

PROGRAM

ISEE-Europe's 2nd Early Career Researchers Conference on Environmental Epidemiology

**2-3 November 2015
Utrecht, The Netherlands**

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Welcome from the Organizers of the Conference

We are thrilled to welcome you to the second ISEE-Europe Young Conference on Environmental Epidemiology in Utrecht, the Netherlands. This conference follows the successful conference held last year in Barcelona. The enthusiasm of the participants and the high quality of the presented research made us realize how important this particular conference is to you and to the European Chapter of ISEE—not only for disseminating excellent research but foremost to foster collaborations and training of a new cohort of young environmental epidemiology researchers. We have taken up the challenge of organizing this conference and have been able to put together an exciting program with pre-conference workshops, early morning sessions, panel discussions, keynotes and contributed talks.

We are pleased to welcome more than 180 participants from more than 20 countries, and we hope that you will take this opportunity to make the most of the interactions with your peers. Let's make it a lively conference!

We would also like to acknowledge the support of the ISEE-Europe Chapter, the city of Utrecht, and Utrecht Life Sciences.

We hope you will enjoy the conference and enjoy your stay in Utrecht.

The organizing committee

Roel Vermeulen

Anke Huss

Ulrike Gehring

Virissa Lenters

Ingrid Dahmen

Welcome from the ISEE Europe Chapter Chairs

Welcome to Utrecht!

After our “premiere” in Barcelona last year, this is now the second ISEE Europe Young and Early Career Researchers Conference! Once again, the organizers have received many abstracts on exciting and interesting research projects from all of you and we are sure that the presented work will be of an excellent standard and a great basis for discussion and collaboration.

We believe this conference has kick-started the important process of getting together, exchanging innovative ideas, enhancing active participation in ISEE and, last but not least, meeting and staying in touch with old and new friends and colleagues from all over Europe. We hope that this conference offers a forum for you to continue on this road of collaboration and scientific excellence and thereby strengthen Environmental Health in Europe, which is as important as ever. We also hope that it will be a great educational experience for you and that you will take home many new ideas and plans for your future work.

Finally, we hope that this conference inspires you to take part in the activities of ISEE and, in particular our European Chapter. Making a contribution to the different committees and groups working hard to improve research, policy, and education in environmental health across Europe is very rewarding. We look forward to many of you volunteering to get involved because together we can make a real difference!

Barbara Hoffmann and Mireille Toledano,
Chair and Vice-Chair of the ISEE Europe Chapter

Committees

Local Organising Committee

Dr. Roel Vermeulen

Dr. Anke Huss

Dr. Ulrike Gehring

Virissa Lenters, MSc

Ingrid Dahmen

Scientific Committee

Dr. Lydiane Agier	INSERM
Dr. Helen Bailey	Institut National de la Santé (INSERM) U1153, Paris-Descartes University
Dr. Xavier Basagaña Flores	CREAL
Dr. Maribel Casas	CREAL
Dr. Francesca De' Donato	Department of Epidemiology, Lazio Regional Health Service
Dr. Sara De Matteis	Imperial College London
Dr. Evi Dons	Vito Belgium
Dr. George Downward	Institute for Risk Assessment Sciences (IRAS), Utrecht University
Almundena Espín Pérez, MSc	Maastricht University
Dr. Joan Forn	Norwegian Institute of Public Health (NIPH)
Dr. Rebecca Ghosh	MRC-PHE Centre for Environment and Health, Imperial College London
Eva Govarts, MSc	Flemish Institute for Technological Research (VITO)
Dr. Monica Guxens	CREAL
Dr. Susan Hodgson	Imperial College London
Dr. Maria Kippler	Karolinska Institutet, Institute of Environmental Medicine
Stefanie Lanzinger, MSc	Helmholtz Zentrum Muenchen, German Research Center for Environmental Health, Institute of Epidemiology II
Dr. Lena Novack	Ben-Gurion University of the Negev
Dr. Ebba Malmqvist	Lund University
Prof. Tim Nawrot	Hasselt University
Dr. Anjoeka Pronk	TNO
Katharina Roser, MSc	Swiss Tropical and Public Health Institute
Dr. Lars Rylander	Lund University
Dr. Matteo Scortichini	Department of Epidemiology, Lazio Regional Health Service
Dr. Maciek Strak	Institute for Risk Assessment Sciences (IRAS), Utrecht University
Dr. Gunnar Toft	Aarhus University
Dr. Mireille Toledano	Imperial College London
Dr. Lilian Tzivian	IUF - Leibniz Research Institute for Environmental Medicine
Dr. Marina Vafeiadi	University of Crete
Dr. Helena Velická	National Institute of Public Health
Dr. Danielle Vienneau	Swiss TPH
Dr. Judith Vonk	University Medical Centre Groningen
Dr. Inge Wouters	Institute for Risk Assessment Sciences (IRAS), Utrecht University

Keynotes

Keynote: The environment within and outside

Dr. Debby Bogaert



Dr. Bogaert joined the Department of Paediatric Immunology of the UMC Utrecht in September 2008 to continue her career as a physician scientist with a focus on pathogenesis of respiratory tract infections. She initiated several ecological studies of the upper respiratory tract microbiome in relation to pathogenesis of respiratory infections. She received several prestigious national grants (VENI, VIDI, Top grant) which have led to the validation and adaptation of a metagenomic pipeline for analysis of low-density respiratory microbiota, the set-up of applied bio-informatic tools, and the first analyses of environmental effects on such microbiota, and their relation with respiratory health and disease. She has (co)authored over 75 peer-reviewed papers.

Panel discussion: 'Are we doing the right research?'

Prof. Bert Brunekreef



Prof. Brunekreef is the Director of the Institute for Risk Assessment Sciences and is Professor of Environmental Epidemiology in both the Faculties of Veterinary Medicine, and the Faculty of Medicine at the Utrecht University. His research focuses on studies of effects of environmental factors on public health with a particular focus on air pollution. On several occasions, Bert Brunekreef served as advisor on national and international panels in the field of environmental health, including the Dutch National Health Council, of which he is a member, WHO and the US EPA. Bert Brunekreef is co-author of more than 300 peer reviewed journal articles in the field of environmental epidemiology and exposure assessment.

Dr. Steven Hamburg



In his role as chief scientist, Steven Hamburg works to ensure that EDF's (Environmental Defense Fund) advocacy is based on the best available science. He is currently coordinating 16 studies on methane emissions from along the natural gas supply chain. Prior to joining EDF he spent 25 years on the faculty of Brown University and the University of Kansas, published extensively on biogeochemistry, climate change impacts on forests and carbon accounting and served as a lead author for the IPCC. He currently co-chairs the Solar Radiation Management Governance Initiative (joint project of Royal Society, TWAS, EDF) and serves on the Hubbard Brook Research Foundation, US EPA's Science Advisory Board, NRC's Board on Environmental Science and Toxicology as well as many university/government advisory bodies.

Mw. Lot van Hooijdonk



Mw. Lot van Hooijdonk is a member (alderman) of the municipality legislative body of the city of Utrecht. She is tasked with legislation concerning traffic and mobility, sustainability and the Environment. In her period as an alderman she has introduced several local legislation including declaring the city center of Utrecht as an environmental zone; making it illegal for old diesel cars and trucks to enter the city center. Before becoming an alderman she was the Vice-Director of the Natuur en Milieufederatie (Nature & Environmental Federation) of the Province of Utrecht.

Dr. Hanna Boogaard



Hanna Boogaard is an epidemiologist and joined the Health Effects Institute in 2012, which is an independent research organization in Boston, MA, funded by the US Environmental Protection Agency and motor vehicle industry. She is involved in research oversight and review of studies investigating health effects of air pollution, and evaluating the effectiveness of interventions to improve air quality and public health. In addition, she is involved in developing new research programs on exposure to traffic-related air pollution, and studies assessing adverse health effects of longterm exposure to low levels of air pollution. Hanna received a PhD in air pollution epidemiology from Utrecht University, Netherlands. She studied health effects of traffic-related air pollution, and effectiveness of traffic policy measures including low emission zones.

Jan Korff de Gidts



Jan Korff de Gidts studied biochemistry and environmental sciences at Utrecht University. After teaching and performing research within interdisciplinary scientific projects at the Universities of Utrecht, Twente and Leiden, he acted as a coach and organizational advisor to numerous organizations. In 2009 he initiated the public interest group, "Kracht van Utrecht" (Force of Utrecht). Together with a team of citizens and experts, he provides concrete proposals for ways to change public perception and to improve transportation and land-use policies in metropolitan Utrecht for a healthier and more sustainable city.

Keynote: Green space and health; an ecological perspective

Dr. Erik Gómez-Baggethun



Erik Gómez-Baggethun (PhD) is a Research Professor at the Norwegian Institute for Nature Research and a Senior Visiting Research Associate at the University of Oxford. His research covers various aspects in ecological economics, with a focus on the links between ecosystems and human well-being. Erik was a lead author of the report 'The economics of Ecosystems and Biodiversity' (TEEB) and chapter coordinator for the CBD's report 'Cities and biodiversity Outlook' (CBO-1). He serves as vice president of the European Society for Ecological Economics, in the editorial boards of various international scientific journals, and in an expert task force of the International Platform for Biodiversity and Ecosystem Services (IPBES).

Early Morning Sessions

The following Early Morning Sessions will be hosted from 8:00-8:50 at the main conference venue, the Ruppert building. There is no need to register for these sessions in advance.

DAY 1: Monday, 2 November			
ROOM		RUPPERT A	RUPPERT D
8:00-8:50		Risk communication	Publishing successfully; Elsevier, EHP

DAY 2: Tuesday, 3 November			
ROOM	RUPPERT 033	RUPPERT A	RUPPERT D
8:00-8:50	How to get funding	Healthy City Environment Initiative	Tutorial to OMICs analyses

Risk communication

Speaker: Fred Woudenberg, Amsterdam Municipal Health Service (GGD)

People fear things that do not make them sick and they get sick from things they do not fear. Traditionally, the job of the epidemiologist is to calculate 'sickness' and to leave 'fear' to others. As a result, even good epidemiology is often not used in daily practice and bad, anecdotal household epidemiology can be very influential. In the early morning session, we look at the importance of an epidemiology of fear and we discuss ways to beat the household epidemiologist.

Publishing successfully; Elsevier Publisher and EHP Editor insights

Speakers: Deirdre Dunne, Senior Publisher Environmental Science & Health, Elsevier, Amsterdam

Barbara Hoffmann, University of Düsseldorf, Associate Editor of Environmental Health Perspectives

Ms. Dunne will share her expertise on how to write a high quality and high impact article. Prof. Barbara Hoffmann will speak about which manuscripts are of greatest interest to the Editorial Board of EHP.

How to get funding for your research idea

Speaker: Vincent Rijsman, Utrecht University

During this early morning session, Vincent Rijsman will outline how to find your way in the European funding landscape; how to look out for partners and finally, how to write an excellent research proposal.

Deciphering the complex; tutorial to OMICS analyses

Speaker: Marc Chadeau-Hyam, Lecturer in Statistical Bioinformatics, Imperial College London, UK

Large-scale OMICS and exposome datasets require novel statistical approaches to analyze marginally and jointly complex exposure and OMICS datasets. A nontechnical overview will be presented of well-established methods used to analyze OMICS data within three main types of regression-based approaches: univariate models including multiple testing correction strategies, dimension reduction techniques, and variable selection models.

Healthy City Environment Initiative;

What would you like to see improved in your cities and how do we do it?

Moderator: Mark Nieuwenhuijsen (CREAL)

This session consists of an early morning session on Tuesday, 3 November (8:00-8:55), followed by a special lunch time session (12:30-13:30).

The majority of people live in cities and urbanization is continuing worldwide. Cities have long been known to be society's predominant engine of innovation and wealth creation, yet they are also a main source of pollution and disease. Within cities there is considerable variation in the levels of environmental exposures such as air pollution, noise, temperature and green space. Emerging evidence suggests that urban and transport planning indicators such as road network, distance to major roads, and traffic density, household density, industry and natural and green space explain a large proportion of the variability. Personal behavior including mobility adds further variability to personal exposures, determines variability in green space and UV exposure, and can provide increased levels of physical activity.

Air pollution, noise and temperature have been associated with adverse health effects including increased morbidity and premature mortality, UV and green space with both positive and negative health effects and physical activity with many health benefits. In many cities there is still scope for further improvement in environmental quality through targeted policies. Making cities 'green and healthy' goes far beyond simply reducing CO2 emissions. Environmental factors are highly modifiable, and environmental interventions at the community level, such as urban and transport planning, have been shown to be promising and more cost effective than interventions at the individual level. However, the urban environment is a complex interlinked system.

Decision-makers need not only better data on the complexity of factors in environmental and developmental processes affecting human health, but also enhanced understanding of the linkages to be able to know at which level to target their actions. Furthermore in cities there are often silos of urban planning, mobility and transport, parks and green space, environmental department, (public) health department that do not work together well enough, multi-sectorial approaches are needed to tackle the environmental problems.

We believe that the International Society of Environmental Epidemiology (ISEE) can play an important role within the progress but some ideas need to be developed, preferably by an enthusiastic team of young researchers.

The main purpose of the initiative is to bring together urban planners, transport engineers, environmentalists and public health experts to discuss the current status, needs and solutions of current and future cities. We aim to develop visions of future scenarios.

To start the progress within the ISEE we bring together young researchers at the ISEE Young Europe to discuss the issues. We envisage 2 one hour sessions with a short introduction to the subject from researchers of the different sectors to set the scene in the early morning session, followed by a discussion and/or short pitch talks at the lunch time session.

Early morning session 8:00-8:50 (Ruppert A)

Moderator	Mark Nieuwenhuijsen (CREAL)
Urban planning	Razieh Zandieh (Twente University)
Transport engineering	Haneen Khreis (ITS Leeds)
Environment	Erik van Nunen (IRAS)
Public health	Natalie Mueller (CREAL)

Lunch time session 12:30-13:30 (Ruppert C)

Moderator: Mark Nieuwenhuijsen (CREAL)

1 minute pitches what you would like to see in the cities;

Closing Session: Discussion

Program

Monday, 2 November 2015

8:00-8:50 Early Morning Sessions

- Session 1 Risk Communication
Room: Ruppert A
Speaker: F. Woudenberg
- Session 2 Publishing Successfully; Elsevier, OEM & EHP Editors
Room: Ruppert D
Speakers: D. Dunne; B. Hoffmann

9:00-10:30 Plenary Session 1

- Room: Ruppert blauw
Chairs: R. Vermeulen, B. Hoffmann, A. Huss,
U. Gehring, V. Lenters, M. Toledano
- 9:00-9:15 Opening: Conference welcome
Chairs: R. Vermeulen, V. Lenters
- 9:15-10:00 D. Bogaerts, The Environment Within and Outside

- | | | |
|-------------|--|-------------|
| 10:00-10:15 | | Abstract ID |
| de Rooij, M | Detection of airborne <i>Coxiella burnetii</i> in the outdoor environment: spatial and temporal variation in exposure levels | 49 |
| 10:15-10:30 | | Abstract ID |
| Forns, J | DDT increases early child behavioral problems at 12 months of age: analyzing exposure to mixtures of persistent organic pollutants | 8 |

10:30-11:00 Coffee break in the hall of the Ruppert building

11:00-12:30	Parallel Sessions 1-3	
Session 1	Pesticides	
11:00-12:30	Room: Ruppert 033	
Presenter	Chairs: H. Bailey, M. Casas	
Ein-Mor, E	The exposure of pregnant women and their offspring to organophosphate pesticides – Preliminary results, the Jerusalem “Environment, Mother, and Child” study	102
Vafeiadi, M	Organophosphate Pesticides Exposure and Micronuclei Frequencies in Preschool Children: The Rhea Plus Project	85
Narduzzi, S	Environmental exposure to β -hexachlorocyclohexane is associated with higher systolic blood pressure among people living close to an industrial area.	149
Brouwer, M	Environmental exposure to pesticides and risk of Parkinson’s Disease in the Netherlands	151
Negatu, B	Unsafe use of Pesticides: a cross-sectional study on Knowledge Attitude and Practice of farm workers in three farm types in Ethiopia.	161
Session 2	Air pollution & child health	
11:00-12:30	Room: Ruppert A	
Presenter	Chairs: E. Malmqvist, L. Tzivian	
Janssen, BG	Exposure to PM _{2.5} air pollution in euthyroid pregnant women: fetal thyroid function and birth weight	22
Tsamou, M	Placental miRNA expression in association with in utero particulate air pollution exposure	68
Saenen, N	Sex-specific placental epigenetic changes of early neurodevelopment genes and particulate matter air pollution exposure	114
Provost, E	Microvascular responses in association with recent and chronic exposure to particulate air pollution in school children	94
Lambrechts, N	Particulate air pollution is associated with increased inflammatory and allergic symptoms in 14-15 year-old adolescents	103

Session 3	Exposome	Abstract ID
11:00-12:30	Room: Ruppert D	
Presenter	Chairs: M. Nieuwenhuijsen, L. Agier	
van Veldhoven, K	The impact of short-term exposure to disinfection by-products on the metabolome – a metabolome-wide association study	88
Golan, R	Associations between Primary Traffic Pollution and Metabolomic Response Patterns in the Dorm Room Inhalation to Vehicle Emissions (DRIVE) Study	50
Vlaanderen, J	The impact of ambient air pollution on the human blood exposome	104
Martens, D	Altered neonatal cord blood lipidome in association with exposure to particulate matter in the early life environment	110
Kuijpers, E	The potential use of a particulate matter sensor for “Exposome” research	45

12:30-13:30 Lunch in the hall of the Ruppert building

13:30-15:00 Parallel Sessions 4-6

Session 4	"Smart" methods for exposure assessment	Abstract ID
13:30-15:00	Room: Ruppert 033	
Presenter	Chairs: S. Hodgson, D. Vienneau	
Chapizanis, D	Sensor Data Analysis for Environmental Exposure Assessment	117
Kuijpers, E.	Prediction of location in indoor/outdoor micro-environments using smart consumer products	53
Triguero-Mas, M	Natural outdoor environments and physical activity	65
Smith, J	Incorporating travel and other microenvironments into population-level exposure estimates - Results from London	158
Dekoninck, L	Spatiotemporal activity based and route sensitive air pollution indicators for epidemiologists	91

Session 5	Health effects of environmental exposures within urban areas	Abstract ID
13:30-15:00	Room: Ruppert A	
Presenter	Chairs: P. Douglas , F. De'Donato	
Héritier, H	Source-specific traffic noise exposure and cardiovascular mortality in Switzerland	148
Pedersen, M	Impact of Air Pollution and Noise From Road Traffic on Pregnancy Induced Hypertensive Disorders and Gestational Diabetes.	44
Bijnens, E	Blood pressure in young adulthood and residential exposure of traffic and greenness in the early life environment of twins	131
Avila-Palencia, I	The relationship between bicycle commuting and self-perceived stress	137
Hampel, R	Short-term effects of air temperature on plasma metabolite levels in a cohort of cardiac catheterization patients.	43
Session 6	Occupational and environmental exposures: associated health risks and challenges in exposure assessment	Abstract ID
13:30-15:00	Room: Ruppert D	
Presenter	Chairs: I. Wouters, L. Rylander	
Xu, Y	Effect of exposure to welding fumes on mitochondrial DNA copy number and its relevance for blood pressure	17
Carlsen, H	Potential health risks associated with exposure to sulfur dioxide from a volcanic source in Iceland	139
van de Langenberg, D	A Conceptual Framework to Describe and Measure Shift Work in Epidemiological studies	123
Feletto, E	Dust to fiber concentration conversion factors for a study of occupational chrysotile exposure and cancer mortality in Asbest, Russian Federation	60
Voogd, E	Challenges in occupational exposure assessment for asbestos in the Netherlands	75

15:00-16:30**Poster Session 1**

Presenter	Room: Hall Ruppert building	
	Air pollution and mortality	Abstract ID
Renzi, M	Time-varying short term effects of air pollution in rome from 1998 to 2014	16
Stafoggia, M	Short-term association between ultrafine particles and mortality in eight European cities	26
Stafoggia, M	Short-term effects of ozone, nitrogen dioxide and oxidant capacity on mortality in Rome	27
Mueller, N	Environmental exposures and natural-cause mortality: a health impact assessment study for Barcelona	70
Basagaña, X	Long-term exposure to air pollution and mortality: a nationwide small area study in Spain (LIFE MED-HISS project)	79
Cox, B	Cattle mortality as a sentinel for the effects of ambient air pollution on human health	92
Costa, A	Cumulative effect of carbon monoxide exposure on deaths among elderly in São Paulo, Brazil, 2000 to 2011.	98
	Air pollution and pregnancy outcomes	Abstract ID
Malmqvist, E	AIR POLLUTION AND FOETAL GROWTH-susceptible time windows	7
Svecova, V	BPDE-DNA adducts, genetic and environmental factors associated with pregnancy outcomes in newborns in the Czech Republic	30
Smith, R	Traffic Pollution and Health in London: epidemiological study on birth outcomes and infant mortality	66
Saenen, N	Placental nitrosative stress and in utero exposure to particulate matter	115
Lepeule, J	Effects of air pollution during pregnancy on placental DNA methylation: an epigenome-wide association study.	172
Lepeule, J	Effects of air pollution during pregnancy on placental DNA methylation: A hypothesis-driven approach in a set of CpGs associated with fetal growth	173

	Air pollution and respiratory health	Abstract ID
Taj, T	First time asthma visits association with levels of short-term and background NO2 level, Skåne Sweden	37
Lanzinger, S	Health Effects of Ultrafine and Fine Particles in Central Europe – Results from the UFIREG study	42
DeVries, R	Outdoor Air Pollution and Exacerbation of Existing COPD: A Case Crossover Analysis	46
Velická, H	Short-Term Effects of Ambient Air Pollution on Asthma Symptoms among Children in Ostrava, Czech Republic	99
Lambrechts, N Govarts, E	Childhood asthma, rhinitis and itchy rash are linked with lifetime exposure to ambient particulate matter and nitrogen dioxide	127
Douglas, P	Exposures and health outcomes in relation to bioaerosol emissions from composting facilities: A systematic review of occupational and community studies	144
Vodonos, A	Association between dust storms and respiratory medications purchases among patients with Chronic Obstructive Pulmonary Disease	145
	Air pollution exposure assessment	Abstract ID
Sorek-Hamer, M	Estimating Daily PM Concentrations Across The Complex Geo-Climate Region of Israel Using High Resolution Satellite-Based AOD Data	21
Kuijpers, E	The potential use of a particulate matter sensor for “Exposome” research	45
Broday, E	Estimating exposure to fine PM at the neighbourhood scale using stationary and mobile particle samplers	61
Kuijpers, E	Exploration of sensor based personal PM10 and PNC exposure assessment methods: a measurement and a modelling approach	77
Chapizanis, D	Predicting location using ANN, based on sensors data	118
Hennig, F	Exposure misclassification with respect to different mobility: European Air Quality Chemistry Transport and Dispersion Model vs. Land Use Regression	119
van Nunen, E	Individualized exposure assessment for Ultrafine particles; preliminary results of the Dutch EXPOSOMICS Measurement Campaign	125
Barratt, B	Mapping commuter exposure to particulate matter on	157

	the London Underground	
Evridiki, P	The use and acceptability of novel technologies to characterise environmental exposure for birth cohort studies	166
	Air pollution/other	Abstract ID
Andersen, Z	Long-term exposure to air pollution and mammographic density in the Danish Diet, Cancer and Health cohort	32
Iacuzio, L	Biomonitoring of the population living near the solid waste incinerator plant in Modena, Italy	33
Vierkötter, A	Ozone exposure and extrinsic skin aging: Results from the SALIA cohort.	36
Yitshak-Sade, M	Air Pollution and Ischemic Stroke	69
Vilor-Tejedor, N	Gene-environment interaction between the ATP7B gene and copper exposure in childhood inattentiveness.	83
Provost, E	Short-term elevations in black carbon exposure are associated with rapid changes in carotid arterial stiffness	95
Cohen, G	Chronic exposure to traffic-related air pollution and long-term incidence of cancer after myocardial infarction	105
Vriens, A	Salivary extracellular fraction of miRNA candidates in association with exposure to ultrafine particles in school children.	113
Carluccio, E	Biomarkers for evaluation of exposure to incinerator plant	164
	Built environment	Abstract ID
Tzivian, L	Depression as intermediate in the association of long-term exposure to traffic noise with cognitive function – results from the Heinz Nixdorf Recall study	1
Saez, M	The problem of misalignment on the assessment of long term effects of traffic noise on mortality in cities of Spain	29
Triguero-Mas, M	The effect of different types of natural outdoor environments on people with poor mental health in Catalonia	63
Okokon, E	Exposure to particulate air pollution and noise during	80

	Climate change/heat	Abstract ID
	commuting by bicycle, bus and car in three European cities.	
Bauleo, L	Health Impact Assessment of Ozone in Italy	25
Kloog, I	Using Satellite Based Spatio-Temporal Resolved Air Temperature Exposure to Study the Association between Ambient Air Temperature and Birth Outcomes in Massachusetts	39
Oudin Åström, D	Significant mortality displacement due to exposure to high temperature in an inland and a coastal climate in Estonia	89
Cox, B	Dairy cattle mortality as a sensitive warning system for the effects of high and low ambient temperature on human health	93
Scortichini, M	Heat and cold attributable deaths in 16 Italian cities in the period 2001-2010	106
de'Donato F	Variation in heat-related attributable deaths in nine European cities before (1996-2002) and after (2004-2010) the 2003 heat wave.	109
Scortichini, M	Adverse weather events and road traffic injuries.	146
	Other	
Skröder, H	Early-life selenium status and cognitive function in childhood	57
Kippler, M	Cadmium exposure from fetal life to school-age and effects on cognitive and behavioral development: a prospective cohort study in rural Bangladesh	72
Ruiz-Castell, M	Risk of depression among first and second generation immigrants in Luxembourg	150

16:30-18:00

Plenary Session 2

Chairs: R. Vermeulen, M. Toledano

Panel discussion: Are we doing the right research?

Dr. Steven Hamburg, Environmental Defense Fund (EDF), Boston, USA

Prof. Bert Brunekeef, Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands

Lot van Hooijdonk, Utrecht Municipality, Utrecht, The Netherlands

Hanna Boogaard, Health Effects Institute, Boston, MA, USA

Jan Korff de Gidts, Kracht van Utrecht, Utrecht, The Netherlands

Welcome by the Mayor of Utrecht, Jan van Zanen

18:00-19:30

Welcome drinks

Room: Ruppert hall

19:30-

Social program (for those who registered)

10:30-11:00 Coffee break in the hall of the Ruppert building

11:00-12:30 Parallel Sessions 7-9

Session 7	RF-EMF: From exposure to health	Abstract ID
11:00-12:30	Room: Ruppert 033	
Presenter	Chairs: M. Guxens, A. Huss	
van Wel, L	Exposure to radiofrequency electromagnetic fields in schools in Amsterdam	112
Martens, A	Perceived and modelled exposure to RF-EMF from mobile phone base stations and the development of nonspecific symptoms	121
Reedijk, M	A prospective pooled cohort study of radiofrequency electromagnetic field exposure in the Netherlands; baseline characteristics and exposure distributions	138
Roser, K	Personal RF-EMF exposure in Swiss adolescents	55
Roser, K	Memory performance in adolescents: a novel approach to differentiate between radiation and non-radiation effects of mobile phones	54
Session 8	Emerging environmental contaminants and early-life health effects	Abstract ID
11:00-12:30	Room: Ruppert A	
Presenter	Chairs: M. Toledano, M. Kippler	
Govarts, E	Prenatal exposure to perfluorinated compounds and risk for Small/Large for Gestational Age (SGA/LGA): pooled analysis within four European birth cohorts	124
Vafeiadi, M	Early life Exposure to Bisphenol A in association with Obesity and Cardiometabolic Traits in Early Childhood.	84
Valvi, D	Early-life exposure to perfluoroalkylate substances and serum concentrations of IGF-1 and IGFBP-3 in 7-year-old children	141
Vernet, C	Pregnancy Exposure to Select Phenols and Phthalates and Pulmonary Function in Five Year-old Male Offspring	171
Franken, C	Genotoxicity and oxidative DNA damaging effects induced by phthalates in 14-15 year-old Flemish adolescents	116

Session 9	Air pollution and OMICS	Abstract ID
11:00-12:30	Room: Ruppert D	
Presenter	Chairs: J. Vonk, K. van Veldhoven	
Gruzieva, O	An integrative genomics approach identifies new asthma pathways related to air pollution exposure	67
Hüls, A	Genetic susceptibility for airborne particle induced skin aging	51
Plusquin, M	Global DNA methylation and exposure to ambient air pollution	170
Clemente, D	Prenatal air pollution exposure and growth: The role of placental mtDNA content	96
Winckelmans, E	Alterations in the peripheral blood transcriptome induced by particulate air pollution exposure	120
12:30-13:30	Lunch in hall Ruppert building	
12:30-13:30	Lunchtime session: Healthy City Environment Initiative	
	Room: Ruppert C	
	Moderator: M. Nieuwenhuijsen	
13:30-15:00	Parallel sessions 10-12	
Session 10	Cancer	Abstract ID
13:30-15:00	Room: Ruppert 033	
Presenter	Chairs: S. de Matteis, J.-P. Zock	
Bauleo, L	Environmental and occupational exposure and mortality in a population cohort of people living in an industrial area in Central Italy	62
Downward, G	An exposure assessment of solid fuel use in Xuanwei and Fuyuan, China	3
Guida, F	Epigenetic biomarkers of the risk of lung cancer	169
Vienneau, D	Mutual effects of radon and UV exposure on skin cancer mortality in Switzerland	155

Bailey, H	Home paint exposures and risk of childhood acute lymphoblastic leukemia: Findings from the Childhood Leukemia International Consortium	73
Session 11	Air pollution and adult health	
13:30-15:00	Room: Ruppert A	Abstract ID
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Manzano Salgado, C	Effect of prenatal exposure to perfluoroalkyl substances on childhood obesity	133
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16:30-17:00

Closing Session

Room: Ruppert blauw

Chairs: R. Vermeulen, A. Huss

M. Nieuwenhuijsen, Final remarks: Healthy City Environment Initiative,

D. Patel, Message from SNRN

B. Hoffmann & M. Nieuwenhuijsen, Student Awards

A. Huss, Closing remarks

Pre-Conference Workshops

Workshops will be held at the Nieuw Gildestein building (close to the main conference venue), Yalelaan 2, Utrecht Science Park, on Sunday, 1 November 2015 from 13:00-17:00. Without registration participation is not possible.

(1) Introduction to land use regression modelling:

Coordinators: Ulrike Gehring, Maciek Strak

Exposure assessment for epidemiological studies of long-term exposure to ambient air pollution is challenging because of substantial small-scale spatial variation. In large population studies, it is impossible to assess individual exposure to ambient air pollution by performing personal measurements. Instead, air pollution exposure modeling is used. Land-use regression modeling, combining air pollution monitoring and modeling using Geographic Information System (GIS) data is becoming increasingly popular.

(2) Statistical strategies for multi-pollutant modelling:

Coordinators: Lützen Portengen, Virissa Lenters

Analyzing mixtures of exposures is a recognized challenge in environmental epidemiology. In this workshop, we will introduce several statistical approaches for multi-pollutant modeling and modeling of exposomics data; models which can simultaneously model multiple, potentially correlated, exposures in one model, including multivariate and variable selection approaches such as sparse partial least squares regression and penalized lasso regression. These modelling approaches generally yield less biased exposure-outcome effect estimates and improved selection accuracy (fewer false positive discoveries) than conventional single-pollutant linear and logistic regression modelling.

(3) Understanding bias through directed acyclic graphs:

Coordinators: Rolf Groenwold, Frauke Hennig

The observational nature of many (environmental) epidemiological studies, make these studies susceptible to different forms of bias. Some of these biases can be controlled for in the analysis of a study, while others may actually be induced by (incorrectly) controlling for particular variables. Directed acyclic graphs (DAGs) provide an intuitive way of representing the ideas one has about the causal structure (s)he tries to unravel. DAGs can help to understand the nature of bias, but also how to control for it. In this workshop, the ideas behind DAGs will be discussed, and what the added value of such graphs can be in the design and analysis of an epidemiological study will be shown.

ISEE Student and New Researcher Network (SNRN) Mentorship Program

The goal of the ISEE SNRN mentorship program is to provide a platform for students and new researchers to interact and learn from more senior researchers in the field of environmental epidemiology.

Becoming a mentor or mentee:

To be a mentor in this program, individuals need to be well-established in the field of environmental epidemiology. If this is you and you are willing to mentor a student or new researcher please complete the ISEE Mentorship Profile Form (<https://docs.google.com/forms/d/1asaO1S8eZyJo9Z2bnPh9kNkeNZ3s-Z8ZrUfTPDsX4Ms/viewform>). All information that is provided will be kept confidential. The mentor can remove his or her name from the mentorship database at any time.

Prospective mentees can use the database maintained by the ISEE SNRN to find a potential mentor and then email the mentorship committee (isee.snrn@gmail.com) to confirm availability and to receive contact information. This database is constantly being updated with potential mentors so please check back if you can't find a suitable mentor. If you are a student or new researcher who is not yet an ISEE SNRN member, please join the ISEE SNRN by emailing isee.snrn@gmail.com.

How it works:

Mentees are responsible for selecting their mentor from the available mentor profiles. Once a suitable match has been made there are no formal requirements or time-commitments for mentors as this will be determined by each mentor-mentee relationship. Email discussion suggestions will be sent out once a month to all mentors and mentees to catalyze discussions. These topics of discussion may include specific research methods, writing grants and papers, dissertation process, graduate school decisions, career advice, work/life balance, etc.

Once a year, coinciding with the annual ISEE conference, mentors and mentees are asked to confirm their continued participation in the mentoring program.

At the annual conference an informal event will also be organized to give mentors and mentees time to speak in person.

Guidelines:

This relationship is not expected to replace existing relationships within universities but rather supplement these with someone with specific research interests in environmental epidemiology that match that of the mentor. This program is also meant to facilitate broader networking within the ISEE community.

Each mentor and mentee relationship should establish ground rules about timing and frequency of contact and areas of discussion.

Confidentiality is important and will be protected in this on-line system, and it is anticipated that the information shared by the mentor and mentee should be kept confidential. The ISEE SNRN is not responsible for ensuring confidentiality in individual mentor/mentee relationships.

Advice given by the mentor does not necessarily reflect the views of the ISEE SNRN.

Either the mentor or mentee may terminate the relationship at any time by notifying the other.

Please visit SNRN at <http://www.iseepi.org/About/snrn.htm>

Practical things

Venue

The conference will be held in the Ruppert building at Utrecht Science Park, Leuvenlaan 19-21, Utrecht, which is located next to the Educatorium. The pre-conference workshops will be held at Yalelaan 2. You can use this website to plan your travel via public transportation: <http://9292.nl/en>

Registration

Please register for the conference (pick up your badge) well before 9:00 on Monday morning.

Water

The Ruppert building hall has a water tap with drinking water. We encourage you to bring a water bottle.

Internet access

There is Wi-Fi access available via the UU-visitor or Eduroam networks.

Oral presentations

The presentation time will be 12 minutes plus an additional 3 minutes for discussion. Please bring your presentation on a USB stick to the room where your presentation takes place and upload it to the computer in that room at least 15 minutes before the start of the session, during the (coffee) break preceding the session. In each session room, staff will be available to help you with this. Please note that if the computer in the lecture rooms is switched off, all files will be deleted. Please bring the USB with your presentation with you.

Posters

Posters will be presented in the hall (ground floor) of the Ruppert building, which is close to the registration desk. Please go there on Monday morning and put up your poster on the board that shows up your poster number. Tape will be provided. All posters will be on display during the entire conference.

On campus

Grocery store: If you wish to buy some food while at the conference, you can visit the Spar store or one of the coffee bars. Most shops only take card payments, but the Spar also takes cash.

Upcoming conferences

25th Epidemiology in Occupational Health Conference, **EPICOH 2016** – Occupational Health: Think Globally, Act Locally: 5-7 September 2016, in Barcelona, Spain

8th Conference on the Science of Exposure Assessment in Epidemiology and Practice, **X2016**: 6-8 September 2016, in Barcelona, Spain

25th Conference of the International Society of Exposure Science, **ISES 2016** – Interdisciplinary Approaches for Health and the Environment: 9-13 October 2016, in Utrecht, The Netherlands

28th Annual Conference of the International Society for Environmental Epidemiology, **ISEE 2016** - Old and New Risks: Challenges for Environmental Epidemiology: 1-4 September, in Rome, Italy

Sponsors

Institute for Risk Assessment Sciences (IRAS), Utrecht University, Utrecht, The Netherlands

Utrecht Life Sciences, Utrecht, The Netherlands

Gemeente Utrecht (City of Utrecht), Utrecht, The Netherlands

Occupational and Environmental Medicine, BMJ Journals

Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain

Molecular and Environmental Epidemiology, Hasselt University, Hasselt, Belgium

Centre for Epidemiology and Screening, Department of Public Health, University of Copenhagen, Denmark

UOC Epidemiologia eziologica ed occupazionale, Dipartimento Epidemiologia del S.S.R. del Lazio, Roma, Italy



**Occupational &
Environmental Medicine**



Abstracts

Abstract ID: 1

Title: Depression as intermediate in the association of long-term exposure to traffic noise with cognitive function – results from the Heinz Nixdorf Recall study

Presenting Author: Tzivian, Lilian

Authors: Tzivian, Lilian (1); Dlugaj, Martha (2); Winkler, Angela (2); Hennig, Frauke (1,4); Fuks, Kateryna (1); Sugiri, Dorothea (1) Schikowski, Tamara (1,6,7); Erbel, Raimund (3); Jöckel, Karl-Heinz (4); Moebus, Susanne (4); Weimar, Christian (2); Hoffmann, Barbara (1,5), on behalf of the Heinz Nixdorf Recall Study Investigative Group

Affiliations: (1) IUF-Leibniz Research Institute for Environmental Medicine, Düsseldorf, Germany; (2) Department of Neurology, University Hospital of Essen, University of Duisburg-Essen, Essen, Germany; (3) Clinic of Cardiology, West-German Heart Center, University Hospital of Essen, University Duisburg-Essen, Essen, Germany; (4) Institute for Medical Informatics, Biometry and Epidemiology, University Duisburg-Essen, Essen, Germany; (5) Medical Faculty, Deanery of Medicine, Heinrich Heine University of Düsseldorf, Düsseldorf, Germany; (6) Swiss Tropical and Public Health Institute, Switzerland; (7) Basel University of Basel, Switzerland

Text:

Background and aims: It has been hypothesized that long-term exposure to traffic noise is associated with performance in neuropsychological tests. Noise is also associated with depressive symptoms, which in turn are adversely associated with cognitive performance. We aimed to analyze whether depressive symptoms intermediate or have a modifying effect on the association of long-term exposure to traffic noise with cognitive performance.

Methods: Cognitive performance was assessed at the first follow-up examination of the population-based Heinz Nixdorf Recall (Risk factors, Evaluation of Coronary Calcium and Lifestyle) study in 4086 participants using five subtests. The global cognitive score (GCS) was a sum of age- and education-specific z-scores of all five subtests. Depressive symptoms were assessed using the German version of the Center for Epidemiologic Studies Depression (CES-D) scale short form. We assessed long-term exposure to traffic noise (weighted 24-h (LDEN)) according to the EU directive 2002/49/EC. Multiple linear regression models adjusted for individual risk factors were calculated for the association of traffic noise with cognitive performance, with and without adjustment for depressive symptoms. Effect modification of depression on the noise-cognitive outcome association was investigated with interaction terms.

Results: In the fully adjusted model, noise was negatively associated with cognitive subtests and with the GCS. For example, a 10 dB(A) increase in LDEN was associated with the GCS (point estimate (β)=-0.07 [95% confidence interval:-0.13;-0.01]). Adjustment for depression attenuated consistently the noise-cognitive outcome associations by 7.0 to 21.9% (i.e. for LDEN and GCS β =-0.06 [-0.10;-0.01]). We did not find a significant modifying effect of CES-D on the noise-cognitive outcome association.

Conclusions: Based on results of this cross-sectional analysis we hypothesize that a relevant fraction of the association of long-term traffic noise exposure with cognitive function occurs due to a mediating effect of depression. Longitudinal studies are needed to corroborate this hypothesis.

Abstract ID: 2

Title: Novel analytical insights to evaluate Attention-deficit/Hyperactivity Disorder symptoms in Imaging Genetic studies.

Presenting Author: Vilor-Tejedor Natàlia

Authors: Vilor-Tejedor Natàlia (1-3); Alemany Silvia (1-3); Caceres Alejandro (1-3); Bustamante Mariona (1-4); Pujol Jesús (5,6); Macià Didac (5,6); González Juan R. (1-3); Sunyer Jordi (1-3,7)

Affiliations: (1) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain. (2) Universitat Pompeu Fabra (UPF), Barcelona, Spain. (3) CIBER Epidemiology and Public Health (CIBERESP), Spain. (4) Center for Genomic Regulation (CRG), Barcelona, Spain. Barcelona, Spain. (5) MRI Research Unit, Hospital del Mar, Barcelona, Spain. (6) Centro Investigación Biomédica en Red de Salud Mental, CIBERSAM G21, Barcelona, Spain. (7) IMIM (Hospital del Mar Medical Research Institute), Barcelona, Spain.

Text:

Background: The main goal of Imaging Genetic studies in Attention-deficit/Hyperactivity disorder (ADHD) is to improve current understanding of the genetic and neurobiological mechanisms associated with brain structure, function and behaviour which ultimately lead to the development of ADHD symptoms. However, high dimensionality and the specific nature of the data still represents a challenge in Imaging Genetic research. This proposal provides novel analytical insights to increase the validity and reliability of the results in Imaging Genetic studies of ADHD.

Methods: A two-stage analysis was performed. In the first stage, we conducted a Genome-wide Association Study of 1,592 individuals in order to perform a selection of the nominal significant intragenic Single Nucleotide Polymorphisms (SNPs) associated with ADHD symptoms. Zero-inflated negative binomial regressions adjusted by age and sex were conducted. In the second stage, we evaluated the influence of the previous selected SNPs in brain morphology in a subset of 135 individuals who underwent structural magnetic resonance imaging (MRI) scanning. We applied a massive univariate linear approach and multifactorial dimensionality reduction methods to assess these potential relationships.

Results: At the first stage, we identified 65 intragenic SNPs associated with ADHD. At the second stage, preliminary results at univariate level suggested that genetic markers associated with childhood ADHD symptoms in general population, in turn, are associated with volumetric changes at the level of the caudate nucleus area. Specifically, the rs13430952 G SNP allele (SRBD1 gene) was associated with smaller bilateral caudate nucleus volumes. At multivariate level, we also found latent factors correlated with caudate nucleus area.

Conclusions: These preliminary results showed that genetic variation associated with childhood ADHD symptoms is associated with volumetric changes at the level of the caudate nucleus morphology. It suggests an influence of genetically determined developmental abnormalities of frontostriatal circuits in ADHD symptoms. To our knowledge this is an important aspect to further analyze given the small number of Imaging Genetic studies in ADHD, specifically in childhood.

Abstract ID: 3

Title: An exposure assessment of solid fuel use in Xuanwei and Fuyuan, China

Presenting Author: Downward, George S

Authors: Downward, George S. (1); Hu, Wei (2); Reiss, Boris (1); Rothman, Nat (2); Xu, Jun (3); Wu, Guoping (4); Chapman, Robert S. (5); Seow, Wei Jie (2); Wei, Fusheng (4); Vermeulen, Roel (1); Lan, Qing (2)

Affiliations: (1) Institute for Risk Assessment Sciences, Utrecht University, The Netherlands; (2) Division of Cancer Epidemiology and Genetics, National Cancer Institute, USA; (3) School of Public Health, The University of Hong Kong, China; (4) China National Environmental Monitoring Center, Beijing, China; (5) College of Public Health Sciences, Chulalongkorn University, Bangkok, Thailand

Text:

Background and aims: Xuanwei and Fuyuan, in Yunnan province China, have among the highest lung cancer rates in the nation regardless of gender or smoking status. Previous research has implicated the domestic combustion of locally sourced "smoky" (bituminous) coal as being responsible for the lung cancer epidemic. However, little is currently understood regarding the etiologic impacts of specific smoky coal smoke constituents.

Methods: We enrolled 163 households representing fuel and stove types used throughout this region and their non-smoking female heads. Fuel, ash, and air measurements were collected and analysed for multiple pollutants including particulate matter, black carbon, polycyclic aromatic hydrocarbons, elemental composition and crystalline silica. Measurements were compared across different fuel (smoky coal, "smokeless"[anthracite] coal, wood) and stove (unvented firepits, ventilated stoves) types.

Results: Coal analysis found higher amounts of volatile matter and quartz in smoky than smokeless coal. Air measurements found that smoky coal was associated with higher measurements of particulate matter, particle phase polycyclic aromatic hydrocarbons, and black carbon than smokeless coal but that wood was associated with even higher measurements of particulate matter and black carbon. Minimal quartz was observed in air measurements with ash analysis indicating that the elevated quartz observed in smoky coal largely went on to form part of the ash. Also of note was the finding that air measurements were typically lower among households using ventilated stoves than households using unvented firepits with the exception of black carbon.

Conclusions: This exposure assessment has provided valuable insight into potential carcinogenic factors in an area with an exceptionally high lung cancer rate. Despite exposure levels being lower when using ventilated stoves or smokeless coal these levels were still high, strongly suggesting that no safe use of solid fuels is possible.

Abstract ID: 4

Title: An evaluation of early countermeasures to reduce the risk of internal radiation exposure after the 2011 Fukushima nuclear incident in Japan

Presenting Author: Nomura, S

Authors: Nomura, S (1); Tsubokura, M (2-4); Gilmour, S (5); Hayano, R (6); Watanabe, Y (6); Kami, M (4); Kanazawa, Y (2); Oikawa, T (2)

Affiliations: (1) Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London, London, UK; (2) Department of Radiation Protection, Minamisoma Municipal General Hospital, Fukushima, Japan; (3) Department of Radiation Protection, Soma Central Hospital, Fukushima, Japan; (4) Division of Social Communication System for Advanced Clinical Research, the Institute of Medical Science, University of Tokyo, Tokyo, Japan; (5) Department of Global Health Policy, Graduate School of Medicine, University of Tokyo, Tokyo, Japan; (6) Department of Physics, Graduate School of Science, University of Tokyo, Tokyo

Text:

Background and aims: After a radiation-release incident, intake of radionuclides in the initial stage immediately following the incident may be the major contributor to total internal radiation exposure for individuals in affected areas. However, evaluation of early internal contamination risk is greatly lacking. This study assessed the relationship between initial stage evacuation/indoor sheltering and internal radiation contamination levels four months after the 2011 Fukushima nuclear incident in Japan, and estimated potential pathways of the contamination.

Methods: The study population comprised 525 participants in the internal radiation-screening program at Minamisoma Municipal General Hospital, 23 km north of the Fukushima nuclear plant. The analyzed dataset included the results of a screening performed in July 2011, four months after the incident, and of a questionnaire on early-incident response behaviors, such as sheltering indoors and evacuations, completed by participants. Association between such early countermeasures and internal contamination levels of cesium-134 were assessed using Tobit multiple regression analyses.

Results: Our study showed that individuals who evacuated to areas outside Fukushima Prefecture had similar contamination levels of cesium-134 to individuals who stayed in Fukushima (relative risk: 0.86; 95% interval: 0.74–0.99). Time spent outdoors had no significant relationship with contamination levels. The effects of inhalation from radiological plumes released from the nuclear plant on total internal radiation contamination might be so low as to be undetectable by the whole-body counting (WBC) unit used to examine participants.

Conclusions: Given the apparent limited effectiveness of evacuation and indoor sheltering on internal contamination, the decision to implement such early responses to a radiation-release incident should be made by carefully balancing their benefits, such as preventing acute external radiation damage, and potential health risks, such as mortality due to the physical burden of evacuation.

Abstract ID: 5

Title: Relationship of behaviour patterns among school children to external radiation dose: a retrospective analysis 18 to 20 months following the 2011 Fukushima nuclear incident in Japan

Presenting Author: Nomura, S

Authors: Nomura, S (1); Tsubokura, M (2-4); Furutani T (5); Hayano, R (6); Kami, M (4); Kanazawa, Y (2); Oikawa, T (2)

Affiliations: (1) Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London, London, UK; (2) Department of Radiation Protection, Minamisoma Municipal General Hospital, Fukushima, Japan; (3) Department of Radiation Protection, Soma Central Hospital, Fukushima, Japan; (4) Division of Social Communication System for Advanced Clinical Research, the Institute of Medical Science, University of Tokyo, Tokyo, Japan; (5) Department of Physics, Graduate School of Science, University of Tokyo, Tokyo

Text:

Background and aims: After the radioactive incident, exposure risk in a daily setting among children was of major public concern. However, evaluation of the risk, which is essential to manage the future health risk, is greatly lacking. Following the 2011 Fukushima nuclear incident, Japan, the relationship of behaviour patterns among school children to external radiation exposure was assessed at the 18 to 20 months period of the incident.

Methods: The population comprised 520 school children from Minamisoma city, located 20km north of the nuclear plant. Data of their doses measured by individual radiation dosimeter and behavior survey results were considered, which were administered by the city office. To evaluate the relationship between behaviour patterns among school children and radiation exposure, a Tobit regression analysis was used.

Results: Mean value of the doses in the study period was 0.34mSv with standard deviation of 0.14mSv, indicating a rough estimation of an annual dose of 1.36mSv, including doses from natural sources. Regression analysis showed that any behaviours related to outdoor activities had no statistically significant relationship with the doses. Meanwhile, 0.1 μ Sv/h increase of air dose rate at home was associated with 10% increase of the dose. Similarly, the percentage change in the dose was a 2% increase for 0.01 μ Sv/h increase of air dose rate on school grounds.

Conclusions: This study may indicate that air contamination levels at places where children spend most of the day can be the significant predictors of the dose rather than outdoor activities in a short period of time, and therefore, are essential for evaluating exposure risk in children.

Abstract ID: 6

Title: Maternal occupational exposure to endocrine-disrupting chemicals across Europe and birth weight and length of gestation

Presenting Author: Birks; Laura

Authors: Birks; Laura (1, 2, 3, 4); Maribel Casas (1, 2, 3, 4); Ana M Garcia (2, 5, 6); Jan Alexander (7); Henrique Barros (8); Anna Bergstrom (9); Jens Peter Bonde (14); Alex Burdorf (10); Nathalie Costet (11); Asta Danileviciute (12); Merete Eggesbø (7); Mariana F Fernandez (2, 13); M Carmen González (5); Regina Grazuleviciene (12); Wojciech Hanke (14); Vincent Jaddoe (10); Manolis Kogevinas (1, 2, 15, 16); Inger Kull (17, 18); Aitana Lertxundi (19, 20); Vasiliki Melaki (22); Anne-Marie Nybo Andersen (21); Nicolas Olea (2, 13); Kinga Polanska (14); Franca Rusconi (23); Loreto Santa-Marina (2, 20, 24); Ana Cristina Santos (8); Tanja GM Vrijkotte (25); Daniela Zugna (23); Mark Nieuwenhuijsen (1, 2, 3, 4); Sylvaine Cordier (11); and Martine Vrijheid (1, 2, 3, 4)

Affiliations: (1) Center for Research in Environmental Epidemiology, Barcelona, Spain; (2) Consorcio de Investigación Biomédica de Epidemiología y Salud Pública, Barcelona, Spain; (3) Universitat Pompeu Fabra (UPF), Barcelona, Spain; (4) Universitat Autònoma de Barcelona, Barcelona, Spain; (5) Department of Preventive Medicine and Public Health, University of Valencia, Valencia, Spain; (6) Center for Research in Occupational Health, Barcelona, Spain; (7) Norwegian Institute of Public Health, Oslo, Norway; (8) Department of Clinical Epidemiology, Predictive Medicine and Public Health, University of Porto Medical School, Porto, Portugal; (9) Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; (10) Department of Public Health, Erasmus University Medical Center, Rotterdam, the Netherlands; (11) InsermU1085 – Irset, University of Rennes, Rennes, France; (12) Department of Environmental Science, Vytautas Magnus University, Kaunas, Lithuania; (13) Instituto de Investigación Sanitaria Ibs.Granada, University of Granada, Granada, Spain; (14) Department of Environmental Epidemiology, Nofer Institute of Occupational Medicine, Lodz, Poland; (15) Hospital Del Mar Medical Research Institute; Barcelona, Spain; (16) National School of Public Health, Athens, Greece; (17) Sachs' Children's Hospital, Södersjukhuset, Stockholm, Sweden; (18) Department of Clinical Science and Education, Karolinska Institutet, Stockholm, Sweden; (19) Faculty of Medicine, University of the Basque Country, Leioa, Basque Country, Spain; (20) BioDonostia Health Research Institute, San Sebastian, Basque Country, Spain; (21) Department of Public Health, University of Copenhagen, Copenhagen, Denmark; (22) Department of Social Medicine, Faculty of Medicine, University of Crete, Heraklion, Crete, Greece; (23) Meyer Children's University Hospital, Florence, Italy; (24) Department of Health, Government of the Basque Country, San Sebastian, Spain; (25) Department of Public Health, Academic Medical Center, University of Amsterdam, Amsterdam, the Netherlands

Text:

Background and aims: Many women of reproductive age are exposed to endocrine-disrupting chemicals (EDCs) at work. In pregnant women, occupational exposure to EDCs may affect fetal growth, but few studies have assessed this association and are of insufficient sample size to evaluate infrequent occupational exposures. We assessed whether maternal occupational exposure to EDCs during pregnancy was associated with birth weight, term low birth weight (LBW), length of gestation, and preterm delivery in a large population-based birth cohort design in Europe.

