

(aOR = 2.35; IC 95%: 1.02–5.44), whose monthly income decreased (aOR = 13.61; IC 95%: 1.49–124.35) or persisted in the lowest income range (aOR = 14.56; IC 95%: 1.46–144.89). This was also the case for those workers who continued their temporary documented (aOR = 5.05; IC 95%: 1.39–18.34) or undocumented (aOR = 36.59; IC 95%: 2.47–541.17) status. A decreased risk was observed in workers who became affiliated to the Social Security (aORa = 0.10; IC 95%: 0.02–0.48).

Conclusions There is an increase of poor mental health in immigrant workers in Spain related to the worsening of their employment conditions. At the same time, it was observed a decrease when Social Security protection increased.

209 AFTER HURRICANE SANDY, IMPLEMENTATION OF THE EXPANDED SYNDROMIC SURVEILLANCE FOR RECOVERY WORKERS AND RESIDENTS

¹H K Kim, ¹Liu, ²Tak, ¹Dropkin, ¹Moline, ¹Silverman. ¹Hofstra North Shore-LIJ School of Medicine, Great Neck, NY, United States of America; ²Massachusetts Department of Public Health, Boston, United States of America

10.1136/oemed-2013-101717.209

Objectives Hurricane Sandy brought wide spread devastation in the region of New York and New Jersey in USA. To our knowledge, there have been no official reports of the health effects from Hurricane Sandy since the day of Hurricane arrival 10/29 in 2012.

Methods To rapidly assess the health impacts of Hurricane Sandy among recovery workers and residents in the affected area, we are building an expanded syndromic surveillance system that integrates the near real-time electronic Emergency Department (ED) visit records collected from 14 EDs within a large health system in NY, the air quality index data from the Environmental Protection Agency (EPA), and the weather data from the National Oceanic and Atmospheric Administration (NOAA). Recovery workers will be identified from billing database. Approximately 50% of occupational/industrial information of ED patients are missing, however patients with work-related injuries and illnesses required to provide this information according to Worker's Compensation system in US. Through a multilevel case-crossover design, we aim to rapid identification of elevated health effects during four exposure windows we developed (the Pre-, During-, Short-term, and Long-term Post-Hurricane) by comparing ED records before (from 2005) and after Hurricane Sandy while adjusting for air pollution levels and weather conditions. The continuing monitoring during the fourth exposure window (i.e. Long-term Post-Hurricane) will ensure early detection of potential occurrences of chronic diseases stemmed from the initial disaster-related acute forms. The implementation of the syndromic surveillance within a large health system will not only improve the healthcare delivery, but also provide important information to the outside stakeholders such as public health agencies to enhance strategic planning for rapid post-disaster response.

210 ATTENUATION OF EXPOSURE EFFECTS OVER TIME: A SIMULATION STUDY

¹K Steenland, ²Karnes, ²Barry, ²Darrow. ¹Atlanta, United States of America; ²Emory U, Atlanta, Ga, United States of America

10.1136/oemed-2013-101717.210

Background Positive exposure-response trends often diminish at higher cumulative exposure, correlated with longer follow-up time. Depletion of susceptibles, increased measurement error at higher cumulative exposure, and saturation of biological pathways, have all been postulated as reasons for attenuation.

Methods We conducted simulations to evaluate rate ratios over time under different assumptions about susceptibility to exposure effects and measurement error; we evaluated exposure-response trends to determine whether attenuation was evident. We simulated a dynamic cohort in which entry occurred over time; the metric of interest was duration of exposure. We also considered cross-sectional analyses in which follow-up started only after a certain point of time. Simulations considered 10,000 subjects enrolled from 1940–2010 and followed through 2020. Ten simulations were conducted for each scenario and exposure-response parameters averaged. An excess relative risk model was used to generate the relationship between duration of exposure and disease, controlling for age. Measurement error of both classical and Berkson type were simulated, with increasing error with increasing exposure. Cox regression was used to evaluate exposure-response trends.

