusted for time and sector.

Results 74 510 firms met the eligibility criteria, with about 3% of firms per year experiencing an inspection, over the time period of 2001 to 2008. The ratio of firms inspected varied by sector, for example, about 8% of primary resources firms were inspected per year during this same period. Inspected firms had a higher injury rate (10 SLF claims per 100 FTE annually) compared to non-inspected firms (4 claims per 100 FTE).

Through GEE analyses, it was found that an inspection reduced injuries (beta coeff=-0.0048 (-0.0067, -0.0029)) in the year following an inspection. The effect was greater for larger (>10FTE) (beta coeff=-0.015 (-0.021, -0.009)) versus smaller firms (<10FTE) (beta coeff=-0.0067 (-0.0094, -0.0040)).

Conclusions These results suggest that inspections do have injury prevention effects, and the differing effects by firm characteristics may indicate the opportunity to target firms according to the most appropriate intervention.

0425  VALIDATION OF THE THAI VERSION OF A WORK-RELATED QUALITY OF LIFE SCALE

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10.1136/oemed-2014-102362.169
Objectives Our aim was (a) to assess the content validity of a Thai translation/version of a quality of work-life evaluation tool, and (b) to examine its accuracy vis-à-vis nursing in Thailand.

Method Descriptive correlation study

Forward-backward translating procedures were used to develop the Thai version of the work-related quality of life scale. Six nursing experts participated in assessing content validity and 374 registered nurses (RNs) participated in its testing. After a two-week interval, 67 of the RNs were retested. Structural validity was examined using principal components analysis and the Cronbach’s alpha calculated. The respective independent sample t-test and intra-class correlation coefficient were used to analyse known-group validity and test-retest reliability.

Sample group: Cluster sampling was used to select 374 registered nurses from the In- and Out-patient Departments at Sirinagarind Hospital, Khon Kaen University.

Results The content validity index of the scale was 0.97. Principal components analysis resulted in a seven-factor model, explaining 59% of total variance (Cronbach’s alpha for the subscales ranged between 0.65 and 0.84, while the overall Cronbach's alpha was 0.925). The known-group validity was established in the assessment results of the difference in bureau-crats (civil servants) vs. casual employees by F (8.855,0.003) and t (3.305, p < 0.01). Apparently, government employees have a better quality of work life than the university’s casual employees. Good test-retest reliability was observed (r = 0.898, p < 0.01).

Conclusions The Thai version of a work-related quality of life scale appeared to be well validated and therefore useable for determining the quality of work-life among nurses in Thailand.
Among police registrants at Survey Wave 2, 5–6 years after 9/11/01, four unique trajectories of probable PTSD symptoms were identified: resilient (83%), recovered (25%), delayed onset (11.2%) and chronic (5.3%). The current study documents the longitudinal trajectories of PTSD in police officers exposed to the WTC attacks at Wave 3 (2011–2012), over 10 years since the WTC attack.

**Method** We examined the prevalence of probable PTSD at the Wave 3 survey using a cut-off score of 44 or greater on the event-specific Posttraumatic Stress Disorder Checklist (PCL) and at least one re-experiencing symptom (DSM-IV criterion B), three avoidance or numbing symptoms (DSM-IV criterion C), and two hyperarousal symptoms (DSM-IV criterion D).

**Results** Probable PTSD was 14.4% (95% CI 13.0–15.9%) at Wave 2 and 12.9% (95% CI, 11.6–14.3%) at Wave 3. Significant predictors of chronic probable PTSD 10 years post-disaster (n = 59/2241, 2.6%) include age 45–69 (aOR 3.16, 95% CI, 1.7–6.0), number of stressful events witnessed on 9/11/01 (aOR 3.00, 1.6–5.8), five or more stressful life events since 9/11/01 (aOR 5.42, 1.9–15.2), and unmet mental health care needs (aOR 6.86, 3.3–14.1). Protective factors include social support (aOR 0.34, 0.1–0.97) and number of close friends or relatives (aOR 0.92, 0.87–0.98).

**Conclusions** Chronic probable PTSD among police responders continues to be a significant problem, associated both with intervening stressful life events and unmet mental health care needs.

**Poster presentation**

**0005** **COMPREHENSIVE ANALYSIS OF RESEARCH AND PROGRAM-BASED STUDIES ON OCCUPATIONAL HEALTH AND SAFETY IN THE PHILIPPINES**

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10.1136/oemed-2014-102362.174

**Objectives** This study looked into the state of occupational health and safety in the country. Specifically, the objectives were 1) to show the current condition of workers, both local and migrant, in terms of their workplace condition and hazard exposures; and 2) to present occupational diseases and illnesses in various industries and occupational groupings in the Philippines.

**Method** The methodology consisted of comprehensive analysis of records and statistics on occupational safety and health, and related variables from various institutions. Data were gathered from reviews of literature, related research studies, and documentary research at the Occupational Safety and Health Centre. Analysis of data was done through a critical appraisal of the current status of occupational and health safety in the Philippines in terms of occupational diseases, injuries, and accidents, and existing occupational health and safety policies.

**Results** The study showed occupational hazards and health and safety conditions in various industries, occupational settings, and job groupings such as in the industrial sector, manufacturing, mining, agriculture, fishing, and cement manufacturing. It also looked into small scale and informal industries such as tanning, laundry shops, pyrotechnique manufacturing and the like. Special segments of the labour force including the women workers, child labourers and migrant workers were also covered. In all these sectors and industries, the study showed attendant occupational diseases and injuries arising from occupational hazards.

**Conclusions** The study showed more complete data on occupational health and safety in the Philippines considering that there is insufficient collection of OHS data by concerned government agencies.

**0006** **EFFECTS OF AGRICULTURAL WORK PRACTICES AND PESTICIDE USE ON OCCUPATIONAL HEALTH OF FARMERS**

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10.1136/oemed-2014-102362.175

**Objectives** This study aimed to identify the associated health symptoms between high and low exposed groups to pesticide, and to come up with an intervention pesticide program for our farmers in the vegetable industry.

**Method** Survey questionnaires were used to look into pesticide exposures and work practices of 534 farmers in the largest eggplant producing province in the northern Philippines. Physical health assessment was conducted by medical doctors to look into the factors associated with health symptoms.
health status of farmers who have been using pesticides for the past years. Laboratory examination of blood was also done, including blood cholinesterase to determine organophosphate exposures.

**Results** Majority were males (53.4%), married (80.5%) with a mean age of 47 years old. The most commonly used pesticides were Tamaran (36.1%), Dithane (34.1%), Sumicide (29.0%), Selectron (24.9%) and Lannate (15.2%). Tamaran, being the most commonly used, has an active ingredient of methamidophos and classified as an organophosphate pesticide. Meanwhile, Dithane, a mancozeb, is a dithiocarbamate pesticide and Sumicide is a pyrethroid with an active ingredient of fenvalerate. In addition, Selectron is composed mainly of ingredients of prochloroz nm and spinosad, respectively (Table 2). During their agricultural work, farmers used pesticides mainly for three to six hours per day (51.2%), one to two days weekly (86.8%) and three to four weeks per month (82.3%). 40.9% who underwent the physical examination were diagnosed to have abnormal assessment results. Analyses indicated that pesticide use and risk factors were found to have association at \( p = 0.05 \) with easy fatigability, weight loss, loss of appetite, cerebellar function, creatinine levels, haemoglobin, mean corpuscular volume, mean corpuscular haemoglobin count, and platelet count. 3.3% of the farmers were found to have abnormal platelet count. Platelet count may indicate whether the patient is having bleeding problems, infectious processes, bone marrow depression, malignancies or anaemia. For RBC cholinesterase activity, it was found that 30.8% of the samples showed depression in activity.

**Conclusions** This study has demonstrated the interaction between the farmers’ pesticide exposure and work practices, as well as physical, neurological and laboratory assessment findings. The study shows that farmers are at a considerable risk of either acute or chronic pesticide poisoning because of improper work practices. Around 40.9% of the farmers were diagnosed to have abnormal physical examination findings while 4.6% presented problems in their neurological functioning and less than 10% of the farmers exhibited abnormal laboratory results. The author recommends the use of the information gathered in this study to improve current policies and standards with regards to surveillance of pesticide use.

**0007 TRENDS OF OCCUPATIONAL INJURY IN THE PHILIPPINES: IMPLICATIONS FOR POLICY**

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10.1136/oemed-2014-102362.176

**Objectives** This study aimed to review and assess the prevalence and incidence of occupational injuries in the Philippines.

**Method** Data collection were done from various agencies, namely, Bureau of Labour and Employment Statistics (BLES) of the Department of Labour and Employment (DOLE), Labour Force Survey of National Statistics Office, among others. Hospital-based surveys and newspaper reports were also sources of data for this study.

**Results** The review showed that about 358 000 fatal and 337 million non-fatal occupational accidents in the world, and 1.95 million deaths from work-related diseases. Occupational injuries in the Philippines showed major trends in injuries, causes of injuries and rates and severity of injury. However, the data lack more specific and segregated information per industry and occupational grouping, as well as identification of risk factors associated with these injuries. Therefore, improvements in injury surveillance and documentation of injury cases as well as research into risk factors at work should be done. All these efforts should lend towards prevention strategies and guidelines on occupational injuries in the Philippines. Also, there is a need to have a standard nomenclature of occupational injuries, starting from the primary data sources (company clinics) which are the basis of the national data. It is suggested that data collection on occupational injuries be a national scale, and not merely randomised collection of data for small, medium and large industries.

**0008 A NEW MODEL FOR OUTREACH TO SMALL INDUSTRIAL FIRMS: SAFETY AUDIT RESULTS FROM THE NATIONAL MACHINE GUARDING PROGRAM**

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10.1136/oemed-2014-102362.177

**Objectives** Small industrial firms frequently lack occupational safety and health (OSH) expertise. In addition, development of effective, widely applicable OSH interventions for small businesses has proven to be a persistent challenge. The National Machine Guarding Program is an intervention currently underway to address these issues among small (3–150 employees) metal fabrication businesses.

**Method** A partnership was formed with workers’ compensation insurers to recruit businesses for an intervention designed to prevent machine-related injuries and improve safety programs such as lockout/tagout. Participants receive a baseline evaluation, two intervention visits, and a follow-up evaluation. Pooled results from baseline safety assessments will be presented.

**Results** 221 businesses from 29 U.S. states were enrolled. At baseline, the mean score for machine safety audit was 73.7%, however, only 67.5% of items concerning point of operation safeguards were present on average. For shop-wide safety programs and policies, mean audit score was 43.4%. Safety program/policy scores were significantly lower among smaller businesses, whereas machine safeguarding equipment scores were similar across all size strata.

**Conclusions** The National Machine Guarding Program represents a new intervention model for widespread outreach to small industrial firms. Baseline safety audit results show a need for improvement in shop-wide safety programs and in critical areas of machine safeguarding. Preliminary results indicate that this is an effective model for recruiting small metal fabrication businesses into a nationwide intervention. Effectiveness of intervention programs in improving these aspects of injury prevention will be evaluated to determine whether broader application is warranted.
**0009**

ASBESTOSIS AND EXPOSURE LEVELS IN A CHINESE ASBESTOS WORKER COHORT

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10.1136/oemed-2014-102362.178

**Objectives** To assess the relationship between quantitative exposure levels and the development of asbestosis in a Chinese asbestos worker cohort.

**Method** A cohort consisting of 577 male workers from an asbestos products factory in China was followed for 37-years. Personal information was collected, including date of hire, specific job types, duration of exposure, and smoking habits. There were 127 workers (22%) diagnosed as asbestosis by a specialised panel using Chinese radiographic Diagnostic Criteria for Pneumocystis (GB5908-86). Individual cumulative fibre exposures (f- yrs/ml) were estimated based on periodic dust/fibre measurements from different workshops and years of working at specific workshops, and then categorised into four levels (quartile). The relationship between the exposure levels and cumulative incidence of asbestosis was assessed with Cox Proportional Hazard Model, adjusting for age and smoking.

**Results** Workers at the four exposure levels were comparable in age at entry, exposure duration (around 25 yrs), and smoking rate. However, the proportion of asbestosis cases was greater with exposure levels, with a nearly three-fold increase (3.42, 95% CI 2.0, 5.9) at the highest exposure level, compared to at the lowest level.

**Conclusions** The study using quantitative estimate of exposures, which was seldom available in China, provides additional evidence for the exposure-response relationship between chrysotile exposure and the development of asbestosis in asbestos workers.

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**0010**

THE IMPORTANCE OF CONDUCTING REGULAR SAFETY INSPECTIONS IN SMALL AND MEDIUM SIZE ENTERPRISES

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10.1136/oemed-2014-102362.179

**Objectives** A considerable effort has been made to examine the health and safety of employees in large-sized enterprises. However, there has not been much attention given to the organisation of work, occupational health and safety, and work disability prevention in small and medium enterprises (SME). The purpose of our study is to examine facilitators and barriers to occupational health and safety among SME in Ontario.

**Method** A cross-sectional design was used to examine the occupational health and safety culture of small and medium sized enterprises from public and private sectors in Ontario. A convenience sample of employees from all position titles in Ontario organisations that ranged from 5 to 100 full-time equivalent employees were invited via email to participate in the survey.

**Results** A total of a 153 questionnaires were returned. Most of the respondents were female (84.2%) with a mean age of 49.8 years (SD = 10.6). Multivariable logistic regression modelling revealed the odds of a safe work environment for SME who conducted regular safety inspections were estimated to be 2.88 (95% CI, 1.57–5.27) greater than the odds of a safe work environment for SME who did not conduct regular safety inspections.

**Conclusions** This study profiled the work and safety among small and medium enterprises in Ontario. Moreover, better implementation and training strategies that focus on adapting occupational health and safety legislation to the nature and diversity of SMEs is warranted.

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**0011**

WORK ABILITY AND WORK-RELATED STRESS: A CROSS-SECTIONAL STUDY OF OBSTETRICAL NURSES IN URBAN NORTHEASTERN ONTARIO

1Behdin Nowrouzi, 1Nancy Lightfoot, 2Loraine Carter, 1Michel Lariviere, 1Ellen Rukholm, 1Robert Shinke, 1Diane Belanger-Gardner, 1Laurentian University, Sudbury, Canada; 2Health Sciences North, Sudbury, Canada

10.1136/oemed-2014-102362.180

**Objectives** The aim of this study was to determine: 1) if quality of work life (QWL), location of cross-training, stress variables, and various demographic factors in nurses are associated with work ability, and 2) nursing occupational stress, QWL, and various associated factors are related with nurses’ work ability.

**Method** This cross sectional study was conducted in 2012 in four hospitals in northeastern Ontario, Canada. A stratified random sample of registered nurses (n = 111) were selected.

**Results** The majority of participants were female (94.6%) ranging in age from 24 to 64 years (M = 41.9, s.d. = 10.2). For the stress and QWL model, one variable: QWL (home-work support) (p = 0.015), cross-trained nurses (p = 0.048), and having more than 4 patients per shift (p = 0.024) significantly contributed to the variance in work ability scores. In the logistic regression model, the odds of a higher work ability for nurses who received home-work support were estimated to be 1.32 (95% CI, 1.06 to 1.66) times the odds of a higher work ability for nurses who did not receive home-work support.

**Conclusions** Work ability in the work environment of obstetrical nursing is important. To be high functioning, workplaces should maximise the use of their employees’ actual and potential skills.

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**0013**

SALIVARY CORTISOL RESPONSE TO A HIGH-PROTEIN CHALLENGE AND METABOLIC SYNDROME IN POLICE OFFICERS

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**Objectives** Policing is considered a high-stress occupation and officers have elevated cardiovascular morbidity and mortality. We evaluated the association between salivary cortisol response to a standardised challenge and the metabolic syndrome (MetSyn), an indicator of increased cardiovascular risk.

**Method** Cross-sectional data from the Buffalo Cardio-Metabolic Occupational Police Stress Study (2004–2009) were analysed. MetSyn was defined as three or more of five components: abdominal obesity, hypertension, elevated triglycerides, reduced high-density lipoprotein cholesterol, and glucose intolerance. Officers provided five salivary cortisol samples, one before challenge (ingestion of a high-protein shake) and four at 15-minute intervals...
Objective The objectives of this study were to assess the importance of the mental suffering of employees in the service sector of a city in western Algeria and to identify risk factors and moderators of this suffering in order to develop an effective prevention.

Method Standardised questionnaires were subjected to 753 employees in the tertiary sector. These questionnaires include three categories: A social and professional record (21 items), Maslach Burn Out Inventory: MBI (22 items), Job Personal Interaction Scale: JPIS 35 questions on the perception of the work environment by the individual divided into 6 rubriques (workload and unpredictability, control, rewards, recognition and fairness at work, social support, conflicts and perceived value of work and training).

The data collected were anonymous and confidential. Data analysis was performed using SPSS (version 17.0). Univariate analysis was performed (chi-square Pearson correlations and a multivariate analysis (logistic regression).

Results The state of burn-out was 23.6% after logistic regression the main social determinants of psychological distress in the overall sample one taking medication to relieve pain (p = 0.0002) remained significant.

Regarding the determinants “professional” contact with the public and strong mode part of work were significant respectively (p = 0.0017 and 0.0042).

Moderators of stress for the multivariate analysis recognised two subscales of bad training (p < 0.01) and conflicts of values and perceived value (p = 0.02).

Conclusions Preventive actions to reduce or eliminate risk factors directly affect the environment and source of work: training more relevant, better organisation of work, especially the riding tasks and recognition of work done.

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Conclusions In the present study, a high prevalence of UI symptoms was found in soccer athletes, with moderate reliability between the pad test and the ICIQ-SF; mild UI was found in both groups. The athletes had the highest scores on the General Health, Emotions and Sleep/Energy domains, which are considered to have the highest impact on quality of life.

0017 LIFE QUALITY IN WORKERS WITH RELATED MUSCULOSKELETAL DISORDERS

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10.1136/oemed-2014-102362.185

Objectives Analyse the quality of life of workers of administrative department who carry out repetitive functions in a medical certification central.

Method This study was carried out in a transversal analytical approaching. The sample was constituted by 62 workers of the administrative sector of a medical certification center in the state of São Paulo. As an instrument of gathering the data the used questionnaires were: Anamnesis Questionnaire with personal and professional data, Nordic Questionnaire, Job stress scale, SF-36 Quality of Life Questionnaire. The characterisation of the sample was obtained through descriptive statistics, where test t and correlation of Pearson test were applied.

Results According to the results of the analysis of the Nordic questionnaire, 33, 87% mentioned feeling pain in the wrists and hands. In the correlation made among the data of SF-36 and Nordic questionnaire, it was showed that they presented complaints about the Nordic, minor was the score in the variables of SF-36: limitation by physical aspects, pain, vitality, emotional aspects and mental health.

Conclusions It is concluded that the most affected segments were wrists and hands, with 33, 87%, followed by anklebone and feet with 16, 13%.

0020 COMPARATIVE STUDY ABOUT QUALITY OF LIFE BETWEEN WOMEN PRACTICING DANCE AND SEDENTARY WOMEN

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10.1136/oemed-2014-102362.186

Objectives This study aimed to compare Quality of life (QOL) of women who practice Jazz compared to sedentary women, in the Sports Centre-414 SESI in Sao Paulo - SP.

Method We carried out a cross-sectional study, with women between 50 and 85 years old, divided into two groups: Activity Group (GA, n = 14) and Sedentary Group (GS, n = 14). QOL was analysed by the SF-36.

Results The GA had a significant improve in 6 domains of SF-36 compared to GS (p < 0.05).

Conclusions The results of this study suggest an improvement in the QOL of practitioners of jazz, especially in the physical and emotional aspects, compared to sedentary women.

0024 EFFECTS OF CHRONIC LOW-DOSE EXPOSURE TO IONISING RADIATION ON PHYSICIAN MICRO-VASCULAR STRUCTURE REVEALED BY NAIL FOLD CAPILLAROSCOPY

Pascal WIAD, Christine Gauron, Christian Derock, Karine Champion, Pascal Cohen, Caroline Meneç, Anne-Sophie Tellier, Hélène Thiel, Michel Grably, Laurent Donadille, Raffaele Piersoala, Dominique Choudat, IRSN, Vandœuvre, France; IRSN, Paris, France; APHP, Paris, France; University Hospital, Grenoble, France; University Hospital, Lille, France; University Hospital, Clermont-Ferrand, France; IRSN, Fontenay Aux Roses, France; Naples University, Naples, Italy; University Paris Descartes, Paris, France

10.1136/oemed-2014-102362.187

Objectives The aim of this study was to assess the long term pre-clinical effects of low-dose radiation on the micro-vascular structure among interventional physicians whose hands are exposed to ionising radiation in their daily practice.

Method The study, approved by the ethics committee, included 186 radiation-exposed (surgeons, cardiologists and radiologists) and 35 unexposed physicians. The study participants filled in a questionnaire describing their present and past daily practice from which the present and cumulative radiation exposures were estimated. Their dermal microcirculation was assessed by capillaroscopy of the nailfold of 8 fingers -thumbs excluded- of each study participant. Two quantitative scores characterising respectively extravasation and morphological abnormalities were obtained based on post-hoc codings of seven semi-quantitative indices by five capillaroscopists. These assessments were randomised and were blind to the exposure. The effect of the radiation exposure on both features was modelled using multilevel proportional odds regression adjusted for potential confounders.

Results The exposure intensity of each act was greatest among surgeons but with a lesser number of acts. The mean estimated cumulative exposure was largest among radiologist and cardiologists. No effect of the exposure could be detected on the extravasation score. The morphological anomaly score increased significantly with duration of exposure and cumulative exposure indices among surgeons and interventional radiologists contrary to cardiologists among which no effect could be detected.

Conclusions Capillaroscopy showed significant effects of chronic low-dose exposure to ionising radiation on micro-vascular structure among exposed physicians but its interest for individual monitoring has not been demonstrated.

0025 ASSESSMENT AND ESTIMATES OF EXPOSURE TO SYNTHETIC AMORPHOUS SILICA AT FIVE GERMAN PRODUCTION PLANTS

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10.1136/oemed-2014-102362.188

Objectives Synthetic amorphous silicas (SAS) are nanostructured polymers of silicon dioxide. We compared two different exposure assessments.

Method This study estimated cumulative exposure to inhalable SAS dust in 484 male workers from five German SAS producing plants. Two procedures (P1, P2) were applied. P1 was based on
an expert assessment. P2 was a multiple exposure assessment (15 scenarios) anchored by a recent measurement series (1375 personal measurements of inhalable SAS dust concentration) and used expert assessments.

**Results** Cumulative exposure estimates for P1 averaged 56.9 mg/m³-years (range: 0.1 to 419); for a selected P2 scenario the mean was 31.8 mg/m³-years (range: 0.4 to 480), (p < 0.0001). Averages varied between the 15 P2-scenarios from 12.6 to 109.6 mg/m³-years. Different time trends for SAS concentrations were observed.

**Conclusions** Both approaches suffer from considerable uncertainties that need to be considered in the epidemiological morbidity study.

**Objectives** To identify psychosocial stress in oncology nurses; Assess the associations between occupational variables and stress in the work environment of nurses in oncology; Discuss the impact of psychosocial stress in nursing work in oncology.

**Method** This is a cross-sectional epidemiological study, which will be used part of the Database - Nurses’ Health Study, the 18 largest hospitals in the city of Rio de Janeiro / Brazil held in 2011. Permission to use the database of the National Cancer Institute was provided by the research coordinator. From a total of 234 nurses, 94% (211) have joined the research. A questionnaire was used Effort-Reward Imbalance and variable of cumulative exposure estimates for P1 averaged 56.9 mg/m³-years (range: 0.1 to 419); for a selected P2 scenario the mean was 31.8 mg/m³-years (range: 0.4 to 480), (p < 0.0001). Averages varied between the 15 P2-scenarios from 12.6 to 109.6 mg/m³-years. Different time trends for SAS concentrations were observed.

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**Psychosocial stress of nurses in oncology:**

**A study of blood multi-element concentrations in lead-exposed and non-exposed workers**

Objectives To investigate if organisational support modifies associations between life events and psychological symptomatology among police officers post Hurricane Katrina.

**Method** Complete data on depression [Centre for Epidemiological Studies Depression scale (CES-D)], PTSD [Posttraumatic Stress Disorder Checklist - Civilian version (PCL-C)] and life change events [Recent Life Changes Questionnaire] were available for 98 police officers assessed 6 years after Katrina. The Survey of Perceived Organisational Support scale was used to assess organisational and supervisory support. Linear regression and ANOVA/ANCOVA were used to compare mean levels of depression and PTSD across quartiles of total life change scores.

**Results** Mean age was 42.5 years; 27% were female. Mean levels of CES-D and PCL-C did not differ significantly between male and female officers. Total life events score was positively and significantly associated with depression and PTSD in both unadjusted and multivariable adjusted models (p < 0.001). Among officers who scored low on organisational support, mean levels of CES-D and PCL-C increased significantly with the increasing quartiles of total life event score (p = 0.005 and p = 0.001, respectively) in fully adjusted models. Associations were not significant among officers who scored high on organisational support.

**Conclusions** Our findings suggest that a higher number of life change events is significantly associated with increasing symptoms of depression and PTSD among officers, and these associations are modified by organisational support. Previous studies suggest that stressful life events are associated with chronic depression. Future studies are warranted to investigate independent contributions of individual life events in associations involving depression, PTSD and support.

**Life events and psychological distress among police officers six years post hurricane katrina**

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Conclusions From the above results, the positive effect of essential elements to health examination values were not clear, little does the influence to the other non-essential elements. However, the damage from occupational non-essential elements exposure still needs to be concerned. Interaction to multi-elements also needs further research.

POLYMORPHONUCLEAR LEUKOCYTES PHAGOCYTIC CAPACITY IN WORKERS OCCUPATIONALLY EXPOSED TO BENZENE

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Objectives To determine phagocytic capacity of PMN leukocytes in workers occupationally exposed to benzene.

Method Cross-sectional study that included 54 workers of a paint manufacture company in Mexico City; exposure to benzene was determined through S-phenylmercapturic acid (SPMA) present in urine. The PMN phagocytic capacity analysis included three parameters: 1) nitro-blue tetrazolium (NBT) reduction, 2) hydrogen peroxide (H$_2$O$_2$) production, and 3) cell adhesion (CAD)

Results In the whole of workers included in the study, NBT reduction ($b$ = -0.419 ± 0.075, H$_2$O$_2$ production = 6.7 ± 1.4 ng, and CAD = 58.3 ± 6.2 µg. SPMA was identified in all workers although 2 of them are not in occupationally exposure to organic solvents (2.3 ± 0.81 µmol/mol creatinine), while the remaining 30 handle these substances (3.2 ± 1.8, $p = 0.02$). Among these exposure groups, there were not statistically differences in any of the parameters analysed. Although the simple regression analysis of these parameters with the concentration of SPMA identified in urine, a decrease was observed in NBT reduction ($b$ = -0.53, $R^2$ = 0.01), in H$_2$O$_2$ production ($b$ = -0.53, $R^2$ = 0.01), none was statistically significant ($p = 0.05$).

Conclusions PMN phagocytic capacity in the workers studied seems to be intact. Attract attention the consistently decrease of the three parameters in relation to the concentration of SPMA identified in urine even when there was no statistical significance. Some limitations do not allow a more complete analysis, so it is encouraged to make further studies.

EARLY PREDICTORS OF NOISE-INDUCED HEARING LOSS

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Objectives Noise-induced hearing loss (NIHL) is the most prevalent occupational disease in Austria and among the most frequent in many other countries. Because of the large inter-individual variation in hearing loss after equal exposures it has long been assumed that some individuals are more vulnerable to NIHL. Earlier attempts to define predictors of NIHL before commencing occupational noise exposure have largely failed.

From a preventive point of view it would be essential to study predictive factors.

Method Between 1982 and 1989 overall 311 apprentices were included into a prospective study during their initial health screening visit. At this occasion a standardised noise exposure was applied (20 min 200–500 Hz, 100 dBA) and the temporal threshold shift (TTS) at 4 kHz was determined during 2–10 min after exposure. Hearing loss was monitored at follow-up visits every 3–5 years. Follow-up was 13 years on average. Permanent threshold shift was predicted by noise years, frequency of wearing noise protectors, but also by the initial TTS at 4 kHz.

Results In this longitudinal study again the importance of personal protective measures was documented, it was also established that individual susceptibility plays an important role. The TTS peak at 4 kHz occurring independent of exposure frequency but especially after low-frequency exposure is a predictor of long-term hearing loss.

Conclusions Considering the importance of individual susceptibility current occupational limit values are likely not protective for everybody. This underlines the necessity of individualised screening programs and a strong commitment towards personal protection measures.

OCCUPATIONAL EXPOSURE TO MINERAL DUST: EFFECTS ON LUNG FUNCTION IN A NINE-YEAR STUDY

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Objectives Occupational mineral dust exposure is a well-known risk factor for numerous respiratory and systemic diseases. Stone work with high quartz exposure in quarries and in consecutive industries is a common situation in Austria. The aim of the present study employing a longitudinal design was to assess the influence of occupational dust exposure on lung function results. Further, the impact of implementation of stricter limit values for work-related contact with Quartz dust on lung function was evaluated.

Method Anthropometric data (age, gender, BMI), smoking behaviour, and lung function parameters (FVC, FEV1, MEF50) of 7204 medical examinations of 3229 female and male workers during the years 2002 to 2010 were analysed following Austrian standards for occupational medicine and ERS guidelines. Analysis of data was performed using models of linear regression.

Results Lung function parameters decreased with duration of occupational dust exposure and smoking. Occupational quartz exposure negatively influenced lung function parameters (FVC - 173.98 ml, FEV1 - 127.94 ml, MEF50 - 200.44 ml/s; all $p < 0.001$). Implementation of stricter Austrian occupational limit values for dust exposure resulted in a highly significant deceleration of annual respiratory decrease.

Conclusions The decrease of lung function is correlated with individual smoking habits and the duration of occupational dust exposure. Smoking cessation is especially recommended to workers exposed to Quartz dust to reduce the risk of increase of poor lung function. Adaptation of current limit values towards stricter limit values could decrease chronic occupational damage of the respiratory system.
CANCER RISK IN OIL REFINERY WORKERS: A MORTALITY STUDY IN FOUR ITALIAN PLANTS

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Objectives To examine the mortality experience of workers employed in four Italian oil refineries.

Method The cohort included 5112 male workers ever employed between 1949 and 2011. The average follow-up period was 49 years. SMR and 95% CI were calculated using as reference age-gender-calendar specific regional rates. Analyses by duration of employment and latency were performed.

Results In the whole cohort, pleural (6 deaths, SMR 1.59; 95% CI 0.7–3.5), brain cancers (14 deaths, SMR 1.47; 95% CI 0.9–2.5) and lymphatic leukaemia (LL) (8 deaths, SMR 1.81; 95% CI 0.9–3.6) showed increased risks. All pleural cancers occurred after 10 years of latency and the highest risk was observed among workers with duration ≥ 20 years; the brain cancer excess was confined in the shortest duration and latency. The LL excess regarded workers with latency and duration longer than 10 years. Mortality from Non-Hodgking lymphoma (NHL) (13 deaths) and acute myeloid leukaemia (AML) did not differ from the expectation. All AML cases (4 deaths) occurred after 20 years of latency (SMR 1.55, 95% CI 0.6–4.1) and a two-fold increased risk was observed in the longest duration. Mortality for NHL + LL (recently classified as subtypes of NHL) showed increased risks among workers with duration and latency classified as 20 years.

Conclusions Our findings confirmed recent epidemiological evidences of an increased risk for pleural cancer and are coherent with most recent meta-analyses suggesting a limited evidence of an increased risk for lymphatic neoplasms in refinery workers possibly due to past exposure to benzene.

CHILDREN BELOW 5 YEARS OF EMPLOYED MOTHERS ARE LESS EXPOSED TO ACUTE POISONING IN ALEXANDRIA, EGYPT

Raed Alazab, Alazhar University, College of Medicine, Cairo, Egypt

10.1136/oemed-2014-102362.196

Objectives To identify the incidence rate and determinants of acute poisoning among children (1–60 months old) of employed mothers.

