

HEALS Newsletter

Health and Environment-wide Associations based on Large population Surveys

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Editorial Note

Welcome to the 8th issue of the HEALS Newsletter!

This issue includes two articles on HEALS work. Specifically, one article by Christian Schieberle, Naixin Li and Rainer Friedrich, from the University of Stuttgart (USTUTT), that addresses how to estimate past and future exposures of population groups and individuals through time. The other, by Joan O. Grimalt, Eva Junqué and Mercè Garí, from the Institute of Environmental Assessment and Water Research (IDAEA-CSIC), describes the mercury accumulation in lean fish from the Mediterranean, and how humans are exposed through diet.

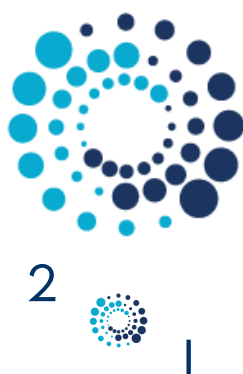
The *Who is Who* section shows the professional profiles of Michael Kabesch, Miranda Loh and Spyros Karakitsios, leading re-

searchers involved in several WPs.

The issue also lists the scientific publications, presentations at meetings, workshops and conferences, and other dissemination activities (e.g. press releases) performed by HEALS researchers during 2018. Interesting forthcoming events for HEALS participants and exposome researchers are also announced.

Finally, we take the opportunity to share with you that a HEALS Special Issue on Environmental Research (Elsevier Journal, impact factor 4.732) is under preparation. First articles on this special issue will appear on 2019.

Our best wishes for a happy and productive 2019!



HEALS

wishes you a

HAPPY NEW YEAR

Life-course exposure assessment of individuals and groups

by CHRISTIAN SCHIEBERLE, NAIXIN LI and RAINER FRIEDRICH

University of Stuttgart (USTUTT)
Stuttgart, Germany

One of the major goals of HEALS is to estimate past exposure retrospectively and future exposure prospectively for both individuals and vulnerable groups. To achieve this goal, we developed a modelling framework, which assesses the determinants of life course trajectories. The model is implemented in a probabilistic manner to allow for incorporation of uncertainty during all stages of the assessment. Borrowing ideas and concepts from social sciences, we apply sequence analysis as a key approach to study discrepancies in life course trajectories. This allows identifying trajectory patterns that account for important stages in life and, more importantly, transitions between them.

For the first time we will use this analysis approach in the field of exposure science to develop a probabilistic model of life course exposure trajectories. We identify socio-economic determinants of the individuals under study and analyse their influence on transitions and, consequently, life course development. Using a Markov chain-based approach, we are able to simulate thousands of potential past and possible future trajectories. We developed this approach using a 3-tier methodology (Figure 1).

The model links life course trajectories with time-activity patterns used in exposure science. We collected a myriad of these patterns from existing time-use studies. These are linked with an

activity-exposure matrix to estimate exposure while conducting certain activities and being located in certain environments. Socio-economic Information collected at individual- and group-level is used to reconstruct past and estimate future life trajectories (Figure 2).

With respect to exposure modelling for individuals we modify and reconstruct the input data including ambient concentration fields for Europe back to the 1930s. Consequently, the concentration data with prolonged time range enable the exposure assessment even for cohorts born early in the 20th century. Besides, we gathered new data to optimize the parameters of concentration modelling for different microenvironments (home, office, school, transportation, outdoor). The input parameters include indoor emission sources w.r.t. cooking or heating but also physical factors such as ventilation rate, just to name a few.

To evaluate the performance of the exposure model we used monitoring data from a previous study (EXPOLIS) and reconstructed the exposure of the individual study participants. The study was undertaken in several cities across Europe during the late 1990s. After excluding data with low quality, we obtained 318 and 226 pairwise samples (both indoor home and outdoor home measurement monitored) for PM_{2.5} and NO₂, respectively.

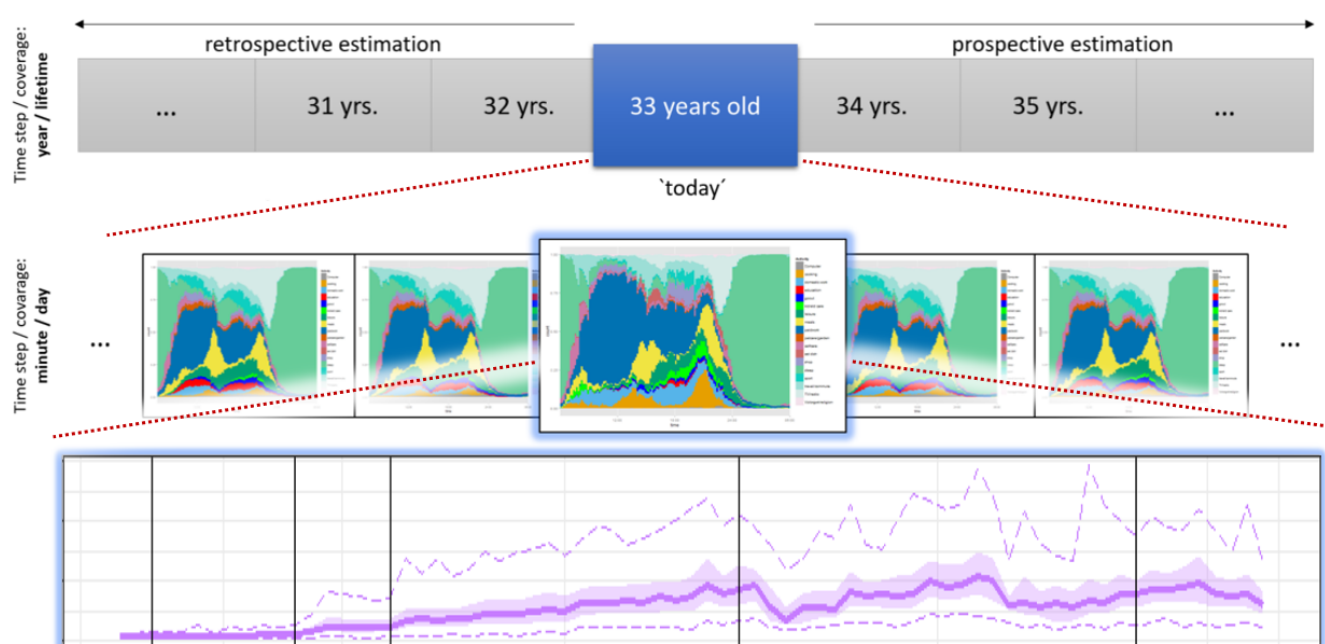


Figure 1. Hierarchical representation of the probabilistic life-long exposure modelling framework. The methodology is capable to estimate both retrospectively and prospectively. It can be applied to individuals and supports identification of group-specific exposures.