Results Under all scenarios considered with less than 100% susceptibility among the exposed, there was evidence of depletion of susceptibles over follow-up time. However, under realistic scenarios considered here, there was only modest evidence of attenuation of a linear exposure-response trend due to depletion of susceptibles. Classical measurement error, but not Berkson error, produced attenuation. Cross-sectional analyses did not dramatically change attenuation patterns.

Conclusions Marked attenuation of exposure-response trends over follow-up time is more likely due saturation of biological pathways or, perhaps less likely, to classical measurement error - than to either the depletion of susceptibles or Berkson measurement error.

211 A NEW OCCUPATIONAL CANCER: CHOLANGIOCARCINOMA AMONG OFFSET COLOR PROOF-PRINTING WORKERS EXPOSED TO 1,2-DICHLOROPROPANE AND/OR DICHLOROMETHANE

¹S K Kumagai, ²Kurumatani. ¹University of Occupational and Environmental Health, Kitakyushu, Japan; ²Nara Medical University School of Medicine, Kashihara, Japan

10.1136/oemed-2013-101717.211

Objectives At the 85th Annual Meeting of the Japan Society for Occupational Health (31 May, 2012, Nagoya, Japan), we reported a cluster of five patients with cholangiocarcinoma among workers in the offset colour proof-printing section of a small printing company in Osaka, Japan. This was the first report of occupational cholangiocarcinoma in the world. Further investigation led to the identification of a total of 11 patients (Occup Environ Med 2013, in print). Here, we present an epidemiological characteristic of the workers in the printing section.

Methods We identified 62 men who had worked in the proof-printing section for at least one year between 1991 and 2006. We interviewed them to learn about the chemicals they used, and estimated their chemical exposure levels. We also investigated medical records of the 11 patients and calculated the standardised mortality ratio (SMR) from 1991 to 2011.

Results Workers used 1,2-dichloropropane (1,2-DCP) from approximately 1985 to 2006 and dichloromethane (DCM) from approximately 1985 to 1997/98. Exposure concentrations were estimated to be 100–670 ppm for 1,2-DCP and 80–540 ppm for

Abstracts

DCM among proof-printing workers. All patients were pathologically diagnosed with cholangiocarcinoma. Age at diagnosis ranged from 25–45 years. Primary cancer sites included the intrahepatic bile duct (five patients) and the extrahepatic bile ducts (six patients). All patients were exposed to 1,2-DCP for 7–17 years and diagnosed with cholangiocarcinoma 7–20 years after the first exposure. Ten patients were also exposed to DCM for 1–13 years. Six of the patients had died by 2011 and the SMR for cholangiocarcinoma was 2,900 (expected deaths: 0.00204, 95% confidence interval: 1.100–6.400).

Conclusion These findings suggest that 1,2-DCP and/or DCM may cause cholangiocarcinoma in humans. New patients appeared among the company workers in 2012 and 2013, and the current number of patients has reached 17.

Session: Plenary session RICOH: Introduction and work activities

212 WORK ACTIVITIES AND ADVERSE PREGNANCY OUTCOMES: A SYSTEMATIC REVIEW

¹M Bonzini, ²K T P Palmer, ²E C H Harris, ²C L Linaker, ³J P B Bonde. ¹Epidemiology and Preventive Medicine Research Centre, University of Insubria, Varese, Italy; ²MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton, United Kingdom; ³Department of Occupational and Environmental Medicine, University of Copenhagen, Copenhagen, Denmark

10.1136/oemed-2013-101717.212

Objectives To assess the relation between five common occupational exposures (working hours, shift work, lifting, standing, workload) and five adverse outcomes of pregnancy (pre-term delivery (PTD), low birthweight, small for gestational age (SGA), pre-eclampsia, gestational hypertension).

Methods We conducted a search in MEDLINE and EMBASE (1966–2011) using combinations of keywords and MeSH terms. Reports were assessed for their reporting and potential for bias and confounding. Meta-estimates of relative risk (RR) were produced where possible. The material comprised 86 reports (57 reports with usable data on PTD, 54 on birthweight and 11 on pre-eclampsia/gestational hypertension).