Method A study was conducted at the poisoning unit of a university hospital. The studied children were from both rural and urban areas, were a mix of boys and girls, did not suffer from any mental disabilities, were aged between 1 month old to 60 months old, and were of Egyptian nationality. Data was collected by using a clinical examination form and a questionnaire. All parents/carers of the studied children were interviewed as well. Clinical assessment of the children included: general health conditions; AVPU (alert, respond to verbal stimuli, respond to pain-stimuli, unconsciousness); and clinical examinations.

Results 18.5% of total admissions were children (1–60 months old), 62.5% were males, 83.3% did not attend nursery, 79.9% were from urban areas, 33% of mothers were illiterate, and 60.2% of poisonings were due to household products. Kerosene alone was implicated in 24.3% of all cases; 37.4% of cases took place in the kitchen; 47.4% of cases were poisoned during the period between 8am and 4pm, and 65.4% reached the poisoning unit within 2 to 4 h of accidental poisoning. Risk factors among the studied children were ordered by stepwise regression analysis as the following: non employed mothers; children who did not attend nursery; children of the male gender; and the education and literacy level of their mothers.

Conclusions Children of non employed mothers are at more risk for acute poisoning.

ASSOCIATIONS OF THERMOPHILIC ACTINOMYCETES AND NON-TUBERCULOUS MYCOBACTERIA WITH RESPIRATORY HEALTH IN OCCUPANTS OF A WATER-DAMAGED OFFICE BUILDING

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10.1136/oemed-2014-102362.197

Objectives We examined microbial correlates of health outcomes in employees in a building with a sarcoidosis cluster and excess asthmas.

Method We offered employees a questionnaire and pulmonary function tests (PFT) and collected 120 floor dust samples by vacuuming workstation areas or the exterior rim of the floor. We analysed dust for culturable fungi, bacteria, actinomycetes, non-tuberculous mycobacteria, and cell wall components of fungi (1→-3)-β-D-glucan and Gram-negative bacteria (endotoxins).

Results Among 136 employees, 77% participated in the questionnaire, 64% in PFTs, and 49% in both. Of the 105 questionnaire participants, 50 (48%) reported at least one hypersensitivity pneumonitis (HP)-like symptom (shortness of breath on exertion, flu-like achiness, or fever and chills) in the last 4 weeks; 69 (66%) reported at least one HP-like symptom in the last 12 months. PFT results were abnormal or borderline for 13 participants (6 obstruction; 2 restriction; 2 mixed pattern; and 3 borderline obstruction). In multivariate logistic regressions, log-transformed levels of thermophilic actinomycetes (GM=580 CFU/m2) were positively associated with HP-like symptoms in the last 4 weeks [odds ratio (OR)=1.6, 95% confidence interval (CI)=1.15–2.35] and 12 months (OR=1.6, 95% CI=1.09–2.32), and with an abnormal/borderline PFT result (OR=1.7, 95% CI=1.04–2.88). Log-transformed mycobacteria levels (GM=960 CFU/m2) were marginally positively associated with HP-like symptoms in the last 4 weeks that improved when away from the building (OR=1.9, 95% CI=0.95–3.85). These associations were not confounded by smoking, gender, age, or building tenure.

Conclusions Our study suggests that thermophilic actinomycetes and non-tuberculous mycobacteria may have played a role in the respiratory illness among occupants of this water-damaged building.

BENIGN PLEURAL ABNORMALITIES AND MESOTHELIOMA AMONG ABRBERTOSIS WORKERS IN HONG KONG

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Poster presentation

**Poster presentation**

**Objectives** To evaluate whether the presence of pleural abnormalities was a reasonable marker to predict mesothelioma among workers with asbestosis in Hong Kong. 

**Method** This is a historical cohort study comprised of 99 male asbestosis workers registered in the Pneumoconiosis Clinic under Hospital Authority of the Hong Kong Government during 1981–2008 who had records of chest radiograph at the time of diagnosis of asbestosis. All asbestosis workers were followed up till 31/12/2008 and the rate of follow-up was 97%. We calculated the sensitivity and specificity of the presence of benign pleural abnormalities (i.e., the presence of benign plaques and/or thickenings at the initial chest radiograph) using mesothelioma deaths as the “good standard”; meanwhile, the positive predictive value (PPV) and negative predictive value (NPV) were also calculated.

**Results** Benign pleural abnormalities appeared in the initial radiograph for 54 asbestosis workers. We observed 15 mesothelioma deaths and 4 of them had benign pleural abnormalities at the initial chest radiographs. The sensitivity, specificity, PPV, and NPV for using the baseline benign pleural abnormalities to predict mesothelioma deaths was 0.27 (95% CI: 0.078–0.55), 0.63 (95% CI: 0.52–0.73), 0.11 (95% CI: 0.032–0.27), and 0.83 (95% CI: 0.71–0.91). These results remained unchanged when workers with co-presenting cancer at the baseline were excluded from the analyses.

**Conclusions** This study suggests a relatively limited value for using benign pleural abnormalities as markers to predict mesothelioma deaths in workers with asbestosis. [Acknowledgement: CUHK Direct Grant (Project code.: 2041587), Hong Kong]

**0045 CHARACTERISING ADOPTION OF PRECAUTIONARY RISK MANAGEMENT GUIDANCE FOR NANOMATERIALS, AN EMERGING OCCUPATIONAL HAZARD**

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**Objectives** Exposure to engineered nanomaterials, ENM, (substances with at least one dimension of 1–100 nm) has been of increased interest, with the recent growth in production and use of nanomaterials worldwide. Various organisations have recommended methods to minimise exposure to ENM. The purpose of this study was to evaluate the extent to which U. S. companies follow the guidelines for reducing occupational exposures to ENM, including those issued by the National Institute for Occupational Safety and Health (NIOSH).

**Method** We collected and reviewed survey data, field reports, and field notes for all NIOSH nanomaterial exposure assessments conducted between 2006 and 2011 to: (1) determine the level of adoption of precautionary guidance on engineering and administrative controls and personal protective equipment (PPE), and (2) evaluate the reliability of companies’ self-reported use of engineering and administrative controls and PPE.

**Results** Use of PPE was reported by 89% of 46 surveyed or visited companies, and 83% reported using engineering controls for at least some processes to protect workers from airborne exposures to nanoscale materials. In on-site evaluations, we observed that more than 90% of the 16 engineered carbonaceous nanomaterial companies that responded to an industrywide survey were using engineering and administrative controls and PPE as reported or more stringently than reported.

**Conclusions** Since PPE use was slightly more prevalent than engineering and administrative controls, better communication may be necessary to reinforce the importance of the hierarchy of controls. These findings may also be useful in conducting exposure assessment and epidemiologic research among U. S. workers handling nanomaterials.

**0046 THE SHIFTWORK AND THE COMMON MENTAL DISORDERS AMONG NURSING WORKERS**

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10.1136/oemed-2014-102362.200

**Objectives** This study aimed to identify the occurrence of Common Mental Disorders (CMD), and its association with the shiftwork among nursing workers.

**Method** This is an exploratory study, cross-sectional with quantitative approach that aimed to identify the occurrence of Common Mental Disorders (CMD), and its association with the shiftwork among nursing workers. The research was conducted in a public University Hospital specialised in cardiology, pulmonology, thoracic and cardiac surgery. The sample consisted of workers who work in nursing care units, semi-intensive and intensive, paediatric and neonatal, making a total of 92 participants. For quantitative data collection was used an instrument of socio demographic and the Self-Reporting Questionnaire (SRQ-20). The collection period was between June and July, 2012.

**Results** The result of the analysis revealed the occurrence of CMD in 44.60% (41) of the nursing workers. Regarding CMD, the answer of the workers was distributed according to the four groups of prognostic evaluated by the SRQ-20: Somatic Group, Decrease of vital energy, Anxious-depressive humour and Depressive thoughts. In relation to social demographic variables and CMD, there was no statistic association.

**Conclusions** The results show the importance of protective measures of mental health for workers since the shiftwork brings strain processes.

**0047 HEALTH DISORDERS BETWEEN NURSING STAFF IN A PUBLIC HOSPITAL OF SAO PAULO**

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**Objectives** This study aimed to identify the injuries and disorders occurred with the nursing staff through the Surveillance System for Nursing Workers Health -SIMOSTE and describe the consequences of injuries.

**Method** This is an exploratory and quantitative study conducted in a public hospital of Sao Paulo. The data were
collected by a software, the Surveillance System for Nursing Workers Health -SIMOSTE in the period December 2012 to March 2013.

**Results** The Surveillance System for Nursing workers Health identified 1847 injuries in the period December 2012 to March 2013. There were prevalence of occurrence between nurses (80.94%) and musculoskeletal diseases were the most prevalent (34.70%), followed by diseases of the respiratory tract (13.05%). Regarding the consequences, observed 10.67% of accidents and 86.63% of medical licenses.

**Conclusions** The data point to the need for development of new shares surveillance focused on the notification of occupational accidents and work-related diseases, and prevention of diseases. The Surveillance system is a technology capable to operationalize institutional policies regarding occupational health and the valuing of human resources, considering that monitoring and analysing the workers' health situation is an indispensable action for the planning of strategies to promote the improvement of their working conditions.

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**0049** ASSOCIATION BETWEEN WORK EXPOSURE, ALCOHOL INTAKE, SMOKING AND DUPUYTREN’S DISEASE IN A LARGE COHORT STUDY (GAZEL)

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**Objectives** In view of the debate about biomechanical and toxic factors in Dupuytren’s disease, we aimed to describe its relationship with certain occupational factors and alcohol intake and smoking.

**Method** Subjects in the French GAZEL cohort answered a questionnaire in 2012 included self-reported Dupuytren’s disease, such as disabling Dupuytren’s disease (including surgery). In 2007, self-assessed lifetime occupational biomechanical exposure was recorded (carrying loads, manipulating a vibrating tool, climbing stairs), as well as alcohol intake, smoking and diabetes mellitus. Analyses were performed on high alcohol intake, smoking and duration of relevant work exposure, stratified by gender for both outcomes.

**Results** A total of 13 587 subjects answered the questionnaire in 2012 (73.7% of the questionnaire sent) and constituted the sample (10 017 men and 3570 women, aged from 64 to 73 years; mean age for men 68 years and for women 65 years). Among men age, diabetes, heavy drinking and over 15 years of manipulating a vibrating tool at work were significantly associated with Dupuytren’s disease; except for diabetes, the association with these factors was stronger for disabling Dupuytren’s disease (or surgery). Among the 3570 women included, 160 reported Dupuytren’s disease (4.5%). The number of cases in the group of women was too low to reach conclusions, although the findings seemed similar for age, diabetes and vibration exposure.

**Conclusions** In this large French cohort study, Dupuytren’s disease in men was associated with high levels of alcohol consumption and exposure to hand-transmitted vibration. It is likely that the same applied to women.

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**0050** AN INTERNATIONAL HISTORICAL COHORT STUDY OF WORKERS IN THE HARD-METAL INDUSTRY: EXPOSURE ASSESSMENT

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**Objectives** A multinational occupational epidemiological study is underway to investigate the total and cause-specific mortality of workers exposed to tungsten carbide with a cobalt binder (WCCo). The study includes 12 US and 9 European plants. The objective of the exposure assessment component, coordinated by the University of Illinois at Chicago, is to reconstruct agent-specific exposure estimates for use in the epidemiological analyses.

**Method** Quantitative occupational exposures are being generated through a process of modelling and validation using industrial hygiene data from study plants. Innovative semi-quantitative methods are being developed to extrapolate data for years in which it is missing, and are based on exposure changes due to manufacturing process changes over time (e.g., moving from manual to automated methods). Company work history information is being used to construct a job dictionary. The resulting exposure estimates and job dictionary will form the job-exposure matrix.

**Results** The agents of interest are WCCo, tungsten carbide, tungsten, cobalt, and carbon black. Current and past working environments are being characterised according to products manufactured and operated and performed and in relation to potential exposures using sampling data, job descriptions, plant and process histories, and information provided by knowledgeable plant personnel.

**Conclusions** Exposure estimates will be generated for the study plants. The multinational aspect of the study provides the opportunity to pool data and produce exposure estimates for all 21 facilities with potential insight into similarities or differences among countries and/or plants involved in the same global industry. This presentation will detail the progress to date on the exposure assessment effort.

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**0052** LEPTIN, ADIPONECTIN, AND HEART RATE VARIABILITY AMONG POLICE OFFICERS

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**Objectives** To investigate the relationship of leptin and adiponectin with heart rate variability (HRV).
Method Leptin and adiponectin levels were measured in 388 non-diabetic officers from the Buffalo Cardio-Metabolic Occupational Police Stress study, following a 12-hour fast. HRV was performed according to methods published by the Task Force of the European Society of Cardiology and the North American Society of Pacing Electrophysiology for measurement and analysis of HRV. Mean values of high (HF) and low frequency (LF) HRV were compared across tertiles of leptin and adiponectin using ANOVA and ANCOVA; trends were assessed using linear regression models.

Results Leptin, but not adiponectin, was significantly and inversely associated with HF and LF HRV. BMI and percent body fat (also waist circumference and abdominal height) significantly modified the association between leptin and LF (but not HF) HRV. Among officers with BMI <25 kg/m², the association between leptin and HRV was not significant. However, among officers with BMI ≥25 kg/m², the association between leptin and HRV was inversely related, after adjustment for age, gender, and race/ethnicity; p-values for trend (HF HRV; p = 0.019 and LF HRV; p < 0.0001). Similarly, among officers with percent body fat ≥25.5%, leptin and LF HRV showed significant, inverse associations (adjusted p for trend = 0.001).

Conclusions Our results show that leptin levels were inversely and significantly associated with HRV among all officers, and particularly among officers with higher levels of adiposity. These results suggest that increased leptin levels may be associated with CVD-related health problems.
night shift work, frequency of night duties, total duration of rotating night shift work and lifestyle factors, i.e. a) smoking cigarettes, b) alcohol consumption, c) physical activity and d) BMI were examined with logistic regression and linear regression analyses adjusted for age.

Results Smoking cigarettes was associated significantly with current rotating night shift work (OR=1.4), frequency of night shifts (OR= 1.5 and OR=1.7 among women with 5–7 and ≥8 night duties/month, respectively) and longer duration of the night shift work (OR=2.1 for duration ≥25 yrs). The total physical activity was higher among rotating night shift nurses (242 vs. 203 MET*h/week), but OR of recreational inactivity was significantly increased among rotating night shift workers (OR=1.6). Mean BMI was significantly higher among postmenopausal women working night shifts when compared to day workers (BMI= 28.9 vs. 27.6 kg/m²), with increased OR of obesity (OR=2.8). No significant associations were observed between night shift work and alcohol consumption.

Conclusions The results of our study indicate that rotating night shift work may be associated with poorer lifestyle, which may contribute to chronic diseases.

0064 LEVELS OF IDEAL, INTERMEDIATE AND POOR CARDIOVASCULAR HEALTH BY EMPLOYMENT CHARACTERISTICS IN 2005–06 NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY
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10.1136/oemed-2014-102362.208

Objectives Employed persons are considered healthier than the general population. Yet, between 5–18% of all coronary heart disease deaths can be attributed to occupational exposures, ranging from noise to job stress. Cardiovascular health (CVH) is based on seven modifiable characteristics (i.e. cigarette smoking, body mass index (BMI), physical activity, diet, blood pressure, and levels of total cholesterol and fasting glucose) used to categorise individuals as having poor, intermediate and ideal CVH. In this study, we compared levels of CVH among employed and unemployed participants in the 2005–2006 National Health and Nutrition Examination Survey (NHANES).

Method The study population included 935 cardiovascular disease-free participants age 20 and older (731 employed, 204 unemployed). Employment status and work characteristics were derived from self-report questionnaires. Poor, intermediate and ideal levels of CVH and its components were defined using American Heart Association criteria. Weighted means and percentages were calculated using SUDAAN 10.0; models were adjusted for age, sex and ethnicity.

Results Mean number of ideal CVH components was significantly higher for employed compared to unemployed participants; 17.7% of those employed had ideal CVH compared to 12.2% of those unemployed. Ideal CVH was significantly lower for those in construction, manufacturing and transportation industries (8.6%) and in precision, product and transportation occupations (4.4%). Ideal CVH was significantly higher for afternoon shift (26.7%) compared to night/rotating (10.9%) and day (18.2%) shift workers.

Conclusions Understanding unique stressors and exposures for persons working in manufacturing, transportation and construction industries would be an important next step in designing interventions to improve their CVH.

0065 ASSOCIATIONS OF SYMPTOMS OF DEPRESSION AND POSTTRAUMATIC STRESS DISORDER WITH PERITRAUMATIC DISSOCIATION, AND THE ROLE OF TRAUMA PRIOR TO POLICE WORK
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10.1136/oemed-2014-102362.209

Objectives Our objective was to determine if symptoms of depression and posttraumatic stress disorder (PTSD) are associated with peritraumatic dissociation, and if this association is modified by trauma prior to police work.

Method Symptoms of depression, PTSD symptoms, peritraumatic dissociative experience (PDE), and trauma before police work were measured using the Centre for Epidemiologic Studies Depression scale, PTSD Check List-Civilian Version, PDE questionnaire, and the brief trauma questionnaire, respectively in 328 police officers. Separate regression models were used to assess if either symptoms of depression or symptoms of PTSD were associated with PDE stratified by prior trauma. Means were adjusted for race, number of drinks per week, and smoking.

Results PDE was significantly positively associated with symptoms of PTSD and depression (β = 0.642, p = 0.0001 and β = 0.276, p = 0.0002, respectively). PDE was positively associated with symptoms of PTSD regardless of trauma before police work (β = 0.599, p < 0.0001 (without prior trauma), 0.750, p < 0.0001 (with prior trauma). In contrast to PTSD, depression symptoms were significantly associated with PDE scores in individuals with prior trauma (β = 0.466, p = 0.0001), but not in individuals without prior trauma (β = 0.130, p = 0.153).

Conclusions The results indicate that an increase in PDE is associated with an increase in symptoms of depression and PTSD. The results also show that PDE is associated with symptoms of PTSD regardless of prior trauma. In contrast, PDE was associated with depression symptoms only in individuals with prior trauma, indicating prior trauma may modify this relationship.

0069 PSYCHOSOCIAL WORK FACTORS, OCCUPATIONAL NOISE EXPOSURE, COMMON MENTAL DISORDERS, AND THE RISK OF TINNITUS
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10.1136/oemed-2014-102362.210

Objectives Tinnitus is common, can be disabling, and may impair concentration, hearing and sleep. Noise induced hearing loss, other subtypes of hearing loss and ototoxic drugs are well-documented risk factors for tinnitus. Psychosocial work factors, depression and anxiety may exacerbate tinnitus, cause tinnitus, or both. The objective is to investigate the relationship between noise exposure, psychosocial work factors, common mental disorders, and tinnitus

Method A total of 554 workers within 10 manufacturing trades and children day-care participated in this cross-sectional study from 2009–2010. The study database contained information on individual short-term and long-term noise exposure levels, hearing levels and questionnaire information on common mental disorders and psychosocial work factors. Associations between
THE TREND IN THE PREVALENCE OF CHILDHOOD HEARING IMPAIRMENT IN TAIWAN AND ITS IMPLICATIONS

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Objectives Childhood hearing impairment (CHI) is a major developmental disability, but data at the national level are limited, especially those on the trends over time. We conducted a study to assess the time trend of CHI prevalence in Taiwan and explore its associated factors.

Method The Taiwan government certifies disabled residents for providing various services and maintains a registry of certified cases. We analysed the registry data on cases under 17 years old from 2000 to 2011 to estimate the prevalence of CHI and assess the time trend.

Results Each year, registered cases ranged from 3427 to 4075. Results Preliminary results show that of the 554 participants, 77% were males an the mean age was 43 years, ranging from 20–64 years. Among the participants, 17% reported tinnitus, 16% had a hearing handicap (WHO-definition), 3% anxiety disorder, 14% burn-out symptoms, 4% depression, and 8% reported work-related stress.

Conclusions Tinnitus is expected to represent a heterogeneous group of underlying disorders. We aim at contributing to a better understanding of the relative importance of the possible underlying factors in a population of occupationally noise exposed workers. Risk analyses are in progress, and results will be presented at the conference.

A STRUCTURAL EQUATION MODELLING METHOD TO DESCRIBE WORK ENVIRONMENT RISK FACTORS AND MUSCULOSKELETAL SYMPTOMS AMONG HOSPITAL NURSES

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Objectives Epidemiological studies have shown that musculoskeletal symptoms are frequent occupational injury and disability among nurses in developing countries. Preventive measures were not able to reduce musculoskeletal disorders significantly in nursing profession. This study was performed to provide a comprehensive assessment of the association among risk factors in developing musculoskeletal symptoms.

Method A structural equation model was applied to describe and analyse complex causal relationships from sets of occupational variables involved in musculoskeletal symptoms. A questionnaire was applied to nurses at hospitals affiliated to Semnan Medical Sciences University to collect data on personal and occupational factors and musculoskeletal symptoms. An ergonomic rapid entire body assessment measured work posture risks.

Results Physical work demand and mental pressure increased the risk of musculoskeletal disorders significantly. Musculoskeletal symptoms increased in nurses who worked for extended hours and experienced frequent unstable work posture. Structural equation model showed that musculoskeletal symptoms were associated directly and indirectly by physical and mental job variables, employment status, age and lifestyle.

Conclusions Covariance structural analysis is useful to describe and understand both the direct and indirect effects of variables with complex relationship between risk factors on the prediction of musculoskeletal symptoms.
However, approximately one-third with PTSD have cognitive impairment regardless of exposure level.

LEVERAGING MULTIPLE DATA SOURCES TO ASSIST OSHA IN ENFORCEMENT: EXAMINING ILLINOIS WORKERS’ COMPENSATION DATA ON AMPUTATIONS

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Objectives The US Occupational Safety and Health Administration (OSHA) relies on survey data to target high risk employers for safety inspections and enforcement. However, OSHA has limited resources and randomly targeting employers for safety inspections as a general strategy is inefficient. In this study, we explore the use of an alternative data source to assist OSHA with a more targeted inspection program.

Method We summarised Illinois Workers’ Compensation Commission (IWCC) court filings for amputations from 2007 through 2012 and identified the industries and companies that are the top offenders for amputations in Illinois within this dataset.

Results In total, there were 1260 amputations, of which 27.1% were severe amputations (not restricted to digits). The industrial sectors with the highest proportion of severe amputations were the mining (50.0%), government (40.6%), and personnel/employment services (temp employment) (40.0%) sectors. The analysis identified a short list of companies and their corresponding worksites, comprising nearly 20% of the amputation claims filed through the court system.

Conclusions Using alternative datasets that provide a specific list of the worst offenders in a region can guide a more efficient use of OSHA resources and create a system that targets the companies with a poor safety record. Random inspections using industry level data from the US Bureau of Labour Statistics does not differentiate between companies that invest in safety within high risk industries from the poor actors. Work-ers’ compensation data is only one resource among many that can be utilised to assist OSHA with targeted inspections of high risk companies.

RECONSTRUCTION OF EXPOSED COHORT AND CUMULATIVE DOSE OF RADIO-CONTAMINATED BUILDING RESIDENTS FOR EPIDEMIOLOGICAL STUDY - UPDATED INFORMATION

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Objectives The purpose of this study is to reconstruct of RCB cohort and to survey occupancy factors for estimation of cumulative dose in study of health risk of Radio-contaminated building (RCB) occupants.

Method The cohort of RCB occupants was established based on household, school and labour registration. Survey of current and retrospective occupancy factors in each age stratum was conducted to estimate the cumulative dose. Risk-period adjusted cumulative dose was generated in this study.

Results There were totally 32,622 in this study cohort, including 13,120 residents of RCBs, 15,368 students in RCB schools, and 4328 labours in RCB business workplaces. The mean and maximal dose in the year of RCB built was 32.7 and 998.56 mSv, respectively (Table 2). The main difference between retrospective (RCB residents) and current (general population) occupancy factors was RCB residents in the past had 2 more hours in living room, while current general population had 2 more hours in bed room. When bedroom was subdivided into bed and desk, we found current general population had 2 more hours in the desk of bed room. In total, the mean cumulative dose was 7.06 mSv with range of 0–1751 mSv. The mean cumulative dose for residents, labours, and students were 16.08, 2.91, and 0.48 mSv, respectively.

Conclusions We have established a new RCB cohort and provided new information of cumulative dose estimation. These data could provide valid information on the risk of cancers and non-cancer diseases at low dose and low dose-rate radiation exposure.

WORK ORGANISATIONAL CHARACTERISTICS AND PSYCHOLOGICAL DISTRESS IN FRENCH CALL-CENTRES. IS THERE A DIRECT EFFECT?

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10.1136/oemed-2014-102362.216

Objectives In cross sectional studies, relationships between perceived stressors and self-reported health are suspected of monomethod bias related to negative affectivity. The purpose of this work was to test if work organisational characteristics (WOC) reported by managers were related to psychological distress (PD) reported by call-handlers, taking into account their perception of work conditions (perceived strain) and usual individual confounders.

Method Managers of 107 call-centres were queried by occupational physicians on their call-centres’ WOC. 4002 call-handlers (2,929 women were considered here) of these call-centres completed self-reported questionnaires in order to evaluate perceived work strain (Karasek and Siegrist questionnaires) and PD (12-items General Health Questionnaire). A 2-level analysis tested the relationships between 14 WOC and PD score flag a direct effect of WOC on psychological distress. We also analysed perceived strain as an effect modifier for WOC using interactions.

Results Five of 14 WOC were significantly related to the PD score: type of calls, call-centre size, number of activity parameters displayed on screen, instructions for client relationships, and required control role of supervisor. In adding perceived strain, the relationship only remained for the type of call.

Conclusions Main results of this study are (1) existence of relationships between WOC reported by managers and psychological distress reported by call-handlers (2) most of effects of WOC are moderated by the perception of work strain.
0080 RETROSPECTIVE EXPOSURE ASSESSMENT ON THE PHOTOLITHOGRAPHY PROCESS IN SEMICONDUCTOR MANUFACTURING FACILITY

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Objective: The purpose of this study was to assess potential occupational exposure to chemicals among workers using both qualitative and quantitative information during specific job tasks on the photolithography process of a semiconductor manufacturing facility.

Method: Historical exposure measurement data from 1997 to 2012 (n = 1347) were collected and classified by each type of chemical during 8 of 36 job tasks, and hallmark risk assessment was performed to determine control bands by job task of interest using the qualitative information on health hazard, duration of use, quantity, exposure control, etc. Finally, Bayesian Decision Analysis was performed to evaluate potential exposure ratings for those 8 job tasks by combining the prior distribution and likelihood distribution into the posterior distribution.

Results: Control bands for 8 job tasks of interest were determined as 1, interpreting that workers use appropriate industrial hygiene, follow recommended job practices, wear personal protective equipment, and install proper ventilation systems. Arithmetic mean and standard deviation for 7 types of chemicals from historical exposure measurement data were 2-heptanone 0.013 ± 0.011 ppm, 1-methoxypropyl-2-acetate 0.163 ± 0.261 ppm, acetone 0.456 ± 0.609 ppm, ethyl 3-ethoxy propionate 0.131 ± 0.106 ppm, ethyl lactate 0.058 ± 0.067 ppm, isopropl alcohol 0.594 ± 0.923 ppm, and n-butyl acetate 0.071 ± 0.368 ppm, respectively, and all concentrations of chemicals were below 10% of OELs. Therefore, exposure ratings of the 8 job tasks were determined as exposure category 1, indicating that the 95th percentile of exposures infrequently exceed 10% of the OELs.

Conclusions: In conclusion, the study findings suggest that potential exposures to chemicals of interest among semiconductor workers for 16 years were very low (below 10% of the OELs) and "highly controlled."

0081 THE ASSOCIATION BETWEEN STATINS USE AND RISK OF HOSPITALIZATION FOR ACUTE HEPATITIS IN PATIENTS WITH HBV INFECTION

Pau-Chung Chen, 1 Meng-jin Chen, 1 Yu-Tse Tsan, 1 Yao-Hsu Yang, 2 Meng-Hung Lin.

Objective: Statins are commonly used to prevent coronary heart disease and stroke, but they may increase the risk of hepatotoxicity and muscle toxicity. Hepatitis B virus (HBV) infected patients are more susceptible to acute hepatitis. However, the safety of statins use in patients with HBV infection is unclear. The purpose of this study was to investigate the association between statins use and risk of hospitalizations related to acute hepatitis in patients with HBV infection.

Method: Our study was a population-based retrospective cohort study. We used a nationwide data of HBV-infected patient from 1999 to 2010 from the Taiwanese National Health Insurance database. Cox proportional hazards regression was used to calculate the hazard ratios (HRs) and 95% CIs for the association between statins use and the occurrence of acute hepatitis in the HBV-infected study cohort.

Results: A total of 255,344 HBV-infected patients were included in the study cohort. Of these patients, 127,672 (50%) had used statins, and 283 (0.11%) were diagnosed with acute hepatitis within one year and incident rate of acute hepatitis in patients with HBV infection was 110.9 per 100,000 person-years. After controlling for potential confounders, no association of acute hepatitis between statins user and non-statin user was found in different follow-up periods and doses within one year.

Conclusions: Among patients with HBV infection, statins use may not be associated with acute hepatitis regardless of larger cumulative dose, drug class of statins. Statins given to HBV-infection patients may not associate with severe liver injury.

0082 DIABETES MANAGEMENT AT WORK

Kandouci, Chahrazed, 1 Belhaj Zoubida, 1 Arab Aicha, 1 Badreddine Abdelkrim Kandouci.

Objective: This study aims to demonstrate the interaction between diabetes and work, but also to identify any difficulties that a diabetic patient can meet at his place of work, which could hinder the daily management of the disease.

Method: This is a descriptive, cross-sectional study that was conducted in the month of September 2012 until April 2013. The support for the survey is a pre anonymous self-administered questionnaire, among diabetic patients in employment in various institutions under agreement with the Department of Occupational Medicine of the University Hospital of Sidi Bel Abbes during their periodic visits.

Results:
- The final sample consisted of 83 diabetics with 61.4% men and 38.6% women, the average age of employees is 50 years, 62.6% of our patients are non-insulin-treated, 77.1% are type 2 diabetes, 68.7% for patients work schedules are compatible with meals and taken the treatment, and 65.1% find it difficult to follow the diet to work, 53% reported hypoglycemia at work with variable severity.
- The type of diabetes is strongly linked to hypoglycemia occurred in the workplace and change of occupation (p = 0.022, p = 0.008)
- Two factors related to the disease: duration of illness affects the occurrence of hypoglycemia (p = 0.014) and has a link with the achievement of capillary blood glucose and Modified Work.

Conclusions: We have seen with the study, some socio-professional factors and factors related to the disease can occur in diabetics management.

0083 OCCUPATIONAL INJURIES AT THE COMMUNITY LEVEL

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Objective: This study was a population-based retrospective cohort study. We used a nationwide data of HBV-infected patient from 1999 to 2010 from the Taiwanese National Health Insurance database. Cox proportional hazards regression was used to calculate the hazard ratios (HRs) and 95% CIs for the association between statins use and the occurrence of acute hepatitis in the HBV-infected study cohort.

Results: A total of 255,344 HBV-infected patients were included in the study cohort. Of these patients, 127,672 (50%) had used statins, and 283 (0.11%) were diagnosed with acute hepatitis within one year and incident rate of acute hepatitis in patients with HBV infection was 110.9 per 100,000 person-years. After controlling for potential confounders, no association of acute hepatitis between statins user and non-statin user was found in different follow-up periods and doses within one year.

Conclusions: Among patients with HBV infection, statins use may not be associated with acute hepatitis regardless of larger cumulative dose, drug class of statins. Statins given to HBV-infection patients may not associate with severe liver injury.
Objectives Low wage and immigrant workers suffer an excess of injuries and are often difficult to reach. There is a need to identify alternative forums for health and safety training. The aim of this study was to determine whether injured workers cluster by geographic area; this would serve as a basis for targeting occupational health and safety interventions at the community level.