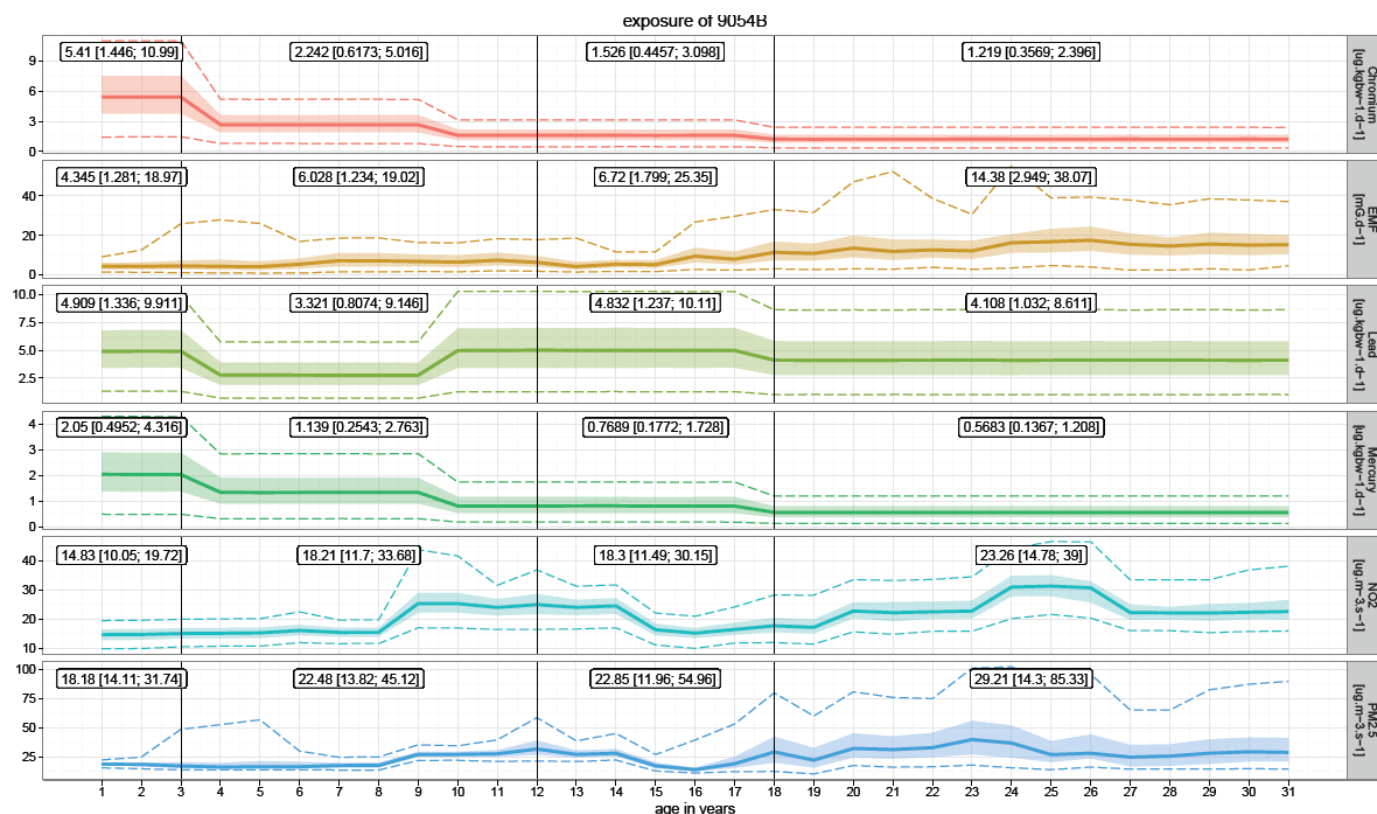


Figure 2. Exemplary past exposure estimates to a subset of stressors via a subset of pathways addressed. The figure shows exposure to Chromium, Lead, and Mercury via ingestion, to EMF, and to two major air pollutants via inhalation (PM2.5 and NO2).

After applying data fusion approaches, the model shows impressive results for both pollutants even with limited knowledge about the study participants: 70% of the PM2.5 measurements and 65% of the NO2 measurements are within the 25th to 75th

percentile range of the model estimates (Figures 3 and 4). The model performance improves when more characteristics are taken into account.

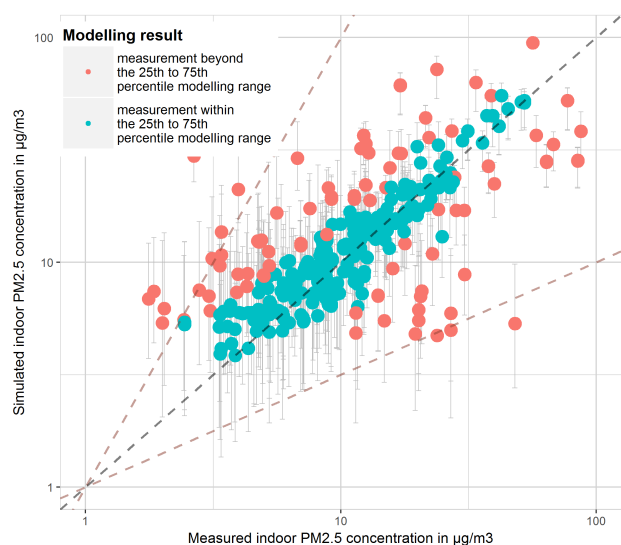


Figure 3. Results of modelling validation with measurement data from EXPOLIS study for PM2.5. The x-axis is the measured indoor concentration, while y-axis is the simulated result. Blue dots (account for 70% of all dots) represent the satisfactory predictions, i.e. measurement within 25th to 75th percentile of modelling range, while red dots represent the opposite result.

