the glucocorticoid part of the HPA axis, measured through CAR, is involved in the causal pathway between occupational and environmental noise exposure and cardiovascular disease.

399 EXPOSURE TO PHTHALATES, PERFLUORINATED COMPOUNDS AND ORGANOCHLORINES AND PREGNANCY OUTCOMES IN WOMEN FROM GREENLAND, POLAND AND UKRAINE

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Objectives Evidence for effects of environmental contaminants on pregnancy outcomes remains inconclusive. We investigated the associations between multiple, correlated exposures and related pregnancy outcomes using Bayesian, multivariate dimension reduction, and shrinkage regression approaches to account for multiple testing and interrelatedness of exposures and outcomes.
Methods We evaluated a cohort of 1322 singletons, born to 547 mothers from Greenland, 197 from Warsaw, Poland, and 588 from Kharkiv, Ukraine, who were recruited in 2002–2004 during routine antenatal care visits. Three secondary metabolites of both diethylhexyl and diisononyl phthalates (DEHP, DINP), eight perfluorinated compounds (PFCs; including PFOS and PFOA), and organochlorines (*p,p*-DDE and PCB-153) were measured and detected in 72–100% of maternal serum samples. Outcomes were preterm birth (<37 weeks), birth weight, and small for gestational age (SGA; $<10^{th}$ percentile age- and gender-specific birth weight). We analysed exposures (clustered, high dimension predictors) and continuous and dichotomous outcomes with partial least squares (PLS) regression, and sparse PLS-discriminant analysis (sPLS-DA), respectively. We compared results with elastic net penalised regression, and Bayesian stochastic search variable selection with spike-and-slab priors of (nonlinear) generalised additive models.
Results While applied methods had various degrees of sparseness, we observed generally consistent associations between DEHP metabolites, several PFCs and both organochlorines, and decreased birth weight and increased risk of SGA. There was no clear evidence of associations between contaminants and preterm birth.
Conclusions Findings suggest that several environmental contaminants are independently associated with impaired fetal growth. Methods which account for correlations between variables and multiple testing may better discriminate robust exposure-response associations than conventional univariate linear and logistic regression models.

400 CIRCULATING SOLUBLE CD27 AND CD30 IN WORKERS EXPOSED TO 2, 3, 7, 8-TETRACHLORODIBENZO-P-DIOXIN (TCDD)

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Objectives Previous studies suggest that 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (TCDD) exposure may be associated with non-Hodgkin lymphoma (NHL) but findings remain inconclusive. There is a need for mechanistic studies to evaluate the biologic plausibility of this association. In this cross-sectional study we investigated changes in plasma levels of two soluble markers of B cell activation, sCD27 and sCD30 and IL1RA, which have been found to be predictive of lymphoma, among workers from a Dutch historical cohort occupationally exposed to chlorophenoxy herbicides and contaminants including TCDD.
Methods Eighty-five workers who had been exposed to either high (n = 47) or low (n = 38) TCDD levels more than 30 years before serum collection were included in the current investigation. Plasma level of the sCD27, sCD30, and IL1RA was measured by ELISA. Current plasma levels of TCDD ($TCDD_{Current}$) were determined by high-resolution gas chromatography/isotope dilution high resolution mass spectrometry. TCDD blood levels at the time of last exposure ($TCDD_{max}$) were estimated using a one-compartment first order kinetic model.
Results Dose-response analyses showed no significant association between blood levels of sCD27, sCD30 and IL1RA and current and estimated past maximum TCDD levels although there was an indication of decreased levels of all markers with increasing TCDD level. Analyses excluding subjects with chronic diseases resulted in a significant decrease in IL1RA with increasing levels of TCDD.
Conclusions No significant dose-response relationship was observed between the measured markers and TCDD level in our study. However, there was a suggestion that sCD27, sCD30 and IL1-RA tended to decrease with increasing TCDD levels. This later observation is consistent with the earlier observation on decreasing cytokine levels with increasing exposures.

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401 COST-BENEFIT ANALYSIS OF INTERVENTIONS USING A PROBABILISTIC APPROACH: A CASE FOCUSING ON QUARTZ EXPOSURE IN THE DUTCH CONSTRUCTION INDUSTRY

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Objectives Ill-health due to exposure in the workplace results in high costs for employers, employees and society. Interventions can be costly and economic evaluations receive more and more attention in the decision making processes regarding investments, including for occupational health. To perform an economic evaluation information regarding the impact of interventions on exposure and subsequently, health and work performance is needed. Additionally, information regarding costs is needed. Meijster *et al*. (2011) presented an approach to evaluate the costs and benefits for different stakeholders. We further developed this approach into a probabilistic model to include variability for input parameters and obtain uncertainty estimates for output parameters. This approach is applied to a hypothetical case study focusing on reducing quartz exposure in the Dutch construction industry.
Methods The original cost-benefit approach was further developed into a probabilistic approach including Monte Carlo simulations using Excel spreadsheets. This enables the user to calculate total costs, total benefits, net costs and cost-effectiveness which can be easily applied for different intervention (s).