Method Work-related injuries from the Illinois Trauma Registry were extracted and mapped by residential zipcode for 2000–2009. Injury data was merged with employment data.

Results There were 23,200 work-related injuries. Of the 13,822 zipcodes, 79.3% of the injuries occurred among residents living in 20% of the zipcodes. 21.2% of the work-related injuries (N = 4914) occurred in the 25 zipcodes with the highest counts. We identified six spatial clusters. In the 25 ZIP codes with the highest rates of injuries among employed persons, less than 1% of the injuries occurred in these zipcodes (N = 99).

Conclusions Training at the community level could reduce workplace injury and is needed to augment the void in workplace training. Alternative datasets, not originally designed for occupational surveillance, could be useful for identifying communities with occupational injury and illness clusters. The validity and usefulness of these datasets should be further assessed, and the communities in which these clusters occur should be mapped to identify community level infrastructure that could be leveraged for training interventions. A bridge should be created between occupational medicine, governmental institutions, social work and community advocacy in order to make a community intervention program viable.

Objectives During the last decades a possible association between the psychosocial working environment and increased risk of Ischaemic heart disease (IHD) has been debated. A systematic review from 2009 found moderate evidence that high psychological demands, lack of social support and iso-strain was associated with IHD. Whether the psychosocial working environment plays a role for patients with existing cardiovascular disease on the risk of new cardiac events and readmissions is unknown.

Method A cohort of patients under 65 years and treated with Percutaneous Coronary Intervention was established in 2006. Three months after the procedure the patients answered a questionnaire about their psychosocial working environment. A total of 528 patients had returned to work 12 weeks after the procedure, while 97 were still sick-listed. Patients were followed in registers for 3+ years to determine cardiac readmissions and events. We examined the association between psychosocial working environment and adverse events among those who had returned to work at 3 months by Cox Regression analysis.

Results We were not able to detect any significant associations between psychosocial working environment in terms of quantitative and cognitive demands, workload, involvement, influence, tolerance, social support, the combinations of effort-reward and demand-control and the risk of adverse events.

Conclusions Reporting of problems in the psychosocial working environment are not associated with risk of adverse cardiac events. However, tendencies of a lower risk of cardiac event were present for employees reporting the worst psychosocial environment. This unexpected finding may be explained by vulnerable persons not returning to work.
LONG-TERM DAY-AND-NIGHT ROTATING SHIFT WORK POSES A BARRIER AGAINST THE NORMALISATION OF LIVER FUNCTION

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Objectives To evaluate the impact of day-and-night rotating shift work (RSW) on liver health, we analysed the association between long term RSW exposure and the normalisation of plasma alanine transaminase (ALT) levels over a five-year period. Method The data from physical examinations, blood tests, abdominal sonographic examinations, personal histories, and occupational records were collected from a cohort of workers in a semiconductor manufacturing company. The sample population was divided into three subgroups for analysis: persistent daytime workers, workers exposed intermittently to RSW (i-RSW), and exposed to persistent RSW (p-RSW). Results Records were analysed for 1196 male workers with an initial mean age of 32.5 years (SD 6.0 years), of whom 821 were identified as rotating shift workers, including 374 i-RSW and 447 p-RSW workers. At the beginning of the follow-up, 275 were found to have elevated ALT (e-ALT): 25.1% day-time workers, 23.0% i-RSW workers and 21.3% p-RSW workers. Of those with e-ALT at the beginning, 101 workers showed normalised serum ALT levels at the end of five-year follow-up: 10.7% of day-time workers, 8.6% of i-RSW workers, and 6.5% of p-RSW workers; P = 0.016. By performing multivariate logistic regression analyses, and comparing with the persistent daytime co-workers, after controlling for confounding variables, analysis indicated that the workers exposed to p-RSW were 46% less likely (OR, 0.54; 95% CI, 0.30–0.95; P = 0.03) to attain normal ALT levels within a five-year interval. Conclusions Persistent day-and-night RSW pose a vigorous obstacle to the normalisation of e-ALT among workers with pre-existing abnormal liver function.

OCCUPATIONAL DEAFNESS DUE TO CO-EXPOSURE TO NOISE AND OTOTOXIC AGENTS

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Objectives In order to estimate the hearing impairment in occupational environment due to the co-exposure to noise and solvents, we have undertaken a cross-sectional study to evaluating the prevalence of hearing loss due to the co-exposure to both solvents and noise. Method We recruited 144 workers, working in electronic materials manufacturing plant, one group is exposed to solvents alone, and the other one exposed to both noise and solvents. In another hand, we followed two other groups in a construction company of farm implements. 136 workers exposed to noise, 96 administrative workers none exposed. The data were collected by means of questionnaire and of an introductory tonal audiometry between 0.125 and 8 KHz. Results The prevalence of hearing loss of more 20dB in the group exposed to the noise and solvents was mush greater (57.8%) than that of the noise alone (35.3%), and that of administrative workers (27.7%) (P < 0.0001). Multivariate logistic regression analysis showed that the solvents and noise group had an estimated risk for hearing loss >20 dB about 4.4 times higher than that of the noise group. Hearing impairment was greater for speech frequency than for high frequency. Conclusions Our results suggest that solvents increase potentially the hearing loss in a noisy environment, with a higher impact on the speech frequencies.

RECOVERY FROM MENTAL CONDITION: IS IT DIFFERENT BETWEEN TBI/NON-TBI

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Objectives This study aimed to determine the rates of psychological symptoms among those with traumatic brain injury (TBI) and with non-TBI at 3 months and 12 months after occupational injury and to examine the change in psychological status over time. Method Our study candidates were injured workers in Taiwan who were hospitalised for 3 days or longer and received hospitalisation benefits from the Labour Insurance. A self-reported questionnaire including Brief Symptom Rating Scale (BSRS-50) and Post-traumatic Symptom Checklist (PTSC) was sent to workers at 3 months and 12 months.

RESULTS Among 853 injured workers who completed the questionnaire at 3 and 12 months, regarding to the severity of BSRS score, 7.8% of those with TBI had recovered at 12 months, comparing with 8.1% in those with non-TBI. On the other hand, approximately 11.6% of those with TBI had recovered from post-traumatic stress symptoms at 12 months, comparing with 9.7% among those with non-TBI. Injured workers with TBI had lower rate of recovery from psychological symptoms, comparing with non-TBI. Conclusions A significant proportion of victims with TBI and non-TBI suffered psychological symptoms after injury. The identification and treatment of psychological symptoms are important for optimal adaptation after traumatic injury.

CHANGES IN VENTILATORY AND HAEMODYNAMIC PARAMETERS DURING EXPOSURE TO ULTRAFINE PARTICLES IN A MANUFACTURING FARM MACHINERY

Zoubida Behadd, Chahrazed Kandouci, Baderdine Abdelkrim Kandouci, Faiza Belmokhtar. UDL Sidi Bel Abbés, Sidi Bel Abbés, Algeria

Objectives To evaluate the influence of occupational exposure to ultrafine particles on cardiopulmonary parameters.
Method Changes in ventilatory and haemodynamic parameters during occupational exposure to ultrafine particles summered studied using a survey-type retrospective cohort exposed unexposed conducted in a company producing agricultural equipment for a period of five month period from January 1 to May 30, 2013 in 139 subjects, including 107 exposed men and 3 unexposed.

The survey consisted of a questionnaire (WHO), a complete physical examination with measurement of blood pressure before and after the job, a spirometer before and after the job.

Results 18.7% were presented, a type of respiratory symptoms in chronic bronchitis against only 6.3% of non-exposed with a statistically significant difference (P = .04).

The prevalence of chronic bronchitis was significantly higher in smokers than in nonsmokers with 23.3% against 7.6% respectively. (P = .01).

The papers have a higher incidence of lung disease than unexposed with 83.2% of restrictive lung disease after exposure in exposed against 78.1% in the unexposed.

Smokers with normal spirometry is less than non-smokers before and after exposure with the following frequencies after exposure: 12.1% in non-smokers against only 4.1% in smokers.

On haemodynamic parameters was noticed an increase in TAP (47.87 mmHg), FC (76.16 mm Hg) after exposure in exposed.

Conclusions Our results have demonstrated the harmful effects of ultrafine particles on changes in ventilatory and haemodynamic parameters.

0100 SEVERITY OF ILLNESS ASSOCIATED WITH WATER RECREATION

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Objectives We evaluated the severity of illness among those engaging in limited-contact water recreation such as boating, fishing, kayaking, and rowing.

Method Data were obtained from a cohort study which assessed the development of illness following water recreation. Disease severity was defined as symptom-days, the total number of days with symptoms related to gastrointestinal illness, respiratory illness, or eye, ear, and skin symptoms. Severity was evaluated in association with the degree of water exposure. Analysis included logistic regression and G-computation.

Results 11.297 participants completed the cohort study, of which 2301 developed symptoms related to gastrointestinal illness, respiratory illness, or eye, ear, and skin symptoms. Severity was evaluated in symptom-days, the total number of days with symptoms related to gastrointestinal illness, respiratory illness, or eye, ear, and skin symptoms. When dichotomized at the 90th percentile, there was a crude relative risk (RR) of 1.47 (1.27–1.72) for those getting their face wet during water recreation, and a RR of 1.65 (1.28–2.12) for those indicating that they swallowed water during water recreation.

Conclusions Increased water exposure, resulting in getting the face wet, or swallowing water is related to increased disease severity among water recreators. Further analysis is necessary to determine if any covariates such as age, race/ethnicity, gender, or previous comorbidities modify or confound the relationship between water exposure and disease severity.

0101 WORK HOURS, JOB STRAIN, AND OCCUPATIONAL WITH ENDOTHELIAL FUNCTION: THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS (MESA)

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Objectives To investigate associations of work hours, job control, job demands, job strain, and occupational category with endothelial function, a predictor of cardiovascular disease (CVD).

Method Currently employed participants free of CVD (n = 1499; 55.5% men; 62% non-white) of the Multi-Ethnic Study of Atherosclerosis provided information on work hours, job decision latitude, and job demands. Responses to current occupation were coded using the Census 2000 Occupational Codes; codes were collapsed to provide four occupational categories. Brachial artery flow-mediated dilation (FMD), a validated measure of endothelial function, was obtained using high-resolution ultrasound. Mean values of FMD, expressed as percent change in brachial artery diameter, were examined across categories of work hours (<40, 40, 41–49, ≥50) and the other exposures using ANOVA/ANCOVA.

Results Occupational category was significantly associated with FMD overall, with Blue-collar workers showing the lowest mean values after adjustment for age, gender, race/ethnicity, education, waist circumference, total and HDL cholesterol, body mass index, systolic and diastolic blood pressure, physical activity, smoking status, and pack-years of smoking: Management/Professional = 4.96 ± 0.22%; Sales/Office = 5.06 ± 0.27%; Services = 4.70 ± 0.29%; Blue-collar workers = 4.18 ± 0.27% (adjusted p = 0.001). There was evidence of effect modification between occupational category and FMD by gender (p = 0.034) such that in stratified analyses, significant associations were observed among women (adjusted p = 0.002) but not men (adjusted p = 0.098). None of the other work exposures were significantly associated with FMD.

Conclusions Blue-collar workers had decreased endothelial function compared to other workers; potential reasons should be examined in future studies. Decreased endothelial function may reflect a biological mechanism explaining occupational differences in CVD.

0102 A RETROSPECTIVE COHORT MORTALITY STUDY OF US PHOSPHATE INDUSTRY WORKERS: AN UPDATE

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10.1136/oemed-2014-102362.229
Objectives To evaluate the mortality experience among all workers (n = 3199) employed at a phosphate fertiliser plant in central Florida beginning 1953 and followed through 2005.

Method All-cause, all-cancers, and cause-specific standardised mortality ratios (SMRs) were calculated with the U. S. population as referent. Lung cancer and leukaemia risks were further evaluated using conditional logistic regression. Employment duration was used as an exposure surrogate for dose-response analyses.

Results The mortality due to all causes combined (SMR=1.07, 95% confidence interval (CI)=1.01–1.13, observed deaths n = 1124), lung cancer (SMR=1.25, 95% CI=1.04–1.49, n = 122), leukaemia (SMR=1.76, 95% CI=1.02–2.81, n = 17), and chronic obstructive pulmonary disease (SMR=1.45, 95% CI=1.09–1.89, n = 54) were significantly elevated. All-cancer mortality was elevated (SMR=1.09, 95% CI=0.97–1.22, n = 303) but not statistically significant for the cohort. Dose-response modelling with adjustments for gender and race did not show statistically significant associations between employment duration (in years) and lung cancer (Odds Ratio (OR) =0.99, 95% CI=0.97–1.02) or leukaemia (OR=1.01, 95% CI=0.96–1.06) mortality.

Conclusions Findings are suggestive of increased lung cancer and leukaemia mortality from exposures encountered in the phosphate fertiliser industry. Increased employment duration, however, did not have significant associations with increased lung cancer or leukaemia mortality.

Objective To investigate and manage subway drivers’ mental health, we conducted a temporary mental health checkup on the subway drivers of one transportation company, and analysed the relationship between the suicide ideation and occupational stress factors.

Method The subway drivers (n = 995) were asked to fill out a questionnaire and individual interviews were conducted afterwards. Interviews were performed using Korean Composite International Diagnostic Interview (K-CIDI). Participants were classified into two groups; suicide ideation group (SIG) and non suicide ideation group (NSIG). Socio-demographic factors, health information, occupational characteristics, Korean Occupational Stress Scale (KOSS), Davidson Trauma Scale (DTS) and Centre for Epidemiological Studies-Depression Scale (CES-D) were included in the questionnaire. Relationship between occupational stress and the suicide ideation within a year were analysed using multiple logistic regression.

Results Logistic regression model after adjusting the age showed that domains of Job demand, Insufficient job control, Interpersonal conflict, Lack of reward, Occupational climate had significant relationship with suicidal ideation. Another model that adjusted factors that was significant in descriptive statistics revealed that domains of Insufficient job control (OR=2.223), Interpersonal conflict (OR=2.478), Lack of reward (OR=2.701) had significant relationship with suicidal ideation.

Conclusions Three occupational stress domains of KOSS had statistically significant relationship with the suicidal ideation within a year after adjusting occupational factors that was related to it. To prevent subway drivers’ suicide ideation, stress management program should be applied to this group.

Objective The study ‘Skin Project’ took place over three years (2010–2012) in a petrochemical site in Sicily, in order to identify skin diseases and the risk of pre-cancerous changes. The idea for the study came from an evaluation of mortality data for skin diseases published by the province of Siracusa in the journal ‘ATLAS RERURUM cognoscere causas’ 2003–2005.

Method The health service of the petrochemical company had addressed first the interest towards its employees, directing them to the screening of skin disorders and in particular towards precancerous and non precancerous forms. The first pilot to assess the eventual success of the project was launched in 2010; the public was invited to undergo a skin examination and videodermatmoscopy and epiluminescence mapping, simply by calling a dedicated health service number. The first cases also showed the need to reach an agreement with the city hospital for the surgical removal of malignant growths.

The visit was carried out by a medical doctor specialising in dermatology, in this case the primary dermatologist of ASP Siracusa and heighten by the use of dermoscopy and epiluminescence. The use of non-invasive technology allowed the study to show the morphological structural of the pigmented lesions.

Results From October 2011 to October 2013, 788 dermatological and videodermatmoscopy with epiluminescence have been carried out, identifying and permitting the surgical removal of 10 melanomas surface, 6 basal cell epithelioma and the identification of more than 40 individuals with dysplastic moles.

Conclusions During the medical examination carried out by the qualified doctor or dermatologist, the patient is asked to undergo a primary prevention and skin self-examination. The study showed a significant effect on the onset of skin diseases compared to the national population and correlated with sun exposure from a young age or from the high temperatures recorded in recent years in Sicily between 2006 and 2012. We report the cases of 3 person a 48 year old male that in two session a year apart has seen a trasformation of his nevus after the removal of melanoma surface. of a subject of 40 years old whom removed a melanoma in the region above the right eye brow and a third case of a man 52 years old removed a mela-noma of the left ear.

Objective Mortality was updated through 2008 for 5203 workers exposed to styrene, fibreglass, and wood dust between
Objectives Gender-sensitive research strategies address men’s and women’s health problems by identifying physiological, ergonomic and socio-cultural gender characteristics that shape study outcomes. These strategies have been inadequately accounted for in many occupational health researches on agriculture workers. In reviewing the occupational health literature on agriculture workers, this paper assesses the processes that incorporate gender perspectives into academic journal editors and support from research funding agencies and through sound interventions and policies. This could be through incentivising and support from research funding agencies and through incorporating gender perspectives into academic journal editorial policies.

Results Overall, 484 cancer deaths occurred (SMR 1.20, CI 1.10–1.31), with excess mortality for respiratory cancers (n = 171, SMR 1.33, CI 1.14–1.55) and prostate cancer (n = 41, SMR 1.44, CI 1.03–1.96). Among 2063 workers highly exposed to styrene and fibreglass there were excesses of mesothelioma (n = 3, SMR 5.28, CI 1.09–15.4) and ovarian cancer (n = 6, SMR 2.94, CI 1.08–6.41). The SRR analysis did not find strong associations between tertiles of styrene exposure and cancer mortality.

Conclusions We found no excess leukaemia or lymphoma mortality. Unanticipated excess mesothelioma and ovarian cancer mortality are difficult to interpret and could be due to fibreglass exposure or employment elsewhere, or could be chance findings.
The Effects of Acute and Chronic Mental Stress on Cardiac Function

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Objectives The main objective of this study is to investigate the effects of chronic and acute stress on blood pressure, heart rate variability and an indicator of cardiac contractility. The study also aims to describe the degree to which various demographic and lifestyle factors modify the observed effect.

Method Chronic stress was assessed with a validated questionnaire, the Perceived Stress Scale. Acute stress was the level of stress experienced from the performance of a simple mental challenge on a scale from 1–100. Heart rate variability is calculated from heart rate measurements recorded via a heart rate monitor. Cardiac contractility index is derived from the amplitude ratio of the first to second heart sounds, as recorded with an electronic stethoscope. Measurements for each of the parameters were taken before and after performance of the task. Pre-task measurements were used as baseline data and related to reported chronic stress levels. Acute stress levels were compared with the difference between pre- and post-task cardiac measurements.

Results Average acute stress level was 17/100. A statistically significant increase in cardiac contractility index was found for acute stress, while no significant change in either HRV or heart rate was noted. Subjects with high chronic stress showed a significantly reduced cardiac contractility than those with low chronic stress, while no difference in HRV was found between groups.

Conclusions Acute and chronic stress exerts differing inotropic effects on the heart, while no chronotropic effect was observed.

Workplace Violence and Depressive Symptomatology Among Police Officer

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Objectives The prevalence of depression in police officer is higher than in the general population. Police officers are often exposed to work place violence, long time work, shift work and other psychosocial stressers. This study was conducted to evaluate the occupational factors associated with depressive symptomatology in police officer.

Method The study sample was 7476 police officers. A structured questionnaire was used to assess exposures to violence, shift working with jobs, health behaviours and sociodemographic factors. Subjects with depressive symptomatology was who experienced depressive symptom for continuously for more than 2 weeks within last 1year. And chronic work place violence exposed subjects was who experienced threat or complaint from work related people more than 4 times per week.

Results Prevalence of depressive symptom among subjects was 35.5% (n = 2622) and higher in subjects exposed to chronic violence. After adjusting covariates, the odds ratio of depression was 2.01 (95% CI; 1.80–2.25) for chronic work place violence exposed subjects (n = 2005, 27.11%), 1.20 (95% CI; 1.02–1.41) for shift working subjects (n = 6270, 85.68%).

Conclusions Our findings support the association workplace violence exposure between depressive symptomatology. Further study with more detailed work place violence exposure classification and measurement is need to confirm the association workplace violence and depressive symptomatology.
DO PARTICIPANTS WHO COMPLETE A TELEPHONE SURVEY IN A LANGUAGE OTHER THAN ENGLISH DIFFER TO THOSE WHO COMPLETE THE SURVEY IN ENGLISH?

Objectives Limited research indicates that using English-language only surveys in prevalence studies conducted in the general population or in specific ethnic populations may result in unrepresentative samples and biased results. In this study we investigated whether participants from ethnic minorities who chose to complete a study interview in a language other than English (LOTE) differed from those who completed the interview in English.

Method This study was conducted within the Migrant Australian Workplace Exposure Study, a population-based telephone survey that assessed the prevalence of exposure to occupational carcinogens among 749 workers of Chinese, Vietnamese and Arabic ancestry. The study was conducted in Australia in 2013. Modified Poisson regression determined the demographic factors associated with completing the interview in a LOTE.

Results Participants who completed the interview in a LOTE differed from those who completed the interview in English on several demographic factors, including sex, city of residence and country of birth. They were more likely to have a post-school qualification and to speak a LOTE at home, and were also more likely to be exposed at carcinogens at work compared with those who completed the interview in English (40% compared with 29%, \(P_{\text{difference}} < 0.01\)).

Conclusions The participants who choose to complete the study interview in their native language had several demographic differences to those participants who completed it in English, and were more likely to be exposed to carcinogens at work. Prevalence studies that offer only English-language study instruments are unlikely to produce representative samples of minority groups, and may therefore produce biased results.

RESPIRATORY SURVEILLANCE IN THAI AUTOMOBILE WORKERS

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Objectives To survey the pulmonary function test in automobile workers.

Background There are some working processes in automobile factory that can affect lung function. Thailand had developed health surveillance in respiratory e.g. predicted values of pulmonary function test for Thai population for a decade.

Method A cross-sectional survey was conducted during June–August 2013 among the workers. Data was collected through periodic examination from 165 people who participated in the study.

Results All workers were male. They were 26–54 years of age and their average working years were 8.8 ± 2.6 years. The report of abnormal pulmonary function test was 12.7% (21 people). They were found to have restricted lung function and had mild to moderate severity without any abnormal chest X-ray. There was 19% (4 people) who had abnormal as same as the previous test in 2012. There was 47% (10 people) who work in welding and body painting zone. The other biological monitoring 2,5-dioxohexane, Toluene, Xylene was done in 17 people who were exposed to these substances and the level was normal.

Conclusions Pulmonary function test is a useful test especially for health surveillance in welding and painting zone even though occupational or work related lung disease was not diagnosed. The environmental examination should be done to explain the working condition.

THE ASSOCIATION OF BLOOD LEAD LEVELS AND BONE DENSITY IN DIFFERENT COMBINATIONAL SNP POLYMORPHISMS AMONG TAIWAN LEAD WORKERS

Objective Past researches almost explored the relationship between a single gene with a single disease. Our study aims to investigate into the interaction of multi-gene with a single disease by using Genetic Algorithms.

Method Samples in this study are from a lead battery factory in Taiwan. We collected the data of their bone density, blood lead levels and 6 SNPs (ACE, alpha-adducin, Bsm, Tag, Apa, ALAD) from 1990 to 2009. When in 2009, a total of 502 employees in this factory. And we used Genetic Algorithms and logistic regression analysis that the genotype in an individual.

Results In this study, our findings suggest that when people’s genotype combined Bsm bb and ALAD 1–1, it will have a protective effect on bone density. It means the Taiwanese lead worker with genotypes of Bsm bb and ALAD 1–1, would have less chance to have low bone density (OR: 0.58; 95% CI: 0.95–0.35).

Conclusions We found the results by using Genetic Algorithms and logistic regression analysis that the genotype in an individual which are Bsm bb type and ALAD 1–1 type plays an important role in protecting bone density among 245 male employees and 261 female employees. In conclusion, our study found Bsm gene and ALAD gene influence bone density. However, the mechanism and the exact relationship between two genes and bone density need further investigation.
SICK LEAVE PATTERNS AS PREDICTORS OF DISABILITY PENSION OR LONG-TERM SICK LEAVE: A 6.75-YEAR FOLLOW-UP STUDY IN MUNICIPAL ELDERCARE WORKERS

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Objectives The public health care sector is challenged by high sick leave rates among home-care personnel. This group also has a high probability of being granted a disability pension. We studied whether a workplace-registered frequent short-term sick leave spell pattern was an early indicator of future disability pension or future long-term sick leave among eldercare workers.

Method 2774 employees’ sick leave days were categorised: 0–2 and 3–17 short (1–7 days) spells, 2–13 mixed short and long (8+ days) spells, and long spells only. Disability pension and long-term sick leave were subsequently identified in a National register. The cumulative incidence proportion as a function of follow-up weeks was estimated using the Kaplan-Meier curve. The relative cumulative incidence (RR) of experiencing one of these events within 352 weeks was analysed in a generalised linear regression model using the pseudo values method adjusted for age, occupation and unfavourable work factors.

Results A frequent short-term and a mixed sick leave pattern increased the RR of being granted a disability pension; the RR was 2.08 (95% CI: 1.00; 1.12) and 2.61 (95% CI: 1.33; 5.12). Inversely, the long-term sick leave pattern was not associated with a significantly increased RR compared with a non-frequent short-term pattern. The risk of long-term sick leave was significantly increased (1.35–1.64 (95% CI: 1.12–2.03) for all sick leave patterns beyond 0–2 short spells.

Conclusions Sick leave length was a better indicator of future workability than spell frequency. Preventive actions should target employees engaged in home-care having sick leave spells exceeding seven days, irrespective of spell frequency.

EXPOSURE TO RESPIRABLE WELDING FUME AND IRON STATUS IN GERMAN WELDERS

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Objectives Siderosis due to excessive iron exposure is a rare disease in welders. Less is known about the effect of inhaled iron on systemic iron status in welders. Here we present the association between exposure to iron as major constituent of the welding fume and the iron status in German welders.

Method In this analysis we included 192 welders from the German WELDOX study not wearing respirators. Respirable welding fume was measured during one shift and analysed for its metal content. Iron status was assessed with different measures, including serum iron, serum ferritin (SF), transferrin, and prohepcidin. High iron stores were classified according to international standards. The influence of exposure to iron and other factors on the iron status was analysed with multiple regression models.

Results Median shift exposure to respirable iron was 88 μg/m³ (interquartile range 13–690 μg/m³). For the overall study population the prevalence of high iron stores (SF > 200 μg/L) was 31.3%. A lower prevalence was found for tungsten inert gas (TIG) welders (16.9%). For all other welders using welding techniques with higher emission rates it was 38.6%. The regression models revealed a significant association of respirable iron and prohepcidin (exp (β)=1.08, 95% CI 1.05; 1.11) and a weaker association between respirable iron and serum ferritin (exp (β)=1.06, 95% CI 1.00; 1.12).

Conclusions Although the iron status is biologically well regulated we found positive associations of respirable iron in welding fumes on prohepcidin and ferritin. We observed more welders with high iron stores in comparison to male persons from the general population.

META-ANALYSIS ON NIGHT SHIFT WORK AND RISK OF METABOLIC SYNDROME

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Objectives This study aims to quantitatively summarise the association between night shift work and the risk of metabolic syndrome (MetS).

Method We systematically searched all observational studies published in English on Pubmed and Embase from 1971 to 2013. We extracted effect measures (relative risk, RR; or odd ratio, OR) with 95% confidence interval (CI) from individual studies to generate pooled results using meta-analysis approach. Pooled RR was calculated using random- or fixed effect model. Downs and Black scale was applied to assess the methodological quality of included studies.

Results A total of 13 studies were included in the meta-analysis. The pooled adjusted RR for the association between “ever exposed to night shift work” and MetS risk was 1.57 (95% CI 1.24–1.93, P heterogeneity = 0.001). Further stratification analysis for gender, MetS definition and study population demonstrated similar trends. The sensitivity analysis confirmed the stability of the results and no publication bias was detected.

Conclusions The present meta-analysis suggests that night shift work is significantly associated with the risk of MetS, showing a positive dose-response relationship with the intensity of night shifts. Large-scale well-design prospective studies are required to further investigate the association, especially in Asia countries.[National Natural Science Foundation of China (Project number 81273172 and 81372964), Shelly@cuhk.edu.hk (Lap Ah Tse)]
USING THE UK BIOBANK STUDY TO ESTIMATE OCCUPATIONAL CAUSES OF CHRONIC DISEASE: COMPARABILITY WITH THE UK NATIONAL POPULATION AND ADJUSTMENT FOR BIAS

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Objectives The UK Biobank study is a sample of 502,682 people aged 40–70, clustered around 22 assessment centres. As part of a project to investigate the causes of COPD and estimate the UK occupational burden, we have assessed the sample’s representativeness with respect to the UK national population, with a view to accounting for potential biases.

Method We have compared characteristics of the Biobank population (age, education, employment, smoking etc) to that of the UK population as estimated from national data sources.

Results Deprivation index scores indicate that Biobank respondents are more affluent wards are over-represented (52%) than Biobank respondents versus versus 28% nationally have scores of less than -2). The Biobank respondents are also better-educated (53%) to degree level, 17% nationally), with similar qualification levels in men and women, whereas more men than women nationally in this age range had higher level qualifications. Fewer were currently employed than nationally (58% vs. 65%), particularly men over 60, with more retired (45% vs. 33%), and fewer disabled or unemployed. There are more in managerial and professional (54% vs. 46%), and fewer in routine and manual occupations (22%, 33%) nationally, and fewer smokers (33% vs. 49%). Fewer in the already under-represented unskilled occupations (47% vs. 70%) for other occupations), or with reported respiratory ill-health (50% vs. 59%) have a usable email address.

Conclusions As Biobank respondents are on average less deprived, better educated and under-represented in unskilled occupations than the national population, estimating national occupational COPD burden, and collecting further data without bias will require data adjustments.

BRAZILIAN CONSTRUCTION INDUSTRY: A CONTRIBUTION TO IMPROVE INFORMATION ON FATAL WORK ACCIDENTS

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Objectives Considering data sources and statistical trends on recent fatal cases resulting from workplace accidents in the Brazilian construction industry, herein two aspects are emphasised: a critical appraisal of the official registers on deaths resulting from work-related accidents, and a discussion on alternatives to achieve better information to support interventions in this sector.

Method Statistics and the variability in the profiles of death at work from 2000 to 2011 were systematically analysed for construction industry according to the federal data sources on dimensions related to occupational health, working conditions and social security.

Results In addition to presentation of specific rates and a set of indicators, a technical proposal is suggested for a more effective and realistic characterisation of the profile of mortality in workplaces by considering age, gender, education, occupation, as well as the more frequent causes related to each type of accident. All of them as a condition to understand the main risks and to help teams of OSH facing the worst violence against workers.

Conclusions By reason of the social and economic costs involving work accidents in Brazil, this study searches to provide a specific comprehension on fatal cases as well as some subsidies for the government to draw policies oriented to minimise risks in the workplaces of construction industry. However, mortality resulting from accidents in the informal labour market should be considered to overcome gap on information. After all, if the number of unemployed workers is underestimated, the number of underemployed has not been taken into account.

SOCIAL SECURITY IN BRAZIL: THE IMPACT OF EPIDEMIOLOGICAL NEXUS ON THE BENEFITS RELATED TO OCCUPATIONAL DISEASES

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Objectives The Ministry of Social Security, in order to face the under-reporting of occupational accidents and diseases, has introduced new methods of identifying them. In addition to the Employment Accident Notification (CAT), the Technical Epidemiological Social Welfare Nexus (NTEP) was established in 2007. This work intends to analyse the role of the NTEP in
improving information regarding to the work-related diseases and, more specifically, on the trend and variation of benefits paid for them.

**Method** Through the NTEP it is possible to establish a nexus for each area of the economic activity, focusing on data of incapacitating diseases recognised by social welfare and involving more than 15 days’ absence from work, using the ICD-10.