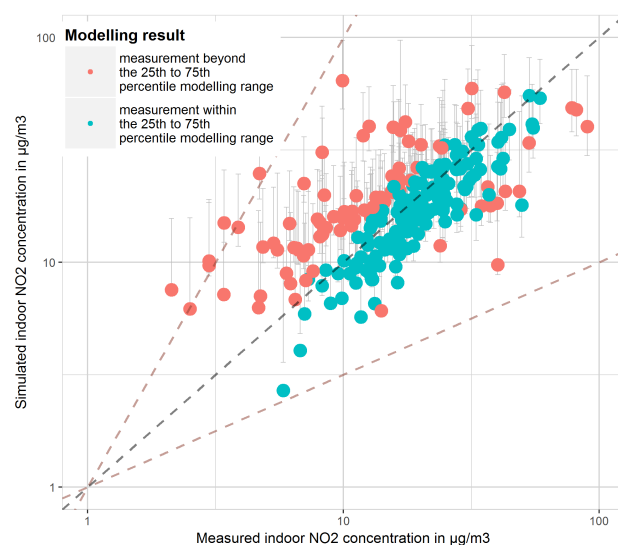


Figure 4. Results of modelling validation with measurement data from EXPOLIS study for NO2. The x-axis is the measured indoor concentration, while y-axis is the simulated result. Blue dots (account for 65% of all dots) represent the satisfactory predictions, i.e. measurement within 25th to 75th percentile of modelling range, while red dots represent the opposite result.

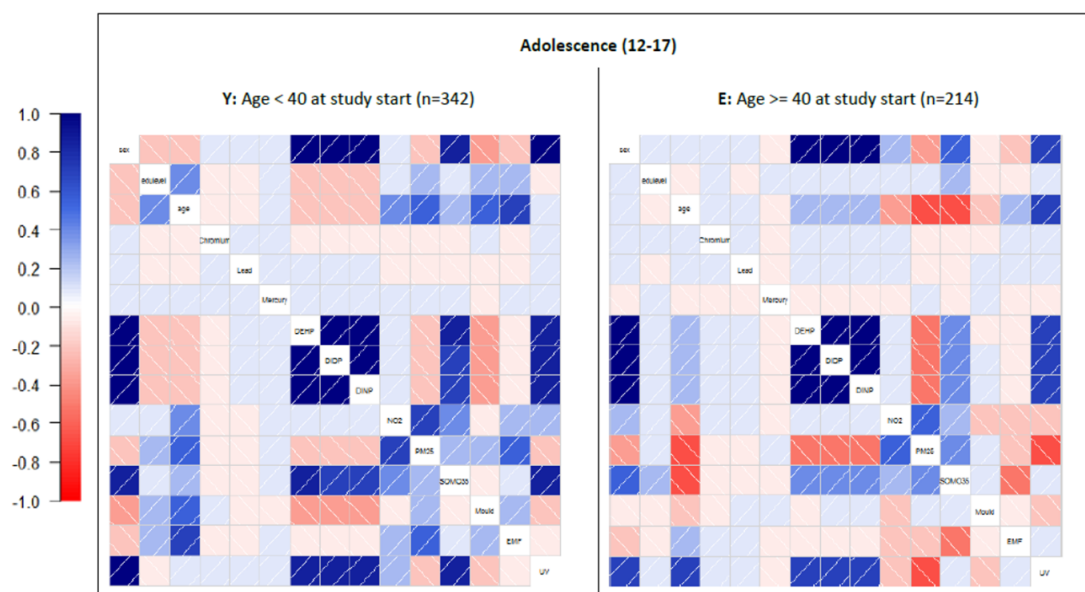


Figure 5. Heat map of pairwise correlations between a subset of socio-economic factors (sex, education, age) and exposure to a subset of stressors. The figure shows past exposure during adolescence (age 12-17) for two groups: Members of group Y were younger than 40 in the year 2012, whereas members of group E were 40 or older.

To demonstrate the capabilities of the framework we applied the approach to an anonymised group of 556 individuals of an Italian population study. Even though the data collected were anonymised, we were able to determine socio-economic data of the individuals and their coarse location data above address level. The individuals cover an age range from 19 to 73 years; about 60% of them are female. Education level ranged from below high school level over high school level to individuals holding university/college degree. We estimated the past exposure of each individual to 12 stressors across several exposure routes.

Specifically, we assessed inhalation of nitrogen dioxide, fine particles and ozone; exposure to UV radiation and electromagnetic fields; exposure to mould; exposure to selected metals via food intake, namely arsenic, chromium and lead; exposure to phthalates (DEHP, DIDP and DINP). Analysing the resulting individual exposure estimates of the 556 Italian individuals, we identified substantial differences in exposure for some of the stressors. We grouped the individuals based on their socio-economic background and found that some of the differences can be linked to circumstances that are characteristic of certain vulnerable groups (Figure 5).

Mercury accumulation in Mediterranean lean fish and human intake

by JOAN O. GRIMALT, EVA JUNQUÉ and MERCÈ GARÍ

(IDAEA-CSIC)
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Until very recently, fish consumption recommendations' to vulnerable population groups, such as infants and pregnant women, have focussed on certain big, migratory and oily fish species. However, since mercury is primarily associated with muscle tissue rather than with fat deposits, predatory but non-migratory fish species, e.g. lean fish, may also accumulate this compound.