Methods: We used a dataset of 133,957 mother-child pairs and we linked maternal job titles with exposure to 10 EDC groups as assessed through a job exposure matrix. For each group, we combined the two levels of exposure (possible and probable) and compared birth outcomes with the unexposed group (unlikely). We performed meta-analyses of cohort-specific estimates.

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Results: Eleven percent of pregnant women were exposed to EDCs at work during pregnancy. Exposure to one or more EDC group was associated with an increased risk of term LBW (OR 1.25, 95%CI 1.04, 1.49). Association was consistent across cohorts.

Conclusions: Results from our large population-based birth cohort design indicate that maternal occupational exposure to EDCs during pregnancy is associated with term LBW newborns.

Abstract ID: 7

Title: Air pollution and foetal growth -susceptible time windows

Presenting Author: Malmqvist, Ebba

Authors: Malmqvist, Ebba (1); Källén, Karin (1); Rignell-Hydbom, Anna (1); Ritz, Beate (2); Rittner, Ralf (1); Rylander, Lars (1)

Affiliations: (1) Lund University, Sweden; (2) University of California, Los Angeles, USA

Text:

Background and aims: Air pollution has been linked with decreased fetal growth but knowledge on susceptible time windows of exposure is scarce.

Methods: In this study we will use outcome data from Swedish medical birth registers and an ultrasound database for around 55 000 pregnancies with two ultrasound measurements (one early in pregnancy and one late in pregnancy). We estimate exposures during different parts of pregnancies for all the pregnancies in the ultrasound database using geocoded residential addresses. The measures of air pollution exposure will be obtained through dispersion modelling with input data from an emissions database (NO_x, PM₁₀, PM_{2.5}, soot) with high resolution (100m grids). We will have knowledge from registers on potential confounders/interfering factors and effect modifiers (e.g. parity, sex, smoking, age and education of the mother).

Results: Results will be presented at the conference.

Abstract ID: 8

Title: DDT increases early child behavioral problems at 12 months of age: analyzing exposure to mixtures of persistent organic pollutants

Presenting Author: Forns J

Authors: Forns, J (1); Mandal, S (1); Iszatt, N (1); Polder, A (2); Thomsen, C (3); Lyche, JL (4); Stigum, H (5); Vermeulen, R (6); Eggesbø, M (1)

Affiliations: (1) Department of Genes and Environment, Division of Epidemiology, Norwegian Institute of Public Health, Oslo, Norway; (2) Department of Food Safety and Infection Biology, Norwegian University of Life Sciences, Ås, Norway; (3) Department of Exposure and Risk Assessment, Division of Environmental Medicine, Norwegian Institute of Public Health, Oslo, Norway; (4) Norwegian University of Life Science, Department of Food Safety and Infection Biology, Oslo, Norway; (5) Department of Chronic Diseases, Norwegian Institute of Public Health, Oslo, Norway; (6) Institute for Risk Assessment Sciences (IRAS), Division Environmental Epidemiology, Utrecht University, Yalelaan 2, 3584 CM, Utrecht, The Netherlands

Text:

Background and aims: Several persistent organic pollutants (POPs) have been implicated as developmental neurotoxicants. However, there are no studies that have looked at the specific or combined effect of POPs. The aim of this study was to assess the association between multiple POPs that infants are exposed to during the perinatal period and early behavioral development using novel statistical methods to deal with correlated exposure data.

Methods: In the present study, we measured concentrations of 24 different POPs, including 13 polychlorinated biphenyls (PCB) congeners, 6 polybrominated diphenyl ethers (PBDE), hexachlorobenzene (HCB), beta-hexachlorocyclohexane (β -HCH), 1,1-dichloro-2,2-bis (p-chlorophenyl) ethylene (p,p'-DDE), 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane (p,p'-DDT) and oxyCD in human milk from 572 mothers. Child behavioral problems were assessed at 12 and 24 months using the infant toddler symptom checklist (ITSC). Several statistical methods were implemented. Firstly, we performed principal component analysis (PCA) to transform correlated variables into a smaller number of uncorrelated principal components. Secondly, several variable selection methods, elastic net (ENET), Bayesian model averaging (BMA) and Stochastic search variable selection (SSVS), were applied to select toxicants associated with ITSC at 12 and 24 months old. Effect size of the selected toxicants was estimated using multivariate linear regression analyses. In addition, we tested for potential effect modification by maternal education, duration of exclusive breastfeeding and child's sex.

Results: p-p'-DDT was selected as the only toxicant associated with behavioral problems at 12 months in all the applied variable selection models (Coefficient by linear regression (based on an IQR increase) = 1.16; 95%CI [0.58; 1.74]). PCA analysis showed a negative association between the fourth principal component, which was composed by p-p'-DDT, p-p'-DDE and B-HCH, and behavioral problems at 12 months. This association with p-p'-DDT was modified by maternal education; larger effect estimates were observed among lower educated mothers. The effect of p-p'-DDT was no longer evident at 24 months of age.

Conclusions: In this population based birth cohort study, we observed a negative association between perinatal exposure to DDT and behavioral development at 12 months, which was most pronounced among children of lower educated mothers. However, this association was no longer evident at 24 months of age using the same instruments.

Abstract ID: 10

Title: Learning DAGs from Data: Performance of different algorithms - a simulation study

Presenting Author: Hennig, Frauke

Authors: Hennig, Frauke (1,2,3); Ickstadt, Katja (2); Hoffmann, Barbara (1,4)

Affiliations: (1) IUF-Leibniz Institute for environmental research, Düsseldorf, Germany; (2) TU Dortmund, Faculty of Statistics, Dortmund, Germany; (3) IMIBE- Institute for Medical Informatics, Biometry and Epidemiology, University Hospital, University Duisburg-Essen, Essen, Germany; (4) Heinrich Heine University of Düsseldorf, Medical Faculty, Deanery of Medicine, Düsseldorf, Germany

Text:

Background and aims: Correct adjustment for confounding variables in observational studies is one of the most essential tasks faced by epidemiological researchers. In 1999 Greenland et al. proposed the DAG (directed acyclic graph)-approach as a non-parametric tool for confounder identification in epidemiology based on expert knowledge. We aim to evaluate performance of algorithms to learn a DAG from observational data in terms of probabilistic and causal interpretation of a DAG.

Methods: We simulated multivariate normally distributed data according to an a priori given DAG including an exposure (X), an outcome (Y) and one to four confounding variables (C1-C4), including different conditional independency settings among the variables C1-C4 (i.e. colliders). To learn a DAG we applied the grow-shrink- (gs), hill-climbing- (hs) and min-max-hill-climbing- (mmhc) algorithm, using the correlation for conditional independence testing and the Bayesian equivalent score with the variable selection prior. In 100 simulations, we evaluated the number (#) of different DAGs resulting from the DAG learning process, the #of correctly detected DAGs, the #of DAGs within the same equivalent class of the underlying DAG (probabilistic) and the #of DAGs resulting in the same minimal sufficient adjustment sets (MSAS) of the underlying DAG (causal).

Results: In most settings, hc-algorithm performed well in detection of the true underlying DAG (# > 85) and in a minimum of different resulting DAGs. In 3 settings where detection of the true underlying DAG was weak (~40%), the hc-learned DAG resulted in the same MSAS as the underlying DAG in >80 simulations. The mmhc-algorithm only performed best for the scenario including a collider (detection of underlying DAG in 97%). The gs-algorithm most often resulted in a partially directed graph, needing additional expert knowledge to obtain a DAG.

Conclusions: Best performance, especially in terms of causal interpretation, was achieved by the hc-algorithm.

Abstract ID: 14

Title: Health impact model for a modal shift from car use to cycling in Belgium: Evaluation of bicycle highways

Presenting Author: Dons, E

Authors: Buekers, Jurgen (1); Dons, Evi (1, 2); Int Panis, Luc (1, 2)

Affiliations: (1) VITO, Mol, Belgium; (2) Hasselt University, Hasselt, Belgium

Text:

Background and aims: Bicycle highways can be defined as supralocal cycling routes along linear infrastructures such as railways and canals. Only recently, and in many parts of the world, large budgets are being spent on the construction of bicycle highways. We aim to evaluate investments in bicycle highways with respect to population health by developing and applying a health impact model in Flanders (Belgium).

Methods: A health impact model was developed to calculate the economic impact of cycling for a given volume of physical activity relative to car use within a defined population in Flanders. The model uses two health indicators: external costs and Disability Adjusted Life Years (DALYs). Considered impacts in the model are: mortality and morbidity related with increased physical activity, air pollution for society and active individuals, accident risks, CO₂ emission, congestion, and noise exposure. The model is applied to the bicycle highways Antwerp-Mechelen and Leuven-Brussels. Different sensitivity analyses with a variable number of cyclists and travelled distances were studied to check the robustness of the Conclusions.

Results: The results demonstrate that, based on the current set of parameters in the model, health benefits equal construction costs at levels of bicycle traffic that are much lower than currently observed volumes. Overall, increased physical activity outweighed other impacts. The benefit:cost ratio for health impact and infrastructure construction costs was on average 5.29, even when the impacts of congestion, noise and reduced CO₂ were not accounted for.

Conclusions: We used a health impact model to retrospectively evaluate investments in bicycle highways in Belgium. The construction costs are almost always much lower than the health benefits. From a health perspective, further investment in bicycle highways seems warranted despite large uncertainties.

Abstract ID: 15

Title: Road traffic air pollution, noise and biochemical markers for cardiovascular health in European cohorts: a harmonised approach

Presenting Author: Cai, Yutong

Authors: Cai, Yutong (1), Blangiardo, Marta (1), de Hoogh, Kees (2), Zijlema, Wilma (3), Doiron, Dany(4), Morley, David(1), Gulliver, John (1), Elliott, Paul (1), Hansell, Anna (1), Hodgson, Susan (1)

Affiliations: (1) MRC-PHE Centre for Environment and Health, Imperial College London, London, UK; (2) Swiss Tropical and Public Health Institute, Basel, Switzerland; (3) Department of Epidemiology, University Medical Center Groningen, Groningen, the Netherlands; (4) Maelstrom Research Group, Research Institute of McGill University Health Centre, Montreal, Quebec, Canada

Text:

Background and aims: Road traffic air pollution or noise is associated with cardiovascular diseases. Adverse risk profiles and systemic inflammation may mediate these associations. This study aims to quantify the joint and separate long-term effects of air pollution (Nitrogen dioxide (NO₂) and Particulate Matter with diameter $\leq 10\mu\text{m}$ (PM₁₀)) and road traffic noise on blood biochemical markers for cardiovascular health, across three European cohorts (HUNT3, Lifelines, UK Biobank).

Methods: Baseline questionnaire data obtained 2006-2013 were harmonized across the three cohorts. Address-level air pollution data were estimated for year 2007 from a satellite-enhanced Land Use Regression model whilst road traffic noise exposure was estimated using a simplified Common Noise Assessment Methods in Europe (CNOSSOS-EU). All harmonized data were virtually pooled on DataSHIELD, where generalized linear models were fitted to assess cross-sectional associations between exposure and each marker (triglycerides, non-fasting glucose and high-sensitivity C-Reactive Protein (hsCRP)), adjusting for age, sex, Body Mass Index, smoking, alcohol-drinking, education, employment and length of residency.

Results: In preliminary analyses, 83,842 participants from HUNT3 and Lifelines had complete covariate data. Each 10 $\mu\text{g}/\text{m}^3$ increase in NO₂ was associated with 5% (95%CI: 3 to 7) increase in hsCRP, and 0.04 mmol/litre (95%CI: 0.03 to 0.05) increase in triglycerides; both associations were robust to adjustments for day-time road noise. A 10 $\mu\text{g}/\text{m}^3$ increase in PM₁₀ was associated with 9% (95%CI: 2 to 15) increase in hsCRP, a 0.12 mmol/litre (95%CI: 0.08 to 0.16) increase in triglycerides, and 0.31 mmol/litre (95%CI: 0.09 to 0.53) increase in glucose, independent of road noise. With respect to noise exposure, a 10 dB(A) increase in day-time road noise was associated with 4% (95%CI: 2 to 6) increase in hsCRP; significance remained after adjustment for PM₁₀ but not NO₂.

Conclusions: Preliminary findings support an association between long-term air pollution exposure and biochemical markers for cardiovascular health, independent of road traffic noise.

Abstract ID: 16

Title: TIME-VARYING SHORT TERM EFFECTS OF AIR POLLUTION IN ROME FROM 1998 TO 2014

Presenting Author: Renzi, Matteo

Authors: Renzi, Matteo (1); Stafoggia, Massimo (1); Forastiere, Francesco (1)

Affiliations: (1) Department of Epidemiology, Rome, Italy

Text:

Background and aims: The association between air pollution and mortality has been widely investigated in epidemiological studies, however little is known on its temporal evolution over long periods. Our aim is to evaluate temporal relationship between air pollution and mortality in Rome during 1998-2014.

Methods: We considered 359,447 natural deaths among people aged 35+ years in Rome, Italy, between 1998-2014. We evaluated daily concentrations of particulate matter (PM₁₀), nitrogen dioxide (NO₂), sulfur dioxide (SO₂) and carbon monoxide (CO) as exposures. We used a time-series analysis adjusted for time trends and meteorology. The associations were estimated over the whole period and by individual years by fitting interaction terms between each pollutant and year.

Results: Annual daily mean concentrations of all pollutants decreased substantially over the study period, with % decreases ranging between 90 for SO₂ to 28 for NO₂. Overall, all pollutants were significantly associated to natural deaths: mortality increased by 1.27% (95%CI=0.90-1.64) and 0.19% (0.13-0.26) for increments of 10 mg/m³ and 1 mg/m³ of lag 0-1 PM₁₀ and CO, respectively. Mortality increased by 3.03% (2.44-3.63) and 2.36% (1.61-3.11) for 10 mg/m³ and 1 mg/m³ variations in lag 0-5 NO₂ and SO₂, respectively. Annual estimates of the air pollutants effects did not display a clear gradient, with slightly decreasing effects over the whole period but large year-to-year variability. When expressed per yearly interquartile ranges, effect estimates showed a clear decreasing trend only for SO₂ and CO.

Conclusions: Air pollution in Rome has substantially decreased over the last two decades. This has not resulted in changes in its effect on mortality, though a reduction in its impact has been detected, at least for SO₂ and CO, as a consequence of reduction in concentrations. More research is ongoing to investigate how the main policy measures undertaken to reduce anthropogenic emissions over time might have influenced the relative composition of the pollution mixture.

Abstract ID: 17

Title: Effect of exposure to welding fumes on mitochondrial DNA copy number and its relevance for blood pressure

Presenting Author: Xu, YiYi

Authors: Yiyi Xu (1), Huiqi Li (1), Maria Hedmer (1), Jonas Björk (1), Håkan Tinnerberg (1), Karin Broberg (2), Maria Albin (1)

Affiliations: (1) Division of Occupational and Environmental Medicine, Lund University, Sweden, (2) Unit of Metals & Health, Institute of Environmental Medicine, Karolinska Institutet, Sweden

Text:

Background and aims: Recent studies suggest that the mitochondrial DNA (mtDNA) copy number is influenced by environmental exposure to particles, a risk factor for cardiovascular disease. Our study aimed to elucidate the effect of occupational exposure to welding fumes on mtDNA copy number, and in turn, if mtDNA copy number modifies the association between particle exposure and cardiovascular response measured as blood pressure (BP).

Methods: In a cross-sectional study, we investigated 101 welders and 127 controls (all non-smoking males) from southern Sweden. Personal sampling of the welders' exposure to respirable dust was performed during work hours and BP was measured once for each subject at work. Relative mtDNA copy number in peripheral blood was measured by quantitative PCR. Multiple linear regression were used to analyze the associations.

Results: MtDNA copy number was higher in welders than controls ($\beta=0.098$, 95%CI: 0.030 – 0.17), the difference remained significant after adjustment for age, BMI, and other potential confounders. Higher mtDNA copy number was associated with higher personal respirable dust exposure among welders with moderate exposure levels ($\beta=0.037$, $P=0.054$). There was some evidence suggesting that MtDNA copy number could modify the effect of welding fumes on BP (P for interaction = 0.074 for systolic BP and 0.25 for diastolic BP): the association between working as a welder and BP could only be seen among carriers of low mtDNA copy number (systolic BP: $\beta=11$, 95%CI: 6.3 – 15; diastolic BP: $\beta=4$, 95%CI: 0.57 – 7.4) after adjusting for age, BMI, and potential confounders.

Conclusions: The increased mtDNA copy number in blood could be explained as a response to the oxidative stress caused by exposure to welding fumes. Individual mtDNA copy number could be a modifier of the effects of welding fumes on BP.

Abstract ID: 18

Title: Health effect of air pollution near an Italian steel plant

Presenting Author: Castriotta, L

Authors: Castriotta, Luigi(1); Barbone, Fabio (1-2-3), Casetta, Anica (2)

Affiliations: (1) University-Hospital of Udine; (2) University of Udine (3); University of Trieste

Text:

Background and aims: As known, the attributable fraction of acute and chronic diseases due to air pollution exposure have become a matter of increasing public concern in recent years. In Friuli Venezia Giulia region (Northeastern Italy) we conducted a retrospective study to evaluate the association among residents living near a steel plant and rates of mortality, from 1989 to 2012.

Methods: The study area was defined as a 5-km circle centred on the main chimney of the steel plant; the total population was 36,389 inhabitants from 1989 to 2012. A set of 8 bands with increasing distance from point source (1,5–5 km) was defined. A GIS mapped residential history of residents within 5km from the main chimney of the steel plant was completed. Among those we selected deaths caused by cancers (all cancers, lung, pleura, bladder and lymphopoyetic cancers), respiratory and cardiovascular diseases, occurred from 1989 to 2012. In each band, standardized mortality ratios (SMRs) were calculated on the basis of mortality rates of the entire area. To evaluate the association between SMRs and distance from the main chimney we conducted Stone test analysis in the entire area and, according to the prevalent wind direction, also in a subgroup of residents living into the South-West sector.

Results: The risk of cancer, especially of lung cancer was higher than expected for the residents located into the South-West sector (28 cases observed vs 18 expected; SMR = 1.5 corresponding to a radius of 2 km; $p=0.003$), and there was a significant decline in risk with increasing distance for male mortality for all cancers ($p=0.003$) and lung cancer ($p=0.005$).

Conclusions: Although this study has several limitations and no causal implication can be drawn, it adds evidence of excess of cancers, in particular, lung cancers, in a population living near the steel plant.

Abstract ID: 19

Title: Barriers to participation of socially disadvantaged groups in human biomonitoring research, and how to overcome them

Presenting Author: Morrens, B

Authors: Morrens, Bert (1); Paulussen, Melissa (2); Den Hond, Elly (3,4); Akhandaf, Yasmina (5); Schoeters, Greet (3); Loots, Ilse (1)

Affiliations: (1) Department of Sociology, University of Antwerp, Belgium, (2) Provincial Institute of Hygiene, Antwerp-Belgium, (3) Environmental Risk and Health, Flemish Institute for Technological Research (VITO), Mol, Belgium (4) Scientific Institute of Public Health, Brussels, Belgium (5) Department of Public Health, University Ghent, Belgium

Text:

Background and aims Environmental justice research demonstrates how socially disadvantaged groups are more exposed to environmental pollution and more susceptible to its health impact. At the same time, these groups are less represented, and thus less visible in biomedical studies and preventive monitoring surveys. This paradox not only undermines the internal validity of scientific data, it also complicates policy actions to identify and tackle environmental health inequalities. In Flanders (Belgium), the large scale human biomonitoring studies conducted by the Centre for Expertise on Environment and Health also face underrepresentation of lower social classes and especially of ethnic minorities. Within the latest monitoring survey on 280 newborns, we therefore designed, implemented and evaluated a recruitment strategy to enhance the participation of socially disadvantaged pregnant women. Our aim was to obtain a study sample representative for the social and ethnic diversity of the Flemish population. We focused on three benchmarks: education, ethnic background and poverty risk.

Results We identified four barriers that hinder participation of these groups, related to personal and situational factors. To address these barriers we initiated a system with personal buddies, to enable both prenatal information transfer about study conditions and postnatal assistance for the completion of self-assessment questionnaires. We also solicited advice on the ethnic matching and vocabulary of our communication materials from intermediary professionals working with the target group and from members of the target group itself. Although our study sample did not reach the proposed benchmarks of social diversity, we were able to double the number of participants with a socially vulnerable or ethnic background compared to similar studies in the past.

Conclusion By investing in direct, person-to-person contact by trusted buddies and by introducing actions to reduce cultural and linguistic obstacles, it is possible to increase the participation rate of socially disadvantaged subpopulations in biomedical research.

Abstract ID: 20

Title: Light at night exposure and breast cancer risk in England

Presenting Author: Hodgson, S

Authors: Descours, Alianore (1); Fecht, Daniela (2); Hodgson, Susan (2)

Affiliations: (1) Centre for Environmental Policy, Imperial College London, UK; (2) MRC-PHE Centre for Environment and Health, Imperial College London, UK

Text:

Background and aims: There is increasing evidence that light at night (LAN) may be a breast cancer risk factor. In vivo, there is strong evidence that LAN exposure stimulates growth of human breast cancer tumor in rats. Epidemiological studies have also found that exposure to LAN is associated with the risk of breast cancer. The aim of this study is to conduct a case-control study to establish the association between outdoor LAN exposure and female breast cancer risk in England, using female lung cancer cases as controls.

Methods: Cancer data were obtained from the Office for National Statistics for the years 2000 to 2012. LAN values were obtained from satellite data and assigned to each case/control's residential postcode centroid (the geographic centre of a collection of approximately 15 adjacent households) in a GIS. The association between LAN and breast cancer will be assessed using logistic regression, adjusted for age, ethnicity, socioeconomic deprivation, and urban/rural status.

Results: Data from ~40,000 breast and 15,000 lung cancer cases per year are available for analysis. Analyses are ongoing and will be presented at the conference (note project end date Sept 2015).

Conclusions: Light pollution is a modifiable feature of the urban environment. If we find evidence that LAN increases breast cancer risk, this would provide compelling evidence for further studies to understand the mechanisms of action, and/or support urban re-design to reduce LAN exposure to reduce the development of breast cancer.

Abstract ID: 21

Title: Estimating Daily PM Concentrations Across The Complex Geo-Climate Region of Israel Using High Resolution Satellite-Based AOD Data

Presenting Author: Sorek-Hamer, M

Authors: Kloog, Itai (1); Sorek-Hamer, Meytar (1,6); Lyapustin, Alexei (2); Coull, Brent (3); Wang, Yujie (4); Just C., Allan (5); Schwartz, Joel (5), Broday M., David (6)

Affiliations: (1) Department of Geography and Environmental Development, Ben-Gurion University of the Negev, Beer Sheva, Israel; (2) NASA GSFC, code 613, Greenbelt, MD, USA; (3) Department of Biostatistics, Harvard T.H. Chan School of Public Health, Boston, MA, USA; (4) University of Maryland Baltimore County, Baltimore, MD, USA; (5) Department of Environmental Health, Harvard T.H. Chan School of Public Health, Boston, MA, USA; (6) Civil and Environmental Engineering, Technion, Haifa, Israel

Text:

Background and aims: Estimates of exposure to PM_{2.5} are often derived from geographic characteristics based on land-use regression or from a small number of fixed ground-site monitors. Remote sensing advances have integrated these approaches with satellite-based measures of aerosol optical depth (AOD), which is spatially and temporally resolved, allowing greater coverage for PM_{2.5} estimations. Israel is situated in a complex geo-climatic region with contrasting geographic and weather patterns, including both green and bright surfaces within a relatively small area. Israel experiences several dust events each year, with high PM concentrations. These events have implications for both source apportionment and possibly also for health impacts. Our goal was to examine the use of high resolution satellite data (MAIAC) in Israel, and to explore the reliability of predicted PM_{2.5} and PM₁₀ at a high spatiotemporal resolution.

Methods: We applied a three stage process, including a daily calibration method based on a mixed effects model, to predict ground PM_{2.5} and PM₁₀ over Israel. We later constructed daily predictions across Israel for 2003-2013 using spatial and temporal smoothing, to estimate AOD when satellite data were missing.

Results: Good model performance was achieved, with out-of-sample cross validation R² values of 0.79 and 0.72 for PM₁₀ and PM_{2.5}, respectively. Model predictions had little bias, with cross-validated slopes (predicted vs. observed) of 0.99 for both the PM_{2.5} and PM₁₀ models.

Conclusions: To our knowledge, this is the first study that utilizes high resolution 1km MAIAC AOD retrievals for PM prediction while accounting for geo-climate complexities, such as experienced in Israel. This novel model allowed the reconstruction of long- and short term spatially resolved exposure to PM_{2.5} and PM₁₀ in Israel, which has a great potential to be used for air quality management, environmental surveillance, and estimation of exposure metrics that can be used in environmental health studies

Abstract ID: 22

Title: Exposure to PM2.5 air pollution in euthyroid pregnant women: fetal thyroid function and birth weight

Presenting Author: Janssen, BG

Authors: Janssen BG (1)*, Saenen ND (1)*, Roels HA (1,2), Madhloum N (1), Penders J (3,4), Gysealaers W (3,5), Vanpoucke C (6), Vrijens K (1), Nawrot TS (1,7) * contributed equally

Affiliations: (1) Centre for Environmental Sciences, Hasselt University, Diepenbeek, Belgium; (2) Louvain Centre for Toxicology and Applied Pharmacology (LTAP), Université catholique de Louvain, Brussels, Belgium; (3) Biomedical Research Institute, Hasselt University, Diepenbeek, Belgium; (4) Department of Clinical Biology, East-Limburg Hospital, Genk, Belgium; (5) Department of Obstetrics, East-Limburg Hospital, Genk, Belgium; (6) Belgian Interregional Environment Agency, Brussels, Belgium; (7) Department of Public Health, Occupational and Environmental Medicine, Leuven University (KULeuven), Leuven, Belgium

Text:

Background and aims: Thyroid hormones are critical for fetal development and growth. Currently, there is no information available whether prenatal exposure to particulate matter (PM) air pollution affects fetal thyroid function and what the impact is on birth weight in normal healthy pregnancies.

Methods: A chemiluminometric immunoassay was used to measure the levels of free thyroid hormones (FT3, FT4) and thyroid stimulating hormone (TSH) in cord blood of 545 mother-newborn pairs enrolled in the ENVIRONAGE birth cohort. Daily PM2.5 exposure levels were calculated for each participant's home address using a spatial-temporal interpolation model in combination with a dispersion model.

Results: TSH levels in cord blood were inversely associated with an interquartile range (IQR) increment in PM2.5 exposure averaged over the entire pregnancy (-1.14 mU/L, p=0.009), and the association was most pronounced for PM2.5 exposure during the first trimester of pregnancy (-1.90 mU/L, p=0.003). Across the three-trimester exposure windows, an IQR PM2.5 increment showed a negative association with the FT4/FT3 ratio (-41.9%, p=0.0001 for the entire pregnancy), which was mainly attributed to a reduction in FT4 concentrations in cord blood. A doubling in cord blood FT4 levels was associated with an increase in birth weight of 401 g (p<0.0001). We observed that PM2.5 exposure during trimester-3 indirectly affected birth weight which was for 24% mediated by cord blood FT4 levels.

Conclusions: In normal healthy pregnancies, exposure to PM2.5 air pollution affects fetal thyroid function, as reflected by changes in cord blood thyroid hormone levels. Cord blood FT4 mediates to some extent the association between PM2.5 exposure and birth weight. Whether PM2.5-induced alterations in fetal thyroid function has bearing on pathological consequences later in life needs further elucidation.

Abstract ID: 24

Title: Physical Activity, Air Pollution and the Risk of Asthma and Chronic Obstructive Pulmonary Disease

Presenting Author: Fisher, J

Authors: Jack E. Fisher (1); Steffen Loft (2); Charlotte S. Ulrik (3); Ole Raaschou-Nielsen (4); Ole Hertel (5); Anne Tjønneland (4); Kim Overvad (6,7); Mark J. Nieuwenhuijsen (8,9,10); Zorana J. Andersen (1)

Affiliations: (1) Center for Epidemiology and Screening, Department of Public Health, University of Copenhagen, Copenhagen, Denmark; (2) Section of Environmental Health, Department of Public Health, University of Copenhagen, Copenhagen, Denmark; (3) Department of Respiratory Medicine, Hvidovre Hospital and University of Copenhagen, Hvidovre, Denmark; (4) Danish Cancer Research Center, Danish Cancer Society, Copenhagen, Denmark; (5) Department of Environmental Science, Aarhus University, Roskilde, Denmark; (6) Department of Public Health, Section for Epidemiology, Aarhus University, Aarhus, Denmark; (7) Department of Cardiology, Aalborg University Hospital, Aalborg, Denmark; (8) Center for Research in Environmental Epidemiology (CREAL), Barcelona, Spain; (9) Universitat Pompeu Fabra, Barcelona, Spain; (10) CIBER Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain

Text:

Background and aims: Physical activity enhances uptake and deposition of air pollutants in the lung, possibly augmenting harmful effects of air pollution on chronic lung disease during exercise. To examine whether benefits of physical activity on the risk of asthma and COPD are moderated by long-term exposure to high air pollution levels in an urban setting.

Methods: 53,113 subjects (50-65 years) from the Danish Diet, Cancer, and Health cohort reported data on physical activity (participation in sports, cycling, gardening and walking) at the recruitment (1993-97) and were followed until 2013 in the National Patient Register until first hospitalization for asthma and COPD. High exposure to air pollution was defined as the upper 25th percentile of modelled nitrogen dioxide (NO₂) levels at residential addresses at the year of recruitment. We used Cox regression to associate participation in sports, cycling, gardening and walking to asthma and COPD, separately, and introduced NO₂ as an interaction term.

Results: 1,347 subjects were hospitalized (1,151 incident and 196 readmissions) for asthma and 3,476 (3,225 incident and 221 readmission) for COPD. We found significant inverse associations of participation in sports (hazard ratio: 0.85; 95 % confidence interval: 0.75-0.96) and cycling (0.85; 0.75-0.96) with the incident asthma hospitalizations, and no effect on readmissions in asthmatics. We found significant inverse associations of participation in sports (0.82; 0.77-0.89), cycling (0.81; 0.76-0.87), gardening (0.88; 0.81-0.94) and walking (0.85; 0.75-0.95) with incident COPD admissions, and similar, but non-significant associations with readmission in COPD patients. Reductions in asthma and COPD admissions associated with physical activities were not modified by NO₂.

Conclusions: Exposure to high levels of traffic-related air pollution did not modify beneficial effects of physical activity on asthma and COPD development and exacerbation.

Abstract ID: 25

Title: Health Impact Assessment of Ozone in Italy

Presenting Author: Golini, M

Authors: Golini, Martina Nicole (1); Ciancarella, Luisella (2); Badaloni, Chiara (1); Cesaroni, Giulia (1); Williams, Martin (3); Forastiere, Francesco (1) and Ancona, Carla (1)

Affiliations: (1) Department of Epidemiology, Lazio Regional Health Service, Italy; (2) Italian National Agency for New Technologies, Energy and Sustainable Development, Italy; (3) University of Urbino, Italy

Text:

Background and aims: We estimated the avoidable impact of Ozone on mortality in Italy comparing the 2005 baseline situation with a future 2020 scenario based on the current legislation (CLe) and the National Energy Strategy (NES).

Methods: Annual and summer (April-September) O₃ concentrations (4*4 km grid) were estimated by using the national AMS-MINNI dispersion model. Population weighted exposures (58 million residents in 2005) by geographic areas (North, Centre, South and islands) and urban/rural areas were assessed. Available concentration-response functions (WHO/HRAPIE) were used to estimate long-term effects on mortality for respiratory diseases and short-term effects on mortality for non-accidental causes. The counterfactual level of 70 µg/m³ was used for O₃ (annual and summer levels) because of the uncertainties in the exposure-response below that value.

Results: At baseline, more than 9 million of Italian residents were exposed to annual O₃ levels above 100 µg/m³, and about the 75% of the population (more than 40 million of subjects) lived in areas where summer concentrations exceed this threshold. We estimated 1,707 (95%CI 622-2,861) annual premature deaths for respiratory diseases for long-term exposure and 2,230 (95%CI 1,079-3,301) annual premature deaths for non-accidental causes attributable to short-term effects, respectively. The largest impact was in Northern Italy, especially in the Po Valley, and in areas with medium and high population density. The 2020 Italian NES would prevent 23% of the long-term, and 14% of the short-term ozone attributable deaths, especially in the South (-26% and -20%, respectively) and in rural areas (-27% and -21%, respectively).

Conclusions: The HIA indicates an important negative impact of Ozone in Italy. Although the NES at 2020 shows a decrease of attributable cases, it is necessary to improve the air quality reducing the emissions of ozone precursors (and the consequent health impact) using the regulatory instruments already available in Italy at national and local levels.

Abstract ID: 26

Title: Short-term association between ultrafine particles and mortality in eight European cities

Presenting Author: Stafoggia, M

Authors: Stafoggia, Massimo (1); Wolf, Kathrin (2); Bedada, Getahun B. (3); Jacquemin, Benedicte (4); Andersen, Zorana J. (5); Lanki, Timo (6); Hennig, Frauke (7,8); Samoli, Evangelia (9)

Affiliations: (1) Department of Epidemiology, Lazio Region Health Service, Rome, Italy; (2) Institute of Epidemiology II, Helmholtz Zentrum München, Neuherberg, Germany; (3) Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; (4) Research Centre in Environmental Epidemiology, Barcelona, Spain; (5) Centre of Epidemiology and Screening, University of Copenhagen, Copenhagen, Denmark; (6) Department of Health Protection, National Institute for Health and Welfare, Kuopio, Finland; (7) IUF – Leibniz Research Institute for Environmental Medicine, Düsseldorf, Germany; (8) Institute for Medical Informatics, Biometry and Epidemiology, University Hospital, University Duisburg-Essen, Essen, Germany; (9) Department of Hygiene, Epidemiology and Medical Statistics, University of Athens, Athens, Greece

Text:

Background and aims: Evidence on the health effects of ultrafine particles (< 0.1 µm, UFP) is inconsistent, mostly from single-city studies based on short or discontinuous time-series. We investigated the association between daily concentrations of UFP and cause-specific mortality in eight European urban areas.

Methods: We collected at least three years of daily data on mortality counts from natural and cardio-respiratory causes, concentrations of UFP, particulate matter < 10, 2.5 or 2.5-10 µm (PM₁₀, PM_{2.5}, PM_{2.5-10}), gases and meteorology, for Helsinki, Stockholm, Copenhagen, Ruhr Area, Augsburg, Barcelona, Rome and Athens between 1999 and 2013. We applied city-specific time-series Poisson models followed by meta-analysis. We evaluated distributed-lag effects, two-pollutant models, effect modification by season, and concentration-response functions.

Results: Daily mean UFP concentrations ranged between 5,105/cm³ in Copenhagen and 34,046/cm³ in Rome, and PM₁₀ between 14.8 µg/m³ in Stockholm and 36.0 µg/m³ in Rome. We observed positive but non-significant associations between UFP and natural mortality at delayed lags 5 to 7 days, with mortality increasing by 0.37% (95% CI (confidence interval): -0.03; 0.77) for an increment of 10,000/cm³ UFP at lag 7. Corresponding estimates for cardiovascular and respiratory mortality were 0.50% (-0.11; 1.12) and -0.09% (-3.20; 3.12), respectively. All estimates were attenuated to a null effect after PM or gases adjustment. We found significant associations between PM₁₀, PM_{2.5}, PM_{2.5-10} and mortality. Effects of all pollutants were higher during warmer months. Finally, all pollutants including ultrafine displayed a linear association with natural mortality, with effects discernible even at low concentrations.

Conclusions: We confirmed previous findings of an association between PM and mortality, while we found weak evidence of UFP effects for lags of 5-7 days after exposure. Further analyses are needed to better understand whether UFP effects are confounded or might be mediated by PM exposure in their relationship with health endpoints.

Abstract ID: 27

Title: Short-term effects of ozone, nitrogen dioxide and oxidant capacity on mortality in Rome

Presenting Author: Stafoggia, M

Authors: Stafoggia, Massimo (1); Forastiere, Francesco (1); Williams, Martin L. (2)

Affiliations: (1) Department of Epidemiology, Lazio Region Health Service, Rome, Italy; (2) MRC-PHE Centre for Environment and Health, Kings College, London, UK

Text:

Background and aims: Short-term health effects of ozone (O₃) and nitrogen dioxide (NO₂) have been widely documented, mostly from analyses considering them separately. However, both pollutants are powerful oxidants in ambient air and should therefore be analyzed jointly. We investigated their association with mortality in Rome by using two-pollutant models and by combining O₃ + NO₂ as a single exposure metric referred to as "oxidant capacity" (Ox).

Methods: We collected daily counts of non-accidental deaths in Rome in 2002-2012. Hourly data on O₃ and NO₂ were retrieved from two co-located monitors, and their sum was computed (Ox). Daily means, maxima and max 8-hr running means were derived and related to mortality counts by time-series analysis adjusting for time trends, meteorology and PM concentrations. O₃ and NO₂ were investigated in both single- and two-pollutant models, while Ox was analyzed individually. All-year and season-specific analyses were performed.

Results: We found stronger associations of O₃ and NO₂ with mortality in two-pollutant models compared to single-pollutant. Mortality increased by 0.93% (95% CI 0.06, 1.81) per 20 ppb increase in daily mean ozone (lag 0-5) when adjusting for NO₂, while it increased by 0.20% (-0.61, 1.02) when analyzed individually. Corresponding estimates for NO₂, with and without O₃ adjustment, were 2.87% (1.61, 4.14) and 2.38% (1.21, 3.56), respectively. Ox was significantly associated with natural mortality (1.40%, 0.58, 2.22), with a concentration-response function J-shaped, showing increasing slope above 150-to-200 ppb. Effect estimates were robust to adjustment models, slightly higher on warmer months, and lower when maximum hourly or 8-hr values were used as exposure metrics.

Conclusions: We estimated strong effects of NO₂ and O₃ on mortality in Rome in two-pollutant models and we observed a strong association with oxidant capacity. This approach better captures the joint effect of both oxidants and should be replicated in future studies

Abstract ID: 28

Title: Health effects of vehicle exhaust ultrafine particles versus secondary ultrafine particles in ambient air

Presenting Author: Tobías, A

Authors: Aurelio Tobías; Cristina Reche, Noemí Pérez, Xavier Querol

Affiliations: Institute of Environmental Assessment and Water Research, Spanish Council for Scientific Research, Barcelona, Spain

Text:

Background and aims: In urban areas, vehicle exhaust is the main emission source, releasing ultrafine particles (<0.1 micron, UFP) with an impact in particle number concentration (N) in ambient air. Evidence on the health effects of UFP is inconsistent. New particles in ambient urban air are the result of direct emissions and also the formation of secondary UFP from gaseous precursors. We segregated UFP into these two classes and investigated their impact on cause-specific mortality in Barcelona, Spain.

Methods: We collected daily mortality counts from natural and cardio-respiratory causes and concentrations of UFP and black-carbon (BC) in Barcelona between 2009-2012. We separated the UFP using a method based on the high correlation between BC and N, since BC in Barcelona is directly attributed to road-traffic emissions. The first component accounts for aerosol constituents emitted by vehicle exhaust (N1) and the second for the photochemical new particle formation enhancements (N2) occurring at midday when BC is at its minimum. We evaluated short-term effects up to one week, using a time-stratified case-crossover design with Poisson regression allowing for overdispersion.

Results: Daily mean UFP concentration (N) was 13,114/cm³, from which 45% is N1. We did not find associations between N and cause-specific mortality. We observed associations for natural and respiratory causes, with mortality increasing by 1.7% (95%: 0.1; 3.2) and 4.9% (0.3; 9.8), respectively, for 3,950/cm³ variation of N1 at lag 1. We also observed a positive association for cardiovascular causes, with mortality increasing by 2% (-0.7; 4.8). We did not find associations between N2 and cause-specific mortality.

Conclusions: UFP from vehicle exhaust are more harmful for human health than those from photochemical nucleation. Although further research is needed to confirm this finding in other locations, this evidence should have an implication for further EU regulation of the UFP concentrations in urban air.

Abstract ID: 29

Title: The problem of misalignment on the assessment of long term effects of traffic noise on mortality in cities of Spain

Presenting Author: Saez, M

Authors: Marc Saez 1,2, Maria Antònia Barceló 1,2, Diego Varga 1, Aurelio Tobias 3,1

Affiliations: (1) Research Group on Statistics, Econometrics and Health (GRECS), University of Girona, Girona, Spain; (2) CIBER of Epidemiology and Public Health (CIBERESP), Spain; (3) Institute of Environmental Assessment and Water Research (IDAEA), Spanish Council for Scientific Research (CSIC), Barcelona, Spain.

Text:

Background and aims: Numerous studies showing statistically significant associations between environmental noise and adverse health effects already exist for short-term (over one day at most) and long-term (over a year or more) noise exposure, both for morbidity and mortality. Recently, several studies have shown this association to be independent from confounders, mainly those of air pollutants. However, what has not been addressed is the problem of misalignment (i.e. the exposure data locations and health outcomes have different spatial locations). Without any explicit control of such misalignment inference is seriously compromised. Our objective is to assess the long-term effects of traffic noise on mortality in the Spanish cities of over 50,000 inhabitants, 1990-2014. We take into account the control of confounding, for both air pollution and socioeconomic factors at a contextual level and, in particular, we explicitly address the problem of misalignment.

Methods: We employed a case-control design with individual data. We used deaths resulting from circulatory diseases (in particular, myocardial infarction, hypertension), Type II diabetes mellitus and respiratory diseases, while for controls we used deaths resulting from AIDS and external causes. The controls were matched with the cases by sex, age and year. We used the annual average equivalent A-weighted sound pressure levels for daytime (7h-21h), evening-time (21h-23h) and night-time (23h-7h), and controlled for the following confounders: i) air pollutants, ii) material deprivation, iii) land use and other spatial variables. We explicitly controlled for spatial misalignment, heterogeneity, spatial dependency and temporal trends. Separate analyses were carried out for men and for women, and for age groups.

Results: We found, as preliminary results, that, for Barcelona, 2004-2007, environmental noise was associated with myocardial infarction mortality along with Type II diabetes mellitus in men and mortality from hypertension in women.

Conclusions: Nevertheless, this association only occurred consistently in the case of mortality from hypertension in women.

Abstract ID: 30

Title: BPDE-DNA adducts, genetic and environmental factors associated with pregnancy outcomes in newborns in the Czech Republic

Presenting Author: Svecova, V

Authors: Vlasta Svecova, Pavel Rossner Jr., Miroslav Dostal, Zuzana Novakova, Irena Chvatalova, and Radim J. Sram

Affiliations: Institute of Experimental Medicine AS CR, Prague, Czech Republic

Text:

Background and aims: We investigated associations between the levels of benzo[a]pyrene-7,8-diol-9,10-epoxide (BPDE)-DNA adducts, a marker of DNA damage, exposure to air pollutants during pregnancy, genetic polymorphisms in 94 selected genes, and pregnancy outcomes, including intrauterine growth restriction (IUGR) and low birth weight (LBW).

Methods: BPDE-DNA adducts were analyzed in placental DNA in 1042 subjects from the regions of Teplice and Prachatice in the Czech Republic, regions with different levels of air pollution. The BPDE-DNA adducts were measured by ELISA.

Results: We found elevated BPDE-DNA adducts in the non-IUGR and non-LBW groups ($p=0.035$; $p<0.001$). Exposure to particulate matter $< 2.5 \mu\text{m}$ in the 4th month of pregnancy was associated with a nonsignificant increase of BPDE-DNA adduct levels in placental DNA and LBW. Multivariate-adjusted logistic regression revealed that mother's smoking is the important factor associated with LBW (OR = 1.71; 95% confidence interval (CI), 1.13-2.58; $p=0.011$). Other variables associated with LBW included sex, gestational age of the newborn, mother's BMI, place of residence, and haplotypes in the promoter region of the gene encoding mannose-binding lectin 2 (MBL2).

Conclusions: The role of air pollution in the risk for both adverse pregnancy outcomes in this particular data set seems to be less important. Acknowledgement: Supported by the Grant Agency of the Czech Republic P30113-13458S.

Abstract ID: 31

Title: Long-term exposure to air pollution and diabetes risk in Danish Nurse Cohort study

Presenting Author: Hansen, AB

Authors: Hansen, Anne Busch (1); Ravnskjaer, Line(2); Andersen, Klaus Kaae(2); Bräuner, Elvira (3); Baastrup, Rikke (4); Ketznel, Matthias (5); Becker, Thomas (5); Hertel, O. (5); Loft, Steffen (1); Andersen, Zorana Jovanovic (1)

Affiliations: (1) Department of Public Health, University of Copenhagen, Copenhagen, Denmark; (2) Danish Cancer Society, Department of Statistic, Copenhagen, Denmark; (3) Aalborg University, Danish building research institute, Copenhagen, Denmark; (4) University of Southern Denmark, National Institute of Public Health, Copenhagen, Denmark; (5) Aarhus University, Department of Environmental Science, Roskilde, Denmark

Text:

Background and aims: Air pollution seems is a newly established risk factor for diabetes, Type 2 Diabetes (T2D), but the data on which pollutants are most relevant are sparse. We studied the effect of long-term exposure to PM_{2,5}, PM₁₀, NO_x and NO₂ on the incidence of diabetes.

Methods: We used the Danish Nurse cohort with 28,731 female nurses recruited in 1993 (19,898) or 1999 (8,833), when they reported information on diabetes and confounders. We followed nurses in the Danish National Diabetes Register from 1995 until 2013. The air pollution levels were estimated at each participants home addresses since 1971, for NO_x and NO₂, and since 1990 for PM_{2,5} and PM₁₀ until 2013. We have model the association between 5-years running mean of NO_x, NO₂, PM_{2,5} and PM₁₀ and diabetes incidence using time-varying Cox proportional hazards model adjusted for physical activity, calendar time, smoking, alcohol use, diet, employment, and marital status. Hazard ratios (HR) and 95% confidence intervals (CI) per interquartile range increase in exposure were reported.

Results: Out of 28,731 nurses, we excluded 4,557 who died before diabetes register onset in 1995, had diabetes at baseline or had missing data on residential address or covariates. Of 24,174 women in the final analyses, 1,137 developed diabetes during the mean 15.1 years of follow-up. We found weak, non-significant positive association with NO₂ (1.03; 0.97-1.10) and NO_x (1.01; 0.98-1.04). We found stronger associations with particles, 10% higher risk for diabetes was related to exposure to PM₁₀ (1.10; 0.98-1.23) and 14% increased risk with PM_{2,5} (1.14; 1.02-1.27). Effect of PM_{2,5} was strongest in nonsmokers (1.24; 1.09-1.42) (p value for interaction 0.01) and in indication of stronger associations in obese women (1.25; 1.06-1.47).

Conclusions: We found that exposure to fine particulate matter is most relevant for diabetes. Non-smokers and obese persons are most susceptible groups.

Abstract ID: 32

Title: Long-term exposure to air pollution and mammographic density in the Danish Diet, Cancer and Health cohort

Presenting Author: Andersen, Z

Authors: Stephanie Huynh (1,2), My von Euler-Chelpin (1), Ole Raaschou-Nielsen (3), Ole Hertel (4), Anne Tjønneland (3), Elsebeth Lyng (1), Ilse Vejborg (5), Zorana J. Andersen (1)

Affiliations: (1) Center for Epidemiology and Screening, Department of Public Health, University of Copenhagen, Copenhagen, Denmark; (2) Department of Neuroscience, Smith College, Northampton, Massachusetts, USA; (3) Danish Center for Cancer Research, Danish Cancer Society, Copenhagen, Denmark; (4) Department of Environmental Science, Aarhus University, Roskilde, Denmark; (5) Diagnostic Imaging Centre, Copenhagen University Hospital, Copenhagen, Denmark.

Text:

Background and aims: Growing evidence suggests that air pollution may be a risk factor for breast cancer, but the biological mechanism remains unknown. High mammographic density (MD) is one of the strongest predictors and biomarkers of breast cancer risk, but it has yet to be linked to air pollution. We investigated the association between long-term exposure to traffic-related air pollution and MD in a prospective cohort of women 50 years and older.

Methods: For the 4,769 women (3,930 postmenopausal) participants in the Danish Diet, Cancer and Health cohort (1993-1997) who attended mammographic screening in Copenhagen (1993-2001), we used MD assessed at the first screening after cohort entry. MD was defined as mixed/dense or fatty. Traffic-related air pollution at residence was assessed by modeled levels of nitrogen oxides (NO_x) and nitrogen dioxide (NO₂). The association between mean NO_x and NO₂ levels since 1971 until cohort baseline (1993-97) and MD was analyzed using logistic regression, adjusting for confounders, and separately by menopause, smoking status, and obesity.

Results: We found inverse, statistically borderline significant associations between long-term exposure to air pollution and having mixed/dense MD in our fully adjusted model (OR; 95% CI: 0.96; 0.93-1.01 per 20 µg/m³ of NO_x and 0.89; 0.80- 0.98 per 10 µg/m³ of NO₂). There was no interaction with menopause, smoking, or obesity.

Conclusion: Traffic-related air pollution exposure does not increase MD, indicating that if air pollution increases breast cancer risk, it is not via MD.

Abstract ID: 33

Title: Biomonitoring of the population living near the solid waste incinerator plant in Modena, Italy

Presenting Author: Iacuzio, L

Authors: Iacuzio, Laura (1); Gatti, Maria Giulia (2); Bechtold, Petra (2); Barbieri, Giovanna (2); Righi, Elena (1); Ferrari, Angela (1); Gherardi, Bianca (3); Casari, Alice (3); Ranzi, Andrea (3); Borsari, Lucia (1); Carluccio, Eugenia (1); Bottosso, Emanuele (1); Soncini, Francesco (1); Lauriola, Paolo (3); Aggazzotti, Gabriella (1); Goldoni, Carlo Alberto (2).

Affiliations: (1) Department of Diagnostic, Clinical and Public Health Medicine, University of Modena and Reggio Emilia, Italy (2) Department of Public Health, Unit of Epidemiology, Local Health Unit of Modena, Italy; (3) Regional Reference Centre on Environment and Health, ARPA Emilia-Romagna Region, Italy.

Text:

Background and aims: As part of the authorization process for the expansion of the municipal solid waste incinerator of Modena, a cross-sectional biomonitoring study was conducted to identify biomarkers of exposure in resident population.

Methods: Approximately 500 people were enrolled between October 2013 and May 2014, among residents within 4 km from the plant. Sampling method implied stratification by exposure, gender and age-group (18-34, 35-49 and 50-69 yrs). Sampling exposure level was measured through the annual mean PM10 concentration map for 2010. Toenail samples were disintegrated by acid mineralization and tested through inductively coupled plasma mass spectrometry for concentrations of cadmium, chromium, manganese and nickel. Effective exposure was estimated through fall-out maps from a quasi-gaussian dispersion model. Biannual PM10 concentration prior to the collection date was assigned according to subjects residence; values were divided into quartiles. Confounders were assessed through a questionnaire covering: personal and biometric data, lifestyle, residential information including traffic exposure, occupational history, health condition and diet. Multivariate regression analyses were performed.

Results: Chromium, manganese and nickel were measurable in >95% of the samples. Concentrations varied between 0.02-35.11 µg/g for chromium (median 0.52, 5th-95th perc 0.09-4.95), 0.02-7.23 for manganese (median 0.25, 5th-95th perc 0.07-0.97), 0.004-39.28 for nickel (median 0.28, 5th-95th perc 0.03-3.74). Cadmium resulted under the limit of quantification in 74.1% of the samples (range 0.006-0.19 µg/g), and was not included in the analysis. Multivariate regression models for manganese, nickel and chromium showed trends of association with several variables, among which some well-known confounders (association of nickel with use of costume jewelry and having amalgam fillings), and some dietary consumptions. Manganese showed a trend of association with incinerator and occupational exposure.

Conclusions: Preliminary results showed an association between manganese levels and exposure. Findings should be reassessed as soon as additional confounders are available.

Abstract ID: 34

Title: Brain structural differences associated with sports participation in children: a population-based study

Presenting Author: López-Vicente, M

Authors: López-Vicente, Mónica (1); Tiemeier, Henning (2, 3, 4); Wildeboer, Andrea (2, 3); Muetzel, Ryan L. (2, 3); Verhulst, Frank C. (2, 3), Sunyer, Jordi (1); White, Tonya (2, 3, 5)

Affiliations: (1) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain; (2) Department of Child and Adolescent Psychiatry, Erasmus Medical Centre-Sophia, Rotterdam, The Netherlands; (3) The Generation R Study Group, Erasmus Medical Centre-Sophia, Rotterdam, The Netherlands; (4) Department of Epidemiology, Erasmus Medical Centre-Sophia, Rotterdam, The Netherlands; (5) Department of Radiology, Erasmus Medical Centre-Sophia, Rotterdam, The Netherlands.

