

(17.3 yrs) for ALS mortality through linkage with Statistics Netherlands. Information on occupational history and potential confounders such as sex, age, smoking, alcohol use, BMI, physical activity and educational level were collected at baseline through a self-administered questionnaire.

Occupations were coded using the International Standard Classification of Occupations (ISCO-88). Occupational exposures were assigned through several job-exposure matrices (JEMs): ALOHA-JEM (solvents, pesticides), DOM-JEM (diesel exhaust, metals), an extremely low frequency magnetic fields (ELF-MF)-JEM and an electrical shock-JEM. Assigned exposure levels were ordinal (background or no exposure, low exposure, high exposure). Exposure measures included 'ever exposure' (ever had a job with high or low exposure) and cumulative exposure. Associations between occupational exposures and ALS mortality were analysed separately for men and women, using Cox-regression. Hazard ratios (HR) and 95% confidence intervals (CI) were estimated using attained age as underlying time scale.

Results 79 cases of ALS were identified in men and 62 in women. In men, ever a job with ELF-MF exposure versus background showed an association with ALS-mortality (ever low HR: 1.51 (95% CI 0.93 - 2.45); ever high HR: 1.95 (95% CI 0.92 - 4.16), and an exposure-response relationship in cumulative exposure (HR third tertile of exposed: 1.87 (95% CI 1.04 - 3.33). Exposure to solvents also showed some significant associations, but no clear exposure-response relationship. Including exposure to electrical shocks or chlorinated solvents into the model only marginally changed the association between ELF-MF and ALS mortality.

Conclusions Of the occupational exposures analysed in this study, only occupational ELF-MF exposure showed a consistent association with ALS mortality.

questions and subsequently rules were written to assign exposure levels to diesel exhaust, pesticides, and solvents. We estimated exposure prevalence for control parents, separately for men and women, and used Kappa statistics to describe the agreement between the two exposure assessment methods.

Results For men, the agreement between the exposures assessed by algorithm and by expert was good to excellent for all three agents at a job level ($\kappa = 0.60-0.83$) and person level ($\kappa = 0.65-0.86$). Overall, exposure prevalence was much lower among women. Agreement was good for diesel exhaust and solvents at both job ($\kappa = 0.67$ and $\kappa = 0.69$) and person level ($\kappa = 0.70$ and $\kappa = 0.72$). Lower agreement was observed for pesticide exposure ($\kappa = 0.40$ for jobs, $\kappa = 0.48$ at person level).

Conclusions The rule-based assessment approach appeared to be an efficient way to assign occupational exposure levels in a community-based case-control study for a range of occupational exposures. It has been successfully applied in a recent study on childhood brain tumours to assess parental occupational exposures to diesel exhaust and pesticides.

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USING HIERARCHICAL CLUSTERING METHODS TO IDENTIFY JOBS WITH SIMILAR RESPONSE PATTERNS IN A POPULATION-BASED CASE-CONTROL STUDY

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Objectives Studies have demonstrated the utility of developing expert-based decision rules based on questionnaire response patterns to assign exposure in population-based studies. However, each expert may identify different response patterns to represent exposure scenarios. To improve the reproducibility of identifying these patterns and increase the efficiency of assigning exposures, we used hierarchical clustering methods to identify groups of jobs (clusters) with similar response patterns.

Methods For each job module in the New England Bladder Cancer Case-Control Study, we applied Ward's average linkage hierarchical cluster models to the questionnaire responses related to occupational diesel exhaust exposure to identify the most distinct 25 and 50 clusters of jobs per module. We assessed the clusters' homogeneity based on the proportion of jobs assigned the same probability category (<50% vs. ≥50% probability of occupational diesel exhaust exposure) from a previous expert-based assessment of each job. A cluster was 'homogeneous' if ≥75% of the jobs were assigned the same probability category. Here we present the results for three modules: carpenter (357 jobs, 17% exposed, 52 unique response patterns), office professional (3,328 jobs, 22% exposed, 87 unique response patterns), and truck driver (508 jobs, 74% exposed, 404 unique response patterns).

Results For carpenters, 76% and 90% of the groups were homogeneous based on 25 and 50 clusters, respectively. For office professionals, 84% and 78% of the groups were homogeneous based on 25 and 50 clusters, respectively. For truck drivers, 76% and 70% of the groups were homogeneous based on 25 and 50 clusters, respectively. b

Session: 13. Exposure assessment methods I

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RULE-BASED EXPOSURE ASSESSMENT VERSUS CASE-BY-CASE EXPERT ASSESSMENT USING THE SAME INFORMATION IN A COMMUNITY-BASED STUDY

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Objectives Retrospective exposure assessment in community-based studies is largely reliant on questionnaire information. Expert assessment is often used to assess lifetime occupational exposures, but these assessments generally lack transparency and are highly time-consuming. A recent study assessing occupational exposure to diesel exhaust suggested that applying an algorithm may improve efficiency, consistency and transparency of the exposure assessment process. It is however unknown whether the observed advantages are generalisable to other occupational exposures. We explored the agreement between a rule-based assessment approach and the original case-by-case expert assessment of occupational exposure to diesel exhaust, pesticides and solvents in a community-based study.

