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### KEYNOTE 1

**How much data is enough?; Implementing regulation for occupational diesel exhaust**

**Roel Vermeulen,** Utrecht University, Utrecht, Netherlands

**Abstract**

When do you have enough data to act? An arduous question that environmental and occupational professionals have struggled with for decades. Science at best offers partial knowledge and information surrounded with (statistical) uncertainties. Such partial knowledge often leads to policies being postponed till more information becomes available. But when is enough data enough?

Occupational exposure to diesel motor exhaust (DME) has long been suspected to be a human carcinogen. The first case-control studies on DME and lung cancer were published in the mid-eighties, followed by several cohort studies conducted in the early part of this century. Based on the accumulating evidence a working group of the International Agency for Research on Cancer (IARC) declared DME as a known carcinogen in 2012. Why did it take 25 years to come to this decision? And what has happened after this decision as national or regional limit values for controlling occupational exposure to diesel exhaust are still rare?

### KEYNOTE 2

**From car to coronary: The cardiovascular effects of nanoparticles in vehicle exhaust  
  
Mark R. Miller,**University of Edinburgh, Edinburgh, United Kingdom

Over the last few decades it has become apparent that particles in air pollution have many detrimental effects in different organ systems. The cardiovascular effects of inhaled particles are especially important, given the high proportion of premature deaths attributed to air pollution that arise from cardiovascular causes. Vehicle exhaust is an especially rich source of nanoparticles in urban air pollution.

This presentation shall provide an overview of our research investigating the cardiovascular effects of diesel exhaust (nano)particles. I will present findings from controlled exposure to dilute diesel exhaust in human subjects and mechanistic studies in animal models, to demonstrate that diesel exhaust particles have multiple detrimental effects on different facets of the cardiovascular system. The presentation will discuss the potential pathways that link inhalation of particles to cardiovascular dysfunction, with an emphasis on oxidative stress and particle translocation. Studies using experimental methods to limit the cardiovascular effects of inhaled particles will also be described.

The findings of this work have implications for public health both in the fields of air pollution and the manufactured nanomaterial industry.

### INVITED IOM PRESENTATION

**50 years of epidemiology, and 25 years of health impact assessment, at the Institute of Occupational Medicine (IOM) in Edinburgh**

**Fintan Hurley**

Institute of Occupational Medicine, Edinburgh, United Kingdom

**Abstract**

I joined IOM as a statistician on 1 October 1975, and worked here, eventually as Scientific Director, until August 2017. My work was primarily occupational epidemiology 1975 to 1990 and environmental health impact assessment (HIA) 2000 to 2017, with both areas quite active through the decade 1990-2000. (The environmental HIA work focused on air pollution and so was also strongly based on epidemiology.)

In this talk I will try to convey something of (i) what I think IOM has done that is interesting and useful through epidemiology and HIA; (ii) what values it has tried to keep through major organisational changes, in the IOM itself and in the wider society, over a 50-year period; and (iii) what it has been like to work here, in epidemiology and HIA, for much of that time – what’s been good, what’s been difficult.

I think that over its 50-year lifetime IOM has made some significant contributions to occupational and public health, in the UK and internationally, through its epidemiology and HIA work; and some good contributions methodologically also. I hope that the talk will honour that contribution, not only by highlighting some achievements, but by situating them in the organisational and funding context that in different ways supported and limited what was and could have been done. In that sense these will be personal reflections - a talk about IOM rather than on behalf of IOM, and hopefully of interest to an audience engaged not only with the results of epidemiology and HIA in occupational and environmental health, but with what it takes to do it and to sustain a capability of doing it over a long and continuing lifetime.

### ORAL PRESENTATIONS

**Setting limits for perfluorinated substances with Epidemiological data: PFOA, Bench Mark Dose Limits and EFSA**

**Tony Fletcher**

LSHTM, London, United Kingdom. PHE, Chilton, United Kingdom

**Abstract**

**Background/Aim:** Limits set for exposure to PFOA (perfluoro-octanoic acid) and other perfluorinated alkyl substances (PFAS), have relied on extrapolation from animal results, with attendant uncertainties. Bench Mark Doses (BMD) as a basis for limits are here proposed using epidemiological data directly. EFSA, the European Food Standards Agency has proposed BMDs for these chemicals drawing on epidemiological data. This presentation will examine the assumptions in this approach.

**Methods:** Using the most replicated and validated health effect of PFOA, increased lipids, BMD methods have been applied to the largest suitable dataset, the C8 study. With no strong evidence of a threshold, at the lower end of the exposure range the relation between lipids and serum PFOA is close to linear, so a benchmark limit for hypocholesteremia (total cholesterol>240 mg/dl) can be established for a given additional risk of this condition. A benchmark response rate (BMR) of a 1% change in response has been recommended for epidemiological data and is used here.

**Results:** The BMD for PFOA at a 1% BMR, from models not including other PFAS, in terms of serum concentration of PFOA was 4.1 ng/ml, with corresponding BMDL at the lower confidence level of 2.8 ng/ml.

**Conclusions:** A BMDL for PFOA of 2.8 ng/ml is close to current population background average serum levels, although the BMDL is sensitive to several factors: average cholesterol vs. risk of high cholesterol, the arbitrary  BMR (others have chosen 5%); adjusting for other PFAS (leading to substantially higher BMDL values).

**Environmental and health inequalities in England (1994-2015)**

**Aina Roca-Barceló**1, Mariachiara Di Cesare2, Daniela Fecht1

1UK mall Area Health Statistics Unit, MRC-PHE Centre for Environment and Health, School of Public Health, Imperial College London, London, United Kingdom. 2Natural Sciences, School of Science & Technology, Middlesex University, London, United Kingdom

**Abstract**

Environmental factors, including deprivation, account for 23% of global deaths. In addition, deprivation is believed to magnify differences in the exposure levels (exposure differential), and in the population’s susceptibility to develop health outcomes given a certain exposure (susceptibility differential). We aimed to examine exposure and susceptibility differentials to a wide array of environmental exposures, such as noise and air pollution, across England (1995-2015).

Population-weighted mean concentrations of the studied exposures were assigned to 2011 Lower Super Output Area, LSOA (1,000-3,000 population). These areas were classified in deciles of Index of Multiple Deprivation (IMD), 2015. To assess the exposure differential component, exposure gradients across IMD deciles were investigated. To evaluate the differential susceptibility component, we used all-cause mortality, specific for gender, 5-year age groups and IMD decile using mid-year population estimates by LSOA. Age-standardized death rates will be compared across IMD deciles. Finally, we will regressed mortality rates to exposure levels and stratified the analysis by deprivation decile.