Island populations are typically high fish consumers, particularly from local markets. Previous studies on newborns and preschool children from Mediterranean populations have shown high mercury concentrations in blood and hair (Garí *et al.*, 2013). To date, few studies have assessed the potential role of predatory but non-migratory fish species regularly consumed by general and infant populations as mercury sources. This issue has been addressed

within the HEALS project and three studies have been recently published on the concentrations of total mercury and methylmercury in a great variety of lean fish species from the Western Mediterranean Sea and the assessment on how these specimens contribute to the total mercury intake in human populations, and more specifically children (Llull *et al.*, 2017; Junqué *et al.*, 2017; 2018).

607 commercial seafood samples from the Western Mediterranean Sea were collected in waters of the Balearic Islands, Gulf of Lyons, Portman and Tunisia (Feb 2014–Nov 2018). Samples from Egypt and the Atlantic Ocean (Senegal, Mauritania coasts) were also collected for comparison. Fish species were selected considering the most consumed by the population.

| Fish species | N | Median | % Not compliance |
|---|----|--------|------------------|
| Small-spotted catshark (<i>Scyliorhinus canicula</i>) | 8 | 0.68 | 25 |
| Red porgy (<i>Pagrus pagrus</i>) | 12 | 0.18 | 25 |
| Common sole (<i>Solea solea</i>) | 8 | 0.40 | 38 |
| Comber (<i>Serranus cabrilla</i>) | 11 | 0.18 | 27 |
| Dusky Grouper (<i>Epinephelus marginatus</i>) | 10 | 1.6 | 100 |
| Conger (<i>Conger conger</i>) | 31 | 0.45 | 45 |
| Common dentex (<i>Dentex dentex</i>) | 17 | 0.78 | 65 |
| John Dory (<i>Zeus faber</i>) | 16 | 0.21 | 19 |
| European hake (<i>Merluccius merluccius</i>) | 31 | 0.18 | 26 |
| Mediterranean moray (<i>Muraena helena</i>) | 38 | 0.39 | 24 |
| Angler (<i>Lophius piscatorius</i>)* | 34 | 0.57 | 15 |

Table 1. Total mercury concentrations (mg/kg ww) in most frequently consumed lean fish species in the Mediterranean. The percentages of compliance with the EU maximum concentrations for THg are also indicated. The maximum level set forth by the EU is 0.5 mg/kg ww, except for the species labelled with an asterisk (1 mg/kg ww).

A considerable number of the most frequently lean fish species exceeded the maximum levels proposed by the European legislation when they originated from the Mediterranean Sea, such as dusky grouper (100% of the examined specimens), common dentex (65%), conger (45%), common sole (38%), hake (26%) and angler (15%), among others (Table 1) (Llull *et al.*, 2017).

The collected fish species were grouped in three trophic levels, those feeding on plankton (first), on small fish and crustaceans (second) and on fish and cephalopods (third) (Llull *et al.*, 2017).

Representation of the Hg concentrations vs. weight of each specimen belonging to species of the third trophic level showed a significant correlation, $r = 0.78$ ($p < 0.01$; Figure 1). Nevertheless, there was also a species effect in the accumulation of this metal (Junque *et al.*, 2018).

The dietary weekly total Hg intakes through fish consumption were calculated by multiplying the median fish concentrations of all analysed samples (mg/kg ww) by the weekly average fish consumptions of the Spanish population. Fiftyth and 95th percentiles of consumption were used to assess the middle bound (MB) and upper bound (UB) for both children (7-12 years old; MB= 46.4 g/day and UB=383 g/day) and adults (older than 17 years: MB= 71.1 g/day and UB= 597 g/day), respectively. Comparison of these results with those reported by EFSA gave similar figures, e.g. 36.3 g/day and 63.6 g/day for children and adults, respectively (EFSA, 2015). Estimated Weekly Intakes (EWIs; $\mu\text{g/kg bw}$) of total Hg were compared to the EFSA Provisional Tolerable Weekly Intakes (PTWIs) of THg and MeHg, 4 $\mu\text{g/kg bw}$ and 1.3 $\mu\text{g/kg bw}$, respectively.

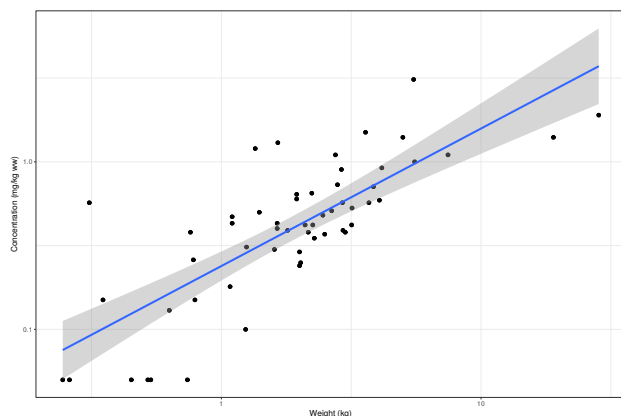


Figure 1. Representation of the mercury concentrations vs. weight of the fish specimens. The coloured area around the curve fitted line correspond to the 95% confidence interval.

The average THg intake due to fish consumption of all collected species, 0.61 $\mu\text{g/g ww}$, involved Hg EWIs of 5.7 $\mu\text{g/kg bw}$ for children aged 7-12 years and 4.4 $\mu\text{g/kg bw}$ for adults when referred to the infant and general Spanish population. These values were higher than the PTWI for total Hg intake recommended by FAO/WHO, 4 $\mu\text{g/kg bw}$ (EFSA, 2012), 140% and 110%, respectively. In the worst case scenario (UB approach), the children and adults would be exposed to 47 $\mu\text{g/kg bw}$ and 37 $\mu\text{g/kg bw}$, which exceeded largely the established upper limit, 1200% and 930%, respectively (Junque *et al.*, 2018).