Text:

Background and aims: The decrease of physical activity in children is a growing public health problem, not only for the consequences in cardiovascular system, but also in the cognitive development. The literature about the effects of physical activity on the child brain at a population level is scarce. We studied the association between sports participation and cortical thickness in a large sample of healthy children.

Methods: The study included 911 6- to 10-year-old children from the Generation R cohort. The information about sports participation was obtained through a parent-reported questionnaire when the children were 6 years old. We created a continuous score of weekly sports participation, and defined two groups of children based on the type of sport (team/individual). Magnetic resonance scans were acquired, and cortical thickness was quantified brain-wide.

Results: Global brain volumetric measures were not associated with weekly sports participation in the fully adjusted models. We identified a cluster, involving left precentral gyrus, in which the thickness was positively associated with sports participation. In a sub analysis only in boys, individual sports were related to thicker cortices in right frontal lobe.

Conclusions: We observed increased cortical thickness in motor and premotor areas associated with sports participation, as well as in prefrontal brain areas related to the regulation of behaviors in children who participated in individual sports. This study is relevant for public health because the results apply to the general population. Further longitudinal studies are needed in order to establish causality.

Abstract ID: 35

Title: N-back task in population and longitudinal studies in children

Presenting Author: López-Vicente, M

Authors: López-Vicente, Mónica (1); Forns, Joan (2); Suades-González, Elisabet (1, 3); Esnaola, Mikel (1); García-Esteban, Raquel (1); Álvarez-Pedrerol, Mar (1); Júlvez, Jordi (1, 4); Burgaleta, Miguel (5); Sebastián-Gallés, Núria (5); Sunyer, Jordi (1)

Affiliations: (1) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain; (2) Department of Genes and Environment, Division of Epidemiology, Norwegian Institute of Public Health, Oslo, Norway; (3) Learning Disabilities Unit (UTAE), Neuropediatrics Department, Hospital Sant Joan de Déu, Universitat de Barcelona, Spain; (4) Harvard School of Public Health, Environmental Health department, Boston, MA, US; (5) Center for Brain and Cognition, Department of Technology, Universitat Pompeu Fabra, Barcelona, Spain

Text:

Background and aims: Working Memory (WM) is a complex cognitive system of limited capacity that allows for simultaneous storage and processing of information. It is well known that WM capacity naturally increases across childhood and adolescence as part of an individual's cognitive maturation and this has important implications for socially relevant outcomes such as academic performance. We aimed to study whether repeated measures of n-back, a WM task, detect age-related trajectories in schoolchildren during a one-year of follow-up.

Methods: We assessed 2,897 healthy children aged from 7 to 11 years with the n-back task. The task consisted of 2 loads or levels of complexity (2- and 3-back) and 2 different stimuli (numbers and words). Participants performed the task four times from January 2012 to March 2013. To study the trajectories during the year of follow-up, we performed linear mixed-effects models including school and subject as random effects.

Results: We observed improvements in n-back outcomes related to age. Greater improvements in performance were observed at younger ages, in girls compared to boys, in task variants with the lowest memory loads and in verbal rather than numerical stimuli.

Conclusions: N-back outcomes in this study detected age-related trajectories in one-year of follow-up. The present results are relevant for epidemiological research because the use of this task will allow the study of factors that may change the normal WM trajectories during childhood.

Abstract ID: 36

Title: Ozone exposure and extrinsic skin aging: Results from the SALIA cohort.

Presenting Author: Vierkötter, A

Authors: Vierkötter, Andrea* (1); Hüls, Anke* (1); Krämer, Ursula (1); Sugiri, Dorothee (1); Stolz, Sabine (1); Schikowski, Tamara* (1, 2, 3); Krutmann, Jean* (1) *equal contribution to this work

Affiliations: (1) IUF-Leibniz Research Institute for Environmental Medicine, Düsseldorf, Germany; (2) Swiss Tropical Institute of Public Health, Basel, Switzerland; (3) University of Basel, Basel, Switzerland

Text:

Background and aims: Ozone is an air pollutant which can readily oxidize with molecules in the stratum corneum. Animal studies suggest that ozone exposure results in depletion of antioxidants and in an increase of oxidative stress. In humans, ozone exposure was found to be associated with an increase of emergency visits due to aggravation of existing skin diseases. Furthermore, in vitro studies indicate that ozone might activate the aryl hydrocarbon receptor and thereby cause wrinkle formation. Whether ozone exposure indeed contributes to extrinsic skin aging has not yet been studied.

Methods: We therefore assessed the association between long-term ozone exposure and skin aging in 806 Caucasian women from the SALIA cohort study (Study on the influence of Air pollution on Lung function, Inflammation and Aging) aged 66-80 years. Skin aging was evaluated by SCINEXATM. Ozone exposure data measured by seven monitoring stations were received from the Environmental Protection Agency of the responsible federal state (LANUV, Essen). The mean ozone of the preceding five years to the investigation year determined at the monitoring station next to the residential address was assigned to the study subjects. Associations were tested by linear regression analyses and adjusted for potential confounders including sun exposure and nitrogen oxides.

Results: Mean ozone concentrations were between 35.0 and 42.6 $\mu\text{g}/\text{m}^3$. The analysis showed that an increase in ozone exposure (24-h and 8-h mean concentrations) was specifically associated with more pronounced facial wrinkle formation ($p=0.032$) and not with pigment spot formation ($p>0.05$) or laxity ($p>0.05$).

Conclusions: Ozone might be an additional risk factor for the formation of coarse wrinkles, which contributes to extrinsic aging of human skin.

Abstract ID: 37

Title: First time asthma visits association with levels of short-term and background NO₂ level, Skåne Sweden

Presenting Author: Taj, T

Authors: Tahir Taj (1); Anna Oudin (2) Ellen Cromley (3)

Affiliations: (1) Environmental and Occupation health Lund University Lund Sweden (2) Environmental and Occupation health Umeå University Umeå Sweden (3) Department of Community Medicine and Health Care, University of Connecticut School of Medicine, USA

Text:

Background and aims: The aim of this research was to assess the proportion of first asthma visits of adults to public primary health care clinics (PHC) in Skåne, occurring when short-term NO₂ was higher than 15 units during 3 days prior to visit and to see whether or not the level of background NO₂ affects this response (high background NO₂ was defined as 10 units or more mean during two years prior to the first asthma visit).

Methods: This is an exploratory study computing global and geographically weighted odds ratios for each PHC. Outcome data was PHC records data from year 2005 till 2010 and air pollution exposure data was also obtained for the same time period from 21 different air pollution monitoring station spread around Skåne, Sweden. For each Primary health care clinic three nearest air pollution monitoring stations were identified using Arc GIS, 20KM was set as maximum distance. Air pollution values were assigned to each PHC of nearest monitoring station only and if nearest station value was missing then second and third station value were used. Geographically weighted odds ratios for each PHC was calculated using SAS version 9,4.

Results: People who visit PHCs with high background pollution and low background pollution were both more likely to have their first respiratory visit for asthma on a high short-term pollution day. The global odds ratio was 1.5 which means that the odds of making a first respiratory visit with asthma when short-term pollution is high are greater for people visiting PHCS in high background areas than for people visiting PHCs in low background areas.

Conclusions: People living in areas with high background air pollution levels are more susceptible of short term air pollution change.

Abstract ID: 38

Title: Disease surveillance on asthma using BaySTDetect

Presenting Author: Boulieri, A

Authors: Boulieri, Areti (1); Blangiardo, Marta (2)

Affiliations: (1,2) Department of Epidemiology & Biostatistics, Imperial College London, UK, and MRC-PHE Centre for Environment and Health, Imperial College London, UK

Text:

Background and aims: Disease surveillance is an important public health practice, as it provides information which can be used to make successful interventions. Innovative surveillance systems are being developed to improve early detection and investigation of outbreaks, with the Bayesian models attracting a lot of interest recently. The objective of this work is to analyse mortality data on asthma disease in England by using the BaySTDetect method, a recently developed method by Li (2012) able to detect outbreaks.

Methods: Outbreak detection requires a system that will be able to flag areas that are differentially expressed. Within the Bayesian framework, spatio-temporal hierarchical models are able to give robust results due to their flexibility. Through the specification of spatially and/or temporally structured random effects information is shared between areas and/or time points, increasing the strength of the parameter estimates. These models are designed to provide estimates and describe risk patterns, however very limited research exists in models that are able to provide a detection mechanism. BaySTDetect is a recently developed method by Li (2012) able to detect areas that follow an "unusual" temporal pattern, and also to control for multiple testing through the specification of the False Discovery Rate (FDR). Mortality data on asthma disease in England are obtained from the Small Area Health Statistics Unit (SASHU) at Imperial College. Important aspect of this work is to examine the relationship between mortality data on asthma and GP drug prescriptions on asthma, in order to evaluate the impact of GP data on disease surveillance, by including this as an explanatory variable in the model. GP drug prescription data are released monthly by the English National Health Service (NHS) for all general practices in England and all drugs. The dataset that is currently available to be used in this project includes 8004 practices along with the number of prescribed drugs for asthma each month. The BaySTDetect model fitted to the data includes a spatial random effect component at super output area (SOA) level and a temporal effect component at month level. The temporal coverage is from August 2010 to November 2013. OpenBUGS software is used for the implementation of the models, and GIS for the mapping.

Results and conclusion: According to preliminary results, a small number of areas were recognised by BaySTDetect as following an "unusual" temporal trend in mortality rates in England when compared to the rest of the areas. From the perspective of policy making, several factors could have contributed to these trends, and further investigation is required to investigate this. This is an ongoing project, and results regarding the relationship between mortality rates and GP drug prescription rates on asthma are expected to be available in time for the conference.

Abstract ID: 39

Title: Using Satellite Based Spatio-Temporal Resolved Air Temperature Exposure to Study the Association between Ambient Air Temperature and Birth Outcomes in Massachusetts

Presenting Author: Kloog, I

Authors: Itai Kloog 1, 2*, Steven J. Melly 2, Brent A Coull 3, Francesco Nordio 2, Joel Schwartz 2

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Text:

Background and aims: The few published studies looking at the association between air temperature (Ta) and birth outcomes have so far shown that increased Ta may elevate the risk of premature birth and stillbirth. Ta stations have limited spatial coverage, particularly in less urban areas. Hence the use of Ta stations can introduce considerable measurement error into epidemiological studies on the health effects of extreme temperature.

Methods: We evaluated the relationship between birth weight and ambient Ta during pregnancy in Massachusetts between 2000-2008 using traditional Ta stations and predicted Ta developed by our group for predicting daily Ta at a 1 km resolution. We estimated exposure to Ta during various prenatal exposure periods from date of birth through full pregnancy for each mother. We used a similar model for PM_{2.5} air pollution (Particulate matter less than 2.5 micrometers in diameter) predictions. We used linear and logistic mixed models as well as accelerated failure time models to estimate the association between Ta exposure and birth weight, preterm delivery, low birth weight and gestational age adjusting for individual level socioeconomic status, traffic density, PM_{2.5}, a random intercept for census tract and mothers health.

Results: Predicted Ta was associated with decreased birth weights for multiple exposure windows (adjusted for PM_{2.5} as well). For example an IQR increase (8.5 °C) in the last trimester average exposure was associated with a 17g (95% confidence interval [CI]= -30 to -4) decrease in birth weight. We found a marginal significant association in the preterm analysis (OR of 1.02, [95% CIs]=1.00 to 1.05) while the low birth weight analysis was not significant with an OR of 1.04 ([95% CIs]= 0.96 to 1.13).

Conclusions: Exposure to high Ta during pregnancy increases the risk of lower birth weight and shorter gestational age.

Abstract ID: 41

Title: Risk of interstitial lung disease following pigeon antigen exposure: a long-term study of pigeon breeders

Presenting Author: Christiansen, C

Authors: Christiansen, Christine C (1); Schlünssen, Vivi (2, 3); Bendstrup, Elisabeth (4); Kolstad, Henrik A (1)

Affiliations: (1) Department of Occupational Medicine, Danish Ramazzini Centre, Aarhus University Hospital, Aarhus, Denmark; (2) Department of Public Health, Aarhus University, Aarhus, Denmark; (3) National Research Centre for the Working Environment, Copenhagen, Denmark; (4) Department of Respiratory Diseases and Allergy, Aarhus University Hospital, Aarhus, Denmark

Text:

Background and aims: Interstitial lung disease (ILD) constitutes a heterogeneous group of inflammatory and fibrotic lung diseases, often with unknown aetiology. Pigeon breeders are exposed to high levels of avian antigens, which are potent causes of hypersensitivity pneumonitis (HP). Little is known about the long term risk of ILD among pigeon breeders. The aim of the present study is to examine if exposure to avian proteins in pigeons breeders is followed by an increased risk of ILD.

Methods: Data on 15.000 members of the Danish Pigeon Racers Association were collected from 1957–2014. From information on name, address, and date of birth, personal identification numbers are provided by Statistics Denmark for a high proportion of members. A 1:50 randomly selected, age and gender matched sample from the general Danish population will constitute the reference. From national registers, we will obtain information on socioeconomic status, occupation and contacts with the healthcare system such as diagnoses, drug prescriptions, and cause of death. The annual number of pigeons will be derived from the number of pigeon rings each member acquires. These, together with admission and resignation dates, are used to estimate exposure intensity, duration, and dose (pigeon-years).

Results: Literature reports an ILD incidence of 31.5 per 10⁵ person years for the general population, and a prevalence of HP among pigeon breeders (Pigeon Breeder's Lung) varying between 0% and 44%. Pigeon breeders are thus expected to have a substantially higher risk of ILD compared to the background population. Results from our analyses, which will be presented at the conference, will show if this holds true.

Conclusions: This study will provide high quality estimates of incidence and prevalence of ILD among pigeon breeders, and may provide important insight into the causes and mechanisms of this group of diseases.

Abstract ID: 42

Title: Health Effects of Ultrafine and Fine Particles in Central Europe – Results from the UFIREG study

Presenting Author: Lanzinger, S

Authors: Lanzinger, Stefanie (1); Schneider, Alexandra (1); Breitner, Susanne (1); Erzen, Ivan (2); Dostal, Miroslav (3); Pastorkova, Anna (3); Bastian, Susanne (4); Cyrus, Josef (1) (5); Zscheppang, Anja (6); Kolodnitska, Tetiana (7); Peters, Annette (1)

Affiliations: (1) Helmholtz Zentrum München- German Research Center for Environmental Health, Institute of Epidemiology II, Neuherberg, Germany; (2) National Institute of Public Health Slovenia, Ljubljana, Slovenia; (3) Institute of Experimental Medicine, Academy of Sciences of the Czech Republic, Prague, Czech Republic; (4) Saxon State Office for Environment, Agriculture and Geology, Dresden, Germany; (5) Environmental Science Center, University of Augsburg, Augsburg, Germany; (6) Technische Universität Dresden, Research Association Public Health Saxony, Dresden, Germany; (7) L.I. Medved's Research Center of Preventive Toxicology, Food and Chemical Safety, Ministry of Health, Chernivtsi, Ukraine (State enterprise)

Text:

Background and aims: Evidence on health effects of ultrafine particles (UFP) is still limited. The UFIREG project aimed at investigating the short-term effects of ultrafine and fine particles on daily (cause-specific) mortality and morbidity in five European Cities.

Methods: UFP (20-100nm) and fine particles <2.5µm (PM_{2.5}) were measured in Dresden and Augsburg (Germany), Prague (Czech Republic), Ljubljana (Slovenia) and Chernivtsi (Ukraine). Meteorological data were obtained from country-specific network stations. Data on cause-specific mortality and hospital admissions were collected for all cities. Depending on data availability the following study periods were chosen: Augsburg and Dresden 2011-2012, Ljubljana and Prague 2012-2013, Chernivtsi 2013-March 2014. The effects of UFP and PM_{2.5} on health outcomes were assessed using confounder-adjusted Poisson regression models examining single (lag0-lag5) and cumulative lags (lag0-1, lag2-5, lag0-5). City-specific estimates were pooled using meta-analyses methods.

Results: Results indicated delayed and prolonged increases in the pooled relative risk (RR) of respiratory mortality (lag5: 5.5%[95%-confidence interval: -1.6;13.2]) and hospital admissions (lag0-5: 3.4%[-1.7;8.8]) in association with a 2,750 particles/cm³ increase (average interquartile range across all cities) in UFP. Our findings pointed to delayed increases in the RR of cardiovascular mortality (lag2-5: 3.0%[-2.7;9.1]) and hospital admissions (lag5: 1.6%[0.1;3.1]) with a 12.4 µg/m³ increase in PM_{2.5}. We observed a 7.5%[4.9;10.2] increase in the RR of respiratory hospital admissions with an increase in the 6-day average of PM_{2.5}. Moreover, hospital admissions due to diabetes increased for UFP, lag4 (7.4%[1.9;13.3]) and for PM_{2.5}, lag5 (4.5%[1.3;7.9]).

Conclusions: Our results indicated delayed and prolonged effects of UFP on respiratory health outcomes. PM_{2.5} was associated with delayed and prolonged effects on cardiovascular and respiratory health outcomes. UFP and PM_{2.5} were associated with delayed increases in diabetes hospital admissions. Further multi-centre studies are needed investigating several years in order to produce powerful results and to draw definite **Conclusions** on health effects of UFP.

Abstract ID: 43

Title: Short-term effects of air temperature on plasma metabolite levels in a cohort of cardiac catheterization patients.

Presenting Author: Hampel, R

Authors: Hampel, Regina (1); Breitner, Susanne (1); Kraus, William E (2); Hauser, Elisabeth (3); Shah, Svati (2); Ward-Caviness, Cavin (1); Devlin, Robert (4); Diaz-Sanchez, David (4); Neas, Lucas (4); Cascio, Wayne (4); Peters, Annette (1); Schneider, Alexandra

Affiliations: (1) Institute of Epidemiology II, Helmholtz Zentrum München, German Research Center for Environmental Health, Neuherberg, Germany, (2) School of Medicine, Duke University, Durham, North Carolina, USA, (3) Duke Molecular Physiology Institute, Durham, NC, USA, (4) National Health and Environmental Effects Research Laboratory, US Environmental Protection Agency, Research Triangle Park, North Carolina, USA

Text:

Background and aims: Epidemiological studies have shown associations between air temperature and cardiovascular events as well as risk factors for cardiovascular disease such as blood pressure and inflammatory blood markers. So far, there are no studies investigating temperature effects on plasma concentrations of metabolites which are also assumed to be associated with cardiovascular disease.

Methods: Metabolite levels of 2,869 participants from the CATHeterization GENetics (CATHGEN) cohort recruited sequentially at the Duke University Cardiac Catheterization Clinic (Durham, NC) were available for analysis. Mass spectrometry profiling of metabolites was performed in fasting plasma between 2001 and 2007. Based on previous analysis, the amino acids glycine, methionine, and citrulline were chosen as outcomes of interest. Daily averages of meteorological variables were obtained from the North American Regional Reanalysis (NARR) project. Immediate, lagged, and cumulative temperature effects on the outcomes were analyzed using (piecewise) linear regression models adjusted for participant characteristics, relative humidity and time-trends. As sensitivity analyses the models were additionally adjusted for ozone.

Results: We observed a 1.7% [95%-confidence interval: 0.2; 3.3] increase in glycine in association with a 10°C increase in the 5-day average of air temperature. Furthermore, temperature effects on glycine were also significant with a lag of two and three days. Changes in methionine and citrulline were observed only when temperature was above 15°C. We found 4.6%[1.4; 7.8] and 4.0%[1.0;7.2] higher levels of methionine and citrulline for a 5°C increase in air temperature on the same day. Similar effects were detected with a lag of one and two days as well as for the 5-day average of temperature. The associations remained similar when adjusting for ozone.

Conclusions: Our preliminary analyses indicate temperature-related changes in the amino acids glycine, methionine, and citrulline. These findings suggest that temperatures influence metabolisms and thereby maybe linked to underlying chronic disease exacerbation.

Abstract ID: 44

Title: Impact of Air Pollution and Noise From Road Traffic on Pregnancy Induced Hypertensive Disorders and Gestational Diabetes.

Presenting Author: Pedersen, M

Authors: Pedersen, Marie (1); Halldorsson, Thorhallur I. (2,3); Olsen, Sjurður F. (2,4); Hjortebjerg, Dorrit I. (1); Ketznel, Matthias (5); Raaschou-Nielsen, Ole (1); Sørensen, Mette (1).

Affiliations: (1) Danish Cancer Society Research Center, Copenhagen, Denmark; (2) Centre for Fetal Programming, Department of Epidemiology Research, Statens Serum Institute, Copenhagen, Denmark; (3) Faculty of Food Science and Nutrition, University of Iceland, Reykjavik, Iceland; (4) Department of Nutrition, Harvard School of Public Health, Boston, USA; (5) Department of Environmental Science, Aarhus University, Roskilde, Denmark

Text:

Background and aims: Road traffic is the main source of both air pollution and noise that have been associated with hypertension and diabetes in adults. Effects during pregnancy are less studied. The aim of the study was to examine the individual and combined effects of ambient air pollution and road traffic noise on pregnancy-induced hypertensive disorders and diabetes.

Methods: We included 80,998 singleton liveborn births in Denmark (1997-2002) from the Better Health in Generations Cohort with complete covariate data and residential history. Exposure to nitrogen oxides (NOX and NO₂) and noise from road traffic was modeled at maternal home addresses. Outcome and covariate data were derived from the registries, hospital records and early-pregnancy questionnaires.

Results: A 10 µg/m³ increase in NO₂ exposure during first trimester was associated with increased odds of preeclampsia (adjusted odds ratio = 1.07 [95% confidence interval = 1.01-1.14]), pregnancy-induced hypertensive disorders (1.07 [1.01-1.13]) and gestational diabetes (1.57 [1.18-2.07]). Noise exposure was associated with increased odds of preeclampsia (1.08 [1.01-1.16]), pregnancy-induced hypertensive disorders (1.07 [1.01-1.14]) and borderline effects for gestational diabetes (1.25 [0.97-1.62]). There was weak evidence for increased risk of gestational hypertension and no evidence for less strict gestational diabetes definitions for both exposures. Associations for both air pollution and noise decreased and only the associations between NO₂, mild preeclampsia and gestational diabetes remained significant in joint exposure models.

Conclusions: Road traffic may increase the risk of hypertensive disorders and diabetes in pregnancy through exposure to both ambient air pollution and noise, although the effects were generally not found to be independent of one another.

Abstract ID: 45

Title: The potential use of a particulate matter sensor for "Exposome" research

Presenting Author: Kuijpers, E

Authors: E. Kuijpers (1); A. Pronk (1); R. Franken (1); M. Voogt (1); D. Sarigiannis (2); D. Chapizanis (2); S. Karakitsios (2); T. Maggos (3); M. Stamatelopoulou (3); J. Bartzis (4); Z. Spiric (2); C. Schieberle (5); S. Steinle (6); M. Loh (6); J. Cherrie (6)

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Text:

Background and aims: It is now possible to assess indoor exposure to particulate matter (PM) with low cost sensors. As part of the HEALS project (www.heals-eu.eu), funded by the European Union 7th Framework Programme (EU FP7), we evaluated the potential use of a low cost PM sensor to assess indoor PM as part of an exposome methodology.

Methods: In an experimental design we simulated several household activities (e.g. vacuum cleaning, cooking) that generate PM and placed the low cost PM sensor (Dylos DC1700) side by side with a conventional device (TSI APS). In addition, the Dylos DC1700 is currently being used in approximately 150 participants in 3 countries across Europe (Scotland, Greece and the Netherlands) as part of a pilot study aimed at developing a methodology for measuring the exposome. Collected data for the first participants (n=3) was visually compared with the Dutch air quality monitoring network.

Results: In the experiment we found a high correlation between the APS and the Dylos DC1700 for different size ranges ($> 0.5\mu\text{m}$ and $> 2.5\mu\text{m}$) (> 0.8). Preliminary results of the pilot study data collected with the Dylos DC1700 suggest large variation in PM between days for a single participant and on average between participants. However, first pilot study results suggest a high correlation with the Dutch air quality monitoring network.

Conclusions: The high correlation between TSI APS and Dylos DC1700 in the experimental setup suggested that this low cost sensor may be used for measuring indoor PM. The typical particle size distribution patterns of the TSI APS will be applied to the results collected with the Dylos DC1700 to increase the size selectiveness and for conversion into calculated mass concentrations. These findings will be used for personal exposure modelling based on time-activity information as part of the HEALS exposome methodology.

Abstract ID: 46

Title: Outdoor Air Pollution and Exacerbation of Existing COPD: A Case Crossover Analysis

Presenting Author: DeVries, R

Authors: DeVries, Rebecca, Kriebel, David, Sama, Susan

Affiliations: University of Massachusetts at Lowell, USA

Text:

Background and aims: Research suggests that outdoor air pollution may be a significant environmental trigger for acute exacerbations of COPD. Most of this research is focused on emergency department visits and hospitalizations while a majority of exacerbations do not result in such. The aim of this study was to quantify the association between short term exposures to outdoor air pollutants (SO₂, NO₂, and PM_{2.5}) and COPD exacerbations experienced at home.

Methods: During a 15 month study period, COPD patients were administered a telephone questionnaire on daily living activities in the week prior to COPD exacerbations (case periods) and other randomly identified healthy weeks (control periods). USEPA outdoor air pollution data were assigned as seven day average concentrations to each case and control period. Single and multi-pollutant conditional logistic regression models were run and confounding and effect modification were explored (meteorological variables, influenza, season, asthma status and COPD severity). Restricted cubic splines were reviewed for non-linear relationships between air pollutant and meteorological variables and risk of COPD exacerbation.

Results: 168 COPD patients residing in central Massachusetts were included. In multi pollutant models (adjusted for temperature and influenza), a strong positive association was found for SO₂ and COPD exacerbation (OR=2.33 (1.62-3.37)) while a moderate negative association was found for PM_{2.5} (OR = 0.89 (0.81-.98)). NO₂ was not associated with COPD exacerbation in multi-pollutant models (OR=1.04 (0.93-1.17)), but was when evaluated without adjustment for SO₂. These results were found at concentrations below USEPA National Ambient Air Quality Standards.

Conclusions: Low levels of outdoor SO₂ and NO₂ were associated with substantial and moderately increased risks of COPD exacerbation, respectively. The negative association with PM_{2.5} is inconsistent with previous findings and may reflect measurement error or unmeasured confounding.

Abstract ID: 47

Title: Why are people dying from unintentional carbon monoxide poisoning? An overview of coroners' findings

Presenting Author: Close, R

Authors: Rebecca Close¹, Amy Rimell¹, Claudia Wells², Vanessa Fearn², Louisa Smith², Danielle Fisher³, Robert Flanagan³, Giovanni Leonardi¹

Affiliations: 1. Centre for Radiation, Chemicals and Environmental Hazards, Public Health England, Chilton, Oxfordshire, UK 2 Office for National Statistics (ONS), Cardiff Road, Duffryn, Newport 3. Toxicology Unit, King's College Hospital NHS Foundation Trust, London, UK

Text:

Background and aims: Unintentional carbon monoxide (CO) poisoning continues to cause morbidity and death in the UK as elsewhere. Narrative reports from coroners may contain information to help prevent CO-related fatalities. The aim of this work is to provide information on the circumstances of unintentional CO-related deaths, England and Wales, 1998-2010.

Methods We studied reports of fatal unintentional non-fire related CO poisoning, England and Wales, 1998-end 2010 collated by ONS. Information regarding the circumstances of the death was extracted from coroner narrative reports and analysed by gender and age as well as place of exposure, source of CO, and circumstances in which death occurred.

Results There were 557 deaths (416 male). Deaths in males were higher in all age groups except 0-9 and 90+ years, most obviously so in those aged 20-69 years (289 male, 58 female). As to place of exposure, 236 (157 male) deaths occurred in a place of residence and 103 (94 male) in a vehicle, boat or garage [no information on place of death in 150 (102 male)]. Data as to source of CO was as follows: gas appliance 151 (113 male), petrol/diesel engine 79 (73 male), solid fuel 77 (43 male) [no information on source 194 (146 male)]. Misuse of an appliance, inadequate ventilation of a vehicle, or a blocked chimney, amongst others, were recorded in one third of all CO-related deaths.

Conclusion The clear preponderance of male deaths, especially in those aged 20-69 years, suggests that prevention campaigns should especially target adult males.

Abstract ID: 48

Title: Spatial and temporal variation in Endotoxin and PM10 levels in ambient air in a livestock dense area

Presenting Author: Rooij, M de

Authors: Myrna M.T. de Rooij¹, Dick J.J. Heederik¹, Inge M. Wouters¹

Affiliations: ¹ Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, the Netherlands.

Text:

Background and aims: The Dutch population is concerned about the influence of livestock farms on their health. Results from studies assessing health effects of livestock farming are inconsistent. Bio-aerosol exposure measurements may enable quantification for more refined exposure response analyses. Particulate matter 10 (PM10) and endotoxin are known to be emitted from livestock farms, and have adverse health effects. We aimed to determine levels of PM10 and endotoxin in ambient air at residential level in a livestock dense area; and to explore spatial and temporal variation.

Methods: Ambient PM10 was collected with Harvard Impactors at eight sites (residential gardens) representing a variety of nearby livestock-related characteristics. Repeated, one week average dust samples were collected from March till September 2011. PM10 mass was determined by gravimetric analysis and endotoxin level by means of Limulus-Amebocyte-Lysate assay. Mixed effect models were used to determine within- and between-site sampling variance.

Results: Preliminary analyses showed temporal variation in PM10 levels to be similar for the eight sampling sites, whereas it varied considerably for endotoxin levels. Spatial variation was larger for endotoxin than for PM10 (between-site variance= 0.024 for endotoxin, 0.006 for PM10; within-site variance= 0.31 for endotoxin, 0.15 for PM10). Side-by-side collected parallel samples showed a lower Pearson correlation for endotoxin (0.59, $p < 0.001$) than for PM10 (0.94, $p < 0.001$), suggesting influence of sampling and analytical variability on overall variance.

Conclusions: The effect of livestock-related sources on absolute PM10 levels seems limited. Endotoxin levels showed more explicit spatial as well as temporal variation which suggest that local sources contribute to the levels observed. More complex analyses with spatial-temporal related variables are needed to provide insight in the relation of livestock-related factors with endotoxin levels. Development of a Land Use Regression model for endotoxin will be challenging, and should be based on a broader set of locations in combination with longer sampling duration.

Abstract ID: 49

Title: Detection of airborne *Coxiella burnetii* in the outdoor environment: spatial and temporal variation in exposure levels

Presenting Author: Rooij, M de

Authors: Myrna M. T. de Rooij¹, Floor Borlée¹, Lidwien A. Smit¹, Arnout de Bruin², Ingmar Janse², Dick J. J. Heederik¹, Inge M. Wouters¹

Affiliations: 1 Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, the Netherlands. 2 Centre for Infectious Disease Control (CIb), National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands

Text:

Background and aims: Several residential Q fever outbreaks raised awareness for the importance of environmental airborne exposure of *Coxiella burnetii*. Geospatial modelling efforts indicated importance of environmental, agricultural and meteorological characteristics. Extensive measurement series investigating *C. burnetii* in the outdoor air repeatedly at residential level are lacking; while these are important for quantification of exposure levels, validation of transmission models and to increase understanding of transmission routes.

Methods: One-week average ambient air particulate matter with an aerodynamic diameter of 10 micron or less (PM₁₀) samples were collected with Harvard Impactors at eight different locations at residential level. Measurements took place from March till September 2011. Samples were analyzed by quantitative Polymerase Chain Reaction for levels of *C. burnetii* DNA. Associations between spatial and temporal characteristics and *C. burnetii* positivity were determined by logistic regression analyses.

Results: *Coxiella burnetii* DNA was detected in 56 out of 202 samples (27.7%), with DNA levels in the non-quantifiable range. Airborne *C. burnetii* presence showed a clear seasonal pattern, coinciding with both temperature and kidding numbers but because of strong correlation their independent effect could not be assessed. Temporal variation was furthermore related to humidity (OR per IQR: 0.603). Proximity of goat farm combined with number of goats on that farm was associated with spatial variation (OR per IQR: 1.964).

Conclusions: Spread of *C. burnetii* by air is driven by multiple complex processes and several temporal and spatial factors have been identified, despite the difficulties inherent in airborne exposure measurements of pathogenic bacteria. This study shows the potential of airborne measurements to contribute to source identification and attribution of a pathogen.

Abstract ID: 50

Title: Associations between Primary Traffic Pollution and Metabolomic Response Patterns in the Dorm Room Inhalation to Vehicle Emissions (DRIVE) Study

Presenting Author: Golan, R

Authors: Rachel Golan(1), Donghai Liang(1), Jennifer L. Moutinho(2), Chandresh N. Ladva(1), Roby Greenwald(3), Rodney J. Weber(2), Stefanie Ebel Sarnat(1), Armistead G. Russell(2), Vishal Verma(2), Dean Jones(1), Jeremy A. Sarnat(1)

Affiliations: (1) Emory University, Atlanta, GA, USA; (2) Georgia Institute of Technology, Atlanta, GA, USA (3) Georgia State University, Atlanta, GA, USA

Text:

Background and aims: Short-and long-term exposures to traffic pollution have been linked to adverse health endpoints. Few studies have examined exposure along a complete emissions-to-dose pathway. The Dorm-Room-Inhalation-to-Vehicle-Emissions (DRIVE)-Study was designed to measure primary multipollutant traffic indicators, estimated at near road monitoring sites, patterns of spatiotemporally variability, and corresponding temporal changes in indoor concentrations, personal exposures, and exposure-related metabolites.

Methods: Intensive field sampling was conducted at the Georgia-Institute-of-Technology (GIT) at 8 monitoring sites (2 indoor, 6 outdoor) ranging from 0.01 to 2.3km away from the most congested highway artery in Atlanta. In addition, 54 GIT students living in dormitories near (20m) or far (1.4km) from the highway were recruited to conduct personal exposure sampling and weekly biomonitoring (saliva and plasma). The pollutants measured included nitrogen-oxides, carbon-monoxide, particle mass, number, elemental and organic carbon and particulate oxidative potential.

Results: Preliminary analyses show pronounced primary traffic pollutant influences on surrounding pollutant levels. Median NO concentrations were 78% higher outside the near road dorm compared to the dorm located away from the traffic hotspot. Similarly, median indoor levels at the near road dorm were elevated, with concentrations that were equivalent to those measured outside the far dorm (3.4 and 5.5ppb, respectively). Roadside site concentrations strongly correlated with corresponding NO levels measured outside and inside the near road dorm (Spearman's $r(rS)=0.91$ and 0.70 , respectively). Correlations between NO measured at roadside and far dorm were weaker ($rS=0.39$ and 0.38 , respectively), suggesting that roadside NO concentrations are less suitable indicator of exposure to primary traffic pollution for subjects living in the far dorm. Targeted and un-targeted metabolomics analysis is currently done on saliva and plasma samples.

Conclusions: Preliminary analyses indicate substantial impact of the selected traffic pollution hotspot on the surrounding area. Future analyses will assess whether these indicators serve as markers of personal or biologically-relevant exposures.

Abstract ID: 51

Title: Genetic susceptibility for airborne particle induced skin aging

Presenting Author: Hüls, A

Authors: Hüls, Anke* (1); Vierkötter, Andrea* (1); Krämer, Ursula (1); Mary S Matsui (2); Stolz, Sabine (1); Krutmann, Jean (1); Schikowski, Tamara (1,3,4), *equal contribution to this work

Affiliations: (1) IUF-Leibniz Research Institute for Environmental Medicine, Düsseldorf, Germany; (2) The Estee Lauder Companies Inc, Melville, NY, United States; (3) Swiss Tropical Institute of Public Health, Basel, Switzerland; (4) University of Basel, Basel, Switzerland

Text:

Background and aims: There is increasing evidence that air pollution exerts detrimental effects on human skin and contributes to skin aging. We showed that airborne particle exposure was associated with more facial pigment spots. Airborne particles are rich in polycyclic aromatic hydrocarbons (PAHs), which can induce melanogenesis by binding to the arylhydrocarbon receptor (AhR). Therefore, we aimed to estimate the role of genetic variation in the AhR signaling pathway on air pollution-induced skin aging.

Methods: We used the German SALIA cohort study of 2008 (N=361, age 67-80 years). Skin aging was evaluated by SCINEXATM. We calculated a weighted genetic risk score out of three single nucleotide polymorphisms (SNPs) related to the AhR signaling pathway (rs17779352, rs2066853, rs2292595). We first tested the gene-environment interaction between long term airborne particle exposure (PM_{2.5} and PM₁₀ from land use regression models (ESCAPE)) and the genetic risk score on pigment spot development by linear regression analyses adjusting for potential confounders. Then, we estimated the association between airborne particle exposure and pigment spot development in subgroups with a low risk score vs. a high risk score (cut point: mean risk score).

Results: Preliminary results indicate that there is a significant gene-environment interaction between airborne particle exposure and the AhR risk alleles on the development of pigment spots on the cheeks (p=0.024 for PM_{2.5}; p=0.032 for PM₁₀). Women with a high genetic risk score developed 56% (95% CI: 21-101%) more pigment spots on the cheeks after an increase of 1.76µg/m³ (IQR) in PM_{2.5} and 37% (95% CI: 12-66%) more pigment spots after an increase of 2.14µg/m³ (IQR) in PM₁₀, whereas there were no significant associations in women with a low risk score.

Conclusions: These preliminary results indicate that genetic variation in the AhR signaling pathway plays an important role on air pollution induced skin aging.

Abstract ID: 52

Title: Association between long-term exposure to air pollution and biomarkers related to insulin resistance, subclinical inflammation and adipokines

Presenting Author: Wolf, K

Authors: Wolf, Kathrin (1); Popp, Anita (2); Schneider, Alexandra (1); Susanne Breitner (1); Hampel, Regina (1); Rathmann, Wolfgang (3); Herder, Christian (4,5); Roden, Michael (4,5,6); Koenig, Wolfgang (7,8,9); Stumvoll, Michael (10); Meisinger, Christa (1); Peters, Annette (1,9,11).

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Text:

Background and aims: Insulin resistance (IR) is present long before the onset of type 2 diabetes and results not only from inherited and lifestyle factors but likely also from environmental conditions. Air pollution as one of these risk factors gained momentum in recent years. We investigated the association between long-term exposure to air pollution at residence and biomarkers related to IR, subclinical inflammation and adipokines.

Methods. Data is based on 2,956 participants of the KORA F4 study conducted between 2006 and 2008 in greater Augsburg, Germany. Individual air pollution concentrations at the residences of the participants were predicted by land-use regression. We analysed associations between air pollutants and HOMA-IR, glucose, insulin, HbA1c, leptin, and C-reactive protein using multivariable linear regression models adjusted for potential covariates. Effect estimates were calculated for the whole study population and subgroups of non-diabetic, pre-diabetic and diabetic individuals.

Results. Among all participants, a 3.6 µg/m³ increase of particulate matter between 2.5 and 10 µm in diameter (PM_{coarse}) increased HOMA-IR by 13.1% (95% CI 0.6, 27.1) and insulin by 14.7% (95% CI 2.8, 28.0). An increase of 11.9 µg/m³ in ambient NO₂ was associated with elevated leptin levels of 14.6% (95% CI 6.1, 23.8). Effect estimates for pre-diabetic individuals were much larger and highly statistically significant, while non-diabetic and diabetic individuals showed rather no or only weak associations. No association was seen for glucose and HbA1c levels. **Conclusions.** Our results suggested an association between traffic-related long-term exposure to air pollution and insulin resistance in the general population attributable to pre-diabetic individuals.

Abstract ID: 53

Title: Prediction of location in indoor/outdoor micro-environments using smart consumer products

Presenting Author: Klein Entink, R

Authors: R. Boessen (1); A. Pronk (1); E. Kuijpers (1); D. Sarigiannis (2); D. Chapizanis (2); F. Pierik (1); S. Karakitsios (2); T. Maggos (3); M. Stamatelopoulou (3); J. Bartzis (4); Z. Spiric (2); C. Schieberle (5); S. Steinle (6); M. Loh (6); J.W. Cherrie (6).

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Text:

Background and aims: The determination of presence in micro-environments, including indoor vs outdoor spaces, is critical for modelling personal exposure based on time-location-activity data. The aim of this study was to investigate the potential use of smart consumer products in combination with other (sensor) data for predicting the presence of the wearer in indoor and outdoor micro-environments.

Methods: As part of the HEALS project time-location-activity data were collected from 28 office workers for 7 days with the MOVES app on a personal smartphone and the Fitbit Flex. In addition, real time personal air temperature (Elitech RC) and global positioning system (GPS) coordinates (Qstarz) were measured for all participants and real time personal UV level (Extech Luxmeter with Semrock 300/80 nm filter) was measured for 4 participants, both devices were attached to the outer clothing. Paper logs were kept by each participant for logging time-activity and indoor and outdoor locations.

Results: The MOVES classification (place, walk, cycle, transport) and the paper log correlated well. The predictive value of personal temperature, GPS, personal UV level, historical weather data (mean local temperature, rainy day) and day/time indicators (day of the week and time of the day) for further classification of indoor cluster versus outdoor cluster was explored using random forest models. Preliminary results indicate a moderate to high accuracy (65-99%) for the different study subjects.

Conclusions: The preliminary results indicate that when using MOVES to assess personal time-location-activity information additional (sensor) data may be used to more reliably classify the places visited into indoor and outdoor spaces. Ongoing analyses focuses on optimizing of the models for predicting indoor versus outdoor locations and on assessing the generalizability of these models

Abstract ID: 54

Title: Memory performance in adolescents: a novel approach to differentiate between radiation and non-radiation effects of mobile phones

Presenting Author: Schoeni, A

Authors: Schoeni Anna (1) (2); Roser, Katharina (1) (2) and Röösl, Martin (1) (2)

Affiliations: (1) Swiss Tropical and Public Health Institute, Basel, Switzerland; (2) University of Basel, Basel, Switzerland

Text:

Background: Concerns about negative impacts on memory due to radiofrequency electromagnetic fields (RF-EMF) emitted by mobile phones and other sources have arisen. We aimed to investigate whether memory is affected by RF-EMF or by mobile phone use itself due to non-radiation related factors.

Methods: We conducted a prospective cohort study with 439 adolescents. Cognitive tests to assess verbal and figural memory performance were completed. Mobile phone use was assessed with questionnaire, operator recorded data was obtained for 233 adolescents. RF-EMF exposure surrogates considering various factors affecting RF-EMF exposure were computed for the brain and the whole body. Data were analysed using a mixed-linear cross-sectional and a longitudinal approach. All analyses were adjusted for relevant confounders.

Results: The kappa coefficients between mobile phone use duration and cumulative RF-EMF brain and whole body dose were 0.62 and 0.48, respectively. In the mixed model cross-sectional analysis, memory performance was negatively correlated with the mobile phone use duration. In the highest exposure group (≥ 75 th percentile) the verbal memory score was reduced by -0.60 (-1.07 to -0.13) compared to the 50% of adolescents with lowest mobile phone use duration. Similar results were found for the RF-EMF dose measure for the brain (-0.72; 95%CI: -1.19 to -0.26) and the whole body (-0.48; 95%CI: -0.95 to -0.01). However, in the longitudinal analyses changes in memory performance within one year were neither related to mobile phone use duration nor to RF-EMF dose measures.

Conclusions: The absence of associations in the longitudinal analyses indicates that neither RF-EMF exposure nor the mobile phone use itself affects the memory performance of adolescents. This study used a novel innovative approach to assess the impact of RF-EMF exposure independent of the duration of mobile phone use. An inherent limitation for interpretation is the correlation between mobile phone use duration and RF-EMF dose measures.

Abstract ID: 55

Title: Personal RF-EMF exposure in Swiss adolescents

Presenting Author: Roser, K

Authors: Roser, Katharina (1) (2); Schoeni, Anna (1) (2) and Rösli, Martin (1) (2)

Affiliations: (1) Swiss Tropical and Public Health Institute, Basel, Switzerland; (2) University of Basel, Basel, Switzerland

Text:

Background: The HERMES (Health Effects Related to Mobile Phone use in adolescentS) study, a cohort study conducted in Switzerland, aims to prospectively investigate whether the exposure to radio frequency electromagnetic fields (RF-EMF) emitted by mobile phones and other wireless communication devices affects cognitive functions or causes behavioural problems and non-specific health disturbances in adolescents. For investigating effects of RF-EMF, the exposure assessment is a crucial part.

Methods: Personal RF-EMF measurements in 95 adolescents were conducted. The adolescents carried an exposimeter, a portable measurement device, for 3 days. Additionally they filled in a time-activity diary installed as an application on a smartphone in flight-mode. The used exposimeter Expom measures frequency bands ranging from 620 MHz to 3500 MHz. These measurements allowed describing the RF-EMF exposure in everyday life of Swiss adolescents.

Results: Overall the total RF-EMF exposure was on average 0.061 mW/m². Highest exposure was measured for the uplink (transmission from mobile phone handsets to base stations) exposure (67.4% of total exposure), followed by downlink (transmission from mobile phone base stations to handsets) (20.8%), exposure from broadcast transmitters (6.9%), WLAN (Wireless Local Area Network) (3.5%) and DECT (Digital Enhanced Cordless Telecommunications) (1.5%). Adolescents' exposure was highest in public transport and cars (0.83 mW/m² in cars, 0.66 mW/m² in buses and 0.53 mW/m² in trains) and was increased during the day (0.077 vs. 0.029 mW/m² during night) and on weekends (0.066 vs. 0.056 mW/m² on workdays). Having WLAN in school increased the WLAN exposure noticeably (26.8%) compared to no WLAN in school. This excess exposure corresponded to 0.9% of the total exposure.

Conclusions: Mobile phones and mobile phone base stations contribute most to the total exposure. Adolescents are highest exposed when travelling in public transport and in cars. WLAN in school increases the WLAN exposure but has little impact on total exposure.

Abstract ID: 57

Title: Early-life selenium status and cognitive function in childhood

Presenting Author: Skröder, H

Authors: Skröder, Helena (1); Kippler, Maria (1); Rahman, Syed Moshfiqur (1,2); Hamadani, Jena (2); Tofail, Fahmida (2); Vahter, Marie (1)

Affiliations: (1) Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; (2) International Center for Diarrheal Disease Research, Dhaka, Bangladesh

Text:

Background and aims: In elderly, selenium status has been suggested to positively affect the cognitive function, and we recently found that increased selenium status in pregnancy was beneficial for children's cognitive function at 1.5 years of age. We have followed-up the children to assess whether the impact of prenatal selenium status remains during childhood.

Methods: Our cohort study was nested in the MINIMat population-based, randomized food and micronutrient supplementation trial in pregnancy, conducted in rural Bangladesh. Selenium in maternal blood [erythrocyte fraction, expressed per g hemoglobin (Hb)] in gestational week 14 was measured using inductively coupled plasma mass spectrometry (ICPMS). Measures of children's IQ at 5 and 10 years were assessed using the third edition of the Wechsler Pre-school and Primary Scale of Intelligence (WPPSI) and the Wechsler Intelligence Scale for Children (WISC), respectively.

Results: Preliminary results from multivariable-adjusted linear regression analyses showed that prenatal selenium status was still significantly associated with children's IQ at both 5 and 10 years of age (n=899). Maternal erythrocyte selenium ranged between 74-359 µg/kg (median 155 µg/kg, corresponding to 0.46 µg/g Hb). An increase of 0.5 µg Se/g Hb was associated with higher points in verbal IQ (2 points, equivalent to 0.2 SD; p=0.090), performance IQ (2.7 points 0.3 SD; p=0.042) and full scale IQ (2.4 points, 0.3 SD; p=0.044) at 5 years, and with the verbal comprehension index (3 points, 0.3 SD; p=0.034), perceptual reasoning index (3.7 points, 0.4 SD; p=0.009), processing speed index and full scale IQ (4 points, about 0.4 SD for both; p=0.010 and 0.007, respectively) at 10 years of age.

Conclusions: Increased selenium status during fetal life appears to be beneficial for children's IQ, and the effects seem to persist into later childhood.

Abstract ID: 58

Title: Human-livestock contacts and their relation to infectious disease transmission, a systematic review of the literature

Presenting Author: Klous, G

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Text:

Background: Micro-organisms transmitted from vertebrate animals -including livestock- to humans account for an estimated 60% of human pathogens. Micro-organisms can be transmitted through inhalation, ingestion, via conjunctiva or physical contact. Close contact with animals is crucial for transmission. The role of intensity and type of contact patterns between livestock and humans for disease transmission is poorly understood. In this systematic review we aimed at summarising current knowledge regarding the intensity of livestock-human contacts and their role in micro-organism transmission.

Methods: We included peer-reviewed publications published between 1996 and 2014 into our systematic review if they reported on human-livestock interactions, human cases of livestock-related zoonotic diseases or serological-epidemiology of zoonotic diseases in human samples. We extracted any information pertaining to type and intensity of livestock-human contacts and associated zoonoses.

Results: 1522 papers were identified, 74 were selected: 6 reported on incidental zoonoses after brief animal-human contacts (e.g. farm visits), 10 on environmental exposures and 15 on zoonoses in developing countries where backyard livestock keeping is customary. 43 studies reported zoonotic risks in different occupations, but actual contact patterns underlying the micro-organism transmission were generally not described. Occupations at risk included veterinarians, culling personnel, slaughterhouse workers and farmers. For culling personnel, more hours exposed to livestock resulted in higher occurrence of health effects. Slaughterhouse workers in contact with live animals were more often positive for zoonotic micro-organisms compared to co-workers only exposed to carcasses.

Conclusions: Little is known about the intensity and type of contact patterns between livestock and humans resulting in micro-organism transmission. Studies performed in occupational settings provide some, but limited evidence of exposure response-like relations for livestock-human contact and micro-organism transmission. Better understanding of contact patterns driving micro-organism transmission from animals to humans may provide options for prevention and should therefore be evaluated in more detail in future studies.

Abstract ID: 59

Title: Association between the Efficacy of Water Treatment Processes and Gastrointestinal Illnesses - A Multi-City Study of Nurse Advice Calls, Sweden

Presenting Author: Tornevi, A

Authors: Andreas Tornevi (1), Melle Säve-Söderbergh (2), Bertil Forsberg (1), Magnus Simonsson (2), Jonas Toljander (2)

Affiliations: (1) Department of Public Health and Clinical Medicine, Division of Occupational and Environmental Medicine, Umeå University, Umeå, Sweden (2) Science Division, National Food Agency, Uppsala, Sweden.

Text:

Background and aims: Numerous of outbreaks of gastrointestinal illnesses have been linked to insufficient drinking water treatment, but it is largely unknown to what extent consumption of public drinking water influences the risk of endemic gastroenteritis. We aimed to investigate if the occurrence and seasonal pattern of gastroenteritis is associated with pathogen elimination efficacy at different drinking water treatment plants.

Methods: Details of all calls to the national nurse advice line between the years 2007-2014 were obtained from 20 localities in Sweden. Calls concerning gastrointestinal illnesses (GI calls) were separated from calls concerning other issues (non-GI calls). Information was obtained about the drinking water treatment process for each locality. The theoretical efficacies of the treatment processes to eliminate viruses, bacteria, and protozoa (log reductions) were calculated and weighted proportionally to the rate these pathogen groups cause gastrointestinal illnesses. The daily number of GI calls relative to non-GI calls was analyzed in relation to the weighted pathogen elimination efficacy in a binomial regression model adjusting for population size, age distribution, geographical area, and long-term trend.

Results: There were 546,169 GI calls and 3,945,595 non-GI calls. The weighted log reductions varied between 0 and 6.4 units. Populations receiving water produced with high pathogen elimination efficacy had a lower proportion of GI calls, and the association was strongest during the winter season. The risk of GI calls decreased by 4% (OR = 0.96) for each ten-fold improvement in the weighted pathogen elimination efficacy.

Conclusions: The results suggest that it is possible to reduce the occurrence of endemic gastroenteritis with a more advanced treatment process for drinking water. These findings apply to conditions when either groundwater or surface water is the raw water source. The effects are particularly evident during seasons when viruses are acknowledged to be the main cause of gastrointestinal illness.

Abstract ID: 60

Title: Dust to fiber concentration conversion factors for a study of occupational chrysotile exposure and cancer mortality in Asbest, Russian Federation

Presenting Author: Feletto, E

Authors: Feletto, Eleonora (1); Schonfeld Sara J (1); Moissonnier Monika (1); Kashanskiy Sergey V (2); Kovalevskiy Evgeny V (3); Schüz Joachim (1); Kromhout, Hans (4)

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Text:

Background and aims: A retrospective cohort study of workers at the JSC "Uralasbest" in Asbest, Russian Federation is being conducted to characterize the association between chrysotile exposure and cancer mortality. Monthly gravimetric dust concentration measurements taken at stationary sampling points throughout the mine and processing factories are available from the 1950s but respirable fiber concentrations were not routinely collected. The aim of this study is to derive conversion factors using parallel dust and fiber concentrations and determine if the factors differed by stage in chrysotile mining and processing or by time.

Methods: Parallel gravimetric dust concentrations and fiber concentrations, using phase-contrast optical microscopy, were collected from Uralasbest in 2007 and 2013/14. In 2007, two factories were operational but by 2013/14 only one remained open. Sampling was repeated on multiple days at each point. Using the daily median of dust- and fiber- concentrations by point, the fiber to dust ratio will be derived. Ratios will be assessed by the factory departments (roughly corresponding to stages of processing), mine and time period.