Methods We used data from a case-control study of childhood acute lymphoblastic leukaemia in which parental occupational exposures were originally assigned by expert assessment. From the available questionnaires, we have now identified key

Conclusions There was reasonable homogeneity using 25–50 clusters per module (representing 3–15% of the number of jobs per questionnaire), but important heterogeneity remained. A more efficient use of expert judgment may be to assess exposure at the cluster-level and then, within expert-identified heterogeneous clusters, at the job-level.

290 VALIDATION OF QUESTIONNAIRE ITEMS AMONG DUTCH CONSTRUCTION WORKERS USING DIRECT WORKPLACE OBSERVATIONS

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Objectives Contact dermatitis is widely present among construction workers. The risk of developing occupational contact dermatitis among this group is probably related to occupational exposure to chemicals. In addition, frequency of glove use and exposure to water during hand washing may also influence the prevalence of hand eczema. The aim of this project was to validate questionnaire items on hand dirtiness and glove use by comparing with direct workplace observations.

Methods A cross-sectional study was conducted at 13 different construction sites in the Netherlands. The questionnaire covered general information such as age, gender, occupation and specific questions regarding hand conditions, glove use, glove types, glove replacement, frequency of hand washing and possible symptoms of hand eczema during the last 12 months.

Data of 177 participants (95% response rate) were analysed. Agreement between observation and questionnaire was assessed by calculating Cohen's kappa. In addition, the sensitivity and specificity were determined. Multivariate analysis was conducted to assess the association between hand eczema and workplace determinants.

Results Observation of hand dirtiness, glove use and glove types were found to agree well with questionnaires, with kappa's of 0.75, 0.61 and 0.88 respectively. The 1-year prevalence of hand eczema was 45.8%. Multivariate logistic regression analysis with hand eczema as dependent variable showed a statistically significant correlation with 'hand cream use' (PR 2.4 (95% CI: 1.6 to 3.8)) and 'hand washing efforts' (PR 1.5 (95% CI: 1.1 to 2.0)). There was also a significant positive association between hand eczema and 'hand dirtiness' and 'glove use'.

Conclusions There is a strong correlation found between direct observations and questionnaire. Therefore, it is reasonable to consider that these questionnaire items are suitable to be used in future epidemiological studies. Hand eczema was often reported and was positively associated with potential determinants of exposure asked for in the questionnaire.

291 OCCUPATIONAL EXPOSURE TO ISOCYANATES; A BASELINE EXPOSURE ASSESSMENT AS BASIS FOR AN INTERVENTION STRATEGY

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Objectives Occupational exposure to isocyanates has been associated with the development of occupational asthma. This study

serves as baseline measurement within an intervention study, aimed at 1) conducting a detailed exposure assessment and determine exposure determinants, 2) providing input for the development of a broad intervention strategy, and 3) evaluating the effectiveness of respiratory protection.

Methods Personal task-based inhalation samples for mixing, spraying and gun cleaning were collected among 37 workers, divided over eighteen companies. Relevant information regarding potential exposure determinants and behavioural and organisational factors was obtained by performing a walk through survey and a questionnaire. Mixed effect regression models were used to identify associations between exposure and work practices, behavioural factors (e.g. knowledge, awareness), and organisational factors (e.g. support towards OSH-programs). The level of respiratory protection during workplace activities was assessed among 22 workers.

Results Spray painting results in the highest exposure levels compared (47 g/m³ NCO) to mixing and gun cleaning (respectively 0.15 g/m³ NCO and 0.7 g/m³ NCO). Worker orientation and spray location seem to be indicative for exposure. A full overview of our analyses and a first outline of the intervention strategy will be presented during the conference. The use of respirators seems task-dependent, where first analyses seem to indicate that the protection factor is above 95%.

Discussion Although we found decreased exposure levels compared to earlier studies, we still see possibilities for interventions to further decrease exposure. For instance through the organisation of work, the frequency of (proper) use of control measures, and further improvements in the use of respirators. The results of our exposure assessment will be used to perform health impact assessment, presented in another abstract.

Session: 14. Exposure assessment II

292 ASSESSMENT OF PSYCHOSOCIAL EXPOSURE: HOW TO ESCAPE THE TRIVIALITY TRAP?

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Objectives Workplace bullying may be a strong determinant of major depression, but only a few studies provide prospective data and none provide independent information on bullying. In a follow-up study we analysed newly-onset depression in relation to workplace bullying measured at the individual level (perceived bullying) and at the work-unit level (witnesses reporting bullying).

Methods Danish employees were recruited from two Danish cohorts of 3.743 and 2.617 workers, respectively. Cohort members received a questionnaire at baseline in 2006–07 with two-wave follow-ups in 2008–09 and 2011. Workplace bullying was measured by self-labelling and by the proportion of employees in a work unit who had witnessed workplace bullying "now and