For MeHg, assuming that 90% of total Hg is in this form, the EWIs were 5.2 $\mu\text{g/kg bw}$ and 4.0 $\mu\text{g/kg bw}$ for MB and 42.5 $\mu\text{g/kg bw}$ and 33 $\mu\text{g/kg bw}$ for UB in children and adults, respectively. The PTWI for MeHg were set to 1.3 $\mu\text{g/kg bw}$ (EFSA, 2012) which was lower than the EWIs for children and adults. According to these PTWIs, the observed EWIs for children and adults were 400% and 310% of the PTWIs for MB and 3300% and 2600% for UB respectively (Junque *et al.*, 2018).

A significant direct dependence between specimen weight of lean fish from the third trophic level and Hg concentration was therefore observed. Extrapolation of the observed Hg concentrations to PTWIs showed higher intakes than the thresholds recommended by EFSA for adults and children, 110% and 140%, respectively. The estimated PTWIs for MeHg corresponded to 310% and 400% of the recommended threshold values. These values represented the worst case scenarios in which only local fish was consumed.

References

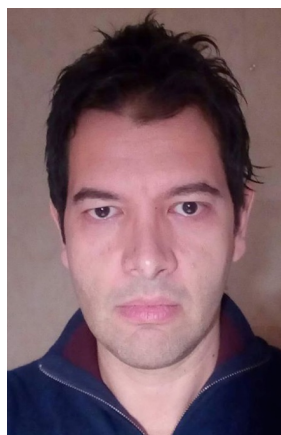
- EFSA (2012) Scientific opinion on the risk for public health related to the presence of mercury and methylmercury in food. *EFSA J* 10, 2985–3226.
- EFSA (2015) The EFSA Comprehensive European Food Consumption Database. . Accessed 28/11/2018.
- Garí M, Grimalt JO, Torrent M, Sunyer J (2013) Influence of socio-demographic and diet determinants on the levels of mercury in preschool children from a Mediterranean island. *Environ Pollut* 182, 291–298.
- Junqué E, Garí M, Arce A, Torrent M, Sunyer J, Grimalt JO. (2017) Integrated assessment of infant exposure to persistent organic pollutants and mercury via dietary intake in a central western Mediterranean site (Menorca Island). *Environ Res* 156: 714–724.
- Junqué E, Garí M, Llull RM, Grimalt JO (2018) Drivers of the accumulation of mercury and organochlorine pollutants in Mediterranean lean fish and dietary significance. *Sci Total Environ* 634: 170–180.
- Llull RM, Garí M, Canals M, Rey-Maqueieira T, Grimalt JO (2017) Mercury concentrations in lean fish from the Western Mediterranean Sea: Dietary exposure and risk assessment in the population of the Balearic Islands. *Environ Res* 158: 16–32.

WHO is WHO



Michael Kabesch heads the department of Pediatric Pneumology and Allergy at the University Mother and Child Hospital St. Hedwig of the University of Regensburg. He is a pediatrician, pediatric pneumologist and allergologist. His main research interests are early genetic and environmental factors associated with various respiratory diseases, allergy and immunity. He was involved in numerous large scale European research activities such as the GABRIEL consortium, publishing the first genome wide association studies on asthma. He was

involved in developing the hygiene hypothesis in asthma with Erika von Mutius in Munich. Nowadays he is especially interested in epigenetic and system medicine research. So far, his research led to more than 170 pubmed listed publications. In HEALS he has started the KUNO Kids birth cohort in Regensburg as part of EX-HES, recruiting almost 2.500 children and families so far. He says: "HEALS is a great opportunity to understand childhood health in a bigger context with all the experts on exposome research getting together with clinicians of all different specialties looking into the onset of disease early on in life comprehensively".



Dr. **Spyros Karakitsios** is an environmental health scientist, with training in physics (B.Sc.), environmental and computational chemistry (M.Sc.) and applied biology (PhD) of the University of Ioannina, with an overall 12 years of experience in risk assessment modelling and 9 years of experience in advanced human exposure science and biologically-based models for human risk assessment. At the moment he is a Senior Scientist at the Environmental Engineering Laboratory of Prof. Sarigiannis and he is

currently teaching Environmental Chemistry in the Aristotle University of Thessaloniki and Computational Biology in the Institute of Advanced Studies in Pavia. He was involved in the frame of the projects HEIMTSA, 2-FUN, HEREPLUS, TAGS, INTERA, INTEGRA, CROME-LIFE+, CHERRIE and the ongoing projects HEALS, BLUEHEALTH, HBM4EU, ERNCIP, PEC, GRIN and NEURO-SOME. In 2017, he won the CEFIC LRI Innovation Award for chemicals risk assessment.



Miranda Loh is a Senior Scientist working in the Centre for Human Exposure Science of the Research Division at the Institute of Occupational Medicine. She is an exposure scientist who tries to understand how people interact with their environment, and how this affects their exposure to both negative and positive aspects of the environment. She is particularly interested in using sensors to evaluate both personal activities, which may affect their exposures to environmental

factors, and environmental factors themselves. She has been involved in evaluating air pollution and physical activity sensors and is using a multi-stressor indoor and personal exposure assessment system, based on sensor technology, that can be used in exposome studies as part of the Health and Environment-wide Associations based on Large Population Surveys (HEALS) study, funded by the European Union. Her work on environmental health extends also to Asia, as the Principal Investigator for the Air Pollution Impacts on Cardiopulmonary disease in Beijing: An integrated study of Exposure Science, Toxicogenomics & Environmental Epidemiology (APIC-ESTEE) funded by the British Natural Environment Research Council, the Medical Research Council, and China's National Natural Science Foundation. She is also involved in air pollution exposure and health projects in India and Thailand. Past projects include assessment of metals exposures of children living near a hazardous waste site in a former mining community and measurement and modelling of exposures and risk to volatile organic compounds.

Publications

The scientific contributions of the HEALS Project are hosted on ZENODO, an open digital repository that enables researchers, scientists, EU projects and institutions to share and showcase multidisciplinary research results (data and publications).