Mean concentration of PM2.5 and NO2 were 14.01µg/m3and 29.13µg/m3, respectively. Preliminary results show a positive gradient of concentration by IMD decile, suggesting an exposure differential by deprivation. More work needs to be done regarding other exposures. Between 1995 and 2015, there were an average of 488,511 deaths per annum, with the highest number registered in 1995 (532,626) and the lowest in 2011 (451,926). Of these, 22% and 17% occurred in the top most and least deprived deciles, respectively. The impact of deprivation on the susceptibility to all-cause mortality by exposure level is currently being investigated.

**Occupational exposures in the rubber manufacturing in the UK and non-cancer mortality**

Mira Hidajat1, Damien McElvenny2, William Mueller2, Peter Ritchie2, John Cherrie2,3, Andrew Darnton4, Raymond Agius5, **Frank de Vocht1**

1University of Bristol, Bristol, United Kingdom. 2Institute of Occupational Medicine, Edinburgh, United Kingdom. 3Heriot-Watt University, Edinburgh, United Kingdom. 4Health and Safety Executive, Bootle, United Kingdom. 5The University of Manchester, Manchester, United Kingdom

**Abstract**

**Background:** Work in the rubber manufacturing industry has been found to be carcinogenic .  Less clear, however, is the relationship between occupational exposures and non-cancer mortality.  In this paper, we seek to clarify these associations focusing on rubber dust, rubber fumes, and N-Nitrosamines (N-Nitrosodimethylamine (NDMA), N-Nitrosomorpholine (NMor), N-Nitrosodibutylamine (NDBA), N-Nitrosodiethylamine (NDEA), N-Nitrosopiperidine (NPIP), and their sumscore (NSS)).

**Methods:** We use data from a cohort of UK rubber factory workers aged 35+ in 1967 and followed for mortality until 2015 (n=36,441) with exposure data collated in the EXASRUB database.  Competing risk survival analysis was used to examine associations between occupational exposures and the following causes of deaths: asthma, urinary disease, bronchitis, cerebrovascular disease, circulatory disease, emphysema, ischemic heart disease (IHD), respiratory disease, and digestive diseases.

**Results:** Mortality from circulatory diseases were associated with higher exposures to rubber dust (Sub-Hazard Ratio (SHR) up to 1.19 95%CI 1.14-1.25), rubber fumes (SHR up to 1.22 95%CI 1.17-1.28), NSS (SHR up to 1.28 95%CI 1.22-1.34), NDMA (SHR up to 1.36 95%CI 1.30-1.43) and NMor (SHR up to 1.17 95%CI 1.12-1.23)). Similarly, increased risks for IHD, respiratory and cerebrovascular disease mortality were associated with higher exposures to all agents. Increased risks of digestive and liver disease mortality were associated with rubber dust, rubber fumes, several nitrosamines. Mortality from asthma, emphysema, and diseases of the oesophagus, stomach and duodenum were not associated with any exposures.

**Conclusion:** Cumulative occupational exposures in the rubber manufacturing industry were associated with increased risk for mortality from several non-cancer diseases.

**Estimating the impact of air pollution in Scotland and potential benefits of pollutant concentration reductions.**

**Duncan Lee**1, Christopher Robertson2, Colin Ramsay3

1School of Mathematics and Statistics, University of Glasgow, Glasgow, United Kingdom. 2Dept. of Mathematics and Statistics, University of Strathclyde, Glasgow, United Kingdom. 3Health Protection Scotland, Glasgow, United Kingdom

**Abstract**

**Background**: Air pollution levels in Scotland are generally low except for elevated pollutant concentrations in city centres, especially NOx/ NO2. Low Emission Zones (LEZs) using EU vehicle emission standards to restrict access to affected areas by the most polluting vehicles have been adopted as an intervention. Estimating the potential health benefits of an LEZ requires understanding of the underlying relationship between pollutant concentrations and measures of health impact. Recent data on these relationships at local level in Scotland was lacking. This pilot study set out to examine these relationships as a possible basis for quantifying the health impact of an LEZ.

**Methods:** Data on cardio-respiratory morbidity and mortality, as well as total non-accidental disease mortality were reviewed for a two year period (2015 to 2016) for 1252 spatially defined Intermediate Zones with an average 4000 population and linked to air pollution data using modelled annual average pollutant concentrations for the relevant years for NO2, NOx, PM10 and PM 2.5.  The impact of air pollution on health outcome risk was analysed using a spatial hierarchical regression model (Lee and Mitchell 2013) controlling for covariates derived from the Scottish Index of Multiple Deprivation (SIMD). Single pollutant, single outcome models were used to account for high pollutant collinearity providing 20 disease-pollutant combinations.

**Results:** Significant associations were found with respiratory hospital admissions for all pollutants and for respiratory mortality with PM2.5.  Cardiovascular disease outcomes, nor total non-accidental mortality showed significant association with any pollutant. Resulting estimates showed LEZs may have relatively modest health benefits.

**Exploring associations between residential exposure to radon and DNA methylation across the lifecourse**

**Frank de Vocht**1, Matthew Suderman1,2, Alberto Ruano-Ravina3, Richard Thomas1,4, Richard Wakeford5, Caroline Relton1,2, Kate Tilling1,2, Andy Boyd1,4

1University of Bristol, Bristol, United Kingdom. 2MRC Integrative Epidemiology Unit, Bristol, United Kingdom. 3University of Santiago de Compostela, Santiago de Compostela, Spain. 4Avon Longitudinal Study of Parents and Children, Bristol, United Kingdom. 5University of Manchester, Manchester, United Kingdom

**Abstract**

**Background:** Radon (and its decay products) is a known human carcinogen and the leading cause of lung cancer in never smokers and the second in ever-smokers. The carcinogenic mechanism from radiation is a combination of genetic and epigenetic processes, but compared to the genetic mechanisms, epigenetic processes remain understudied in humans. This study aimed to explore associations between residential radon exposure and DNA methylation in the general population.

**Methods:** Potential residential radon exposure for 75 meter area buffers was linked to genome-wide DNA methylation measured in peripheral blood from children and mothers of the ARIES subsample of the ALSPAC birth cohort. Associations with DNA methylation were tested at over 450,000 CpG sites at ages 0, 7 and 17 years (children) and antenatally and during middle-age (mothers). Analyses were adjusted for potential residential and lifestyle confounding factors and were determined for participants with complete data (n = 786-980).