Results: There were 621 daily medians of dust and fiber measurements from which to calculate the ratios. The median of the daily fiber concentration was 2.1 f/cc in 2007 and 1.4 f/cc in 2013/14. The median of the daily dust concentration was 2.4 mg/m³ in 2007 and 2.1 mg/m³ in 2013/14. The ratios were not stable across the two measurement periods. However, there was an indication of an increase during the production process with lower ratios in the beginning and higher ratio at the end of the enrichment process, as expected. Data analysis is still ongoing.

Conclusions: Preliminary analyses suggest variability in ratios between sampling points in an expected direction. Further analysis of the ratios will be undertaken to determine whether conversion factors can be derived for use in the cohort study.

Abstract ID: 61

Title: Estimating exposure to fine PM at the neighbourhood scale using stationary and mobile particle samplers

Presenting Author: Broday, E

Authors: Eztion, Yael; Broday, David

Affiliations: Civil & Environmental Engineering, Technion, Haifa, Israel

Text:

Background and aims: Exposure to fine particulate matter (PM) is known to be associated with adverse health effects in humans, in particular with respiratory and cardiovascular outcomes. However, many of these associations are based on rather coarse exposure metrics, including different spatiotemporal interpolation schemes, satellite derived modeled PM, etc. High spatial PM resolution can be achieved using land use regression (LUR) models, yet these models are either stationary or vary rather simplistically with time. Hence, these methods may suit long-term exposure estimation but fail short-term exposure estimation. Hence, they may not fit future studies which will account for the people commute. As an alternative, we propose to measure size-resolved PM concentrations at very high spatiotemporal resolution using a network of stationary and mobile cheap PM sensors.

Methods: Field measurement of PM is examined by a complimentary approach to standard monitoring, using two types of fine particle samplers (7 devices in total) that were deployed for about 6 months in a typical urban residential neighborhood and measured fine particle number concentrations.

Results: The sensor measurements were consistent with data obtained simultaneously by a reference aerosol spectrometer. Deploying the PM sensor at different locations within the neighborhood demonstrated their ability to detect spatiotemporal concentration variability that can be partially attributed to local emissions (traffic) and to anthropogenic activity (outdoor cooking).

Conclusions: High correlations and low RMSE were found between the PM sensors and the benchmark devices. Excellent inter-comparison among the sensors was revealed. Low spatial variability among the PM sensors was detected, but all present very similar asymmetric concentration distributions with a clear spatial intermittent component representing time-varying emission sources and meteorological phenomena. Exposure of neighbourhood residents seems to be very similar in spite of residence along major route or in a quieter area.

Abstract ID: 62

Title: Environmental and occupational exposure and mortality in a population cohort of people living in an industrial area in Central Italy

Presenting Author: Bauleo, L

Authors: Bauleo Lisa (1); Ancona Carla (1); Stefania Massari (2); Antonucci Chiara (1); Bucci Simone (1); Roberto Sozzi (3) and Forastiere Francesco (1)..

Affiliations: (1) Department of Epidemiology Lazio Regional Health Service – Italy; (2) INAIL, Italian Workers' Compensation Authority – Italy; (3) Environmental protection Agency Lazio Region - Italy

Text:

Background and aims: Assessing the health impact from industrial pollution is problematic because it is difficult to disentangle the independent effect of environmental factors, occupational exposures, and socioeconomic position (SEP). The Civitavecchia's area (Rome), has been characterized by two oil-fuelled power plants, and a cement factory close to a large harbor. Recently, a coal power plant has been in operation. We evaluated the effects of emissions from the harbor on mortality in a cohort of people living in the area, taking into account the effect of occupational exposure and SEP.

Methods: A cohort of people resident in five municipalities from 1996 to 2010 were enrolled (from Municipal Registers) and followed-up until 2012. Data were linked with regional mortality dataset and with National Pension Fund to achieve information about employment in construction industry. Census data in 2001 at census block level were used to assess an area-based SEP index. Exposure to ships emissions at the harbor (PM10) at residential address was assessed using a Lagrangian dispersion model. Cox Mortality Hazard Ratios were calculated including a linear term for PM10 exposure (5th-95th percentiles difference) and age, gender, calendar period, occupation, exposure to NOx from traffic, and SEP (HR, 95%CI).

Results: 133.444 people were enrolled (49% males, 43% low SEP, 6% employed in the construction industry). We found an association between PM10 and non-accidental mortality (HR 1.10, 95%CI 1.05-1.15), lung cancer (HR 1.25, 95%CI 1.06-1.49), respiratory disease (HR 1.24, 95%CI 1.03-1.50) and Acute Coronary Events (ACE) (HR 1.17, 95%CI 0.97-1.42). There was an independent effect of occupational exposure in the construction industry ranging from 1.20, 95%CI 1.11-1.31 for non-accidental mortality to HR 1.80, 95%CI 1.30-2.48 for ACE.

Conclusions: Results indicate independent associations of modelled exposure to PM10 from the harbor and employment in the construction industry with mortality among residents in this area.

Abstract ID: 63

Title: The effect of different types of natural outdoor environments on people with poor mental health in Catalonia

Presenting Author: Triguero-Mas, M

Authors: Triguero-Mas, Margarita (1,2,3); Gidlow, Christopher J. (4); Martínez, David (1,2,3); de Bont, Jeroen (1,2,3); Carrasco-Turigas, Glòria (1,2,3); Martínez-Íñiguez, Tania (1,2,3); Hurst, Gemma (4); Masterson, Daniel (4); Seto, Edmund (5); Jones, Marc V. (4); Nieuwenhuijsen, Mark J. (1,2,3)

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Text:

Background and aims: Experimental studies have reported associations between short-term exposure to natural outdoor environments (NOE) and health benefits. However, they lack insight into mechanisms, often have low external and ecological validity, and have rarely focused on ill populations. The objectives of this study were to investigate: (i) the effects of unconstrained exposure to real natural and urban environments on psycho-physiological indicators of people with poor mental health, (ii) the possible differential effects of 30 and 210-minute exposures, and (iii) the possible mechanisms explaining these effects.

Methods: People with poor mental health were exposed to green, blue and urban environments in groups for a period of 210 minutes. During the exposure period, participants were instructed to do what they would usually do in that environment. Before, during (at 30 and 210 minutes) and after each exposure, several psycho-physiological measures were taken.

Results: When compared with responses to urban environment, we found statistically significantly lower negative mood, and stress levels in the green exposure environment, and statistically significantly lower negative mood, and statistically significant favorable changes in HRV indicators in the blue exposure environment. Physical activity and restoration partially mediated the associations between NOE and mood. Physical activity and air pollution partially mediated the associations between NOE and HRV.

Conclusions: Our study found that individuals exposed to NOE had better mood, lower stress levels, and higher physiological relaxation compared to those exposed to urban environments. Associations were partially mediated by physical activity, restoration, and/or air pollution.

Abstract ID: 64

Title: Is being in natural outdoor environments associated to mood, mental health, vitality and somatisation?

Presenting Author: Triguero-Mas, M

Authors: Triguero-Mas, Margarita (1,2,3); Donaire-Gonzalez, David (1,2,3,4); Seto, Edmund (5); Valentín, Antònia (1,2,3); Martínez, David (1,2,3); Smith, Graham (6); Hurst, Gemma (6); Carrasco-Turigas, Glòria (1,2,3); Masterson, Daniel (6); van den Berg, Magdalena (7); Ambròs, Albert (1,2,3); Martínez-Íñiguez, Tania (1,2,3); Dedele, Audrius (8); Grazulevicius, Thomas (8); Voorsmit, Martin (7); Cirach, Marta (1,2,3); Jerret, Michael (9, 10); Ruijsbroek, Annemarie (11); Gražulevičienė, Regina (8); Kruize, Hanneke (11); Gidlow, Christopher J. (6); Nieuwenhuijsen, Mark J. (1,2,3)

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Text:

Background and aims: Existing evidence shows that contact with natural outdoor environments (NOE) benefits human health and well-being. Various mechanisms have been suggested to explain this association, including reduction of stress, increase of social interactions and physical activity. We explored whether being in NOE was associated to better mood, mental health, vitality and somatisation. We also aimed to investigate if physical activity, social interactions and stress could mediate these associations.

Methods: The study was conducted in four European cities: Barcelona (Spain), Stoke-on-Trent (United Kingdom), Doetinchem (The Netherlands), and Kaunas (Lithuania). Smartphones were used to collect objective information on the location, physical activity, momentary mood, and momentary social interactions of 100 people in each city. Participants were asked to fill in a diary every morning and every evening to collect objective information on their mental health status, vitality, somatisation and stress level. We used GIS to determine physical activity, social interactions and mood in NOE. Statistical analyses were performed with pooled data and separately by country.

Results: We found that being in NOE was associated with better mood, and vitality, but not with mental health nor somatisation. We also found that stress was mediating the associations between being in NOE and vitality. However, when looking at each city separately, we found that these results were replicated only in the cities of Barcelona and Stoke-on-Trent, while in the other two cities no statistically significant associations were found.

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Conclusions: Our results indicate that being in NOE improves mood and vitality in Barcelona and Stoke-on-Trent city. Also, that the improvement of vitality is mediated by stress

Abstract ID: 65

Title: Natural outdoor environments and physical activity

Presenting Author: Triguero-Mas, M

Authors: Triguero-Mas, Margarita (1,2,3); Donaire-Gonzalez, David (1,2,3,4); Seto, Edmund (5), Valentín, Antònia (1,2,3); Martínez, David (1,2,3); Smith, Graham (6); Carrasco-Turigas, Glòria (1,2,3); Masterson, Daniel (6); van den Berg, Magdalena (7); Ambròs, Albert (1,2,3); Martínez-Íñiguez, Tania (1,2,3); Dedele, Audrius (8); Grazulevicius, Thomas (8); Voorsmit, Martin (7); Cirach, Marta (1,2,3); Jerret, Michael (9, 10); Wendel-Vos, Wanda (11); Gražulevičienė, Regina (8); Kruize, Hanneke (11); Gidlow, Christopher J. (6); Nieuwenhuijsen, Mark J. (1,2,3)

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Text:

Background and aims: Promotion of physical has been usually based on health education and social marketing activities. However, natural outdoor environments (NOE) have been recently suggested as a potential physical activity promoter. We aimed to investigate whether residential proximity to natural outdoor environments (NOE) was associated with time spent in NOE, physical activity performed in NOE and physical activity performed in all environments.

Methods: The study was conducted in four European cities: Barcelona (Spain), Stoke-on-Trent (United Kingdom), Doetinchem (The Netherlands), and Kaunas (Lithuania). Smartphones were used to collect objective information on the location and physical activity of 100 people in each city. We used GIS to determine residential proximity to NOE and physical activity performed in NOE. Statistical analyses were performed with pooled data and separately by country.

Results: We found that residential proximity to NOE was not associated with physical activity performed in all environments, but was associated with time spent in NOE and physical activity performed in NOE. However, when looking at each city separately, we found that these results were replicated only in the city of Barcelona, while in the other three cities no statistically significant associations were found.

Conclusions: Our results indicate that residential proximity to NOE does not promote physical activity in all environments in any of the studied cities. However, residential proximity to NOE increases time spent in NOE and physical activity performed in NOE in Barcelona city.

Abstract ID: 66

Title: Traffic Pollution and Health in London: epidemiological study on birth outcomes and infant mortality

Presenting Author: Smith, R

Authors: Smith, Rachel B (1); Gulliver, John (1); Fecht, Daniela (1); Blangiardo, Marta (1); Beevers, Sean (2); Dajnak, David (2); Ghosh, Becky (1); Kelly, Frank (2); Anderson, H Ross (2,3); Toledano, Mireille B (1)

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Text:

Background and aims: Traffic pollution encompasses toxic air pollutants and noise. There is consistent evidence for an association between air pollution and infant mortality, and some evidence suggesting a small effect of air pollution on birth weight, intrauterine growth retardation and preterm delivery. Few studies have examined the relationship between these outcomes and noise, but there is some suggestion of an association with low birthweight. This study aims to investigate exposure to traffic-related noise and air pollution during pregnancy in relation to birth outcomes and infant mortality.

Methods: The study region is the Greater London area, for the years 2003-2010. Outcome data are from national birth and mortality registers. Monthly concentrations of primary traffic air pollutants (NO₂, NO_x, exhaust and non-exhaust related PM_{2.5} and PM₁₀) and regional/urban background air pollutants (Ozone, and total PM_{2.5} and PM₁₀) have been estimated using a dispersion model at a 20m x 20m grid resolution. Time-weighted average air pollution estimates at address-level will be calculated for each trimester, the entire pregnancy, and postnatal time periods. Annual road traffic noise levels have been modeled at address-level using the TRAFFIC Noise Exposure (TRANEX) model. The relationship between individual and joint noise and air pollution exposures with birth outcomes (birth weight outcomes, preterm birth, stillbirth and infant mortality) will be analysed, adjusting for a potential confounding factors such as maternal age, smoking and deprivation.

Results and Conclusions: There are approximately 1 million births and stillbirths in the study area during the years 2003 to 2010. The study is in progress and the focus of the presentation will be on study design. This will be the largest study to examine the effects of environmental noise exposure upon birth outcomes. The study will provide insights in to the joint and relative roles of noise and air pollution upon birth outcomes.

Abstract ID: 67

Title: An integrative genomics approach identifies new asthma pathways related to air pollution exposure

Presenting Author: Gruzieva, O

Authors: Gref, Anna (1), Kebede Merid, Simon (1), Gruzieva, Olena (1), Ballereau, Stéphane (2), Becker, Allan (3), Bellander, Tom (1), Bergström, Anna (1), Bossé, Yohan (4), Bottai, Matteo (1), Chan-Yeung, Moira (5), Fuertes, Elaine (6,7), Ierodakoniou, Despo (8,9), Jiang, Ruiwei (10), Kobor, Michael (10), Korek, Michal (1), Kozyrskyj, Anita L. (11), Kumar, Ashish (1), Lemonnier, Nathanaël (2), MacIntyre, Elaina (6,7,12), Nickle, David (13), Obeidat, Ma'en (14), Pellet, Johann (2), Standl, Marie (6), Sääf, Annika (1), Söderhäll, Cilla (15), Tiesler, Carla MT. (6,16), van den Berge, Maarten (17,18), Vonk, Judith M. (9,18), Vora, Hita (19), Xu, Cheng-Jian (17,18,20), Antó, Josep M. (21), Auffray, Charles (2), Brauer, Michael (22), Bousquet, Jean (23), Brunekreef, Bert (24), Gauderman, W. James (19), Heinrich, Joachim (6), Kere, Juha (15), Koppelman, Gerard H. (18,25), Postma, Dirkje (18,26), Carlsten, Christopher (27), Pershagen, Göran (1), Melén, Erik (1,28).

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Text:

Background and aims: The evidence on traffic-related air pollution exposure (TRAP) and incident childhood asthma is inconsistent, and may depend on genetic factors. We aimed to identify mechanisms of childhood asthma using genome-wide SNP data and individual TRAP exposure, and to evaluate the effect of susceptibility SNPs and TRAP on DNA-methylation and gene expression.

Methods: We used LUR models to estimate individual outdoor NO₂ levels at the birth address and performed a genome-wide interaction study for doctor's diagnosis of asthma up to 8 years in three European birth cohorts with replication in two North American cohorts (n=3,322 subjects). The top GWIS and replicated SNPs were assessed for methQTL effects in peripheral blood cells and eQTL effects in human lung specimens. Short- and long-term TRAP associations with methylation patterns and TRAP-induced differential gene expression in blood cells were also assessed.

Results: The novel loci MAGI1, B4GALT5, MOCOS and DLG2, and the previously lung disease linked locus ADCY2 showed strong evidence for interaction with TRAP (genome-wide significance or replication). The top replication SNP rs686237 was identified as an eQTL for B4GALT5 ($p=1.18 \times 10^{-17}$) and affected TRAP-induced gene expression ($p=0.03$). Differential methylation following TRAP exposure was seen for DLG2, ADCY2, MAGI1 and MOCOS. Identified genes belong to the guanylate kinase, sphingolipid and calcium signaling pathways, suggesting involvement in asthma pathogenesis.

Conclusions: Our results indicate that gene-environment interactions are important for asthma development and that functional genomics analyses in conjunction with environmental exposures may give valuable insights about pathophysiologic mechanisms.

Abstract ID: 68

Title: Placental miRNA expression in association with in utero particulate air pollution exposure

Presenting Author: Tsamou, M

Authors: Tsamou, Maria (1)*; Vrijens, Karen (1)*; Madhloum, Narjes (1); Nawrot, Tim S (1,2

Affiliations: (1)Center for Environmental Sciences, Hasselt University, Diepenbeek, Belgium; (2)Department of Public Health, Occupational, Environmental & Insurance Medicine, Leuven University (KU Leuven), Leuven, Belgium; * both authors contributed equally to this work

Text:

Background and aims: Particulate matter exposure during in utero life may entail adverse health outcomes later in life. Epidemiological studies in adults have linked air pollution's adverse effects to alterations in gene expression profiles, which can be regulated by epigenetic mechanisms, including microRNAs (miRNAs). MiRNAs have been implicated in diverse biological processes. We investigate the potential influence of air pollution exposure in early life on placental miRNA expression.

Methods: Within the framework of the ENVIRONAGE birth cohort, the expression of four miRNAs (miR-16, miR-21, miR-146a and miR-222) was analyzed by qRT-PCR in placental tissue from 211 mother-newborn pairs. Multiple regression models were used to study placental miRNA expression and in utero exposure to particulate matter over various time windows during pregnancy. In silico analysis was performed to predict genes and pathways targeted by the studied miRNAs.

Results: All four measured placental miRNAs were associated with air pollution exposure in early-life. For each 5 μm^3 increase in PM_{2.5} exposure, the expression of miR-21 and miR-222 was reduced by 32.1% (95%CI: -52, 3.8, $p=0.0305$) and 23.9% (CI: -41.8, -0.6, $p=0.0462$) during the 2nd trimester, respectively. The expressed miR-146a was significantly decreased by 30.1% (CI: -47.3, -7.1, $p=0.0144$) in the 2nd trimester and by 39.3% (CI: -60.6, -6.4, $p=0.025$) during the entire pregnancy. The effects were independent of mother's age, pre-gestational BMI, smoking status, parity and educational status, and newborn's gender and gestational age, seasonality and apparent temperature. Pathway analysis based on in silico predicted miRNA targets revealed immune responses as the core pathways targeted by the studied miRNAs.

Conclusions: Environmental exposure to particulate air pollution in early-life can modify the placental expression of miRNAs-21, -146a and -222 in human placental tissue. These miRNAs might be relevant targets for PM induced effects in fetal programming and health outcomes later in life.

Abstract ID: 69

Title: Air Pollution and Ischemic Stroke

Presenting Author: Yitshak-Sade, M

Authors: Yitshak-Sade, Maayan^{1,2}; Novack, Victor^{1,2}; Ifergane, Gal^{2,3}; Horev, Anat³ and Kloog, Itai⁴

Affiliations: (1) Clinical Research Center, Soroka University Medical Center, Israel; (2) Faculty of Health Sciences, Ben Gurion University, Israel; (3) Department of Neurology, Soroka University Medical Center; (4) Department of Geography and Environmental Development, Faculty of Humanities and Social Sciences, Ben Gurion University, Israel.

Text:

Background and aims: Among the environmental exposures that may induce oxidative stress leading to Neurological pathology, air pollution may be considered as the most prevalent source. We aimed to evaluate the association between exposure to Particulate Matter <10µm in diameter (PM₁₀) and <2.5µm in diameter (PM_{2.5}) and ischemic stroke.

Methods: We included all members of the largest health maintenance organization, who admitted to Soroka University Medical Center with stroke between the years 2005-2012, and had a geocoded address in Southern Israel—a desert area characterized by a wide range of PM levels originate both from natural and anthropogenic sources. Exposure assessment was based on a novel hybrid model incorporating daily satellite remote sensing data at 1km spatial resolution. We performed case crossover models, adjusted for average temperature and relative humidity, stratified by personal characteristics and distance from main roads. We repeated the analyses using penalized spline functions of PM to examine possible nonlinear associations.

Results: We included 4,176 cases. Inter Quartile Range (IQR) and [maximal values] of PM₁₀ and PM_{2.5} were: 36.3-54.7 [235.2] µg/m³ and 16.7-23.3 [76.28] µg/m³. The subjects average age was 70, 53.4% were males. Positive associations between ischemic stroke and increases of IQR concentrations of PM₁₀ or PM_{2.5} average concentrations, at the day of the event, were observed among subjects < 55 years (OR [95% CI]: 1.11 [1.02; 1.20] and 1.10 [1.00; 1.21]). Stronger associations were observed in subjects who lived within 75 meters from a main road (1.22 [1.03; 1.43], and 1.26 [1.04; 1.51]). The associations with the smoothed functions of PM₁₀ and PM_{2.5} were stronger within the lower range of PM.

Conclusions: We observed higher risk for ischemic stroke associated with PM in the day of the event, among young adults. The higher associations found within the lower range of PM and particularly among subjects who reside in proximity to main roads, suggest stronger effect of traffic pollution and not pollution of natural sources.

Abstract ID: 70

Title: Environmental exposures and natural-cause mortality: a health impact assessment study for Barcelona

Presenting Author: Mueller, N

Authors: Mueller, Natalie (1,2,3); Rojas-Rueda, David (1,2,3); Cole-Hunter, Tom (1,2,3); Cirach, Marta (1,2,3); Martinez, David (1,2,3); Dadvand, Payam (1,2,3); Basagaña, Xavier (1,2,3); Foraster, Maria (4,5); Triguero-Mas, Margarita (1,2,3); Gascon, Mireia (1,2,3); Donaire, David (1,2,3); Nieuwenhuijsen, Mark (1,2,3)

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Text:

Background and aims: By 2050, 60% of people globally are projected to live in urban areas. As inhabited environments influence physical and mental well-being, sustainable city designs that can provide improved and more equitable health outcomes are needed. We conducted a health impact assessment study for Barcelona estimating preventable natural-cause mortality from compliance with international recommendations for performance of physical activity (PA), exposure to air pollution, noise and heat, and access to green spaces (GS).

Methods: Exposure estimates for all five exposure domains and natural-cause mortality data were available for 1,357,361 Barcelona residents aged ≥ 20 years in 2012. Barcelona exposure levels were compared to internationally-recommended exposure levels. The strengths of association between the estimated inadequate exposure levels and natural-cause mortality were quantified. Population attributable fractions were calculated to estimate the number of deaths preventable if compliance with recommendations was achieved.

Results: In 2012, 15,049 deaths from natural-causes occurred among Barcelona residents ≥ 20 years. Initial analyses show that up to 10% of premature deaths from natural causes could be prevented if internationally-recommended levels for PA; air pollution, noise, heat and access to GS were met. The biggest share in preventable deaths appears to be attributable to increases in PA, followed by exposure reductions in air pollution, heat and noise. Universal access to GS occurs to have a minor impact on natural-cause mortality.

Conclusions: In Barcelona, up to 10% of premature deaths are attributable to non-compliance levels of PA, air pollution, noise, heat and access to GS. Exposure to environmental factors can be modified by changes in the built-environment and personal behavior. We appeal to policy-makers and urban and transport planners to consider health impacts when designing cities and emphasize the importance of (1) vibrant mixed-land use designs; (2) the provision of urban greening; and (3) the reduction of motorized traffic through the promotion of active transport.

Abstract ID: 71

Title: Impact of HVAC on school IEQ

Presenting Author: Toyinbo, O

Authors: Oluyemi, Toyinbo (1,2); Jarek, Kurnitski (3); Richard, Shaughnessy (4), Mari, Turunen (1,2); Ulla, Haverinen-Shaughnessy (1,4)

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Text:

Background and aims: Students spend a lot of time in their learning environment, and classroom indoor environmental quality (IEQ) has been associated with students' health, absenteeism, and learning outcomes. IEQ can be impacted by many building characteristics. For example, a not well maintained school building may have its heating, ventilating, and air conditioning (HVAC) unit working below capacity. This study analyses the associations between measured IEQ variables (ventilation rate, temperature) and those retrieved from the register that are assumed to be standard.

Methods: Physical measurements of classroom temperature and airflow were done in 108 classrooms from 60 Finnish elementary schools in the summer and spring of 2007. Data-loggers were used for classroom temperature while ventilation rates were estimated from classroom carbon dioxide (CO₂) measurements or exhaust airflow. Information about school building characteristics, and type and condition of heating, ventilation, and air conditioning (HVAC) systems were retrieved from the Finnish population register center (FPRC). IBM SPSS statistics version 20 was used for data analysis.

Results: Significant associations were observed between HVAC upgrade and airflow measurement ($r = .709$), ventilation rate per student ($r = .703$), ventilation per m² ($r = .714$), and mean temperature ($r = -.249$). Number of students in classroom associated with ventilation rate per student ($r = -.359$) and there were associations between number of floors and both airflow measurement and ventilation rate per student ($r = -.262$ and $r = -.313$ respectively). Ventilation rate per student also had a relationship with mean temperature ($r = -.303$).

Conclusions: There is need for scheduled maintenance and upgrade of HVAC in schools to achieve an acceptable classroom IEQ with adequate adjustment to accommodate the number of students in a classroom at any particular time.

Abstract ID: 72

Title: Cadmium exposure from fetal life to school-age and effects on cognitive and behavioral development: a prospective cohort study in rural Bangladesh

Presenting Author: Kippler, M

Authors: Kippler, Maria (1); Tofail, Fahmida (2); Malin Igra, Annachiara (1); Hamadani, Jena (2); Rahman, Syed Moshfiqur (1, 2), Vahter, Marie (1)

Affiliations: (1) Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; (2) International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b), Dhaka, Bangladesh

Text:

Background and aims: We have previously shown that rural Bangladeshi children's pre- and postnatal exposure to cadmium, a common food pollutant, affected their growth and IQ at pre-school age. We now aim to explore whether the cadmium-related effects on children's neurophysiological development persist at 10 years of age and if they are potentiated by the continued exposure.

Methods: Children born from October 2002 to December 2003 within our longitudinal mother-child cohort, originating from a food and micronutrient supplementation trial conducted during pregnancy (MINIMat), were selected for follow-up of development at 5 and 10 years of age (n=1530). Cadmium exposure was assessed by concentrations in urine (a marker of long-term exposure) of the mothers during pregnancy and the children at 5 and 10 years, measured using ICP-MS. Cognitive function (IQ) was assessed using the Wechsler Pre-school and Primary Scale of Intelligence (WPPSI-III) and the Wechsler Intelligence Scale for Children (WISC-IV) and behavior using the Strengths and Difficulties Questionnaire.

Results: In linear regression analyses, adjusted for multiple confounders, children in the highest tertile of urinary cadmium (median 0.43 µg/L; 10 years) had significantly lower verbal comprehension index (-1.9 points; 95% CI: -3.0, -0.71), working memory index (-1.7 points; -3.0, -0.36), processing speed index (-2.1 points; -3.4, -0.85), and full scale IQ (-1.9 points; -3.0, -0.83) at 10 years of age than children in the lowest tertile (median 0.13 µg/L). Exposure prenatally and at 5 years appeared to be less influential. No associations were found with behavior. We are presently conducting longitudinal analyses, using linear mixed-effects model fit by maximum likelihood estimation in combination with quantile regression analyses to provide further information on potential critical periods of exposure and susceptible sub-groups.

Conclusions: Children's low-level cadmium exposure appears to have a negative impact on their IQ.

Abstract ID: 73

Title: Home paint exposures and risk of childhood acute lymphoblastic leukemia: Findings from the Childhood Leukemia International Consortium

Presenting Author: Bailey, H

Authors: Bailey, Helen D, (1, 2); Metayer, Catherine (3) ; Milne, Elizabeth (4); Petridou, Eleni (5); Infante-Rivard, Claire (6); Spector, Logan G (7); Clavel, Jacqueline (2); Dockerty, John D (8); Zhang, Luoping (3); Armstrong, Bruce K (9,10) ; Rudant, Jérémie (2); Fritschi, Lin (11); Amigou, Alicia (2); Hatzipantelis, Emmanouel (12); Kang, Alice Y (3); Stiakaki, Eftichia (13); Schüz, Joachim (1)

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Text:

Background and aims: Acute lymphoblastic leukemia (ALL) the most common childhood cancer, occurs mainly in children under five years, which suggests a role for parental exposures before birth or the child's exposure in the early childhood years. It has been suggested that home paint exposure increases the risk of childhood ALL.

Methods: We obtained individual level data from eight case-control studies participating in the Childhood Leukemia International Consortium. All studies had home paint exposure data for the pregnancy period with additional data for the 1-3 month period before conception in five, the year before conception in two, and the period after birth in four studies respectively. Cytogenetic subtype data were available for some studies. Data were harmonized to a compatible format. Pooled analyses of individual data were undertaken using unconditional logistic regression.

Results: The pooled odds ratio (OR) for home paint exposure in the 1-3 months before conception and risk of ALL was 1.54 (95% confidence interval (CI) 1.28, 1.85) based on 3,002 cases and 3,836 controls from five studies, while it was 1.00 (95% CI 0.86, 1.17) based on 1160 cases and 1641 controls from two studies for exposure in the year before conception. For exposure during pregnancy, using 4,382 cases and 5,747 controls from eight, the pooled OR was 1.14 (95% CI 1.04, 1.25). Based on data from 1,962 cases and 2,973 controls from four studies the OR for exposure after birth was 1.22 (95% CI 1.07, 1.39). The risk was greater for certain cytogenetic subtypes and if someone other than the parents did the painting.

Conclusions: Home paint exposure shortly before conception, during pregnancy and/or after birth appeared to increase the risk of childhood ALL, especially in certain circumstances. Until there is any evidence to the contrary, it may be prudent to limit exposure during these periods.

Abstract ID: 74

Title: Cadmium exposure and risk of breast cancer: a meta-analysis

Presenting Author: Filippini, T

Authors: Filippini, Tommaso (1); Vinceti, Marco (1)

Affiliations: (1) CREAGEN – Center of Environmental, Genetic and Nutritional Epidemiology, University of Modena and Reggio Emilia, Modena, Italy

Text:

Background and aims: Cadmium (Cd) is a toxic metal with estrogenic activity and established human carcinogenicity, but several uncertainties still exist about the amounts of relevant exposure and particularly the cancer types involved.

Methods: We carried out a systematic search in the PubMed-Medline database in April 2015, using as MeSH terms 'cadmium', 'breast cancer', or 'breast tumor'. We identified 24 eligible studies, 16 case-control and 8 cohort ones. We performed a meta-analysis according to study design and type of Cd exposure assessment, using random-effects model considering the moderate heterogeneity between these investigations.

Results: The exposure assessment methodology influenced the meta-analysis results, which however generally indicated an increased risk of breast cancer. For studies using urine Cd concentrations for exposure assessment, we found a summary relative risk (RR) of 2.14 (95% CI 1.37-3.34) and 1.39 (0.67-2.92) for case-control and cohort studies, respectively. For cohort studies using dietary Cd intake for exposure assessment, summary RR was 1.00 (0.87-1.15). Stratified analysis according to Estrogen Receptor (ER) status showed a summary RRs of 1.05 (0.94-1.16) and 1.00 (0.82-1.21) for positive and negative cancer types, respectively. For Progesterone Receptor (PR), RRs were 0.87 (0.69-1.10) and 1.10 (0.83-1.45) for positive and negative status, respectively. Considering body mass index (BMI) as effect modifier, RR was 1.08 (0.96-1.23) and 0.99 (0.93-1.05) for BMI<25 and BMI≥25, respectively.

Conclusions: Despite the limitations of this meta-analysis, such as the differences in exposure assessment methods and the statistical imprecision of the point estimates, overall results appear to suggest a direct association between cadmium exposure and breast cancer, with higher RR in subgroups such as ER-positive, PR-negative and normal weight women.

Abstract ID: 75

Title: Challenges in occupational exposure assessment for asbestos in the Netherlands

Presenting Author: Voogd, E

Authors: Voogd, Eef (1); Spaan, Suzanne (1); Schinkel, Jody (1)

Affiliations: TNO, dept. Risk Analysis of Products in Development (RAPID), Zeist, The Netherlands

Text:

Background and aims: Exposure to asbestos is known to cause adverse health effects like asbestosis and cancer. Although the use of several types of asbestos has been banned in most countries, it is still present throughout modern society due to the use of asbestos for several purposes in several industries in the past. Recently, the Dutch government has decided to lower the occupational exposure limit (OEL) from 10.000 to 2000 fibres/m³ chrysotile. The Dutch Health Council has advised to also lower the OEL (phased) for amphibole asbestos to 300 fibres/m³. These changes have large implications, as exposure at the workplace needs to be substantially reduced to ensure a safe work environment, but also with regard to exposure assessment, since the current methods for defining asbestos exposure are not sensitive enough to measure concentrations ≤ 300 fibres/m³.

Current approach: At this moment, stakeholders from industry and government initiate and collaborate in research to update and improve the current framework for exposure assessment including the currently used risk classification system (which includes exposure reduction strategies and personal protection), with a primary focus on the Dutch asbestos-removal sector. For updating this classification, the underlying database is being updated, and efforts are made to gather more measurement data by means of streamlining and standardizing the data collection within the industry. Also possibilities to improve the sensitivity of the analytical methods by means of for instance automation are being explored. In parallel, innovations with regard to improved work methods for working with asbestos or asbestos-containing materials are being stimulated. These new developments with regard to exposure assessment and (risk) classification are needed to comply with the renewed Dutch legislation concerning asbestos in the workplace, and current joint efforts from all stakeholders involved are a big step in meeting these requirements.

Abstract ID: 76

Title: Increased respiratory symptoms in COPD patients living in the vicinity of livestock farms

Presenting Author: Borlée, F

Authors: Floor Borlée^{1, 2}, Dr. C. Joris Yzermans², Dr. Christel E. van Dijk², Prof. Dr. Dick Heederik¹, Dr. Lidwien A. M. Smit¹

Affiliations: (1) Institute for Risk Assessment Sciences, IRAS, Utrecht University, Netherlands, (2) Institute for Health Services Research, NIVEL, Utrecht, Netherlands

Text:

Background and aims: Several studies have investigated the effect of livestock farm emissions on respiratory health of local residents but results are inconsistent. This study aims to explore associations between the presence of livestock farms and respiratory health in a high density livestock farming area in the Netherlands. We focused especially on associations between farm exposures and respiratory symptoms within subgroups of potentially susceptible patients with a pre-existing lung disease.

Methods: In total, 14,875 adults (response 53.4%) completed a questionnaire concerning respiratory health, smoking habits, and personal characteristics. Different indicators of livestock farm exposures relative to the home address were computed using a geographic information system.

Results: Prevalence of COPD and asthma was lower among residents living within 100m of a farm (OR 0.47 (0.24-0.91), 0.65 (0.45-0.93) respectively). However, > 11 farms in 1000m compared to < 4 farms in 1000m (4th quartile vs. 1st quartile) was associated with wheezing among COPD patients (OR 1.71 (1.01-2.89)). Using general practitioners' electronic medical records, we demonstrated that selection bias did not affect the observed associations. In addition, there were no indications of selective migration of patients living close to livestock farms, in more in depth analysis of the electronic medical records.

Conclusions: Our data suggest a protective effect of livestock farm emissions on respiratory health of residents. Nonetheless, COPD patients living near livestock farms reported more respiratory symptoms, suggesting an increased risk of exacerbations.

Abstract ID: 77

Title: Exploration of sensor based personal PM10 and PNC exposure assessment methods: a measurement and a modelling approach

Presenting Author: Kuijpers, E

Authors: M. Voogt (1); E. Kuijpers (1); J. Duyzer (1), S. van Ratingen (1); Roel Vermeulen (2); Gerard Hoek (2), F. Pierik (1); A. Pronk (1)

Affiliations: (1) TNO, NL; (2) IRAS, NL

Text:

Background and aims: The expansion of (low cost) small sensors enables the development of practical methods for the assessment of air pollution through distributed networks and personal measurements. In this study we explore the development of two approaches to assess personal exposure to particles (PM10 and Particle Number Concentration): a measurement and modelling approach.

Methods: To measure personal PM10 exposure we fitted a data logger and battery pack to the OPC-N2 sensor (Alphasense optical particle counter). For OPC-N2 validation and correction purposes during the study, outdoor stationary measurements will be compared with data from TEOM-FDMS at the local authority monitoring station. Personal exposure to PNC will be measured with miniDiSC (FHNW). Gaussian and street canyon dispersion models will be used to create 10 minute averaged exposure maps of the city of Eindhoven. Background concentration data will be obtained from measurements at fixed locations. The maps can be coupled with personal location-activity information obtained via GPS sensors to obtain personal exposure estimates.

Results: The measurement and modelling approach will be tested among 12 citizens that live and work in the city of Eindhoven. Participants will wear a backpack with the personal OPC-N2, miniDiSC and GPS sensor for 5 days in June 2015. The citizen study will be carried out in cooperation with AiREAS Eindhoven.

Conclusions: The results of the measurement and modelling approach for the assessment of personal exposure to PM10 and PNC will be presented and compared.

Abstract ID: 78

Title: Risk of ALS and passive residential exposure to pesticides: a population based study

Presenting Author: Violi, F

Authors: Violi, Federica (1); Filippini, Tommaso (1); Malagoli, Carlotta (1); Mandrioli, Jessica (2); Signorelli, Carlo (3); Odone, Anna (3); Ferrante, Margherita (4); Fiore, Maria (4); Ledda, Caterina (4); Mauceri, Cristina (4); Patti, Francesco (4); Costanzini, Sofia (5); Fabbi, Sara (5); Teggi, Sergio (5); Vinceti, Marco (1).

Affiliations: (1) CREAGEN-Research Center in Environmental, Genetic and Nutritional Epidemiology- University of Modena and Reggio Emilia, Italy (2) Dep. of Biomedical, Metabolic and Neural Sciences- University of Modena and Reggio Emilia, Italy (3) Dep. of Biomedical, Biotechnological and Translational Sciences- University of Parma, Italy (4) Dep. "G.F.Ingrassia", Hygiene and Public Health- University of Catania, Italy (5) LARMA- University of Modena and Reggio Emilia, Italy

Text:

Background and aims: Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disease of the motor neuron. Its etiology is still unknown, but environmental factors as agricultural pesticides may play a possible role.

Methods: We carried out a population-based case-control study in the provinces of Modena, Reggio Emilia and Parma (Northern Italy) and Catania (Southern Italy). For each case diagnosed in that area from 1998 to 2011, four controls matched by sex, age and province of residence were randomly selected from the general population. We identified and geocoded subjects' historical residence within a Geographical Information System (GIS) database. To evaluate passive exposures to neurotoxic pesticides, we added to the GIS two land use models related to the 2000s and to the 1980s, focusing on an area of 100 meters around the residences. We computed the percentage of that area dedicated to different cultivations (vineyards, orchards, extensive arable farming and crops) for which potentially neurotoxic pesticides had been used, to assess passive exposure to these chemicals.

Results: We identified 703 ALS cases and 2737 matched controls, 1251 of which (including 254 cases) did not change residence over the entire study period. We computed the odds ratio (OR) associated with different land use through a conditional logistic regression model, dichotomizing subjects' exposure according to pesticide use in the surrounding area. For residences at time of diagnosis OR was 1.15 (95% confidence interval 0.73-1.79) for vineyards, 0.99 (0.70-1.39) for orchards and 0.95 (0.78-1.15) for extensive arable farming and crops. For historical residences ORs were 0.74 (0.50-1.11), 1.07 (0.73-1.58) and 1.00 (0.78-1.28), respectively.

Conclusions: Study results show little evidence of any association between passive exposure to potentially neurotoxic pesticides and risk of developing ALS.

Abstract ID: 79

Title: Long-term exposure to air pollution and mortality: a nationwide small area study in Spain (LIFE MED-HISS project)

Presenting Author: Basagaña, X

Authors: Basagaña, Xavier (1,2,3); Agis, David (1,2,3); Arévalo, Gustavo (4); Ghigo, Stefania (5); Bande, Stefano (5); Martínez-Solanas, Èrica (1,2,3); Benach, Joan (2); Baldasano, Jose Maria (4); Cadum, Ennio (5)

Affiliations: (1) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain; (2) Universitat Pompeu Fabra (UPF), Barcelona, Spain; (3) CIBER Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain; (4) Barcelona Supercomputing Center and Centro Nacional de Supercomputación (BSC-CNS), Barcelona, Spain; (5) Arpa Piemonte, Torino, Italy.

Text:

Background and aims: Studies on the health effects of long-term exposure to air pollution are usually based on cohorts of participants living in big cities and are not representative of the entire population. We assessed the relationship between air pollution and mortality using data from the entire population of Spain.

Methods: Mortality counts from 2,218 small areas (areas with at least 3,500 inhabitants) covering the entire Spain for years 2005-2010 were used in the analysis. Average annual levels of NO₂, O₃, PM₁₀, PM_{2.5} for the period 2009-2013 were obtained from the CALIOPE air quality forecasting system in a 4x4 km grid and were up-scaled at the small area level. We used Poisson regression models of observed deaths with expected deaths (based on age and sex distributions) included as an offset. Separate models were fitted for each pollutant and for natural, cardiovascular and respiratory causes. Models were adjusted for the following area-level variables: population, unemployment, lung cancer mortality rates (as a surrogate of smoking prevalence), and an index of economical activity. Unstructured and spatial random effects were included in the model.

Results: In models without spatial random effects, all-cause mortality was positively associated with O₃, PM₁₀ and PM_{2.5} (Relative risks (RR) and 95% credibility intervals (CI) comparing bottom to top quartile of exposure were 1.06 (1.04, 1.08), 1.10 (1.08, 1.12), and 1.09 (1.07, 1.11), respectively) and negatively associated with NO₂ (RR=0.98, 95% CI: 0.96, 0.99). After inclusion of spatial random effects, all associations became non-significant, except for PM₁₀, which became protective (RR=0.95, 95% CI: 0.92, 0.98). Similar results were obtained for cardiovascular and respiratory mortality.

Conclusions: Results indicate the presence of strong unmeasured confounders with a spatial structure. Analyses will be updated by including mortality in years 2011-2013 and by using better markers for socioeconomic status and other known confounders.

Abstract ID: 80

Title: Exposure to particulate air pollution and noise during commuting by bicycle, bus and car in three European cities

Presenting Author: Okokon, E

Authors: Okokon, Enembe O. (1); Turunen, Anu W. (1); Taimisto, Pekka (1); Yli-Tuomi, Tarja (1); Pennanen, Arto (1); Vouitsis, Ilias (2); Samaras, Zisis (2); Keuken, Menno (3); Lanki, Timo (1)

Affiliations: (1) Department of Health Protection, THL - National Institute for Health and Welfare, P.O.Box 95, FI-70701 Kuopio, Finland; (2) Laboratory of Applied Thermodynamics, Aristotle University, Thessaloniki, Greece; (3) TNO, Netherlands Organization for Applied Scientific Research, Utrecht, The Netherlands

Text:

Background and aims: In order to curb greenhouse gas emissions, contemporary city commuters are encouraged to shift from private car use to active or public transport modes. However, personal exposures to particulate matter (PM) and noise during commuting may be substantial. Therefore, studies comparing exposures during car trips versus the recommended modes of transport are needed.

Methods: We measured personal exposure to various sized particulates, soot, and noise during commuting by bicycle, bus and car in three European cities: Helsinki in Finland, Rotterdam in the Netherlands and Thessaloniki in Greece. We also estimated the intakes of particulates and soot.

Results: The total number of one-way trips yielding data on some measured parameter were 84, 72, 94 and 69 for bicycle, bus, closed-window car and open-window car modes, respectively. In general, PM and soot concentrations were higher during bicycle and bus trips than during car (with windows closed) trips. Bike:car ratios of PM₁₀ ranged from 1.1 in Thessaloniki to 2.6 Helsinki, while bus:car ratios ranged from 1.0 in Rotterdam to 5.6 in Thessaloniki. The highest noise levels were recorded during bicycle rides. The highest intakes of PM and soot were estimated to occur during bicycle rides.

Conclusions: Schemes to decrease active commuters' and public-transport users' environmental exposures should be incorporated into urban transport policies.

Abstract ID: 81

Title: Hazard Assessment of Drinking Water Following Thermal Treatment

Presenting Author: Oranskaia, I

Authors: Oranskaia, Irina; Gurvich, Vladimir; Kuzmina, Elena; Slishkina, Tatyana; Gorbunova, Tatyana; Postnikova, Dariya

Affiliations: A Federal Scientific Institution "Ekaterinburg Medical Research Centre for Prophylaxis and Health Protection in Industrial Workers"

Text:

Background and aims: The process of boiling potable water can trigger transformation of chemicals in it. Our objective was to assess safety of potable water before and after boiling and to calculate predicted values of carcinogenic and non-carcinogenic risks for adult and child population.

Methods: Potable water from the centralized drinking water supply source of a large industrial center was taken as the study object. Its chemical composition before and after 15-minute boiling was identified using gas chromatography with mass spectrometric detection and high-performance liquid chromatography. Both carcinogenic and non-carcinogenic risks for adults and children were assessed using the risk assessment methodology.

Results: In the course of hazard identification of the potable water we established that it contained 15 chemicals before and 31 chemicals – after boiling. The analysis of those chemicals showed that inorganic chemical substances transformed into organic forms – C-Cl bonds of organic compounds destructed: organochlorides decomposed and released free chlorine. More condensed saturated and unsaturated aromatic compounds appeared in all functional groups including carboxylic acids, amines, and polycyclic aromatic compounds. The total carcinogenic risk from consumption of water was estimated $1.63E-06$ before and $1.81E-03$ after 15-minute boiling. Benzo(a)pyrene (53%) and trichloroethylene (40%) contributed most to the total values of carcinogenic risk of water before boiling whereas after boiling contribution of chrysene (65%) and 2,6-dinitrotoluene (35%) was the highest. Hazard indices estimated for boiled water exceeded 1.0 both for the child (1.067-6.180) and adult (2.247-2.648) population, thus indicating probability of adverse effects of the combined priority pollutants on the central nervous system, liver, growth and premature death in the former and on the central nervous system and premature death in the latter. Trichloroethylene and 2,6-dinitrotoluene contributed most to the total non-carcinogenic risk.

Conclusions: Potable water boiling causes transformation of chemicals and emergence of dangerous properties of water. The risk of adverse health effects increases, especially in children. The hazardous water properties can be related to chlorination during water treatment

Abstract ID: 82

Title: The Effect of Surrounding Greenness Exposure Duration on Childhood Asthma in Kaunas

Presenting Author: Andrušaitytė, S

Authors: Andrušaitytė, Sandra; Gražulevičienė, Regina

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Text:

Background and aims: The aim of this study was to investigate the association between surrounding greenness level and time spent outdoor and preschool children's asthma.

Methods: A nested case-control study included 1489 4–6 year-old children in Kaunas city, Lithuania. Data on asthma was obtained from the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. The surrounding greenness was measured as the average of the satellite-based Normalized Difference Vegetation Index (NDVI) within the buffers of 100 meters from each child's home. Association between NDVI and asthma was estimated by multivariable regression, controlling for covariate.

Results: The NDVI-100 m was directly associated with prevalence asthma. There was association between the more time spend outdoor and asthma risk (OR 0.72 95% CI 0.48–1.10). Using NDVI-100≤median and time spend outdoor ≤5 h/per week as a reference group we find statistically significant decrease asthma risk associated with time spend outdoor more that 5 hour per week (sOR 0.50 95% CI 0.26–0.94).

Conclusions: This study suggests that more time spend outdoor can play reducing the risk of asthma among children in lower level of the surrounding greenness.

Abstract ID: 83

Title: Gene-environment interaction between the ATP7B gene and copper exposure in childhood inattentiveness

Presenting Author: Alemany, S

Authors: Alemany Silvia (1-3); Vilor-Tejedor Natalia (1-3); Bustamante Mariona (1-4); Pujol Jesús (5-6); Macià Dídac (5); Álvarez-Pedrerol Mar (1-3); Sunyer Jordi (1-3, 7).

Affiliations: (1) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain. (2) Universitat Pompeu Fabra (UPF), Barcelona, Spain. (3) CIBER Epidemiology and Public Health (CIBERESP), Spain. (4) Center for Genomic Regulation (CRG), Barcelona, Spain. (5) MRI Research Unit, Hospital del Mar, Barcelona, Spain. (6) Centro Investigación Biomédica en Red de Salud Mental, CIBERSAM G21, Barcelona, Spain. (7) IMIM (Hospital del Mar Medical Research Institute), Barcelona, Spain.

Text:

Background and aims: Copper is an essential metal in the biochemistry of the nervous system. The ATPase copper-transporting, beta polypeptide (ATP7B) gene regulates excretion through the bile and concentrations of free copper in systemic circulation. Loss-of-function variants in the ATP7B gene may result in severe metabolic disorders such as Wilson's disease. This disorder is characterized by an overload of copper in liver and brain causing hepatic and neurological deficits. While there is an increasing interest regarding the role of copper concentrations in organs and body fluids in neurodegenerative diseases and cognition, little is known about the effects of copper on neurodevelopment as an air pollutant. The current study aimed to test whether copper as an air pollutant is associated with inattentiveness depending on genetic variations within the ATP7B gene.

Methods: Two functional single nucleotide polymorphisms (SNP) within the ATP7B gene (rs1061472, rs732774) were assessed in 1478 children drawn from the BREATHE project. Children aged 7 to 10 years from 39 schools of Barcelona were tested via a computerized test to evaluate inattentiveness measurements. Copper levels of traffic-related pollutants were measured in each school. Linear regression analyses were conducted for each SNP.

Results: No main effects were detected. Significant interactions were found between copper concentrations and the two SNPs [rs1061472, $\beta=2.32$; $p=0.036$; 95% CI 0.15-4.50; rs732774, $\beta=-2.42$; $p=0.030$; 95% CI -4.61-(-0.23)]. Exposure to copper had opposite effects on inattentiveness depending on ATP7B genotypes. Carriers of the rs1061472-GG and rs732774-CC genotypes presented higher inattentiveness when exposed to high rates of copper. Each interaction accounted for 0.3% of the variance of inattentiveness.

Conclusions: Despite the small effect size of the interactions and the limited statistical power of the study, our results suggest that variations within the ATP7B gene should be considered when examining the effects of airborne copper in childhood cognition.

Abstract ID: 84

Title: Early life Exposure to Bisphenol A in association with Obesity and Cardiometabolic Traits in Early Childhood.

Presenting Author: Vafeiadi, M

Authors: Marina Vafeiadi,¹ Theano Roumeliotaki,¹ Antonis Myridakis,² Georgia Chalkiadaki,¹ Eleni Fthenou,¹ Maria Venihaki,³ Marianna Karachaliou,¹ Katerina Sarri,¹ Maria Vassilaki,¹ Euripides G. Stephanou,² Manolis Kogevinas,^{4,5,6,7} Leda Chatzi¹

Affiliations: 1Department of Social Medicine, Faculty of Medicine, University of Crete, Heraklion, Greece, 2Environmental Chemical Processes Laboratory (ECPL), Department of Chemistry, University of Crete, Heraklion, Greece, 3Lab of Clinical Chemistry-Biochemistry, Department of Laboratory Medicine, School of Medicine, University of Crete, Heraklion, Crete, Greece, 4Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain, 5Hospital del Mar Research Institute (IMIM), Barcelona, Spain, 6CIBER Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain, 7National School of Public Health, Athens, Greece

Text:

Background and aims: Bisphenol A (BPA) is a chemical used extensively worldwide in the manufacture of plastic polymers. The environmental obesogen hypothesis suggests that early life exposure to endocrine disrupting chemicals such as BPA may increase the risk for weight gain later in childhood but few prospective epidemiological studies have investigated this relationship. We examined the association of early life BPA exposure with offspring obesity and cardiometabolic risk factors in 500 mother-child pairs from the RHEA pregnancy cohort in Crete, Greece.

Methods: BPA concentrations were measured in spot urine samples collected from mothers (1st trimester of pregnancy) and their children at 2.5 and 4 years of age. We measured birth weight, body mass index (BMI) from 6 months to 4 years of age, waist circumference, skinfold thickness, blood pressure, serum lipids, C-reactive protein, and adipokines at 4 years of age. BMI growth trajectories from birth to 4 years were estimated by linear mixed effects models with fractional polynomials of age. Adjusted associations were obtained via multivariable regression analyses.

Results: The prevalence of overweight was 9% at 2, 13% at 3 and 17% at 4 years of age. Geometric mean BPA concentrations were 1.2 µg/g creatinine (SD 7.9) in 1st trimester, 5.1 µg/g (13.3) in 2.5 years and 1.9 µg/g (4.9) in 4 years. After confounder adjustment, each 10-fold increase in BPA at 4 years was associated with a higher BMI z-score (β log₁₀ µg/g=0.2; 95% CI: -0.01, 0.4), higher waist circumference (β =1.2 cm; 95% CI: 0.1, 2.2) and greater sum of skinfold thickness (β =3.7 mm; 95% CI: 0.7, 6.7) at 4 years. Prenatal and 2.5 years BPA was not associated with child anthropometry from birth to 4 years. We found no significant associations of early life exposure to BPA with other offspring cardiometabolic risk factors.