The collection of HEALS scientific papers on ZENODO can be found in the following website:

<https://zenodo.org/collection/user-heals>

Papers published since July 2017 include:

- M. Aggerbeck & E.B. Blanc (2018) Role of mixtures of organic pollutants in the development of metabolic disorders via the activation of xenosensors. *Current Opinion in Toxicology* 8: 57–65.
- R.P. Sharma, M. Schuhmacher, V. Kumar (2018) The development of a pregnancy PBPK Model for Bisphenol A and its evaluation with the available biomonitoring data. *Science of the Total Environment* 624: 55–68.
- P. Schutzmeier, A. Focil Baquerizo, W. Castillo-Tandazo *et*

- et al.* (2018) Efficacy of N,N'-bis-(2-mercaptoethyl) isophthalamide on mercury intoxication: a randomized controlled trial. *Environmental Health* 17: 15.
- J. Gromadzinska, K. Polanska, L. Kozłowska *et al.* (2018) Vitamins A and E during Pregnancy and Allergy Symptoms in an Early Childhood-Lack of Association with Tobacco Smoke Exposure. *Environmental Research and Public Health* 15(6): E1245.
 - M. Garí, Y. González-Quinteiro, N. Bravo, J.O. Grimalt (2018) Analysis of metabolites of organophosphate and pyrethroid pesticides in human urine from urban and agricultural populations (Catalonia and Galicia). *Science of the Total Environment* 622-623: 526–533.
 - B.L. van Drooge, E. Marco, J.O. Grimalt (2018) Atmospheric pattern of volatile organochlorine compounds and hexachlorobenzene in the surroundings of a chlor-alkali plant. *Science of the Total Environment* 628-629: 782–790.
 - E. Junqué, M. Garí, R.M. Lluell, J.O. Grimalt (2018) Drivers of the accumulation of mercury and organochlorine pollutants in Mediterranean lean fish and dietary significance. *Science of the Total Environment* 634: 170–180.
 - J.O. Grimalt, S. Böse-O'Reilly, P. van den Hazel (2018) Steps forward reduction of environmental impact on children's health. *Environmental Research* 164: 184–185.
 - R.P. Sharma, M. Schuhmacher, V. Kumar (2017) Developing integrated PBPK/PD coupled mechanistic pathway model (miRNA-BDNF): An approach towards system toxicology. *Toxicology Letters* 280: 79–91.
 - V. Karri, V. Kumar, D. Ramos *et al.* (2018) An in vitro cytotoxic approach to assess the toxicity of heavy metals and their binary mixtures on hippocampal HT-22 cell line (2018). *Toxicology Letters* 282: 25–36.
 - V. Karri, V. Kumar, D. Ramos *et al.* (2017) Comparative In Vitro Toxicity Evaluation of Heavy Metals (Lead, Cadmium, Arsenic, and Methylmercury) on HT-22 Hippocampal Cell Line. *Biological Trace Element Research* 184(1): 226–239.
 - M.A. Martínez, J. Rovira, R.P. Sharma *et al.* (2017) Prenatal exposure estimation of BPA and DEHP using integrated external and internal dosimetry: A case study. *Environmental Research* 158: 566–575.
 - V. Karri, M. Schuhmacher, V. Kumar *et al.* (2017) Proteomics approach for improving the mechanisms associated with MeHg toxicity in HT-22 hippocampal cell line. *Toxicology Letters* 280: S259.
 - N.M. Yatim, G. Margison, E. Johnstone, A.C. Povey (2017) Associations between placental O6-methylguanine DNA methyltransferase (MGMT) activity, air pollutants and birth outcomes. *Placenta* 57: 301–301. Meeting Abstract: P2.27.
 - N.B. Ahmad, N.M. Yatim, A. Povey, E. Johnstone (2017) Heavy metal levels in human placentas. *Placenta* 57: 330–330. Meeting Abstract: P2.121.
 - M. Kabesh (2018) Personalisierte Pneumologie. *Atemwegs- und Lungenkrankheiten* 44: 1–7.
 - P. Schutzmeier, A. Focil Baquerizo, W. Castillo-Tandazo, N. Focil, S. Bose-O'Reilly (2018) Efficacy of N,N'-bis-(2-mercaptoethyl) isophthalamide on mercury intoxication: a randomized controlled trial. *Environ Health* 17(1): 15.
 - P.J. Landrigan, R. Fuller, N.J.R. Acosta, O. Adeyi *et al.* (2018) The Lancet Commission on pollution and health. *Lancet* 391(10119): 462–512.
 - N. Steckling, A. Gotti, S. Bose-O'Reilly S, D. Chapizanis *et al.* (2018) Biomarkers of Exposure in Environment-wide Association Studies – opportunities to decode the Exposome using Human Biomonitoring data. *Environmental Research* 164: 597–624.
 - M. Mari, J. Rovira, F. Sánchez-Soberón *et al.* (2018) Partial replacement of fossil fuels in a cement plant: Assessment of human health risks by metals, metalloids and PCDD/Fs. *Environmental Research* 167: 191–197.
 - B.L. van Drooge, R.M. Prats, C. Reche *et al.* (2018) Origin of polycyclic aromatic hydrocarbons and other organic pollutants in the air particles of subway stations in Barcelona. *Science of the Total Environment* 642: 148–154.
 - R.P. Sharma, M. Schuhmacher, V. Kumar (2018) Development of a human physiologically based pharmacokinetic (PBPK) model for phthalate (DEHP) and its metabolites: A bottom up modeling approach. *Toxicology Letters* 296: 152–162.
 - K. Polanska, W. Hanke, N. Pawlas *et al.* (2018) Sex-Dependent Impact of Low-Level Lead Exposure during Prenatal Period on Child Psychomotor Functions. *Int J Environ Res Public Health* 15 pii: E2263.
 - M.A. Martínez, J. Rovira, R. Prasad Sharma *et al.* (2018) Comparing dietary and non-dietary source contribution of BPA and DEHP to prenatal exposure: A Catalonia (Spain) case study. *Environmental Research* 166: 25–34.
 - V. Karri, D. Ramos, J.B. Martinez *et al.* (2018) Differential protein expression of hippocampal cells associated with heavy metals (Pb, As, and MeHg) neurotoxicity: Deepening into the molecular mechanism of neurodegenerative diseases(2018) *Journal of Proteomics* 187: 106–125.
 - S. Santos, I. Eekhout, E. Voermann *et al.* (2018) Gestational weight gain charts for different body mass index groups for women in Europe, North America, and Oceania. *BMC Medicine* 16: 201.
 - J.S. Tratnik, T. Kosjek, E. Heath *et al.* (2018) Urinary bisphenol A in children, mothers and fathers from Slovenia: Overall results and determinants of exposure. *Environmental Research* 168: 32–40.
 - M. Martínez, I. Castro, J. Rovira *et al.* (2019) Early-life intake of major trace elements, bisphenol A, tetrabromobisphenol A and fatty acids: Comparing human milk and commercial infant formulas (2019) *Environmental Research* 169: 246–255.