**Results:** Average potential exposure to radon was associated in an exposure-dependent manner with methylation at cg25422346 in mothers during pregnancy, with no associations at middle age. For children, radon potential exposure was associated in an exposure-dependent manner with methylation of cg16451995 at birth, cg01864468 at age 7, and cg04912984, cg16105117, cg23988964, cg04945076, cg08601898, cg16260355 and cg26056703 in adolescence.

**Conclusions:**Residential radon exposure was associated with DNA methylation in an exposure-dependent manner. Although residual confounding cannot be excluded, the identified associations may show biological mechanisms involved in early biological effects from radon exposure.

**Prenatal, early-life and childhood exposure to air pollution and lung function in children: the Avon Longitudinal Study of Parents and Children (ALSPAC) cohort**

**Samuel Cai**1,2, Anna Hansell3, Raquel Granell4, Marta Blangiardo1, Daniela Fecht1, John Gulliver3, John Henderson4, Paul Elliott1

1Imperial College London, London, United Kingdom. 2King's College London, London, United Kingdom. 3Centre for Environmental Health and Sustainability, University of Leicester, Leicester, United Kingdom. 4Department of Population Health Sciences, Bristol Medical School, University of Bristol, Bristol, United Kingdom

**Abstract**

**Background:**Exposure to particles pollution during intrauterine development and through childhood may have lasting effects on respiratory health.

**Methods:**In a population-based cohort recruited during pregnancy,individualexposures to source-specific particulate matter with a diameter≤10µm (PM10) during each trimester, 0-6 months, 7-12 months (1990-1993) through childhood up to age 15 years (1991-2008) were estimated using dispersion modelling, accounting for residential mobility. Forced expiratory volume in 1 second (FEV1) and Forced vital capacity (FVC) were measured at age 8 and 15 years and converted into age-height-gender adjusted z-scores. Linear regression models were fitted to investigate associations between PM10 exposure and lung function, adjusting for potential confounders.

**Findings:**13,963 study children were included in this analysis. At age 8 years, exposure to interquartile (IQR) higher primary PM10(0·72µg/m3) from road traffic during the first trimester was associated with lower FEV1 (-0·049, 95%CI:-0·082 to -0·016) and FVC (-0·048, 95%CI:-0·081 to -0·015) z-scores. Similar associations were also seen for exposures during the second and third trimester, and for exposure during early childhood (0-6months, 7-12 months, and 0-7 years). Associations were stronger among boys, children whose mother had a lower education level or smoked during pregnancy. PM10 from all sources during the third trimester was significantly associated with lower FVC z-scores. However, no significant negative associations were seen at age 15 years.

**Interpretation:**Exposure to road-traffic PM10 from as early as in the first trimester may result in small but significant reductions in lung function at age 8 years.

**Prediction of variability in blood lead concentrations from dietary patterns and food groups in pregnant British women**

**Caroline Taylor**1, Rita Doerner1, Kate Northstone1, Katarzyna Kordas2

1University of Bristol, Bristol, United Kingdom. 2University at Buffalo, Buffalo, USA

**Abstract**

**Background/aim:** Identification of dietary patterns and food groups in pregnancy in relation to measures of lead status could provide the basis for a more useful alternative to a nutrient-specific advice to minimise fetal exposure to lead. The aim was to evaluate whether dietary patterns and food groups are associated with blood lead concentration (B-Pb) in pregnancy.

**Design:** Whole blood samples were collected from women enrolled in the Avon Longitudinal Study of Parents and Children (ALSPAC) and were analysed for lead (median 11 (IQR 9­­-13) weeks’ gestation). Dietary pattern scores were derived from principal components analysis of a food frequency questionnaire (32 weeks’ gestation). Associations of quartiles of dietary pattern scores, and of food groups categorised by frequency of consumption, with the likelihood of B-Pb ≥5 µg/dl were identified with adjusted logistic regression (n=2167 complete cases).

**Results:** There was a negative association between the ‘confectionery’ dietary pattern and the odds of B-Pb ≥5 µg/dl (OR 0.62; 95% CI 0.41-0.94). There were no associations with other dietary patterns. There was a strong positive association between the food group ‘all leafy green and green vegetables’ and the odds of B-Pb ≥5 µg/dl (OR 1.45; 1.04-2.01). Conversely, ‘cakes and biscuits’ had a negative association (OR 0.63; 0.43-0.93).

**Conclusion:**There were isolated and modest associations between diet and B-Pb. A healthy diet in pregnancy, with a variety of foods consumed in moderation, remains the best advice to minimise exposure to lead from the diet, as well as providing many other benefits.

**Modelling Health Impacts from Long-term Exposure to Outdoor Air Pollution in Thailand**

**William Mueller**1, Susanne Steinle1, Miranda Loh1, Sotiris Vardoulakis1, Nopadol Precha2, Wissanupong Kliengchuay2, Narut Sahanavin3, Ratthaphol Sillaparassamee4, Kanchana Nakhapakorn2, Kraichat Tantrakarnapa2, John Cherrie1,5

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**Abstract**

**Background**: Air pollution is an important preventable cause of illness and premature mortality around the world, with a large burden in Asia.

**Objective**: To assess outdoor air pollutant trends in Thailand across three decades and to make a preliminary assessment of associated health impacts from long-term exposures.

**Methods**: We collected data on CO, NO2, O3, PM10, PM2.5, and SO2from 68 automatic monitoring stations across Thailand over 1996 to 2017. We combined historic exposure to PM2.5 and O3 with select causes of mortality to conduct a health impact assessment (HIA) for the projected population of adults aged 30+ years in Thailand in 2020.

**Results**: Reductions were observed in annual mean concentrations in the monitoring data from 1996 to 2017 for CO (0.77 to 0.63 ppm; -19%), SO2 (5.0 to 2.3 ppb; -54%), NO2 (15.0 to 12.0 ppb; -20%), PM10 (72.5 to 39.5 µg/m3; -46%), and PM2.5 (41.5 to 18.5 µg/m3; -56%); however, increases were apparent for O3 (32.4 to 47.3 ppb; +46%). For the year 2020, we estimate the number of deaths and population attributable fractions for lung cancer (1,850; 14%), chronic lower respiratory disease (2,210; 19%), ischaemic heart disease (2,640; 12%), and cerebrovascular disease (3,360; 11%) associated with long-term exposure to PM2.5 and O3 (respiratory disease only).

**Conclusion**: Historic levels of PM2.5 and O3 are estimated to cause thousands of attributable deaths in Thailand annually. We will extend exposure data to include modelled air pollution concentrations, expand the HIA to additional health outcomes, and examine uncertainties in the assessment.

