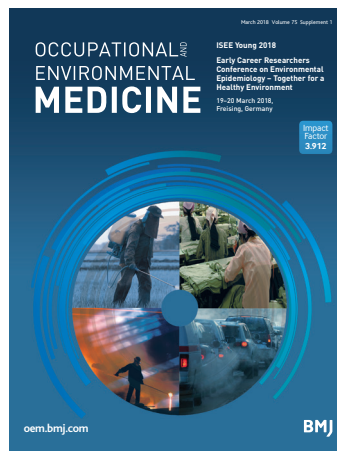# Occupational and Environmental Medicine

Publication of this supplement was supported by the Bill & Melinda Gates Foundation. Open access was supported by US Centers for Disease Control and Prevention.

Contents

March 2018 Volume 75 Supplement 1

EDITOR'S CHOICE
This article has been chosen by the Editor to be of special interest or importance and is freely available online.

OPEN ACCESS
This article has been made freely available online under the BMJ Journals Open Access scheme.
See http://injuryprevention.bmj.com/site/about/guidelines.xhtml#open

C|O|P|E COMMITTEE ON PUBLICATION ETHICS
This journal is a member of and subscribes to the principles of the Committee on Publication Ethics
www.publicationethics.org

equator
network

recycle
When you have finished with this magazine please recycle it.

Abstracts

AIR POLLUTION EXPOSURE DURING DIFFERENT TIME WINDOWS FROM BIRTH AND LUNG FUNCTION GROWTH UP TO ADOLESCENCE

[1]Edith Milanzi*, [2,3]Gerard Koppelman, [4]Henriette Smit, [5]Alet Wijga, [1]Marieke Oldenwening, [3,6]Judith Vonk, [1,4]Bert Brunekreef, [1]Ulrike Gehring. [1]Institute for Risk Assessment Sciences (IRAS), Environmental Epidemiology and Veterinary Public Health, Utrecht, Netherlands; [2]University Medical Centre Groningen, Paediatric Pulmonology and Paediatric Allergology, Groningen, Netherlands; [3]University Medical Centre Groningen, Groningen Research Institute for Asthma and COPD (GRIAC), Groningen, Netherlands; [4]University Medical Centre Utrecht, Julius Centre for Health Sciences and Primary Care, Utrecht, Netherlands; [5]National Institute for Public Health and the Environment (RIVM), Centre for Prevention and Health Services Research, Bilthoven, Netherlands; [6]University Medical Centre Groningen, Epidemiology, Groningen, Netherlands

Background/aim Air pollution exposure has been associated with lower lung function in children. Evidence on relevance of exposure during various stages of childhood and potential effects of exposure on lung function growth into adolescence is lacking.

Methods Within the Dutch PIAMA birth cohort, we conducted cross-sectional (n=721) and longitudinal analyses (n=915) of associations of time window air pollution exposure with lung function at 16 years and lung function growth from 8 to 16 years respectively. We estimated average concentrations of nitrogen dioxide (NO2), particulate matter with aerodynamic diameters<2.5 (PM2.5),<10 (PM10), 2.5–10 μm (PMcoarse), and PM2.5 absorbance at home addresses since birth using land use regression models. Time window average exposures included: birth, preschool (birth–4 years), primary school (4–12 years) and secondary school (12–16 years) periods. We analysed associations of time window exposures with lung function and lung function growth using linear regression and linear mixed effects models.

Results Higher air pollution levels during all time windows were associated with lower forced expiratory volume in 1 s (FEV1) in adolescence, e.g. -2.36% (95% CI: −3.76 to −0.94) per interquartile range (IQR, 1.18 μg/m³) increase in secondary school time window PM2.5, and with reduced FEV1 growth e.g. difference in 1 year growth per IQR (0.8 μg/m³) increase was −0.28% (95% CI:−0.44 to −0.11) per IQR increase in PM10 at birth. Results were similar for all pollutants and prominent in males than in females.

Conclusion Air pollution exposure during all time windows was associated with lower lung function (growth) from childhood into adolescence.

THE INTERACTIVE EFFECTS BETWEEN PARTICULATE MATTER AND TEMPERATURE ON MORTALITY IN BEIJING, CHINA

Lin Tian*, Xiaochuan Pan. Peking University, Department of Occupational and Environmental Health, Beijing, China

Background/aim The interactive effects between temperature and inhalable particulate matter (aerodynamic diameter <10 μm, PM_{10}) on mortality have been examined in some previous studies, but the results were inconsistent. This study aim to explore whether the effects of PM_{10} on daily non-accidental, cardiovascular and respiratory mortality are modified by temperature level in Beijing from 2006 to 2009.

Methods We applied bivariate response surface model and temperature-stratified model based on time-series Poisson generalised additive model (GAM) to examine the interactive effects in single- and two-pollutant models. The modification of age and gender were examined in subgroup analyses.

