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

[1]E Tan, [1]Warren, [1]Fishwick, [2]Meijster, [2]Klein Entink, [2]Pronk. [1]*Health and Safety Laboratory, Buxton, United Kingdom;* [2]*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?

[1]F Barone Adesi, [2]Burstyn. [1]*National Cancer Institute, Bethesda, United States of America;* [2]*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[1]. 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.