### POSTER PITCH PRESENTATIONS

**Network on the Coordination and Harmonisation of European Occupational Cohorts (OMEGA-NET)**

Ingrid Mehlum1, Maria Albin2, Merete Bugge1, Alex Burdorf3, Gemma G Castaño4, Manolis Kogevinas4, Henrik Kolstad5, Raquel Lucas6, **Damien McElvenny**7, Neal Pearce8, Vivi Schlünssen5, Michelle Turner4, Roel Vermeulen9

1STAMI, Oslo, Norway. 2Karolinska Institute, Stockholm, Sweden. 3Erasmus University, Rotterdam, Netherlands. 4IS Global, Barcelona, Spain. 5Aarhus University, Aarhus, Denmark. 6University of Porto, Porto, Portugal. 7Institute of Occupational Medicine, Edinburgh, United Kingdom. 8London School of Hygiene & Tropical Medicine, London, United Kingdom. 9Utrecht University, Utrecht, Netherlands

**Abstract**

Occupation and paid employment is an essential component of adult life and a major determinant of health and healthy ageing. However, in recent years there has been very limited coordination and promotion of European health research on occupation and employment. Europe currently has some of the most valuable occupational, industrial, and population cohorts in the world. The lack of integration of these cohorts hampers the optimal exploitation of these resources, essential to underpin evidence-based interventions and policy.

OMEGA-NET is a 4-year COST Action network, starting in October 2017, funded by EU.

The overarching concept is to create a network to optimize the use of occupational, industrial, and population cohorts at the European level.  We will inventory numerous cohorts with occupational information in Europe; implement an online interactive tool with detailed information on existing cohorts; facilitate work on harmonisation of occupational exposure and health outcome information and new protocols for data collection; connect scientific communities on occupational health in Europe and beyond; and provide networking, leadership, and training opportunities for early career researchers in occupational epidemiology and exposure assessment.

Collaboration through OMEGA-NET will enhance the scientific output from individual studies and facilitate pooled studies, data sharing, and transfer of tools and skills to make more efficient use of existing cohorts. The work will provide a foundation for an enhanced evidence base for the identification of health risks and gains related to occupation and employment to foster safe and healthy preventive strategies and policies.

**Air pollution, lung function and COPD: results from the large population-based UK Biobank study**

**Anna Hansell**1, Kees de Hoogh2, Nicole Probst-Hensch2, Isabel Fortier3, Yutong Cai4, Sara De Matteis4, Dany Doiron3

1University of Leicester, Leicester, United Kingdom. 2Swiss Tropical and Public Health Institute, Basel, Switzerland. 3Research Institute of the McGill University Health Centre, Montreal, Canada. 4Imperial College London, London, United Kingdom

**Abstract**

Evidence for impacts of air pollution on respiratory morbidity is less well established than its effects on mortality. We used UK Biobank data and European Study of Cohorts and Air Pollution Effects (ESCAPE) air pollution estimates to explore cross-sectional associations of air pollutants with lung function and chronic obstructive pulmonary disease (COPD) prevalence.

The dataset comprised 303,887 individuals aged 40-69 years, with complete data. We examined associations of residential ambient particulate matter (PM2.5, PM10 and PMcoarse) and nitrogen dioxide (NO2) concentrations with forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC), FEV1/FVC ratio, and COPD (FEV1/FVC < lower limit of normal). Effect modifiers considered were gender, age, obesity, smoking status, household income, asthma status, and occupations previously linked to COPD.

Higher exposures to each pollutant was significantly associated with lower lung function. A 5 µg/m3 increase in PM2.5 concentration was associated with lower FEV1 (-83.13 mL [95%CI: -92.50, -73.75]) and FVC (-62.62 mL [95%CI: -73.91, -51.32]). COPD prevalence was associated with higher concentrations of PM2.5 (OR 1.52 [95%CI: 1.42 to 1.62], per 5 µg/m3), PM10 (OR 1.08 [95%CI: 1.00 to 1.16], per 5 µg/m3), and NO2 (OR 1.12 [95%CI: 1.10, 1.14], per 10 µg/m3), but not with PMcoarse. Larger lung function associations were seen for males, individuals from lower income households and ‘at-risk’ occupations, and higher COPD associations for obese, lower income and non-asthmatic participants.

Ambient air pollution was associated with decreased lung function and increased COPD prevalence in this large UK study.

**Exposure Assessment for a Study of Cognitive Impairment in Former Professional Footballers in England**

**Ioannis Basinas**1, John Cherrie1,2, Richard Graveling1, Damien McElvenny1, Valentina Gallo3, Simon Kemp4, Neil Pearce5

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**Abstract**

Evidence is accumulating on the possible increased risks of neurodegenerative disease in former (professional) sportspersons.  This study will assess the associations between a history of repetitive low-level head trauma and general and neurological health in retired professional footballers aged 50+ in England.  The main exposure measures are concussions and cumulative lifetime repeated sub-concussive head impacts (RSHIs), either from heading footballs or other forces applied to the head.  Information on factors associated with concussions and RSHIs will be collected via a structured questionnaire during face-to-face interviews.

Our approach will include:

1. Literature search to identify potentially important proxy measures of RSHI during training and matches;
2. Developing a model of cumulative RSHIs, based on the more strongly predictive variables, which may include playing position, the frequency of heading, the number of games played and training sessions attended, decade of play and the type of ball used.
3. The model will be developed from analyses of head contacts from video footage of matches and training, at the individual level and in general, and from statistics on playing career.  We will also consult a panel of former professional footballers on the exposure assessment.

The exposure data will be crucial to assess whether those with higher exposure within the study cohort are at increased risk compared to those with lower exposure.

**Low-level occupational exposure to ionizing radiation and IHD mortality**

Mira Hidajat1, Richard Wakeford2, Roseanne McNamee2, Raymond Agius2, Richard Martin1, **Frank de Vocht**1

1University of Bristol, Bristol, United Kingdom. 2University of Manchester, Manchester, United Kingdom

**Abstract**

**Background:** Although previous studies have reported increased circulatory disease risk with low-level exposure to ionizing radiation, it remains unclear whether this association should be attributed to radiation exposure or resulted from residual confounding from non-radiation risk factors. This case-control study investigates the dose-response association between exposure to ionising radiation and IHD mortality, considering potential confounding from non-radiation risk factors.

**Methods:** A nested matched case-control sample of UK nuclear fuel processing industrial workers (N=2,440) aged <=50 years between 1950-1998 was used. Cases (workers who died from IHD) and controls (alive at time of case’s death) were matched 1:1 based on age and employment start year. Cumulative doses from external radiation and to the liver from internal alpha-particles were provided by Public Health England.