Conclusions: Early childhood BPA exposure was associated with excess child adiposity.

Abstract ID: 85

Title: Organophosphate Pesticides Exposure and Micronuclei Frequencies in Preschool Children: The Rhea Plus Project

Presenting Author: Vafeiadi, M

Authors: Marina Vafeiadi¹, Theano Roumeliotaki¹, Antonis Myridakis², Georgia Chalkiadaki¹, Danai Feida¹, Eleni Fthenou¹, Andrea Rossnerova³, Radim Sram³, Euripides G. Stephanou², Manolis Kogevinas^{4,5,6,7}, Leda Chatzi¹

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Text:

Background and aims: Organophosphate pesticides (OPs) are one of the most commonly used classes of insecticides worldwide. Early life exposure to OPs has been adversely associated with child health, while in vitro and animal studies have reported genotoxic and mutagenic effects. Micronuclei (MN) are extranuclear small nuclei caused by DNA damage, serve as markers of pre-carcinogenic events and have been associated with cancer risk in adults but few studies have examined MN frequency in children. We investigated for the first time the association of exposure to OPs with MN frequency in lymphocytes of 200 preschool children from a pregnancy cohort in Crete, Greece.

Methods: We used the cytokinesis-block micronucleus assay to assess MN frequencies in 1000 binucleated T-lymphocytes (MNBN) in children at 4 years of age. Automated MNBN detection was performed by using the MetaSystems Metafer Slide Scanning Platform. Dialkyl phosphate (DAP) metabolites of OP pesticides were measured in child urine samples at 4 years and were summed on a molar basis to yield total DAPs, as well as total dimethyl phosphate (DM) and diethyl phosphate (DE) metabolites. Negative binomial regression models were used to estimate associations between DAP concentrations and MN frequencies in childhood.

Results: The geometric mean of total DAP, DE, and DM concentrations were 64, 25 and, 32 nmol/L, respectively in 4 years. After confounder adjustment, each 10-fold increase in total DAP was associated with higher MNBN incidence (IRR log₁₀ =1.31; 95%CI: 1.01, 1.71). Total DE and DM concentrations were positively but not significantly associated with MNBN frequency (IRR log₁₀=1.21; 95%CI: 0.90, 1.62; IRR log₁₀ =1.21; 95%CI: 0.97, 1.50, respectively) at 4 years.

Conclusions: Early life exposure to OPs may increase the risk of micronuclei frequency in children. Further studies are needed to explore the underlying biological mechanisms of these associations.

Abstract ID: 86

Title: Job-Task-Exposure Matrices to assess occupational exposure to disinfectants among U.S. nurses

Presenting Author: Quinot, C

Authors: Quinot, Catherine (1,2); Dumas, Oriane (3,4); Henneberger, Paul (5); Varraso, Raphaëlle (1,2); Wiley, Aleta (3); Speizer, Frank (3); Goldberg, Marcel (1,2,6); Zock, Jan-Paul (7); Camargo, Carlos Arturo (3,4); Le Moual Nicole (1,2)

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Text:

Background and aims: Occupational exposure to disinfectants is associated with work-related asthma, especially in healthcare workers. However, little is known about the specific products involved. In epidemiologic studies, assessment of exposure by job-exposure matrices (JEM) is less prone to differential misclassification bias than self-report. We designed JEM and job-task-exposure matrices (JTEM) to better evaluate disinfectant exposures using data from the Nurses' Health Study II, a prospective study of U.S. female registered nurses.

Methods: Disinfectant use was assessed by an occupational questionnaire in a random sample of 9,082 nurses (49-68 years) without asthma. A JEM was created based on the frequency (1-3, >4 days/week) of reported use of 7 disinfectants and use of sprays in 8 nursing jobs. Nurses reported weekly disinfection tasks to clean instruments (21%) and surfaces (54%). A JTEM combining job types and disinfection tasks was created to further reduce misclassification. Exposure was evaluated in 3 classes (low, medium, high) using product-specific cut-offs (such as <30%, 30-49.9%, ≥50%, respectively, for alcohol) defined from the distribution of the percentage of self-reported exposure per job and tasks.

Results: Alcohol (weekly use: 39%), bleach (22%) and sprays (20%) were the most frequently reported; more nurses were classified exposed (medium/high) by JEM (84% for alcohol, bleach and sprays) and JTEM (62%, 62%, 59%, respectively). Agreement between JEM and JTEM were fair to moderate (kappa: 0.3 to 0.5) for all disinfectants except for formaldehyde (kappa: 0.8). For emergency room, operating room and education or administration nursing jobs, JEM and JTEM estimates were similar whereas more variations were observed for other jobs.

Conclusion: The JTEM may provide more accurate estimates than the JEM especially for nursing jobs with heterogeneous tasks, which will reduce exposure misclassification. These methods and others based on exposure intensity/frequency will be applied to study associations with asthma.

Abstract ID: 87

Title: Survey of pollen allergy in Hungary

Presenting Author: Vadassy, R

Authors: Rita Vadassy 1, Mihály János Varró 2, Donát Magyar 2, Anna Páldy 2

Affiliations: 1 Semmelweis University Doctoral School , 2 National Public Health Center

Text:

Background and aims: There are no reliable data concerning the prevalence of pollen, especially ragweed pollen allergy in Hungary. The aim of the study was to conduct a questionnaire survey concerning the prevalence of allergy and the frequency of allergic symptoms during the birch and ragweed pollen seasons. The results were compared to the data of Patients' Hayfever Diary (PHD) where the patients register their symptoms.

Methods: a questionnaire containing eight questions were distributed among the 19 County Public Health Agencies with the aim to get at least 100 answers. To ascertain comparability, the questions regarding the symptoms were identical to those of the PHD. Descriptive statistical methods, khi2 probe were used for the analysis of the 2013 and 2014 data of PHD and of the 2015 questionnaire survey.

Results: 1500 questionnaires were collected from 18 counties. 71% of respondents were females. 35% of the respondents had pollen allergy, out of which 50% had ragweed and 12% birch pollen allergy. 25% of allergic cases were confirmed by diagnostic tests. Based on the questionnaire survey the occurrence of asthmatic symptoms was 3.33% during the period of birch pollination, this rate did not differ significantly from the rate of similar symptoms during the pollination of ragweed (4.14%). The occurrence of symptoms of rhinoconjunctivitis was similarly high in both seasons. Based on the PHD the rate of asthmatic symptoms was significantly higher during the birch pollen season (3.3% in 2013 and 3.4% in 2014) than in the ragweed pollen season (1.7% in both years) ($p < 0.05$). The rate of symptoms of rhinoconjunctivitis was higher during ragweed season in both years.

Conclusions: The results of the Patients' Hayfever Diary are supported by the data of the questionnaire survey. The finding of higher occurrence of asthmatic symptoms during the birch season needs further study.

Abstract ID: 88

Title: The impact of short-term exposure to disinfection by-products on the metabolome – a metabolome-wide association study

Presenting Author: van Veldhoven, K

Authors: van Veldhoven, Karin (1); Kogevinas, Manolis (2); Font-Ribera, Laia (2); Villanueva, Cristina M (2); Guida, Florence (1); Chadeau-Hyam, Marc (1); Vineis, Paolo (1,3); Scalbert, Augustin(4); Kumar Barupal, Dinesh (4)

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Text:

Background and aims: Exposure to disinfection by-products (DBPs), found in drinking water and chlorinated swimming pools, has been associated with adverse health outcomes such as bladder cancer and impaired respiratory health. The underlying biological mechanisms are still unknown and therefore the aim of this study was to investigate the impact of DBPs on the metabolome.

Methods: We used data from the PISCINA II study, part of the EU-funded EXPOsOMICS project. This short-term cross-over study was performed in an indoor chlorinated pool where 60 volunteers (18-40y non-smokers) swam for 40 minutes. Questionnaires about lifestyle factors and physical activity were completed, heart rate was monitored, and exhaled breath and blood samples were collected before and 2 hours after swimming. Exposure to DBPs was assessed using measurements of chloroform, bromodichloromethane, dibromochloromethane and bromoform in exhaled breath. Untargeted metabolomics of blood samples was conducted using a UHPLC-QTOF mass spectrometer operated in ESI positive mode. The association between the difference in the exposures after and before swimming and the difference in compounds after and before swimming was analysed using confounder adjusted generalized linear models (delta model), controlling the family wise error rate at 5%. As a set of sensitivity analyses, several other approaches were used, including partial least squares regression and penalized regression.

Results: A total 4,608 chemical compounds were detected using the metabolomics assay. Exposure to higher levels of chloroform was associated with an increase in the level of one compound. Paired analyses of the difference of the compounds after/before also showed an association with both chloroform and the sum of all trihalomethanes.

Conclusions: Our work provides insights into metabolic changes induced by exposures to DBPs, shedding light on biological pathways affected by these exposures, and in-turn impacting future risk of adverse health outcomes.

Abstract ID: 89

Title: Significant mortality displacement due to exposure to high temperature in an inland and a coastal climate in Estonia

Presenting Author: Oudin Åström, D

Authors: Daniel Oudin Åström (1,2), Christofer Åström (1,2), Kaidi Rekker (2,3), Ene Indermitte (2), Hans Orru (2,1)

Affiliations: (1) Occupational and Environmental Medicine, Umeå University (2) Department of Public Health, University of Tartu (3) Tartu Health Care College

Text:

Background and aims: The on-going climate change is predicted to result in a growing number of extreme meteorological events such as heat waves throughout Europe. The effect of high temperature and heat waves is already having an important impact on public health in terms of increased mortality. Increased mortality and morbidity has been recorded previously in Central and Eastern Europe. Increased mortality during times of elevated temperatures may be followed by days and weeks with lower than normal mortality, i.e. mortality displacement. We intend to investigate the time course of mortality in a coastal and an inland region in Estonia.

Methods: We collected daily numbers of deaths and daily meteorological observations in the form of daily maximum temperatures for a coastal and an inland region of Estonia during the time period 1997-2013. We applied a distributed lag non-linear model to investigate the time course of mortality in Estonia.

Results: We report increased mortality from the point of minimum mortality and this increase in mortality lasts for a couple of days in both regions. The immediate effects of high temperatures are of a larger magnitude in the inland region than for the coastal area. The total effect of elevated temperatures is lessened by a significant mortality displacement, noticeable in both regions. The increased mortality during hot days is compensated by lower than normal mortality up to twelve days after temperatures start to increase in the coastal areas, whereas mortality is only significantly lower than normal 2-3 days in the inland region.

Conclusions: We observed significant mortality displacement in Estonia, both for a coastal and inland climate. This suggests that elderly and people with chronic disease, who generally would have been expected to die soon after exposure to elevated temperatures anyway, are most affected by elevated temperatures in Estonia.

Abstract ID: 90

Title: Interpolation in between road measurements in RF-EMF exposure assessment

Presenting Author: Aerts, S

Authors: Aerts, Sam (1); Joseph, Wout (1); Colussi, Loek (2); Kamer, Jos (2); Martens, Luc (1); Bolte, John (3)

Affiliations: (1) Department of Information Technology, Ghent University / iMinds, Ghent, Belgium; (2) Radiocommunications Agency Netherlands, Amersfoort, The Netherlands; (3) National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands

Text:

Background and aims: In the Netherlands, a large database of dense radiofrequency (RF) monitoring data is available, covering a majority of connecting roads and streets of the four largest cities. Our aim is to find out whether this existing database can be used effectively for RF electromagnetic fields (EMF) exposure assessment within the enclosed areas, and how much inner data is needed to complement the road data to increase the assessment accuracy.

Methods: Measurements were performed in the GSM 900 MHz and 1800 MHz bands around and inside a residential area in Amersfoort, with an RF measurement system installed on the roof of a car. The average power density per tile of 35 m by 35 m was calculated from all collected samples within that tile. Then, using ordinary kriging, we interpolated the power density in the area using random combinations of 10 to 100% of the edge and 0 to 100% of the inner data samples. Each combination was modeled 100 times and validated with 50 inner data points.

Results: Using only edge data, large errors but reasonable correlation statistics are obtained. However, analysis of the validation results further shows that by covering at least 10% of the inner area, the edge data effectively lose their influence on the model. Correlation coefficients of 0.8 and relative errors of 50% are obtained, which is comparable to the literature.

Conclusions: From the results of our pilot study in Amersfoort, we cautiously conclude that our approach is sound, and that a relatively accurate interpolation model of the RF-EMF exposure within an area can be built using measurements on the edge complemented with measurements in 5 to 10% of the inner area, corresponding to 40 to 80 tiles of 35 m by 35 m per km².

Abstract ID: 91

Title: Spatiotemporal activity based and route sensitive air pollution indicators for epidemiologists

Presenting Author: Dekoninck, L

Authors: Dekoninck, Luc (1); Botteldooren, Dick (1), Int Panis, Luc (2)(3)

Affiliations: (1) Department of information technology, University of Ghent, Belgium, (2) Flemish Institute for Technological Research (VITO), Boeretang 200, 2400 Mol, Belgium, (3) School for Mobility (IMOB), Hasselt University, Wetenschapspark 5 bus 6, 3590 Diepenbeek, Belgium

Text:

Background and aims: For traffic related air pollution, huge variability of meteorology, traffic, traffic dynamics and route choice hampers accurate exposure and health assessments. One of the main issues in exposure science and epidemiology is applying the complex exposure and dose functions to the personal time activity pattern of the individuals in custom populations, for example in epidemiological cohorts.

Methods: Noise measurements are used to quantify the instantaneous traffic and traffic dynamics in parallel with air pollution measurements. Instantaneous spatiotemporal LUR models with a high resolution (10 seconds while in-traffic) can assess and disentangle the PM exposure variability into a local traffic component and a slow varying background component. Instantaneous μ LUR models are built for bicyclists using noise measurements under various conditions. μ LUR models sensitive to instantaneous meteorological conditions are built for in-vehicle and indoor exposure using noise maps as an alternative proxy to traffic data. A personal exposure data workflow can apply the μ LUR models to any custom population. The exposure assessments can be extended to dose and indicator assessments with the temporal resolution of the μ LURs.

Results: Disentangling the air pollution variability into a meteorological component and a local traffic component improves the prediction of the personal exposure significantly. Noise maps capture the effects of traffic in a spatial resolution matching the spatial variability of the traffic related particulate matter (BC and UFP). Personal attributes of the subjects in a cohort enable the simulation of time-activity patterns. External validation of the personal exposure model for Black Carbon is successful.

Conclusions: Activity and micro-environment specific μ LURs can calculate complex exposure and dose including non-linear effects of the individual behavior including route choice. A personal indicator dataflow framework can extrapolate the μ LURs to any custom population and has the potential to improve the policy support and health effect research.

Abstract ID: 92

Title: Cattle mortality as a sentinel for the effects of ambient air pollution on human health

Presenting Author: Cox, B

Authors: Cox, Bianca (1); Gasparrini, Antonio (2,3); Catry, Boudewijn (4); Fierens, Frans (5); Vangronsveld, Jaco (1); Nawrot, Tim (1,6)

Affiliations: (1) Centre for Environmental Sciences, Hasselt University, Diepenbeek, Belgium (2) Department of Social and Environmental Health Research, London School of Hygiene & Tropical Medicine (LSHTM), London, UK (3) Department of Medical Statistics, LSHTM, London, UK (4) Public Health and Surveillance, Scientific Institute of Public Health (WIV-ISP), Brussels, Belgium (5) Belgian Interregional Environment Agency, Brussels, Belgium (6) Department of Public Health and Primary Care, University of Leuven, Leuven, Belgium

Text:

Background and aims: Although the use of animal sentinels may provide additional insights, the short-term effects of air pollution on mortality have never been studied in animal populations. Therefore we investigated the association between ambient air pollution and the risk of mortality in dairy cows.

Methods: We collected ozone (O₃), particulate matter (PM₁₀), and nitrogen dioxide (NO₂) concentrations at the level of the municipality for 87,108 dairy cow deaths in Belgium from 2006 to 2009. We combined a case-crossover design with distributed lag nonlinear models in the warm and the cold period of the year.

Results: We found acute and delayed effects of air pollution on dairy cattle mortality during the warm season. The increase in mortality for a 10 µg/m³ increase in 2-day (lag 0–1) O₃ was 1.3% (95% CI: 0.3, 2.2), and the corresponding estimates for a 10 µg/m³ increase in same-day (lag 0) PM₁₀ and NO₂ were 1.2% (95% CI: -0.3, 2.8) and 9.4% (95% CI: 6.4, 12.4), respectively. Compared to the acute effects, the cumulative 26-day (lag 0–25) estimates were considerably larger for O₃ (3.6%; 95% CI: 0.4, 6.9) and PM₁₀ (5.1%; 95% CI: 0.8, 9.5), but not for NO₂ (2.9%; 95% CI: -4.1, 10.3). We did not find consistent evidence for air pollution effects during the cold period.

Conclusions: Our study adds to the existing epidemiologic findings in human and suggests that dairy cattle may serve as sensitive sentinels for air pollution related health effects. Furthermore, our results indicate that air pollution effects go beyond short-term mortality displacement.

Abstract ID: 93

Title: Dairy cattle mortality as a sensitive warning system for the effects of high and low ambient temperature on human health

Presenting Author: Cox, B

Authors: Cox, Bianca (1); Gasparrini, Antonio (2,3); Catry, Boudewijn (4); Vangronsveld, Jaco (1); Nawrot, Tim (1,5)

Affiliations: (1) Centre for Environmental Sciences, Hasselt University, Diepenbeek, Belgium (2) Department of Social and Environmental Health Research, London School of Hygiene & Tropical Medicine (LSHTM), London, UK (3) Department of Medical Statistics, LSHTM, London, UK (4) Public Health and Surveillance, Scientific Institute of Public Health (WIV-ISP), Brussels, Belgium (5) Department of Public Health and Primary Care, University of Leuven, Leuven, Belgium

Text:

Background and aims: Extreme temperatures are associated with increased mortality among humans. The use of animal sentinels may add to the available epidemiologic evidence and may provide additional insights. Therefore, we investigated the effects of low and high ambient temperature on the risk of mortality among dairy cattle.

Methods: We combined a case-crossover design with distributed lag nonlinear models on 87,108 dairy cow deaths in Belgium from 2006 to 2009. We used separate quasi-Poisson models for the warm and the cold season.

Results: During the warm season both high and low temperatures were associated with significantly increased mortality risk among dairy cattle. Heat effects were acute and were followed by a deficit in mortality three to five days after the exposure. Accounting for this harvesting effect, the estimated 11-day (lag 0–10) increase in dairy cattle mortality for a 1°C increase in mean temperature above the heat threshold (16.8°C) was 2.17% (95% CI: 0.11, 4.28). Cold effects in the warm season were delayed by five days and persisted up to 18 days. Over lag 0–25 days the estimate for a 1°C decrease below the cold threshold (13.9°C) was 4.90% (95% CI: 0.40, 9.60). We did not find evidence for temperature effects during the cold season.

Conclusions: We showed significant increases in dairy cattle mortality associated with low and high ambient temperatures and the temporal pattern of the association is very similar to that observed in humans. Therefore, dairy cows may serve as sensitive indicators of temperature-related health risks in human populations.

Abstract ID: 94

Title: Microvascular responses in association with recent and chronic exposure to particulate air pollution in school children

Presenting Author: Provost, E

Authors: Provost, Eline B (1,2); Saenen, Nelly D (1); Kicinski, Michal (1); Louwies, Tijs (1,2); Vrijens, Karen (1); Int Panis, Luc (2,3); De Boever, Patrick (1,2); Nawrot, Tim S (1,4)

Affiliations: (1) Centre for Environmental Sciences (CMK), Hasselt University, Diepenbeek, Belgium; (2) Environmental Risk and Health, Flemish Institute for Technological Research (VITO), Mol, Belgium; (3) School for Mobility (IMOB), Hasselt University, Diepenbeek, Belgium; (4) Department of Public Health & Primary Care, Leuven University (KU Leuven), Leuven, Belgium

Text:

Background and aims: Microvascular changes may represent an underlying mechanism through which particulate matter (PM) exposure contributes to cardiovascular disease development. We investigated the effect of both recent and chronic exposure to PM on the microcirculation, exemplified by retinal vessel calibers, in a panel of healthy children.

Methods: 225 children (49.1 % girls; mean age 9.9 years) were recruited at two primary schools in Belgium. Participating children were examined three times at school over the course of the school year, during which the fundus of both eyes was photographed. The caliber of the retinal blood vessels was summarized as the central retinal arteriolar/venular equivalent (CRAE/CRVE). Recent exposure to PM_{2.5} was measured at the school prior to the examination. Residential proximity to major roads was used as a proxy for chronic exposure. The effect of recent and chronic exposure to PM on retinal vessel caliber was estimated using mixed models, while adjusting for gender, age, BMI, blood pressure, heart rate, birth weight, time and day of examination, mother's education and passive smoking.

Results: Each doubling in recent exposure to PM_{2.5} was associated with a 0.51 μm (95% CI: 0.17 to 0.86 μm ; $p=0.0035$) narrowing of the retinal arteriolar caliber (CRAE), while venular caliber (CRVE) widened 0.55 μm (95% CI: 0.06 to 1.04 μm ; $p=0.029$). Children living twice as close to a major road had 0.84 μm (95% CI: -0.0044 to 1.68 μm ; $p=0.051$) narrower arterioles.

Conclusions: We show that vessel calibers of the retinal microcirculation of healthy children aged 8 to 12 years respond to recent PM exposure. Additionally, children living closer to major roads showed smaller calibers of their arterioles. Since changes in the microcirculation have been associated with cardiovascular disease development, these results suggest that the microcirculation is a pathophysiological target for air pollution from a young age onwards.

Abstract ID: 95

Title: Short-term elevations in black carbon exposure are associated with rapid changes in carotid arterial stiffness

Presenting Author: Provost, E

Authors: Provost, Eline B (1,2); Louwies, Tijs (1,2); op 't Roodt, Jos (1,3); Dons, Evi (1,2); Int Panis, Luc (2,4); De Boever, Patrick (1,2); Nawrot, Tim S (1,5)

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Text:

Background and aims: Vascular functional and structural changes may underpin the association between airborne black carbon (BC) and cardiovascular events. The accurate assessment of personal exposure is a major challenge in epidemiological research. BC concentrations are strongly related to time-activity patterns and this is particularly relevant when investigating short-term effects. In a panel of healthy adults, we investigated associations between arterial stiffness measures and short-term BC exposure that was measured with personal monitoring devices.

Methods: This panel study included 54 participants (92.3% female, mean age 40.7 years). Personal BC exposure was monitored with a small micro-aethalometer sensor during one workweek. During this week, functional and structural properties of the carotid artery were examined ultrasonographically on two separate days. The effect of different short-term personal BC exposure windows on carotid artery stiffness measures was estimated using mixed models while adjusting for gender, age, BMI, mean arterial pressure, HDL to total cholesterol ratio, glucose level, alcohol consumption, smoking status, apparent temperature, day of the week and hour of clinical examination.

Results: Personal BC exposure 1 to 8 hours before the clinical examination was significantly associated with different measures of carotid arterial stiffness. Young's elastic modulus and pulse wave velocity, both direct measures of stiffness, were positively associated with BC exposure, while the distensibility and compliance coefficient, measures of elasticity, were negatively associated with BC exposure during these time windows.

Conclusions: Short-term elevations in BC exposure are associated with increased arterial stiffness. This response may reflect a pathway by which air pollution triggers an increased risk of cardiovascular events in vulnerable individuals.

Abstract ID: 96

Title: Prenatal air pollution exposure and growth: The role of placental mtDNA content

Presenting Author: Clemente, D

Authors: Diana B.P. Clemente^{1,2}, Maribel Casas², Carmen Iñiguez³, Loreto Santa Marina⁴, Tim S. Nawrot^{1,5}, Martine Vrijheid^{2,6}, on behalf of the INMA project.

Affiliations: (1) Centre for Research in Environmental Epidemiology, Barcelona, Spain; (2) Centre for Environmental Sciences, Hasselt, Belgium; (3) Foundation for the Promotion of Health and Biomedical Research in the Valencian Region (FISABIO), Valencia, Spain; (4) Health Research Institute (Biodonostia), Gipuzkoa, Spain; (5) Department of Public Health, Occupational and Environmental Medicine, Leuven University (KULeuven), Leuven, Belgium; (6) Universitat Pompeu Fabra, Barcelona, Spain.

Text:

Background and aims: In recent years, evidence has shown that prenatal traffic-related air pollution exposure influences fetal growth. Changes in mitochondrial DNA (mtDNA) content may represent a biologically relevant endpoint on the mechanisms underlying the association between air pollution and fetal growth restrictions. In this study, we aimed to assess the role of placental mtDNA content on the association of prenatal NO₂ exposure with fetal growth assessed by ultrasound measurements.

Methods: In this study, we used 333 mother-newborn pairs from the Spanish INMA study (Sabadell: n = 120; Gipuzkoa: n = 152; Valencia: n = 61). We used temporally adjusted land-use regression models to estimate exposure to nitrogen dioxide (NO₂). We estimated growth curves for femur length (FL), head circumference (HC), abdominal circumference (AC), biparietal diameter (BPD), and estimated fetal weight (EFW) during pregnancy (weeks 12-20, 12-32 and 20-32). DNA was extracted from placenta tissue cells. Relative placental mtDNA content was measured using quantitative real-time polymerase chain reaction.

Results: Each 10 µg/m³ increment in prenatal NO₂ exposure was associated with a relative decrease in placental mtDNA content of 4.3% (95% confidence interval (CI): -7.4, -1.1%). BPD at 12-32 and 20-32 weeks was significantly associated with prenatal NO₂ exposure (during weeks 0-12, 0-20, 12-20 and 0-32). HC at 12-32 and 20-32 weeks was significantly associated with prenatal NO₂ exposure during weeks 20-32 and weeks 0-32. The other fetal growth parameters were not significantly associated with prenatal NO₂ exposure. Each interquartile range increase in placental mtDNA content was significantly associated with an increase of 5.2% (95% CI: 0.4, 7.8%) in BPD at weeks 20-32.

Conclusions: Our results give an implication that prenatal air pollution exposure can impair fetal head growth. Furthermore, we showed that placental mtDNA content can play a role in this adverse effect.

Abstract ID: 97

Title: PRENATAL EXPOSURE TO GLYCOL ETHERS AND SEX HORMONE LEVELS IN CORD BLOOD

Presenting Author: Warembourg, C

Authors: Warembourg Charline (1,2), Cordier Sylvaine (1,2), Giton Frank (3,4), Fiet Jean (4), Multigner Luc (1), Garlandézec Ronan (1,5)

Affiliations: (1) National Institute of Health and Medical Research (UMR Inserm Irset 1085), France; (2) University of Rennes 1, France; (3) AP-HP, CIB GHU Sud Henri Mondor, France; (4) National Institute of Health and Medical Research (U955 eq07), France; (5) School of Public Health (EHESP), France.

Text:

Background and aims: Glycol ethers (GE) are solvents present in a wide range of occupational and domestic products. Several animal and epidemiological studies have suggested that some of them could alter gonadal and reproductive functions. To explore association between prenatal exposure to GE and sex hormone levels in cord blood.

Methods: Concentrations of 8 GE metabolites were measured in one urinary sample, collected before 19 weeks of gestation, among 350 pregnant women randomly selected from a mother-child birth cohort study (France) with available cord blood samples. Sex hormone-binding globulin (SHBG), estradiol (E2), total testosterone (T), bioavailable testosterone, and anti-Müllerian hormone (AMH) were measured in cord blood. Associations between GE metabolites and sex hormones were explored by multiple linear and spline regressions adjusted for potential confounders.

Results: Six metabolites were detected in more than 10% of the urinary samples, from 12% (propoxyacetic acid [PAA]) to 94% (phenoxyacetic acid [PhAA]). Significant quadratic relations were observed between methoxyethoxyacetic acid and SHBG ($p=0.03$) and E2 ($p=0.01$). Significant lower levels of T were observed when methoxyacetic acid was detected ($p=0.03$). Modifications of hormone levels were also suggested with exposure to PhAA and PAA. Some associations differed according to newborn sex. No association was found with AMH.

Conclusions: To our knowledge, this is the first study about prenatal GE exposures and sex hormone levels in cord blood. Significant nonlinear relations were observed and results by newborn sex suggested an alteration of both male and female gonads at various levels of exposure. However, modifications of hormone levels in cord blood could also be interpreted as a result of placental endocrine functions and exposures to GE may also be surrogates for potential coexposures.

Abstract ID: 98

Title: Cumulative effect of carbon monoxide exposure on deaths among elderly in São Paulo, Brazil, 2000 to 2011

Presenting Author: Costa, A

Authors: Costa, Amine (1); Hoek, Gerard (2); Brunekreef, Bert (2); Ponce de Leon, Antonio (1)

Affiliations: (1) University of Rio de Janeiro State, Rio de Janeiro, Brazil; (2) University of Utrecht, Utrecht, NL

Text:

Background and aims: Although many studies have already reported the association between air pollution and mortality, fewer of them have used large lag structures to assess the exposure effects. The aim of this study was to evaluate the cumulative effect of carbon monoxide (CO) exposure on respiratory deaths, using generalized additive distributed lag models (GADLM).

Methods: This study was a daily time series of deaths among elderly living in São Paulo, Brazil, between 2000 and 2011. The number of respiratory deaths was obtained from records of the Brazilian Mortality System. The concentrations of CO were obtained from the Environmental Company of São Paulo and the maximum 8-hour moving average was used. The exposure effect was evaluated from lag 0 to lag 20 or 30, adding a polynomial structure. The Poisson GADLM was adjusted for trend, seasonality, temperature, air humidity, weekdays and holidays. These analyzes were performed using packages included in R software.

Results: For each increase of 1 ppm of CO, there was a significant increase in the number of daily respiratory deaths of 1.56% on lag 0 and 1.30% on lag 1. Analyzing the cumulative effect, the increase in deaths was 6.41% until lag 10 and 5.96% until lag 20. Extending the analysis until lag 30, the significant effect could be seen until lag 24, with 3.92% of increase. The results were similar when only chronic respiratory deaths are examined; the single effect on lag 0 was 1.48% and the cumulative effect until lag 10 was 5.39%. Additionally, significant negative effects did not found until lag 30, suggesting absence of mortality displacement.

Conclusions: The effect size was larger when cumulative lag structures were used than when looking single lags. Consequently, these results indicate that the public health impact could be underestimated when single effects are chosen.

Abstract ID: 99

Title: Short-Term Effects of Ambient Air Pollution on Asthma Symptoms among Children in Ostrava, Czech Republic

Presenting Author: Velická, H

Authors: Velická, Helena (1); Brabec, Marek (1); Malý, Marek (1); Keder, Josef (2); Puklová, Vladimíra (1); Kazmarová, Helena (1)

Affiliations: (1) National Institute of Public Health, Prague, Czech Republic; (2) Czech Hydrometeorological Institute

Text:

Background and aims: The industrial city of Ostrava is a heavily air polluted area of the Czech Republic. This contribution is devoted to one part of our broader project concerning short-term effects of particulate matter PM₁₀, nitrogen dioxide NO₂ and sulphur dioxide SO₂ on incidence of asthma symptoms.

Methods: The study involved 147 children with asthma classified as mild persistent or moderate persistent, age range of 7 - 18 years, residents of Ostrava city. The respondents (their parents) filled an initial questionnaire and then daily completed one diary record relating to asthma symptoms and changes of the state of health. The study covered four months of the heating season November 2013 - February 2014. Concentrations of PM₁₀, NO₂ and SO₂ in ambient air provided as smoothed daily maps were linked with two addresses of each respondent (the residence and the school, using the GPS coordinates) and time spent daily on those addresses. Thus the exposure of the respondents to the measured air pollutants was determined. The relationships between the exposures and the effects were established by generalized additive models (GAM) with spline components. Several health outcomes were evaluated, including incidence of cough, difficult breathing and wheeze, use of asthma medication, and restricted daily activity.

Results: A positive association between 24-hour air pollution exposures and asthma symptoms or other complaints of the respondents was observed. Mostly the association was statistically significant. The combined category of "difficult breathing" and "wheezing" was highly significantly associated with exposure to any of all three pollutants in question (p-value < 0.0001).

Conclusions: Consistently with findings in other studies, short-term effects of ambient air pollution on incidence of asthma symptoms are statistically significant among children in Ostrava. Acknowledgement: Financial Support of The Grant Agency Ministry of Health of the Czech Republic (IGA MZ ČR č. NT 14608-3/2013).

Abstract ID: 100

Title: How does indoor air quality relate to children's respiratory health?

Presenting Author: Patelarou, Evridiki (1); Kelly, Frank (2)

Authors: Patelarou, Evridiki (1); Kelly, Frank (2)

Affiliations: (1) Department of Postgraduate Research, Florence Nightingale Faculty of Nursing and Midwifery, King's College London, London, UK; (2) MRC-PHE Centre for Environment and Health, NIHR Environmental Hazards Health Protection Research Unit, King's College London, London, UK

Text:

Background and aims: A number of studies have addressed the potential effect of prenatal exposure to indoor pollutants and respiratory disease during early childhood but as yet, findings from existing studies are not conclusive. The purpose of this review was to summarize existing epidemiological evidence of the association between quantitative estimates of indoor air pollution with early childhood respiratory disease.

Methods: We carried out a systematic literature search to summarize and evaluate the results of peer-reviewed epidemiological studies undertaken in "westernized" countries that have assessed exposure to indoor pollutants and early life asthma and wheezing.

Results: A comprehensive literature search yielded 1840 studies for consideration. Following application of eligibility criteria to titles and abstracts 22 independent studies were deemed relevant for further review. Two additional studies were next identified through examination of the references' lists of these 22 studies. Of these 24 selected studies, 16 adopted a prospective cohort design and 8 were case-control studies. In terms of pollutants examined, 14 studies assessed exposure to bio-aerosols, 8 studies assessed exposure to specific air chemicals and two studies assessed exposure to bio-aerosols and air chemicals. A further, 11 studies examined the association of exposure with asthma and 16 with wheezing. Findings showed that existing studies have reported contradictory effects of indoor pollutants levels (bioaerosols and chemicals) and occurrence of asthma/ wheezing.

Conclusions: Future research must explore the complex nature of the indoor environment in order to provide a sound basis to underpin proper risk management and communication interventions by local health protection agencies.

Abstract ID: 101

Title: The exposure of pregnant women and their offspring to Phtalates – Preliminary results from the Jerusalem “Environment, Mother, and Child” study

Presenting Author: Ein-Mor, E

Authors: Eliana Ein-Mor(1), Ronit Haimov-Kochman(2), Smadar Even-Tov(2), Juma Natsheh(2), Zivanit Ergaz-Shaltiel(2), and Ronit Calderon-Margalit(1)

Affiliations: (1) Hadassah-Hebrew University Braun School of Public Health, Jerusalem, Israel;
(2) Hadassah-Hebrew University Medical Centers, Jerusalem, Israel

Text:

Background and aims: There is a growing concern over adverse effects of prenatal exposure to phthalates. Such exposure was suggested to be associated with genital development, and impaired neurodevelopment of the offspring. We aimed to estimate the exposure to phtalates of pregnant women from Jerusalem, and to estimate the association of exposure with birth outcomes.

Methods: An ongoing cohort study of pregnant women recruited at 11-18 weeks of gestation. Data collection includes an interview and a maternal urine sample upon recruitment, amniotic fluid and a second urine samples during follow-up visits, and a postpartum interview, an examination of the offspring, including the Ballard maturational assessment (BMA), anthropometric measurements of the anogenital distance (AGD), and a urine sample of the offspring. Specimens of 73 women and 49 of their offspring were sent to the Institute for Occupational, Social and Environmental Medicine of the University Erlangen-Nürnberg, Germany for analysis of 11 creatinine-adjusted phthalate metabolites.

Results: All maternal specimens were above the limit of quantification (LOQ) in 7 metabolites. An inverse association was noted between the sum of DEHP metabolites (Σ DEHP) and AGD in males. A positive association was noted between Σ DEHP and BMA. DiNP metabolites were inversely correlated with birthweight (BW) and head circumference (HC). Inverse associations were observed between Σ DEHP in neonates urine and BMA, BW, HC and female AGD.

Conclusions: Intrauterine exposure to phthalates is highly prevalent in Jerusalem. Our findings suggest associations between exposure and birth outcomes. Increasing the sample sized is needed to support these findings

Abstract ID: 102

Title: The exposure of pregnant women and their offspring to organophosphate pesticides – Preliminary results, the Jerusalem “Environment, Mother, and Child” study

Presenting Author: Ein-Mor, E

Authors: Eliana Ein-Mor(1), Ronit Haimov-Kochman(2), Smadar Even-Tov(2), Juma Natsheh(2), Zivanit Ergaz-Shaltiel(2), and Ronit Calderon-Margalit(1)

Affiliations: (1) Hadassah-Hebrew University Braun School of Public Health, Jerusalem, Israel; (2) Hadassah-Hebrew University Medical Centers, Jerusalem, Israel

Text:

Background and aims: There is a concern regarding the possible adverse effects of intrauterine exposure to organophosphate pesticides (Ops). We aimed to estimate the OPs exposure among pregnant women from Jerusalem and to estimate the association of such exposures with birth outcomes.

Methods: A cohort study of women in early pregnancy (11-18 weeks of gestation). Data collection includes an interview and a maternal urine sample upon recruitment, amniotic fluid and a second urine samples during follow-up visits, and a postpartum interview, an examination of the offspring, including the Ballard Maturational Assessment (BMA), and a urine sample of the offspring. Samples were analyzed at the Friedrich Alexander University, Germany for OP dialkyl-phosphate (DAPs) metabolites.

Results: So far, 339 pregnant women were recruited, of whom 212 reached term, and 173 neonates were examined (53.6% males). Six OPs metabolites were analyzed for 73 mothers and 49 newborns. Median maternal urinary concentration of OPs metabolites of Σ DAPs (sum of 6 nonspecific dialkyl phosphate metabolites) was 0.232 micromol/L with 54-100% of the samples above the limit of quantification (LOQ) in 5 metabolites. Median newborn Σ DAPs exposure was 0.055 micromol/L with 53-98% of samples >LOQ. Σ DAPs levels, both in maternal and neonatal urine, were positively associated with head circumference, gestational age and birth weight, whereas a U-shape association was evident between maternal DAPs and BMA.

Conclusions: Our study demonstrates high levels of intrauterine exposure to OPs in Jerusalem. The positive association between OPs and fetal measurements may be confounded by socioeconomic status and high consumption of fruits.

Abstract ID: 103

Title: Particulate air pollution is associated with increased inflammatory and allergic symptoms in 14-15 year-old adolescents

Presenting Author: Lambrechts, N

Authors: Lambrechts, Nathalie (1); Govarts, Eva (1); Den Hond, Elly (1); Franken, Carmen (1, 2); Den Hond, Elly (1); Nelen, Vera (3), Loots, Ilse (2); Baeyens, Willy (4); Sioen, Isabelle (5); Nawrot, Tim (6); Bruckers, Liesbeth (6); Schoeters, Greet (1, 2, 7)

Affiliations: (1) VITO, Mol, Belgium; (2) Antwerp University, Belgium; (3) Provincial Institute of Hygiene, Antwerp, Belgium; (4) Vrije Universiteit Brussel (VUB), Brussels, Belgium; (5) Ghent University, Belgium; (6) Hasselt University, Belgium; (7) University of Southern Denmark, Odense, Denmark

Text:

Background and aims: The northern part of Belgium (Flanders) has among the highest annual concentrations of air pollutants (PM₁₀ and PM_{2.5}) in Europe. This can mainly be attributed to Western civilization hallmarks such as dense traffic and urbanization. At the same time, the prevalence of allergic sensitization in children and adolescents keeps on rising.

Methods: Six hundred adolescents were recruited as part of the Flemish Environmental Health Surveillance program (FLEHS3). It was hypothesized that exposure to particulate matter (PM) was associated with respiratory and allergic symptoms and related biological markers. Individual exposure to PM_{2.5} and PM₁₀ at the home address was estimated based on an interpolation model and the monitored immission levels. pH of exhaled breath and exhaled nitric oxide (eNO) was measured in 408 participants to monitor inflammation of the airways. Urinary 8-hydroxy-deoxyguanosine (8-OHdG) concentration was determined as a measure of systemic oxidative stress. Data on symptoms of asthma, hay fever, eczema and respiratory infections were self-reported by standardized questionnaires. The change in effect for an exposure increase of P₂₅ to P₇₅ was calculated by multiple linear or logistic regression models. All models were adjusted for gender, age, smoking status, familial allergy and a priori defined covariates.

Results: Multiple regression analysis showed 1.5% acidification of breath (95% CI=0.1-3.0%) with an increase of PM₁₀ exposure. The urinary concentration of 8-OHdG increased 1.065 times (95% CI=1.007-1.126) when PM_{2.5} changed. In addition, augmenting exposures to PM₁₀ as well as PM_{2.5} were associated with more frequent reporting of allergies to household and personal care products (PM₁₀: OR=1.665, 95% CI: 1.182-2.344; PM_{2.5}: OR=1.834, 95% CI: 1.240-2.714), as well as allergies to pets (PM₁₀: OR=1.952, 95% CI=1.284-2.967; PM_{2.5}: OR=1.875, 95% CI=1.202-2.923). No significant associations were established between air pollutants and eNO. Prevalence of hay fever, eczema, asthma nor infections were associated with PM exposure.

Conclusions: The associated increase of inflammatory and allergic symptoms with increasing PM levels at the home location of adolescents confirms that the immune system is a target organ for particulate air pollutants. The studies of the Flemish Center of Expertise on Environment and Health were commissioned, financed and steered by the Ministry of the Flemish Community (Department of Economics, Science and Innovation; Flemish Agency for Care and Health; and Department of Environment, Nature and Energy).

Abstract ID: 104

Title: The impact of ambient air pollution on the human blood exposome

Presenting Author: Vlaanderen, J

Authors: Vlaanderen, J.J. (1), Janssen, N.A. (2), Hoek, G. (1), Barupal, D.K. (3), Cassee, F.R. (1,2), Gosens, I. (2), Strak, M. (1), Steenhof, M. (1), Brunekreef, B. (1), Scalbert, A. (3), Vermeulen, R.C.H. (1)

Affiliations: (1) Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, The Netherlands; (2) National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands; (3) International Agency for Research on Cancer, Lyon, France

Text:

Background and aims: Early biological perturbations due to exposure to ambient air pollution might be reflected in the composition of the set of compounds present in blood originating from air pollution components and their metabolites (defined here as the blood exposome).

Methods: In a semi-experimental study design we exposed 31 healthy young adults at 4 different locations to varying levels of air pollution. These volunteers were exposed to ambient air pollution for 5 hours, at sites with varying emission source profiles, under standardized conditions to control for physical activity and dietary intake. On site, we measured a range of air pollution components including particulate matter (PM) mass, particle number concentration, ozone, and nitrogen oxides. We collected blood from the participants before, and 2 and 18 hours after the 5 hour exposure period. We employed untargeted metabolite profiling using an ultra-high pressure liquid chromatography coupled to time of flight mass spectrometry to assess levels of up to 7000 compounds in 361 blood samples. We assessed the association between air pollution component concentrations and changes in the composition of the blood exposome.

Results: We observed a perturbation of the blood exposome both 2 and 18 hours after exposure. The number of associations between air pollutants and blood metabolic features was higher 18 hours after exposure (n=1548) than 2 hours after exposure (n=457). We are currently in the process of annotating a subset of the most robustly associated metabolic features.

Conclusions: Our study provides some indication for an association between particulate components of ambient air pollution and an acute perturbation of the blood exposome. Strengths of our study are a semi-experimental design in which associations between air pollution and acute health effects have previously been demonstrated, repeated collection of blood samples, and use of a high resolution mass spectrometer for metabolite profiling.

Abstract ID: 105

Title: Chronic exposure to traffic-related air pollution and long-term incidence of cancer after myocardial infarction

Presenting Author: Cohen, G

Authors: Cohen, Gali (1); Levy, Ilan (2); Broday, David M. (2); Kark, Jeremy D. (3); Levin, Noam (4) Steinberg, David M. (5); Yuval (2); Gerber, Yariv (1)

Affiliations: (1) Dept. of Epidemiology and Preventive Medicine, School of Public Health, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel (2) Technion Center of Excellence in Exposure Science and Environmental Health, Technion Israel Institute of Technology, Israel (3) Epidemiology Unit, Braun School of Public Health and Community Medicine, Hebrew University and Hadassah Medical Organization, Jerusalem, Israel (4) Dept. of Geography, Hebrew University of Jerusalem, Israel (5) Dept. of Statistics and Operations Research, School of Mathematical Sciences, Raymond and Beverly Sackler Faculty of Exact Sciences, Tel Aviv University, Tel Aviv, Israel

Text:

Background and aims: Previous studies have demonstrated associations between long-term exposure to traffic-related air pollution and risk of cancer, particularly lung cancer, and recently bladder and kidney cancers. Higher cancer incidence rates in survivors of myocardial infarction (MI) compared with the general population were recently observed. We examined the association between chronic exposure to nitrogen oxides (NO_x) and cancer incidence in a cohort of MI patients.

Methods: Patients aged ≤65 years admitted to hospital in central Israel with first MI in 1992-1993 were followed through 2013 for cancer via the National Cancer Registry. Data on socio-demographic and cancer risk factors were obtained, including smoking measured at baseline and 4 times during follow-up. Using land-use regression models, annual averages of NO_x during follow-up were estimated individually, according to geocoded home addresses, recorded at baseline and confirmed after five years. Cox models were used to study the relationship between NO_x and cancer, accounting for changes in patients' addresses and cigarette consumption by treating NO_x and smoking as time-dependent variables.

Results: Mean (SD) NO_x exposure during follow-up was 24 (11) ppb (range 9-84). Among 1393 cancer-free patients at baseline (mean age, 54 years; 81% men), 262 developed cancer during a median follow-up of 18 years, of which 70 (27%) were lung, bladder or kidney cancers. The age-adjusted hazard ratio (HR) for cancer was 1.07 (95% CI: 0.97-1.18) per 10-ppb increase in NO_x. Further adjustment for socio-demographic and clinical characteristics (including smoking) yielded an HR of 1.06 (95% CI 0.95-1.17). The association between NO_x and incidence of lung, kidney or bladder cancers was slightly stronger (age-adjusted HR=1.20, 95% CI: 1.01-1.42; multivariable-adjusted HR=1.12, 95%CI: 0.94-1.33).

Conclusions: Chronic residential exposure to NO_x may constitute an environmental risk factor for cancer incidence among MI survivors. Variation in the strength of association between specific cancers needs to be further explored.

Abstract ID: 106

Title: Heat and cold attributable deaths in 16 Italian cities in the period 2001-2010

Presenting Author: Scortichini, M

Authors: Scortichini Matteo (1), Leone Michela (1), de'Donato Francesca K (1); Manuela De Sario (1), Antonio Gasparrini (2), Paola Michelozzi (1)

Affiliations: (1) Department of Epidemiology, Lazio Regional Health Service, (2) London School of Hygiene and Tropical Medicine, UK

Text:

Background and aims: Within the Italian national heat prevention program a time series study was carried out to estimate the geographical heterogeneity in the impact of heat and cold on mortality in 16 Italian cities.

Methods: Poisson distributed lag non-linear models were used to estimate cause-specific relative Risks (RR) associated with heat and cold exposure among the population aged 35 and over. Attributable risk fractions and the total number of natural deaths were calculated. A sensitivity analysis was conducted on 9 subgroups of causes.

Results: The study shows a significant attributable fraction of deaths in most cities for both heat and cold with a geographical heterogeneity in the impact. The effects above the threshold of heat range between 8.1% in Florence and 1.4% in Palermo, while in winter the impact is greater with attributable fractions comprised between 19% in Genova and 2.4% in Bari. Conversely, for extreme events the number of heat attributable deaths are greater than those for cold, with an average fraction of 1.2% attributed to temperatures over the 97.5th percentile (ranging from 2.3% in Bari to 0.4% in Padova), compared with a 0.8% attributed to temperatures under the 2.5th percentile (2.0% in Trieste, 0.3% in Cagliari). No consistent north-south geographical gradient was observed.

Conclusions: Heat and cold have an impact on mortality, not only for extreme temperatures, but also moderate exposures. Results show a high heterogeneity between cities in Italy that can be explained by differences in local climate and population characteristics and susceptibility patterns.

Abstract ID: 107

Title: Frequency of Occupational Diseases and Work Accidents of Military Medical Students And Evaluation of Protective Practices Against Occupational Risks During Medical Education

Presenting Author: Babayigit, M

Authors: Babayigit, Mustafa Alparslan (1); Ilhan, Mustafa Necmi (2), Oysul, Guven (1)

Affiliations: (1) Gülhane Military Medical Academy, Department of Public Health, Ankara, Turkey; (2) Gazi University Medical School, Department of Public Health, Ankara, Turkey

Text:

Background and aims: In this study, it was aimed to investigate frequency of occupational disease and work accidents of military medical undergraduate students regarding occupational risks.

Methods: In this cross-sectional study, all the medical students studying at Gulhane Military Medical Faculty consisted of the study population (N = 754). Open and closed-ended questionnaire consisting of 20 questions was performed to the students between the 27th of March and the 11th of April, 2014.

Results: Mean age of the medical students, was 21.5 ± 1.84 years with a participation rate of 82.4%. Of all the students, 95.0% have not been caught any occupational disease so far, while stating that the risk of developing an occupational disease among the 6th grade students was 8.80 times greater than the First Class students (OR = 8.80, 95% CI 2.70 to 28.63). The 76.7% of students (473 students) stated that they had not have any work accident, until now. The risk of having a work accident were 1.78 times more likely (OR = 1.78, 95% CI 0.92 to 3.32) in class 6 students than first class students. Of all participants, 29.7% (183 people), had been vaccinated at least one shot since the start of training in the Faculty of Medicine, where 19.6% of students of preclinical period, 46.9% of students of clinical period were found to be vaccinated. Class 5 and 6 students had been vaccinated 92 times, and 63 times more likely than the first class students, respectively [OR = 92.66, 95% CI (26.70 to 321.59), OR = 63.01, 95% CI (17.96 to 221.01)]. The incidence of being vaccinated and having a work accident had a statistically significant differences between classes ($p < 0.001$).

Conclusions: Medical students' knowledge and awareness toward occupational health and safety should be enhanced, and low immunization status among students should be improved. Training and practices of health and safety in the medical school, especially in the hospital region which have a high level of risk of work-related accidents and occupational diseases, should be increased and the safety culture should be improved.

Abstract ID: 108

Title: Determination Of Some Physical Threats In Indoor Area Of An Outpatient Clinic Of A Tertiary Level Military Hospital

Presenting Author: Babayigit, M

Authors: Babayigit, Mustafa Alparslan (1); Ogur Recai (1)

Affiliations: (1) Gülhane Military Medical Academy, Department of Public Health, Ankara, Turkey

Text:

Background and aims: Improving staff/patient health and safety through environmental measures to reduce staff stress/fatigue, increase effectiveness in delivering care, and improve overall healthcare quality should be a priority of modern hospital perception. In this study, it's aimed to determine the levels of some environmental exposures (noise, illumination and electromagnetic field) to increase awareness against environmental risk factors among health workers.

Methods: In this descriptive study, noise, illumination, and electromagnetic field (EMF) levels were detected 28 different locations in the polyclinic area of a 1200-bed University Hospital in a weekday of October, 2013. A light meter (Extech EA31®, USA), a gaussmeter (FW Bell 4100 ELF Gauss/Tesla Meter®, USA), and a sound level meter (Extech 407780®, USA) instrument were used for the measurements.

Results: In this study, the average number of person, and some physical threats such as noise, illumination and EMF in waiting areas of services, social areas, and toilets have been presented. The average mean of noise and EMF levels were found to be statistically significant among location of measurements ($p < 0.05$). Noise levels were the highest in the social areas. Even though higher number of person were in the waiting areas, it was unexpectedly found that noise levels were the lowest in the radiology service. However, EMF levels were higher in the radiology service waiting areas, as expectedly ($p < 0.05$).

Conclusions: To increase staff effectiveness, reduce errors, and increase staff and patient satisfaction, designing better workplaces and regularly quality controls in terms of physical environment should be maintained in hospitals.

Abstract ID: 109

Title: Variation in heat-related attributable deaths in nine European cities before (1996-2002) and after (2004-2010) the 2003 heat wave

Presenting Author: de'Donato F

Authors: de'Donato Francesca K. (1); Scortichini Matteo (1), Leone Michela (1), Manuela De Sario (1), Antonis Analitis (2), Ballester Ferran (3), Basagana Xavier (4), Forsberg Bertil (5), Antonio Gasparrini (6), Lanki Timo (7), Anna Paldy (8), Mathilde Pascal (9), Paola Michelozzi (1)

Affiliations: (1) Department of Epidemiology, Lazio Regional Health Service, (2) Department of Hygiene and Epidemiology, Medical School, University of Athens, Greece, (3) Environmental Health Unit, Centro superior de investigacion en salud publica, Valencia (4) Centre for Research in Environmental Epidemiology -CREAL (5) Department of Environmental Health, Umea University, (6) London School of Hygiene and Tropical Medicine, Uk (7) Unit of Environmental Epidemiology, National Public Health Institute, Finland (8) Jozsef Fodor National Center of Public Health, National Institute of Environmental Health, Hungary (9) Department of Environmental Health (DSE), Institute de Veille Sanitaire, France

Text:

Background and aims: One of the aims of the EU-funded PHASE project was to evaluate the impact of heat prevention and adaptation programs by measuring changes in the number of deaths attributable to heat in 9 European cities (Athens, Barcelona, Budapest, Helsinki, Paris, London, Rome, Stockholm, Valencia) considering two periods, 1996-2002 and 2004-2010, before and after 2003. This year was chosen as cut point as population awareness to heat-related risks increased and many countries across Europe introduced heat prevention plans after this extreme event.