**Results** Benefits for work-related diseases increased 128.2% during 2005–2008. However, the greatest changes occurred after 2007. From May 2006 to March 2007, when only the employer’s CAT was used, 125 246 Accident and Disease Assistance authorizations were issued. But, with the addition of the NTEP to the CAT this number rose to 293 912, an increase of 134.7% over the period from April 2007 to February 2008. The detachable figures are for “musculoskeletal system and connective tissue” (107 764 cases), “mental and behavioural disorders” (8930 cases), and “diseases of the nervous system” (8396 cases).

**Conclusions** The accident benefits for work-related diseases are growing more than other welfare benefits. This reality requires more studies and technical insights as well as priorities in terms of specific strategies for OSH policy.

**ASSOCIATIONS BETWEEN JOB STRESS, SOCIAL SUPPORT AND INSOMNIA AMONG NURSES**

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**Objectives** To investigate the association between job strain, social support at work and insomnia among registered nurses.

**Method** A cross-sectional study was conducted among 3,229 nurses (87% women) in 18 major public hospitals in Rio de Janeiro/Brazil. Data collection was based on a comprehensive self-filled questionnaire that included questions on insomnia and the Job Content Questionnaire (JQC). Job strain (high psychological demands and low control) and social support were evaluated by the Portuguese version of the 2.0-JCQ, defined by the quadrant approach. In addition, emotional demands were also assessed, so that high strain was evaluated considering separately the psychological and the emotional demands. Insomnia was defined as having at least one of the insomnia symptoms: difficulty initiating sleep, maintaining sleep or early morning awakening. Multivariate logistic regression and adjusted odds ratios and 95% confidence intervals were calculated.

**Results** The overall prevalence of insomnia was 34.3%. Individuals with high job strain and low social support experienced insomnia more frequently (p < 0.05). After adjusting for sociodemographic, work and health-related variables, high strain doubled the chances of presenting insomnia considering both the psychological (OR=2.20, CI 1.74–2.78) and the emotional demands (OR=1.99, CI 1.57–2.53). High strain in combination with low support at work increased the chances of insomnia even more.

**Conclusions** High strain is suggested as a possible risk factor for insomnia considering both psychological and emotional demands. The lack of social support from co-workers and supervisors seem to potentiate the odds for insomnia.
Method We completed searches of MEDLINE and PSYInfo from inception of each database to June 2013, to identify primary studies evaluating patient’s recovery expectations across all clinical populations. Teams of reviewers completed title and abstract screening of citations, full text review of potentially eligible articles, data extraction, and quality assessment of eligible studies. Findings from the review and input from content experts informed the development of a summary instrument.

Results We identified 8435 unique citations; 102 studies were eligible. Studies reported on 55 different instruments to assess symptom exaggeration; 42% of studies used the MMPI-2. Quality of studies ranged from low to moderate. Items that comprise our summary instrument will be presented at EPICOH.

Conclusions Multiple instruments are available to assess symptom exaggeration among patients presenting with mental illness; however, no instrument has shown ideal psychometric properties. We are hopeful that our instrument will facilitate the testing and development of a novel tool with superior sensitivity and specificity for detecting symptom exaggeration.

Objectives Of workers approved for long-term disability benefits, 31.6% suffer from a primary mental illness. Negative patient recovery expectations are associated with worse outcome in many conditions. Our objectives were: 1) to complete a systematic review to identify measures that assess patient recovery expectations, and 2) using the results from our review, develop an instrument designed to assess recovery expectations in individuals receiving disability benefits secondary to a mental health disorder.

Method We completed searches of MEDLINE and PSYInfo from inception of each database to June 2013, to identify primary studies evaluating patient’s recovery expectations across all clinical populations. Teams of reviewers completed title and abstract screening of citations, full text review of potentially eligible articles, data extraction, and quality assessment of eligible studies. Findings from the review and input from content experts informed the development of a comprehensive list of items that captured patient’s recovery expectations.

Results We identified 12 599 unique citations; 46 studies were eligible. Studies reported on 20 different instruments assessing patient’s recovery expectations. A minority (20%) of studies included measurement properties of reported instruments; 11% evaluated mental health conditions. No instruments were validated among patients receiving disability benefits or explored associations with return to work. Generalizability to disabled patients receiving wage replacement benefits is therefore unclear. Items that comprise our summary instrument will be presented at EPICOH.

Conclusions Our instrument holds promise for identifying claimants holding negative recovery expectations, which may be associated with prolonged recovery. These unhelpful beliefs may be a useful target for early interventional therapies.
**Objective** The incidence of metabolic syndrome (MS) increases rapidly in China. Growing evidence suggests that alterations in circadian systems and sleep disorders have participated in the etiology of metabolic disorders. This study aims to investigate the relationship between night shift work and MS risk and examine the underlying mechanisms that have never been explored by previous epidemiological studies.

**Method** We are establishing a prospective night shift worker cohort in Shenzhen, China. More than 10,000 workers will be recruited and followed up. A standardized questionnaire is used to collect information on lifetime night shift work, light at night, occupational hazards, sleep disorders, etc. Fasting blood and spot urine samples are also collected for further usage. CVD risk factors include hypertension, diabetes, overweight and dyslipidemia. All participants will have the annual or biennial occupational physical examination.

**Results** We reported data from a manufacturing company dealing with welding and shipment. We obtained 131 day workers and 370 shift workers with a response rate of 95%. The shift workers are significantly younger than day workers. The smoking and alcohol drinking status are comparable in two groups. The presence of number of CVD risk factors positively relate to the years of shift work after adjusting for age and other confounding factors.

**Conclusions** These preliminary results suggest long-term night shift work may increase CVD risk factors, while these will be updated in the future. [National Natural Science Foundation of China (Project number 81273172 and 81372964), Shelly@cuhk.edu.hk (Lap Ah Tse)]

**Objectives**

1. To evaluate the clinical symptoms with matching on age and sex.
2. To conduct a study paper without exposure to evaluate the clinical symptoms with matching on age and sex.

**Method**

1. The evaluation of occupational exposure by air sampling was carried out in two pressings using colorimetric detector tubes for spot metering (Dragger pumps). The first in any point in the space, the second opening when the window.
2. The results showed that the exposure was increased by 10 ppm and 200 ppm for the first and second pressings, respectively.
3. Data collection made by a questionnaire (one of Hogstedt).
4. Were conducted psychometric tests.
5. The evaluation of occupational exposure by air sampling was carried out in two pressings using colorimetric detector tubes for spot metering (Dragger pumps). The first in any point in the space, the second opening when the window.
6. The results showed that the exposure was increased by 10 ppm and 200 ppm for the first and second pressings, respectively.
7. Data collection made by a questionnaire (one of Hogstedt).
8. Were conducted psychometric tests.
9. The evaluation of occupational exposure by air sampling was carried out in two pressings using colorimetric detector tubes for spot metering (Dragger pumps). The first in any point in the space, the second opening when the window.
10. The results showed that the exposure was increased by 10 ppm and 200 ppm for the first and second pressings, respectively.
11. Data collection made by a questionnaire (one of Hogstedt).
12. Were conducted psychometric tests.

**Conclusion**

1. There is a significant difference between exposed and unexposed populations on the presence of clinical signs except for the presence of three signs: nightmares, tingling in arms and digestive disorders.
2. There is a significant difference between the two populations for all the psychometric tests.
3. Perclorehylene air rate upon opening of the window is greater than or equal to 100 ppm and both are higher than the limit value (ACGIH 2005).

**Objectives**

1. To confirm the existence of an occupational exposure to perchlorehylene dry cleaners or employees of the questionnaire results allowed us to identify a number important information on the symptoms observed in the study population according to exposure.
2. To confirm the existence of an occupational exposure to perchlorehylene dry cleaners or employees of the questionnaire results allowed us to identify a number important information on the symptoms observed in the study population according to exposure.
3. To confirm the existence of an occupational exposure to perchlorehylene dry cleaners or employees of the questionnaire results allowed us to identify a number important information on the symptoms observed in the study population according to exposure.
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5. To confirm the existence of an occupational exposure to perchlorehylene dry cleaners or employees of the questionnaire results allowed us to identify a number important information on the symptoms observed in the study population according to exposure.
haematopoietic malignancies and other cancers following occupational styrene exposure.

Method The cohort consists of 74 902 workers (84% men) in the Danish reinforced plastics industry, originating from 481 companies ever producing reinforced plastics in Denmark 1964–2009. We identified all workers in the National Supplementary Pension Fund Registry for which all employees are compulsory members. Cancer diagnoses were found in the National Cancer Registry. Standardised Incidence Rate Ratios (SIRs) and 95% confidence intervals (95% CI) were used for relative risk estimation.

Results Among the 74 902 workers, we identified 10 374 cases of cancer accumulating 1.5 million person years. The overall SIR was 1.00 (95% CI 0.98–1.02). SIR for lymphatic and haematopoietic cancers was 0.99 (0.91–1.07). Among male workers we observed increased risk of buccal cavity and pharyngeal cancers (SIR 1.24; 1.12–1.37), cancers of the respiratory system (SIR 1.33; 1.26–1.39), and bladder cancer (SIR 1.08; 1.0–1.17), and among female workers cancers of the respiratory system (SIR 1.41; 1.22–1.62).

Conclusions The cohort experiences the same overall cancer risk as the general population and no increased overall risk of malignant haematopoietic diseases was apparent. However, we observed increased risks for cancers that may be due to confounding from smoking and alcohol. Internal risk assessment that includes historical styrene exposure data will supplement the current findings.

0178 QUALITY OF LIFE OF WORKERS SUFFERING FROM SHOULDER PAIN
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Objectives To compare the quality of life (QoL) in three groups of workers suffering or not from shoulder pain (SP) lasting more than one month during the preceding 12 months.

Method Between 2002–2005, 3710 workers were randomly included in a French surveillance system of work-related musculoskeletal disorders. In 2007, 2332 responded to a follow-up questionnaire, 2049 were still active. Workers completed the Nordic Questionnaire to assess SP and the SF-36 for QoL. Three groups were defined according to health status at follow-up:

- **Group 1**: workers without SP (men: 87.9%; women: 79.2%)
- **Group 2**: workers with SP without neck, elbow and hand/wrist pain lasting more than one month during the preceding 12 months (men: 4.2%; women: 6.0%)
- **Group 3**: workers with SP and neck, elbow or hand/wrist pain lasting more than one month during the preceding 12 months (men 7.9%; women 14.8%)

The mean scores of SF-36 were compared with Kruskall-Wallis test and post-hoc comparisons were performed. Analyses were stratified by gender.

Results Workers in group 2 had lower scores of physical health compared to workers in group 1, whatever the gender. Workers in group 3 had lower scores of physical and mental health compared to workers in group 1. Two dimensions of mental health in men and the four dimensions of physical health and one dimension of mental health in women had lower scores in group 3 compared to group 2.

Conclusions Workers with SP and upper-limb pain have poorer QoL compared to workers without SP and workers with SP without upper-limb pain.

0179 INDEPENDENT MEDICAL EVALUATIONS - IMPORTANT, NEGLECTED, IN NEED OF REFORM: A SYSTEMATIC REVIEW
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Objectives Independent medical evaluations (IMEs) are a common and influential form of assessment, often influencing whether patients receive compensation for an injury or illness. To inform the evidence-base underlying IMEs, we conducted a systematic review of all primary literature conducted in North America.

Method We searched CINAHL, EMBASE, MEDLINE and PsycINFO and other sources for studies published through to Sept. 20, 2011. We included all primary literature on the topic of IMEs from a North American perspective. Assessment for study inclusion, data extraction and risk-of-bias analyses were performed in duplicate.

Results We included 52 studies, all of which were observational in design and most of which focussed on determining the rate of malingering among examinees. Estimates of non-credible symptom over-reporting among patients presenting for IMEs ranged from 16% to 55%, with studies at lower risk of bias finding higher estimates. Other studies found that inter-rater reliability among IME assessors for assigning degree of impairment to the same IME report was poor, and that patients presenting for an IME with external incentive (e.g. litigation, disability benefits) perform systematically worse across a range of psychometric tests versus patients presenting with similar illness/injury but without external incentive.

Conclusions Symptom exaggeration is common among patients presenting for IMEs, and particularly among those patients with external incentive. IME assessors reviewing the same case demonstrate little agreement regarding the degree of impairment that should be assigned. Standards for IME assessment and reporting are urgently needed to ensure greater reliability and validity of this common form of assessment.

0180 DOES LONG-TERM STRESS CAUSE DEPRESSION? OCCUPATIONAL NOISE EXPOSURE AND THE USE OF ANTIDEPRESSANTS
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ASSOCIATIONS BETWEEN PRE-DEFINED OCCUPATIONAL GENDER BIAS IN OCCUPATIONAL EPIDEMIOLOGY

Objectives The aim is to examine occupational noise exposure as a risk factor for depression, utilising noise exposure as an objective measure of distressing working conditions that circumvents reporting bias.

Method In a 7-year cohort study we followed 109 378 industrial workers and 45 613 financial workers from 2001 or first year of employment thereafter until 2007. At start and end of follow up we recorded mean, full-shift noise exposure levels by personal dosimeters for 1077 workers from randomly selected companies. We assumed a linear relation with calendar year and predicted exposure levels by trade and occupation since 1980 and calculated cumulative noise exposure. Danish national registries provided complete employment histories since 1980, psychiatric diagnoses (1977–2001), and remission of antidepressants (Selective Serotonin Reuptake Inhibitors, SSRI) (1994–2007). Workers with psychiatric diagnoses or use of antidepressants before 2001 were excluded.

Results During follow-up we identified 7754 incident users of SSRIs. Among women, risk of starting SSRI medication increased by cumulative noise exposure level OR=1.02 (95% CI: 1.01–1.02) per dB(A)-year when adjusted for age, calendar year and socioeconomic status. When excluding white-collar workers no effect was seen among women and no effect of noise was apparent among men overall.

Conclusions These preliminary results do not provide strong evidence that occupational noise exposure is a risk factor for depression. The increased OR seen among all women can be explained by differences in socioeconomic status between the blue-collar industrial workers and the white-collar financial workers since no trends were apparent in internal analyses among blue-collar workers.

0186 GENDER BIAS IN OCCUPATIONAL EPIDEMIOLOGY RESEARCH: A SYSTEMATIC REVIEW ON WORK-RELATED LUNG CANCER

Objectives The “one-eyed science” pointed out by some authors has contributed to the invisibilization of working conditions as a health determinant among women. Our objectives were to document current epidemiological practices in the assessment of work-related lung cancer risks, and to discuss how gender-related biases compromise the scientific validity of exposure and risk estimates among women, as compared to men.

Method A systematic literature review over the last 7 years was performed, and based on the screening of 410 abstracts retrieved from PubMed, 122 articles were retained. Data were collected through a questionnaire, and analysed both quantitatively and qualitatively. Articles were classified according to the gender distribution of the study sample as either men only, women only or mixed.

Results Androcentrism was present, as nearly 50% of studies recruited men-only participants. Moreover, 45% of them were subject to an overgeneralization of study results. Gender-insensitivity could be observed from the papers (35%) which did not provide justification for the gender composition of study sample. A double standard was also suspected in the exposure assessment methods. Sex and gender-related terms were found to be frequently used interchangeably.

Conclusions Upgraded results with an increased sample size are forthcoming. Meanwhile, these preliminary results raise the question of the “gender bias” in epidemiology, and how sex and gender should be taken into account in the design, conduct, analysis and dissemination of results in order to minimise gender-related biases and reinforce the scientific validity of research.

APPLICATION OF A DYNAMIC POPULATION-BASED MODEL TO ASSESS THE EFFECT OF SILICA EXPOSURE INTERVENTIONS ON COPD IN DUTCH CONSTRUCTION WORKERS: RESULTS FROM THE ‘RELIEVED WORKING STUDY’

Objectives A multidimensional intervention aimed at reducing silica exposure in the Dutch construction industry was performed. The objective of this study was to assess the effect of...
the achieved reduction in exposure on the burden of chronic obstructive pulmonary disease (COPD) in construction workers.

**Method** The intervention aimed at technical, organisational and psycho-social factors and was performed in four construction companies. Pre and post intervention respirable quartz exposure measurements were taken in these and four additional control companies. A mathematical simulation model was used to generate COPD prevalences (GOLD stage ≥1) in response to silica exposure, population characteristics and Dutch trends in smoking behaviour for a population of 20–65 year old construction workers with lifetime silica exposure.

**Results** Pre-intervention exposure assessment demonstrated highest respirable quartz levels (mg/m³) for concrete drillers (GM: 0.20, GSD: 2.75), ruck pointers (GM: 0.18, GSD: 2.18) and demolishers (GM: 0.12, GSD: 2.86), exceeding the Dutch occupational exposure limit (OEL) in 71, 92 and 97% of cases, respectively. Preliminary simulations estimated COPD prevalence at 21, 20 and 17% for these groups respectively, as compared to 14% when quartz exposure is reduced to the Dutch OEL and 8% with no exposure.

**Conclusions** For several job categories high exposure levels exceeding the Dutch OEL were observed. Reducing these levels to below the OEL would lead to a substantial reduction in the burden of disease. The post intervention exposure levels will become available early 2014. The effect on the burden of disease and economic impact will be assessed with an refined model incorporating population dynamics.

**0190 CARPAL TUNNEL SYNDROME AND CARPAL TUNNEL SYNDROME-LIKE SYMPTOMS IN RELATION TO MECHANICAL EXPOSURES ASSESSED BY A JOB EXPOSURE MATRIX: A TRIPLE CASE-REFERENT STUDY**

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**Objectives** To evaluate relations between occupational mechanical exposures and (1) carpal tunnel syndrome verified by ENG (ENG+CTS) and (2) CTS-symptoms with normal ENG (ENG-CTS).

**Method** We plan a triple-case referent study of 1000 ENG +CTS and 1000 ENG-CTS cases identified at a university department of clinical neurophysiology. For each case, two sex, age, and primary care centre matched controls will be sampled (risk set sampling). Both retrospectively and prospectively identified cases will be included with standardised clinical examination of the last-mentioned group. Conditional logistic regression analyses will be performed comparing the two case control sets, while unconditional logistic regression will be applied comparing ENG+CTS cases to ENG-CTS controls. Questionnaire information will be collected on job history, lifestyle, symptoms, and disability. Job titles will be linked to a job exposure matrix (JEM) based on measurements of hand-wrist movements (goniometer measurements) and expert ratings.

**Results** The main hypothesis is that exposure-response relations will be found for ENG+CTS, but not for ENG-CTS with respect to forceful work and awkward wrist postures, while repetitive work will show exposure-response relations in both groups. The Danish Working Environment Research Fund has granted financial support for a 3-year PhD project starting January 2014.

**Conclusions** The study will take advantage of specific and well documented case diagnoses and independent exposure assessment. The results are expected to produce new insights into exposure-response relations between occupational mechanical exposures and risk of CTS.

**0191 ARE INDOOR CONCENTRATIONS OF AIRBORNE MOULD SPORES IN NON-INDUSTRIAL ENVIRONMENTS SUFFICIENTLY HIGH TO CAUSE HYPERSENSITIVITY PNEUMONITIS?**

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**Objectives** Antigen exposure is the only diagnostic criteria specific for hypersensitivity pneumonitis (HP) compared with other interstitial lung diseases. Indoor mould exposure in non-industrial environments has been claimed to cause HP, but little is known about exposure levels. Our objective was to compare indoor concentrations of airborne mould spores for patients diagnosed with indoor HP with background levels and levels measured for patients diagnosed with farmers’ lung and suberosis.

**Method** We included 8 patients diagnosed with HP based on characteristic clinical findings, signs of indoor mould growth at home or at their non-industrial work place, and increased levels of precipitating antibodies for moulds. We collected 110 air samples from all affected rooms, adjacent rooms, and outdoor.

**Results** The average total spore concentrations varied between 22 000 and 36 000 spores per m³, and the average viable concentrations between 35 CFU/m³ and 457 CFU/m³, with no clear association between spore concentration and affected rooms, adjacent rooms and outdoor.

**Conclusions** The observed levels did not exceed usual indoor and outdoor levels and were orders of magnitude below levels measured for patients diagnosed with farmers’ lung and suberosis, and we question if indoor mould levels in non-industrial environments are sufficient to cause HP. Relying solely on signs of moulds or presence of precipitating antibodies when diagnosing HP may cause other interstitial lung diseases to be overseen and patients may take initiatives such as quitting the job or leaving their homes that will not alleviate their disease but have significant social consequences.
Objectives Social position and social mobility are associated with cancer incidence and mortality, yet little is known about their association with mediating factors such as occupational exposures to carcinogens. Our aim was to assess the association between the type of professional trajectory and multiple occupational exposure profiles.

Method Data were extracted from the Giscop93 study (n = 1009), which is a cohort of cancer patients with (mainly) respiratory tumours. Job histories were reconstructed through interview, then a multi-disciplinary expert group examined the probability of occupational exposure to a list of 54 potentially carcinogenic agents. The typology of professional trajectories was built based on employment stability, employment continuity, job qualification trend, and multiple skills through Multiple Correspondence Analysis followed by Ascending Hierarchical Classification. Association with multiple-exposure profiles was then assessed through multiple logistic regression.

Results Men and women differed in terms of predominant job category over the lifecourse (68.2% of blue-collar-workers among men, 57.3% of employees among women, p = 0.0001). Professional trajectories were grouped in four classes as “stable qualified, employee” (21.3%), “stable manual, independent blue-collar-worker” (24.4%), “stable tiring, no gain in qualification” (30.5%), and “very unstable, precarious” (23.8%). Among men, the last two categories were associated with exposure to at least five different occupational carcinogens (ORstable_tiring/stable_qualified=2.0 [1.3;3.1], ORvery_unstable/stable_qualified=2.6 [1.6;4.2]). No such association was found among women.

Conclusions The association found between the type of professional trajectory and multiple occupational exposures among men should be replicated among people not suffering cancer. Further analysis will investigate the gendered differences observed.

Objectives To analyse the relationship between mental health and non-agricultural informal employment in Central America; and to examine whether patterns of association differ by gender. Method Cross-sectional study of 8904 non-agricultural workers (48% women) based on the I Central American Survey of Working Conditions and Health of 2011. Employment profiles were created combining formal and informal characteristics: labour relationship (permanent employees, temporary employees, self-employed, employers), social security coverage (yes, no), type of contract for employees (written, oral or no contract), company size for employers (≤5, >5 workers). Using logistic regression models, odds ratios (OR) of poor mental health (measured by GHQ12 questionnaire) and 95% confidence intervals (95% CI) were calculated by sex, adjusting for country and age, with employment profiles as independent variable. The reference group was permanent employees covered by social security with a written contract.

Results Around 37% of women and 34% of men reported poor mental health. In both sexes all profiles without social security coverage were associated with poor mental health except for permanent employees. Temporary employees covered by social security were associated with poor mental health if they have oral or no contract for women and men. Covered permanent employees with oral or no contract among women (OR: 1.70, 95% CI:1.12–2.59) and covered self-employed among men (OR: 1.59, 95% CI:1.03–2.46) were associated with poor mental health.

Conclusions In Central America health inequalities by employment profiles exist, principally for not being covered by social security, or having an oral or no contract for employees (main characteristics of informal employment). Few gender inequalities have been found.

Objectives The objective was to study participatory for solid waste management of undergraduate students Faculty of Physical Education Srinakharinwirot University Ongkarak.

Method Collect the data by the questionnaire developed interview used as a tool to collect employed quantitative data. The content validity was improved and adjusted by the suggestion of the experts.

Results The result revealed that: the sample were women 75.5%, age between 18–22 years old, age average 19.75 years old (S. D. = 1.047, Min=18, Max=22), the bin condition, or storage of waste provided by the University have various stains 81.5%, minor is not covered or close incompletely 56.8% and 36.1% damaged, broken or leaking the trash. The storage of waste by University cause of nuisance 88.7%; almost of foul smell 92.5%, minor is nuisance form animals and insects such as flies, mice, etc., 36.6% and the other (the leachate outflow / waste overflow flooded / gruose) 4.2%. The knowledge level about solid waste management almost moderate level 53.5%, minor was high level 45.5% and low level 1.1%. The attitude level about solid waste management almost moderate 65.8%, minor were low level 18.2%, and high level 16.0%. The practice behaviour level about solid waste management almost moderate 72.8%, minor were high level 15.2% and low level 12.0%.

Conclusions Undergraduate students have the knowledge, but not implemented for separate the garbage, and the correct type of waste, uncooperative for separate the garbage because of that embarrassment and there is not enough knowledge about solid waste management. The University do not have the campaign seriously.

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1. María López-Ruiz, José M Martínez, Fernando G Benavides, Vanessa Puig-Barrachina, Maríana Rojas, Lucía Artazcoz. CIBER Epidemiología Y Salud Pública (CIBERESP), Spain; 2Universitat Pompeu Fabra, Barcelona, Spain; 3Facultad de Informática, Universidad Nacional de Costa Rica, Heredia, Costa Rica; 4Agencia de Salud Pública de Barcelona, Barcelona, Spain

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1. Blanche Cotte, Séverine Toul, Noémie Levêque-Morlais, Stéphane Peiry, Anne-Valérie Guiard, Michel Vetel, Emma Rigaud, Isabelle Baldi, Pierre Lebailly, Institut National du Cancer et Prévention, F-14000, Caen, France; 2University of Caen Basse-Normandie, F-14000, Caen, France; 3Calvados General Tumor Registry, Centre François Baclesse, F-14000, Caen, France; 4Insécur Cancer Registry, Faculty of Medicine, University of Strasbourg, F-67085, Strasbourg, France; 5Mutualité Sociale Agricole, Caisse Centrale, F-93547, Bagnolet, France; 6Inserm, ISPED, Centre d’Inserm U987- Épidémiologie-Biostatistique, F-33000, Bordeaux, France; 7University of Bordeaux, ISPED, Laboratoire Santé Travail Environnement, F-33000, Bordeaux, France

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Objectives Prostate cancer is one of the most frequent cancers worldwide. Its etiology is largely unknown with farming being suspected. Our aim was to identify occupational risk factors for prostate cancer in farmers in the French prospective cohort study AGRICAN.

Method During the period from enrollment (2005–2007) to 31 December 2009, 1664 incident prostate cancer cases were identified in the cohort (n = 92669) by linkage with cancer registries. Data on occupational history and agricultural exposures during lifetime on 13 types of crops and 5 types of animals were collected by the enrollment questionnaire. Hazard ratios (HR) were estimated using Cox regression analysis with attained age as underlying time scale.

Results Elevated risks were found for six agricultural activities: cattle, hogs, horses, grassland, wheat/barley and tobacco (HR=1.07 to 1.16; p = 0.07 to 0.23). Prostate cancer risk was related to duration of work in wheat/barley and tobacco productions, number of cattle and hogs, and grassland area. We also observed an increased risk for fruit growing, with both duration and area. Increased prostate cancer risk was associated with applying pesticides on wheat/barley (HR=1.40, p = 0.06) with a duration relationship, and with making hay (HR=1.16, p = 0.03).

Conclusions Our analysis suggests that the risk of prostate cancer is increased in some farming activities, mainly in crops. This work will be completed by a multivariate analysis, with variables positively associated with the outcome in the previous analysis. The possible association between use of some chemical classes of pesticides and prostate cancer occurrence will be analysed through a crop-exposure matrix (PESTIMAT).

Objectives The aim of this study was to evaluate the dimensional structure of the SRQ-20 in different occupational groups. It’s a validation study that involved four sectional drawing surveys.

Method Individual analysis of the databases has been conducted by using the method of principal components. The latent class analysis has been used in the factor analysis of tetrachoric correlations in order to assess the dimensionality of the instrument, aiming to tailor the assessment method to the distribution of variable (categorical). The Vuong-Lo-Mendell-Rubin test adjusted Lo Mendell Rubin (LRT Test), the parametric bootstrap verisimilitude ratio test has been used to review the adequacy of the number of classes extracted in the recipiency of the CMD. The reliability of the latent classes has been evaluated by Latent Class Reliability Coefficient (LCRC).

Results The factor analysis of tetrachoric correlations allowed the assessment of the dimensions of the SRQ-20 and the comparison between different categories of workers. As a complement, the latent class analysis permitted the interpretation of subgroups for expressions of common mental disorders in the occupational sphere, providing in-depth research.

Conclusions The study combined two methods of analysis for assessing the dimensional structure of the SRQ 20 among workers. The factor analysis of tetrachoric correlations enabled us to verify the dimensional stability of the instrument, since the number of extracted factors and dimensions represented maintained similarities in the groups assessed. The study points to the use of measures of SRQ 20 as valid for screening TMC occupational groups.
Objective: Working in the rubber and rubber product manufacturing industry has been classified by the International Agency for Research on Cancer (IARC) as definitely carcinogenic. However, given the complex nature of the chemicals, the phasing out of the use of certain chemicals, and the trend in reduction in exposures, there remains a great deal of uncertainty about the nature of the risks, if any, encountered by workers today.

Method: We have at our disposal a large retrospective cohort study of 40,000+ workers who were aged 35+ in 1967, which was last followed up to 1976. We are carrying out an updated cancer mortality analysis adding 35 years to the previous cancer mortality follow-up. We will determine the nature of the dose-response relationships for important known and suspected carcinogens using quantitative exposure modelling based on available measurement data from the EXASRUB project (dust, fumes, solvents, and n-Nitrosamines).

Results: We will report on progress to date with the study, which has received ethical approval and is currently seeking other clearances from the UK research governance system for such studies, and will further report on proposed exposure modelling strategies.

Conclusions: This is the largest and statistically most powerful cohort of its type and will have an exhaustive, quantitative exposure assessment. This study will add substantially to our knowledge of the longer term risks associated with the chemicals present in the industry in the UK, including those from working conditions several decades ago, and will thereby also be important for exposure conditions in the developing world.

Objective: The association between shift work and obesity is multifaceted and depends on population factors. Further investigations within a highly educated and diversified workforce are warranted.

Objective: In the Czech Republic the musculoskeletal disorders (MSDs) represent a major problem. Their frequency has been continually increasing to the degree that they currently rank as the second most frequent cause of temporary working disability. The MSDs represent 50% (607 cases) of the officially recognised occupational diseases (incidence 30.3/100,000 employees) and are the most frequent category of occupational diseases in the Czech Republic.

Method: The authors describe the Czech Republic official national system of hazard identification and risk/exposure assessment (“Categorization of working operations”) used as a basic tool for effective risk management in enterprises (database of 74,731 subjects/enterprises in 2011) and analyse 4,353 occupational MSDs during 2005–2011.

Results: Working population in the Czech Republic currently totals about 4.5 million people. Of them, about 117 thousand are exposed to vibrations (+2.6% of total work force), about 739 thousand are exposed to overload by physical work (+16% of total work force), and about 600 thousand are working in a bad working posture (+13% of total work force). It follows that almost 30% of the Czech total work force is exposed to a risk factor for MSDs.

Conclusions: The goal of the system of categorization of working operations is to get objective and comparable data for risk assessment, optimisation of working conditions, rational measures and handling problems. Authors emphasise consultative role of occupational health services (OHs) in the hazard identification and risk/exposure assessment.

Supported by scientific programme PRVOUK P25/LF1/2 of Charles University in Prague, Czech Republic.
Objectives One hypothesised mechanism by which chronic stress results in negative health outcomes is through allostatic load (AL), which is a measure of the cumulative ‘wear and tear’ experienced by the body when activating physiologic responses in order to maintain homeostasis. This study aimed to quantify and compare the mean levels of allostatic load experienced by workers in different occupations and industries in Chile.

Method From a weighted national survey of the Chilean population (n = 1199), occupations and industries were categorised by their average AL level, which was measured using a composite of secondary biomarkers of chronic stress exposure that fell outside of a “well-centred” range (extreme normal high value biomarkers). The numbers of biomarkers that fell outside of this range were counted for each worker in order to represent AL. Adjusting by age, sex, education, smoking status, and personal income, Poisson-log generalised linear mixed models were used to generate mean levels of AL for each occupation and industry.

Results An important and statistically significant gradient was observed in mean AL levels between different occupations (from 0.7 to 4.1 mean number of extreme normal high value biomarkers) and industries (from 0.8 to 2.3).