**Results:** Preliminary results suggest cumulative occupational external radiation doses of >=183.9 mSv (highest quantile of exposure) were associated with higher IHD mortality risk compared to non-exposed workers [OR=1.58 (95% C.I.=1.02-2.46)]. Models were adjusted for blood pressure, BMI, smoking, employment characteristics (length, start year, and age at start), noise exposure, shiftwork, and internal dose monitoring. There was no evidence that internal dose or lower external radiation exposures were associated with higher IHD mortality.

**Conclusion:** Preliminary results indicating increased IHD mortality risks for workers in the highest quantile of cumulative external exposure to radiation (>=183.9 mSv) were unattributable to residual confounding from baseline health risk factors, shiftwork or noise exposure, and provide additional evidence that protracted, low-level radiation exposure is associated with increased IHD mortality risk .

**Supporting occupational cohort studies**

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1University of Oxford, Oxford, United Kingdom. 2Kings College London, London, United Kingdom. 3University of Lancaster, Bailrigg, United Kingdom

**Abstract**

An occupational cohort study is the most robust epidemiological design for studying the effects of workplace hazards and findings can be extrapolated to the environment. A cohort may be time-consuming and labour-intensive to set up but, once done, can be extended, incorporate new outcome variables, and support nested case-control studies. It is important that this expensive investment is preserved so that these resources can be fully exploited to support workplace health.

In recent years, the bureaucratic burden on researchers has increased. In the UK, research ethics, data protection, and data access applications have become more cumbersome, with an increase in the supporting documents required. Although fast-track procedures exist, epidemiological studies often require the same procedures and oversights as invasive physiological and pharmacological studies.

Fortunately, there are initiatives to help. The MRC published (2014) a review and guidance about maximising the value of population cohorts and its Cohort Strategic Review Group pre-assesses applications involving cohorts (http://mrc.ukri.org). And OMEGA-NET will ‘optimize and integrate occupational, industrial, and population cohorts at the European level’ (http://omeganetcohorts.eu/).

We propose a checklist be defined for assessment of research protocols involving cohorts, in order to streamline processes for both researchers and official committees. The informal UK & Ireland Occupational Epidemiology group should have a role in drafting such a checklist, working with interested organisations, such as EPICOH, OMEGA-NET, and the MRC.

**Chronic Kidney Disease of undetermined cause (CKDu), an emerging disease in developing nations: a Malawian geographical study with focus on potable water sources**

**Sophie Hamilton**1, Neil Pearce2, Daniela Fecht1, Paolo Vineis1

1Imperial College London, London, United Kingdom. 2London School of Hygiene and Tropical Medicine, London, United Kingdom

**Abstract**

**Background:** An epidemic of chronic kidney disease (CKD) clustering in rural communities low- and middle-income countries (LMICs) is increasingly being recognised. The condition has been termed CKD of undetermined cause (CKDu) due to unidentified underlying aetiology. Hypothesized causes include heat stress and heavy metal exposure.  We aim to investigate presence of CKDu in Malawi and identify potential risk factors including nephrotoxic heavy metals in potable drinking water.

**Methods:** Blood samples (n=204) were used to estimate kidney function across an urban and rural sample population. We applied linear and logistic regression models including postulated risk factors age, sex, body mass index, and fat-free mass to estimate risk of low kidney function (eGFR) (<90 ml/min/1.73m2). Local water samples were collected from portable water sources and analysed for trace metals. We analysed spatial distribution of trace metals across the study area using Empirical Bayesian Kriging.

**Results:** Prevalence of low eGFR was 17% (95%CI=12.0, 24.0). Factors associated with low eGFR were rurality [OR 5.68, 95%CI 1.92-19.56]; and age per 10-year increment [OR 2.38, 95%CI 1.47-4.14]. Mean trace metal concentrations did not exceed permissible limits. However, some sites contained trace metal concentrations exceeding World Health Organization limits by several orders of magnitude, including iron (8411.0µg/L, permissible limit 2000µg/L).

**Conclusions:** Reduced kidney function was observed across our study area with higher risks in rural areas. This corroborates with previous studies. No nephrotoxic trace metals exceeded permissible limits, however low-concentration synergies must be investigated to rule these out as risk factors for reduced kidney function in Malawi.

**Hospital admissions due to neurological disease among the Pesticide Users’ Health Study cohort**

**Gillian Frost**, Anne-Helen Harding

Health and Safety Executive, Buxton, United Kingdom

**Abstract**

**Background:**  Many occupational cohort studies rely on cancer and death registrations to ascertain health status, particularly when contact with participants is not possible.   These sources are less useful for chronic diseases like neurological disease.  Hospital admissions provide a potential source of information for such health outcomes.  The aim of this study was to investigate the admission rate for neurological disease among a British cohort of pesticide users.

**Methods:**  The Pesticide Users’ Health Study comprises pesticide users certified under the Control of Pesticides Regulations (1986) between 1994 and 2003.  Hospital Episode Statistics (HES) Admitted Patient Care (APC) data were obtained for participants who lived in England between April 1997 and March 2012, along with national tabulations of admissions for comparison.   Age, period, sex and region Standardised Admission Ratios (SARs) were estimated using time to first admission.   Internal analyses were conducted using the Prentice, Williams and Peterson Total Time (PWP-TT) model to incorporate multiple admissions.

**Results:**  Preliminary analysis included 52,671 participants followed-up for 736,415 person-years.  Approximately 5% of participants had at least one hospital admission where neurological disease was mentioned.  SARs tended to be below unity but varied by factors such as region, certification type and birth year.

**Discussion:**  The analysis is ongoing.  Preliminary results will be presented and the methodology will be discussed, along with challenges of working with HES APC data for an occupational cohort.  Next steps will include analysis of more detailed pesticide use information collected on a subset of the cohort.

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### POSTER PRESENTATIONS

**An evaluation of whether to lower the public health action level for lead exposure in children in England**

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**Abstract**

Lead exposure is especially harmful in young children and the developing foetus.  A blood lead concentration at or above 10μg/dL (0.48μmol/L) is the current action level leading to public health case management to identify and remove the source(s) of exposure to lead. However, population lead exposure has fallen, and there is very strong evidence of neuro-toxicity even at blood lead concentrations well below the current action level.  We aim to evaluate whether to lower the action level for England.

We convened a working group to address this issue.  We will perform a rapid review and overview of systematic reviews to evaluate the evidence. We will review laboratory data from the Supra-regional Assay laboratory network (that analyses the large majority of paediatric blood lead tests in England).  We will also consider whether different action levels might trigger different management protocols.