Results For PTD, findings across a large evidence base were consistent in ruling out large effects (e.g. $RR > 1.2$). Larger and better quality studies were even less positive (RR 1.04 to 1.18). For SGA, the position was similar but meta-estimates were close to the null. For pre-eclampsia/gestational hypertension the evidence base was insufficient to draw strong conclusions.

Conclusions The balance of evidence is not compelling enough to justify mandatory restrictions on any of the activities considered in this review. Over time, estimates of risk for these activities and outcomes have become smaller.

213 RISK OF MISCARRIAGE IN RELATION TO WORK AT NIGHT, WORK HOURS, LIFTING AND STANDING: A META-ANALYSIS

¹J P B Bonde, ²Jørgensen, ³Bonzini, ⁴Palmer. ¹Bispebjerg Hospital, Copenhagen, Denmark; ²Bispebjerg Hospital, Copenhagen University, Copenhagen, Denmark; ³Epidemiology and Preventive Medicine Research Centre, Department of Clinical and, Varese, Italy; ⁴MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton General, Southampton, United Kingdom

10.1136/oemed-2013-101717.213

Objectives Miscarriage is a prevalent adverse pregnancy outcome that has been linked to ergonomic risk factors at work in numerous studies but no scientific consensus has emerged. In order to improve the impact of occupational health counselling of pregnant women the objective of this study was to quantify the risk of miscarriage according to prevalent work activities and to discuss causal inference based upon all available scientific data.

Methods A search in Medline and EMBASE 1966 - 2012 identified 29 primary papers reporting the relative risk (RR) of miscarriage according to work at night, long working hours, heavy lifting or prolonged standing. Following an assessment of completeness of reporting, confounding and bias, each risk estimate was characterised as more or less likely to be biased. Studies with equivalent measures of exposure were pooled to obtain a weighted common risk estimate. Sensitivity analyses excluded studies most likely to be biased.

Results Working fixed nights was associated with a moderately increased risk of miscarriage [pooled RR 1.51 (95% CI 1.27–1.78, $n = 5$)], while working for more than 40–52 hours weekly, lifting >100 kg/day and standing > 6–8 hours/day were associated with small risk increments: the pooled RR s ranging from 1.16 (prolonged standing, number of risk estimates 6) to 1.33 (working hours, number of risk estimates 9). Most RR s tended to become smaller and statistically non-significant when analyses were restricted to higher quality studies.

Conclusions These largely reassuring findings do not provide a case for mandatory restrictions in relation to working fixed night shifts, long working hours, occupational lifting and prolonged standing. Considering the limited evidence base, however, it seems prudent to advise women against work entailing high levels of these exposures.

214 OCCUPATIONAL LIFTING AND FETAL DEATH: FINDINGS FROM THE DANISH NATIONAL BIRTH COHORT USING A INDUSTRY-JOB EXPOSURE MATRIX

¹E M Mocevic, ²Jørgensen, ³Svendsen, ³Frost, ⁴Nybo Andersen, ²Bonde. ¹Copenhagen, Denmark; ²Department of Occupational and Environmental Medicine, Copenhagen, Denmark; ³Danish Ramazzini Centre, Department of Occupational Medicine, Herning, Denmark; ⁴Department of Public Health, Copenhagen, Denmark

10.1136/oemed-2013-101717.214

Objective We have in an earlier prospective cohort study observed a moderately increased risk of miscarriage based upon self-reported information on occupational lifting. In this paper we aim to corroborate or refute this observation by application of a industry-job exposure matrix for pregnant women.

Methods For 68,096 occupationally active women, who participated in the Danish National Birth Cohort, information on occupational lifting was collected by telephone interviews around gestational week 16. We established an industry-job exposure matrix (IJEM) by computing the industry and job specific mean values of the pregnant women's self-reported daily lifting activities while pregnant. Subsequently all women were assigned IJEM value for her industry and job. The associations between occupational lifting and early miscarriage (12 weeks or less), late miscarriage (13–21 weeks), and stillbirth (22 weeks or more) were analysed using Cox regression models with gestational age as the underlying time variable and adjustment for age, body mass index, parity, smoking and alcohol consumption.