Methods: Poisson distributed lag non-linear models were used to estimate cause- and age-specific relative risks (RR) associated with heat exposure comparing 99th percentile vs. 75th percentile of mean summer temperatures. Relative risks and attributable risk fractions were compared in the two periods.

Results: A reduction in the attributable risk fraction was observed only in Athens, Paris and Rome with a significant number of lives saved, respectively of 992, 688 and 601 in each city the period 2004-2010. In London a slight decrease in the impact was shown, although not significant. In Barcelona, in the second period a shift in the turning point of the curve was observed suggesting the population has adapted to high temperatures and the effect was associated only to more extreme conditions. Also interesting to note that excess deaths attributable to heat were observed in Helsinki and Budapest in the second period. This is possibly due to an increase in temperatures in the recent years exposing local populations to conditions not observed before.

Conclusions: Considering future climate change, heat prevention plans need to be implemented across Europe even in areas less affected by heat. Where already in place, plans need to be evaluated and temporal variations in the impact and in susceptible subgroups characteristics need to be monitored to ensure prevention measures target subjects most at risk.

Abstract ID: 110

Title: Altered neonatal cord blood lipidome in association with exposure to particulate matter in the early life environment

Presenting Author: Martens, D

Authors: Martens, Dries.S. (1); Gouveia-Figueira, Sandra (2); Madhloum, Narjes (1); Janssen, Bram G. (1); Plusquin, Michelle (1); Forsberg, Bertil (3); Nording, Malin L. (2); Nawrot, Tim S. (1,4)

Affiliations: (1) Centre for Environmental Sciences, Hasselt University, Diepenbeek, Belgium; (2) Department of Chemistry, Umeå University, Umeå, Sweden (3) Division of Occupational and Environmental Medicine, Umeå University, Umeå, Sweden (4) Department of Public Health & Primary Care, University of Leuven, Leuven, Belgium

Text:

Background and aims: The period of in utero life is a critical window programming diseases later in life. We studied oxylipin profiles as part of the lipidome in early life as potential relevant pathways to later life disease.

Methods: Oxylipins were extracted by SPE (solid phase extraction) from 197 cord blood plasma samples (750 µl) from the ENVIRONAGE (ENVIRonmental influence ON AGEing in early life) birth cohort in Belgium. Thirty-seven specific oxylipins reflecting the cyclooxygenase (COX), lipoyxygenase (5-LOX and 12/15-LOX) and cytochrome P450 (CYP) metabolic pathways were quantified by ultra-performance liquid chromatography coupled to electrospray ionization tandem mass spectrometry (UPLC-ESI-MS/MS). Principal component analysis and multiple regression models were applied to associate oxylipin pathways as well as individual metabolites with in utero PM_{2.5} exposure, while adjusting for newborns gender, gestational duration, maternal age, maternal smoking status, maternal BMI, and cord blood total cholesterol and HDL levels.

Results: PM_{2.5} exposure during pregnancy averaged (25th-75th percentile) 15.7 (13.5-17.5) µg/m³. Six metabolites combined in a principal component (PC), representing the 5-LOX pathway was positively associated with PM_{2.5} exposure during the entire ($\beta = 0.11$; 95% CI: 0.03, 0.20; $p = 0.01$) and second trimester of pregnancy ($\beta = 0.06$; 95% CI: 0.01, 0.10; $p = 0.01$). Eleven metabolites combined in a PC representing the 12/15-LOX pathway was positively associated with PM_{2.5} during the second trimester of pregnancy ($\beta = 0.09$; 95% CI: 0.03, 0.15; $p = 0.006$). No associations were found for the COX and CYP pathways.

Conclusions: In utero exposure to particulate matter was associated with the lipoyxygenase pathways (5-LOX and 15-LOX) in newborns. These changes at the level of the lipidome indicate an altered inflammatory state of the newborn at birth induced by air pollution.

Abstract ID: 111

Title: The GERoNiMO XMobiSense survey: measuring mobile device usage in Europe

Presenting Author: van Wel, L

Authors: van Wel, Luuk (1), de Llobet Viladoms, Patricia (2,3,4), Huss, Anke (1), Rösli, Martin (5), Foerster, Milena (5), Wiart, Joe (6), Sarrebourg, Thierry (6), Cardis, Elisabeth (2,3,4), Vermeulen, Roel (1), on behalf of the GERoNiMO consortium

Affiliations: (1) Institute for Risk Assessment Sciences (IRAS), Utrecht University, Utrecht, the Netherlands (2) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain (3) Universitat Pompeu Fabra (UPF), Barcelona, Spain (4) CIBER Epidemiología y Salud Pública (CIBERESP), Madrid, Spain (5) Swiss Tropical and Public Health Institute, University of Basel, Switzerland (6) Orange, France

Text:

Background and aims: The use of mobile phones for calls results in absorption of radiofrequency electromagnetic fields (RF-EMF) energy in the brain of the caller as the device is usually held close to the head. Other uses (e.g. internet, games, music, texting, speaker phone) result in different levels of exposure to different organs in the body depending on the distance and relative position of the phone to the head and body. The way we use our mobile phones has markedly changed with the development of new technologies and changes in communication systems (i.e. 3G, 4G). Current information on usage patterns and levels of mobile phone use, which is needed to estimate RF-EMF exposure levels in the population, is scarce.

Within GERoNiMO, an EC funded project aimed at investigating potential health risk of EMF, a survey using the XMobiSense app installed on smartphones and tablets is being conducted to obtain information on patterns and levels of mobile phone and tablet use in the general population in selected European countries.

Methods: Participants can install XMobiSense via a dedicated website which contains information on the project and the application. At the time of installation, participants must agree to the privacy policy and answer a few key questions on their main demographic characteristics. Once installed, no further interaction from the participant is required as data is automatically uploaded, anonymously, to the study servers.

Results: The ultimate goal is to recruit 5000 participants in participating countries.

Conclusions: Preliminary data of the survey will be presented at the conference.

Abstract ID: 112

Title: Exposure to radiofrequency electromagnetic fields in schools in Amsterdam

Presenting Author: van Wel, L

Authors: van Wel, Luuk (1), van Eijdsden, Manon (2), Vermeulen, Roel (1), Vrijkotte, Tanja (3), Monica Guxens (4), Rob van Strien (2), Kromhout, Hans (1), Huss, Anke (1)

Affiliations: (1) Institute for Risk Assessment Sciences (IRAS), Utrecht University, Utrecht, the Netherlands (2) Department of Epidemiology and Health Promotion, Public Health Services of Amsterdam (GGD) (3) Department of Public Health, Academic Medical Center (AMC), Amsterdam, the Netherlands, (4) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain

Text:

Background and aims: Concern has risen regarding potential health effects of children's exposure to radiofrequency electromagnetic fields (RF-EMF). There is limited knowledge of children's indoor exposure to RF-EMF. As children spend a large proportion of their time in schools, assessing children's exposure in schools will contribute to a more accurate exposure assessment of children.

Methods: Primary schools in the Amsterdam area, involved in the ABCD-study, were visited between July 2011 and July 2012. In each school, two classrooms were selected in which spot measurements were taken with an exposure meter able to measure 14 different frequency bands. Spot measurements were combined to obtain average power density levels for each classroom on the 14 frequency bands as well as total average power density.

Results: Spot measurements were performed in 101 primary schools in the Amsterdam area, corresponding to 48% of all primary schools in the municipality. A total of 203 classrooms were measured. Total average power density was 0.085 mW m⁻¹, of which less than one third could be attributed to indoor RF-EMF sources: Median DECT (cordless phone signals) contribution is 6% (IQR 1 – 23), median WiFi 9% (IQR 4 – 15). Total downlink from (outdoor) mobile phone base stations accounted for median 19% (IQR 4 – 52) of average total power density.

Conclusions: Average power density in primary schools in the Amsterdam area were low. Main contributors to total power density were DECT phones and downlink signals from mobile phone base stations.

Abstract ID: 113

Title: Salivary extracellular fraction of miRNA candidates in association with exposure to ultrafine particles in school children.

Presenting Author: Vriens, A

Authors: Annette Vriens* (1), Tim S. Nawrot (1,2) , Nelly Saenen (1), Michal Kicinski (1), Eline Provost (1,3), Karen Vrijens (1), Patrick De Boever (1,3), Michelle Plusquin (1,4)

Affiliations: (1) Environmental Biology, Centre for Environmental Sciences, Hasselt University, Diepenbeek, Belgium (2) Department of Public Health, Leuven University, Leuven, Belgium (3) Environmental Risk and Health, Flemish Institute for Technological Research (VITO), Mol, Belgium (4) MRC/PHE Centre for Environment and Health, School of Public Health, Imperial College, London, UK

Text:

Background and aims: Intercellular communication via miRNAs in extracellular vesicles (EV) contributes to pathophysiological processes. miR-222 functions in cell cycle and vascular biology, whereas miR-146a is important in inflammation. In this study, we investigate the association of these miRNA candidates in salivary EVs and acute changes in small particulates in 8-12 years old children.

Methods: Saliva was collected and stabilized for RNA preservation from 90 children at two different time points, circa 11 weeks apart. EVs in saliva were obtained by means of differential centrifugation and ultracentrifugation. The expression levels of miR-222 and miR-146a were profiled by qPCR. We regressed on the EV miRNA expression and recent exposure to ultrafine and fine particulates measured at the school site by use of mixed models, while accounting possible confounders such as gender, age, BMI, passive smoking, maternal education, hours of television use, time of the day and day of the week.

Results: Recent exposure to UFP was associated with an increase in miR-222 expression in EV in saliva. An IQR increase in indoor UFP concentration is associated with a 24.96% increase (95% CI: 7.15% - 42.77%; $p=0.0091$) in EV miR-222 levels. Similarly, an IQR increase in outdoor UFP concentration is associated with a 30.87% increase (95% CI: 11.69% - 50.05%; $p=0.0022$) in miR-222 expression in salivary EV. However, recent exposure to larger particles (PM_{2.5}) was not found to induce changes in miR-222 or miR-146a expression in salivary vesicles.

Conclusions: Children attending school on days with higher ambient concentrations of ultrafine particulates (diameter smaller than 300 nm) had higher expression in saliva of miRNA-222 in extracellular vesicles. This rapid response was independent of exposure to larger particulates, suggesting that UFP exposure is particularly relevant in the process of rapid adaptations of EV miRNA's. This implies that UFP exposure might influence cell-cell communication.

Abstract ID: 114

Title: Sex-specific placental epigenetic changes of early neurodevelopment genes and particulate matter air pollution exposure

Presenting Author: Saenen, N

Authors: Nelly D. Saenen (1), Bram G. Janssen (1), Karen Vrijens (1), Harry A. Roels (1,7), Wim Vanden Berghe (2), Wilfried Gyselaers (3,4), Charlotte Vanpoucke (5), Patrick De Boever (1,6), Tim S. Nawrot (1,8)

Affiliations: (1) Centre for Environmental Sciences, Hasselt University, Diepenbeek, Belgium; (2) Department of Biomedical Sciences, PPES Epigenetic Signaling Lab, University of Antwerp, Wilrijk, Belgium; (3) Biomedical Research Institute, Hasselt University, Diepenbeek, Belgium; (4) Department of Obstetrics, East-Limburg Hospital, Genk, Belgium; (5) Belgian Interregional Environment Agency, Brussels, Belgium; (6) Unit Environmental Risk & Health, Flemish Institute for Technological Research (VITO), Mol, Belgium; (7) Louvain Centre for Toxicology and Applied Pharmacology (LTAP), Université catholique de Louvain, Brussels, Belgium; (8) Department of Public Health & Primary care, Leuven University (KU Leuven), Leuven, Belgium.

Text:

Background and aims: Exposure to particulate matter (PM) air pollution during pregnancy may affect human fetal development. Epigenetic mechanisms are believed to play an essential role in the developmental changes during early life. Within the ENVIRONAGE birth cohort, we investigated whether in utero exposure to PM is associated with differences in placental DNA methylation of genes involved in early neurodevelopment, i.e., Brain-Derived Neurotrophic Factor (BDNF), Leptin (LEP) and 5-Hydroxytryptamine (serotonin) receptor 2A (HTR2A).

Methods: Using highly quantitative bisulfite-PCR pyrosequencing, DNA promoter methylation was assessed in placental tissue of 385 newborns from the ENVIRONAGE birth cohort. Daily PM_{2.5} exposure levels were estimated for each participant's home address using a spatiotemporal interpolation model in combination with a dispersion model. We fitted mixed-effect models, stratified for newborn's sex, to evaluate the associations between DNA promoter methylation of the selected genes and PM_{2.5} exposure during pregnancy.

Results: Methylation of placental BDNF and HTR2A in male infants raised respectively by 0.46% ($p = 0.02$) and 4.8% ($p = 0.02$) for an interquartile range increment in PM_{2.5} during the second trimester of pregnancy. These associations were independent of maternal age, maternal education, maternal smoking status, gestational age, CpG site, first trimester temperature, and season at birth. No associations were observed between PM_{2.5} exposure and placental LEP methylation. In girls no significant associations were noted.

Conclusions: Placental promoter methylation of BDNF and HTR2A, two genes implicated in early neurodevelopmental trajectories, are influenced by in utero exposure to PM_{2.5} in a sex-specific way. Future studies should elucidate the significance of the sex-specific PM_{2.5} impact on placental promoter methylation with respect to neurodevelopment later in life.

Abstract ID: 115

Title: Placental nitrosative stress and in utero exposure to particulate matter

Presenting Author: Saenen, N

Authors: Nelly D. Saenen (1), Karen Vrijens (1), Bram G. Janssen (1), Narjes Madhloum (1), Martien Peusens (1), Wilfried Gyselaers (2,3), Charlotte Vanpoucke (4), Wouter Lefebvre (5), Harry A. Roels (1,6), Tim S. Nawrot (1,7)

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Text:

Background and aims: A wide variety of adverse health effects on both fetuses and neonates have been ascribed to particulate matter (PM) air pollution. Recent evidence suggests that PM exposure results in increased oxidative and nitrosative stress. In the ENVIRONAGE birth cohort, we investigated the association of placental 3-nitrotyrosine (3-NT) with PM exposure during various time windows of pregnancy.

Methods: 3-NT levels were measured in 341 placental tissue samples, selected from the ENVIRONAGE birth cohort, using a competitive ELISA. Daily PM₁₀ and PM_{2.5} exposure levels ($\mu\text{g}/\text{m}^3$) were interpolated for each mother's residential address using a spatiotemporal interpolation method in combination with a dispersion model. Multiple linear regression models were used to assess the association between 3-NT and PM exposure for different pregnancy windows.

Results: The placental 3-NT level, adjusted for gender, gestational age, maternal age, pre-gestational BMI, smoking status, and warm or cold period at delivery, raised with 31.0% ($p = 0.0008$) for an interquartile range increment in whole pregnancy PM_{2.5} exposure. The association was driven by PM_{2.5} exposure during the first trimester (25.7%, $p = 0.01$) and second trimester (37.0%, $p = 0.003$) of pregnancy.

Conclusions: We observed a positive association between 3-NT levels in the placenta and PM_{2.5} exposure during whole pregnancy. Our findings, which are in line with experimental evidence on cigarette smoke and diesel exhaust exposure, indicate the influence of PM exposure during pregnancy on placental oxidative stress. The impact of placental 3-NT with regard to PM exposure on newborn's health needs further elucidation.

Abstract ID: 116

Title: Genotoxicity and oxidative DNA damaging effects induced by phthalates in 14-15 year-old Flemish adolescents

Presenting Author: Franken, C

Authors: Franken, Carmen (1,2), Lambrechts, Nathalie (1), Govarts, Eva (1), Koppen, Gudrun (1), Den Hond, Elly (1), Voorspoels, Stefan (1), Bruckers, Liesbeth (3), Loots, Ilse (4), Nelen, Vera (5), Sioen, Isabelle (6), Nawrot, Tim (7), Baeyens, Willy (8), van Larebeke, Nicolas (8,9) and Schoeters, Greet (1,2,10)

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Text:

Background and aims: Phthalates are used as plasticizers and solvents in a variety of consumer products. Mechanistic studies have shown that specific phthalates have anti-androgenic endocrine effects and that they induce oxidative stress by release of ROS and/or impairing antioxidant defenses. Our study focused on adolescents as a vulnerable population due to increased use of personal care products during puberty.

Methods: In the Flemish Environment and Health Studies (FLEHSII, 2007-2011; FLEHSIII, 2012-2016), we analyzed the presence of phthalate metabolites in urine samples of 14-15 years old adolescents (FLEHSII: n=210; FLEHSIII: n=208) and tested whether the levels were associated with oxidative stress and DNA damage. Individual exposure to phthalates was estimated by measuring phthalate metabolites in urine: MEHP, MEHHP, MEOHP, MnBP, MBzP, MiBP and MEP. MEHP, MEHHP and MEOHP were summed as they originate from the same parent compound DEHP. DNA damage was measured using the (fpg-modified) comet assay and the micronucleus test in whole blood, and by 8-OHdG in urine. Multiple linear regression models were used to estimate the change of effect for an increase of the exposure from P25 to P75. All models were adjusted for gender, age, smoking status and statistically significant ($p < 0.05$) covariates.

Results: All phthalate metabolites were detectable in Flemish youngsters and the average values were in agreement with concentrations found in different international studies. In the FLEHSII study, multiple regression analysis showed significant positive associations of MBP, MBzP and DEHP with DNA breaks measured by the (fpg-modified) comet assay (OR (95%CI): MBP: 1.01(1.00-1.01); MBzP: 1.02(1.00-1.04); DEHP: 1.09(1.03-1.15)). Urinary MBP levels were positively associated with concentrations of 8-OHdG (OR (95%CI): 1.01(1.01-1.02)). Augmenting exposures to phthalates were associated with higher concentrations of 8-OHdG in urine in the adolescents of FLEHSIII (OR (95%CI): DEHP: 1.21(1.11-1.32); MnBP: 1.22(1.12-1.34); MBzP: 1.18(1.06-1.31); MEP: 1.12(1.03-1.23); MiBP: 1.19(1.04-1.29)). No statistically significant associations were found with the micronucleus test.

Conclusions: In conclusion, increased exposure to phthalates, is associated with higher levels of oxidative stress related DNA damage at current exposure levels in adolescents recruited from the general population of Flanders. This confirms the hypotheses that oxidative stress is a critical mechanism for phthalate action.

Acknowledgments: The studies of the Flemish Center of Expertise on Environment and Health were commissioned, financed and steered by the Ministry of the Flemish Community (Department of Economics, Science and Innovation; Flemish Agency for Care and Health; and Department of Environment, Nature and Energy).

Abbreviations: ROS: reactive oxygen species; MEHP: mono(2-ethylhexyl) phthalate; MEHHP: mono(2-ethyl-5-hydroxyhexyl) phthalate; MEOHP: mono(2-ethyl-5-oxohexyl) phthalate; MnBP: mono-n-butyl phthalate; MBzP: monobenzyl phthalate; MiBP: mono-isobutyl phthalate; MEP: mono-ethyl phthalate; DEHP: di(2-ethylhexyl) phthalate; Fpg: formamidopyrimidine DNA glycosylase; ELISA: enzyme-linked immunosorbent assay; 8-OHdG: 8-hydroxy-2-deoxyguanosine.

Abstract ID: 117

Title: Sensor Data Analysis for Environmental Exposure Assessment

Presenting Author: Chapizanis, D

Authors: Dimosthenis Sarigiannis (1); Dimitrios Chapizanis (1); Periklis Kontoroupis (1,2); Spyros Karakitsios (1,2).

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Text:

Background and aims: The downsizing of monitoring technologies and costs make it possible for various environmental stressors and exposure factors to be measured more easily and frequently, thus providing a more reliable "time-geography of exposure" shifting the current paradigm from a population to an individual level. This study examines the feasibility of using a series of sensors for tracking personal location and activities and assessing exposure at a personal level.

Methods: A trial multi-sensor campaign took place in Thessaloniki, examining the use of the Moves app and commercially available fitness monitors, such as the FitBit Flex, for tracking people's location and activities. Four participants wore these devices along with a GPS sensor and an accelerometer for a week. Location, motion and intensity of activity data were used as input to an Artificial Neural Network (ANN) model, aiming at deriving a time-activity model based solely on sensor data as a more precise substitute to cumbersome time logs. Using a Monte Carlo analysis, distributions of participants' movement and activities were extrapolated to a larger population. Furthermore, using a geographically explicit agent-based model (ABM), the trajectory of individual participants, "agents", was modelled and projected on a geo-referenced layer and finally superposed onto high spatial resolution urban air quality modelled maps of hourly concentration of PM in Thessaloniki. Taking into account the results of the ABM the intensity and, thus, relative inhalation rate corresponding to the individuals' activities were estimated.

Results: Personal exposure, expressed as inhalation-adjusted exposure to air pollutants was then evaluated by assigning pollutant concentrations to an agent based on his/her coordinates, activities and the corresponding inhalation rate. PM levels and size distribution varied among different parts of the urban agglomeration and hours of the day, as well as among different seasons. On average, personal exposure results were between 10 and 20% more accurate than the equivalent estimate using ambient air concentration of PM as exposure proxy. Moreover, our approach permitted the identification of exposure peaks and troughs and, consequently, allowed the derivation of useful Conclusions regarding capping exposure to high pollution levels.

Conclusions: Data collected by "smart" devices can help provide more accurate exposure assessment for exposure simulation modelling and epidemiology studies. An improvement of environmental exposure assessment, extending it to intake dose, would allow us to draw better Conclusions on the association between environment and health at the population level. The dynamic nature of intake dose assessment at the individual level allows for the derivation of guidance regarding behavioral options that limit exposure to high pollution levels.

Abstract ID: 118

Title: Predicting location using ANN, based on sensors data

Presenting Author: Chapizanis, D

Authors: D. Sarigiannis (1); D. Chapizanis (1); S. Karakitsios (1); A. Pronk (2); E. Kuijpers (2); R. Boessen (2); T. Maggos (3); M. Stametelopoulou (3); J. Bartzis (4); Z. Spiric (5); C. Schieberle (6); M. Loh (7); J. Cherrie (7).

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Text:

Background and aims: The spread of smartphone applications and fitness monitors provides less expensive Methods for tracking time-location-activity data, which is a critical source of information for modelling personal exposure. The present study examines the potential use of smart consumer products data for predicting location status.

Methods: A trial campaign of instrument reliability took place examining a series of monitors, such as the FitBit Flex and Moves app, for tracking people's location and activities. Four participants in the city of Thessaloniki wore these devices along with a wearable temperature sensor, an Actigraph and a GPS sensor for a week. Since location data alone does not reliably determine whether a person is indoors outdoors or in transit, the predictive value of the aforementioned devices data was explored using an ANN, resulting to a time-activity model based solely on sensor records. The independent variables that fed the ANN input layer were consisted of a) personal temperature, Temp, b) the change of personal temperature with time, $dTemp/dt$, c) personal speed, Speed, e) the observed temperature, based on a central weather station measurements, Tempout, d) and the ratio of personal temperature to the observed one, Temp/Tempout. Moreover, day light information was transformed into a categorical element (day or night) which was also included as an input variable. The initial database was divided into training and validation set (85% and 15% of the total record entries, respectively) and the models developed from the training set were tested using the validation set.

Results: The ANN predicted results were compared to real data based on time-activity log records, filled out on paper by participants. The accuracy of the ANN predictions is close to 85%.

Conclusions: While the model is being refined, it is already clear that this kind of investigation provides useful information on the utility of commercial devices as modular add-ons to exposure studies.

Abstract ID: 119

Title: Exposure misclassification with respect to different mobility: European Air Quality Chemistry Transport and Dispersion Model vs. Land Use Regression

Presenting Author: Hennig, Frauke

Authors: Frauke Hennig (1,2), Liliana Tzivian (1), Dorothee Sugiri (1), Anna Buschka (1), Michael Memmesheimer (3), Hermann Jakobs (3) and Barbara Hoffmann (1,4)

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Text:

Background and aims: Chemistry transport and dispersion models (CTM-DM) and land-use regression (LUR) models have been used for estimating individual air pollution exposure in population-based studies. In this investigation we aim to address misclassification with respect to participants' mobility around their residences.

Methods: In the Ruhr Area in Germany, particulate matter with a dynamic diameter $\leq 10 \mu\text{m}$ (PM₁₀) concentrations have been estimated with the European Air Quality and Dispersion (EURAD) Model, a Chemistry Transport Model, as well as with a LUR model as part of the European Study of Cohorts for Air Pollution Effects (ESCAPE) study at 4809 residences. To evaluate the effect of exposure misclassification with respect to the mobility of the population under investigation, we first chose random locations within a 1km-buffer around a participant's residence for each participant and assumed that the participants stayed 10 hours per day at this random location. We then assigned purely residence-based exposures and calculated weighted exposure concentrations, taking time away from home and location into account. We calculated differences and correlations between both exposure metrics and compared the change in assigned exposures for ESCAPE-LUR and EURAD-CTM. Additionally we evaluated exposure differences with increasing distances (100-200m, >200-300, ..., >900-1000m) of random locations.

Results: For 4809 residences the randomly chosen locations were equally distributed within distance groups (100-200m, >200-300, ..., >900-1000m). Differences in PM₁₀ (mean \pm SD) were $0.05\pm 0.07 \mu\text{g}/\text{m}^3$ for EURAD-CTM and $0.12\pm 0.11 \mu\text{g}/\text{m}^3$ for LUR with correlations of 1 and 0.99 respectively. With increasing distance, exposure differences increased more slowly in mean and deviation for EURAD-CTM with $0.03\pm 0.04 \mu\text{g}/\text{m}^3$ (100-200m), $0.04\pm 0.07 \mu\text{g}/\text{m}^3$ (401-500m), and $0.09\pm 0.09 \mu\text{g}/\text{m}^3$ (901-1000m) and more rapidly for LUR with 0.03 ± 0.03 , 0.09 ± 0.08 and $0.20\pm 0.14 \mu\text{g}/\text{m}^3$ respectively.

Conclusions: Misclassification of exposure with respect to increasing spatial mobility of the participants is more likely for LUR-modelled exposure, especially for distances larger than 200 m.

Abstract ID: 120

Title: Alterations in the peripheral blood transcriptome induced by particulate air pollution exposure

Presenting Author: Winckelmans, E

Authors: Winckelmans Ellen (1); Nawrot Tim (1,2); Tsamou Maria (1); Baeyens Willy (3); De Boever Patrick (1,4); Jennen Danyel (5); Reynders Hans (6); Schoeters Greet (4,7,8); Van Larebeke Nicolas (9); Vrijens Karen (1)

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Text:

Background and aims: Many epidemiological studies have linked increased levels of airborne particulate matter 10 (PM10) with adverse health outcomes and higher mortality rates. However, the complex mechanisms underlying PM-induced adverse health effects still need to be further elucidated. This study aims to identify genes and pathways, separately for men and women, that are affected by medium term (one month averages) PM10 exposure.

Methods: The study population consists of 49 men and 51 women between 50 and 65 years old living in Flanders. Gene expression was measured in peripheral blood. We performed linear regression analyses adjusted for personal and temporal characteristics to investigate alterations in gene expression induced by medium term PM10 exposure. Overrepresentation (ConsensusPathDB) and gene set enrichment (GSEA) analyses were used to identify enriched pathways.

Results: A total of 1136 and 2295 genes, for men and women respectively were significantly associated with PM10 exposure. 90 genes were significant for both men and women. Overrepresentation and gene set enrichment analyses revealed significant pathways related to the mitochondria and histone-related processes for women. For men, significant pathways were related to the tricarboxylic acid (TCA) cycle and insulin receptor signaling. Currently, we are verifying a subset of significant genes related to the mitochondria in a distinct study population.

Conclusions: We identified gender specific genes and pathways that are significantly associated with air pollution exposure. Possibly, energy producing processes are upregulated in order to compensate for PM-induced oxidative stress or increased energy demand.

Abstract ID: 121

Title: Perceived and modelled exposure to RF-EMF from mobile phone base stations and the development of nonspecific symptoms

Presenting Author: Martens, A

Authors: Martens, AL (1,2); Slottje, P (1,3); Timmermans, DRM (2,4); Kromhout, H (1); Korevaar, JC (5); Smid, T (2,6), Vermeulen, RCH (1)

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Text:

Background and aims: A part of the population experiences health complaints (such as headache or fatigue) that they associate with exposure to radiofrequency electromagnetic fields (RF-EMF). We studied the associations between measured, modeled, and perceived exposure, with the aim of eventually assessing the relative importance of perceived and modeled exposure in relation to the development of non-specific symptoms.

Methods: We have previously shown that a 3D geospatial model NISMap can estimate exposure from mobile phone base stations at the home address with reasonable validity ($r_{Sp} = 0.60$). We extended on this observation by comparing NISMap estimates with personal measurements in 47 volunteers. We used the prospective Dutch Occupational and Environmental Health Cohort Study (Arbeid, Milieu en Gezondheid Onderzoek, AMIGO) to analyze the relationship between modeled and perceived RF-EMF exposure from mobile phone base stations and non-specific symptoms. This general population cohort consists of 14829 adults (aged 31-65 years at baseline) across the Netherlands who were recruited via their General Practitioner. We modeled RF-EMF exposure at the home address of the participants with NISMap. Perceived exposure and non-specific symptoms are measured longitudinally by questionnaire.

Results: In the measurement study we found a moderate correlation ($r_{Sp} = 0.49$) between 48 hour personal RF-EMF measurements and model predictions. We found a weak association ($r_{Sp} = 0.11$) between modeled and perceived exposure in the AMIGO cohort. Preliminary analyses showed that perceived ($p < 0.001$), but not modeled exposure was significantly associated with reporting more symptoms at baseline. Further (longitudinal) effect analyses are ongoing.

Conclusions: The measurement study showed that a meaningful ranking of participants on RF-EMF from mobile phone base stations can be achieved. Due to the apparent contrast between modeled and perceived exposure to RF-EMF we are well positioned to disentangle potential effects of both measures on the development of health complaints.

Abstract ID: 122

Title: Early-life exposure to persistent organic pollutants and asthma in Norwegian children

Presenting Author: Lenters, V

Authors: Lenters, Virissa (1); Mandal, Siddhartha (2); Forns, Joan (2); Portengen, Lützen (1); Eggesbø, Merete (2); Vermeulen, Roel (1)

Affiliations: (1) Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands; (2) Department of Genes and Environment, Division of Epidemiology, Norwegian Institute of Public Health, Oslo, Norway

Text:

Background and aims: There is suggestive evidence that prenatal and early-life exposure to certain environmental contaminants may increase the risk of developing respiratory and allergic diseases via immune-mediated pathways. We investigated associations between multiple persistent organic pollutants (POPs), comprising chemical 4 classes, and risk of severe asthma.

Methods: We studied 1015 Norwegian mother-child pairs enrolled in 2002–2009 in the Norwegian Human Milk Study (HUMIS) prospective cohort study. Concentrations of 15 PCBs, 7 brominated flame retardants (PBDEs and HBCD), 5 organochlorine pesticides (*p,p'*-DDE, *p,p'*-DDT, HCB, β -HCH, oxychlordane) and 2 perfluoroalkyl substances (PFOA and PFOS) were quantified in pooled breast milk samples, reflecting pre- and postnatal exposures. The outcome, asthma, was defined as a hospital visit for asthma ($n=44$, 4.3%). We estimated associations between exposures and asthma using single-pollutant logistic regression models, and also simultaneously evaluated all exposures in multi-pollutant models using elastic net and group lasso penalized regression modeling.

Results: 23 of the 29 exposure biomarkers were quantified in >70% of breast milk samples, and 35% of these biomarkers had pairwise Spearman correlation coefficients >0.5. In single-pollutant adjusted models, 3 PCBs (congeners 105, 118 and 138) were inversely associated with asthma ($p<0.05$), and β -HCH was positively associated, although borderline significant, with asthma; however, none of the associations survived correction for multiple comparisons. In multi-pollutant models, PCB-118 and the organochlorine pesticides were most consistently selected.

Conclusions: Overall, findings provide little support for associations between the set of POPs we assessed and risk of asthma. In future analyses we will explore the potential modifying effects of the child's early-life gut microbiota—specifically, fecal profiles of short-chain fatty acids, metabolites of gut microbiota—on associations between POPs and asthma and other respiratory disease outcomes.

Abstract ID: 123

Title: A Conceptual Framework to Describe and Measure Shift Work in Epidemiological studies

Presenting Author: van de Langenberg, D

Authors: van de Langenberg, Daniëlla (1), Vlaanderen, Jelle (1), Rodenburg, Wendy (2), Rookus, Matti (3), Vermeulen, Roel (1)

Affiliations: (1) IRAS, Institute for Risk Assessment Sciences, Utrecht University, the Netherlands; (2) RIVM, National Institute for Public Health and the Environment, the Netherlands; (3) NKI, Netherlands Cancer Institute, the Netherlands

Text:

Background and aims: Shift work is a multidimensional exposure and disrupts both lifestyle and circadian rhythms. Identifying which dimensions contribute most to night-shift work induced adverse health effects is important both from an etiological and a public health perspective. We developed a conceptual framework that describes the multidimensionality of exposure to shift work in order to optimally utilize future epidemiological studies through implementation of improved exposure metrics.

Methods: We conducted a literature review to identify exposure dimensions and associated biological pathways related to night-shift work. We structured the exposure dimensions and biological pathways to provide a clear overview. Moreover, we focused on the identification of measurement methods which can improve the assessments of each of the identified exposure dimensions related to night-shift work.

Results: The conceptual framework describes the wide range of (biological, social and behavioral) aspects and includes the following shift-work dimensions: disturbed social pattern, behavioral changes including diet and physical activity, disturbed sleep pattern, eating at night, light at night, and sun exposure. We have identified a suite of tools which are capable of measuring these dimensions including traditional epidemiological methods (e.g. questionnaires), objective exposure measurement devices (e.g. actimetry and light sensors), and biological markers (traditional markers for circadian disruption such as clock genes, markers related to cardio-metabolic disorders and omics). Furthermore, we provide an example on how this framework can be used to develop risk analyses through the use of Directed Acyclic Graphs.

Conclusions: Accurately measuring shift-work aspects in future research, using our conceptual framework, will result in innovative new research directions and might lead to promising clues for interventions. We used the conceptual framework to design a molecular epidemiology study among nurses which aims to identify the most relevant exposure dimensions of night-shift work using detailed questionnaires and objective monitors. In addition we aim to identify biomarkers for both acute and chronic circadian disruption associated to these specific night-shift work dimensions. Linking accurate measurements of specific night-shift work dimensions with biomarkers reflecting circadian disruption might provide insights into which dimensions are most harmful to human health.

Abstract ID: 124

Title: Prenatal exposure to perfluorinated compounds and risk for Small/Large for Gestational Age (SGA/LGA): pooled analysis within four European birth cohorts

Presenting Author: Govarts, E

Authors: Govarts, Eva (1); Iszatt, Nina (2); Eggesbø, Merete (2); Murinova, Lubica (3); Trnovec, Tomas (3); de Cock, Marijke (4); van de Bor, Margot (4); Hertz-Picciotto, Irva (5); Legler, Juliette (6); Schoeters, Greet (1,7,8)

Affiliations: (1) Unit Environmental Risk and Health, Flemish Institute for Technological Research (VITO), Mol, Belgium; (2) Division of Epidemiology, Norwegian Institute of Public Health, Oslo, Norway; (3) Slovak Medical University, Faculty of Public Health, Department of Environmental Medicine, Bratislava, Slovakia; (4), Department of Health and Life Sciences, VU University, Amsterdam, The Netherlands; (5) Department of Public Health Sciences, School of Medicine, University of California, Davis, USA; (6) Institute for Environmental Studies (IVM), VU University, Amsterdam, The Netherlands; (7) Department of Biomedical Sciences, University of Antwerp, Antwerp, Belgium; (8) University of Southern Denmark, Institute of Public Health, Department of Environmental Medicine, Odense, Denmark

Text:

Background and aims: Animal studies indicate that maternal exposure to perfluorinated compounds (PFCs) is associated with reduced fetal growth. However, the results of human studies are inconsistent. Within the framework of the EU OBELIX project, we investigated associations between prenatal exposure to perfluorooctanoic (PFOA) and perfluorooctyl sulfonate (PFOS) with measures of fetal growth.

Methods: We used perfluor measurements in cord blood or breast milk samples in 662 women from four European birth cohorts from 2002-2012. All measurements were reexpressed as cord serum estimates. SGA and LGA were calculated as birth weight less and higher than the 10th and 90th percentile respectively of birth weight for each week of pregnancy defined by externally obtained country- and sex-specific reference weight curves. We used multiple logistic regression analyses to model the association between the perfluors and SGA or LGA, adjusted for confounders and covariates.

Results: In the global pooled database 64 (9.7%) and 81 (12.2%) of the newborns were born as SGA- and LGA-babies respectively, the gestational age ranged from 30 to 44 weeks with a median of 40 weeks. The mean (standard deviation) levels of PFOA and PFOS in cord blood serum were 1089 (716) and 2458 (1597) ng/L respectively. PFOA levels were found to be significantly (p -value <0.05) associated with an increased odds of having a SGA baby [per 100 ng/L cord serum increase of PFOA: adjusted odds ratio (OR) (95% CI) = 1.035 (1.010, 1.061)]. The results did not change substantially in any of the sensitivity analyses. No statistically significant associations were found for PFOS.

Conclusions: The findings suggest that low-level exposure to PFOA has an adverse impact on human fetal growth. Acknowledgements: The research received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement OBELIX 227391.

The studies of the Flemish Center of Expertise on Environment and Health were commissioned, financed, and steered by the Ministry of the Flemish Community (Department of Economics, Science and Innovation; Flemish Agency for Care and Health; and Department of Environment, Nature and Energy). The Norwegian Human Milk Cohort (HUMIS) is additionally supported by funds from the Norwegian Research Council's MILPAAHEL

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National Cancer Institute grant # R01-CA96525.

Abstract ID: 125

Title: Individualized exposure assessment for Ultrafine Particles; preliminary results of the Dutch EXPOsOMICS Measurement Campaign.

Presenting Author: van Nunen, E

Authors: van Nunen, Erik (1); Vlaanderen, Jelle (1); Vermeulen, Roel (1); Hoek, Gerard (1)

Affiliations: (1) Institute for Risk Assessment Sciences (IRAS), Division of Environmental Epidemiology (EEPI), Utrecht University, Utrecht, NL

Text:

Background and aims: Exposure to Ultrafine Particles (UFP) is hypothesized to be associated to adverse health effects, such as pulmonary and cardiovascular disease. However, little is known about variation in UFP exposure at the individual level. In this study we compared 24-hour personal UFP measurements to UFP measurements at the façade of individual's homes.

Methods: As part of the EXPOsOMICS study, UFP measurements were performed among 42 healthy non-smoking subjects, living at a busy road (>10,000 vehicles/24 hours) or a quiet road in Utrecht or Amsterdam. Subjects carried a backpack for 24 hours containing a miniDiSC to measure real-time exposure to UFP. Simultaneously, UFP levels were measured outside at the subject's home address. Measurements were conducted three times for each subject, spread between seasons to cover seasonal differences. Data were paired by monitoring day, and analysed using paired sample T-tests to assess differences between both personal and outdoor medians of 24-hour UFP levels from subjects living on busy vs. quiet roads. Spearman Correlation coefficient was determined for personal and home outdoor UFP levels. Analyses were conducted using R (Version i386 3.1.3).

Results: For each individual, 1-second UFP concentrations showed high variability, reflecting diversity of UFP sources. 24-hour median UFP outdoor concentrations were moderately higher at major (n=61) versus quiet roads (n=63) (10,460 UFP cm⁻³ ; 9.311 UFP cm⁻³, p=0.023). Personal UFP exposure tended to be lower for subjects living at major roads (5,743 UFP cm⁻³ ; 6,312 UFP cm⁻³, p=0.053). A moderate positive correlation between median personal and home outdoor UFP concentrations was found (ρ=0.552, p<0.001). Further analyses available at the conference.

Conclusions: Preliminary results provide indication that outdoor UFP concentrations at the home address influences 24-hour personal exposures to UFP. Results emphasize the need to disentangle influences of indoor and outdoor UFP sources to improve the characterization of personal UFP exposure in future epidemiological studies.

Abstract ID: 126

Title: Physical Activity through Sustainable Transport Approaches: Quantifying the health benefits and risks of active mobility

Presenting Author: Dons, E

Authors: Dons, Evi (1, 2); Laeremans, Michelle (1,2); Avila-Palencia, Ione (3); Orjuela, Juan Pablo (4); Cole-Hunter, Tom (3); Nieuwenhuijsen, Mark (3); de Nazelle, Audrey (4); Int Panis, Luc (1, 2)

Affiliations: (1) VITO, Mol, Belgium; (2) Hasselt University, Hasselt, Belgium; (3) CREAL, Barcelona, Spain; (4) Imperial College, London, UK

Text:

Background and aims: Lack of physical activity is the fourth leading risk factor for mortality. Walking and cycling for travel is suggested as an innovative measure to increase the activity level. Unfortunately, being active in traffic implies exposure to elevated air pollution concentrations which comes with a health cost. We designed a study to collect objective and quantitative data on the health effects of being physically active in a polluted environment.

Methods: This study is part of the European PASTA project, which aims to recruit 14,000 subjects for the collection of self-reported data on commuting behavior and level of physical activity. In selected participants (120 in 3 cities), we validate survey-data by tracking them using a GPS, μ -aethalometer, Sensewear armband, Zephyr BioHarness and the ExpoApp. These data are related to the participant's health status which is defined by blood pressure, heart rate variability, fundus photography, lung function and inflammation. Personal measurements started in February 2015 and will continue for 1 year.

Results: The PASTA project has already collected 1827 complete baseline questionnaires in Antwerp, Barcelona and London. 70% of participants expressed interest to participate in an experiment. As we focus on physical activity, we want to estimate ventilation and inhaled air pollution dose, rather than using personal exposure. Several methodologies exist, based on activity classification, METs, heart rate, or breathing rate. Preliminary results indicate that daily inhaled dose was highest using method 1 and 3, but only half with method 4. For the heart rate method, we used single formulas for the whole group, but results suggest that an individually derived VE-HR profile would be preferable.

Conclusions: The calculation method influences ventilation and dose estimations, but all 4 methods are often used independently. This is relevant as this variable is the dependent variable when determining dose-response associations in epidemiological studies.

Abstract ID: 127

Title: Childhood asthma, rhinitis and itchy rash are linked with lifetime exposure to ambient particulate matter and nitrogen dioxide

Presenting Author: Colles, A

Authors: Sofie De Prins (1) (2); Eva Govarts (1); Ann Colles (1); Els Van de Mieroop (3); Vera Nelen (3); Van Den Heuvel Rosette (1); Frans Fierens (4); Caroline Teughels (5); Greet Schoeters (1) (2) (6); Gudrun Koppen (1)

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Text:

Background and aims: Asthma, rhinitis and eczema are the most common allergy-related conditions in children. It is suggested that ambient air pollution contributes to the increase in the prevalence of these diseases. This study investigated the associations between asthma, rhinitis and eczema symptoms and lifetime exposure to PM₁₀, PM_{2.5} and NO₂ in children that were recruited from the general population in Flanders.

Methods: For 595 children of 9 to 10-years old, symptoms related to asthma, rhinitis and eczema were self-reported using a standardized questionnaire. Lifetime exposure to PM_{2.5}, PM₁₀ and NO₂ at the home address was estimated using the RIO interpolation model. Exposure-effect associations were assessed using logistic regression models adjusting for sex, maternal education level, maternal smoking during pregnancy, having no siblings and familial presence of asthma, hay fever and eczema.

Results: An interquartile range (IQR) increase in PM_{2.5}, PM₁₀ or NO₂ was associated with odds ratios (ORs) for asthma of 2.39 (95% CI: 1.34, 4.25), 1.96 (95% CI: 1.13, 3.42) and 1.68 (95% CI: 1.02, 2.74), respectively. The ORs for rhinitis for an IQR increase in PM_{2.5} and PM₁₀ were 1.35 (95% CI: 1.01, 1.81) and 1.35 (95% CI: 1.02, 1.78), respectively. The estimated ORs (95% CI) for itchy rash for an IQR increase in PM_{2.5}, PM₁₀ or NO₂ were 1.56 (95% CI: 1.12, 2.15), 1.51 (95% CI: 1.11, 2.06) and 1.39 (95% CI: 1.05, 1.83), respectively.

Conclusions: Increased risk of asthma, rhinitis and itchy rash were associated with lifetime exposure to PM_{2.5}, PM₁₀ and NO₂ for 9 to 10-year old children in the Flemish region.

Abstract ID: 128

Title: Counting asbestos bodies in bronchoalveolar lavage: trend analysis and a systematic review

Presenting Author: Nuys, V

Authors: Nuyts, Valerie (1); Vanhooren, Hadewijch (1); Nackaerts, Kristiaan (2); Nemery, Ben (1)

Affiliations: (1) Centre for Environment and Health, Department of Public Health and Primary Care, KU Leuven, Belgium; (2) Department of Respiratory Diseases, University Hospitals Leuven, University of Leuven, Leuven, Belgium

Text:

Background and aims: Asbestos bodies (AB) in bronchoalveolar lavage (BAL) can be quantified by light microscopy and their concentration is indicative of past cumulative asbestos exposure. The objective of this retrospective study was to assess clinical and exposure characteristics, as well as possible time trends, among patients in whom AB had been measured in BAL. We also conducted a systematic review of the literature on the subject.

Methods: BAL samples were available from 548 subjects over a period from January 1997 until December 2013. The processing of samples and the microscopic analysis were done by a single expert and 75% of samples came from a single tertiary care hospital, allowing clinical and exposure data to be extracted from patient files. MEDLINE and Embase databases were searched for relevant articles on the subject, and 45 relevant articles were selected.

Results: The study population (96% males) had a mean age of 62.2 (± 12.3) years. AB were detected in 56.4% of the samples, giving a median concentration of 0.5 AB.ml⁻¹ (95th percentile: 25 AB.ml⁻¹; highest value: 164.5 AB.ml⁻¹). The AB concentration exceeded 1 AB.ml⁻¹ in 40.1% and 5 AB.ml⁻¹ in 18.6% of the samples. A significant decrease in AB concentrations was apparent over the years. High AB concentrations corresponded to high reported exposures to asbestos. AB concentrations were higher among patients with pleural disorders when compared to other disease groups. A systematic review of 45 published articles confirmed these observations: groups with occupational exposure to asbestos and patients with asbestos-related disease (ARD) had higher prevalences of positive BAL samples.

Conclusions: This retrospective study of a large clinical population and a systematic literature review support the value of counting AB in BAL to assess past exposure to asbestos.

Abstract ID: 129

Title: IQ benefit by reduction strategies of environmental lead (Pb) exposure in Flanders over a 14 year period

Presenting Author: Remy, S

Authors: Remy, Sylvie (1); Hambach, Ramona (1,2); Van Sprundel, Marc (1); Teughels, Caroline (3), Schoeters, Greet (1,4,5)

Affiliations: (1) University of Antwerp, Antwerp, Belgium; (2) Occupational Health Service Attentia Prevention & Protection, Brussels, Belgium; (3) Flemish Government, Brussels, Belgium; (4) Flemish Institute for Technological Research (VITO), Mol, Belgium; (5) University of Southern Denmark, Odense, Denmark

Text:

Background and aims: Epidemiologic studies have shown that even very low blood lead (Pb) concentrations in children are associated with a lower intelligence quotient (IQ). Prevention strategies have enabled a tremendous decrease in environmental Pb exposure. The Flemish Environment and Health Studies (FLEHS) enabled to monitor the reduction of blood Pb levels in adolescents in Flanders (Belgium) over the past 12 years.

Methods: Subsets of the Flemish population were sampled in 2004, 2008, and 2013. Mean adolescent blood Pb levels were respectively 2.25 µg/dL (N = 1679; 95% CI: 2.25-2.33), 1.46 µg/dL (N = 207; 95% CI: 1.38-1.55), and 0.95 µg/dL (N = 204; 95% CI: 0.90-0.99). There is evidence for a linear dose response relationship from 2µg/dL (0.513 IQ points lost per µg/DL from 2-10 µg/dL; 0.19 IQ points per µg/DL from 10-20 µg/dL; and 0.11 IQ points per µg/DL above 20µg/dL (Environ Health Perspect 117:1162-1167 (2009)).

Results: Based on the blood Pb analysis and assuming log-linear distributions, we estimated that 57% of the Flemish population had blood Pb concentrations above 2µg/dL in 2004; 23% in 2008; and 2.5% in 2013. We calculated the IQ loss due to Pb exposure over this time period (2000-2013) and compared it to the estimated loss from 2013-2027 (both 14 years). Based on the dose response relationship, the average IQ loss in individuals above the threshold of 2µG/dL was 1.15 points in 2004, 0.31 in 2008, and 0.15 in 2013. To calculate the IQ loss in the population born between 2000 and 2013, the levels measured in 2004 were fixed for the period 2000-2004, the levels measured in 2008 for the period from 2005-2008, and the levels measured in 2013 from 2008-2013 and from 2014-2027. Using the annual Flemish birth number of 2008 (70302), we calculated that 249845 IQ points were lost due to Pb exposure between 2000 and 2013, while we estimated that 3689 points will be lost between 2014 and 2027.

Conclusions: Prevention strategies in Flanders have enabled an IQ benefit of 246157 IQ points over a 14 year period.

Abstract ID: 130

Title: Maternal residential greenness and traffic indicators in association with alterations in placental mitochondrial DNA content in twins

Presenting Author: Bijmens, E

Authors: Bijmens, Esmée M (1,2); Nawrot, Tim S (1,3); Derom, Catherine (4,5); Janssen, Bram G (1); Vrijens, Karen (1); Vlietinck, Robert (4); Gielen, Marij (2); Zeegers, Maurice P (2)

Affiliations: (1) Centre for Environmental Sciences, Hasselt University, Diepenbeek, Belgium; (2) Department of Complex Genetics, NUTRIM School of Nutrition and Translational Research in Metabolism, Maastricht University Medical Centre, Maastricht, The Netherlands; (3) Department of Public Health, Leuven University (KU Leuven), Leuven, Belgium; (4) Centre of Human Genetics, University Hospitals Leuven, Leuven, Belgium; (5) Department of Obstetrics and Gynaecology, Ghent University Hospital, Ghent, Belgium

Text:

Background and aims: Residential traffic exposure is an important environmental source of free radicals. Oxidative stress may stimulate mitochondrial proliferation to supply energy however the increasing abundance of dysfunctional mitochondria causes further oxidative damage. We investigated maternal traffic and residential greenness exposure during pregnancy in association with mitochondrial DNA content in placental tissue in twins.

Methods: Among 175 twins of the East Flanders Prospective Twin Survey, mitochondrial DNA content was measured in placental tissue. Maternal traffic exposure was determined using Geographic Information Systems. Additionally, we estimated the relative importance of genetic and environmental sources of variance.

Results: Large effects of the shared environment on mitochondrial DNA content were observed, while genetic factors appeared to play a minor role. In addition, placental mitochondrial DNA content was significant associated with maternal residential proximity to traffic exposure and land use indicators. A doubling in distance to the nearest major road was associated with a decrease in mitochondrial DNA content of 8.47% (95 CI: -13.9 to -2.8%; $p=0.006$). An interquartile increase (22%) in maternal residential surrounding greenness (5 km buffer) was associated with an decrease of 10.04% (95% CI: -15.2 to -4.5%; $p=0.001$) in mitochondrial DNA content.

Conclusions: This is the first study to show that maternal residential greenness and traffic indicators are associated with alterations in placental mitochondrial DNA content. Higher mitochondrial DNA content might both intensify and/or be a reflection of oxidative stress.

Abstract ID: 131

Title: Blood pressure in young adulthood and residential exposure of traffic and greenness in the early life environment of twins

Presenting Author: Bijnens, E

Authors: Bijnens, Esmée M (1,2); Zeegers, Maurice P (2); Loos, Ruth (3); Gielen, Marij (2); Vlietinck, Robert (4); Derom, Catherine (4,5); Nawrot, Tim S (1,6)

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Text:

Background and aims: The barker hypothesis states that the origin of adults diseases is located in the early life environment. They show that the intrauterine environment has important effects on blood pressure and hypertension in adults. However, the effects of residential traffic exposure and residential greenness in the early life on blood pressure are currently unknown.

Methods: Ambulatory (24-hour) blood pressures of 278 twins were obtained at the age of 18 to 25 years. Addresses at birth and at adult age were geocoded. Residential surrounding greenness was defined as semi-natural, forested and agricultural area based on CORINE Land Cover and the Normalized Difference Vegetation Index (NDVI) in buffers of 5000 m. We used mixed regression models accounting for sex, gestational age, birth weight, birth order, zygosity-chorionicity, age, smoking, physical activity, BMI, 24 h urinary sodium and potassium, Gamma-Glutamyl Transferase, age mother, smoking during pregnancy, birth year, parental education and neighbourhood socio-economic status.