The working group will assess: the credible range of the current mean paediatric blood lead concentration in England; the evidence of a causal association for adverse health effects at blood lead concentrations below the current action level; and the likely change in number of cases notifiable to Public Health England to assess stakeholder impact. We will recommend a preferred option for a revised action level, and changes required to current notification and case-management protocols in England.   We will consult on these recommendations with stakeholders.

We will evaluate the evidence for whether the current action level is fit for purpose, and if required recommend changes to public health practice and guidance.

**Examining the role of greenspace to mitigate air pollution and motivate physical activity in four European cities**

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**Abstract**

Exposure to urban greenspace may affect health via a complex set of pathways, including lessened exposures to air pollution and enhanced opportunity for physical activity. The HEALS study included personal monitoring of mothers of young children to pilot novel devices and collect environmental exposure data from individuals in four European cities. The data collected over ~1-week periods thus present an opportunity to assess these two important pathways for which greenspace may benefit health.

We include three metrics of greenspace exposure (Normalised Difference Vegetation Index [NDVI], tree canopy density, and proximity to green land use) and will track objective measurements of physical activity through personal GPS data, including the duration engaging in active, e.g., walking, and passive, e.g., driving, transport. Fitbit units worn by study participants recorded steps per minute. Indoor PM2.5 and noise levels were collected from participants’ homes, and we are exploring the use of the Data Integration Model for Air Quality to estimate outdoor air pollutant concentrations.

Based on the Edinburgh participants (n=29), preliminary results suggest no associations between residential greenspace metrics with indoor PM2.5, noise levels, or indicators of physical activity. However, using the GPS data, mean NDVI levels demonstrated significant positive correlations with the overall distance of walking or running (r=0.46; p=0.02) and also overall steps (r=0.41; p=0.04) during the monitoring period. No such associations were identified with tree canopy densities. We will expand the analysis to incorporate covariates of individual participants and data from the other cities to refine these early results.

**The SSHeW study: Does slip resistant footwear reduce slips among healthcare workers? A randomised controlled trial**

**Gillian Frost**1, Sarah Cockayne2, Caroline Fairhurst2, Catherine Hewitt2, Mark Liddle1, Michael Zand3, Heather Illes-Smith4, Lorraine Green4,5, Rachel Cunningham-Burley2, David Torgerson2

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**Abstract**

Slips, trips and falls on the same level are common causes of workplace injuries in Great Britain.   After consideration of workplace slip risks, employers or staff may decide to use slip-resistant footwear but there is limited evidence about the effectiveness of such an intervention.   The aim of the SSHeW (Stopping Slips among Healthcare Workers) study is to evaluate the effectiveness and cost-effectiveness of slip-resistant footwear at preventing slips among National Health Service (NHS) staff.

The SSHeW study is a two-arm randomised controlled trial aiming to recruit 4400 NHS staff across seven Trusts in North England.  Participants are block-randomised 1:1 to the intervention (provision of 5-star GRIP-rated slip-resistant footwear) or control group (offered the footwear at the end of the trial).  The primary outcome is incidence of self-reported workplace slips over a 14-week period, as reported via weekly text messages.  An economic evaluation will assess cost-effectiveness in terms of cost per quality adjusted life year gained.

Recruitment rates currently range from ~45-90% depending on Trust.  To date, most participants are female (~85%), and work in clinical areas (~30%), wards (~55%) or in the community (~15%).  Response rates to weekly text messages range from ~85-90%, with participants responding to an average of 11 out of the 14 weekly text messages.

This is an ongoing trial with recruitment ending December 2018, and so final results will not be presented.  The presentation will focus on the study design, progress to date, and particular successes or challenges during the trial.

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**Investigating cooking activity patterns and exploring perceptions of air quality interventions among women in biomass fuel households in urban Rwanda; a cross-sectional study**

**Catherine Campbell**1, Suzanne Bartington2, Telesphore Kabera3, Francis Pope4, Patrick Tumwizere3, Clement Umwanyirigira3, Pacifique Abimana3, Neil Thomas2

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**Abstract**

**Background:** Household Air Pollution (HAP) was ranked as the 8th leading contributor to premature mortality in the 2016 Global Burden of Disease Study, disproportionately affecting women and children in Sub-Saharan Africa. Improved cookstoves (ICS) are promoted to mitigate HAP-related impacts, however contextual socio-cultural challenges in Low- and Middle-Income Countries limit long-term adoption. Policy stakeholders require comprehensive baseline information concerning local cooking practices to inform development and evaluation of effective air quality interventions which also meet end-user needs.

**Aims:** To report local cooking patterns, awareness of HAP associated health risks and perceptions of air quality interventions among charcoal cooking fuel users in urban Kigali, Rwanda.

**Methods:** Semi-structured questionnaire administered to 36 mothers (age 18-55 years) residing in traditional charcoal biomass fuel households. Univariate analyses were used to characterise cooking practices and investigate perceptions to HAP interventions.

**Results:** Fewer than half of participants (47%, n=17) were aware of the health risks associated with biomass smoke exposure. Cost was the main reason cited for using charcoal fuel for cooking (92%, n=33) and 29 households (81%) reported to use plastic as an additional lighting fuel. Only 33% n=12 of participants had heard of ICS but all expressed interest to try one and the majority desired it to be mobile (89%, n=32), with the facility for multiple pans (53%, n=19).

**Conclusion:** These findings highlight the need for an educational intervention or health promotion campaign and additionally, inform future air pollutant monitoring fieldwork and the development of public health interventions to reduce HAP exposure in Rwanda.

**Air and Noise Pollution, Preterm Birth and Stillbirth in London**

**Rachel Smith**1, Daniela Fecht2, John Gulliver1,3, Sean Beevers4, David Dajnak4, Marta Blangiardo1, Margaret Douglass2, Anna Hansell2,3, Ross Anderson4,5, Frank Kelly4, Mireille Toledano1

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**Abstract**

**Background:** Evidence for associations between ambient air pollution and both preterm birth and stillbirth is inconsistent.  Road traffic pollution comprises potentially toxic air pollutants and noise, but only three studies of preterm birth have investigated these co-exposures together, with conflicting results, and none for stillbirth.   This study investigates long-term exposure to both air and noise pollution during pregnancy and risk of PTB and, for the first time also, stillbirth.

**Methods:** The study population comprises 581,774 singleton births across Greater London from 2006-2010. Monthly concentrations of NO2, NOX, source-specific traffic-related PM2.5, PM2.5, PM10 and ozone were estimated at 20 x 20m resolution using a dispersion model, and time-weighted averages were calculated for 1st trimester and last 3 months of pregnancy at address-level. Annual road traffic noise levels were modelled at address-level. We analysed the relationship between air pollutant/noise exposures and preterm birth/stillbirth using logistic regression.