Conclusions There is a clear occupational gradient of AL in the Chilean workforce. Preventive and clinical activities should focus on occupational and industrial gradients in AL should be examined further.

Objectives To estimate the number and prevalence of occupational exposure to benzene in Brazil.

Method This study was carried out with the economic active population of Brazil, using 2010 Census data. Benzene data from the Finish National Job-Exposure Matrix, FINJEM, by occupational groups and sex were used to estimate the weighted number and prevalence of occupational exposure to benzene in Brazil. Because of differences in the Brazilian and Finish occupational classification codes, an assessment of acceptance by occupational safety and health experts was also made.

Results From a total of 86 353 839 workers, 7 376 761 have jobs in occupations potentially exposed to benzene. Based on FINJEM parameters, approximately 778 025 workers were identified as probable exposed to benzene in their jobs, a weighted prevalence of 9.1/1000 workers, higher among men (11.2/1000) than among women (6.0/1000). Most of the benzene exposed workers were from the group of machine repair and engine mechanics (66%). The nine experts who ranked the occupational codes regrouping agreed with 97% of the proposed matches.

Conclusions Benzene is targeted by health surveillance in Brazil but little data are available on occupational exposure. Job-exposure matrix can be an useful tool for epidemiological monitoring of benzene exposure for surveillance purpose. There is a need to develop a JEM with national data thus making feasible the evaluation of the Benzene National Agreement impact on this exposure control and workers’ health.

Objectives Based on previous analyses, using ROC curves and correlation, we aim to improve agreement assessments between diverse formulations of the Demand Control (DC) Model for Job Strain in order to test its ability to predict anxiety and depression (AD) in a nationally representative population of workers from Chile, a country transitioning to high economic development and with high prevalence of AD.

Method A weighted national sample of 9503 workers representing the entire Chilean workforce was surveyed during 2010–2011 in Chile. Goldberg Health Questionnaire (12 questions) to assess AD and diverse formulation of the DC model were used as dependent and independent variables respectively. Bland-Altman plots for agreement and Poisson-log models (controlled for demographics) for predictive ability were used to assess each formulation.

Results Good agreement between Log and Quotient formulations. For different formulations, high strain jobs had between 1.7 (quadratic and tertile formulations) and 3.7 (extreme tertile formulation), higher prevalence of AD than low strain jobs. Approximately 12–25% of AD cases might be attributed to increased strain.

Conclusions Predictive ability of the DC model for AD was similar in trend to other studies. Most accurate models (extreme formulations) and 3.7 (extreme tertile formulation), higher prevalence of AD than low strain jobs. Approximately 12–25% of AD cases might be attributed to increased strain.

Objectives Although styrene has been reported to cause colour vision impairment, the results were still inconclusive. Whether the impairment was related to short-term or long-term exposure was not known. The study aims to evaluate colour vision in high styrene exposed fiberglass-reinforced plastics (FRP) laminators.

Objectives Depression and anxiety as an outcome of job strain in the Chilean workforce.

Method To estimate the number and prevalence of occupational exposure to benzene in Brazil using a Job-Exposure Matrix.

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Method Fifty workers from two yacht factories participated, including 23 FRP laminators and 27 non-FRP workers. Pre-shift colour confusion index (CCI) was measured on the first workday of a week by using Lanthony Desaturated Panel D-15d. Concentrations of volatile organic compounds related to FRP laminating were collected by a stainless canister, and then analysed using a GC/MS. Cumulative working hours for FRP laminating was obtained from daily administrative records of the companies. Logistic regression was used to assess correlation between cumulative working hours (past 0.5, 2, and 8 years) of FRP laminating and pre-shift CCI, where work time and CCI were stratified by median and the model was adjusted for age and regular alcohol consumption.

Results The mean styrene exposure during FRP laminating was 4.2 ppm. The median of cumulative working hours for FRP laminating in the past 0.5, 2 and 8 years was 2, 49, 248 h respectively. Higher cumulative working hours for FRP laminating was associated with poor CCI (past 0.5 yrs, odd ratio (OR)=3.1, p = 0.1; past 2 yrs, OR=4.8, p = 0.03; past 8 yrs, OR=6.5, p = 0.01). The effect of long-term exposure to styrene appeared to be stronger than short-term exposure.

Conclusions Long-term exposure to styrene from FRP laminating was associated with colour vision impairment.

0234 HEAD AND NECK CANCER AND OCCUPATIONAL EXPOSURE TO ASBESTOS, MINERAL WOOLS AND SILICA: RESULTS FROM THE ICARE STUDY

Objectives To study the associations between head and neck cancer risk and occupational exposure to asbestos, mineral wools and silica.

Method ICARE is a population based case-control study conducted in France. Analyses were restricted to men and included 1833 cases of head and neck squamous cell carcinomas (HNSCC) and 2747 controls. Complete occupational history was collected. Occupational exposures were assessed through job-exposure matrices. Logistic models were used to estimate adjusted odds ratios (ORs) and 95% confidence intervals (CI).

Results Exposure to asbestos was associated with an elevated risk of HNSCC (OR=1.9, CI 1.6–2.3), and the risk increased significantly with the probability, duration and cumulative level of exposure. Significantly increased risks were found for all cancer sites: larynx (OR=2.1, CI 1.6–2.8), hypopharynx (OR=2.0 CI 1.5–2.8), oropharynx (OR=1.6 CI 1.3–2.1) and oral cavity (OR=1.9 CI 1.4–2.6). Conversely, after adjustment for asbestos exposure, exposure to mineral wools was not associated with HNSCC risk (OR=0.8 CI 0.6–1.0), for any of the cancer sites. Exposure to silica was not associated with HNSCC risk overall (OR=0.9 CI 0.7–1.2), but non-significantly elevated ORs were observed for the highest level of cumulative exposure for oropharyngeal (OR=1.6 CI 0.8–3.2) and hypopharyngeal cancer (OR=1.9 CI 0.9–4.1).

Conclusions Our findings confirm the role of asbestos exposure in laryngeal cancer, and suggest that asbestos exposure increases also the risk of oral and pharyngeal cancer. There is some evidence of an association between silica exposure and pharyngeal cancer. Exposure to mineral wools was not associated with HNSCC risk in our study.

0236 ESTIMATING THE PROPORTION OF OCCUPATIONAL CANCERS WITH MINIMAL RESOURCES: AN EXAMPLE FROM QUEBEC

Objectives To estimate the number of work-related cancer cases and deaths in order to prioritise research activities.

Method Numbers of compensated incident cancers (between 2005–2007) and cancer deaths (between 1997–2005) were obtained from the Quebec Workers’ Compensation Board. A second series of estimates was calculated by applying proportions of cancers attributable to work published for Finland (Nurminen and Karjalainen 2001) and for the United Kingdom (Rushon and colleagues 2012) to Quebec tumour registry data for 28 cancer sites. A comparison of industrial profiles of Finland, United Kingdom and Canada showed reasonable similarities between the countries over the last decades.

Results Compensation statistics reported an annual average of 94 incident cancers and 40 cancer deaths (98–99% men), 60–64% of which being mesotheliomas, followed by respiratory cancers (30–37%). Using published estimates of attributable fractions, it was estimated that 6.0% of incident cancers (men, 9.1%; women, 2.7%) and 7.6% of cancer deaths (men, 11.7%; women, 2.8%) could be attributable to work, resulting annually in 2200 new cancers and 1200 deaths. Incident cancers of the lungs, prostate, bladder, skin and breast (women) were the most numerous, whereas cancer sites resulting in more deaths were lung, breast (women) and mesothelioma. On average, 53% of incident mesothelioma cases were compensated yearly.

Conclusions This attempt at better estimating, albeit imperfectly, importance of the burden of cancer from occupational exposures can help prioritise research activities and increase stakeholders’ awareness. However, better estimates of human impact and economic costs are warranted to justify large investments in preventive interventions.
trustworthiness of the study was examined using Lincoln and Guba (1985) principles.

Results Seventeen health care workers participated in our study. There are five main themes generated, including (1) Emotional loading: shock and collapse, fear of being seroconverted to infectious diseases, worry about family members, and damage of the professional image. (2) Disappointment on the working environment: lack of manpower support, feel isolated and helpless. (3) Disapproving eyes: invasion of privacy, fear of being labelled. (4) Impact on life: feelings of life-threatening, prophylaxis of physical discomfort, impact on professional ambitions. (5) Self-adjustment: efforts to recover from the event.

Conclusions A needlestick injury not only causes risk of infection, but has great psychosocial impact to the victims. Intervention should cover psychosocial support to the health care workers in addition to prophylaxis of infection.
0242 IMPACT OF OCCUPATION ON BLOOD LEAD LEVELS IN PREGNANT WOMEN

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Objectives To examine the relationship between occupation and blood lead levels in pregnant women of Durango, Mexico.

Method A cross sectional study was conducted with 299 pregnant women. Information on occupation, risk factors and socio-demographic data was collected by means of a structured questionnaire. Blood lead concentration was tested by graphite furnace spectrometry. Women were divided into three groups according to occupation: working in places with potential source of lead exposure (exposed group), working in places without lead exposure (control group I), and non-working women (control group II). The X² test was used to assess statistical differences between the groups, and one way ANOVA was applied for comparisons. Logistic regression was performed using blood lead ≥ 5 µg/dL or ≥ 5 µg/dL as dependent variable, and adjusted for jurisdiction, income, gestational age, and abortions.

Results Only 24(8%) women worked in places with potential source of lead exposure, 47(15.7%) worked in other places, and 228(76.3%) did not have a remunerated job. Mean blood lead concentration in the study sample was 2.79 µg/dL. However, blood lead ≥ 5 µg/dL accounted for 25% of exposed women, 2.1% of control group I, and 6% of control group II (X² = 13.04; p < 0.001). Mean blood lead level was 4.24 µg/dL in the exposed group, 2.31 µg/dL in the control group I, and 2.74 µg/dL in the control group II; those differences were statistically significant (0.001). Logistic regression confirmed that blood lead ≥ 5 µg/dL is associated with occupational exposure (p = 0.036).

Conclusions Our findings suggest that surveillance for occupational exposure to prevent health damages during pregnancy is needed.

0243 SCREENING AND DISABILITY PREVENTION FOR MUSCULOSKELETAL DISORDERS OF HIGH-TECH INDUSTRY WORKERS IN TAIWAN

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10.1136/oemed-2014-102362.287

Objectives In Taiwan, 40–60% of the working population is affected by musculoskeletal disorders (MSD). MSD may lead to reduced productivity, decreased work ability, and even disability. The aim of this study was to describe the effects about occupational health medical team preventing and management of MSD.

Method The design was prospective study describing the high-tech industry workers screening and disability prevention for MSD. The quantitative analysis of the questionnaire was conducted through descriptive statistics and pair- t test in order to indicate the direction and relationship between the two sets of occupational health medical team intervention program.

Results Of the 386 high-tech industry workers who completed the questionnaire, the use of pair-t test comparing two months of occupational health medical program, individual symptom scores significantly decreased 1.99 points to 6.12 points. The degree of functional subjects increased from 37% to 74%, a significant improvement. Work ability index before treatment was 38.49 to 39.36 points after treatment improved, particularly in the self-evaluation and self-ability and physical work / effort needs very significant improvement in symptoms improve work ability index, increased efficiency and productivity. Subjects original degree of disability is about 22.33%, significantly decreased to 18.1% after treatment.

Conclusions Early worksite screening and intervention for MSDs performed by occupational health medical team intervention program were effective on improving the work ability and the functional level. This service may also prevent worsening of the MSDs, and lead to significant reductions in occupational disorders, decreased health care costs, and improvements in production efficiency.

0246 WEEKEND WORK AND PSYCHOSOCIAL WELL-BEING IN KOREAN WORKERS

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10.1136/oemed-2014-102362.288

Objectives To identify association between weekend work and psychosocial well-being in a representative sample of Korean workers.

Method We analysed the associations between weekend work and psychosocial well-being in 29 711 workers using data from the 2011 Korean Working Conditions Survey. Weekend work was defined by working one or more day on Saturday or on Sunday over the last month. Psychosocial well-being was measured by WHO well-being index. Multiple logistic regression analysis was performed adjusting age, education, income, regular/non-regular work, working time with stratifying sex and shift-work.

Results The prevalence of weekend work was higher in male (62.4%) than in female (54.8%). The longer working time per week, the more employees worked weekend 

40 (42.6%), 40–48 (45.3%), 49–60 (80.6%), ≥61 (94.9%). Shift workers (87.3%) worked more than non-shift workers (56.2%) on weekend. In non-shift workers, weekend work group (≥4 days) [OR=1.34 (95% CI 1.22–1.48), OR=1.17 (95% CI 1.05–1.31)] and weekend work group (>4 days) [OR=1.19 (95% CI 1.03–1.38), OR=1.30 (95% CI 1.10–1.52)] were significant risk factors associated with lesser psychosocial well-being in male and female respectively.

Conclusions Weekend work is associated with a significant increase in lesser psychosocial well-being among Korean non-shift workers.

0247 EVALUATION OF SHIFT FATIGUE AND PHYSICAL HEALTH INTERVENTION IN PAPER MANUFACTURER OF WORKERS

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10.1136/oemed-2014-102362.289

Objectives Shift and fatigue is one the most easily neglected health issues in occupation safety. The purposes of the study were to develop convenient method to evaluate the sources of fatigue in worksite and develop a physical health promotion program.

Method The design was prospective study describing the paper manufacturer workers. Use myoton measurement muscle stiffness and elasticity. The quantitative analysis of the three
PREDICTING PHYSICIAN’S DUTY STRESS BY PARASYMPATHETIC NERVOUS FUNCTION (ALSO TO BE CONSIDERED FOR MINI-SYMPOSIUM: EARLY DETECTION AND MANAGEMENT OF WORKERS UNDER STRESS)

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Objectives Early stress markers are useful in detecting workers with occupational stress. The aim of this study was to determine whether heart rate variability was associated with physicians’ duty loading, and also a good predictor for stress markers.

Method An observational study on physicians with variable duty loading was conducted in a secondary referral medical centre in northern Taiwan in 2012. For every participant, 24-hr electrocardiography (EKG) and hourly blood pressure were obtained during three test days, i.e., regular-duty (only day shift), moderate-duty (day and night-shift with moderate number of patients cared), and high-duty days (day and night-shift with higher number of patients cared). Blood samples for stress markers were obtained at 8 am on the test day, and 8 am on the second morning.

Results A total of 12 staff physicians satisfactorily completed the study. The number of patients covered at night shift was 0, 92 ± 8, and 187 ± 9, for regular-, moderate-, and high-duty nights, respectively. Total phone calls, urgent procedures, new patients admitted, critical patients cared and times of awakenings were significantly higher as the duty loads increased. The parasympathetic indicator derived from continuous EKG, high frequency normalised unit (HFnu), was negatively related to loading of total patient cared (P < 0.0001). Reduced HFnu predicted elevated night systolic blood pressure (P = 0.016) and serum uric acid (P = 0.024), and 24 h urine vanillylmandelic acid (P = 0.0045), dopamine (P = 0.011), and norepinephrine (P = 0.027).

Conclusions HFnu derived from heart rate variability measurement may predict several important stress markers during night-shift duties.
**Results** There is strong evidence for an association between high exposure to ionising irradiation and stroke, from studies on patients undergoing therapeutic x-ray treatment and atomic bomb survivors. The evidence for an association with occupational exposure to ionising irradiation is limited. There is moderate evidence for an increased risk among smelter workers, and limited evidence for carbon disulfide. The evidence for dynamite, motor exhaust and other combustion products is insufficient.

**Conclusions** This review identified limited evidence for an association between several chemical and physical occupational exposures and stroke. The few available studies on smelter workers all showed indications of an increased risk of stroke, and this association needs further investigation.

**Objectives** Little is known about the time window for accumulation of occupational exposures and shoulder disorders. We aimed to evaluate cumulative occupational shoulder exposures as risk factors for surgery for subacromial impingement syndrome (SIS), and to examine how long the relevant exposure time period is.

**Method** We conducted a nationwide register study of all persons born in Denmark (1933–1977), with at least 5 years of full-time employment (1993–2007). In the follow-up period (2003–2008), first-time events of surgery for SIS were identified. Cumulative exposure estimates for a 10-year period were obtained by linking occupational codes with a job exposure matrix. Exposure estimates were expressed according to the pack-year concept of smoking (e.g. arm-elevation-years). We used logistic regression equivalent to discrete survival analysis with a one year time lag, adjusting for age, sex, region, and calendar year, and compared the ORs for exposure time windows of increasing length.

**Results** The adjusted OR (ORadjusted) for surgery for SIS reached 2.0 for arm-elevation-years, repetitive-movement-years, and force-years, and the ORadjusted for hand-arm-vibration-years reached 1.5. We found an increase in ORadjusted from 1.0 to 2.1 when expanding the exposure time window from 2 to 10 years back in time.

**Conclusions** Our findings suggested that upper arm-elevation, repetitive movements, forceful exertions, and hand-arm-vibration were risk factors for surgery for SIS, and indicated a cumulative exposure effect within a 10 year time span.

**Objectives** Commuting accidents are accidents occurring while travelling to and from work, and in the course of work. Effort to reducing commuting accidents is important in managing occupational accidents. In Malaysia, the number of claims for commuting accident has shown an increased of 28.3% (17 170 to 22 036) from 2001 to 2010, compared to a decreased in number workplace accident claims by 31.8% (61 163 to 35 603). This increase was despite the total number motor vehicle casualties decreased by 44.0% over the same period. The aim of this study is to review the current efforts on reducing motor vehicle accident.

**Method** Systematic review of peer review literature, accidents statistics, initiatives and policies related prevention of motor vehicles accidents

**Results** Review of the statistics showed that most of the commuting accident casualties occurred during travel to and from work (88.5%), during the morning shifts (68.8%) and involving less than five kilometres of travel (55.0%). Motorcycles riders contributed significantly to these casualties. Although motorcycles only accounted for 15.8% of the vehicles involved in accidents, they contributed 49.7% of casualties and 58.7% of the total fatalities. Many initiatives targeted at motorcycles riders were already in place; including mandatory usage of helmet (rider and pillion), compulsory use of daytime headlight, dedicated motorcycle lanes on highways, road safety education in schools and workplace, however the accident rates were still high.

**Conclusions** A more comprehensive intervention programme targeted at motorcycle riders and the investment on safer public transportation system is needed to reduce commuting accidents.

**Objectives** Nursing manpower shortage has long been a problem in the healthcare system in Taiwan. The main cause of this problem has been nurses’ lacking of willingness to retain in job. This study aims to identify factors for nurses’ consideration of leaving their job.

**Method** Study participants included female nurses from a nation-wide representative sample of accredited tertiary and secondary referral hospitals, selected using stratified random sampling. To candidate participants, a structured, self-administered questionnaire was distributed, which included demographic information, description of work conditions, the Chinese Job Content Questionnaire, and the modified Chinese Copenhagen Burnout Inventory. Consideration of leaving job is defined by “having ideation of leaving job weekly or more frequent” and the estimation of not working as a nurse in two years.

**Results** A total of 1031 female nurses completed the questionnaire satisfactorily. Among them 16.7% considered leaving job. Personal burnout, client-related burnout, and conflict with family needs predict consideration of leaving job. While inquired what work factors were important for their making decision of leaving job, overtime work was listed number one, followed by shift

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work, insufficient vacation time, affected personal health, unexpected or short notice in shift arrangements, low respect at work, and salary and benefits. **Conclusions** The problem of high percentage of nurses considering leaving job has been real. This problem was related to high burnout and conflicting with family needs in nurses, most likely caused by high work load and problems in work arrangements.

**0260 COMBINED EFFECT OF CIGARETTE SMOKING AND NON-FERROUS METAL EXPOSURE IN THE DEVELOPMENT OF DIGESTIVE DISEASE IN INDUSTRY WORKERS**

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Objective: The purpose of the study was to determine the prevalence of digestive diseases in workers in non-ferrous metallurgy, and to evaluate the effect of cigarette smoking in the development of digestive diseases in exposed workers. Method: A retrospective combined cross-sectional and case-control study was performed. Industry workers from a non-ferrous plant and controls were monitored for an 8-year period. All workers received regular clinical examinations: evaluation for smoking status, occupational exposure to Pb and Cd, digestive disease using an epidemiological survey. Four representative groups were selected: Group (1)-exposed smokers, Group (2)-non-exposed smokers, Group (3)-exposed non-smokers, Group (4)-non-exposed non-smokers. The prevalence of digestive diseases was determined in each group. Linear regression analysis was used to assess the correlation between the levels of exposure and biomarkers of exposures, as well as between the amount of smoking and the burden of digestive disease. Results: During the studied period, Pb&Cd levels in the air of all workplaces were persistently high (Pb = 0.9–13.3 mg/m³, Cd = 0.3–1.3 mg/m³). Clinical examination identified the classic symptoms of chronic occupational intoxication with Pb. There was a relatively high prevalence of smoking in group (1) and (2). The prevalence of digestive disease was significantly higher in exposed smokers. Linear regression analysis showed close relationship between the studied parameters. Conclusions: There is high prevalence of smoking and digestive disease in industry workers. Cigarette smoking may act as a confounder in the assessment of the severity of occupational disease related to noxious metal exposure in industry workers. The goal for all facilities and workers is to minimise smoking and occupational exposure to noxious agents.

**0263 CAN WORKPLACE CHEST X-RAY SURVEILLANCE PROGRAMS SHED LIGHT ON WORKERS’ INJURIES? PREVALENCE AND PREDICTORS OF RIB FRACTURES AMONG ACTIVE AND FORMER UKRAINIAN COAL MINERS**

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Objective: Chest x-ray surveillance programs for pneumoconiosis are well established public health tools. Data on rib fractures, part of the ILO system of classification, may shed light on injuries in these populations. We sought to determine the prevalence of rib fractures from a cross-sectional study of current and former Ukrainian coal miners. Method: Between 2001 and 2003, coal miners with at least five years of underground mining experience were randomly selected from employment records of 7000 current and 9000 former miners from three mines. CXRs were read by two NIOSH B-readers. Interviewers collected work and smoking history. The prevalence and predictors of at least one rib fracture with 95% confidence intervals [95% CIs] was estimated using univariate methods and logistic regression. Results: Average age was 47.1 years among the 598 active miners and 56.9 years among the 468 former miners. Total mining tenure and years of work at the coal face were similar in both groups, about 20 and 8 years respectively. The prevalence of rib fractures was almost twice as high in former compared with current miners (15.5% [11.6, 19.5%] vs. 7.9% [5.6, 13.3%], respectively). Prevalence increased with age among active miners; among former miners prevalence was highest in 45 to 55 year olds. Conclusions: CXR surveillance for pneumoconiosis may have use in monitoring injury among miners. While the prevalence of rib fracture appeared high in this population, caution is warranted interpreting our findings: no comparison groups exist and the use of this methodology for characterising injury prevalence is untested.
DIMENSIONAL STRUCTURE OF THE JOB CONTENT QUESTIONNAIRE-JCQ AMONG HEALTH WORKERS OF BAHIA, BRAZIL

Konna Remberde, Fernando Carvalho, Tânia Araújo. Federal University of Bahia, Salvador, Bahia, Brazil; State University of Feira de Santana, Feira de Santana, Bahia, Brazil.

Objectives The aim of this study was to evaluate the dimensions of the JCQ among healthcare workers.

Method A validation study with 3055 health workers was conducted. Factor analysis was employed through the principal components method. For extraction of factors, parallel analysis was performed using the Monte-Carlo simulation. For the technique of factor analysis, the verification of the sampling adequacy of the studies was performed by measuring the Kaiser-Meyer-Olkin (KMO). The PROMAX oblique rotation was applied for a better understanding of the values, assuming mutual correlation between the factors.

Results There was adequacy of the data for factor analysis according to the criteria of the KMO test (0.93). Four dimensions, which together explained 100% of the total variance, were extracted. The first dimension was composed of physical and emotional demands by means of the social support from coworkers. The second dimension represented items of control over work; the third dimension consisted of items of social support of the headship; the fourth dimension presented items of psychological and physical illnesses.

Conclusions The number and dimensions of the frame captured by an instrument depend on the set of subjective symptoms to be investigated. In spite of the technical/methodological advances of analysis, there are still limitations in the use of instruments to measure subjective constructs in the occupational sphere.

PHYSIOLOGICAL ASPECTS OF LOAD CARRIAGE ACTIVITY DONE BY FOOD GRAIN HANDLING WORKERS IN INDIA

Hema Bhatt, Promila Sharma. G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India.

Objectives There are many rice mills and food grain depots where a large number of workers are engaged for processing paddy and rice, storage and distribution. Lifting, carrying and depositing sacs of food grain are the major jobs carried out by these workers. The present study was undertaken to evaluate the workers with respect to the workload, energy expenditure and musculoskeletal pain or discomfort resulting out of work practice.

Method Present study was conducted at Rudrapur city in Uttar-akhand state of India. Representative samples of 40 rice mill workers engaged under Food Corporation of India were taken for study. Descriptive cum experimental research design were chosen to find work profile, for identification of risks factors at work places and to assess the physiological workload of the rice mill workers.

Results Average peak heart rate of the rice mill workers suggested the workload as moderate to very heavy. Their average energy expenditure values also indicated the workload as moderate to heavy. Musculoskeletal pain or discomfort was maximally reported in knee by 64.5% depot workers whereas low back and knee was reported by 35.5% rice mill workers. Besides the weight of the sac, awkward postures like bending and twisting of trunk adopted frequently causes the problem.

Conclusions A significant problem associated with manual handling activities involving loading and unloading tasks is the fact that they are the primary cause of overexertion injuries. Further studies and rationalisation of work method may improve the health and safety of the workers.

IS PERCEIVED STRESS RELATED TO AN INCREASE IN SALIVARY CORTISOL

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Objectives Perceived Stress is a suspected cause of many psychological and physical illnesses. However it remains to be discovered what physiological measures are involved. While it is widely known that acute stress leads to an increase in cortisol levels, the findings in prolonged stress research have not been consistent. This study explores the association between Perceived Stress and salivary cortisol levels using the largest population ever used in this field.

Method 4467 public employees in the PRISME cohort in 2007. 3217 of those did a similar follow up study in 2009.

A 4-item Danish version of the PSS-scale was used to measure perceived stress and operationalized as the average score. Salivary cortisol samples were taken at 30 min post awakening and at 8 pm. A mean value of cortisol was calculated. In our analysis we applied logarithmic transformation to the concentrations.

Results Linear regression analysis done for the association between PSS-score and salivary cortisol levels showed no significant association between the two. For cortisol mean the regression resulted in $\beta=0.005$ ($CI: -0.036$–$0.026$) in 2007 and $-0.010$ ($CI: -0.047$–$0.028$) in 2009. Cortisol morning analysis resulted in $\beta=-0.013$ ($CI: -0.050$–$0.023$) in 2007 and $\beta=-0.003$ ($CI: -0.048$–$0.042$) in 2009. Cortisol evening analysis resulted in $\beta=-0.000$ ($CI: -0.042$–$0.042$) in 2007 and $\beta=-0.007$ ($CI: -0.047$–$0.061$) in 2009.

Conclusions Overall this study does not provide any evidence that perceived stress is associated with salivary cortisol.

AN INTERNATIONAL HISTORICAL COHORT STUDY OF WORKERS IN THE HARD-METAL INDUSTRY: MID-STUDY EPIDEMIOLOGY UPDATE

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Objectives A multinational occupational epidemiological study of workers exposed to tungsten carbide with a cobalt binder (WC-Co) is underway in the US and Europe. The epidemiological component will investigate total and cause-specific mortality risks and exposure-response relationships with focus on lung
cancer. We designed the study to overcome certain limitations of earlier epidemiology studies.

**Method** The epidemiological and exposure assessment components of the study are coordinated by the University of Pittsburgh and the University of Illinois at Chicago, respectively. Our cohort comprises 12 manufacturing sites in the US and nine sites in Europe, and represents three companies, five countries (US, Austria, Germany, Sweden and UK) and multiple manufacturing processes and exposures. Statistical analyses will adjust external and internal mortality rate comparisons for potential co-exposures, including smoking histories obtained via a nested case-control study. The study will include separate and pooled analyses.

**Results** Our data collection effort identified two additional US study sites and additional subjects in the German and Swedish sites. Accordingly, our originally projected cohort size of 21,000 subjects has increased to 35,508 (US-7005; Europe-33,503). Vital status tracing, cause of death determination and identification of subjects for the nested case-control study are ongoing.

**Conclusions** Our study will enable country-specific and pooled analyses of mortality rates and exposure-response relationships among workers from 21 study sites and the opportunity to compare and contrast findings across countries, sites, companies and/or manufacturing processes and exposures involved in this global industry. We will detail progress to date on the US and combined epidemiological component of the study.
exposure to flour dust and wood dust, but not to natural or artificial textile fibres. A consistent inverse risk was observed for B-cell lymphoma (OR = 0.6, 95% CI 0.3–1.0), and it was likewise for its major subtypes, namely diffuse large cell lymphoma (DLBCL), follicular lymphoma (FL) and chronic lymphocytic leukaemia (CLL). Age <= 18 at first exposure conveyed a further decrease in lymphoma risk (OR = 0.5, 95% CI 0.2–1.2).

Conclusions Although with interpretative limitations due to the small study size, our results suggest that exposure to flour dust and wood dust might contribute a reduction in risk of malignant lymphoma.

0273 FACTORS ASSOCIATED WITH THE USE OF HEARING PROTECTION DEVICE AT WORK

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Objectives To identify factors associated with hearing protection device use (HPD) at work.

Methods This is a cross-sectional study carried out with a random cluster area sample of households from the city of Salvador, Bahia, Brazil. Questionnaires were used to obtain sociodemographic, occupational and health related data. Noise exposed worker were those who reported having to shout to be heard in the workplace. When exposed, they were asked whether they use HPD, and how often was it.

Results There were 2429 workers from 18 to 65 years of age, and 299 (12.3%) reported being exposed to loud noise at work. The prevalence of HPD use was 44.5%, 59.3% and 21.4% for men and women, respectively. Among men, only high socioeconomic status (prevalence ratio, PR=1.47; 95% confidence interval = 1.15, 1.88) were associated with HPD use. In contrast, among women the perception of a good safety climate was associated with HPD use (PR=2.09; 95% CI: 1.04, 4.21), clear rules to prevent work-related injuries (PR=2.92; 95% CI: 1.34, 6.34), particularly the reporting of having supervisors committed with safety (PR=2.09; 95% CI: 1.04, 4.21), clear rules to prevent work-related injuries (PR=2.81; 95% CI: 1.41, 5.59) and when they were informed about work safety guidelines (PR=2.42; 95% CI: 1.23, 4.76).

Conclusions Our results show that there is a gender bias regarding HPD use less favourable to women compared with men; women’s HPD use is more likely to be positively influenced by safety climate suggesting that gender needs to be taken into account in hearing protection programs.

0274 OCCUPATIONAL NOISE EXPOSURE AND THE PREVALENCE OF HYPERGLYCEMIA

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Objectives This cross-sectional study aimed to investigate the association between occupational noise exposure and the prevalence of hyperglycemia among workers.

Method We recruited 532 volunteers in a machinery and equipment manufacturing factory as the study population in Central Taiwan. The walk-through survey was performed to identify the workplaces with noise levels above 80 A-weighted decibel (dBA) first and then the noise dosimeter was used to conduct personal time-weighted-average sound levels. After assigning each subject to a similar exposure group, we classified all subjects into high-exposure (noise levels ≥85 dBA, n = 91), median-exposure (80≤ noise levels <85dBA, n = 62), low-exposure (noise levels <80 dBA, n = 76) and reference groups (officers, n = 303). Logistic regressions were applied to estimate the risk of hyperglycemia by different exposure groups after controlling for potential confounders.