Presentations at International Meetings

Dissemination and networking activities since July 2017 included the participation of several HEALS members at international workshops, conferences and scientific events hereinafter summarised:

- **N. Steckling *et al.* (LMU)** Global Burden of Disease due to moderate Chronic Metallic Mercury Vapor Intoxication resulting from Mercury use in Artisanal Small-Scale Gold Mining. 13th International Conference on Mercury as a Global Pollutant (ICMGP). Providence, Rhode Island, USA. 16th-21st July 2017.
- **N.M. Yatim *et al.* (UM)** Associations between placental O6-methylguanine DNA methyltransferase (MGMT) activity, air pollutants and birth outcomes. IFPA Conference. Manchester, UK. 30th August - 2nd September 2017.
- **N.B. Ahmad *et al.* (UM)** Heavy metal levels in human placentas. IFPA Conference. Manchester, UK. 30th August - 2nd September 2017.
- **V. Karri *et al.* (URV, PCB)** Proteomics Approach for improving the Mechanisms associated with MeHg Toxicity in HT-22 Hippocampal Cell line (Lecture). EUROTOX 2017. Bratislava, Slovakia. 10th-13th September 2017.
- **R.P. Sharma *et al.* (URV)** Development and validation of PBPK model for DEHP and its metabolites: Application to cohort and case-control studies (Lecture). EUROTOX 2017. Bratislava, Slovakia. 10th-13th September 2017.
- **Z. Spiric & T. Staflov (OIKON)** Air pollution control in Macedonia and Croatia by moss biomonitoring (Invited Introductory Lecture). Air Protection 2017. 10th Croatian Scientific and Professional Conference. Primosten, Croatia. 3rd-7th October 2017.
- **C. Schieberle *et al.* (USTUTT)** Life course exposure trajectories: A probabilistic model for prospective and retrospective exposure characterization (Lecture). 19th International Symposium on Environmental Pollution and its Impact on Life in the Mediterranean Region (MESAEP 2017). Rome, Italy. 4th-6th October 2017.
- **S. Sanyal *et al.* (UPMC, CNR, FMUP, JSI, NIOM, OIKON)** Maternal smoking during pregnancy and birth weight in European cohorts: The HEALS project (Lecture). DOHaD 2017. Rotterdam, The Netherlands. 15th-18th October 2017.
- **M.H. Soomro *et al.* (UPMC)** Exposure to metals during pregnancy and the association with gestational diabetes mellitus: Results from EDEN mother child cohort (Poster). DOHaD 2017. Rotterdam, The Netherlands. 15th-18th October 2017.
- **K. Polanska *et al.* (NIOM, ISS)** Micronutrients during pregnancy and child psychomotor development: opposite effects of Zinc and Selenium (Poster). DOHaD 2017. Rotterdam, The Netherlands. 15th-18th October 2017.
- **K. Polanska *et al.* (NIOM, ISS)** Environmental tobacco smoke exposure during pregnancy and child neurodevelopment (Poster). DOHaD 2017. Rotterdam, The Netherlands. 15th-18th October 2017.
- **M. Dickinson *et al.* (FERA, AUTH)** Using Metabolomics in Human Cohort Studies to Evaluate the Exposome in the EU project HEALS (Lecture). Metabomeeting 2017. Birmingham, UK. 11th-13th December 2017.
- **J.O. Grimalt (CSIC)** Environmental benefits and threats of life in the cities (Lecture). Central Organization of CSIC in Barcelona. Barcelona, Catalonia. 18th February 2018.
- **J.O. Grimalt (CSIC)** Environmental benefits and threats of life in the cities (Lecture). Cervantes Institute. Manchester, UK. 20th February 2018.
- **M. Gari *et al.* (CSIC)** Urinary concentrations of organophosphate and pyrethroid metabolites from two Spanish populations (Lecture). DGAUM. Munich, Germany. 7th-9th March 2018.
- **M. Gari *et al.* (CSIC)** Exposure to persistent organic pollutants and risk of metabolic syndrome in the population of Catalonia (Poster). 3rd Early Career Researchers Conference on Environmental Epidemiology. Munich, Germany. 19th-20th March 2018.
- **M. Gari *et al.* (CSIC)** Urinary concentrations of organophosphate and pyrethroid metabolites from two Spanish populations (Poster). 3rd Early Career Researchers Conference on Environmental Epidemiology. Munich, Germany. 19th-20th March 2018.
- **J.O. Grimalt *et al.* (CSIC)** Drivers of the accumulation of measured organochlorine pollutants in Mediterranean lean fish and dietary significance (Lecture). PPTOX Conference. Torshavn, Faroe Islands. 28th-31st May 2018.
- **M. Gari *et al.* (CSIC)** Temporal trends of organochlorine compounds and PBDEs from utero until 4 years of age in the Asturias INMA birth cohort (Lecture). PPTOX Conference. Torshavn, Faroe Islands. 28th-31st May 2018.
- **M. Gari *et al.* (CSIC)** Human exposure to organophosphate and pyrethroid pesticides in occupational and general populations in Catalonia and Galicia (Spain) (Poster). PPTOX Conference. Torshavn, Faroe Islands. 28th-31st May 2018.
- **J.O. Grimalt (CSIC)** Three decades of research on the environmental Health effects associated to chlor-alkali plants (Lecture). Institut d'Estudis Catalans. Barcelona, Catalonia. 6th June 2018.
- **J.O. Grimalt (CSIC)** Advantages and disadvantages of life in big cities (Lecture). Cervantes Institute. El Cairo, Egypt. 16th July 2018.
- **J.O. Grimalt (CSIC)** Life in big cities. Advantages and drawbacks (Lecture). International University Menendez y Pelayo. Santander, Spain. 23th July 2018.
- **N. Li (USTUTT)** Lifelong exposure of population subgroups with PM2.5 (Lecture). Ottawa, Canada. 28th August 2018.
- **M. Gabriel *et al.* (INEGI)** Empowering society by creating healthy urban environments (Lecture). World Health Organization (WHO) International Healthy Cities Conference. Belfast, Northern Ireland. 1st-4th October 2018.