**Results:** There were 3,392 (0.6%) stillbirths in the study population, and 5.8% of live births were preterm. Preliminary results show increased odds of preterm birth and stillbirth associated with interquartile range increases in Trimester 1 ozone exposure; and suggest a possible association between high road traffic noise and increased risk of preterm birth but only after adjustment for specific air pollution co-exposures.

**Conclusions:** Our preliminary findings suggest that exposure to higher levels of ozone during early pregnancy may increase risk of preterm birth and stillbirth; and a possible relationship between long-term traffic-related noise and risk of preterm birth.

**Estimating vehicle drivers’ exposure to air pollution during working hours**

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**Abstract**

According to WHO report, air pollution is a significant factor contributing to health risks and leads to about three million premature deaths globally, with urban citizens being particularly affected. The research idea is to measure the level of exposure to air pollution in vehicle drivers (bus, taxi and city council drivers) during their working hours in Newcastle Upon Tyne, UK and discover the effect of exposure on drivers’ heart rate during driving time. The focus is to measure PM2.5, PM10, NO2, CO, CO2, and volatile organic compounds (VOCs) levels inside the vehicle. The study participants are classified into three groups, where group “A” represents bus drivers, group “B” represents taxi drivers and group “C” represents the city council fleet drivers, with each group comprising of three participants. All vehicles will be fitted with an air pollution monitoring device, a GPS recorder and the drivers will wear a smart arm-strap to record heart rate continuously during the monitoring process. The sampling would be performed twice respectively, wherein at the first monitoring process PM2.5, PM10 and NO2 data would be collected and CO, CO2 and VOCs would be collected at the second monitoring process. The monitoring processes would be performed during cold months and warm months. The anticipated results would discover the levels of air pollution that drivers exposed to and how the exposure to air pollution affect their heart rates. And to discover possible techniques or solutions that can help in reducing the exposure to air pollution among these subpopulations.

**Association between pesticide exposure and lung function: a systematic review and meta-analysis.**

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**Abstract**

**Background:** Epidemiological studies have reported associations between pesticide exposure and respiratory health effects, but the specific causal agents and the quantitative impact on lung function are unclear. To fill these gaps, we undertook a systematic review of the available literature on the association between pesticides exposure and lung function.

**Methods:** We searched MEDLINE, EMBASE and Web of Science databases to 1 October 2017 without any date or language restrictions using a combination of MeSH terms and free text for ‘pesticide exposure’ and ‘lung function’. We included studies that met the criteria of our research protocol registered in PROSPERO, and we assessed their quality using a modified Newcastle-Ottawa scale. We used the metan command in Stata 15 with fixed-effect models where I²from test for heterogeneity <50%.

**Results:** Among the 2,356 articles retrieved, 56 articles were included in the systematic review and were pooled in a meta-analysis for FEV1/FVC, FVC and FEV1and PEF. We found no effect for paraquat exposure on FEV1/FVC (Standardized Mean Difference (SMD) = 0.05; 95%CI 0.04, 0.15). Cholinesterase (ChE) inhibiting pesticides showed a significant negative effect on FEV1/FVC (SMD = -0.27; 95%CI -0.39, -0.14).

**Conclusion:** In our meta-analysis, ChE inhibiting pesticides exposure reduced FEV1/FVC. Limits were heterogeneity between studies, likely due to different type of exposure assessment to pesticides, and adjustment for potential confounders. Further larger prospective studies with a more accurate exposure assessment including type of pesticides are warranted to focus preventive strategies. Respiratory surveillance should be enhanced in workers exposed to ChE-inhibiting pesticides.

**Keyword:**pesticide, lung function, systematic review

**Social Networking Site use in young adolescents: association with health-related quality of life and behavioural difficulties**

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**Abstract**

Despite Social Networking Sites (SNS) having a minimum age of 13, adolescents younger than this age are using SNS. In this study, we examine overall and night-time self-reported SNS use in relation to Health-Related Quality of Life (HRQoL, measured by KIDSCREEN-10) and behaviour (measured by Strengths and Difficulties Questionnaire, SDQ) in 5,229 adolescents aged 11-12 in the Study of Cognition, Adolescents and Mobile Phones (SCAMP) cohort. Two thirds of the study population used SNS for more than a minute a day. Weekday and weekend SNS use on both mobile phones and other devices was significantly associated with lower HRQoL in females (all p-values for linear trend < 0.005) but not males (all p-values for trend  > 0.1) (p-value for interaction <0.01). Using SNS during the night was also significantly associated with lower HRQoL in females (adjusted β coefficient - 2.199 (95% CI - 3.175, - 1.223)) but not males (β – 0.904 (95% CI – 1.941, 0.133)). Higher weekday and weekend use of SNS on both mobile phones and other devices was associated with increased behavioural difficulties (p-value for trend <0.001). Similarly, night-time SNS use was associated with greater behavioural difficulties (β – 2.536 (95% CI 1.094, - 2.979)). We would argue that this is an issue that should be considered by policy-makers and SNS providers, as we have shown potential relationships between SNS use and HRQoL and behaviour in 11-12 year olds, despite age restrictions on SNS.

**Could exposure to Environmental and Occupational Particulate Air Pollution be a Contributor to Neurodegeneration and Diabetes?**

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**Abstract**

It has been hypothesised that environmental air pollution, especially airborne particles, is a risk factor for type 2 diabetes mellitus (T2DM) and neurodegenerative conditions. A systematic review of the epidemiological evidence found a positive association between ambient air pollution and both T2DM and neurodegeneration risks, such as dementia and a general decline in cognition [1]. However, corresponding evidence for workplace exposures are lacking. Further research is needed to identify the mechanisms associated with particulate exposure and disease pathogenesis and to investigate the risks in occupational populations. This work describes an epidemiological study being undertaken to investigate the association between occupational and environmental exposure to fine particulate matter, and diabetes and neurodegenerative diseases and biomarkers of these conditions. The study relies upon data from the UK Biobank, an existing health resource that has data on around 500,000 volunteer participants, aged between 37 and 73 years from across Great Britain (England, Wales and Scotland) at the study baseline (2006–2010). We consider already collected data on the participants’ location and occupation to estimate their exposure to airborne particles using available public pollution data and a job-exposure matrix. The association between air pollution and the diseases will be first investigated and then we will explore whether occupational exposure modifies the association or increases the ability to predict the outcomes.