Results The mean noise levels of high-exposure, median-exposure, low-exposure and office workers were 89.3 ± 2.90 dBA, 83.4 ± 0.4 dBA, 76.7 ± 1.1 dBA and 71.4 ± 4.0 dBA, respectively, and there was a significant difference between groups (p < 0.001). The prevalence of hyperglycemia among high-exposure, median-exposure, low-exposure and office workers were 10.2%, 13.2%, 11.3% and 9.9%, respectively. After controlled for age, sex, education level, body mass index, cigarette smoking, alcohol drinking and regular exercise, the odds ratio of hyperglycemia between the high-exposure and office workers was 3.96 (95% confidence interval = 0.83–18.83), which had a marginal difference (p = 0.08).

Conclusions Occupational noise exposure above 85 dBA might be associated with the increasing prevalence of hyperglycemia. Future studies should be conducted to demonstrate the potential causality of occupational noise and hyperglycemia.

0275 AN ERGONOMIC ASSESSMENT: OCCUPATIONAL HEALTH AND SAFETY RISK FACTORS OF COMMERCIAL CAFETERIA WORKERS

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Objectives Kitchen work is demanding, both physically and mentally. The employees work under pressure of time and perform various parallel tasks, many of which include exposure to a combination of risk factors of MSDs. This study was conducted for ergonomic assessment of commercial kitchen workers working in university hostel cafeteria.

Method A survey of 40 workers employed at university hostel cafeteria at G. B Pant University of Agriculture and Technology at Uttarakhand state in India was carried out. Self administered questionnaire, interviews and observations were used as research instruments to collect data.

Results It was found that there exists some major risk factors including repetition, awkward postures, force exertion, static posture, mechanical contact stress, temperature and vibration at these commercial kitchen workstation. 77.5 percent respondents were found to be involved in 5–8 h, 15 per cent of respondent were found to be involved for 9–12 h and 7.5 percent of the respondents were found working for 13–16 h. Nearly all the workers felt pain in neck, shoulders, wrist, elbow, knee, and ankle, upper and in lower back.

Conclusions An ergonomically designed workstation reduces the human efforts, enhances the work efficiency and at the same time provides the safety to the worker. Kitchen workers should be given awareness about the advantages and disadvantages of the good ergonomic practices so as to reduce the occupational health hazards and increase productivity.
THE ROLE OF VARIOUS PREDICTORS OF SEIZURE RECURRENTNESS IN ASSIGNMENT OF YOUNG MEN TO PROFESSIONS WITH ASSOCIATED EXPOSURE TO (SEIZURE) RISK FACTORS

Marcello Noli,
Occup Environ Med

Objectives
To study the risk of epileptic seizures as a function of disease severity and occupational stress (physical and mental) in new military recruits in the Israel Defense Forces (IDF).

Method
The medical records of over 145,000 18-year-old men, recruited to the IDF between the late-nineties and early two-thousands, were used to assemble a cohort, which was followed for a period of 36 months. The severity of the disease was determined according to 5 categories. Recruits were subdivided according to the following occupational categories: Combat Units (CU), Maintenance Units (MU) and Administrative Units (AU).

Results
The annual incidence rate for a first seizure was 26/100 000. The rates in CU and MU were lower than AU (0.41 and 0.81 vs. 1 respectively, p < 0.01). Similar findings were found in other disease categories.

Conclusions
The low rate for a first seizure and the lower overall seizure rate in CU compared to MU and AU may be explained by the recruiting of a healthy population, higher motivation than before, and meticulous adherence to diagnostic criteria. The higher recurrence rate in our research as compared to the previous follow up, may be attributable to the modification of disease categories. Our findings suggest moderating occupational restrictions for epilepsy patients and using EEG and relapse-free periods of 2-6 years as fitness for work criteria. We propose the reassessment of severity criteria currently used by the IDF.

ENVIRONMENTAL EXPOSURE TO NANOPARTICLES IN SARDINIA, ITALY: A PILOT STUDY OF RESIDENTIAL EXPOSURE NEARBY AN INDUSTRIAL AREA AND A MILITARY SHOOTING RANGE

0277

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Objectives
Objective of our pilot study was to explore the airborne ultrafine particle count in residential areas nearby industrial and military settings with reference to urban and rural areas.

Method
We monitored airborne ultrafine (ranging 7nm - 10 microm) particles in residential areas nearby a large oil refinery, a military shooting range, in the largest urban area in the region and in a rural area. We conducted eight samplings (6 h each) using a Electrical low pressure impactor (ELPI plus - Dekati, Tampere, Finland). Wind speed and direction, temperature and humidity during each sampling were registered. Data on other potential sources of ultrafine particles, from both anthropic and natural origin, were also resigetered. The airborne nanoparticle concentration was expressed as particle count/cm3.

Results
The median ultrafine particle count was 7408 (max 179605)/cm3 in the residential area nearby the oil refinery, 9079 (max 114281)/cm3 nearby the military shooting range, 19040 (max 142324)/cm3 in the urban area and 25419 (max 373434) in the rural area.

Conclusions
Our results show that ultrafine particles were ubiquitous in the sampling sites. Median counts were higher in the rural area than nearby industrial and military settings. We speculate that anthropic activities, including widespread use of wood burning fireplaces in rural areas, as well as technical measures to control industrial particulate emissions implemented in the past years, might have contributed. Further studies and additional sampling will allow a more detailed picture of exposure levels to better characterise risk of possible adverse health outcomes associated with environmental exposure to nanoparticles.

HEAD AND NECK CANCER AND OCCUPATIONAL EXPOSURE TO CHLORINATED SOLVENTS: RESULTS FROM THE ICARE STUDY

0279

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Objectives
To investigate the associations between head and neck cancer risk and occupational exposure to chlorinated solvents.

Method
ICARE is a population based case-control study conducted in France. Analyses were restricted to men and included 1833 cases of head and neck squamous cell carcinomas (HNSCC) and 2747 controls. Complete occupational history was collected. Job-exposure matrices allowed to assess exposure to five chlorinated solvents (trichloroethylene, perchloroethylene, methylene chloride, chloroform and carbon tetrachloride). Odds ratios (ORs) adjusted for smoking, alcohol drinking and other potential confounders and 95% confidence intervals (CI) were estimated with logistic models.

Results
No association was found for occupational exposure to trichloroethylene, methylene chloride, chloroform and carbon tetrachloride, and no dose-response relationships were observed. A non-significantly increased risk of HNSCC was observed for perchloroethylene (OR=2.1, CI 0.7–6.3), when comparing the highest tertile of cumulative exposure with no exposure. Analysis by cancer site showed that this increased risk was limited to laryngeal cancer. The risk of laryngeal cancer increased with cumulative exposure to perchloroethylene (p for trend=0.03), with a significantly elevated OR (OR=5.0, CI 1.6–15.6) for the highest tertile of cumulative exposure. Exposure to perchloroethylene was not associated with the risk of oral or pharyngeal cancer. No associations were found between other chlorinated solvents and any of the cancer sites.

Conclusions
These findings suggest that high levels of exposure to perchloroethylene may increase the risk of laryngeal cancer. Our study does not provide evidence that other chlorinated solvents are risk factors for HNSCC.
OCCUPATIONAL RISK FACTORS FOR PROSTATE CANCER: A CASE-CONTROL STUDY IN GUADELOUPE (FRENCH WEST INDIES)

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Objectives To study the associations between occupation, industry and prostate cancer risk in Guadeloupe, a high incidence area.

Method Incident cases of prostate cancer (707 cases) and 722 population controls were included. Information on lifetime occupational history and other potential risk factors was collected by interview. Logistic regression was used to estimate adjusted odds-ratios (OR) and their 95% confidence intervals (CI).

Results A significantly decreased risk was observed in farmers (OR=0.5; CI 0.4–0.7), whereas marginally elevated ORs were found for farm workers, especially in sugarcane and banana farming. Banana plantation workers had been exposed to chlordecone, an estrogenic insecticide previously found to be associated with prostate cancer risk in this population. Significantly increased risks of prostate cancer were found in stock clerks (OR=2.7; CI 1.0–7.2), fishermen (OR=2.0; CI 1.0–4.0), mail distribution clerks (OR=7.7; CI 1.7–34.4) and electricians employed for more than 20 years (OR=4.0; CI 1.0–15.8), as well as in public administration (OR=1.8; CI 1.2–2.9), retail trade (OR=2.6; CI 1.1–6.0) and manufacture of food products (OR=2.0; CI 1.1–3.9), particularly sugar (OR=13.2; IC 1.6–108). Non-significantly elevated ORs were also seen for construction workers and transport equipment operators.

Conclusions Although the overall findings suggest that occupational factors have only a limited role in prostate cancer aetiology, elevated risks of prostate cancer were found in several occupations or industries. Exposure to pesticides, solvents, traffic-related air pollution, low physical activity, whole-body vibration may explain some of these increased risks.

THE RELATIONSHIP BETWEEN SOCIOECONOMIC POSITION, WORKING CONDITIONS AND SICKNESS ABSENCE IN A LIFE-COURSE PERSPECTIVE

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Objectives Socioeconomic position (SEP) in childhood and in adulthood, and work environment factors are predictors of sickness absence (SA). Our objective was to examine the relationships between these factors in a life-course perspective, which has hardly been done previously.

Method Our study sample was all employed individuals who partook in the HUNT study and who were born between 1967 and 1976 (N = 4530). Outcome was the risk of at least one SA episode in 2009. Educational attainment (5 categories) served as indicator of adult SEP, whereas highest parental education level and father’s average income during early childhood (0–6 years) were indicators of childhood SEP. Work factors were job control, physically demanding work and shift work. Risk ratios (RRs) were estimated using Poisson regression.

Results 29% of the women and 17% of the men had SA during follow-up. There was a strong gradient according to adult SEP for both genders. The age-adjusted RR for having an SA episode, comparing highest and lowest educational levels, was 2.83 for women and 3.85 for men. The RR was marginally weakened in women (-4%) and strengthened in men (+18%), after adjusting for childhood SEP (Model 2). Including all work factors in the model reduced the RRs by 20% compared to Model 2 (RR 2.20 and 3.62, respectively), the largest impact for physically demanding work (15% reduction in RR).

Conclusions There were strong social gradients in SA, partly mediated through work environment factors in a life-course perspective. We found gender differences that are difficult to explain.

MESOTHELIOMA INCIDENCE AND OCCUPATION IN THE NORDIC COUNTRIES – A FOLLOW UP DURING FOUR DECADES

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10.1136/oemed-2014-102362.314

Objectives The purpose of this study was to study differences in incidence of malignant mesothelioma between the Nordic countries.

Method We used data from the ongoing Nordic Occupational Cancer Study (NOCCA). Occupational title by 3-digit level was obtained from the countries’ population and housing censuses in 1960, 1970, 1980 and 1990. A job-exposure matrix (JEM) was developed, including 25 carcinogens with specific exposure levels for 283 occupations for years 1945 to 1994, using national exposure databases and expert assessments. All mesothelioma cases (ICD-7 158 for peritoneum and 162.2 for pleura) in the Nordic countries 1961–2005 were identified through linkages with national cancer registers. We calculated Standardised Incidence Ratios (SIR) of mesothelioma for 53 occupations/occupational categories for men and women and linked with the NOCCA JEM.

Results A total of 7899 persons were diagnosed with mesothelioma in the Nordic cohort from 1961 to 2005, of which 24.3% were women. There was an increased significant SIR of mesothelioma among 15 of the 53 occupations/occupational categories for men, and for nine different occupations for women. The men’s excessed risk was observed in typical male-dominated occupations, highest for plumbers (SIR 4.64, 95% CI 4.09 to 5.24), with a total of 241 cases.

Conclusions We found great consistency among men between countries with occupations associated with asbestos exposure. For women, we found greater diversity between countries and risk assessment in occupations not associated with asbestos exposure. Unclear diagnosis of mesothelioma of the peritoneum and misclassification of occupation may be behind this.
Objectives Stroke is the third most common cause of death in developed countries, exceeded only by coronary heart disease and cancer, but there is still little knowledge on occupational risk factors. A systematic critical review was performed to assess the strength of evidence for causal associations between work-related psychosocial risk factors, shift work and stroke.

Method Literature on stroke incidence or mortality and occupational factors published up to 2012 was identified from Medline and other relevant databases. The 4,471 abstracts were evaluated independently by two reviewers. Six studies relevant to shift work and eight studies (among them four cohorts from Scandinavia) exploring job strain, job control or other job related “stress” exposures were identified. The evidence for an association was assessed according to defined criteria as strong, moderate, limited, or insufficient.

Results There is limited evidence for an association between shift work and stroke, mainly based on results from two occupational cohorts.

There is also limited evidence for high job strain or low job control from cohort studies. Case- crossover studies, which would better reflect short-term effects, were lacking, and the only case-referent study found was very small.

Conclusions There is now fairly solid evidence that shift work and work-related psychosocial stress are risk factors for coronary heart disease; a fact that supports an association also with stroke, another cardiovascular disease. However, the epidemiological evidence for stroke is limited, with few studies, and very limited exposure information. Better study designs are needed to elucidate accumulated as well as triggering/short time effects.

Conclusions This study identified increased risks of rectal, kidney, prostate, and esophageal cancers among male mining industry workers employed in specific sectors. There are also a number of limitations and challenges that accompany the investigation. Our findings may have important implications for our understanding of occupational cancer risk factors and potential policy interventions in the mining industry.

Objectives Mining workers in Canada may be exposed to several potential carcinogens including crystalline silica, various metals, and diesel exhaust. This study aimed to assess the risk of cancer among male mining workers employed in various Canadian mining sectors.

Method The Cohort was created by Statistics Canada through the linkage of the 1991 Canadian Census (long form) to the Canadian Mortality Database, Canadian Cancer Registry, and annual Tax Summary Files (1991–2006). This linkage resulted in a cohort of 1.1 million working males aged 25–74, including over 14,000 workers employed in the mining industry. Cox proportional hazards modelling was used to estimate hazard ratios (HR) and corresponding 95% confidence intervals, adjusted for age and region.

Results There were 700 cancers among 660 mining industry workers. There was an increased risk for rectal cancer (HR: 1.37, 1.01–1.88), particularly in gold mining (HR: 3.11, 1.47–6.56). Increased risks of kidney and prostate cancer were observed for coal mining (HR: 2.71, 1.12–6.57 and HR: 1.80, 1.10–2.94, respectively), and esophageal cancer in metal mining other than gold or iron (HR: 2.78, 1.13–6.80). There were also elevated risks for stomach and laryngeal cancer among mining workers.

Objectives Because of the importance given to the implementation of health promotion programs nowadays generating positive outcomes important to society and especially to businesses, employees and the financial market this study was designed to assess students’ baseline knowledge of expertise in occupational medicine on health promotion and correlate it with the
students’ baseline knowledge. Faculdade de Medicina da Universidade de São Paulo (internal fifth-year residents and first-year internal medicine) as well as evaluate their own health habits.

**Method** We conducted a cross-sectional study in which we applied two questionnaires that had been used in previous studies by Ferreira Junior, 2011. The questionnaires so called 1) “Survey of attitudes and behaviour” and 2) “Questionnaire assessment of knowledge in health promotion.” Regarding the epidemiological data to submit descriptive statistics and Excel filters the table.

**Results** The higher scores among graduate students, were related to nutrition and oral hygiene, both at present as expected in a year. Questions about professional attitude in their 13 items’ scores were higher post-graduate training in the item. In other items, students’ grades and graduation from residency and postgraduate students were equal. When comparing the mean of graduate students called in questionnaire 2, all items showed lower values in relation to the notes of interns and residents.

**Conclusions** The loss in quality of care is undeniable, since there is awareness on the part of the respondents own lack of technical knowledge updated with regard to health promotion that contrasts with the self-perception of adequate training to do so.

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**CARDIOVASCULAR DISEASE AS A RISK FACTOR FOR DISABILITY RETIREMENT**

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**Objectives** The relationship between work and some diseases that they can provide is already known for a long time. Because of these conditions some projects were created to improve conditions of work and to support the worker loses her job capacity such, among them the disability retirement. The objective of this study was to identify cardiovascular disease as risk factors for disability retirement.

**Method** We realised a literature review, including articles published in 2000 to 2013, being surveyed those in the period from April to November 2013, using the following descriptors: risk factors, pensions and cardiovascular diseases in databases PUBMED/MEDLINE, BIREME, SCOPUS, WEB OF SCIENCE and COCHRANE. Found, respectively, 8, 8, 27, 2 and 0 items. After deleting the duplicate items, those whom were not in English or Portuguese and non revolved around the topic of study, 7 remained. All showed a positive association between disability retirement and cardiovascular diseases.

**Results** In the study used to compare relative risk for cardiovascular disease retirement with musculoskeletal found the same risk for both diseases. Other studies showed association between increased uric acid, poorly controlled hypertension, perceived stressful work postures and work and increased risk for this retirement. There is a huge investment in prevention campaigns for workers’ health to prevent the musculoskeletal disease, but not always the same commitment to the prevention of the cardiovascular.

**Conclusions** In conclusion cardiovascular disease has high significance for the health of the employee, being an important risk factor for disability retirement, and should be encouraged to implement policies to prevent these.

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**THE NIHS GULF STUDY: CORRELATIONS OF CONCENTRATIONS BETWEEN VARIOUS OIL CHEMICALS AND TOTAL HYDROCARBONS**

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**Objectives** In the 2010 Deepwater Horizon Oil Spill, thousands of workers may have been exposed to various potentially harmful chemicals found in crude oil including benzene, ethylbenzene, xylene, and toluene. These and total hydrocarbons (THC) (a composite of all the volatile chemicals in crude oil) were monitored. Over 150 000 personal measurements were taken, but many of the measurements of individual chemicals were...
below the analytic method’s limit of detection (LOD), making estimation of exposure levels challenging. The concentration of each chemical relative to THC is related to the concentration of the chemical and THC in the source crude oil. Knowing these relationships, we can develop models to predict concentrations of individual chemicals from THC concentrations when only a THC concentration was detectable. The goal of this study was to determine the correlations between concentrations of the various oil chemicals and THC for use in situations where only THC was above the LOD.

**Method** We calculated correlations on the rig ships and support vessels located near the well by vessel and time period using linear regression analysis that accounts for censored data.

**Results** We found significant differences in correlations between concentrations of the chemicals and THC across vessels and over time that likely reflect different vessel activities and degrees of crude oil weathering throughout the response and clean-up efforts.

**Conclusions** Correlations between concentrations of the chemicals of interest and THC can be used to estimate the chemical’s concentration when its measurement is below the LOD.

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**THE PREVALENCE OF RISK FACTORS ASSOCIATED WITH COMPUTER VISION SYNDROME AMONG COMPUTER WORKS IN SÃO PAULO, BRAZIL**

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**Objectives** The aims of this study were to investigate work conditions, to estimate the prevalence and to describe risk factors associated with Computer Vision Syndrome among computer works in São Paulo.

**Method** The methods include a quantitative cross-sectional observational study and an ergonomic work analysis, using work observation, interviews and questionnaires. The case definition was the presence of one or more specific ocular symptoms answered as always, often or sometimes. The multiple logistic regression model, were created using the stepwise forward likelihood method and remained the variables with levels below 5% (p < 0.05).

**Results** The operators were mainly female and young (from 15 to 24 years old). The call centre was opened 24 h and the operators weekly hours were 36 h with break time from 21 to 35 min per day. The symptoms reported were eye fatigue (73.9%), “weight” in the eyes (68.2%), “burning” eyes (54.6%), tearing (43.9%) and weakening of vision (43.5%). The prevalence of Computer Vision Syndrome was 54.6%.

**Conclusions** The organisation and psychosocial factors at work should be included in prevention programs of visual syndrome among call centres’ operators.

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**THE NIEHS GULF STUDY: RECALCULATION OF EXPOSURE MEASUREMENT DATA BETWEEN THE LIMIT OF DETECTION (LOD) REPORTED BY THE LABORATORY AND THE ANALYTICAL METHODS’ LODS**

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**Objectives** BP contractors collected nearly 25 000 personal passive dosimeter samples (about 150 000 individual exposure measurements, primarily benzene, ethylbenzene, toluene, xylene and total hydrocarbon (THC)), related to the response and cleanup of the Deepwater Horizon oil spill. BP used a sampling strategy based on compliance with applicable occupational exposure limits (OELs). Most of the measurements were below the reported limit of detection (censored). This occurred because the analytic laboratories calibrated their instruments relative to the chemicals’ OELs and they reported measurements below the lowest calibration standard (approximately 5% of the OEL) as less than the LOD. In an epidemiology study, however, all exposure levels are of interest rather than only those levels related to an OEL. Published evaluation studies on the analytical methods indicate that the methods were capable of measuring much lower concentrations than those reported. This presentation discusses the process used to recalculate the measurement data to the analytic method’s LOD.

**Method** Gas chromatograph output, the dosimeters’ and chemicals’ physical property data, and the slope and intercept of calibration curves were used to calculate concentrations below reported LODs.

**Results** The recalculation effort resulted in the reduction of all censored measurements from 92.8% to 60.2% and the THC censored measurements from 71.9% to 19.1%. 

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Conclusions The recalculation resulted in a substantial reduction in the number of measurements below the LOD. The degree of censoring after recalculation is well within the operating range of the statistical methods used in the GuLF STUDY to estimate exposure levels.

Objectives Over 150,000 measurements taken on workers responding to the 2010 Deepwater Horizon oil spill are being used to develop exposure estimates for the participants in the GuLF STUDY. A large portion of the measurements, however, has values below the limit of detection (left-censored). The β-substitution method has been shown to provide accurate estimates for handling censored data, but a comparison to a Bayesian method, which permits the estimation of uncertainty and accounts for prior information, is currently lacking. The goal of this research was to compare the two methods.

Method Each method was challenged with computer-generated datasets drawn from lognormal distributions with the geometric mean (GM) = 1, sample sizes = 5–100, geometric standard deviation (GSD) = 2–5, and percent censoring = 10–90%. Percent bias and coverage (the percentage of 95% uncertainty intervals containing the truth) were used as evaluation metrics.

Results For most of our simulation scenarios, estimates of bias from the β-substitution and Bayesian methods were generally comparable for the AM and GM. The β-substitution was generally less biased in estimating the GSD and the 95th percentile than the Bayesian method. The Bayesian method provided consistently better coverage for the AM than β-substitution. It also provided uncertainty estimates the GM, GSD, and the 95th percentile while β-substitution does not.

Conclusions The β-substitution method generally was observed to have little bias but it only allows the calculation of uncertainty estimates around the AM. The Bayesian approach provided reasonably accurate point and interval estimates (i.e., coverage), but this comes with the cost of additional computation.

Objectives Since its registration in 1994, acetochlor, an herbicide licensed for use on corn, has been one of the most commonly used pesticides in the US. We evaluated use of acetochlor and cancer incidence in the Agricultural Health Study, a prospective cohort of licensed pesticide applicators.

Method During a telephone interview administered from 1999–2005, participants provided information on acetochlor use and other factors. Total lifetime days of acetochlor use were calculated and an intensity-weighting algorithm was applied that accounted for factors that modify exposure. We used Poisson regression to estimate relative risks (RR) and 95% confidence intervals (CI) for cancers that occurred from the time of interview through 2011 in Iowa and 2010 in North Carolina. We examined all cancer sites together, and individual sites with >10 exposed cases.

Results Among 33,484 men, 3,234 incident cancers and 304 acetochlor-exposed cases occurred. An increased risk of lung cancer was observed among ever users of acetochlor (n = 23) (RR = 1.57; CI = 0.95–2.59) compared to never users, but there was no evidence of an exposure response trend (p-trend = 0.30). Also, there was increased risk of colorectal cancer (n = 25) with high acetochlor use (RR = 1.60; CI = 0.97–2.65, p-trend = 0.14).

Conclusions The associations between acetochlor use and colorectal and lung cancer are novel. However, due to lack of exposure-response trend, small number of exposed cases, and relatively short time between acetochlor use and cancer development, these findings warrant caution in interpretation and further investigation.
conditions, blue collar with musculoskeletal disorders and inspection with injuries. The findings provide relevant information for disease’s prevention and health promotion policies with priority to the most vulnerable occupational groups.

**CONDITIONS OF RETURN TO WORK OF NURSES AFTER MATERNITY LEAVE**

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**Objectives** Currently, countries like France, Spain, Italy, United States and Brazil there was an increase in the proportion of workers aged between 25–45 years, a period considered fertile. This scenario has determined that many workers had to choose between career and motherhood. The aim is to analyse the amount of Brazilian nursing professionals, in the period from January, 2012 to July 2013, returned to work after maternity leave.

**Method** Was performed a literature review at Pub Med and BIREME. There was a review of the medical records of nursing professionals met at a public university hospital of São Paulo, Brazil, from January 2012 to July 2013.

**Results** Returned to work after maternity leave: 80% (57) of nursing assistants, 70% (16) of the nursing staff and 94.6% (53) of nurses. Among the layoffs, 62.5% (15) occurred within the first 3 months, and only 18.75% (3) in the first six and nine months after maternity leave.

**Conclusions** It is possible to conclude that the nursing professional return to work after maternity leave quality requires investment in health policies that promote greater social and labour support.

**THE NIEHS GULF STUDY: ESTIMATE OF WORKERS’ EXPOSURES THROUGH THE INHALATION ROUTE ON SEVEN RESPONSE VESSELS NEAR THE WELL-SITE DURING THE DEEPWATER HORIZON OIL SPILL**

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**Objectives** After the Deepwater Horizon, response vessels were brought near the wellhead area to stop the leak, collect oil and drill the relief wells. The objective of this paper is to characterise inhalation exposure on these vessels for various exposure groups (EGs) to total hydrocarbons (THCs).

**Method** Approximately 100 EGs based on job title group, tasks and time period during the response effort were standardised across these vessels. Descriptive statistics were calculated from the measurements for each EG on each vessel. Since many of the data were censored (i.e., below the limit of detection), a Bayesian method was used to obtain estimates for the arithmetic mean (AM), geometric mean, and geometric standard deviation.

**Results** During the first time period (April 20–May 14), the range of the AMs on the vessels was 1.9–24.2 ppm THC. Exposures were lower during the second period (May 15–July 15) when dispersant was used to reduce air concentrations (0.1–14.6 ppm). After top-capping the well, a substantial reduction was observed on all seven ships (0.1–1.9 ppm). After bottom capping (~August 10), exposures generally increased on the ships (0.1–3.8 ppm), most likely due to decontamination activities. The vessel capping the well and the vessel burning waste oil and gas had significant differences from the vessels drilling the relief wells.

**Conclusions** Differences were found by vessel and time period that likely reflected oil weathering and differences in job and vessel activities.

**PARENTAL OCCUPATIONAL EXPOSURE TO IONISING RADIATION AND SELECTED BIRTH DEFECTS IN THE US**

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**Objectives** Results of previous studies of occupational exposure to ionising radiation (IR) and birth defects are inconsistent. Our objective was to assess the association between maternal and paternal occupational exposure to ionising radiation (IR) and birth defects using a larger sample than previous studies.

**Method** We studied 27 809 case mothers and 10 200 control mothers who participated in the National Birth Defects Prevention Study (NBDPS), giving birth between 1997 and 2009. Our exposure assessment was based on a textual analysis of the mother’s description of her occupation, workplace and job activities (and those of the infant’s father) during the three months before and the three months after the estimated date of conception. Logistic regression was used to examine crude and adjusted odds ratios for the association between possible maternal and paternal occupational exposures to IR and 45 birth defects. We assessed the possibility of confounding from pre-pregnancy diabetes and body mass index, smoking, use of supplements containing folic acid, use of alcohol, use of illicit drugs, pregnancy intention, study location and demographic variables.

**Results** We excluded 17 mothers with a history of cancer, and 12 568 mothers who were unemployed, homemakers or students during the periconceptional period. Overall, 3% of the mothers and 2% of the fathers were exposed to IR. The remainder of our results are underway and will be presented at the meeting.

**Conclusions** Our results will be interpreted taking account of multiple statistical comparisons and the possibility of recall bias.

**MONITORING MERCURY EXPOSURE AMONG ARTISANAL AND SMALL-SCALE MINERS: DEVELOPING AND EVALUATING A SURVEILLANCE PROTOCOL**

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**Objectives** - Develop a mercury exposure surveillance protocol targeted at artisan and small-scale miners that includes taking occupational histories, ancillary tests, counselling and educating patients regarding exposure.
Prevalence of Leucopenia Among Industry Workers 2000–2009

Objective To estimate the prevalence of leucopenia among industrial workers 2000–2009.

Methods The study population comprises workers from manufacturing industries of the Bahia State, Brazil, who had annual compulsory medical checkups in a national not-for-profit occupational safety and health care system during the study period. We retrieved computerised medical records, clinical and laboratory exams, and also workplace risk assessment, occupational and socio-demographic data. Leucopenia was defined as having leucocytes counting less than 4000.

Results From a total of 64,454 workers with valid blood counting data, 12,303 (19.09%) had leucopenia over the study time. Prevalence of leucopenia was 21.87% in 2005, 20.73% in 2006 showing a declining trend until 2009 when reached 15.89% (p < 0.001). Leucopenia was higher among male workers than women (p < 0.001) and in the rubber and plastic industry.

Conclusions Blood cell counting is compulsory monitored in industry, data are rarely analysed and results made public. Preliminary results of our analysis show that there is a declining trend of leucopenia prevalence suggesting a possible positive impact of the Benzene National Agreement on workers’ health in the rubber and plastic industry in Bahia.
AN EPIDEMIOLOGIC STUDY OF ACUTE CORONARY SYNDROME IN THE WORKING POPULATION

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Objective Some of cardiovascular diseases, like stroke and acute coronary syndrome (ACS), are compensable diseases in Taiwan as well as Japan and Korea. The number of compensated cases in the disease has increased from 13 in 2006 to 92 in 2012. The information on workplace risk factors before onset of disease is rare, and this aim of this study is to conduct a case control study for analysing the association between ACS and work stress, using hospital-based study.

Method The study population was the patients in a medical centre. Questionnaire was designed based on literatures about non-work-related and work-related risk factors of cardiovascular diseases. The work-related factors included working time, working pattern, burnout scale, mental stress. The inclusion criteria of case group were workers more than 20-year-old, diagnosed with acute coronary syndrome and having job at onset. The inclusion criteria of control group were diagnosed without acute coronary syndrome and having job at recruitment.

Results There were 47 cases and 121 controls recruited. The results shows case group had larger percentage of male, alcohol intake, no intake of any healthy diet, and higher education level than control group. In addition, family history of premature heart disease, history of diabetes, and history of current URI were more prevalent in case group. Multivariate logistic regression shows that smoking and night work were statistical significant factors associated with occurrence of acute coronary syndrome (OR=6.11, 3.59).

Conclusions When we think about the strategy on preventing cardiovascular diseases for working population, work-related factor, like night work, should be considering.
Poster presentation

PREVALENCE OF OBESITY AND RISK OF METABOLIC COMPLICATIONS AMONG WORKERS OF A HARNES PLANT

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Objectives To explore the prevalence of obesity and risk of metabolic complications among workers of a harness plant in Durango, Mexico.

Method A cross-sectional study was conducted on 300 workers. Measurements of body mass index (BMI) and waist hip ratio (WHR) were obtained. BMI (m/kg²) was classified into underweight (<18.5), normal range (18.5–24.9), pre-obese (25.0–29.9), obese class I (30.0–34.9), obese class II (35.0–39.9), and obese class III (>40.0). Risk of metabolic complications (RMC) was considered high when WHR > 0.85 for women, and > 0.95 for men; and moderated between 0.80–0.85 for women and 0.90–0.95 for men. Analysis of variance (ANOVA) was applied for continuous variables, and χ² test for categorical variables.

Results The mean age (±SD) of the subjects was 28.7 (±8.9) yrs. In the sample, 51.7% were male. According to the BMI, 47.3% of participants were in the normal range, 35.3% pre-obese, and 15.7% showed obesity. According to the WHR, 30% were at high risk, and 28.6% at moderate risk for developing metabolic complications. The RMC (high and moderate) was significant more prevalent in women than in men, 77.5% vs 49.3%, (p < 0.0001). ANOVA yielded significant variation in obesity according to age (p < 0.0001). Post hoc Tukey test showed differences of obese class II with normal range (p = 0.007) and underweight (p = 0.0169).