Results The implementation of the intervention resulted in a benefit of € 3,906,000 (standard deviation €3,987,000) and 7,200 saved disability-adjusted life years (standard deviation 3,000). Including uncertainty and variation for cost elements and performing Monte Carlo simulations (1000 runs) gave insight in the variability in the output. For two stakeholders (employees, society) the output was surrounded with uncertainty but cost-effective. For the third stakeholder (employers), due to the uncertainty, it was not possible to indicate whether the intervention would be cost-effective. The analysis indicated that the most important source for variance was productivity.
Conclusions The described approach gives insight in costs and benefits for different stakeholders in a structured manner. Including a probabilistic approach gives valuable insight in uncertainty and sensitivity of the different cost elements resulting in a more certain outcome of the analysis.

402 DOES EARLY RETIREMENT REDUCE THE RISK OF MYOCARDIAL INFARCTION? A PROSPECTIVE REGISTRY LINKAGE STUDY OF 617,511 DANISH WORKERS

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Objectives Demographic changes throughout the industrialised world will increase the proportions of retired individuals relative to the active workforce in the coming decades. This will put a substantial financial strain on the economy. Recent studies suggested that early retirement may have beneficial effects on health outcomes. In this study we examined if the risk of myocardial infarction (MI) was reduced following retirement in a Danish population sample.
Methods Participants were 617,511 Danish workers, born between 1932 and 1948 entering the study at the age of 60, without previous known incidents of MI or ischemic heart disease. Information on retirement and MI were obtained from Danish national registers. The participants were followed-up from the week they turned 60 years until event (incident MI) or censuring due to death to causes other than MI, migration, absence from the labour market of more than 26 weeks, or end of 8 years of follow up, whichever came first. We used Cox proportional hazard model to address the relation between retirement and onset of MI, while adjusting for age, sex, income, jobgroup, education, cohabitation and ethnicity.
Results Three per cent of the population was diagnosed with MI during follow up. Retirement was associated with a modestly increased risk of MI (OR = 1.11; 95% CI = 1.06 to 1.16) when comparing retired workers with active workers of the same age. Further analyses stratified by covariates yielded similar results.
Conclusions This study does not support the hypothesis that early retirement reduces risk of MI. On the contrary, we found that retirement was associated with a modestly increased risk of MI.

403 OCCUPATIONAL SAFETY AND HEALTH IMPACT ASSESSMENT; HEALTH, SOCIO-ECONOMIC AND COST EFFECTS OF EXCLUDING SMALL LOW RISK COMPANIES OF THE RIE-OBLIGATION

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Objectives Policy makers have an urgent need for quantitative data to support their decision-making process. More and more quantitative data are available, but the main problem remains how to construct useful information from all this data. The TNO Occupational Safety and Health Impact Assessment (OSHIA) ex ante tool helps policy makers with ex ante impact assessment in the field of occupational safety and health. This paper applies this method on a case example, the abolishment of the obligation to carry out a RIE for companies (1–9 employees) in low risk sectors in the Netherlands.
Method A stepwise quantitative ex ante evaluation was carried out following the TNO OSHIA framework. To gain insight into the affected population, compliance with the current legislation, and the effect of (abolishment of) a RIE on work-related exposures, health (MSD, depressive symptoms), QALY's, and socioeconomic effects (sick leave, productivity). Data were used from the Netherlands Working Conditions Survey (NWCS), the Employers' Labour Survey (WEA), and the literature (QALY, productivity). A cost-benefit analysis was carried out to estimate the change in costs for employees, employers and society if the RIE would be abolished. The analysis was based on several scenarios of the change in exposure. Within each scenario a sensitivity analysis was included.
Results The examined change in legislation would affect approximately 250,000 employees in approximately 65,000 companies. Of these companies, only 27% carried out a RIE in 2010. In most scenarios the health and socio-economic effects were small.
Conclusions The stepwise approach of the ex ante impact assessment proved to be useful to estimate the consequences of a policy change in OSH. In particular, the use of scenarios and the analysis of the uncertainty provides insight that facilitates policy decisions.

404 LONGITUDINAL ASSOCIATIONS BETWEEN FLIGHT SCHEDULES AND OCCUPATIONAL ACCIDENTS AMONG CABIN CREW

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Objectives Work schedules of cabin crew involve early starts, long working hours, night flights and the crossing of time zones. This can impose disturbed sleep, fatigue, lack of alertness, and possibly cause occupational accidents onboard. Although it has been shown that the risk for occupational accidents increases over successive shifts, it is unclear what kind of longitudinal flight schedule exposure affects their incidence. Therefore the objective of this study is to examine the associations between cumulative exposure to different flight schedules and the occurrence of occupational accidents among cabin crew.
Methods Data from the five-year historic MORE cohort was used. The study population consisted of 6311 cabin crew members from this cohort. For each employee, daily flight schedules from 2005 until 2008, and registered occupational accidents in 2009 were collected. The association between the cumulative exposure to different types of flight schedules and the