

**Conclusions** The presented simulation model may be used to evaluate the change in health outcomes that result from different intervention strategies for the MVR sector.

### 331 A DYNAMIC POPULATION-BASED MODEL FOR THE DEVELOPMENT OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

<sup>1</sup>E Tan, <sup>1</sup>Warren, <sup>1</sup>Fishwick, <sup>2</sup>Meijster, <sup>2</sup>Klein Entink, <sup>2</sup>Pronk. <sup>1</sup>Health and Safety Laboratory, Buxton, United Kingdom; <sup>2</sup>TNO, Zeist, The Netherlands

10.1136/oemed-2013-101717.331

**Objectives** We present a mathematical model for the development of chronic obstructive pulmonary disease (COPD), incorporating population dynamics, trends in smoking, and occupational exposure to respirable dust, fumes and gases. The model simulates a population of workers longitudinally throughout their lifetimes and allows us to study the combined effects of smoking and exposure on the development and progression of COPD.

**Methods** The model comprises: a population model, describing the attributes and dynamics of the population; a smoking model, representing demographic and individual trends in smoking; an exposure component, characterising inter- and intra-individual variation and temporal trends in occupational exposures; and a disease component, describing changes in FEV1, FVC, symptoms and exacerbations. Lung function parameters associated with a “healthy” population were estimated from international health surveys. Annual mean excess declines in FEV1 relating to smoking and occupational exposure to several agents, including coal dust and silica, were sourced from literature. Inter-individual variation in declines encapsulates susceptibility of individuals, some of whom will experience especially deleterious effects of smoking and exposure. Sensitivity analysis provides information on the most influential parameters and uncertainties associated with the model.

**Results** A preliminary simulation without occupational exposure predicted a current prevalence of >10% in males of working age, consistent with a recent Health Survey for England study, and a modest decline over the next 30 years due to recent trends in smoking participation rates. Using coal dust as a surrogate for poorly soluble dusts, the model confirms that reduction in long-term exposure decreases an individual’s risk of developing COPD, with the greatest impact in non-smokers.

**Conclusions** The model provides us with valuable information on current and future trends in COPD in Britain. It may be used to assess the effects of reducing levels of exposure or of introducing health surveillance.

### 332 DURATION AS A PROXY FOR CUMULATIVE EXPOSURE: SHOULD WE TRUST POSITIVE RESULTS?

<sup>1</sup>F Barone Adesi, <sup>2</sup>Burstyn. <sup>1</sup>National Cancer Institute, Bethesda, United States of America; <sup>2</sup>Drexel University, Philadelphia, United States of America

10.1136/oemed-2013-101717.332

**Objectives** We considered a problem common to occupational epidemiology, where cumulative exposure is the true dose metric for disease but investigators are only able to measure duration of exposure.

**Methods and Results** We considered the problem from the theoretical perspective and explored our results in simulations of an occupational cohort of medium size. The duration of exposure is related to cumulative exposure by measurement error with some properties of Berkson-type error. This arises because cumulative exposure = duration\*intensity and can be re-written as true = observed\*error, with error term having distribution of average long-term exposure intensity for a worker. When duration and intensity are independent, the theory predicts that fitting duration instead of cumulative exposure will not inflate probability of type-I error under the null hypothesis. However, when there is an association between cumulative exposure and the outcome, loss of power to detect an association is expected. In practice, data do not always conform to assumptions made in the theoretical study. We confirmed these predictions in a simulation study for a cohort of 1000 workers with rare outcome in unexposed and with varying correlation of intensity and duration. We first analysed the data using logistic regression models including metrics of exposure as continuous variables. We then explored the situation where exposure groups are formed using quartiles of observed exposure metrics among “cases” and odds in the highest quartile are compared to the lowest. Patterns observed in both analyses were consistent with those expected from theory.

**Conclusions** Epidemiologists should be more confident in interpreting positive results that arise from use of duration of exposure in lieu of true dose metrics when it is cumulative exposure because type-I error remains at nominal values. The interpretation of null associations remains difficult due to loss of power.