Results: Among twins who moved during life (n=181), night time blood pressure was inversely associated with residential surrounding greenness at adult age as well as with residential greenness in early life. An interquartile increase in residential greenness exposure in early life (5000 m radius) was associated with a 1.98 mmHg (95 CI: -3.4 to -3.4%; p=0.009) decrease in adult night systolic blood pressure. The estimate changed to 2.42 mmHg (95 CI: -4.7 to -0.2%; p=0.04), after additional adjustment for residential greenness exposure in adulthood. We found no significant effect of adult residential greenness with adult blood pressure, while accounting for the early life greenness exposure.

Conclusions: Besides the residential greenness environment at young adult age, residential greenness in the early life environment was independently associated with adult blood pressure. This indicates that residential greenness during the early life environment has persistent effects on blood pressure.

Abstract ID: 132

Title: Socio-demographic and dietary determinants of perfluoroalkyl substances maternal concentrations in pregnancy

Presenting Author: Casas, M

Authors: Manzano-Salgado, Cyntia B. (1, 2); Casas, Maribel (1, 2); Lopez-Espinosa Maria-Jose (2, 3); Ballester, Ferran (2, 3); Ibarluzea, Jesus (2, 4, 5); Santa Marina, Loreto (2, 4, 5); Vioque, Jesus (2, 6); Sunyer, Jordi (1, 2); Vrijheid, Martine (1, 2)

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Text:

Background and aims: Prenatal exposure to perfluoroalkyl substances (PFAS) might affect child health; but maternal determinants of PFAS exposure are unclear. We evaluated whether socio-demographic and dietary factors predict PFAS maternal concentrations during pregnancy in a birth cohort.

Methods: We analyzed the concentrations of perfluorohexanesulfonic acid (PFHxS), perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorononanoic acid (PFNA) in 1,239 maternal plasma samples at 10-13 weeks of pregnancy collected in 2003-2008. Women also completed a questionnaire on socio-demographic characteristics and food frequency. We used multivariate linear regressions to assess changes in the geometric mean (Δ GM) of PFAS concentrations by (1) socio-demographic characteristics and, (2) food groups (servings per week). P-value less than 0.05 were considered statistically significant.

Results: Country of birth and region were the strongest predictors of PFAS exposure during pregnancy; specifically women from Spanish origin ($n= 1,153$) had significantly higher PFAS concentrations (Δ GM \geq 34%) than non-Spanish. PFHxS and PFOA concentrations were significantly higher in nulliparous women (Δ GM \geq 24%) and in women with no previous breastfeeding (Δ GM \geq 18%). Moreover, women with the highest intake of fish during pregnancy (including fatty, lean and shellfish) had a significant increase of 9% and 10% in PFOS and PFNA concentrations, respectively. PFOS concentrations significantly increased with higher intake of red meat (Δ GM \geq 8%) but decreased with higher consumption of vegetable oil (Δ GM \leq 8.0%). Women with high intake of fruits, legumes and prepared food had lower PFOA concentrations.

Conclusions: Country of birth, region, parity and previous breastfeeding are the main predictors of maternal PFAS concentrations during pregnancy in our sample. Moreover diet, mainly fish consumption, might be an important source of PFAS exposure during pregnancy.

Abstract ID: 133

Title: Effect of prenatal exposure to perfluoroalkyl substances on childhood obesity

Presenting Author: Casas, M

Authors: Manzano-Salgado, Cyntia B. (1, 2); Casas, Maribel (1, 2); Lopez-Espinosa Maria-Jose (2, 3); Ballester, Ferran (2, 3); Iñiguez, Carmen (4); Santa Marina, Loreto (2, 5, 6); Vioque, Jesus (2, 7); Sunyer, Jordi (1, 2); Vrijheid, Martine (1, 2)

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Text:

Background and aims: Prenatal exposure to perfluoroalkyl substances (PFAS) may play a role in childhood obesity; however evidence from prospective studies is limited. We evaluated the effect of prenatal exposure to PFAS on postnatal rapid growth at 6 months and overweight at 4 years of age in a Spanish birth cohort.

Methods: We assessed perfluorohexanesulfonic acid (PFHxS), perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorononanoic acid (PFNA) in 1,234 maternal plasma samples collected at 12 weeks of pregnancy. We defined rapid growth as an increase in z-weight score >0.67 at 6 months. We calculated body mass index (BMI) z-scores at 4 years and defined overweight as BMI z-scores \geq 85th percentile. We evaluated the effect of prenatal PFAS exposure on rapid growth and overweight using logistic regressions, and on BMI z-scores using linear regressions.

Results: Our sample had 22% rapidly growing children at 6 months of life and 30% overweight children at 4 years of age. PFOA was associated with a rapid growth at 6 months in boys in the crude model (tertiles 3rd vs. 1st, Odds Ratio (OR): 2.03; CI95%: 1.19, 3.48) but not in the adjusted model (OR: 1.69; 0.93, 3.19). In the adjusted models PFOA was associated with an increase in continuous BMI z-scores at 4 years also in boys but not in girls (tertiles 2nd vs. 1st; β -coefficient: 0.25; 0.02, 0.49 and; tertiles 3rd vs. 1st; β : 0.24; -0.02, 0.49). For overweight at 4 years this association was not statistically significant. Moreover, no association was seen between prenatal exposure to PFHxS, PFOS and PFNA and, postnatal rapid growth or BMI.

Conclusions: This is one of the largest prospective studies on PFAS exposure and childhood obesity. Our results suggest that prenatal exposure to PFOA but not other PFAS might increase postnatal rapid growth and BMI in boys, but not in girls.

Abstract ID: 134

Title: How outdoor temperature and air pollutants affect the risk of work injuries in three Italian cities. A case-crossover study.

Presenting Author: Scortichini, M

Authors: Federica Asta (1); Patrizia Schifano (1); Alessandro Marinaccio (2); Michela Bonafede (2); Giuseppe Campo (2); Paola Michelozzi (1)

Affiliations: (1) Department of Epidemiology, Lazio Regional Health Service, Rome, Italy; (2) Italian government agency for the insurance against work-related injuries (INAIL)

Text:

Background and aims: We analyzed for the first time in Italy the association between heat, cold, air pollutants and WRI and to identify more susceptible workers' categories.

Methods: All injuries occurred between 2001-2010 in Milan, Turin and Rome were extracted from the Italian workers' compensation claims. Association between temperature (T), PM10, NO2, O3 and WRI were estimated using a time-stratified case-crossover separately in May-September (warm season, WS) and November-February (cold season, CS). We compared 10th to 90th percentile (pctl) of T in the WS and 25th to 5th pctl in the CS; and 25th to 95th pctl for each pollutant. Interactions with industrial sectors and workers' categories were studied.

Results: We evaluated 468,816 WRI. In the WS, increases in T (lag 0-7) and NO2 (lag 0-8) were associated to an increase in WRI. Specifically for NO2 the lowest effect was in Milan (63 vs 37 mg/m³:1.19 (CI95%:1.16-1.23)) and the highest in Turin (68 vs 39 mg/m³:1.30 (CI95%:1.24-1.37)) while for an increase of T from 21C° to 34C° the lowest effect was in Milan (OR: 1.04 CI95%:1.01-1.07) and the highest in Rome (OR:1.06; CI95%:1.03-1.08). In CS decreasing T and increasing NO2 levels were associated to an increase in WRI. For a 2C° decrease of T the OR of WRI ranges between 1.12 (CI95%:1.01-1.20) in Turin and 1.02 (CI95%:1.01-1.04) in Rome. Construction, transport and energy industry were sectors more susceptible to T in both seasons, with bricklayer, metalworker, mechanic, and asphalter the more susceptible workers' categories. The effect of NO2 was not modified by categories.

Conclusions: Our study is one of the first showing an effect of temperature and NO2 on WRI and identifying susceptible subgroups. The strongest effect on WRI risk was associated to NO2 increases during the WS. Results should be considered when planning worker health and safety prevention programs.

Abstract ID: 135

Title: Associations between long-term exposure to air pollution and perturbations in the transcriptome

Presenting Author: Mostafavi, N

Authors: Mostafavi, Nahid (1); Vlaanderen, Jelle (1); Portengen, Lutzen (1); Chadeau-Hyam, Marc (1,2); Modig, Lars (3); Palli, Domenico (5); Bergdahl, Ingvar A. (3,4); Brunekreef, Bert (1); Vineis, Paolo (2,6); Hoek, Gerard (1); Kyrtopoulos, Soterios A. (7); Vermeulen, Roel (1,2)

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Text:

Background and aims: Epidemiologic studies have consistently shown associations between long-term exposure to ambient air pollution and chronic health effects. We hypothesized that early indication of biological perturbations due to ambient air pollution could be detected in genome-wide gene expression profiles from peripheral blood mononuclear cells (PBMC) in healthy individuals.

Methods: We assessed the effect of exposure to ambient air pollution on genome-wide gene-expression profiles in PBMC collected from 587 healthy individuals that participated in two prospective cohorts from Italy and Sweden. We estimated long-term air pollution (NO_x) exposure levels for our study participants at time of blood collection (1990 to 2006) using exposure models developed within the European Study of Cohorts for Air Pollution Effects. We used three complementary statistical approaches: univariate analysis (coupled with a 20% false discovery rate (FDR) control), Elastic Net regression combined with stability selection, and Graphical Unit Evolutionary Stochastic Search (GUESS) to identify for which genes expression level was associated to long-term average exposure to NO_x. We also assessed the score from univariate analysis for a list of transcripts whose expression was previously found to be altered by air pollution. We subsequently assessed the association between noteworthy transcripts and plasma inflammatory markers we previously measured in this study.

Results: There was little overlap between the distribution of NO_x exposure levels in the Italian and the Swedish cohort. Therefore, we performed the analyses both on the combined cohorts and stratified by cohort. Using the univariate approach we identified six transcripts in the Italian cohort and no transcripts in the Swedish cohort that were significantly associated with NO_x. Elastic Net regression selected 1 of these 6 transcripts in the Italian cohort while GUESS did not select any transcripts.

Conclusions: In summary, our study provides some suggestion of subtle changes in gene expression related to long-term air pollution within the exposure range studied.

Abstract ID: 136

Title: PASTA: Longitudinal Study on Correlates of Active Mobility and Evaluation of Top Measures through an online platform

Presenting Author: Avila-Palencia, I

Authors: Avila-Palencia, Ione (1); Dons, Evi (2); Standaert, Arnout (2); Cole-Hunter, Tom (1); Gerike, Regine (3); Goetschi, Thomas (4); de Nazelle, Audrey (5); Int Panis, Luc (2); Nieuwenhuijsen, Mark J (1)

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Text:

Background and aims: Increasing physical activity (PA) is one of the key approaches to address non-communicable diseases. Active mobility (AM), namely walking, cycling and the use of public transport, is well suited to provide routine activity. To assess mobility patterns, researchers need to achieve a balanced sample with roughly equal shares for each mode of transport (pedestrians, cyclists, public transport users, and drivers). With web-based approach researchers can reach out more effectively any sub-group, following in real-time how the recruitment is evolving and being able to take decision about how to approach the recruitment strategy. The main aim of the PASTA project is to promote and facilitate AM.

Methods: PASTA leads a longitudinal study on correlates of AM and evaluation of top measures in 7 European cities for 2 years. All cities are aimed to recruit 14000 (2000 per city) adults who live, work and/or study in the case study cities. The participants register on an online platform, where they can complete a general questionnaire to collect baseline data. Subsequently, they are invited by e-mail every 13 days to complete further short follow-up questionnaires to collect information on travel behaviour and PA behaviour (IPAQ). The platform includes a researcher dashboard, which allows monitoring the progress of the recruitment, number of completed questionnaires and basic info on participation to detect possible sample biases in each case study city.

Results: To date, 5000+ participants have been recruited. Questionnaire completion rates are above 80% for baseline, above 90% for short and 85% for long follow-up. Users report on average 3.5 trips per travel day, 55% of participants are women, 57% report walking, and 12% report biking daily or almost daily.

Conclusions: The online platform implementation has proven to be a practical way for monitoring features to optimize sample distribution and recruitment strategies.

Abstract ID: 137

Title: The relationship between bicycle commuting and self-perceived stress

Presenting Author: Avila-Palencia, I

Authors: Avila-Palencia, Ione (1); Cole-Hunter, Tom (1); Donaire-Gonzalez, David (1); de Nazelle, Audrey (2); Michael Jerrett (3); Nieuwenhuijsen, Mark J (1)

Affiliations: (1) CREAL, Barcelona, Spain; (2) Imperial College London, London, UK; (3) University of California, Berkeley, USA.

Text:

Background and aims: Active mobility, namely walking, cycling and the use of public transport, is being encouraged in cities across the world to address physical inactivity, vehicular congestion, air pollution and climate change. Active mobility, particularly bicycle commuting, is well suited to provide routine physical activity, e.g. for travel to and from work or education. It has been suggested that greater time spent actively commuting is associated with higher levels of physical and mental wellbeing. The current study aimed to evaluate the relationship between bicycle use for commuting among the working or studying adult population of Barcelona (Spain) and self-perceived stress.

Methods: A cross-sectional study was performed with 788 adults who commuted to work or study places in Barcelona. They responded to a comprehensive telephone survey concerning their travel behaviour from June 2011 through to May 2012. Based upon responses, participants were categorised into two commute type groups: bicyclist commuters and non-bicyclist commuters. The self-perceived stress was assessed with the short version of the Perceived Stress Scale (PSS-4), which measures the degree to which situations in one's life over the past month are appraised as stressful. The self-perceived stress was categorised as stressed and non-stressed. The relationship was assessed by multivariate logistic regression models adjusted for all potential confounders.

Results: There was a statistically significant relationship between bicycle commuting and self-perceived stress; the bicyclist commuters had increased percentage of being non-stressed. This relationship was robust when adjusted for confounders.

Conclusions: A relationship between being a bicycle commuter and being non-stressed among adults surveyed in Barcelona was found. The relationship identified should be considered for decision makers to promote active mobility, particularly bicycle commuting.

Abstract ID: 138

Title: A prospective pooled cohort study of radiofrequency electromagnetic field exposure in the Netherlands; baseline characteristics and exposure distributions

Presenting Author: Reedijk, M

Authors: Reedijk, Marije (1,2); Lenters, Virissa (1); Slottje, Pauline (1,6); Rookus, Matti (3); Korevaar, Joke (4); Verschuren, Monique (2,5); Zock, Jan-Paul (4); van Leeuwen, Floor (3); Kromhout, Hans (1); Peeters, Petra H (2); Vermeulen, Roel (1,2)

Affiliations: (1) Division of Environmental Epidemiology, Institute of Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands; (2) Julius Center for Health Sciences of Primary Care, University Medical Center Utrecht, Utrecht, The Netherlands; (3) Netherlands Cancer Institute, Antonie van Leeuwenhoek Hospital, Amsterdam, The Netherlands; (4) Netherlands Institute for Health Services Research, Utrecht, The Netherlands; (5) National Institute for Public Health and the Environment, Bilthoven, The Netherlands; (6) Department of General Practice and Elderly Care, EMGO+ Institute for Health and care research, VU University Medical Center, Amsterdam, The Netherlands

Text:

Background: The rapid worldwide distribution of mobile phones and other wireless devices has led to public concern and scientific interest about possible health effects of radiofrequency electromagnetic fields (RF-EMF). Previous epidemiological studies relied mostly on retrospective exposure assessment or were cross-sectional, and evidence on possible RF-EMF health effects has been inconsistent. To better quantify RF-EMF health risks, a large prospective cohort was established in the Netherlands as part of the international COSMOS study.

Methods: In total 88,471 participants (aged 19–88, mean 50.2 years; 89% female) were enrolled in 2011–2012 upon completion of a detailed questionnaire. The source population included female nurses (Nightingale); adults from the general population, recruited via a national general practitioners network (AMIGO); and an existing prospective cohort (EPIC-NL). Near-field RF-EMF exposure from mobile phones will be assessed using a combination of self-reported and operator-recorded data. Far-field environmental RF-EMF exposure from base stations will be modelled using a 3D radiowave propagation model. Other RF-EMF sources such as WiFi and DECT-phone use will be assessed by questionnaire. Multiple health outcomes will be ascertained by linkage to cancer and mortality registries and symptoms are assessed in baseline and repeat questionnaires.

Results: 74% of the participants reported ever having used a mobile phone. More than half of these called more than 30 min/week and more than 1 call per day. Preliminary results indicate that agreement between self-reported and operator-recorded usage is moderate—48% for call duration and 47% for the number of calls. Agreement is dependent on several demographic and usage-intensity characteristics, such as age.

Conclusions: This prospective pooled cohort study (as part of COSMOS) offers a unique opportunity to study the health effects of RF-EMF, as both self-reported and operator-recorded data is collected prior to the diagnosis of disease, and will contribute to the existing exposure assessment research on RF-EMF.

Abstract ID: 139

Title: Potential health risks associated with exposure to sulfur dioxide from a volcanic source in Iceland

Presenting Author: Carlsen, H

Authors: Hanne Krage Carlsen (1); Haraldur Briem (2); Thorsteinn Jóhannsson (3); Unnur Valdimarsdóttir (1,4); Thorolfur Gudnason (2)

Affiliations: (1) Centre of Public Health, University of Iceland, Reykjavík, Iceland. (2) Directorate of Health, Reykjavík, Iceland. (3) The Environmental Agency, Reykjavík, Iceland. (4) Department of Epidemiology, Harvard TH Chan School of Public Health, Boston, MA, USA.

Text:

Background and aims: During the Holuhraun volcanic eruption in Iceland August 31 2014- February 27 2015 the eruption was the biggest source of sulfur dioxide (SO₂) in Europe. SO₂ has been associated with exacerbations of respiratory disease. The aims of this study were to determine if SO₂ exposure from the eruption in Holuhraun was a) a risk to the general population and b) professionals who worked near the eruption site.

Methods: During the eruption period SO₂ levels were monitored nation-wide by the Icelandic Environmental Agency. Data was obtained from Medicines and Patient Registries (primary care and in-hospitalizations) about dispensing of anti-asthma medicines and exacerbations of respiratory disease. Respiratory health and symptoms experienced at previous visits to the site was surveyed in professionals who had visited the eruption site They also answered questions about respiratory health

Results: During the eruption period August 31 2014 - February 27 2015, the highest measured 1-hour and 24-hour SO₂ concentration exceeded air quality guidelines more than 10-fold in North and East Iceland. Preliminary analysis suggest that there was an increase in asthma drug usage and respiratory disease in Northeast Iceland in September and October 2014. Time series analyses revealing potential population health effects are underway and will be presented at the conference. Lung function measurements were performed on 32 professionals (mean age 39 years, 6 females) who worked regularly at the eruption site. 16 were followed up upon return. There were no differences in lung function before and after visiting the eruption site. Eye and nasal irritation at the eruption site was reported by 41% (14/32) and 43% (13/32) respectively.

Conclusions: Based on exposure levels, it is possible that SO₂ exposure posed a significant health risk to the general population. Professionals who worked near the eruption site did not have decreased lung function after visiting the site.

Abstract ID: 140

Title: Health effects of volcanic gases – a systematic review

Presenting Author: Carlsen, H

Authors: Hanne Krage Carlsen (1)

Affiliations: (1) Centre of Public Health, University of Iceland, Reykjavík, Iceland.

Text:

Background and aims: Gaseous emissions from volcanoes can also continue between active eruptions and in geothermal regions VOG exposure can be permanent. The health effects of volcanic gases was last systematically reviewed more than 10 years ago.

Methods: The databases Pubmed, Web Of Science and SCOPUS were searched for articles presenting original results, in the English language that had a human health outcome and exposure to gases from erupting volcanoes or geothermal areas. Exclusion criteria were: Non-human health outcome, article not in English, The articles were reviewed to assess risk of bias using the guidelines for reviewing observational studies (MOOSE) and the Newcastle-Ottawa Scale (NOS) for assessing nonrandomised studies.

Results: In total, 23 studies were found that matched the inclusion criteria. The studies could be categorized as either studies of degassing in geothermal areas (11) or exposure to gas from recently active or active volcanoes (12). The study areas were in New Zealand, the Azores, Iceland, Japan, Hawaii, Vanuatu and Indonesia. Most studies had a moderate risk of bias. The most common finding was associations between increases of respiratory symptoms and exposure to volcanic gases, both from active volcanoes and geothermal areas. Certain cancers were increased in geothermal areas. No associations were found with neurological outcomes, teeth decay.

Conclusions: The risk of bias was lower in the studies in earlier reviews. Volcanic gas exposure may be associated with respiratory symptoms.

Abstract ID: 141

Title: Early-life exposure to perfluoroalkylate substances and serum concentrations of IGF-1 and IGFBP-3 in 7-year-old children

Presenting Author: Valvi, D

Authors: Valvi, Damaskini (1); Weihe, Pal (2); Grandjean, Philippe (3)

Affiliations: (1) Harvard T.H. Chan School of Public Health, Boston, MA, USA; (2) Department of Occupational Medicine and Public Health, The Faroese Hospital System, Tórshavn, Faroe Islands; (3) Harvard T.H. Chan School of Public Health, Boston, Massachusetts, USA, and University of Southern Denmark, Odense, Denmark

Text:

Background and aims: Serum concentrations of Insulin-like growth factor 1 (IGF-1) and insulin-like growth factor binding protein 3 (IGFBP-3) play a critical role in children's growth and development; they could therefore mediate potential adverse effects due to perfluoroalkylate substances (PFASs) on adiposity and insulin resistance. Given the experimental support for this hypothesis, we evaluated the associations between developmental PFAS exposures and child serum concentrations of IGF-1 and IGFBP-3.

Methods: We examined 262 children from a Faroese birth cohort born in 1986/7. Prenatal PFAS concentrations (i.e. PFOS and PFOA) were measured in cord whole blood collected at birth. Postnatal PFAS, IGF-1 and IGFBP-3 concentrations were measured in child serum first collected at age 7 years. Multivariate linear regression β coefficients (95%CI) were expressed as % of the sex-specific geometric means (GM%) of IGF-1 and IGFBP-3 per doubling of PFAS concentrations.

Results: Serum concentrations of PFOS and PFOA were higher in child serum (GM \pm GSD=30 \pm 1.5 and 5 \pm 1.5 ng/mL, respectively) compared to concentrations in cord whole blood (GM \pm GSD=2.5 \pm 1.6 and 2.5 \pm 2.2 ng/mL, respectively). Postnatal PFOS concentrations were associated with lower concentrations of IGF-1 (GM%; 95%CI: -35%; -71%, -0.2%) and IGFBP-3 (GM%; 95%CI: -20%; -39%, -1.2%) in boys, and with higher concentrations of IGF-1 (GM%; 95%CI: 39%; 7%, 71%) and IGFBP-3 (GM%; 95%CI: 19%; -9%, 48%) in girls (P for sex interaction <0.05). Postnatal PFOA concentrations were similarly associated with lower IGF-1 concentrations in boys, and higher IGF-1 concentrations in girls (P for sex interaction <0.05); associations with IGFBP-3 were in the same direction as those for IGF-1, but did not reach statistical significance. Prenatal PFAS exposure was not associated with child serum IGF-1 and IGFBP-3 concentrations.

Conclusions: These findings suggest that concurrent exposure to PFAS may be associated with sex-dependent alterations in the growth hormone axis that regulates weight and glucose homeostasis.

Abstract ID: 142

Title: Fetal and childhood growth patterns related to cardiometabolic risk factors in children from the Spanish INMA birth cohort study

Presenting Author: Valvi, D

Authors: Valvi, Damaskini (1-2); David Martinez (1); Ferran Ballester (3); Jesús Ibarluzea (4); Adonina Tardon (5); Jordi Sunyer (1); Martine Vrijheid (1)

Affiliations: (1) Centre for Research in Environmental Epidemiology, Barcelona, Spain (2) Harvard T.H. Chan School of Public Health, Boston, US; (3) School of Nursing, University of Valencia, Valencia, Spain; (4) Biodonostia Health Research Institute, San Sebastian, Spain; (5) Department of Preventive Medicine and Public Health, University of Oviedo, Oviedo, Spain

Text:

Background and aims: The fetal and early postnatal periods are thought to be critical windows of susceptibility to the adverse effects of environmental influences on cardiometabolic health that may become apparent in later life. The association between low birth weight and cardiometabolic outcomes is well-documented in birth cohort studies however whether fetal and postnatal longitudinal patterns may predict cardiometabolic risk in later life remains unclear. We evaluated the associations between fetal and postnatal growth patterns and cardiometabolic risk factors in preschool children.

Methods: We analysed 734 children from the Spanish INMA birth cohort study. Longitudinal patterns of fetal growth parameters were defined as the SD-score difference between gestational weeks 12-20 and 20-34. Latent class growth curve models defined five body mass index (BMI) SD-score trajectories from birth to age 4 years. A continuous score of child cardiometabolic risk at 4 years (mean; range: 0; -6, 9) was generated as the sum of age- and sex-specific SD-scores for BMI, mean arterial pressure, high-density lipoprotein cholesterol and triglyceride serum concentrations.

Results: Fetal weight and abdominal circumference SD score differences between 20 and 34 weeks were positively associated to the cardiometabolic risk score (β ; 95%CI: 0.21;0.02, 0.42 and 0.14; -0.01,0.32, respectively). Children that presented lower or higher sizes at birth followed by a rapid BMI gain had on average higher cardiometabolic risk scores than children with average sizes at birth and slower BMI gains at later ages. Postnatal BMI trajectories mediated the associations between fetal growth and cardiometabolic risk score.

Conclusions: Findings suggest that fetal growth parameters in late pregnancy and postnatal BMI trajectories may predict cardiometabolic risk in preschool children. Further research is needed to elucidate the role of genetic predisposition and developmental exposures to environmental influences, such as maternal nutrition and chemical exposures, on early life longitudinal growth patterns.

Abstract ID: 143

Title: Genetic susceptibility and night shift work in relation to breast, prostate and colorectal cancer in the MCC-Spain study

Presenting Author: Espinosa, A

Authors: Espinosa Ana (1,2,3,4); Papantoniou Kyriaki (1,3,4); Castaño-Vinyals Gemma (1,2,3,4); Moreno Victor (4,5); Inés Gómez-Acebo (4,6); Ardanaz Eva (4,7); Altzibar Jone M. (4,8); Pérez-Gómez Beatriz (4,9); Pollán Marina (4,9); Llorca Javier (4,6); Bustamante Mariona (1,3,4,10); Kogevinas Manolis (1,2,3,4)

Affiliations: (1) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain; (2) IMIM (Hospital del Mar Medical Research Institute), Barcelona, Spain; (3) Universitat Pompeu Fabra (UPF), Barcelona, Spain; (4) CIBER Epidemiología y Salud Pública (CIBERESP), Madrid, Spain; (5) Catalan Institute of Oncology, Hospitalet, Spain; (6) Universidad de Cantabria, Spain; (7) Instituto de Salud Pública de Navarra, Pamplona, Spain; (8) Public Health Division of Gipuzkoa, Biodonostia Research Institute, San Sebastian, Spain; (9) Centro Nacional de Epidemiología-Instituto de Salud Carlos III, Madrid, Spain; (10) Genomics and Disease, Center for Genomic Regulation (CRG), Barcelona, Spain

Text:

Background: Epidemiological studies on shift work have shown an association between night shift work and breast cancer while less evidence is available for prostate and colorectal cancer. There is some evidence on genetic susceptibility and gene-environment interactions with genes in circadian pathways in relation to breast cancer. We explored in a joint analysis the role of circadian gene polymorphisms and night shift work in relation to risk of breast, prostate and colorectal cancer in a population-based study in Spain (MCC-Spain study).

Methods: We analyzed 2928 cases (1118 colorectal, 1001 breast and 809 prostate) and 2550 population controls in 10 areas of Spain. We assessed exposure to ever night shift work through lifetime occupational histories. We evaluated 293 SNPs from 24 genes involved in circadian rhythm regulation and melatonin metabolism. We analyzed marginal shift work effects using unconditional logistic regression analysis adjusting for potential confounders. We examined gene-environment (GxE) interactions testing simultaneously the main effect and the GxE interaction (2 degrees of freedom test). We also performed a gene-based test using VEGAS (versatile gene-based association study).

Results: Twenty-two% of controls and 24% of cases had ever worked in permanent or rotating night shift for ≥ 1 year. Having ever worked for more than a year as a night shift worker was associated with an increased cancer risk (OR=1.15, 95%CI 1.01-1.31). We found significant main effects for 3 SNPs in TPH2 after correction for multiple testing (Benjamini-Hochberg), the corrected p-value for the gene-based test was also significant ($p=0.024$). Other nominal associations were observed. Some SNPs showed statistical nominal interactions in genes such as NPAS, PER2, NQO2, CYP2C19, TPH1 and TPH2. For breast cancer, we also found a significant interaction after multiple testing correction for 1 SNP in NQO2 ($p=0.012$).

Conclusions: In this large population-based study we found a marginal increased cancer risk in shift workers. We also observed some suggestive interactions between circadian genes and night shift work on cancer risk.

Abstract ID: 144

Title: Exposures and health outcomes in relation to bioaerosol emissions from composting facilities: A systematic review of occupational and community studies

Presenting Author: Douglas, P

Authors: Douglas, Philippa (1); Pearson, Clare (1); Littlewood, Emma (1); Robertson, Sarah (2); Gant, Timothy W (2); Hansell, Anna L (1, 3)

Affiliations: (1) Small Area Health Statistics Unit, MRC-PHE Centre for Environment and Health, and NIHR HPRU in Health Impact of Environmental Hazards, Imperial College London, London, UK (2) Centre for Radiation, Chemical and Environmental Hazards, Public Health England, Harwell Campus, Didcot, Oxfordshire, UK (3) Public Health and Primary Care, Imperial College Healthcare NHS Trust, London, UK

Text:

Background and aims: EU directives restricting the use of landfills is increasing the number of composting facilities in the UK. Composting yields bioaerosols, which have the potential to harm human health. The aim of this study was to complete a systematic review of occupational and community studies that have compiled results examining exposure and/or health effects of bioaerosol emissions from composting plants.

Methods: A literature search was conducted across 6 electronic databases. Studies published in English between January 1960 and July 2014 that concerned exposures and health effects of bioaerosols emitted from composting facilities were included. Exposure data and/or health effects estimates were extracted and studies examined for risk of bias.

Results: 536 papers were identified, 124 were duplicates, 286 papers were excluded after screening the title/abstract, and 60 excluded after assessing the full paper. 66 articles were included; 9 health studies (7 occupational, 2 community), 48 exposure studies (38 occupational, 4 community, 6 with both) and 9 health and exposure studies (5 occupational, 4 community). In the exposure studies, measurements were highly variable, but significantly higher concentrations of bioaerosols were detected during agitation activities. Studies concerning health generally reported upper respiratory symptoms. Study designs were mainly cross-sectional with only one cohort study. Sample sizes were generally low and many studies were at high risk of response bias.

Conclusions: Health and exposure data for composting remains limited and there is little insight into potential long-term effects. More longitudinal studies are needed including longer-term personal and community exposure monitoring.

Abstract ID: 145

Title: Association between dust storms and respiratory medications purchases among patients with Chronic Obstructive Pulmonary Disease

Presenting Author: Vodonos, A

Authors: A. Vodonos^{1,2}, M. Friger¹, L. Anvon³, I. Katra⁴, V. Novack²

Affiliations: 1Department of Public Health, Faculty of Health Sciences, Ben-Gurion University of the Negev 2Clinical Research Center, Soroka University Medical Center and Faculty of Health Sciences, Ben-Gurion University 3 Soroka University Medical Center 4Department of Geography and Environmental Development, Ben-Gurion University of the Negev

Text:

Background and aims Dust storms (DS) have been associated with exacerbations of COPD. Previous analyses relying on the hospitalization data could underestimate the incidence of the mild to moderate events not requiring hospitalization. The prevalent clinical approach in management of patients with acute exacerbation of COPD is to administer either systemic or inhaled steroids and bronchodilators. We investigated whether there is an association between DS and increased purchases of medications both for long and short-term therapy.

Methods Negev region is located in the margins of the dust belt providing ideal conditions for analyzing the effect of DS on health outcomes. Environmental data obtained from the monitoring station. DS day was defined as a day with a PM₁₀ concentration that was two standard deviations above the background value. We used medications dispensing data for Clalit Health Services (CHS) adults (insuring 70% of the region population) during 2001–2011. Medications were divided into Systemic Steroid Course (SS), short and long-term inhaled form medications. We utilized the case-crossover approach to data analysis.

Results We identified 6393 COPD patients purchasing SS, 5418 short and 3485 long-term inhaled medications. Over 50% of the patients were above the age of 65, 44% were women. Increased purchases of SS was shown 3-5 days after the DS day, (OR=1.026, 95%CI 1.001-1.052), (OR=1.048, 95%CI 1.022-1.074) while increased purchase of inhaled-form medications was shown 4-7 after the DS day (OR= 1.020, 95%CI 1.001-1.039), (OR=1.022, 95%CI 1.003-1.040) and (OR=1.036, 95%CI 1.0017-1.055). Older (above the age of 65) or female patients were at higher risk for increased purchases of inhaled form medications 4-6 days after the DS.

Conclusions Exposure to non-anthropogenic particulate matter (DS) is associated with pulmonary morbidity. We found a delayed effect on increased medications purchases following DS. Furthermore, women and older patients are particularly vulnerable groups to dust exposure.

Abstract ID: 146

Title: Adverse weather events and road traffic injuries.

Presenting Author: Scortichini, M

Authors: Scortichini Matteo (1), Farchi Sara (1), de'Donato Francesca K (1), Paola Michelozzi (1)

Affiliation: (1) Department of Epidemiology, Lazio Regional Health Service

Text:

Background and aims: Previous studies have shown there is a strong relation between rainfall and road traffic injuries, but there is less evidence on the effect of extreme temperatures, especially heat. The aim of this study is to assess the association between adverse weather events and road traffic injuries.

Methods: A time series analysis was conducted to evaluate the effect of rainfall and temperature on road traffic injuries in the city of Rome in the period 2003-2008. The study included all Emergency room visits for trauma of residents of age 15 to 64, for which "road" was recorded as the location of the trauma. Mean daily temperature was modeled with a spline, while rainfall was considered both as dichotomic and continuous (daily mean mm). Exposures were fitted together in the model, in order to control for each other. Confounders included were day of week, holidays and a long time trend.

Results: 249941 ED visits (daily mean of 114) were observed in the study period. The risk of road traffic injuries raised of 8.5% (CI: 7.9 – 9.2) in days of rain, while an increment of 1mm of rainfall was associated with a 2.0% (CI:1.2 – 2.6) higher risk. Effect of temperature was smaller, but significant. The risk raised of 0.68% (CI:0.56 – 0.72) for 1 °C increment of temperature over the threshold of 25 °C, while cold had a slightly higher effect, 0.92% (CI: 0.74 – 1.12) for a 1°C reduction under the 5°C threshold.

Conclusions: The occurrence of road traffic injuries is related to adverse weather events. Not only rainfall, but also extreme temperatures raised the risk of an accident. These findings are relevant in order to design preventive measures, especially considering this adverse health outcome especially involves young population.

Abstract ID: 147

Title: Research of The Possible Effects of Health Employees' Physical Activity Level on Their Life Quality In A Training and Research Hospital

Presenting Author: Alparslan, M

Authors: Kurklu, Sercan (1); Babayigit, Mustafa Alparslan (1); Oysul, Guven (1), Aktas Mavili, Aliye (2)

Affiliations: (1) Gulhane Military Medical Academy, Department of Public Health, Ankara, Turkey; (2) Selcuk University, Faculty of Health Sciences, Department of Social Services, Ankara ,Turkey

Text:

Background and aims: This research aimed to determine the effects of physical activity levels on their quality of life among health employees.

Methods: The research population of this descriptive study included physicians, allied health personnel, and administrative staff, who work in Gulhane Military Medical Academy Training and Research Hospital. One hundred and twenty employees who had not chronic illness was the sampling group of this study. Thirty personnel who had high scores from International Physical Activity Questionnaire was selected as high physical activity group. Ninety personnel who had similar socio-demographic features and work in the same departments compared other group was selected as low physical activity group. In order to determine the physical activity levels of health employees, short form of the International Physical Activity Questionnaire (IPAQ) was used. SF-36 quality of life scale was performed to evaluate the quality of life of the employees.

Results: Except marital status, there was no statistically significant differences between study groups in terms of sex, age, weight, height, BMI, duration of residence, education and occupation. There were statistically significant differences between study group in subscales of SF-36, physical functioning, role limitations due to physical health, general health role limitations due to emotional problems, social functioning, total physical health score and total mental health score. According to the results this study, it has been determined that physical activity affects the quality of life of health professionals positively.

Conclusions: Physical activity facilities and awareness health professionals should be improved.

Abstract ID: 148

Title: Source-specific traffic noise exposure and cardiovascular mortality in Switzerland

Presenting Author: Héritier, H

Authors: Héritier, Harris (1,2), Vienneau, Danielle (1,2), Foraster, Maria (1,2), Brink, Mark (3), Cajochen, Christian (4,2), Eze, Ikenna C. (1,2), Köpfli, Micha (5), Wunderli, Jean-Marc (6), Probst-Hensch, Nicole (1,2), Röösli, Martin (1,2)

Affiliations: (1) Swiss Tropical and Public Health Institute, Basel, Switzerland (2) University of Basel, Basel, Switzerland(3) Federal Office for the Environment, Bern, Switzerland(4) Centre for Chronobiology, Psychiatric Hospital of the University of Basel, Switzerland(5) n-Sphere AG, Zürich, Switzerland(6) Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

Text:

Background: It is unclear which noise exposure patterns (degree of intermittence of noise events, diurnal distributions) are most detrimental for health. One aim of SiRENE (Short and Long Term Effects of Traffic Noise Exposure) is to investigate the association between source-specific noise (road, rail and air traffic) exposure and cardiovascular mortality in the Swiss population.

Methods: Besides calculating average noise levels SiRENE's nationwide assessment of noise exposure includes a novel acoustical parameter to quantify transportation noise intermittency – 'Intermittency ratio' which is a measure of event-based sound intensity. Exposure for year 2001, estimated at façade points for all buildings in Switzerland, is linked by dwelling unit and floor to each record of the Swiss National Cohort (SNC). The SNC is a near-complete population cohort, based on a probabilistic linkage between the censuses and mortality records. We use Cox proportional hazards models with age as the underlying timescale and adjusting for various confounders to investigate the association between noise exposure and mortality from cardiovascular endpoints from the year 2000 to 2008.

Results: Adjusted hazard ratio for a 10dB increase of road traffic noise at the loudest side of the building was 1.05 (95% CI: 1.05; 1.06) for all cardiovascular diseases, 1.06 (95% CI: 1.05; 1.07) for ischemic heart diseases, 1.04 (95% CI: 1.02; 1.06) for stroke and 1.09 (95% CI: 1.06; 1.11) for blood pressure related causes of death.

Conclusions: These are preliminary results which will be complemented with an evaluation of additional noise exposure metrics in a next step.

Abstract ID: 149

Title: Environmental exposure to β -hexachlorocyclohexane is associated with higher systolic blood pressure among people living close to an industrial area.

Presenting Author: Narduzzi, S

Authors: Narduzzi, Silvia (1); Porta, Daniela (1); Bruno, Rosa Maria (2); Di Lascio, Nicole (2); Faita, Francesco (2); Sicari, Rosa (2); Fantini, Fiorella (3); Blasetti, Francesco (3); Pagliei, Mario (4); Rantakokko, Panu (5); Kiviranta, Hannu (5); and Forastiere, Francesco (1)

Affiliations: (1) Department of Epidemiology, Lazio Regional Health Service, Rome, Italy (2) Institute of Clinical Physiology – CNR, Pisa, Italy(3) Department of Prevention, Local Health Unit Roma G, Colleferro, Italy(4) Department of Emergency and admission, Local Health Unit Roma G, Colleferro, Italy, former director(5) Department of Health Protection, National Institute for Health and Welfare, Kuopio, Finland

Text:

Background and aims: Human exposure to persistent organic pollutants has been associated to a variety of adverse health effects, including blood pressure. Health consequences of exposure to β -hexachlorocyclohexane (β -HCH), a lipophilic byproduct of lindane, might include cardiovascular alterations. The aim of this study is to evaluate the relationship between β -HCH serum concentrations and blood pressure (BP) among residents within 1 km of the Sacco river (Lazio, Italy), close to a chemical plant responsible for soil and water contamination.

Methods: A cross-sectional study included a face-to-face interview, a blood test and BP measurements; β -HCH levels were measured in serum. Linear regression analyses were used to study the association between β -HCH (continuous for 1 ng/mL volume and in quartiles) and BP, adjusting for gender, age, BMI, smoking habit, BP lowering drugs (BPLD) use, lipids. Sensitivity analyses were performed to account for BPLD effect, assuming that the underlying BP in the medicated participants is equal or higher than the measured value under medication.

Results: A total of 599 individuals completed the examinations. They were 5-91 years old, 20% had hypertension, their mean (SD) systolic/diastolic BP was 124/78 (18/11) mmHg, 23% were treated with BPLD, 20% were smokers and their mean BMI was 28 kg/m². The median β -HCH serum concentration was 71 ng/g lipids. Serum β -HCH was positively associated with systolic BP (β Coefcrude: 5.58, 95%CI: 3.76-7.44; β Coefadj: 1.61, 95%CI: 0.01-3.21) but not with diastolic BP. The association with systolic BP was stronger among people not taking anti-hypertensive drugs (β Coefadj: 1.80, 95%CI: 0.11-3.50). The effect of β -HCH effect on systolic BP was non-linear (β Coeff β -HCH₂₅₋₅₀pct: -1.33, 95%CI: -4.83-2.18; β Coeff β -HCH₅₀₋₇₅pct: 3.29, 95%CI: -0.62-7.21; β Coeff β -HCH_{>75}pct: 4.72, 95%CI: 0.46-8.98).

Conclusions: The results from this study suggest that environmental exposure to β -HCH increases the risk of having higher systolic BP values. This is a novel finding for this organochloride pollutant.

Abstract ID: 150

Title: Risk of depression among first and second generation immigrants in Luxembourg

Presenting Author: Ruiz-Castell, M

Authors: Ruiz-Castell, Maria (1); Stranges, Saverio (1)

Affiliations: (1) Centre d'Etudes en Santé Publique, Luxembourg Institute of Health (LIH), Strassen, Luxembourg

Text:

Background and aims: One particularity of Luxembourg is its cultural diversity (approx. 44% of inhabitants are from other nationalities, namely Portuguese (16.2%). The aim is to assess whether first generation immigrants are at higher risk of depression compared to non-immigrants and second generation immigrants.

Methods: Cross-sectional data on 1,506 residents of Luxembourg were collected from the Luxembourg European Health Survey (EHES-LUX). Risk of depression was measured using The Patient Health Questionnaire for depression (PHQ-9). First and second generation immigration status classification was created based on information about participants country of birth. Logistic regressions were used to examine the association between depression and immigration status. Models were adjusted for age, sex, social support, socioeconomic characteristics and alcohol use.

Results: The prevalence of depressive symptoms in the Luxembourgish population was 24.00%. Differences were observed between non-immigrants (20.33%), first generation immigrants (24.68 %) and second generation (30.45 %) with significantly higher prevalence observed in second generation immigrants ($P < 0.001$). The odds of having depression was significantly higher among second generation immigrants (OR: 1.69, 95% CI: 1.16-2.47) compared to non-immigrants and first generation immigrants independently of socioeconomic disadvantages and behavioral characteristics.

Conclusions: Social programs of health promotion should be addressed to improve mental wellbeing in immigrants, especially in second generation immigrants.

Abstract ID: 151

Title: Environmental exposure to pesticides and risk of Parkinson's Disease in the Netherlands

Presenting Author: Brouwer, M

Authors: Maartje Brouwer (1), Anke Huss (1), Marianne van der Mark (1), Peter Nijssen (2), Wim Mulleners (3), Antoinetta Sas (4), Teus van Laar (5), Geert de Snoo (6), Roel Vermeulen (1,7)* and Hans Kromhout (1)* * shared last authorship

Affiliations: (1) Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, Utrecht, the Netherlands; (2) St. Elisabeth Hospital, Tilburg, the Netherlands; (3) Canisius-Wilhelmina Hospital, Nijmegen, the Netherlands; (4) Vlietland Hospital, Schiedam, the Netherlands; (5) University Medical Center, Groningen, the Netherlands; (6) Institute of Environmental Sciences, Leiden University, Leiden, the Netherlands; (7) Julius Centre for Public Health Sciences and Primary Care, Utrecht University Medical Centre, Utrecht, the Netherlands

Text:

Background: Exposure to pesticides has been associated with increased risk of Parkinson Disease (PD), but it remains unclear which pesticides account for this association. We developed a spatio-temporal model to estimate environmental exposure to individual pesticides in the Netherlands, based on agricultural land-use data and expert-based assessment of historical pesticide use. We investigated the association between residential proximity to crops, environmental exposure to a number of a priori selected pesticides, and the risk of PD, in a large hospital based case-control study.

Methods: From 2006 to 2011, 438 PD patients and 856 individually matched controls were enrolled in 5 hospitals in the Netherlands. A complete residential history was collected, as were data on potential confounders. Acreages of six main crops were determined around the residential address using predefined buffers (0-50m, >50-100m, >100-500m and >500-1000m), for each residence and time-period. Employing our model, we assigned exposure to pesticides. Associations with PD risk were investigated using conditional logistic regression adjusting for potential confounders.

Results: Preliminary results are indicative of an association between proximity to orchards and bulbs fields and risk of PD (ever lived within 50m, OR 2.14, 95%CI 0.86-5.30, and OR 1.69, 95%CI 0.23-12.35, respectively). In line, for pesticides predominantly used in orchards (e.g. captan, carbaryl), we observed a slightly increased risk of PD. These findings were not statistically significant and based on few exposed cases. Effect estimates were attenuated with increasing distance. No association between proximity to arable crops and risk of PD was found.

Conclusions: We found some indication for an association between residential proximity to orchards or bulbs fields, and risk of PD in these preliminary analyses. For the preselected pesticides results remained inconclusive. We will further investigate the potential effect of combined pesticide exposures and timing of exposure on the risk of PD in this case-control study.

Abstract ID: 152

Title: A SYSTEMATIC COMPARISON OF REGRESSION-BASED STATISTICAL METHODS TO ASSESS THE EXPOSOME-HEALTH ASSOCIATION

Presenting Author: Agier, L

Authors: Agier, Lydiane (1); Portengen, Lützen (2); Portengen, Lützen (2); Chadeau-Hyam, Marc (3); Basagaña, Xavier (4); Giorgis-Allemand, Lise (1); Siroux, Valérie (1); Robinson, Oliver (4); Vlaanderen, Jelle (2); González, Juan R. (4); Nieuwenhuijsen, Mark (4); Vineis, Paolo (3); Vrijheid, Martine(4); Slama, Rémy (1); Vermeulen, Roel (2)

Affiliations: (1) Team of Environmental Epidemiology applied to Reproduction and Respiratory Health, Inserm and Univ. Grenoble-Alpes, U823 Joint Research Center, Grenoble, France (2) Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands (3) Department of Epidemiology and Biostatistics, MRC-PHE Centre for Environment and Health, School of Public Health, Imperial College London, Norfolk Place, London, W2 1PG, United Kingdom (4)Center for Research in Environmental Epidemiology (CREAL), Barcelona, Spain

Text:

Background and aims: We compared the performances of several regression-based statistical methods in assessing the exposome-health association. From the results of the simulation study, we developed a protocol for the analyses of the relations between the Exposome and health in Helix project.

Methods: In a simulation study, we generated 237 exposure covariates with a realistic correlation structure, and a health outcome related to 0 to 10 of these covariates through a linear regression model. Models were compared in terms of false discovery proportion (FDP) and sensitivity; we also used alternative definitions of FDP and sensitivity taking into account the correlation between variables selected by models and true predictors.

Results: The elastic net, sparse partial least-squares regression, Graphical Unit Evolutionary Stochastic Search (GUESS) Bayesian variable selection model, and the deletion/substitution/addition algorithm showed on average over all simulation settings a sensitivity of 78% and a FDP of 37%, with minor differences between methods. The environment-wide association study (EWAS) underperformed these methods in terms of FDP (68% on average) and bias, with a higher sensitivity. On average over all methods but EWAS, alternative sensitivity and FDP were 95% and 11%, respectively.

Conclusions: Correlation between exposures is a challenge for exposome research, even when covariates are considered separately. Purely statistical approaches are limited in their ability to efficiently differentiate true predictors from correlated covariates. Our alternative definitions of sensitivity and FDP could be insightful for further model investigations.

Abstract ID: 153

Title: Placental DNA Methylation is associated with birth weight and maternal smoking: an epigenome-wide association study

Presenting Author: Lepeule, J

Authors: Johanna LEPEULE^{1,2}, Emilie ABRAHAM^{1,2}, Lise GIORGIS-ALLEMAND^{1,2}, Jorg TOST³, Daniel VAIMAN⁴, Barbara HEUDE⁵, Anne FORHAN⁵, Marie-Aline CHARLES^{5,6}, Rémy SLAMA^{1,2} and the EDEN study group

Affiliations: 1: Inserm, Institut Albert Bonniot (U823), Team of Environmental Epidemiology applied to Reproduction and Respiratory Health, Grenoble, France. 2: University J. Fourier Grenoble, Grenoble, France. 3: Laboratory for Epigenetics and Environment, Centre National de Génotypage, CEA – Institut de Génomique, Evry, France. 4: Genomics, Epigenetics and Physiopathology of Reproduction, Institut Cochin (U1016), Inserm, Paris. 5: Inserm, UMR1153 Epidemiology and Biostatistics Sorbonne Paris Cité Center (CRESS), Team “Early origin of the child’s health and development” (ORCHAD), Paris, F-75014 France; Paris Descartes University France. 6: Inserm and INED Joint Research Group, PARIS, and Inserm (U1018), CESP, Villejuif, France.

Text:

Background and aims: Epigenetics has been suggested to be involved in the association between early-life environment, birth developmental indicators and future health. We examined the association of placental methylation in 426 049 CpGs with birth weight (BW) and maternal pregnancy smoking.

Methods: Among 668 pregnant women from the well-characterized EDEN mother child cohort, placenta samples were collected at delivery using a standardized protocol. DNA methylation was assayed using the Infinium HumanMethylation450 BeadChip. Using a genome-wide agnostic approach, we first fitted robust linear regression on BW using each CpG methylation level and maternal smoking (yes/no) at each trimester of pregnancy as predictors adjusted for confounders (plate, batch, chip, gestational age, sex of the child, centre of recruitment, parity, age, education and BMI of the mother). Among CpGs identified at the first step, we then fitted robust linear regression on each CpG’s methylation using maternal smoking (yes/no) at each trimester of pregnancy as predictors adjusted for the same set of confounders.

Results: Average BW was 3304 (sd=488) grams. We identified 109 CpGs below the Bonferroni significance threshold (10^{-7}) showing differential methylation in relation to BW. Out of the 109 CpGs associated with BW, 18 CpGs were significantly ($p < 0.05$) associated with maternal smoking. One of them, located in the SIKV2L region, was below the Bonferroni significance threshold (10^{-4}); Increased methylation at this CpG was associated with maternal smoking and higher BW.

Conclusions: After correction for multiple testing, we identified 1 CpG mapped to SIKV2L (related to embryogenesis and spermatogenesis) whose methylation level was positively associated to maternal smoking and BW. Our findings suggest that SIKV2L methylation is unlikely to mediate the adverse effects of maternal smoking on BW. Other CpGs might be of interest for mediation analyses.

Abstract ID: 154

Title: Mothers and young children are related, even in the urinary levels of chemicals present common consumer products

Presenting Author: Koppen, G

Authors: Gudrun Koppen (1), Eva Govarts (1), Adrian Covaci (2), Guido Vanermen (1), Marie-Christine Dewolf (3), Els Van De Mierop (4), Dominique Aerts (5), Pierre Biot (5), Greet Schoeters (1,5,6)

Affiliations: (1) Environmental Risk and Health unit, Flemish Institute for Technological Research (VITO), Mol, Belgium; (2) Toxicological Center, University of Antwerp, Belgium Faculty of Pharmaceutical, Biomedical and Veterinary Sciences, University of Antwerp, Belgium; (3) Environment and Health Risk Assessment Hainaut Vigilance Sanitaire - Hygiène Publique en Hainaut, Belgium; (4) Provincial Institute of Hygiene (PIH), Antwerp, Belgium; (5) Faculty of Pharmaceutical, Biomedical and Veterinary Sciences, University of Antwerp, Belgium (6) University of Southern Denmark, Institute of Public Health/ Department of Environmental Medicine, Odense, Denmark

Text:

Background and aims: Within 17 European countries, biomarkers of environmental pollutants were measured in harmonized way to allow a European-wide comparison (EU projects COPHES and DEMOCOPHES).

Methods: Within the Belgium DEMOCOPHES project, 129 mothers (27-45y) and their 129 children (6-11y) were recruited in the Brussels agglomeration and more rural areas. Phthalate metabolites (PMs), bisphenol A (BPA) and triclosan (TCS) were measured in first morning void urine, collected both by mother and child on the same day. Face-to-face questionnaires gathered information on major sources or life style factors.