Conclusions The prevalence of obesity and RMC are quite high in studied population. The risk is higher among women and increases with age.

THE SHIFT WORK AND THE BURNOUT SYNDROME

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Objective This study aims to identify the presence of burnout in nursing workers of an intensive care in children with heart disease.

Method This is an exploratory, transversal and quantitative study with 92 nursing workers of a children intensive care in a university hospital of Sao Paulo, skilled on cardiology. The data were collected by MBI - Maslach Burnout Inventory. The data were analysed statistically and were presented in graphs and tables.

Results The results showed that the subjects have an average age of 31 years old, 93.5% were female, 69.3% worked less than 10 years in a paediatric and neonatal cardiology unit, and 79.3% have only one employment. It was observed that burnout levels were considered high in 8 (8.7%) of the participants and shows that 46 (50%) of workers have a high score for at least one of the three dimensions. The occurrence of burnout among workers in the study reveal the need for studies in the field of nursing paediatric proposed prevention and intervention to subsidise worker health nursing.

MENTAL HEALTH PROBLEMS OF SEAFARERS

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Objectives Recent investigations have shown that workplace bullying as a long lasting traumatic experience with the symptoms of victimisation may lead to psychological distress. The objective of our study was to investigate the prevalence of workplace bullying among seafarers and the associations with psychological distress in Klaipeda, Lithuania.

Method In this observational study, totally 450 seafarers were investigated (response rate 68%). We used the anonymous questionnaire with demographical variables, Negative acts questionnaire and GHQ-12. The SPSS 17.0 was used in the statistical analyses. Logistic regression analysis was employed for the associations between workplace bullying and mental distress among seafarers, controlling for variety of demographical and psychosocial factors.

Results The prevalence of occasional bullying among seafarers was 10.1%, severe bullying 3.8%, mental distress 9.3%. The OR of occasional bullying for psychological distress was 2.92; 95% CI 1.13–18.78. After adjustment for nationality, age, occupational position the OR of occasional bullying for psychological distress was 3.47; 95% CI 0.95–12.63, of severe bullying 6.52; 95% CI 1.34–31.76.

Conclusions The significant associations between workplace bullying and psychological distress imply that the preventive measures should be directed towards the improvement of the psychological climate in the workplace for health promotion strategies in seafaring.
**0332** STRESS AS HUMAN ELEMENT AT WORK: A SURVEY OF FILIPINO SEAFARERS

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**Objectives** Seafaring entails working on board ships for a long period of time away from home. This results into various psychological experiences by the world’s 1.2 million seafarers working on international commercial vessels. Filipino seafarers comprise almost 30% of the world’s seafarers. The study will look at the stress management profile of Filipino seafarers including how stress is manifested and implications for prevention.

**Method** Questionnaires were administered to 2500 Filipino seafarer respondents representing various ranks/positions. Respondents were chosen from different manning agencies and training centres in different parts of the Philippines. Different sets of questionnaires were administered to different sectors such as management and labour. The questionnaire was divided into the following categories: socio-demographic profile, health and lifestyle, attitude towards work and family/home, work and home-related experiences, symptoms/signs of stress, coping with work-related experiences, and infrastructure on board.

**Results** Respondents were 69%ratings and 31% officers mostly within the age of 25–50 working in bulk carrier vessels and tankers. Health problems normally experienced are vision, hypertension, muscular, hearing and respiratory. 50% drink alcohol and 20% smoke on board. 55% sleep well and 87% exercise. Most workers are satisfied with their jobs. Significant sources of stress are routine nature of job, long hours of work, tension among crew, and thoughts of impending early retirement. Home-work interface elements are major sources of stress such as family concerns and careers of wives.

**Conclusions** Socio-psychological problems need to be addressed by developing appropriate programmes. This should be mainstreamed in the occupational health agenda for seafarers.

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**0334** USE OF SALIVARY BIOMARKERS TO EVALUATE A STRESS MANAGEMENT INTERVENTION

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**Objectives** To discuss methodological issues related to using salivary biomarkers to evaluate response to a stress management intervention.

**Method** Findings from a study which utilised salivary biomarkers to evaluate group responses to a stress management program are discussed.

In that study, we measured responses to qigong practice as a stress intervention among 34 healthy adults.

**Results** Specific biomarkers studied were a stress hormone (cortisol); a surrogate marker co-released with acute stress (alpha amylase); and a marker of early physiological response to stress i.e. immune status as reflected by immunoglobulin A (IgA).

Salivary cortisol and IgA were monitored over 10 weeks in the intervention group (n = 18) and the control group (n = 16).

Median salivary cortisol concentrations (nmol/l) at weeks 1, 6 and 10 were 4.4, 4.8, 4.3 and 4.3, 4.0, 3.3 for the control and intervention groups. Median IgA secretion rates (µg/min) were 58.9, 63.6 and 67.4 for the control group and 43.8, 54.9 and 72.9 for the intervention group.

Acute response to qigong practice, measured by median salivary alpha amylase (U/ml) showed no significant change before and after a one hour session of practice (107.7 and 93.8).

Saliva collection technique, circadian rhythm and half-life of the biomarkers, and their relative concentrations in different body compartments e.g. blood and saliva, can affect the results and were taken into account in the study protocol.

**Conclusions** For valid interpretation of study findings, the choice of biological markers and other methodological issues have to be considered when using salivary biomarkers to evaluate response to a stress management intervention.

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**0336** MUNICIPAL CARTOGRAPHY OF ASBESTOS EXPOSURE IN A PARIS’ SUBURB: AN ORIGINAL USE OF AN OCCUPATIONAL EXPOSURE DATABASE

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**Objectives** Fibrex database can be described as a board giving a correspondence between jobs and quantitative indications of occupational exposure to one or several noxious fibres. The objective of this present work is to propose a municipal index of asbestos exposure and finally map it by crossing the Fibrex database with activity sectors data of the French national institute for statistics and economic studies (INSEE) at a city scale in a northern Paris’ suburb.

**Method** Fibrex database consists of more than 10 000 data of occupational exposure to organic or inorganic fibres from natural or artificial origins. It allows a focus on asbestos fibres by giving a median value of exposure to that carcinogenic substance within a given activity sector. Knowing the distribution of the workforces by activity sectors and associating the median values of exposures of the considerate work, it is possible to envisage an exposure score at a city scale.

**Results** The calculated score proposes a partial but original view of the potential exposure to asbestos by territorial unit in the end of 90’s. The use of city-scale data allows bringing to light the territorial heterogeneity of occupational exposures to asbestos in a Paris’ suburb.

**Conclusions** This contribution shows an original use of an occupational exposure database ending in a city-scale mapping.

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**0337** SENSE OF COHERENCE AND MENTAL HEALTH AMONG SEAFARERS IN RELATION TO PHYSICAL ACTIVITY

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**Objectives** Seafaring is a specific occupation due to long-term isolation from the society and the family. The aim of the study was to investigate the prevalence of psychological distress (PD) and sense of coherence (SOC) among seafarers in relation to occupational and leisure time physical activity (PhA).

**Method** 248 seafarers, attending the Maritime Medical Centre in Klaipeda for the mandatory health examination answered the anonymous questionnaire (GHQ-12) and SOC. The mean values
Poster presentation

0338 ABSENTEEISM FOR MEDICAL REASON IN HOSPITAL SURROUNDINGS

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Objectives Our work aims to:
- assess occupational disability for medical reasons in hospitals across the entire work stoppages substantiated by a medical certificate,
- to identify the reasons
- and describe the causes and medical certificates responsible for this phenomenon.

Method It is a descriptive epidemiological study on the whole of the medical absences reported by employees between January 1, 2012 and December 31, 2012 in two hospitals: CHU and EHS Obstetrics and Gynaecology of Sidi-Bel-Abbes.

Support for the survey is a questionnaire completed by the doctor, it collects informations about: individual characteristics, socio-professional characteristics, and information on the declared absence (place of occurrence, the date of delivery to the employer, the type of certificate...)
- Medical causes listed according to the International Classification of Diseases (CIM 10).

Results The study population represents a workforce of 2884 employees and includes the entire staff of the CHU and EHS Obstetrics and Gynaecology of Sidi-Bel-Abbes.

We recorded 331 medical certificates off work reported by our study population. However we objectified about 3/4 of the certificates are initial certificates and 72% that are issued by the public sector.

The rate of medical absenteeism in the hospital surroundings is estimated at 7.68% with a predominance of medical absences related to illness (98%) against only 2% for those related to accidents with a male predominance (5%) containing 1% for females.

Conclusions Our results can be used in a preventive perspective to improve the professional environment and therefore reduce the incidence of medical absenteeism.

0339 EVALUATING TEMPORAL TRENDS IN OCCUPATIONAL LEAD EXPOSURE USING META-REGRESSION OF DATA IN THE PUBLISHED LITERATURE

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Objectives The published literature provides useful data for examining exposure differences across industries, jobs and time periods, but the analysis is challenging because the data is usually in summary form. We used mixed-effects meta-analysis regression models, which are commonly used to summarise health risks from multiple studies, to predict temporal trends of lead blood and air concentrations in multiple US industries from the published data.

Method We extracted the geometric mean (GM) and geometric standard deviation (GSD) of blood and personal air measurements from US worksites from the literature. When not reported, we derived the GM and GSD from other summary measures. Industries with measurements in ≥2 years and spanning ≥10 years were included. Models were developed separately by industry and sample type. Each model used the log-transformed GM as the dependent variable and calendar year as the independent variable. It also incorporated a random intercept that weighted each study by the inverse of the sum of the between- and within-study variances. Within-study variances consisted of the squared log-transformed GSD divided by the number of measurements. Maximum likelihood estimation was used to obtain the regression parameters and between-study variances.

Results The blood measurement models predicted statistically significant declining trends (2–11% per year) in 5 of the 13 industries. The air measurement models predicted statistically significant declining trends (1–3%) in 2 of the 10 industries; increasing trends (7–10%) were observed for 2 industries.

Conclusions Meta-analysis provides a useful tool for synthesising occupational exposure data that can aid future retrospective exposure assessment.

0342 LUNG CANCER RISK ATTRIBUTABLE TO OCCUPATION: IN A CASE CONTROL STUDY IN BLACK SOUTH AFRICANS, 2001–2008

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Objectives Lung cancer is the 4th most common malignancy in South Africa. Although smoking is a well established risk factor, the role of occupational exposures in the local setting is not clear. We estimated the lung cancer risk attributable to occupations.

Method Data from on-going Johannesburg Cancer Case-Control Study of black African adult cancer patients (2001–2008) was used. Information from 579 lung cancer cases and 1120 frequency matched controls was analysed. Controls were randomly selected from cancers not known to be associated with the effects of tobacco, matched by sex and age (±5 years). Usual
Occupation exposure stated at interview were used as an indicator of occupational exposure. Odds ratios (OR) and 95% confidence intervals (CI) were estimated using unconditional logistic regression and attributable fraction (AF) by Miettinen’s formula, adjusted for smoking pack years, HIV status and domestic fuel type use.

**Results** The mean age of cases and controls was 56.0 and 57.1. Among men, adjusted OR for lung cancer was 3.0 (95% CI 1.4–6.4) in miners and 1.7 (95% CI 1.3–3.2) in transport occupations. In women, the adjusted OR in domestic workers was 7.3 (95% CI 1.7–11.3) whereas working in the food and beverage industry was 4.9 (95% CI 1.4–26.8). Occupation resulted in an AF of 14% in men and 26% in women.

**Conclusions** Occupational risk factors for lung cancer in South Africa are gender-specific, having more impact in women than in men. Further studies are needed to assess possible specific exposures in the mining and transport industries for men, and food industry and private homes for women.

**0343** MESOTHELIOMA RATES IN SOUTH AFRICA: TRENDS 1995–2008

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**Objectives** Mesothelioma is a rare neoplasm which is caused by asbestos exposure. South Africa has mined and refined all three types of asbestos since 19th century with the peak of production in 1940–1980s. At present asbestos use and production is banned in South Africa. Trend 1995–2008 in mesothelioma rate was assessed to determine burden of asbestos related deaths due to mesothelioma by year and gender.

**Method** Death certificates with underlying cause of death stated as C45 were selected for the study in 1995–2008. For each year of study, age and gender distribution was obtained from the national statistical releases. Mesothelioma rates, 95% confidence interval were calculated for each year and sex, and for age groups and sex. Poisson regression was used to test for trend.

**Results** In total 2472 cases were identified of deaths due to mesothelioma, 1919 in men and 573 in women in the study period. There was 3:1 male to female ratio. The trend was stable and constant over time for both men and women cases. Mortality rate in men was 8–16 per million and in women 2–5 per million.

**Conclusions** If mortality rate remains at current estimates we can expect 2134 cases until 2020. However, it is authors opinion that mortality rate is underestimated due to the competing causes of death, and shortened longevity. Just looking at other countries and their diagnosed cases, such as Great Britain, major consumer of asbestos from South Africa, it becomes apparent how little mesothelioma cases are diagnosed in our country.

**0370** OCCUPATIONAL ACCIDENTS AND DISEASES AMONG COMMUNITY HEALTH AGENTS IN THE MUNICIPALITY OF CARAGUATUTUBA/SP

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**Objectives** Identify and analyse of the occupational accidents and diseases occurred with the community health agents in the municipality of Caraguatatuba/SP.

**Method** This descriptive, exploratory, cross-sectional field study with a quantitative approach had the purposes of identifying and analysing of the occupational accidents and diseases occurred with the community health agents in the municipality of Caraguatatuba/SP. The data were collected from 137 workers by means of a questionnaire and an interview.

**Results** The data related to occupational accidents reveal that less than half (59; 43.07%) of the workers had occupational accidents, most of them (44; 74.59%) having reported one; the total of accidents reported was 80, and the most frequent were biker trauma in traffic accidents (43; 53.75%), followed by dog bites (13; 16.25%) and falls (12; 15.00%); the most frequent type of occupational accident was the typical (64; 80.00%), followed by road accidents (13; 16.25%) and occupational disease (3; 3.75%). Besides, 22.63% reported diseases as osteoarticular system and of the connective tissue (13; 30.96%), diseases of the circulatory system (7; 16.88%), the respiratory system, mental and behavioural disorders, skin and subcutaneous tissue diseases (4; 9.52%, respectively).

**Conclusions** The data point to the importance for an investment in the health community health agents in the municipality of Caraguatatuba/SP with training program.
was relatively low. We recommend expanding the service beyond Maccabi onto other health service organisations.

**0381 ADJUSTMENT FOR MULTIPLE COMPARISONS IN A JOB AND INDUSTRY-TITLE ANALYSIS OF A CASE-CONTROL STUDY OF PROSTATE CANCER**

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**Objectives** To evaluate the impacts of empirical Bayes (EB) and semi-Bayes (SB) adjustment to account for multiple testing in a hypothesis-generating study of prostate cancer (PCa) risk by occupation and industry.

**Method** The study population comprises 19377 PCa cases and 1995 population controls aged 40–75 years, all residing in Montreal. Odds ratios (OR) and 95% confidence intervals (CI) of PCa risk for ever employment in an occupation and industry were estimated using unconditional logistic regression models adjusted for age, ancestry, and family history of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa. EB and SB adjustment was applied to the estimates, with prior variances of 0.15, 0.25 and 0.35 selected for SB. Occupation and industry effects were considered mutually exchangeable, and familiality of PCa.

**Results** 5 of the 89 occupations and 3 of the 63 industries had a significantly elevated PCa risk prior to EB/SB adjustment, compared to an expected 2 and 1.5 categories due to random chance. The only positive association remaining significant following EB was for subjects ever employed in government (OR=1.4, 95% CI 1.1–1.5). The remaining elevated PCa risks with SB were found for employment in social occupations (OR=1.5, 95% CI 1.1–2.0) and for forestry workers (OR=1.7, 95% CI 1.1–2.6), in addition to government (OR=1.4, 95% CI 1.1–1.7). The choice of prior variance had a negligible impact on the estimates.

**Conclusions** The use of EB and SB reduced the number of positive associations compared to the unadjusted estimates. The elevated PCa risk observed for employment in government remained consistent across the adjustment approaches.

**0387 SMOKING AND ALLERGIC CONTACT DERMATITIS: CAUSATION OR CORRELATION?**

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**Objectives** Contact dermatitis (CD) is the most common occupational skin disease and includes both irritant and allergic forms (ICD and ACD). Smoking has been associated with all of CD, hand eczema and sensitization in previous studies, but never explored in relation to work-related ACD and ICD specifically. This abstract describes differences in patients who have a work-related diagnosis of ICD, ACD or both ICD and ACD.

**Method** Data from a study of patients with possible work-related skin or respiratory disease were used. Data included demographics, symptoms, smoking history and physician diagnoses. Differences between diagnosis groups (ICD, ACD, both) were investigated using chi square and ANOVA.

**Results** In total 163 subjects were diagnosed with work-related CD. Of these, 44% were female, approximately half (51%) were ever smokers and 30% were atopic; the mean age was 44.2 years. ICD was diagnosed in 57% of subjects, ACD in 43% and both ICD and ACD in 14%. Current smoking was common among subjects with ACD (40%) and those with both ACD and ICD (35%) compared to those with ICD (17%) (p = 0.02); no difference in pack-years was observed.

**Conclusions** The rate of smoking in this sample was similar to the Canadian population. Age, sex and atopy did not differ between diagnosis groups. Current smokers were more common among those with ACD and those with ACD and ICD. The mechanism by which smoking may be related to the development of allergic skin disease remains unclear (e.g., systemic inflammation, contact, behavioural differences) but deserves further attention.

**0388 AN UPDATE OF MORTALITY AND CANCER INCIDENCE AMONG ONTARIO URANIUM MINERS EXPOSED TO RADON PROGENY**

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**Objectives** Underground uranium mining and milling was conducted in Northern Ontario from 1955 to 1996. The Ontario uranium miner’s cohort was created to study the health effects of radon and other occupational exposures. Study objectives include providing updated estimates of cancer incidence and mortality for miners exposed to radon daughters, a project funded by the Canadian Nuclear Safety Commission.

**Method** The cohort of mine and mill workers was created using data from the National Dose Registry (Canada’s ionising radiation exposure registry), and the Ontario Mining Master File (containing work history information collected during annual chest x-rays) data. The cohort consists of men who worked for at least one week between 1954 and 2004. Follow-up was recently extended from 1986 to 2007 for mortality and included follow-up for cancer incidence from 1969–2005. Standardised mortality ratios (SMRs), standardised incidence ratios (SIRs) and their 95% confidence intervals (CIs) will be calculated based on Canadian national reference rates.

**Results** The final cohort consisted of 28 546 miners. The mean age of the miners at entry into the study was 28.8 years. Miners in the cohort had a mean cumulative exposure of 21.0 WLM over an average of 5.3 years of total exposure. Between 1954 and 2007, a total of 8572 deaths were observed, and of these 2809 were due to cancer, including 1246 lung cancer deaths.

**Conclusions** The Ontario uranium miner’s cohort study continues to be a valuable source of assessing uranium miners risk of cancer mortality and incidence.
HEART RATE VARIABILITY IN PARTICLE EXPOSED TRAIN DRIVERS IN THE STOCKHOLM SUBWAY

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Objectives Exposure to particulate matter in urban air is a recognised risk factor for cardiovascular disease, but little is known about possible effects from exposure to the high levels of metal-rich particles prevailing in underground subway systems. This led us to investigate heart rate variability (HRV) in occupationally exposed subway drivers.

Method 29 train drivers (18 men and 11 women) in the Stockholm subway were investigated from November 2004 to March 2005. All were non-smokers in ages 25–50. Personal particle exposure levels were obtained in an occupational hygienic investigation (mean PM2.5 19 μg/m3, DataRAM 33 μg/m3). We registered continuous ECG over 24 h. The HRV measures obtained were LF, HF, LF/HF, HR and SDNN. The arithmetic mean (based on 5-minutes intervals) in the group was calculated for each measure and exposure situation, as well as the mean in group of the individual quotients between the exposure situations. One-sample t-tests were used to analyse whether the quotients differed from one.

Results The mean quotients between working in tunnel and working outside tunnel were significantly above one for LF (p = 0.04) and significantly below one for HR (p = 0.03) and SDNN (p = 0.00). The quotients between total working-hours and leisure-hours were significantly above one for HR (p = 0.03) and significantly below one for SDNN (p = 0.00).

Conclusions Overall, our results do not indicate any clinically significant effects on the cardiac autonomic function, as measured by HRV, for particle exposed subway drivers in Stockholm, even though there were some indications of a decrease in SDNN.

WORKPLACE BULLYING AND POSTTRAUMATIC STRESS SYMPTOMS AMONG FAMILY PHYSICIANS IN LITHUANIA

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Objectives The study investigated the associations between workplace bullying and posttraumatic stress symptoms as compared to and controlled for associations between the latter and other psychosocial stress factors at work and in everyday life, employing a representative sample of Lithuanian family physicians.

Method With a response rate 89.2%, a total of 323 family physicians filled in anonymous questionnaire on workplace bullying, post traumatic symptomatology (IES-R), other psychosocial stressors at work and in everyday life, personal health resources (sense of coherence), behavioural characteristics and demographic variables. The statistical software SPSS 14.0 for Windows was used in the analysis. Associations were tested by way of multivariate logistic regression analysis.

Results A high prevalence of bullying was found among the family physicians in Lithuania, with 13% experiencing severe workplace bullying and 17.3% more occasional incidents of bullying. The prevalence of posttraumatic stress symptoms was also high (15.8%). The Odds ratio (OR) of severe bullying for posttraumatic stress after adjustment for age and gender was 8.05, 95% confidence interval (CI) 3.80–17.04. In the fully adjusted model it increased to 13.88, 95% CI 4.68–41.13, indicating cumulative effects of all the investigated stressors.

Conclusions Workplace bullying is prevalent among Lithuanian family physicians, as is symptoms of posttraumatic distress. Strong associations between posttraumatic stress and exposure to severe bullying indicate that bullying is a significant source of mental health problems among physicians and more so than most other well known psychosocial stressors at work and in daily living.

EPIDEMIOLOGY OF LOW BACK PAIN AMONG NURSES OF THE HOSPITAL OF SÉTIF (ALGERIA)

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Objectives Identifying risk factors and quantification of the prevalence of low back pain among nurses and service agents working at the hospital in Sétif (Algeria).

Method A questionnaire containing 45 items was submitted by a physician to 450 people, of which only 300 people have agreed to meet. Responses have been verified by cross-checking with the information contained in the medical records of the occupational medicine service. Controlled data have been analysed by the chi-square test and multivariate logistic regression techniques using the “IBM SPSS 20” software.

Results The prevalence of LBP is 66.67%, it is significantly higher between 30 and 49 years of age and between 2 and 5 years of seniority at the hospital. These low back pains have a gradual onset in 52.0% and radiates along the sciatic nerve in 62.0%. The logistic regression analysis revealed the following associations: low back pain predicted by psychosocial factors (stress, sleep disturbance and fatigue late in the day), the usual working posture and frequent positioning of patients in bed. Regarding sleep disorders, we cannot say if they are a source or a consequence of low back pain even if they are strongly associated with this disease.

Conclusions Occupational factors that have a significant influence on the development of low back musculoskeletal disorders are not only mechanical and postural order but also organisational, social and psychological.

RISK OF NON-HODGKIN LYMPHOMA IN HEALTH OCCUPATIONS

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Objectives Several non-Hodgkin lymphoma (NHL) risk factors are typical features of health occupations. We investigated risk of NHL and its major subtype among health workers.
Method A pooled analysis of 10 case-control studies was conducted within the Interlymph Consortium. Overall, the study population included 10786 NHL cases and 12069 controls. Each occupation of study subjects was coded using the 1968 ISCO classification. Risk of NHL, diffuse large B cell lymphoma (DLBCL), follicular Lymphoma (FL), chronic lymphocytic leukemia (CLL) and T-cell Lymphoma, associated with having been working for one year or more in specific health occupations was calculated as the Odds Ratio (OR) and its 95% confidence interval (95% CI) with unconditional logistic regression, adjusting by age, gender and study area. Risk was also calculated for duration of employment > 10 years.

Results Health workers employed 10 year or more showed a significant 19% excess risk of FL, which was restricted to male workers (OR = 1.62; 95% CI 1.02, 2.59). FL risk was highest (OR = 2.23, 95% CI 1.17–4.26) among the medical staff, and it was consistent in both genders. Male personal care workers also showed an increase in NHL risk (OR = 2.52; 95% CI 1.18–5.36). Risk was not increased among nurses. No consistent patterns of increasing risk was observed for the other NHL subtypes.

Conclusions Shift work, ethylene oxide, and viral agents are well known NHL risk factors among health workers. Our results suggest that risk might be more elevated among the medical staff and among men.
AN OLD TRADE WITH AN UNANSWERED QUESTION:

PUBMED SEARCH STRINGS FOR THE STUDY OF

labour. The 3-rd group consisted of 2078 workers, hard manual labour without influence of bone-seeking toxic factors (metal-worker, painters, moulders etc.). The 4-th group - 3240 workers and employees of auxiliary departments not subjected to the influence of unfavourable industrial factors (engineer, command, economists etc.). The observed were divided into four age groups and three working experience groups.

Results In the observed population the prevalence of SPS was 9,6 (95% CI 8,9–10,7), among male - 8,6 (7,8–9,4), among female - 1,9 (10,5–13,5). The highest rates of SPS were aged 40 to 49 years - 11,0 (9,6–12,4) and older than 50 years - 11,9 (10,5–13,3). The highest prevalence index of SPS were registered in the B first group - 32, 9% (workers exposed to toxic effects of fluoride and physical strain), the lowest - in the 3-rd group - 6,9% (without the impact of toxic action). Rate of shoulder pain prevalence is authentically higher among the workers of hard manual labour and under the toxic influence of fluoride. The prevalence of SP in the 3rd group was similar to the index of the 4th group.

Conclusions The highest RR of SPS progress was observed in the 1st group in the relation to 4th (5,6) and 3rd groups (5,2), at the same time etiological fraction (EF) was 77,5% and 78,7%, it indicates very high influence of labour conditions on prevalence of SPS. Influence without the manual labour index of RR and EF is much higher in the 2nd group, than in 3rd and 4th groups.

It’s worth noting that the highest prevalence of SPS was found among patients with broncho-pulmonary system diseases - 24,8 (20,1–29,4), it is higher than among patients with neck pain - 23,4 (21,5–25,3). Among the analysed “non-manufacturing” data co-morbid pathology of the respiratory system and neck pain increase the risk of the shoulder pain syndrome development.

The relative risk of SPS was higher among patients with neck pain (7,0) than with comorbidity of broncho-pulmonary system (2,6).

AN OLD TRADE WITH AN UNANSWERED QUESTION:

DOS ES ARC-WELDING FUME EXPOSURE INCREASE THE
RISKS OF OBSTRUCTIVE PULMONARY DISEASES? FIRST
FINDINGS FROM THE WELSHIP CROSS-SECTIONAL
STUDY

Objective Increasingly, global manufacturing is shifting to emerging economies and with it the use of arc-welding for applications in different industries. The chronic respiratory adverse effects resulting from exposure to gases and ultrafine metal particles in welding fume are incompletely understood.

We aimed to measure the prevalence of arc-welding related pulmonary obstructive outcomes by analysing data collected in a shipyard in the Middle East.

Method Between January and December 2013, through cross-sectional survey, we collected spirometry data and behavioural, occupational and respiratory symptoms information from a random sample of male shipyard workers; 397 were exposed to welding fume and 127 were non-exposed. The sample was selected from a total population of about 8000 employees, by frequency matching for ethnicity and age relatively to full-time welders (‘highly’ exposed).

Results Of the 580 workers invited, 26 subsequently left their job; of the remainder, 95% (524) agreed to participate. The participants, from the Indian subcontinent (90%) or Philippines (10%), had a median age of 38 years. Ever smoking was reported by 37%, with full-time welders reporting the lowest proportion of current smoking, 18% (24/131).

Overall, 13% reported respiratory symptoms with a higher prevalence in the winter months. Post-bronchodilator spirometry data were available for 91% of workers. Mean values for FEV1 and FVC were 2.87L and 3.48L, with no statistically significant differences across exposure groups (p-values: 0.71 and 0.48).

Conclusions These preliminary results need to be explored further in relation to smoking, past and current occupational exposure. This population, it is hoped, will form the basis for a longitudinal study.
THE NORTH AMERICAN POOLED PROJECT (NAPP): POOLED ANALYSES OF CASE-CONTROL STUDIES OF PESTICIDES AND AGRICULTURAL EXPOSURES, LYMPHOHEMATOPOIETIC CANCERS AND SARCOMA

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Objectives Previous studies have noted associations between specific pesticides and multiple cancer types. However, assessments for many pesticides have been limited by small numbers of exposed cases. To address this, we established the North American Pooled Project (NAPP), a collaborative effort to evaluate the relationship of pesticide and agricultural exposures to risks of lymphohematopoietic cancers and sarcoma.

Method We harmonised previously collected data from three population-based case-control studies conducted in four American states with a similar Canada-wide study conducted in six provinces. Descriptive analyses of pesticide exposures, personal protective equipment (PPE) use, and demographic data were completed. The prevalence of self-reported pesticide use among cases and controls was determined for specific agents and chemical classes.

Results The NAPP includes 5131 controls and 3274 cases (non-Hodgkin lymphoma [NHL] N=1690; Hodgkin lymphoma [HL] N=507; multiple myeloma [MM] N=587; soft tissue sarcoma N=490). Preliminary descriptive analyses indicate that approximately two-thirds of controls and NHL and MM cases ever lived or worked on a farm or ranch. Nearly half of controls and half of NHL, HL, and MM cases reported using any pesticide. Over 120 different insecticides, herbicides, and fungicides were reported. More than 17% of participants reported using the phenoxy herbicide 2,4-D and over 5% reported DDT, malathion, atrazine, or glyphosate. Around 6% of NHL cases and controls reported ever using PPE.

Conclusions The large number of cases and controls and high frequency of pesticide use in the NAPP will allow us to evaluate less commonly used pesticides, cancer sub-types, and smaller relative risks than previously possible.

CUMULATIVE MERCURY EXPOSURE AND PERIPHERAL NERVE FUNCTION IN A SAMPLE OF U.S. DENTAL PROFESSIONALS

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Objectives To calculate individual cumulative mercury exposures from a convenience sample of dental professionals and measure the effect on peripheral nerve function.

Method To calculate individual cumulative mercury exposures, we used a formula that takes into account the number of years they practiced dentistry. Both fixed and repeated measures were used. The measure of effect shows a significant positive association for many pesticides have been limited by small numbers of exposed cases. To address this, we established the North American Pooled Project (NAPP), a collaborative effort to evaluate the relationship of pesticide and agricultural exposures to risks of lymphohematopoietic cancers and sarcoma.

Participants attended the American Dental Association’s (ADA) conventions held from 1997–2006. Individual surveys were completed and measurements were taken of the median and ulnar sensory nerve amplitude and latency in the dominant hand. The ADA has measured the average urinary mercury concentration of participants since 1977, allowing a cumulative mercury exposure to be estimated for each individual dentist based on the number of years they practiced dentistry. Both fixed and mixed effects (accounting for repeated measures) linear regression models were used.

Results 3923 observations from 2649 dentists were used to perform linear regression using multiple models. Models included individuals with or without imputed BMI, along with either repeated measures or initial observations only. Adjusted covariates included hand temperature, gender, age and BMI. Individuals with rheumatoid arthritis, diabetes, carpal tunnel syndrome (for median nerve models only), or hand temperatures interfering with the accuracy of the instrument were excluded. The main effect of cumulative exposure was found to be significant (p-value <0.05) in median nerve latency and amplitudes but insignificant in ulnar nerve measures. All models but ulnar nerve latency showed a highly significant interaction of cumulative exposure and age (p-value < 0.01).

Conclusions Using an estimated cumulative mercury exposure as the measure of effect shows a significant positive association with decreased peripheral nerve function. This study is the first of its kind to estimate dentists’ cumulative mercury exposure and its effect on peripheral nerve function.