Results We found that the effect estimates of PM_{10} varied across temperature levels for non-accidental and different cause-specific mortalities. The PM_{10} effects in high levels of temperature were stronger than in low levels for non-accidental and respiratory mortality. For cardiovascular mortality, the effects were only statistically significant in low temperature level at current day, which was stronger than in high temperature level. The effects of PM_{10} for female were stronger than male in high temperature level, while in low temperature level, the effects were stronger for male group. The effects of PM_{10} were stronger for elder people (≥65) in both high and low temperature levels. Compared with low temperature, the effects were stronger in high levels for both of the age groups.

Conclusion The daily mortality attributed to PM_{10} could be modified by temperature. The interaction between air pollution and global climate change has potential strategy and policy implications.

RISK OF AMYOTROPHIC LATERAL SCLEROSIS AND PASSIVE RESIDENTIAL EXPOSURE TO PESTICIDES: COMPARISON OF QUESTIONNAIRE-BASED WITH GIS-BASED EXPOSURE ASSESSMENT METHODS

[1]Tommaso Filippini*, [1]Carlotta Malagoli, [2]Sofia Costanzini, [1]Federica Violi, [1]Silvia Cilloni, [2]Sergio Teggi, [3]Maria Fiore, [3]Margherita Ferrante, [1]Marco Vinceti. [1]University of Modena and Reggio Emilia, Department of Biomedical, Metabolic and Neural Sciences, Modena, Italy; [2]University of Modena and Reggio Emilia, Department of Engineering 'Enzo Ferrari', Modena, Italy; [3]University of Catania, Department of Medical, Surgical Sciences and Advanced Technologies 'G.F. Ingrassia'', Catania, Italy

Background/aim Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disease with still unknown aetiology. Among environmental factors, pesticides have been investigated due to their potential neurotoxic effects. Within a population-based case-control study conducted in two Italian regions, we aimed to investigate ALS risk due to passive residential exposure to pesticides using two methodologies.

Methods The exposure assessment was carried with an individual questionnaire, which collected information of the entire residential history of subjects, focusing on rural residence or in the vicinity of agricultural areas. It was compared with assessment based on geographical information system (GIS), avoiding direct contact with study subjects. To do that, we computed the percentage (≥50%) of rural land use within the 100 m round buffer around each subjects' residence, according to cover maps of two periods available from the Department of Agriculture, recent (2003–2009) and historical (1978–1989) ones. Risk for passive residential exposure to pesticides was computed using a sex and age adjusted logistic regression model for both methods, and their agreement was assessed using Cohen's kappa (k).

Results The odds ratio (OR) with their 95% confidence intervals (CI) for passive residential exposure to pesticides was 1.67 (95% CI 0.87 to 3.20) from the questionnaire-based assessment, while ORs from the GIS-based assessment were 1.05 (0.40 to 2.73) and 1.13 (0.49 to 2.63) for the recent and historical period, respectively. The agreement between two methods considering all participants was generally moderate to high, with k of 0.564 (95% CI:

0.361 to 0.767) and 0.648 (0.494–0.802) for recent and historical periods, respectively. Analyses divided between cases and controls yielded similar results, with k of 0.468 (0.133–0.803) in cases and 0.630 (0.382–0.879) in controls for recent period, and 0.642 (0.380–0.904) in cases and 0.652 (0.464–0.840) in controls for historical one.

Conclusion Our results showed a slight increased risk of passive exposure to pesticides using the questionnaire-based assessment, with less conclusive results from the GIS-based one. The similar agreement either between periods and case/control status, suggested also that no substantial information bias and differential exposure misclassification occurred when assessing pesticides exposure in our population.

Air pollution I

P I – 1–1   **ASSESSMENT OF VARIABILITY OF COMMUTING-RELATED AIR POLLUTANT EXPOSURES IN DIFFERENT IN-VEHICLE MICROENVIRONMENTS**

Oksana Ananyeva*, Olena Turos, Arina Petrosian. *O.M. Marzeiev Institute for Public Health of the National Academy of Medical Sciences of Ukraine, Air Quality Laboratory, Kyiv, Ukraine*

Background/aim In-vehicle microenvironments can contribute significantly to human daily exposure to traffic-related air pollutants, which have been associated with adverse respiratory, cardiovascular and reproductive health outcomes. Despite recent advances in commuters exposure research, variations in exposure between different routes and transport modes present a challenge for health effects studies.

Methods Commuters exposure to traffic-related air pollution was studied for two public transportation routes with different length and various car intensities in Kyiv city, Ukraine. Concentrations of PM10, PM2.5, PM1, CO and CO2 were measured between July and October on 42 weekdays during traffic peak hours while commuting by bus and by light vehicle. Light car microenvironment was tested for 2 cabin ventilation modes: windows opened without air conditioning system (A/C) working and windows closed with A/C turned on. Additionally, background measurements were conducted at an urban background location.