### 333 ADAPTING AN INTERRUPTED TIME SERIES DESIGN TO VOLUNTARILY REPORTED SURVEILLANCE DATA: ADVANTAGES OF STATISTICAL INTERACTIONS IN REDUCING BIAS

S J Stocks, McNamee, Carder, Agius. University of Manchester, Manchester, United Kingdom

10.1136/oemed-2013-101717.333

**Objectives** To describe the method we use to identify temporal associations between events such as changes in legislation and changes in the incidence of work-related ill-health (WRI) using surveillance data and to show some examples applying this method.

**Methods** The Health and occupation reporting network (THOR) collects reports of work-related ill-health from clinical specialists. Previously we have published a method to analyse time trends in the incidence of WRI using a 2 level negative binomial regression model with beta distributed random effects<sup>1</sup>. The model also controls for calendar time, reporter type (monthly or annual reporter) and first month as a new reporter. One variable that influences reporting to the THOR surveillance scheme is the length of membership time *i.e.* reporters tend to report fewer cases after longer membership time resulting in an inherent downward trend in incidence. In an attempt to mitigate this effect, alongside other factors affecting trends in reporting that are not directly related to the incidence of WRI, we have employed a segmented interrupted time series design and included statistical interaction terms in the model. Briefly time periods describing the time periods pre and post-event, and groups representing cases and comparators are prospectively defined. Groups are usually defined by occupation and/or suspected agent. Comparisons are made of the estimated change in incidence per reporter according to inclusion or exclusion within a group.

**Results** This method has been applied to estimate the effect of events anticipated to influence the incidence of short latency WRI (e.g. asthma, dermatitis). Examples will be shown.

**Conclusions** THOR data can contribute to the evaluation of the impact of events such as changes in legislation or interventions.

## Session: 21. Low back pain

### 334 DIFFERENCES IN RISK FACTORS FOR NEUROPHYSIOLOGICALLY CONFIRMED CARPAL TUNNEL SYNDROME AND ILLNESS WITH SIMILAR SYMPTOMS BUT NORMAL MEDIAN NERVE FUNCTION

<sup>1</sup>D Coggon, <sup>1</sup>G Ntani, <sup>1</sup>E C Harris, <sup>1</sup>C Linaker, <sup>2</sup>R Van der Star, <sup>1</sup>C Cooper, <sup>1</sup>K T Palmer. <sup>1</sup>University of Southampton, Southampton, United Kingdom; <sup>2</sup>University Hospital Southampton, Southampton, United Kingdom

10.1136/oemed-2013-101717.334

**Objectives** To explore whether neurophysiologically confirmed carpal tunnel syndrome (CTS) has different risk factors from sensory symptoms in the hand that occur in the absence of impaired median nerve conduction.

**Methods** We compared 475 patients with neurophysiologically confirmed (NP+ve) CTS, 409 patients investigated for CTS but negative on neurophysiological testing (NP-ve), and 799 controls. Exposures to risk factors were ascertained by self-administered questionnaire. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were estimated by logistic regression.

**Results** NP+ve CTS was associated with obesity, use of vibratory tools, repetitive movement of the wrist or fingers, poor mental health and workplace psychosocial stressors. NP-ve illness was also related to poor mental health and occupational psychosocial stressors, but differed from NP+ve disease in showing associations also with prolonged use of computer keyboards and tendency to somatise, and no relation to obesity. In direct comparison of NP+ve relative to NP-ve cases, the most notable differences were for obesity (OR 2.7, 95% CI 1.9–3.9), somatising tendency (OR 0.6, 95% CI 0.4–0.9), diabetes (OR 1.6, 95% CI 0.9–3.1) and work with vibratory tools (OR 1.4, 95% CI 0.9–2.2).

**Conclusions** When viewed in the context of earlier research, our findings suggest that obesity, diabetes, use of hand-held vibratory tools, and repeated forceful movements of the wrist and hand are causes of impaired median nerve function. In addition, sensory symptoms in the hand, whether from identifiable pathology or non-specific in origin, may be rendered more prominent and distressing by hand activity, low mood, tendency to somatise, and psychosocial stressors at work.