**References**

1.          Dimakakou, E., et al., International Journal of Environmental Research and Public Health, 2018. 15(8).

**Mesothelioma mortality in Great Britain: how much longer will dockyards dominate?**

**Carl Reynolds**1, Andrew Darnton2, Paul Cullinan1

1National Heart and Lung Institute, Imperial College London, London, United Kingdom. 2Health and Safety Executive, Bootle, United Kingdom

**Abstract**

**Background:** Great Britain pioneered the use of asbestos and now has the highest mesothelioma incidence in the world. Dockyards were an important exposure source and environmental studies have shown strong associations with mesothelioma. Our aim was to assess whether there has been a geographical shift in the distribution of cases given the decline of shipbuilding and progressive exposure regulation.

**Methods:** We compared spatial autocorrelation statistics (Moran's I) for mesothelioma standardized mortality ratios (SMRs) at ward level for 2002-2008 and 2009-2015. Subsequently we measured the mean distance of the deceased’s postcode to the nearest dockyard at ward level using postcode centroid data provided by HSE and openstreetmap geodata. The coefficient of distance to dockyard for ward SMR was calculated using ordinary least squares regression for men and women, for the whole period, 2002-2008, and 2009-2015.

**Results:** Moran's I (p<0.0001) changed from 0.13 to 0.09 for men, and 0.02 to 0.03 for women, comparing 2002-2008 with 2009-2015. For men and women, for all years, the coefficient of distance to dockyard for ward SMR was -0.26 (95% CI -0.33 to -0.19, p<0.001); in men it was -0.29 (95%CI -0.34 to -0.24, p<0.001) and in women -0.03 (95%CI -0.2 to 0.15, p=0.75). In men for 2002-2008 it was -0.26 (95%CI -0.35 to -0.18, p<0.001) and for 2009-2015 it was -0.22 (95%CI -0.29 to -0.15, p<0.001).

**Conclusion:** Moran's I is lower for men in 2009-2015 than 2002-2008 suggesting mesothelioma deaths are becoming more dispersed but dockyards remain strongly spatially associated with mortality.

**Trends in occupational and work-related respiratory disease attributed to cleaning products**

Melanie Carder, Martin Seed, Annemarie Money, **Martie van Tongeren**, Raymond Agius

the University of Manchester, Manchester, United Kingdom

**Abstract**

**Introduction:**Exposure to cleaning products has been associated with adverse respiratory outcomes. This study aimed to investigate the medically reported incidence, trends in incidence and occupational determinants of work-related respiratory disorders attributed to cleaning agents, and to explore the role of ‘Quantitative Structure Activity Relationships’ (QSAR) in determining their mechanisms.

**Methods:**Respiratory diagnosesattributed to cleaning agents were identified and extracted from The Health and Occupation Research (THOR) surveillance network, 1989-2017. Incidence, trends in incidence and incidence rate ratios by occupation were investigated. Agents were classified by chemical type and QSAR hazard indices were determined for specific organic chemicals.

**Results:**Approximately 6%(779 cases) of the (non-asbestos) THOR respiratory cases were attributed to cleaning agents. Diagnoses were predominantly asthma (58%) and inhalation accidents (27%) with frequently reported chemical categories being aldehydes (30%) and chlorine/releasers (26%).No significant trendin incidence (1999-2017) was observed (annual average change of -1.8% (95% CIs:-4.8, 1.3)). This contrasted to a statistically significant annual decline in incidence (-5.0% (95% CIs: -5.9, -4.0)) for non-cleaning (excluding asbestos) agents. There was a large variation in risk between occupations. 7 of the 15 specific organic chemicals identified had a QSAR generated hazard index consistent with being a respiratory sensitiser.

**Conclusion:**Specific occupations appear to be at increased risk of adverse respiratory outcomes attributed to cleaning agents. Whilst exposure to agents such as glutaraldehyde have been addressed, other exposures, such as to chlorine, remain important. Chemical features of the cleaning agents helped distinguish between sensitising and irritant agents.

**Does time spent by adolescents on social media affect their BMI?**

**Callum Parr**, Lana Al-Nusair, Seung Min Han

Imperial College London, London, United Kingdom

**Abstract**

**Background:** Social media use is now a common use of mobile phones among teenagers. With adolescent smartphone ownership having risen sharply, with 71% of 11 year olds now owning a smartphone, the WHO recommends research on mobile phone use on all aspects of children’s health as a high priority. While previous research demonstrates an increase in BMI in children when exposed to conventional media-based behaviours (e.g. television), there is little research on the impact of social media on adolescent BMI.

**Methods:** We investigated the effects on time spent on social media on mobile phones, as well as all other devices, on BMI z-scores. 238 secondary school students were recruited and underwent biometric measurement and completed a computerised assessment and questionnaire. Age and sex-specific BMI z-scores were calculated. A linear relationship existed between BMI z-scores and time spent on social media, therefore a linear regression model was used for analysis.

**Results:** For both social media use on mobile phones and on all other devices, a decrease in BMI z-score was found between 1 and 30 minutes, with an increase in z-score seen after 31 minutes of social media usage. The largest increase in BMI z-score was seen with 31-59 minutes of social media usage across all device types.

**Conclusions:** We found no significant association and no evidence of an increasing trend between social media use and BMI z-scores. However, there is a suggestion of an increase in BMI in higher social media use in mobile phones and other devices.

**Modeling Exposure Reduction for Personal Level Interventions and Health Impacts**

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**Abstract**

Most health impact assessments of air pollution and related interventions are based on outdoor source concentrations of PM2.5. This does not account for personal level exposures, or the impact of smaller scale interventions. We developed a probabilistic model of the reduction in personal exposures to PM2.5 of people in Beijing, London, and Bangkok from facemask wearing and use of indoor air purifiers.  The model includes time-activity patterns and microenvironmental concentrations. Concentration distributions were derived as follows: Indoors – mass balance model incorporating infiltration factors for outdoor air pollution and indoor source emission strengths; outdoors – ambient monitoring data; transportation – the ratio of in-vehicle to urban background concentrations. Wherever possible, we derived parameters from local literature. Where not available, we used parameter values from the wider literature. Data on the effectiveness of low- and high- efficiency masks were from a volunteer study, and data on the effectiveness of air purifiers were from a literature review. A preliminary analysis suggested that, for an identical time-activity pattern, wearing a high efficiency facemask while outdoors and during travel would reduce median inhaled concentrations of PM2.5 from 11 to 8 ug.m-3 in London and 36 to 24 ug.m-3 in Beijing. These reductions were similar to those from the use of an air purifier indoors: reduction from 11 to 7 ug.m-3 in London and 36 to 24 ug.m-3 in Beijing.  Further refinements to the parameterization of the model are being made to allow computation of inhaled doses and estimation of associated health impacts of these interventions.