Results: The targeted consumer products were detectable in almost all participants. Most urinary concentrations of PMs were higher in children compared to the mothers (MEHP, 5oxo-MEHP, 5OH-MEHP, MBzP, MiBP, and MnBP). Monoethyl phthalate MEP and TCS were lower in children compared to the mothers, whereas for BPA, there was no difference between the age groups. Despite the different levels among children and mothers, the concentrations of all compounds between mother and child were good correlated (Spearman rank $r = 0.28$ to 0.51 , $p < 0.01$, except for the oxidative metabolites of MEHP, $r = 0.13$ and 0.15 , $p < 0.15$ for 5oxo-MEHP and 5OH-MEHP, respectively). This indicates that exposure routes, such as diet, home environment, personal care products, are important determinants. Indeed, most compounds were linked to life style factors or home environment included in the questionnaire. For PMs, similar home and life style factors were associated with the contaminant concentrations in both age groups (PVC in home for MBzP, MiBP, MnBP; personal care products use for MiBP and MnBP).

Conclusion: Chemicals (chronically) present in daily life of a Belgium background population were easily measurable in urine. Young children' and their mothers' levels correlated well, suggesting that food consumption and home environment, which are (rather) similar among family members, most probably determined a considerable part of the exposure.

Abstract ID: 155

Title: Mutual effects of radon and UV exposure on skin cancer mortality in Switzerland

Presenting Author: Vienneau, D

Authors: Danielle Vienneau (1,2); Kees de Hoogh (1,2); Dimitri Hauri (3), Martin Rösli (1,2) for the SNC Study Group

Affiliations: (1) Swiss Tropical and Public Health Institute, Basel, Switzerland; (2) University of Basel, Basel, Switzerland; (3) Federal Statistical Office, Espace de l'Europe 10, Neuchâtel, Switzerland; (4) ImmoCompass AG, Untere Zäune 3, Zurich, Switzerland

Text:

Background and aims: Melanoma and non-melanoma skin cancer are among the most common cancers in Switzerland. In addition to exposure to ultraviolet (UV) radiation, radon attached on particles deposited on the skin has been suggested as a risk factor. In Switzerland, exposure gradients for UV and radon are considerable due, respectively, to large differences in altitude and in geology and soil type. We aimed to investigate the mutual effects of UV and radon exposure on skin cancer mortality.

Methods: We used Cox regression with age as the underlying time scale to study the association between UV and radon exposure on skin cancer mortality (ICD10: C43-44) in Swiss adults for the study period 04 Dec 2000 to 31 Dec 2008. Exposure for the study period was modelled at address-level. We used a national exposure prediction model developed and validated with the measurements from the Swiss Radon Database. A long-term UV index was modelled by linear regression using measurements of daily maximum UV index at 4 Swiss locations, 2x2km monthly global radiation grids and a 25x25m digital terrain model. Models were adjusted for sex, civil status, language, education, job position and neighbourhood socio-economic position.

Results: The study population included 4.3 million adults and ~2300 skin cancer deaths (definitive primary cause). We found no correlation between radon and long-term UV exposure ($r = -0.01$). Controlling for the alternate exposure, adjusted hazard ratios were 1.15 (95% CI: 1.06-1.26) per 100 Bq/m³ for radon and 1.38 (1.15-1.66) per increment in the UV index.

Conclusions: A better understanding of the role of the UV radiation and radon exposure for skin cancer is of high public health relevance. Our study suggests that both are risk factors for skin cancer.

Abstract ID: 156

Title: The influence of outdoor air pollution on cadmium exposure assessment: a cross-sectional population-based Italian study

Presenting Author: Filippini, T

Authors: Filippini Tommaso (1); Cherubini Andrea (2); Maffei Giuseppe (2); Greco Salvatore (2); Malagoli Carlotta (1); Malavolti Marcella (1); Sieri Sabina (3); Krogh Vittorio (3); Vescovi Luciano (4); Modenesi Marina (4); Michalke Bernhard (5); Vinceti Marco (1)

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Text:

Background and aims: Cadmium (Cd) poses serious environmental health hazards to humans. Cigarette smoking and diet are usually main sources of exposure in non-occupationally exposed subjects, while non-ferrous metal industrial production, fossil fuel combustion, cement production and waste incineration are main anthropogenic sources of outdoor air Cd. The study aim was to assess the influence of outdoor air pollution on serum Cd levels in an Italian population.

Methods: Outdoor exposure to particulate matter $\leq 10\mu\text{m}$ (PM₁₀) from motorized traffic was assessed for fifty residents randomly-selected from Modena municipality. We geocoded their residence and modeled the corresponding ambient air PM₁₀ concentration using the California LINE Source Dispersion Model version 4 (CALINE-4) as a proxy of environmental air Cd level. We compared these estimates with serum Cd, measured with inductively coupled plasma mass spectrometry. Information on smoking habits and Cd dietary intake were collected with a semi-quantitative food frequency questionnaire. We determined with both crude and multivariate linear regression models the influence of outdoor PM₁₀ levels, smoking and dietary Cd intake on serum Cd, computing β -coefficients and their 95% confidence interval (CI).

Results: Median values (25th–75th) for serum and dietary Cd were 40.60 ng/l (30.05–53.50) and 13.36 $\mu\text{g}/\text{die}$ (10.45–16.77). Crude β -coefficients for PM₁₀, dietary Cd and smoking on serum Cd levels were 0.617 (95% CI -0.194–1.428, P=0.133), 0.026 (-0.827–0.829, P=0.952) and 6.962 (-0.022–13.945, P=0.051), respectively. Adjusted values were 0.463 (-0.365–1.292, P=0.266), -0.036 (-0.866–0.793, P=0.930) and 6.057 (-1.175–13.289, P=0.099), respectively.

Conclusions: In our population, the most important factor influencing Cd serum content appears to be cigarette smoking, followed by outdoor air pollution (measured by PM₁₀ levels) and lastly diet, possibly for the limitations of dietary assessment methodology. In addition, other unmeasured factors could have influenced serum Cd content, such as a slow release from liver and kidney due to antecedent long-term exposure.

Abstract ID: 157

Title: Mapping commuter exposure to particulate matter on the London Underground

Presenting Author: Barratt, B

Authors: SMITH James D; GREEN David; BEEVERS Sean; KELLY, Frank J; BARRATT Benjamin

Affiliations: MRC-PHE Centre for Environment and Health, King's College London, London, UK

Text:

Background: The London Underground (LU) is a semi (45%) subterranean railway system that carries over 1.2 billion passengers per year. Previous research into human exposure on the LU is limited to occupational-health applications (Adams et al., 2001, Seaton et al. 2005). Personal exposure studies have highlighted the potential importance of particulate exposure on underground transport, despite the relatively short exposure periods. **Objectives:** 1) To map PM concentrations across the LU network. 2) To characterize PM chemical and physical properties. 4) To derive source specific calibration factors for optical instruments. 3) To improve understanding of relationships between PM concentrations and underground rail transit design.

Methods: We placed personal monitoring equipment in the driver's cabin, and simultaneously in the passenger's cabin, to measure black carbon, PM_{2.5} and particle number concentration across the entire network (Aethlabs microAeth, TSI Sidepak and Phillips Aerasense respectively). All stations across the network were monitored on at least two occasions. We complimented this with 'fixed site' platform monitoring with reference equipment to derive calibration factors for the portable equipment.

Results: Mapping illustrated consistently higher PM concentrations on deeper lines. Underground PM_{2.5} concentrations far exceeded ambient concentrations. Particle number concentrations were lower than typical kerbside concentrations, but higher than the urban background. Mean particle diameter was <100 nm. PM concentrations in the carriage dropped to ambient levels within a few minutes of emerging from tunnels or passing through cuttings. PM concentrations in carriages were generally higher than in those in the driver's cab due to regular carriage door opening.

Conclusions: Subterranean rail transit represents a significant component of daily PM exposure for many residents of large cities, including sensitive populations. Further questions remain about the relative toxicity of underground dust, the health relevance of short severe PM exposures and how we are to deal with difficult/conflicting public transport messages.

Abstract ID: 158

Title: Incorporating travel and other microenvironments into population-level exposure estimates
- Results from London

Presenting Author: Smith, JD

Authors: James David Smith, Benjamin Barratt, Heather Walton, Christina Mitsakou, Nutthida Kitwiroon, Frank Kelly and Sean Beevers

Affiliations: MRC-PHE Centre for Environment and Health, King's College London

Text:

Background and aims: Studies using epidemiological methods find health issues linked to air pollution including respiratory problems, cardio-vascular issues and cancer. Exposure to pollutants is typically assigned using annual average values at a coarse spatial scale e.g. area of residence ('static' method). However pollutant concentrations vary daily and hourly. Also subjects spend much of their time away from the home. Our primary objective was to use a large Transport for London dataset to model people's movements and produce more detailed exposure estimates on an individual and population-wide level.

Methods: We processed origin and destination journey data using routing APIs to recreate subjects' days over 24 hours on a minute-by-minute basis (timestamp, latitude, longitude, and microenvironment). We combined this with a UK-wide 20m x 20m CMAQ-Urban model of weekday/Saturday/Sunday diurnal profiles of PM_{2.5} and NO_x concentrations. We linked each subject to pollutant concentrations using their location and the time, and then we used mass-balance equations and indoor/outdoor ratios to model individuals' microenvironments.

Results: Using the LHEM average exposure is found to be 37% and 61% lower than when using address-point estimates, for PM_{2.5} and NO_x (NO+NO₂), respectively. The distribution of PM_{2.5} exposures from the LHEM is larger than the equivalent exposure at the residential address (6.02 µg m⁻³ to 32.24 µg m⁻³ for LHEM compared to 11.16 µg m⁻³ to 20.01 µg m⁻³ for address-point). However for NO_x the distribution is smaller (4.93 µg m⁻³ to 136.26 µg m⁻³ for LHEM compared to 20.09 µg m⁻³ to 180.51 µg m⁻³ for address-point).

Conclusions: The LHEM suggests that air quality epidemiological studies that do not include population movements and micro-environmental modelling may be assigning exposure incorrectly. Using this model we can now better understand and quantify the complexity of exposure in the urban environment.

Abstract ID: 159

Title: A life course approach to explore circulating inflammatory imprints of socio-economic position and mobility.

Presenting Author: Castagné, R

Authors: Castagné, Raphaële (1,2); Delpierre Cyrille (2); Kelly-Irving, Michelle (2); Campanella, Gianluca (1); Guida, Florence (1); Krogh, Vittorio (3); Palli, Domenico(4); Panico, Salvatore (5); Sacerdote, Carlotta (6); Tumino, Rosario (7); Kyrtopoulos, Soterios (8); Saberi Hosnijeh, Fatemeh (9); Lang, Thierry(2); Vermeulen, Roel (1, 9); Vineis, Paolo (1, 10,11); Stringhini, Silvia (12); Chadeau-Hyam, Marc (1, 9, 11) on behalf of the EnviroGenoMarkers project.

Affiliations: (1) Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London, London, UK (2) INSERM, UMR1027, F-31000 Toulouse, France(3) Fondazione IRCCS- Istituto Nazionale dei Tumori, Milan, Italy(4) Istituto per lo Studio e la Prevenzione Oncologica (ISPO Toscana), Florence, Italy(5) Department of Clinical Medicine and Surgery, University of Naples Federico II, Naples, Italy(6) Piedmont Reference Centre for Epidemiology and Cancer Prevention (CPO Piemonte), Turin, Italy(7) Cancer registry and Histopathology Unit, Azienda Ospedaliera 'Civile -M.P.Arezzo', Ragusa, Italy(8) National Hellenic Research Foundation, Institute of Biology, Pharmaceutical Chemistry and Biotechnology, Athens, Greece(9) Institute for Risk Assessment, Division of Environmental Epidemiology, Utrecht University, Utrecht, the Netherlands(10) HuGeF, Human Genetics Foundation, Torino, Italy(11) MRC-PHE Centre for Environment and Health, Imperial College, London, London, UK(12) Institute of Social and Preventive Medicine, Lausanne University Hospital, Lausanne, Switzerland

Text:

Background and aims: Lower socioeconomic position (SEP) has consistently been associated with poorer health, but the moment(s) in life SEP-related health disparities emerge remain unclear. To explore potential biological imprints and consequences of SEP experiences, we investigate the relationships between (combinations of) immune markers and SEP indicators in a life course context.

Methods: Using blood-derived cytokine profiles measured by a multiplex array in 268 participants from the Italian component of the European Prospective Investigation into Cancer and Nutrition cohort (EPIC-Italy), we evaluated the association of early life, young adulthood and later adulthood SEP with 28 markers of inflammation which were examined either separately or through summary inflammatory scores, to assess their joint discriminatory performances with respect to SEP indicators and trajectories.

Results: We identified increased inflammation burden in participants whose father had a manual occupation through increased plasma levels of CSF3 (G-CSF; $\beta=0.29$; $P=0.002$), and increased inflammatory score ($\beta = 1.96$; $P=0.029$). While not directly associated to inflammatory status, participant's education was found significantly associated after adjusting on father occupational position ($\beta = -2.22$; $P=0.024$). The social mobility as modelled by the interaction between paternal occupation and own-education revealed a significant difference between "Non Manual-Highly Educated" and "Manual-Highly Educated" ($\beta =3.51$, $P= 0.008$).

Conclusions: Low socio-economic position in childhood is associated with modest increment in adult inflammatory burden; however, the analysis of social trajectories suggests a stronger effect of an ascendant SEP trajectory (low paternal SEP, and higher own adult SEP) on inflammatory score.

Abstract ID: 160

Title: Secondary School Cohort Study of Mobile Phone Use and Neurocognitive and Behavioural Outcomes: Bio-sampling Pilot

Presenting Author: Chang, I

Authors: Chang, Irene (1); Knowles, Gemma (1); Fleming, Charlotte (1); Dove, Rosamund (2); Mudway, Ian (2); Elliot, Paul (1); Dumontheil, Iroise (3); Thomas, Michael (3); Röösl, Martin (4); Toledano, Mireille (1).

Affiliations: (1) MRC-PHE Centre for Environment and Health, Department of Epidemiology and Biostatistics, Imperial College London, London, UK; (2) Analytical & Environmental Sciences Division, Health Protection Research Unit in Health Impacts of Environmental Hazards, King's College London, London, UK; (3) Department of Psychological Sciences, Birkbeck University, London, UK; (4) Department of Epidemiology and Public Health, Swiss TPH, Basel, Switzerland

Text:

Background and aims: The Study of Cognition, Adolescents and Mobile Phones (SCAMP) is a 3-year secondary school-based cohort study which aims to investigate whether exposure to radiofrequency (RF) fields from children's use of mobile phones and other wireless technologies is associated with their neurocognitive and behavioural development. Data on mobile phone use, cognitive function, behaviour and potential confounding factors are collected from pupils via a school-based computerised assessment and from optional home-based pupil and parent online questionnaires at baseline and follow-up. Parents are also asked to provide permission for their child's SCAMP assessment data to be linked with their child's mobile traffic, health and educational data. To enhance questionnaire-based information and provide additional accurate information about potential confounders such as puberty, stress and environmental smoke exposure, a pilot study to collect non-invasive biological samples (urine and saliva) and anthropometric measurements was conducted with Year 7 pupils at a participating SCAMP school.

Methods: The pilot study assessed response rates and acceptability of three collection methods (fully school-based, fully home-based, half home-/school-based). Year 7 households were posted an information pack and received a reminder email. Due to poor response rates from both home-based options, school-based collection was carried out for all pupils.

Results: Of the 144 Year 7 students, 9 (6%) were absent, 9 (6%) were opted out by their parents and 26 (18%) did not give assent on the day. A total of 100 saliva and 81 urine samples were collected, representing a 79% and 64% assent rate among children, respectively.

Conclusions: School-based bio-sample collection was feasible and acceptable to the school, parents and pupils. Results from this pilot study informed the protocol for additional bio-sample collections, which are currently ongoing.

Abstract ID: 161

Title: Un safe use of Pesticides: a cross-sectional study on Knowledge Attitude and Practice of farm workers in three farm types in Ethiopia.

Presenting Author: Mormeta, B

Authors: Mormeta, Beyene (1, 2); Mekonnen, Yalemshay (3); Roel, Vermeulen (1); Hans, Kromhout (1)

Affiliations: 1. Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, Utrecht, the Netherlands. 2. Pesticide Risk Reduction Project-Ethiopia, Federal Ministry of Agriculture, Addis Ababa, Ethiopia. 3. Microbial, Cellular & Molecular Biology Department, Collage of Natural & Computational Sciences, Addis Ababa University, Addis Ababa, Ethiopia.

Text:

Background and aims: Many chemical pesticides are intensively used in fast changing agricultural sector of Ethiopia. We studied pesticide related knowledge attitude and practice in a cross-sectional study in three farm types (large scale closed/green houses, large scale open and small scale irrigated) in Ethiopia.

Methods: The study included a total of 601 farmer and farm workers who were surveyed using a pre-tested structured questionnaire. Descriptive statistics were used to analyze and interpret the collected data.

Results: Out of the surveyed subjects; 15% did know the most important route of occupational pesticide exposure; 85% did not attain any pesticide related training; 81% were not aware of modern alternatives to chemical pesticide; 10% employ complete personal protective equipments; 62 % do not usually bath after work. Though it was negligible, better attendance of training, employment of protective measures and hygienic practices were seen in large scale closed farms and pesticide applicators but were worst in the case of small scale irrigated farms and re-entry workers. Large scale close and open farms usually store pesticides in a locked storage but 6 % of the small scale farmers and farm workers, store pesticides in a locked container. Empty pesticides containers were properly smashed and incinerated regularly in large scale closed farms but collected in one place and buried in large scale open farms whereas 75% of farmers and farm workers in small scale farms threw empty containers in farming fields.

Conclusions: The study showed that knowledge regarding hazards, work practices and hygiene measures to reduce exposure was limited resulting in widespread occupational and environmental risks. Training on safe handling and management of pesticides, implementation of occupational safety measures and extension of integrated pest management that takes in account institutional difference between various farm types in Ethiopia is urgently needed.

Abstract ID: 162

Title: A method for semi-quantitative assessment of exposure to pesticides in three farm types in Ethiopia

Presenting Author: Mormeta, B

Authors: Mormeta, Beyene (1, 2); Mekonnen, Yalemshay (3); Roel, Vermeulen (1); Hans, Kromhout (1)

Affiliations: 1. Division of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, Utrecht, the Netherlands. 2. Pesticide Risk Reduction Project-Ethiopia, Federal Ministry of Agriculture, Addis Ababa, Ethiopia. 3. Microbial, Cellular & Molecular Biology Department, College of Natural & Computational Sciences, Addis Ababa University, Addis Ababa, Ethiopia

Text:

Background and aims: Occupational pesticides exposure is associated with diverse acute and chronic health effects. An inexpensive and easily adapted exposure assessment method was developed to describe exposure to pesticides in diverse farm types of a resource constraint country like Ethiopia.

Methods: Data on pesticide exposure and related factors were collected from 601 farm workers, of whom 256 were applicators and 345 were re-entry workers, using a pre-tested structured questionnaire. The farm workers were selected from small scale irrigated farms, large scale green houses and open farms. Two separate exposure estimation algorithms were developed for applicators and re-entry workers. Exposure weights were developed for each exposure modifying factor based on survey data, previously published studies and expert judgments. Based on individual reports we derived a semi-quantitative exposure score based on the algorithms and duration of work. Analysis-of-Variance (ANOVA) and t-tests, using the log-transformed cumulative exposure estimates, were performed to investigate whether any significant differences in mean values of cumulative exposure between different farm types, male applicators and male and female re-entry farm workers exists. In all the analyses $p < 0.05$ was considered statistically significant.

Results: Estimated Mean Cumulative Exposure (MCE) values showed statically significant differences across farm types for male applicators and female re-entry workers ($p < 0.05$) but not for male re-entry workers ($p = 0.91$). Estimated MCE value was higher among female than male re-entry workers, but this difference was not statically significant ($t = 1.56$, $p = 0.11$). In all exposure groups an increasing trend of estimated MCE values was shown with increasing age groups.

Conclusions: We developed a method for semi-quantitative estimation of occupational pesticide exposure using previously published exposure algorithms. A field survey showed that farmers and farm workers' exposure to pesticides can be easily and inexpensively ranked and that these showed face-validity. These estimates will be used in ongoing epidemiological studies in Ethiopia on the health effects of pesticides.

Abstract ID: 163

Title: Secondary School Cohort Study of Mobile Phone Use and Neurocognitive and Behavioural Outcomes: preliminary baseline exposure patterns

Presenting Author: Knowles, G

Authors: Knowles, Gemma (1); Chang, Irene (1); Fleming, Charlotte (1); Elliot, Paul (1); Dumontheil, Iroise (2); Thomas, Michael (2); Rösli, Martin (3); Toledano, Mireille (1).

Affiliations: (1) MRC-PHE Centre for Environment and Health, Department of Epidemiology and Biostatistics, Imperial College London, London, UK; (2) Department of Psychological Sciences, Birkbeck University, London, UK; (3) Department of Epidemiology and Public Health, Swiss TPH, Basel, Switzerland

Text:

Background and aims: The Study of Cognition, Adolescents and Mobile Phones (SCAMP) is a longitudinal secondary school-based cohort study which aims to investigate whether children's use of mobile phones and wireless technologies affects their neurocognitive or behavioural development. Specifically, SCAMP will investigate whether any observed associations are due to exposure to radiofrequency fields from phones, all radiofrequency sources, or from 'brain-training' that may occur from frequent use of these technologies.

Methods: Data on mobile phone use, cognitive function, behaviour and potential confounding factors are collected from pupils via a school-based computerised assessment and from optional home-based pupil and parent online questionnaires at baseline and follow-up. Parents are also invited to provide permission for their child's SCAMP assessment data to be linked with their child's mobile traffic, health and educational data.

Results: To date, baseline data from the computerised assessment are available for 4364 children (aged 11-12 years; 46% male; 40% White, 16% South Asian, 14% Black) from 28 schools (15 state and 13 independent) in London, UK. Preliminary analyses of these data show that 3568 children (82%) own a mobile phone and, of these, 3077 (86%) own a smartphone. Among children who own a mobile phone, 1400 (32%) reported making or receiving at least 1 call per day, and 401 (11%) and 590 (16%) reported an average call duration of ≥ 30 min/day for weekdays and weekend days, respectively. Baseline data collection is ongoing.

Conclusions: SCAMP will improve our understanding of children's radiofrequency exposures and any effects on neurocognitive and behavioural development. The results will provide an evidence base to inform policy and enable parents and children to make informed life choices.

Abstract ID: 164

Title: Biomarkers for evaluation of exposure to incinerator plant

Presenting Author: Carluccio, E

Authors: Carluccio, Eugenia (1); Gatti, Maria Giulia (2); Bechtold, Petra (2); Barbieri, Giovanna (2); Romolo Michael (2); Campo Laura (3); Sucato Sabina (3); Polledri Elisa (3); Olgiati Luca (3); Ranzi, Andrea (4); Bianca, Gherardi (4); Casari, Alice (4); Floramo Maria (1); Soncini, Francesco (1); Borsari, Lucia (1); Iacuzio, Laura (1); Bottosso, Emanuele (1); Righi, Elena (1); Aggazzotti ,Gabriella(1); Goldoni, Carlo Alberto (2); Fustinoni Silvia (3); Lauriola, Paolo (4)

Affiliations: (1) Department of Diagnostic, Clinical and Public Health Medicine, University of Modena and Reggio Emilia, Italy; (2) Department Of Public Health Medicine, Unit of Epidemiology and risk communication, AUSL Modena, Italy; (3) Department of Clinical Sciences and Community Health, University of Milan and Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy; (4) Regional Reference Centre on Environment and Health, ARPA Emilia Romagna Region, Italy;

Text:

Background and aims: As part of the authorization process for the expansion of the solid waste incinerator of Modena, a cross-sectional biomonitoring study was conducted to identify biomarkers of exposure in resident population.

Methods: Approximately 500 people were enrolled between November and April 2013. Sampling method implied stratification by exposure, gender and age-group. Sampling exposure level was measured through the PM10 fall-out maps. Urine of subjects were measured the concentration of heavy metals (Cd, Cr, Cu, Hg, Ni, Pb, Ni, Zn, V, Tl, As, Sn), and polycyclic aromatic hydrocarbons (PAHs). Confounders were assessed through a questionnaire (personal and biometric data, lifestyle, residential and employment history, health condition, diet). Multivariate regression analyses were performed.

Results: The metals values are on average within the limits indicated by the reference laboratory, and were correlated with the following variables: age, sex, BMI, smoking status, education, exposure to vehicular traffic, diet and consumption drugs. Among the PAHs, only Benzo(a)anthracene has presented more than 50% of values below the limit of quantification. Others PAHs showed the following indices: Mean, Median, SE(ng/l): Naphthalene 35.1 26.2 ±1.10, Acenaphthylene 0.7 0.5 ±0.03, Acenaphthene 1.6 0.9 ±0.27, Fluorene 2.1 1.6 ±0.07, Phenanthrene 10 7.4 ±0.6, benz[a]Anthracene 2.2 2.1 ±0.04, Fluoranthene 0.8 0.7 ±0.02, Pyrene 0.7 0.6 ±0.03, Chrysene 0.3 0.2 ±0.01 and 1-Hydroxypyrene (ug / l) 0.1 0.05 ±0.01. PAHs also showed significant relationships with variables known in literature (smoking habits and dietary variables) also some of them have shown relations with greater exposure levels to incinerator.

Conclusions: the study shows an association between only PAHs level exposure; this results combined with those of a previous study of Modena argues in favor of a possible use of the IPA urinary as tracers of internal exposure for incinerator in Modena.

Abstract ID: 165

Title: Investigation of the impact of socio-economic status on the prevalence of ragweed pollen allergy in schoolchildren in Hungary

Presenting Author: Vörös, K

Authors: Vörös, Krisztina (1); Varró, Mihály János (2); Bobvos, János (2); Magyar, Donát (2); Mácsik, Annamária (2); Rudnai, Péter (2); Páldy, Anna (2)

Affiliations: (1) Semmelweis University, School of PH. D. studies, Budapest, Hungary (2) National Institute of Environmental Health, Budapest, Hungary

Text:

Background and aims: Ragweed pollen allergy (RPA) has become an important health problem in Hungary. The aim of this analysis was to assess the role of risk factors, especially of socio-economic status (SES) on RPA among the third grade schoolchildren by a questionnaire survey run in 2005.

Methods: The standardised questionnaires of the National Children Health Respiratory Survey, based on the International Study of Asthma and Allergies in Childhood, were filled in by parents anonymously. Descriptive and analytical (mixed logistic regression) methods were applied to identify possible risk factors of RPA by Stata 10.0 software.

Results: 82,082 questionnaires were sent to almost all schools in Hungary. The response rate was 73.1%. 81-86% vs 63-74% of RPA stated by parents was confirmed by a doctor in different (affluent vs deprived) regions. In the models (parents signed and doctor diagnosed RPA) the outcome was positively associated with the increasing population size of settlements. Significant risk factors were male sex (OR=1.31, 95% CI=1.23-1.40 and OR=1.39, 95% CI=1.29-1.50), lower respiratory symptoms in the first 2 years of life (OR=1.85, 95% CI=1.72-1.98 and OR=2.02, 95% CI=1.87-2.19), Romany ethnicity (OR=1.43, 95% CI=1.24-1.63 and OR=1.20, 95% CI=1.02-1.41) and dissatisfaction with housing conditions (OR=1.15, 95% CI=1.06-1.25 and OR=1.15, 95% CI=1.05-1.26). Getting social aid had negative associations with prevalence (OR=0.92, 95% CI=0.84-0.99 and OR=0.90, 95% CI=0.82-0.99).

Conclusion: Based on the results SES has an impact on RPA. Active preventive measures should take these findings into considerations

Abstract ID: 166

Title: The use and acceptability of novel technologies to characterise environmental exposure for birth cohort studies

Presenting Author: Evridiki, P

Authors: Evridiki Patelarou¹, Artemis Doutsis², Samyukta Mukopadhyay², Mireille Toledano³, Vivien Bright⁴, Frank Kelly², Benjamin Barratt²

Affiliations: (1) Department of Postgraduate Research, Florence Nightingale Faculty of Nursing and Midwifery, King's College London, London, UK; (2) NIHR GSTFT/KCL Biomedical Research Centre, Faculty of Life Sciences & Medicine, King's College London, London, UK (3) MRC-PHE Centre for Environment and Health, , Imperial College London, London, UK(4) Department of Chemistry, University of Cambridge, Cambridge, UK

Text:

Background and aims: Existing reviews have addressed the need for improved environmental exposure assessment methods to strengthen associations between health outcomes and environmental contaminants. It is also well known that dynamic assessments, where the pregnant women's behaviour and activities are related to exposure, can be used to develop behavioural advice on reducing risk. However, the technology to be used requires evaluation prior to large-scale deployment in cohort studies. Therefore, this pilot study aimed to test novel technologies for environmental exposure assessment and to evaluate participant acceptability of these methods including inconvenience and privacy issues.

Methods: A convenience sample of 20 pregnant women of varying SES and ethnicity background were recruited whilst they were attending their obstetrics appointments at a hospital in London. Two visits at their homes were arranged and their exposure to a wide range of environmental stressors and parameters were continuously recorded over a seven day period using a static monitoring platform. Furthermore, participants' activity, step and sleep patterns were collected by using miniature personal devices and mobile phone apps. Finally, this project applied qualitative methods to investigate the views and experiences of pregnant women from participating to the study.

Results and Conclusions: All participants demonstrated high uptake and persistent use of the personal devices and mobile phone apps. Installation of the static units was tolerated in all cases. Key themes related to women's views and experiences from participating to the study included ease of use, noise management, equipment management, areas of difficulty and suggestions for improvement. A detailed overview of environmental stressors to which pregnant women were exposed along with the concentrations patterns will be presented. Finally, the assessment of operational issues arising in the field will be discussed together with a series of recommendations on the most applicable and effective use of sensor technologies in full birth cohort environmental exposure.

Abstract ID: 167

Title: Ambient Air Quality Standards for Particulate Matter - An Overview

Presenting Author: Gintowt, E

Authors: Meltem Kutlar Joss, Emily Gintowt, Daniela Dyntar, Regula Rapp, Nino Künzli

Affiliation: Swiss Tropical and Public Health Institute, Dept of Epidemiology and Public Health, Basel, Switzerland,

Text:

Background and aims: Combustion is a driving force of both air pollution and greenhouse gas emissions. The air quality guideline values proposed by WHO are based on the available research and set at levels to protect public health. Governments are responsible for setting national or local air quality standards. Although available associations between air pollution and health outcomes are rather similar across all countries with no evidence for region specific health effects, air quality standards differ largely across the world. The objective of our investigation was to compile a list of all long-term standards set for particulate matter (PM). PM is an excellent marker of health relevant characteristics of air quality and scientific evidence for adverse effects of PM is very strong.

Methods: We have searched the web for official documents, asked WHO and international collaborators to contribute to the list of air quality standards with the respective reference.

Results: We have compiled air quality limit values from over 40 countries worldwide. 39 countries set standards for particulate matter: 34 (87%) countries for PM₁₀, 19 (49%) also or solely for PM_{2.5}. WHO proposes an annual air quality guideline value of 10 µg PM_{2.5}/m³, which has been adopted by only three countries to date: Australia (with an even stricter value of 8 µg/m³), Canada and Iran. In Switzerland, its adoption is currently under discussion. The U.S. Environmental Protection Agency has set the limit value at 12 µg PM_{2.5}/m³. Other countries have set limit values between 15 and 40 µg/m³. PM₁₀ limit values worldwide range from 20 (Switzerland, WHO) to 60 µg/m³, many at 50 µg/m³.

Conclusions: This is a first overview on ambient air quality standards worldwide for particulate matter. The broad spectrum of values reflects the countries' options to implement science based environmental regulations to protect public health. Studies have shown that the societal and health costs of air pollution are much larger than the costs of clean air regulations. In light of the globalized economy there is a clear need to also globalize air quality standards to protect peoples' health in all countries and to hinder the export of heavily polluting industries or technologies to countries with less stringent policies. The additional global warming potential of combustion related particulate matter builds an even stronger case to improve air quality and at the same time tackle climate change.

Abstract ID: 168

Title: GIS-based Analyses of Census Tract Demographics and Quadrivalent HPV Vaccine Type Attributable Preinvasive Cervical Lesions

Presenting Author: Patel, D

Authors: Patel, Deven, MPH1,2; Scahill, Mary1; Johnson, Michelle L. MPH3; Steinau, Martin, PhD4; Unger, Elizabeth R. MD, PhD4 Van Wijngaarden, Edwin PhD2; Hollick, Gary PhD1; Bennett, Nancy M. MD, MS1,5

Affiliations: 1Center for Community Health, University of Rochester School of Medicine and Dentistry, 2Department of Public Health Sciences, University of Rochester School of Medicine and Dentistry, 3Division of STD Prevention, National Center for HIV, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention, 4Division of High-Consequence Pathogens and Pathology, National Center for Emerging and Zoonotic Infectious Diseases 5Department of Medicine, University of Rochester School of Medicine and Dentistry

Text:

Background and aims: Human papillomavirus (HPV) vaccination was recommended in 2006 for females aged 11 or 12 and through age 26 for those not previously vaccinated. Demographic determinants of HPV types targeted by the quadrivalent vaccine are not well understood. This study explores the relationship between geographic-based demographics and the prevalence of quadrivalent vaccine types (HPV6/11/16/18) in cervical intraepithelial neoplasia 2/3 and adenocarcinoma in situ (CIN2+).

Methods: Using Geographic Information Systems (GIS) and epidemiologic data from the HPV-IMPACT sentinel surveillance program in Monroe County, NY from 2008-2013, 1,789 females with CIN2+ and HPV typing were assigned to 189 census tracts. Analyses used U.S. Census Bureau tract-level demographics, which included employment status, race, and education. Census tracts were divided into quartiles separately for each demographic factor. Poisson regressions estimated the Prevalence Ratios (PRs) of vaccine-type HPV CIN2+ among those with known HPV typing with respect to census tract demographics.

Results: Census tracts with the highest quartile of Black residents (>34%) had a lower proportion of HPV6/11/16/18-attributable CIN2+ compared to the lowest quartile tracts (<2%) [51% vs. 62%; PR: 0.85 (95% CI: 0.71, 1.02)]; tracts with the highest quartile with less than a high school education (>27%) had a lower proportion of HPV6/11/16/18-attributable CIN2+ compared to the lowest quartile (<12%) [50% vs. 59%; PR: 0.87 (95% CI: 0.73, 1.05)], and tracts with the highest quartile of employed residents (>82%) showed higher HPV6/11/16/18-attributable CIN2+ than those in the lowest quartile (<66%) [55% vs. 53%; PR: 1.08 (95% CI: 0.90, 1.31)]. None of these differences were statistically significant.

Conclusions: Further research is needed to explore potential variation in the epidemiology of HPV6/11/16/18-attributable CIN2+ by census track and to understand contributions of demographics and vaccination to community level differences in CIN2+.

Abstract ID: 169

Title: Epigenetic biomarkers of the risk of lung cancer

Presenting Author: Guida, F

Authors: Guida, Florence (1); Campanella, Gianluca (1); Severi, Gianluca (2,3,4); Johansson, Mattias (5,6); Sandanger M, Torkjel(7); Vineis, Paolo (1,2); Chadeau-Hyam, Marc (1)

Affiliations: (1) MRC-PHE Centre for Environment and Health, Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London, London, UK; (2) HuGeF, Human Genetics Foundation, Torino, Italy; (3) Cancer Epidemiology Centre, Cancer Council of Victoria, Melbourne, VIC, Australia ; (4) School of Population and Global Health, Centre for Epidemiology and Biostatistics, University of Melbourne, Melbourne, VIC, Australia; (5) International Agency for Research on Cancer, Lyon, France; (6) Department of Biobank research, Umeå University, Sweden; (7) Department of Community Medicine UiT- The Arctic University of Norway, Tromsø, Norway

Text:

Background and aims: Lung cancer is the first cause of death from cancer worldwide. Despite advancements in therapies, survival rates remain very low, essentially owing to the lack of reliable tools and markers enabling an early diagnostic. Building upon a recent study from our group identifying strong long-term epigenetic biomarkers of tobacco smoke exposure, we aim to validate and complement this list of potential markers, to assess the ability of these markers to predict future risk of lung cancer, and to quantitatively appraise the benefits of their use compared to classical smoking-related metrics to predict risk of lung cancer, hence contributing to risk stratification improvements.

Methods: We used data from two lung cancer case-control studies nested in prospective cohorts: the Italian component of the European Prospective Investigation into Cancer and Nutrition (EPIC) and the Norwegian Women and Cancer cohort (NOWAC). For each of the participants (N=377 from Italy; N=249 from Norway), genome-wide methylation profiles were acquired from blood samples collected at enrolment using the Illumina-HM450 DNA methylation array. Using an epigenome-wide association approach (EpWAS) we screened methylation profiles to identify CpGs whose methylation fractions would be associated to lung cancer risk, using logistic regressions controlling for technical variations. Additional adjustments (e.g. on smoking) were also implemented in the scope of sensitivity analyses. The discriminatory performances of the resulting models were characterized by the area under the receiver operating characteristic curve (AUC for the ROC curve).

Results: Results from the EpWAS and ROC curves are illustrated as well as a series of sensitivity analyses notably assessing the robustness of these findings across different time to diagnosis. Comparisons of the predictive abilities of our candidate biomarkers to those of classical smoking indices are also reported.

Conclusions: Our work provides in-depth investigation of the main potential biomarkers relevant to predict lung cancer risk.

Abstract ID: 170

Title: Global DNA methylation and exposure to ambient air pollution

Presenting Author: Plusquin, M

Authors: Michelle Plusquina , Florence Guidaa, Gianluca Campanellaa, Roel, Vermeulena, b, c, Marc Chadeau-Hyama,b, Paolo Vineisa,d *On behalf of the EPIC-Italy and EPIC-NL consortium

Affiliations: a MRC-PHE Centre for Environment and Health, Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London, Norfolk Place, London W2 1PG, UK. b Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands. c Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, The Netherlands. d HuGeF, Human Genetics Foundation, Torino, Italy.

Text:

Background and aims: Ambient air pollution is a complex mixture of particulate matter (PM) and gases. It has been associated with several adverse health effects although underlying mechanisms are not well understood yet. Advances in technologies such as sensor systems and molecular analytical approaches, such as epigenetics, provide new opportunities to improve the understanding of how the environment impacts disease outcomes. The aims of this study are to investigate the effects of low-level exposure to different air pollutants by exploring the association of global DNA methylation with ambient air pollution in healthy individuals.

Methods: We used data from 2 studies nested in the European Prospective Investigation into Cancer and Nutrition (EPIC) study. Our data include participants from Italy (n=457) and the Netherlands (n=167), in which methylation profiles were acquired from prospective blood samples using the Illumina 450K Methylation assay. Long-term air pollution exposure estimates of PM_{2.5}, PM₁₀, PM_{2.5}abs, NO_x and NO₂ were calculated using exposure models developed within the European Study of Cohorts for Air Pollution Effects (ESCAPE). We assessed the association between global methylation and air pollution estimates using beta-regression controlling for technical variations (and confounding factors (age, gender, smoking, being a cancer case later in life)).

Results: Exposure to NO₂ and NO_x was associated with a global hypomethylation on the CpG island's shores -significant in Netherlands ($\beta \pm se = -3.5E-03 \pm 1.6E-03$, p-value=0.03 and $\beta \pm se = -1.7E-03 \pm 7.4E-04$, p-value=0.02 for NO₂ and NO_x respectively) and borderline significant in Italy ($\beta \pm se = -1.8E-04 \pm 1.1E-04$, p-value=0.09, and $\beta \pm se = -8.4E-05 \pm 5.1E-05$, p-value=0.09 for NO₂ and NO_x, respectively). The promoter regions were borderline significant for NO₂ in the Dutch cohort. No significant associations were found for particulate matter.

Conclusions: Our results suggest an association between outdoor NO_x and NO₂ levels and DNA hypomethylation at CpG island's shores in healthy adults.

Abstract ID: 171

Title: Pregnancy Exposure to Select Phenols and Phthalates and Pulmonary Function in Five Year-old Male Offspring

Presenting Author: Vernet, C

Authors: Vernet, Céline (1,2); Pin, Isabelle (1,2,3); Giorgis-Allemand, Lise (1,2); Philippat, Claire (4,5); Benmerad, Meriem (1,2); Quentin, Joane (1,2,3); Annesi-Maesano, Isabella (6,7); Siroux, Valérie (1,2); Slama, Rémy (1,2); and the EDEN mother-child cohort study group

Affiliations: (1) Univ. Grenoble Alpes, IAB, Team of Environmental Epidemiology applied to Reproduction and Respiratory Health, Grenoble, France; (2) INSERM, IAB, Team of Environmental Epidemiology Applied to Reproduction and Respiratory Health, Grenoble, France; (3) Grenoble University Hospital, Pediatrics unit, Grenoble, France; (4) Department of Public Health Sciences, University of California, Davis, CA, USA; (5) MIND (Medical Investigations of Neurodevelopmental Disorders) Institute, University of California, Davis, CA, USA; (6) INSERM, EPAR (Epidemiology of Allergic and Respiratory Diseases) Department, Paris, France; (7) UPMC Univf, Medical School Saint-Antoine, Paris, France

Text:

Background and aims: Endocrine disruptors, in particular from the phenols and phthalates families, are suspected of adverse effects on respiratory health. Such an effect is supported by their immunomodulatory and pro-inflammatory properties. In humans, studies on the effects of early-life exposure to phenols and phthalates on objective pulmonary function measurements are lacking, except for bisphenol A. Our aim was to evaluate associations between maternal pregnancy exposure to select phenols and phthalates and pulmonary function measurements in male offspring at 5 years of age.

Methods: Among 228 boys participating in a mother-child cohort, nine phenols and eleven phthalates metabolites were quantified in spot maternal urine samples collected between 23 and 29 gestational weeks. Boys were followed until age 5, when Forced Expiratory Volume in 1 second (FEV1) was measured by spirometry. Associations of each urinary metabolite concentration with FEV1 in percent predicted (FEV1%) were characterized by linear regression adjusted for potential confounders.

Results: Monocarboxy-iso-octyl phthalate (MCOP), a di-isononyl phthalate (DINP) metabolite, exhibited evidence of adverse association with FEV1% (β for 1-ln unit increase, -1.86; 95% CI, -3.58, -0.15). Boys in the highest tertiles of two di(2-ethylhexyl) phthalate (DEHP) metabolites had FEV1% decreased by 4.15% (mono(2-ethyl-5-oxohexyl), or MEOHP, 95%CI, -7.74, -0.55) and 3.80% (mono(2-ethyl-5-carboxypentyl), or MECPP, 95%CI, -7.38, -0.22), compared to the lowest tertiles. No association was observed for the other phthalates and phenols.

Conclusions: This study is one of the first to suggest that prenatal exposures to DINP and DEHP or their metabolites may decrease pulmonary function in early childhood.

Abstract ID: 172

Title: Effects of air pollution during pregnancy on placental DNA methylation: an epigenome-wide association study

Presenting Author: Abraham, E

Authors: Abraham, Emilie (1); Giorgis-Allemand, Lise (1); Tost, Jorg (2); Galineau, Julien (3); Hulin, Agnes (4); Siroux, Valérie (1); Vaiman, Daniel (5); Charles, Marie-Aline (6); Heude Barbara (6); Forhan Anne (6); Slama, Remy (1); Lepeule, Johanna (1); and the EDEN mother-child cohort study group

Affiliations: (1) Team of Environmental Epidemiology applied to Reproduction and Respiratory Health, Inserm and Univ. Grenoble Alpes, Grenoble, France; (2) Laboratory for Epigenetics and Environment, CEA – Institut de Génomique, Evry, France; (3) Air Lorraine, Nancy, France; (4) ATMO Poitou-Charentes, La Rochelle, France; (5) Genomics, Epigenetics and Physiopathology of Reproduction, Institut Cochin, Inserm, Paris; (6) Inserm, UMR1153 Epidemiology and Biostatistics Sorbonne Paris Cité Center (CRESS), Team “Early origin of the child’s health and development” (ORCHAD), Paris Descartes University France

Text:

Background and aims: Epigenetic marks are likely to bear the memory of early life environmental exposures and to be associated with health on short and long terms. We tested whether exposure to nitrogen dioxide (NO₂) and particulate matter up to 10µm (PM₁₀) during pregnancy were associated with placental DNA methylation using an agnostic approach.

Methods: Placenta samples were collected at delivery in 668 women from a mother-child cohort. DNA methylation was assayed using the HumanMethylation450 Illumina BeadChip (450K). After stringent quality control and removal of probes on the sex chromosomes and probes potentially influenced by genetic variation or mapping to multiple locations, 426,049 CpGs were retained and normalized. NO₂ and PM₁₀ levels averaged during each trimester and whole pregnancy were estimated at the home address by a dispersion model. Robust linear regression models were fitted on each CpG methylation level, using air pollutants levels as predictors adjusted for potential batch, chip and plate effects and other potential confounders. We tested the association at a 5% level using a Bonferroni correction for multiple testing.

Results: NO₂ and PM₁₀ pregnancy levels were on average (s.e.) 19.0 (7.6) and 20.0 (4.5) µg/m³ respectively. The mean level of methylation was not significantly different according to the sex of the child or the recruitment center. In the regression models, all p-values were greater than the Bonferroni-adjusted significance level of 10⁻⁷. Two CpGs were highly associated (10⁻⁷ < p-value < 10⁻⁵) with both NO₂ and PM₁₀ during the first trimester and the whole pregnancy. One CpG was not associated with any gene while the other mapped to ADARB2, which may regulate RNA editing.

Conclusions: In this epigenome-wide analysis, we observed no significant association between placental DNA methylation and NO₂ and PM₁₀ levels using the stringent Bonferroni correction. To our knowledge this is the largest study to date on the topic.

Abstract ID: 173

Title: Effects of air pollution during pregnancy on placental DNA methylation: A hypothesis-driven approach in a set of CpGs associated with fetal growth

Presenting Author: Abraham, E

Authors: Abraham, Emilie (1); Giorgis-Allemand, Lise (1); Tost, Jorg (2); Galineau, Julien (3); Hulin, Agnes (4); Siroux, Valérie (1); Vaiman, Daniel (5); Charles, Marie-Aline (6); Heude Barbara (6); Forhan Anne (6); Slama, Remy (1); Lepeule, Johanna (1); and the EDEN mother-child cohort study group

Affiliations: (1) Team of Environmental Epidemiology applied to Reproduction and Respiratory Health, Inserm and Univ. Grenoble Alpes, Grenoble, France; (2) Laboratory for Epigenetics and Environment, CEA – Institut de Génomique, Evry, France; (3) Air Lorraine, Nancy, France; (4) ATMO Poitou-Charentes, La Rochelle, France; (5) Genomics, Epigenetics and Physiopathology of Reproduction, Institut Cochin, Inserm, Paris; (6) Inserm, UMR1153 Epidemiology and Biostatistics Sorbonne Paris Cité Center (CRESS), Team “Early origin of the child’s health and development” (ORCHAD), Paris Descartes University France.

Text:

Background and aims: Epigenetic marks are likely to bear the memory of early life environmental exposures and to be associated with health on short and long terms. In a genome-wide study, we had identified 109 CpGs whose placental methylation level was associated with birth weight. Here we aimed to test whether maternal exposure to nitrogen dioxide (NO₂) and particulate matter up to 10µm (PM₁₀) during pregnancy could influence methylation level at these CpGs.

Methods: Placenta samples were collected at delivery in 668 women from a mother-child cohort. DNA methylation was assayed using the HumanMethylation450 Illumina BeadChip (450K). We focused on 109 CpGs whose methylation levels were significantly (p -values < Bonferroni-corrected threshold of 10^{-7}) associated with birth weight in this cohort. NO₂ and PM₁₀ levels averaged during each trimester and whole pregnancy were estimated at the home address by a dispersion model. Robust linear regression models were fitted on each CpG methylation level, using air pollutants levels as predictors adjusted for methylation batch, chip and plate and other potential confounders.

Results: Average NO₂ and PM₁₀ pregnancy levels were 18.9 (s.e., 7.6) and 20.0 (4.5) µg/m³, respectively. Five of the 109 tested CpGs were significantly ($p < 0.05$) associated with both NO₂ and PM₁₀ levels during either the second or third trimester of pregnancy. Two additional CpGs, one related to tumor suppression (TSSC1) and the other involved in the catabolism of quinolinic acid (QPRT), were significantly related to NO₂ exposure at each trimester and during the whole pregnancy.

Conclusions: Amongst 109 CpGs previously associated with birth weight in the same population, we identified 7 CpGs associated with maternal air pollution exposure during pregnancy. The identified CpGs are candidates for mediation analyses of air pollution effects on birth weight via DNA methylation.

Abstract ID: 174

Title: Testicular germ cell tumours and parental occupational exposure to pesticides: a register-based case-control study in the Nordic countries (NORD-TEST study).

Presenting Author: Le Cornet, C

Authors: Le Cornet, Charlotte (1,2); Fervers, Béatrice (2,3); Oksbjerg Dalton, Susanne (4); Feychting, Maria (5); Pukkala, Eero (6,7), Tynes, Tore (8,9); Hansen, Johnni (4); Nordby, Karl-Christian (9); Béranger, Rémi (1,2,3); Kauppinen, Timo (10); Uuksulainen, Sanni (10); Wiebert, Pernilla (5); Woldbæk, Torill (9); Skakkebak, Niels E. (11); Olsson, Ann (1,5); Schüz, Joachim (1)

Affiliations: (1) International Agency for Research on Cancer (IARC), Lyon, France; (2) Centre Léon Bérard, Lyon, France; (3) Université Claude Bernard, Lyon, France; (4) Danish Cancer Society Research Center, Copenhagen, Denmark; (5) Karolinska Institutet, Stockholm, Sweden; (6) Finnish Cancer Registry, Helsinki, Finland; (7) School of Health Sciences, Tampere, Finland; (8) Cancer Registry of Norway, Oslo, Norway; (9) National Institute of Occupational Health, Oslo, Norway; (10) Finnish Institute of Occupational Health (FIOH), Helsinki, Finland ;(11) University Hospital of Copenhagen Department of Growth and Reproduction, Copenhagen, Denmark

Text:

Background and aims: A potential impact of exposure to endocrine disruptors, including pesticides, during the intra- uterine life has been hypothesized in testicular germ cell tumours (TGCT) aetiology, but exposure assessment is challenging. This large-scale registry-based case-control study aimed to investigate the association between parental occupational exposure to pesticides and TGCT risk in their sons.

Methods: Cases born in 1960 or onwards, aged between 14-49 years, and diagnosed between 1978-2013 in Denmark, Finland, Norway or Sweden, were identified from the respective nationwide cancer registries. Four controls per case were randomly selected from the general national populations, matched on year of birth. Information on parental occupation was collected through censuses or Pension Fund information and converted into a pesticide exposure index based on the Finnish National Job-Exposure Matrix.

Results: A total of 9,569 cases and 32,028 controls were included. No overall associations were found for either maternal or paternal exposures and TGCT risk in their sons with odds ratios of 0.83 [95% confidence interval 0.56-1.23] and of 1.03 [0.92-1.14], respectively. Country-specific estimates and stratification by birth cohorts revealed some heterogeneity. Cryptorchidism, hypospadias and family history of testicular cancer were risk factors but adjustment did not change the main results.

Conclusions: This is the largest study on prenatal exposure to pesticides and TGCT risk, overall providing no evidence of an association. Limitations to assess individual exposure in registry-based studies might have contributed to the null result.

Program at a glance

DAY 1: Monday, 2 November

ROOM	RUPPERT HALL	RUPPERT BLAUW		RUPPERT 033	RUPPERT A	RUPPERT D
8:00-9:00	Conference registration		<i>Early morning sessions:</i>		Risk communication	Publishing; Elsevier, EHP Editor
9:00-10:30		Plenary Session 1: Opening, Microbiome				
10:30-11:00	Coffee break					
11:00-12:30			<i>Parallel sessions:</i>	Pesticides	Air pollution and child health	Exposome
12:30-13:30	Lunch					
13:30-15:00			<i>Parallel sessions:</i>	Novel methods of exposure assessment	The built environment	Occupational exposures and
15:00-16:30	Poster session 1 / Coffee break					
16:30-18:00		Plenary Session 2: The Right Research?				
18:00	Drinks					

DAY 2: Tuesday, 3 November

ROOM	RUPPERT HALL	RUPPERT C	RUPPERT BLAUW		RUPPERT 033	RUPPERT A	RUPPERT D
8:00-9:00				<i>Early morning sessions:</i>	Sources of EU funding	Healthy City Environment	Tutorial to OMICs analyses
9:00-10:30			Plenary Session 3: Green space				
10:30-11:00	Coffee break						
11:00-12:30				<i>Parallel sessions:</i>	RF-EMF: From exposure to health	Emerging env. contaminants &	Air Pollution and OMICS
12:30-13:30	Lunch	Healthy City Environ. Initiative					
13:30-15:00				<i>Parallel sessions:</i>	Cancer	Air pollution and adult health	Methods: Detection and selection
15:00-16:30	Poster session 2 / Coffee break						
16:30-17:00			Closing Session				

Floor plan