### 335 ERGONOMIC INTERVENTIONS IN NURSING FACILITIES: LONG-TERM EFFECTIVENESS OF A COMPREHENSIVE PROGRAM

A G Garg, J M K Kapellusch. University of Wisconsin-Milwaukee, Milwaukee, United States of America

10.1136/oemed-2013-101717.335

**Objective** Determine long-term efficacy of a comprehensive, multi-facility ergonomic intervention, utilising patient handling devices and participatory approach, on patient handling injuries to nursing personnel and comfort and safety of patients.

**Background** Musculoskeletal injuries (MSDs), in particular back and shoulder injuries, are a major problem for nursing personnel

in patient care. In USA, nursing aides (NAs) have the highest incidence rate of days-away-from-work injuries and illnesses (465/10,000 workers) from MSDs, a rate more than seven times the national MSD average for all occupations. The majority of injuries and illnesses (56%) among NAs involved contact with patients, with 86% of those injuries due to overexertion.

**Methods** A pre-post design (pre: 38.9 months, post: 51.2 months) was used to evaluate the efficacy of an ergonomic intervention using patient handling devices in six long-term care facilities and one chronic care hospital. Each facility formed teams consisting of: worker representatives, management, and an ergonomic specialist. These teams developed comprehensive ergonomics programs using participatory approach to reduce patient handling injuries, primarily through implementation of “no-manual-lifting-policies”.

**Results** Compared to pre-intervention, post-intervention data showed significant reductions in: injuries (59.8% reduction), lost workdays (86.7%), modified duty days (78.8%) and worker's compensation costs (WCC) (90.6%) associated with patient handling activities ( $p < 0.001$ ). The mean of payback periods was 15 months.

Patient handling devices were rated to be less stressful on the low back ( $p < 0.001$ ), shoulders ( $p \leq 0.008$ ) and wrists ( $p \leq 0.005$ ). Patients rated these devices as more comfortable ( $p \leq 0.007$ ) and safe ( $p \leq 0.010$ ) than manual lifting methods. The programs had no effect on staffing levels.

**Conclusions** This study demonstrates that comprehensive ergonomics programs, properly utilising patient handling devices, are effective in reducing patient handling injuries, lost workdays, modified duty days, and WCC as well as improving patient comfort and safety during patient transfers.

### 336 RISK FACTORS FOR NEW-ONSET SCIATICA IN JAPANESE WORKERS: FINDINGS FROM THE JAPAN EPIDEMIOLOGICAL RESEARCH OF OCCUPATION-RELATED BACK PAIN (JOB) STUDY

<sup>1</sup>M K Matsudaira, <sup>2</sup>Kawaguchi, <sup>3</sup>Isomura, <sup>4</sup>Arisaka, <sup>5</sup>Miyoshi, <sup>6</sup>Konishi. <sup>1</sup>Kawasaki, Japan; <sup>2</sup>Clinical Study Support, Inc., Nagoya, Japan; <sup>3</sup>Institute of Medical Science, Tokyo Medical University, Tokyo, Japan; <sup>4</sup>Kanto Rosai Hospital, Kawasaki, Japan; <sup>5</sup>Spine Center, Yokohama Rosai Hospital, Yokohama, Japan; <sup>6</sup>Department of Orthopaedic Surgery, Nagasaki Rosai Hospital, Nagasaki, Japan

10.1136/oemed-2013-101717.336

**Objective** To identify potential risk factors for the development of new-onset sciatica in initially symptom-free Japanese workers with no history of sciatica.

**Methods** Two-year, prospective cohort data collected for the Japan Epidemiological Research of Occupation-related back pain (JOB) study were used for the analysis. In total, 5,310 participants responded to a self-administered baseline questionnaire (response rate: 86.5%). Furthermore, 3,194 (60.2%) completed both 1- and 2-year follow-up questionnaires. The baseline questionnaire assessed individual characteristics, ergonomic work demands, and work-related psychosocial factors. The outcome of interest was new-onset sciatica with or without low back pain (LBP) during the 2-year follow-up period. Incidence was calculated for participants who reported no history of lumbar radicular pain (sciatica) and no LBP in the past year prior to baseline. Logistical regression assessed risk factors associated with new-onset sciatica.

**Results** Of 765 eligible participants, 141 (18.4%) reported a new episode of sciatica during the 2-year follow-up. In crude