WHEN STANDARD OCCUPATIONAL EXPOSURE ASSESSMENTS ARE UNSUITABLE – EXPOSURE OBSERVATIONS WITH SOUTH AFRICAN HERBICIDE SPRAYERS

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Objectives South African herbicide sprayers removing alien vegetation are exposed to a myriad of herbicides resulting in acute and chronic health risks. Workers often are not willing to participate in standard biological monitoring assessments through the provision of blood and urine in order to assess these potential risks. Furthermore, laboratory capacity to analyse herbicides residues are limited. The study aim was to document workers’ exposure risks in order to develop health interventions using an observation exposure assessment method.

Method Researchers observed three teams, each comprised of 10 workers and one contractor, from February to June 2012. An observational guide was developed and findings were recorded in a field journal. Observations were supported with video and photographic materials.

Results The on-site observations revealed workers lack of PPE compliance, behaviours that increased their exposure risks, and non-compliance with work standards. Workers’ exposure risks were compounded by harsh working conditions, high turnover rates of workers, worker’s low risk perceptions, power struggles, and gendered beliefs of masculinity being threatened by PPE use.

Conclusions In some circumstances researchers are unable to use biological monitoring methods to establish pesticide exposure risks for workers in developing countries. Observation methods are a viable alternative method, particularly for informing worker risk reduction interventions.
0417 PRELIMINARY STUDY OF DISTRESS AMONG MEDICAL AND PARAMEDEICAL STAFF OF MOROCCAN HOSPITAL

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Objectives Mental health status of medical and paramedical staff has an impact on the quality and quantity of their productivity and on their relationship with the patients. The objective of this preliminary study is to measure mental health status in hospital staff, especially, emotional disorder “distress.”

Method The study is realised in hospital in Rabat, Morocco, among 100 medical and paramedical staff. The 12-items General Health Questionnaire GHQ) and questionnaire about their health status are used.

Results The results show that, according to gender; among 50 men, 50% suffer from distress and among 50 women, 58% are distressed.

Also, according to specialty; 80% of doctors and 47.5% of nurses in different categories (55% of nurses in anaesthesia and resuscitation, 45% of nurses of laboratory, polyvalent nurses and radiology nurses) suffer from this emotional disorder.

The findings demonstrate also, that 23% and 36% of the staff sample’s suffer from different health problems (gastritis, allergies, asthma, colopathy, hypertension...) and from sleep disorders respectively.

Conclusions These preliminary results have highlighted the danger that threatens the health status of medical and paramedical staff of this hospital. Deeper investigations are needed to determine all the possible factors that could be influencing this status and studying the possible relationship between the founded pathologies and distress.

0420 SEVERE OCCUPATIONAL INJURIES IN MOROCCO

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Objectives Occupational injuries represent a considerable part of the injury burden to society, affecting people in most productive years of their lives. The aim of this study is to describe the profile of severe occupational injuries in Kenitra city, economic capital of the Gharb region (NW Morocco).

Method This is a descriptive retrospective analysis of severe occupational injuries (fatal injuries or resulting in permanent disability) notified in the delegation of employment of Kenitra in 2008–2009. The results do not include occupational diseases or journey accidents.

Results There were 210 severe workplace injuries reported; 176 resulted in temporary disability and 34 were fatal. According to data recorded, 91% of the victims were men with a male-female ratio of 10.05. The most exposed sectors were building and public works sector (38%), wood, furniture, paper, cardboard, textile and clothing industries (29.5%) and metallurgical industries (10%). Accidents were caused by machinery and falling materials, followed by falls from height and electricity.

Conclusions The assessment and prevention of occupational risks are a major asset to improve the quality of work and retain employees through a better quality of work life.

0423 DEVELOPMENT OF A DISEASE SURVEILLANCE SYSTEM FOR SILICOSIS AND RESPIRATORY DISORDERS IN STONE CARVING WORKERS IN THAILAND

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Objectives To (a) develop a surveillance system for silicosis (b) estimate prevalence of silicosis and respiratory disorders among stone carvers and (c) develop a guideline for screening for silicosis.

Method This was a cross-sectional, descriptive study of 1257 stone carvers. Data were collected between July and October, 2012. The 767 participants in the study were classified by job categories. Exposure indices were constructed. Health outcomes (including job description, respiratory symptoms and chest radiographs) were assessed and confirmed by diagnosis by a B reader.

Results Of the total population, 767 underwent chest radiographs (age ≥24 to 75 years; 97.1% male). The duration of exposure was between 2 and 30 years. The prevalence of radiographic change was 8.9% (68 subjects). There were 66 subjects with parenchymal lesions and profusion (> grade 1/0 as per ILO classification). Two subjects have pleural abnormalities. Importantly, 55 cases among 68 with radiographic abnormalities were compatible with tuberculosis; 32 of whom showed no clinical evidence of tuberculosis.

Conclusions The diagnostic differentiation between silicosis and tuberculosis is challenging; consequently, discrepancies can arise when reporting the prevalence of the two diseases. Our research group is developing a system for screening silicosis for referral to a clinician in chest medicine. The remaining at-risk population will be examined by chest X-ray in July 2013 and the hazard surveillance and exposure to silica performed next.

0426 OCCUPATION AND LEUKAEMIA IN SPAIN 2007–2012

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Objectives Established risk factors for leukaemia do not explain the majority of leukaemia. Previous studies have suggested the importance of occupation in leukaemogenesis.

To evaluate associations between job title and leukaemia in the population the MCC-Spain

We studied occupational variation of the risk of chronic lymphocytic leukaemia

Method We have 30,744 occupational interviews recruited during 2007 to 2012 all was codified on 67 group homogeneous units, according to a defined criteria, in the same category defined by a set of tasks of the same characteristics. We analysed 196 cases of leukaemia (aged 20–75 years) and yours controls
randomly selected from 9 regions in a population based case-control study in Spain (MCC-Spain study) with demographic details, information on potential confounders and a comprehensive employment history. Each case of leukaemia may have one or more occupations. All occupation were codified by Occupational National Code (CNO 94) and The International Standard Classification of Occupations (ISCO-88) Associations between occupation and leukaemia were analysed using logistic regression adjusting for gender, age, and smoking.

**Results** We analysed the 27.4% of leukaemias.6% never had occupation with risk of leukaemia and 41% were worked at least one occupation with probably exposition to carcinogens for leukemia. Analysis is ongoing and results will be presented at the conference.

**Conclusions** In summary, our study showed some evidence supporting the role of some kind occupation in the development of leukaemia. However, given the relative low numbers the results have to be interpreted with some caution. On have analyse the exposition on these occupations.

**Objectives** A potential "healthy worker effect" may bias the studied effect of shift work on health. The observed differences in health behaviour and health outcomes might be caused by: (i) primary selection, (ii) influence from the with shift work related environment, and (iii) impact of shift work. We aimed to study these potential sources.

**Method** A cohort of 4754 male trainees who had finished their professional training and started their career in the production environment, and (iii) impact of shift work. We aimed to study these potential sources.

**Results** We analysed the 27.4% of leukaemias.6% never had occupation with risk of leukaemia and 41% were worked at least one occupation with probably exposition to carcinogens for leukemia. Analysis is ongoing and results will be presented at the conference.

**Conclusions** In summary, our study showed some evidence supporting the role of some kind occupation in the development of leukaemia. However, given the relative low numbers the results have to be interpreted with some caution. On have analyse the exposition on these occupations.

**Objectives** The US workforce, like workforces around the globe, is ageing - which creates new challenges for occupational health researchers and practitioners. Throughout their working lives, workers experience changes in occupational exposures, behaviours and time demands. The ways in which age-related changes in specific injury risk factors interact to influence injury risk are complex. Data reported in Mortbidity and Mortalitity Weekly Reports Data collected by the United States Bureau of Labour Statistics was analysed to compare age-related differences in occupational injury rates across several industrial sectors and subsectors.

**Method** Occupational injury incidence rate estimates were developed to compare age-related patterns by industry and injury type. Injury count data from 2010, stratified by age group, industry sector and injury type, were provided by the US Bureau of Labour Statistics Survey of Occupational Injuries and Illnesses. The Current Population Survey was used to develop estimates of at-risk experience. Data from a diverse collection of industry subgroups (defined by NAICS codes) were analysed, including agriculture, transportation and warehousing, private hospitals, nursing and residential care facilities, police protection and construction.

**Results** There are significant differences in the rates of occupational injuries when stratified by age group, industry and injury type. Occupational safety programs and policies should consider age-related differences in injury risks when allocating resources toward prevention efforts.

**Objectives** Fractional exhaled nitric oxide (FeNO) has been implicated as a pulmonary biomarker in various respiratory disease, including COPD. Measurement of FeNO is a simple, non-invasive tool for assessing airway inflammation. Nevertheless, the usefulness of FeNO measurements in COPD patient in clinical practice is unclear. The objective of this review was to evaluate the efficacy of management of COPD based on FeNO in comparison with pulmonary function test.

**Method** Cochrane library (CENTRAL), MEDLINE, EMBASE and reference lists of articles were searched. The last searches were in July 2013. Results of searches were reviewed against predominantly criteria for inclusion. Relevant studies were selected, assessed and data extracted independently by two people. Participant articles with COPD management based on pulmonary function test compared with FeNO measurement were selected. Risk of bias for each study was assessed using the QUADAS (quality assessment of studies of diagnosis accuracy included in systematic reviews) scale.

**Results** Finally, eight studies were included. Of the eight studies, four were a negative and one were positive correlation between
FeNO and pulmonary functions. Three studies were not significant correlation. The various results of studies were affected by characteristics of the patients (COPD severity, smoking status, treatment status) and differences in FeNO measurement methods. **Conclusions** The studies include in this review highlight the difficulties of correlation between FeNO and pulmonary function. So, the role of add-on monitoring of FeNO to pulmonary function test is less clear because of the absence of conclusive double-blind, randomised, control studies concerning potential clinical benefits in the management of COPD. Further randomised controlled trials are required.

**Objectives** The aim of this research was to estimate and compare the direct and indirect influence (mediated by respondents’ education) of three indicators of CSES (childhood financial conditions, mothers’ education, fathers’ education) on: i) the generic health dimensions included in the EQ-5D; ii) self-rated health (SRH), iii) age-comparative self-rated health (ASRH); and; iv) subjective well-being. **Method** The data was analysed using Stata command Paramed. Log-linear regression was used for the health and life satisfaction outcomes to estimate the natural direct effects (NDE), natural indirect effects (NIE) and marginal total effects (MTE) as risk ratios (RR). Statistically significant interaction (p < 0.05) was observed between the CSES exposures and gender, regressed on the health and wellbeing outcomes, therefore the analysis was conducted separately for men and women. **Results** Childhood financial conditions was associated (NDE) with all health measures. Men had a higher risk of being unhealthy on the composite EQ-5D measure, and the anxiety/depression dimension, but women had a higher risk of being unhealthy on the dimensions self-care, usual activities, pain/discomfort, as well as on SRH. Childhood financial conditions had no statistically (p > 0.05) significant NIE mediated by respondents’ education, on any health measure. While almost all NDEs of parental education on health outcomes were not statistically significant (p > 0.05), most of the NIEs of parental education were statistically significant (p < 0.05). **Conclusions** Childhood financial conditions have a strong direct effect on later health and wellbeing, independent of respondents’ education, while parental education has an indirect effect on later health mediated by respondents’ education.

**Objectives** The healthy worker effect (HWE) is widely known to bias standardised risk estimates from occupational cohort studies. Multiple factors contribute to HWE bias that is commonly characterised as confounding due to the selection of individuals with “better health status” who are more likely to gain and retain employment relative to a general population including non-employed persons. Comparisons between standardised mortality ratios (SMRs) estimated from reference population rates with different characteristics allow for quantitative evaluation of different components of the HWE. **Method** Data from over five decades for a company-wide mortality registry comes from life insurance claims, and deaths are validated against the U. S. National Death Index. Average person-years at risk during five-year calendar periods for the occupational cohort population are estimated. The expected mortality counts are specific to age, sex, race, and calendar-time period strata. SMRs are calculated based on the mortality rates for the general U. S. population and the company-wide population. **Results** From 1956 through 2012, the annual US employee population has ranged from 29 000 to 108 000 workers. The mortality registry includes over 80 000 deaths validated through 2010, 25% due to malignant neoplasms and 37% due to cardiovascular diseases. **Conclusions** The HWE influences the interpretation of standardised estimates from occupational studies. Comparisons for different reference populations can evaluate differential HWE bias of associations between occupational exposure and mortality. Analyses based on company reference rates identify contributions from components of the HWE based on comparable demographic characteristics, a similar likelihood of obtaining and retaining employment, and an equivalent potential for ascertainment of mortality outcomes.
mortality counts using adjusted rates for national and regional DuPont worker populations. Robust specification of priors will be sought. Implementation of the calculations will be developed in common software.

Conclusions We plan to develop a method for SMR calculation that accounts for the healthy worker selection effect both in the point estimate and uncertainty interval.

0310 NAPPING DURING NIGHT SHIFT AND SELF-REPORTED HYPERTENSION AMONG NURSING WORKERS

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10.1136/oemed-2014-102362.377

Objectives Night and shift work are suggested risk factors for hypertension. Considering the relationship between sleep deprivation and blood pressure, this study focuses on self-reported hypertension and napping during night shift. Our aims are (1) to analyse the prevalence of hypertension among day and night workers and (2) to test the association between napping regularly during night shifts and prevalence of hypertension among night workers.

Method This cross-sectional questionnaire study was carried out at 18 public Brazilian hospitals in 2010–2011 (N=3229 registered nurses). Only women workers were included in the analysis (N=1992). Statistical treatment of data was carried out in two steps: (i) assessing self-reported hypertension considering work schedule and (ii) analysing nap habits during night shifts and self-reported hypertension.

Results Mean age was 39.9 (SD=10) years. Napping during the night shift (for up to three hours) increased the odds of self-reported hypertension 1.8-fold (95% CI 1.36–2.45) compared with day workers with no experience on night shifts, after adjusting for age, physical activity, smoking habits, and housework. Among night workers, sleeping during the night shift reduced the odds of reporting hypertension (OR=0.79; 95% CI 0.63–1.00), compared to those who reported not to sleep during the night shifts.

Conclusions The higher prevalence of hypertension among shift workers was confirmed. Dipping patterns and blood pressure control may be influenced by short periods of sleep in night shifts. The potential positive effect of naps on blood pressure deserves further investigation through automatic monitoring.

0341 COUNTERFACTUALS, QUANTUM MECHANICS AND G-ESTIMATION: CAUSALITY THREATENS EPIDEMIOLOGY

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10.1136/oemed-2014-102362.378

Objectives Causal reasoning should have an explicit formal structure.

Method Such a structure can be provided with the help of counterfactuals. This approach allocates different versions (factual and non-factual) of exposures and responses to every basic study unit (e.g., a subject observed at one point of time). Comparisons of these versions within the unit imply causal statements about the effect of exposures. This approach may appear unusual and strange but it is consistent to basic principles of modern physics (superposition principle of quantum mechanics).

Results The outline of causality in counterfactual terms is helpful to solve problems like defining and measuring direct and indirect causal paths or to specify biases and adjusting procedures. In contrast to experimental research observational studies (like those performed in epidemiology) suffer from missing randomization. A causal concept is important to understand the reliability of such studies: a strict counterfactual framework motivates to analyse observational studies in terms of generalised treatments (“G”). G-estimation is a procedure that defines the causal effect estimates on the individual level by counterfactual failure times. Causal models are nested within estimating models (“structurally nested failure time models”).

Conclusions Such a strict counterfactual reasoning challenges standard estimators and estimating procedures usually applied in epidemiology.

0348 THE HEALTHY WORKER SURVIVOR EFFECT DISSECTED: ADDRESSING COMPONENT PARTS

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10.1136/oemed-2014-102362.379

Objectives The healthy worker survivor effect (HWSE) is a well-recognised bias usually described as a form of selection bias or confounding. A more precise epidemiologic explanation, however, has been elusive. We distinguish several components of the HWSE and suggest methods for bias correction in occupational cohort studies.

Method Although generally referred to a single effect, we demonstrate using simulation studies that there are in fact four distinct aspects of the HWSE. Two aspects, (1) time-varying confounding by variables on the causal pathway and (2) heterogeneity in susceptibility, are functions of the underlying process of the exposure and disease under study. The other two, (3) left truncation and (4) right truncation, are functions of how the data are collected, ie the study design. We quantify the bias induced by each aspect of HWSE on dose-response parameter estimates and apply methods designed to reduce the bias.

Results We find that causal techniques, eg, g-estimation and IPTW, can correct for time-varying confounding. Heterogeneous susceptibility in combination with either left or right truncation can be corrected using inverse probability of censoring weights. The health related variables needed to make either of these methods succeed in reducing the bias are often unmeasured.

Conclusions HWSE occurs due to the presence of any of four factors that may function separately or in concert to produce a downward bias if not accounted for. We provide guidance for methodologic approaches to reduce the bias.

0351 G-ESTIMATION: WHY DOES IT WORK AND WHAT DOES IT OFFER?

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10.1136/oemed-2014-102362.380
Objectives Standard data analysis procedures provide biased answers to etiologic questions in occupational studies. G-estimation is an alternative that allows researchers to avoid healthy worker survivor bias, and its results can be expressed as estimates of the impacts of hypothetical policy interventions.

Method Rather than estimating the association between observed exposure and observed outcome, g-estimation models the counterfactual outcomes under no exposure as a function of observed outcomes and exposures. Adjustment for confounders is achieved by predicting exposure conditional on those confounders and on the counterfactual outcome. The method leverages the assumption that all confounders are measured: within strata of the measured confounders, observed exposure is “randomised” – that is, statistically independent of counterfactual outcome. This allows for correct adjustment for time-varying confounders affected by prior exposure and thus avoids healthy worker survivor bias.

Results Results can be expressed in terms of the impacts of hypothetical exposure limits. For example, after g-estimation of an accelerated failure time model, counterfactual survival times under a series of specified exposure limits can each be compared to observed survival time. This allows the researcher to report estimates of the total number of years of life that could have been saved by enforcing each limit.

Conclusions G-estimation is a valuable tool for occupational epidemiologists because it can both prevent bias due to the healthy worker survivor effect and estimate the impacts of hypothetical exposure limits.
Symposiums

Results The presentations will provide examples of how such models can offer a richer description of epidemiologic associations. Insights may be important when risk assessments are based on epidemiologic results that assess cumulative exposures without consideration of exposure patterns or age-related susceptibility.

Conclusions Models that encompass dynamic aspects of exposure should be encouraged in risk modelling. Such models may also provide information about biologic pathways of disease, leading to better understanding of (for instance) the impact of metabolic saturation on the observed exposure–response curve, or the natural progression of the disease.

0368 DISENTANGLING THE EFFECT OF EXPOSURE DURATION, INTENSITY, AND TIME SINCE EXPOSURE IN STUDIES OF CHRONIC HEALTH EFFECTS
Jelle Vlaanderen, Lutzen Portengen, Roel Vermeulen. IRAS Utrecht University, Utrecht, The Netherlands
10.1136/oemed-2014-102362.384

Objectives Due to their interrelatedness, modelling independent effects of intensity, duration, and time since exposure on disease risk is complex. The indiscriminate use of the cumulative exposure metric (product of intensity and duration of exposure) might bias reported associations between exposure to hazardous agents and disease risk. We explored the use of a general framework to flexibly model the effects of intensity, duration, and time since exposure on chronic disease.

Method We will provide examples of models falling within the flexible framework. One of such models is an excess relative risk model that is linear in cumulative exposure and exponential in the intensity (or duration) of exposure and time since cessation. This model has been applied successfully to explore effect modification of cumulative exposure by intensity (or duration) of exposure for a number of exposures. We will demonstrate the application of this model in two studies of smoking and chronic disease.

Results In our example the excess relative risk model generally fits the data best. In both studies we observed a strong effect of time since cessation. We observed effect modification by intensity of smoking in one study.

Conclusions Application of flexible models will provide insight into whether the use of cumulative exposure in an epidemiological analysis is justified or whether reducing complex exposure history to a metric such as cumulative exposure is overly restrictive. Combining information on observed patterns of effect modification with mechanistic insights might contribute to the incorporation of biological hypotheses in the development of more biologically relevant exposure metrics.

0376 PROTRACTING EXPOSURES
David Richardson. Department of Epidemiology, Chapel Hill, NC, USA
10.1136/oemed-2014-102362.385

Objectives When an exposure is protracted or repeated over time, questions arise regarding variation in the effect for different temporal patterns of exposure. We review approaches to describe variation in an exposure’s effect as a function of age-at-exposure, time-since-exposure, and exposure rate. These models implicitly assume that the effect of an exposure increment on subsequent disease risk depends upon its intensity and time-since-exposure, but not upon the intensities of prior exposures.

Then, we consider the possibility that the effect of an exposure is dependent upon earlier exposures. We use the term ‘desensitisation’ to refer to the scenario in which a person’s response to an exposure diminishes if they have been previously exposed to it. We use the term ‘sensitisation’ to refer to the scenario in which a person becomes more susceptible to the effect of an exposure if they have been previously exposed to it.

Method We propose a general model for analysis of disease rates in a setting of protracted or repeated exposure that encompasses (de)sensitisation. We illustrate the model using empirical data from a cohort mortality study.

Results The presentation provide examples of how such models can offer a insights into a notion of interaction between an exposure at one point in time and later exposure to the same agent.

Conclusions The possibility that an exposure’s effect may depend upon prior exposure to it is often considered in narrative descriptions of etiological processes, yet not readily accommodated by most standard approaches for analysis of protracted occupational and environmental data.

0377 REPRODUCTIVE EFFECTS OF WORKING NIGHT AND ROTATING Shifts
Christina Lawson. The National Institute for Occupational Safety and Health, Cincinnati, Ohio, USA
10.1136/oemed-2014-102362.386

Objectives Recent studies suggest that shift workers who experience exposure to light at night could be at increased risk for adverse reproductive outcomes.

Method Defined by cyclical patterns of circulating hormones, the reproductive system is vulnerable to shifts in circadian rhythms, either through sleep disturbances, altered melatonin production, exposure to light at night, or some other mechanism. Several occupational groups, including health care workers, law enforcement, firefighters, and manufacturing workers are required to work night shifts. Worldwide, millions work at least one night per month.

Results Research will be reviewed on shift work and reproductive outcomes, including menstrual cycle patterns, fertility, pregnancy loss, preterm delivery, and birth weight. The limitations of current research will also be discussed: is there a dose response effect from the number of years of shift work, or can the effects be reversed once shift work stops? Are there different effects from permanent night shift versus rotating shift involving nights?

Conclusions Future research needs will be identified, including the need for validation of self-reported shift work data and the mechanisms by which shift work affects reproductive health. Recommendations for shift workers and employers will be explored.

0380 DYNAMICS OF EXPOSURE AND DISEASE PROGRESSION: THE USE OF COMPARTMENTAL MODELS
Marc Chadeau-Hyam. Imperial College, London, UK
10.1136/oemed-2014-102362.387

Objectives Chronic diseases are usually slow-developing condition and their risk may result from both long-term exposure and successive exposure increments, hence calling for models accounting for dynamics of exposure and disease progression.
Method Discrete compartmental models are defined by a set of ordered states (compartments) reflecting the health status, and can be fully characterised by the set of transition probabilities between each compartment. When defined at the individual level, each participant contributes to the likelihood of the model at each year from the time of entering the initial stage (e.g. birth) to the moment they reach an absorbing state (e.g. death or clinical onset). Model estimation aims at quantifying the transitions ensuring the best reconstruction of the pathological trajectories in each subject, hence adding to the classification problem (discriminating healthy and diseased subjects) a dynamic component (estimating the time of onset).

Individual exposure histories can be summarised through cumulative exposure functions and subsequently plugged into the compartmental framework as parameters of transition probabilities.

Results While these models were initially developed to accommodate data from longitudinal studies, we will illustrate, using lung cancer cases, control and a varying history data, the validity and utility of such approaches. We will assess the underlying assumptions yielded by this methodological drift and will exemplify the rich statistical inference these approaches are able to provide.

Conclusions We will finally introduce potential extensions over this framework that include omics biomarkers to model genetically-driven susceptibility and/or to identify the stage (s) at which exposure (s) are more likely to mediate their effects.

0410 LONG NIGHT SHIFTS AMONG HEALTH WORKERS AND PHYSICAL AND MENTAL HEALTH: THE INFLUENCE OF ON-SHIFT NAP AND DOMESTIC WORK
Lucia Rotenberg, Rosane Griepe, Aline Silva-Costa, Luciana Portela, Thiago Diniz, Adenilda Amuda. Oswaldo Cruz Foundation, Rio de Janeiro, Brazil

Objectives This presentation during the Shift work Symposium aims to discuss data on physical and mental health among health workers, considering the relevance of on-shift naps and routine housework. In addition, the presentation aims also to analyse the cumulative exposure to night work.

Method Data to be presented are based on several epidemiological studies among nursing teams working at 18 Brazilian public hospitals. Databank includes information on socio-demographic and health. Data on work refers to the allowance (or not) to take naps during the night shift and nap regularity. Occupational history data considers (i) whether day workers have worked at night in the past and for how long and (ii) the reasons for quitting night work among former night workers.

Results The allowance for taking naps was observed in all studied hospitals. On-shift nap is a frequent practice among nursing workers. The analysis of occupational history revealed to be relevant as regards physical and mental health. Among former night workers, those who quitted night work for health reasons are at a higher risk of reporting mental suffering.

Conclusions Housework demands seem to aggravate sleep deprivation related to night work, despite evidences of beneficial effects of on-shift naps on workers’ recovery. The specific study of former night workers has revealed to be a fruitful approach in studies on health, obesity included, lifestyle and habits, as well as sleep disturbances. Occupational history is an adequate approach for a comprehensive understanding of the impact of night work on health.

0422 CORONARY ARTERY DISEASE MORTALITY AMONG WORKERS EXPOSED TO CARBON DISULFIDE AND SHIFT WORK AT A CHEMICAL MANUFACTURING PLANT
Tania Carreño, Misty Hein, Kevin Hanley, Susan Viet, Avima Ruder. National Institute for Occupational Safety and Health, Cincinnati, Ohio, USA; Westat, Bethesda, Maryland, USA

Objectives Previous studies at a New York State chemical manufacturing plant reported elevated risks of cardiovascular disease among workers. We updated the mortality experience of 1874 workers employed between 1949 and 2006 through December 31, 2007. We investigated exposures to carbon disulfide and shift work and their association with coronary artery disease.

Method Jobs with carbon disulfide and shift work exposure (≥1 day) were identified among departments and job titles in specific years. Standardised mortality ratios (SMR) compared mortality to the US population, adjusted for gender, race, age, and calendar year. Internal comparisons used directly standardised rate ratios (SRR).

Results Overall, excess deaths were observed for coronary artery disease (SMR=1.24, 95% CI 1.04–1.48). Most workers exposed to carbon disulfide performed shift work; we evaluated coronary artery disease mortality in groups defined by duration of exposure to these agents. Compared to the US population, statistically significant increases in mortality were observed among workers with both exposures for 90 days or more (SMR=1.36, 95% CI 1.03–1.76), and among workers with fewer than 90 days of both exposures (SMR=1.31, 95% CI 0.65–2.34). Using cutpoints of 4 years (median exposure duration among long-term cases), the results were no longer statistically significant. In internal comparisons, long-term workers exposed to carbon disulfide and shift work for 4 years or more had a near 3-fold increase in coronary artery disease mortality, compared to workers exposed less than 4 years.

Conclusions Excess coronary artery disease mortality confirms earlier results, but further investigation is needed to understand risk factors.

0430 INDIVIDUAL VARIABILITY, FROM CANDIDATE G*E TO GEWIS
Manolis Kogevinas, Centre for Research in Environmental Epidemiology (CREAL, Barcelona, Spain)

Objectives In the 1990s there were great expectations that the use of markers of genetic susceptibility would allow the identification of new occupational risks, a more complete characterisation of dose-response relationships and improved risk assessment. Several interaction studies were conducted examining candidate genes, for example on isocyanate exposure, genes in immune pathways (e.g. HLAII group) and occupational asthma, or studies on cancer, aromatic amines and the NAT2 gene.

Method Very few replicated in more than one population. Part of the problem was the small sample size and the selective
evaluation of candidate genes/SNPs. The availability of GWAS should, theoretically, solve the second problem. We have very few GEWIS (genome-wide interaction study) on occupational exposures and they suffer even more than candidate-gene studies from sample size and also from lack of available studies for replication.

**Results** Apart from exposures, GEWIS may help identify new diseases genes since many may only have an effect in combination with exposure. In addition GEWIS should provide a much more complete evaluation of specific pathways, e.g. oxidative stress. The use of a specific pathway-based approach is still valuable if based on biological knowledge. Contrary to major advances brought by molecular epidemiology, studies on gene-environment interactions have proven to be complex and with few well established findings.

**Conclusions** I will discuss reasons for this, discuss recent changes from the use of genome-wide analyses and compare with earlier approaches based on evaluations of interactions of occupational exposures with few candidate genes. I will provide examples from a recent GEWIS on occupational asthma.

**Objectives** Derivation of the exposure-response curve at low (occupational) exposures is often troubled by the fact that within epidemiological investigations power to discern the exposure-response curve (ERC) at low exposure levels is often limited. Conversely, we often observe non-linear exposure-response curves at the higher end of the exposure range which amongst others may be due to metabolic saturation.

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**Results** Studies on benzene exposed occupational populations have indicated 1) non-linear production of reactive metabolites at low levels of exposure; 2) non-linear production of benzene-oxide adducts; and 3) non-linear associations between benzene and hematotoxicity. This is of particular interest as there have been indications of a possible non-linear association between benzene and leukaemia in epidemiological studies.

**Conclusions** The evidence on a molecular and clinical level may provide evidence for a possible non-linear association between benzene and leukaemia and provides promise that molecular data can directly be integrated in epidemiological risk analyses to inform ERGs.

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ELUCIDATING MECHANISMS USING COMPARATIVE MOLECULAR EPIDEMIOLOGY: IMMUNOLOGIC ALTERATIONS IN WORKERS EXPOSED TO TRICHLOROETHYLENE AND FORMALDEHYDE

Qing Lan, Luoping Zhang, Roel Vermeulen, Wei Hu, Bryan Bassig, Wei Jie Seow, Meredith Shiels, Allan Hildesheim, Martyn Smith, Nat Rothman. Occupational and Environmental Epidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, US; Department of Environmental Health Sciences, School of Public Health, University of California at Berkeley, US; Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherland; Infections and Immunoepidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, US

Objectives There is a well-established connection between immune status and carcinogenesis, as an increased risk of cancer has been associated with a history of immunosuppressive medication use, with certain chronic infections such as HIV, and with certain autoimmune diseases and lifestyle factors which result in chronic immune alterations and abnormalities. Furthermore, more subtle changes in immune functioning, including imbalances in Th1/Th2 responses resulting from cytokine alterations, have been implicated in the oncogenic process via regulation of transcriptional factors and of tumor growth, angiogenesis, and cell differentiation and survival. Occupational exposures such as trichloroethylene (TCE) are hypothesized to increase cancer risk partly through immunological mechanisms. Characterizing the relationship between occupational chemical exposures and various immune markers could provide important insights into the link between occupational exposures, immunological responses to such exposures and subsequent cancer risk.

Method We previously have shown that occupational exposure to trichloroethylene and formaldehyde are associated with hematotoxic effects. Here, we compare the chemical-specific patterns of subsets of CD4 and CD8 cells and other immune-related markers from studies of factory workers exposed to these chemicals.

Results The complete blood cell count, lymphocyte subsets, and other immune markers from molecular epidemiology studies of occupational exposure to TCE and formaldehyde will be presented to evaluate the effect of these chemical exposures on immune marker concentrations.

Conclusions Our findings suggest that TCE and formaldehyde exposure can alter levels of immunologically active compounds and cell types in different patterns.
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