Results It was revealed that pollutants concentrations in all transport modes for both routes were higher than respective background values. The highest median PM10 exposures were registered in public buses (66 $\mu g/m^3$ for PM10, 33 $\mu g/m^3$ for PM2.5 and 0.25 $\mu g/m^3$ for PM1) following the longest route and lowest in cars with closed windows and working A/C (14 $\mu g/m^3$ for PM10, 11 $\mu g/m^3$ for PM2.5 and 17 $\mu g/m^3$ for PM1). Median CO exposure was highest in the car when windows opened without A/C (3.1 ppm), while median CO2 concentrations were the highest in the car with A/C turned on and closed windows (1841 ppm). It was observed that turning car cabin air conditioning system on could reduce PM exposure by 50%–60% depending on size as well as to further improve ventilation rate and filtration efficiency.

Conclusion The results revealed that observed variability of commuting-related pollution levels is predefined by commuting route, vehicle type and cabin ventilation mode. Findings of this research proved that exposure to air pollutants in vehicle microenvironments should be accounted in studies of impacts of daily air pollution exposures on human health.

P I – 1–2   **AIR POLLUTION AND ELDERLY MORTALITY IN SÃO PAULO, BRAZIL: AN ANALYSIS OF CUMULATIVE RISK INDEX FROM MULTIPOLLUTANT MODELS**

[1]Amine Farias Costa*, [2]Gerard Hoek, [2]Bert Brunekreef, [3]Antonio Ponce de Leon. *[1]Brazilian National Cancer Institute, Rio de Janeiro, Brazil; [2]Utrecht University, Utrecht, Netherlands; [3]Rio de Janeiro State University, Rio de Janeiro, Brazil*

Background/aim Considering the difficulty to separate the effects from individual pollutants present in mixtures, the cumulative risk index (CRI) estimates the combined effect from several pollutants together. We evaluated the association between air pollution exposure and daily elderly mortality using CRI from multipollutant models.

Methods This study was a daily time series of non-accidental and cause-specific mortality among the elderly living in São Paulo, Brazil, between 2000 and 2011. Effects of NO2, particulate matter smaller than 10 μm (PM10), carbon monoxide (CO) and ozone (O3) were estimated in Poisson generalised additive models. The single lag effect (lags 0 and 1) and the cumulative effect (lag 0 to 10) were evaluated in one, two-, three- and four-pollutant models and the CRI was estimated for each model. Air pollution effect estimates are presented as percentage increase or decrease in the number of deaths, and their 95% confidence interval (CI), for the interquartile range of air pollutants.

Results An association between NO2, PM10, CO and O3 exposures and deaths was found in one- and multipollutant models. For circulatory deaths, the CRI of NO2, for lag 1 (1.13%; CI: 0.69 to 1.57) and the cumulative lag 0–10, was close to the CRI of the four-pollutant model (1.49% for lag 1 (CI: 0.91 to 2.06)). For respiratory deaths, the CRI from the two-pollutant model with CO and O3 (12.34% for lag 0–10 (CI: 7.12 to 17.81)) represents the largest fraction of the CRI from the four-pollutant model (12.23% for lag 0–10 (CI: −2.65 to 29.38)). For non-accidental deaths, the pattern differs per lag. For lag 1 the CRI of all two-, three- and four-pollutant (1.49%; CI: 0.91 to 2.06) models was similar.

Conclusion The results suggest that air pollution mixtures have an effect on elderly mortality. The CRI documented that single pollutants did not fully capture the risk of the mixture.

P I – 1–3   **MORTALITY AND MORBIDITY EFFECTS OF LONG-TERM EXPOSURE TO LOW-LEVEL PM2.5, BLACK CARBON, NO₂ AND O₃: AN ANALYSIS OF EUROPEAN COHORTS**

[1]Maciej Strak*, [2]Richard Atkinson, [3]Marie-Christine Boutron, [4]Francesco Forastiere, [5]John Gulliver, [6]Ole Hertel, [7]Barbara Hoffmann, [8]Kees de Hoogh, [9]Nicole Janssen, [10]Klea Katsouyanni, [11]Goran Pershagen, [12]Annette Peters, [13]Ole Raaschou-Nielsen, [14]Per Schwarze, [15]Gudrun Weinmayr, [1]Gerard Hoek, [1]Bert Brunekreef. *[1]IRAS, Utrecht, Netherlands; [2]St George's, University of London, London, UK; [3]INSERM, Paris, France; [4]DEP Lazio, Rome, Italy; [5]Imperial College, London, UK; [6]Aarhus University, Aarhus, Denmark; [7]University of Düsseldorf, Düsseldorf, Germany; [8]Swiss TPH, Basel, Switzerland; [9]RIVM, Bilthoven, Netherlands; [10]National and Kapodistrian University of Athens, Athens, Greece; [11]Karolinska Institutet, Stockholm, Sweden; [12]Helmholtz Zentrum München, Neuherberg, Germany; [13]Danish Cancer Society, Copenhagen, Denmark; [14]Norwegian Institute of Public Health, Oslo, Norway; [15]Ulm University, Ulm, Germany*

Background/aim Epidemiological cohort studies have consistently found associations between long-term exposure to outdoor air pollution and a range of morbidity and mortality