

Results Among 4,773 workers ever exposed to TFE, we found lower SMRs from most causes of death and increased SMRs for cancer of the liver (SMR 1.27; 95% CI: 0.55, 2.51; 8 deaths) and kidney (SMR 1.44; 95% CI: 0.69, 2.65; 10 deaths), and for leukaemia (SMR 1.48; 95% CI: 0.77, 2.59; 12 deaths). A non-significant upward trend ($P = 0.24$) by cumulative exposure to TFE was observed for liver cancer. TFE and APFO exposures were highly correlated, therefore their separate effects could not be disentangled.

Conclusions The pattern of findings in this large study substantially narrows the range of uncertainty on the possible cancer risk entailed by working in TFE synthesis and polymerisation, and justifies continuing efforts to minimise exposure, which has already dropped considerably over the years. However, the findings could neither conclusively confirm nor refute the hypothesis that TFE poses a carcinogenic risk to human beings. If a cancer hazard exists, then the risk is small, even in workers with relatively high exposure.

285 NASAL MRSA CARRIAGE IN FARMERS STRONGLY ASSOCIATED WITH MRSA AIR LEVELS

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Objectives MRSA carriage prevalence is as high as 60% in livestock farmers in the Netherlands. Human carriage was associated with carriage in animals. However, animal-to-human transmission and especially airborne exposure are poorly studied. We determined MRSA air levels and a possible dose-response relationship with nasal MRSA carriage in farmers.

Methods Human MRSA carriage and stable MRSA air levels were assessed in three independent populations of 38 assumed frontrunner pig farms (A), 50 random pig farms (B), and 49 veal calf farms (C). Farmers were identified as human participants spending on average ≥ 20 hours/week working on the farm. Per farm 1–6 electrostatic dust collectors (EDCs) were placed. Nasal swabs were taken from farmers and analysed for presence of MRSA by culturing and PCR. EDCs were analysed by qPCR, which resulted in an equivalent of the number of colony forming units (CFUeq) per EDC.

Results Mean MRSA air levels were lowest on veal farms and highest on pig farms. Generally, the average MRSA air levels corroborated with the MRSA nasal carriage prevalence in the three populations. Mean MRSA/EDC/farm for population A was 225 CFUeq (95%CI: 170–281); for population B it was 385 CFUeq (95%CI: 239–530), and for population C it was 59 CFUeq (95%CI: 26–93). Nasal MRSA carriage prevalences were 53% for population A, 72% for population B, and 31% for population C. Working hours ranged from 20–80 hours/week, with means of 48, 46, and 39 hours for population A, B, and C, respectively.

In a multivariate pooled analysis, a strong association between MRSA carriage and the mean MRSA concentration (expressed as log (MRSA)/EDCs/farm) was shown ($RR = 1.37$; $p = 0.0008$), independent of the association with working hours ($RR = 1.01$; $p = 0.03$) and adjusted for age, sex and smoking.

Conclusions Results suggest an important role of MRSA transmission through air, which has not been established earlier.

286 REDUCED HEALTHCARE-ASSOCIATED INFECTIONS FOLLOWING A UK WIDE CAMPAIGN PROMOTING HAND WASHING COINCIDED WITH INCREASED IN CONTACT DERMATITIS IN HEALTHCARE WORKERS

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Objectives Over the past decade there has been increasing concern among the public and government about high rates of healthcare associated infections and low levels of hand hygiene compliance. In response the “Cleanyourhands” campaign was rolled out from 2004 in all acute NHS hospital trusts. A national level evaluation of this intervention found a substantial increase in the use of hand cleaning products in acute trusts between 2004 and 2008, which was associated with a reduction in meticillin resistant *S aureus* and *C difficile* infections¹. This study aims to compare the increased usage of hand hygiene products¹ in acute NHS trusts with changes in the incidence of CD attributed to hand washing in healthcare workers.

Methods Reports of occupational CD to a surveillance scheme by dermatologists and occupational physicians (OPs) were analysed, using a prospective interrupted time series design with time periods matching those used in the evaluation of the “Cleanyourhands” intervention¹. Comparisons were made between reports attributed to frequent hand washing and other causal agents, to mitigate bias arising from the voluntary nature of the reporting scheme.

Results The incidence of CD attributed to hand washing was significantly increased relative to all other causes in healthcare workers following the “Cleanyourhands” campaign (statistical interaction; 95% CIs: dermatologists 2.19; 1.62 - 2.96, OPs 2.44; 1.15 - 5.18). The increase reported by dermatologists was predominantly irritant CD (2.58; 1.74 - 3.81) rather than allergic CD (1.04; 0.38 - 2.84).

Conclusion The increase in irritant CD reported by dermatologists, and all CD by OPs, is consistent with the increase in use of hand cleaning agents following the “Cleanyourhands” campaign. Attention should be paid to the adverse effects of frequent hand washing as well as prevention of infections.

¹Stone *et al* BMJ 2012;344:e3005 doi: 10.1136/oemed-2013-101717.333

287 OCCUPATIONAL EXPOSURES AND AMYOTROPHIC LATERAL SCLEROSIS MORTALITY IN A LARGE PROSPECTIVE COHORT

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Objectives This study aims to study multiple occupational exposures and their possible associations with Amyotrophic Lateral Sclerosis (ALS) mortality within the Netherlands Cohort Study (NLCS).

Methods For this case-cohort analysis, 120,852 persons aged 55 to 69 years at time of enrollment in 1986 were followed up

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(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

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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