- **C. Caradeuc *et al.* (UPD)** Impact on the human HepG2 cell metabolome of exposure to a mixture of 2 persistent organic pollutants (Poster). 20th International Congress on In Vitro Toxicology. Berlin, Germany. 15th-18th October 2018.
- **J.O. Grimalt (CSIC)** Air immission measurements of dioxins in Barcelona (Lecture). Public Health Agency of Barcelona. Barcelona, Catalonia. 22nd October 2018.
- **M. Garí *et al.* (CSIC)** Application of structural equation modelling and environment-wide association studies for the assessment of metabolic syndrome and the exposure to environmental pollutants (Lecture). Herbstworkshop on Innovative Designs. 22nd-23rd November 2018.
- **M.A. Martínez *et al.* (URV)** Dietary and non-dietary pre-natal exposure to endocrine disruptors (BPA and DEHP). Spanish case study (Lecture). 28th Annual Meeting SETAC 2018. Rome, Italy.
- **M.A. Martínez *et al.* (URV)** Prediction and evaluation of the internal dosimetry of two wide spread endocrine disruptors in fetus using a physiologically based pharmacokinetic model (Lecture). 54th Congress of the European Societies of Toxicology (EUROTOX 2018). Brussels, Belgium.
- **R.P. Sharma *et al.* (URV)** PBPK/PD coupled HPG SB model to analyze the reproductive toxicity of EDs: case study on mixture effects of DEHP and TCDD (Lecture). 54th Congress of the European Societies of Toxicology (EUROTOX 2018). Brussels, Belgium.
- **V. Kumar *et al.* (URV, PCB)** A System-based Comparative Proteomics Approach to Investigate Heavy metals mixtures toxicity mechanism relates to the neurodegeneration on Hippocampal cell line. 54th Congress of the European Societies of Toxicology (EUROTOX 2018). Brussels, Belgium.
- **M. Marquès *et al.* (URV)** From biomonitoring to PBPK/PD modeling of Bisphenol A and its analogues: The mixture approach. SETAC North America 39th Annual Meeting. Sacramento, USA.

Other dissemination activities

- **UPD** Robert Barouki was awarded with the 2018 INSERM Prize, for his implication in Toxicology and Society.



- **URV** Toxic elements in clothes. Several Spanish and international Radios, TV, and newspapers.
- **URV** Pollution in schools is analyzed in Tarragona, Catalonia (Diari Tarragona newspaper).



- **URV** Dissemination activities in several schools of Tarragona country: Air Quality, Exposure and Health.
- **URV** Dissemination activity with gynaecologists and medical doctors in Sant Joan Hospital in Reus (Tarragona).

- **OIKON** Prof. Zdravko Spiric was member of the scientific and expert committee at the 10th Croatian Scientific and Professional Conference (Air Protection 2017), held in Promisten, Croatia, on October, 3rd-7th 2017. A poster was presented, and leaflets were distributed in order to promote and disseminate the HEALS project in the event.



- **URV** Dr. Joaquim Rovira was awarded with 2018 Toxic Travel award.
- **URV** In 2018, two thesis were successfully defended in URV, both related to the HEALS project.
 - **Dr. Venkatanaidu Karri** "Development and Application of an in vitro models for estimating mixture Metal (Pb, Cd, MeHg, As) Mode of toxicity in Brain (Hippocampus)". PhD Supervisors: Dr. Marta Schuhmacher and Dr. Vikas Kumar.
 - **Dr. Raju Prasad Sharma** "Integrative systems toxicology for human health". PhD Supervisors: Dr. Marta Schuhmacher and Dr. Vikas Kumar.

Forthcoming Events

HEALS meetings

- **HEALS-EWAS Meeting**
17–18th January 2019, Paris (France).
<http://www.heals-eu.eu/>

Other related meetings

- **European Respiratory Society International Congress (ERS)**
9–13th September 2017, Milan (Italy)
<https://erscongress.org/>
- **53rd Congress of the European Society of Toxicology**
10–13th September 2017, Bratislava (Slovak Republic)
<http://www.eurotox2017.com/>
- **19th Annual Scientific Conference of the ISEE**
24–28th September 2017, Sydney (Australia)
<http://www.isee2017.com/>
- **19th International Symposium on Environmental Pollution and its Impact on Life in the Mediterranean Region**
4–6th October 2017, Rome (Italy)
<http://www.mesaep.org/>
- **International Society of Exposure Science Annual Meeting**
15–19th October 2017, Durham, North Carolina (USA)
<http://intlexposurescience.org/ISES2017/>
- **Biospecimen Research Symposium: Quality matters**
27–28th February 2018, Luxembourg
<http://www.isber.org/events/EventDetails.aspx?id=1022653>

Editorial Board

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Editorial Information

If you wish to contribute to the *Newsletter* or share information for publication, please contact Mercè Garí:

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