



European Human Exposome **NETWORK**

The world's largest project network studying the impact of environmental exposure on health

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NEWSLETTER

Understanding and studying the human exposome will help create better prevention strategies to address a pressing public health issue. This requires a holistic approach, with different areas of scientific research working in close collaboration.



Welcome

Welcome to the first European Human Exposome Network (EHEN) newsletter. EHEN is the world's largest network of projects studying the impact of environmental exposures across a lifetime - the *exposome* - on human health. It brings together nine research projects, receiving over €100 million from Horizon 2020, the EU's framework programme for research and innovation. The nine projects are ATHLETE, EPHOR, EQUAL-LIFE, EXIMIOUS, EXPANSE, HEDIMED, HEAP, LongITools, and REMEDIA.

These projects will contribute to advancing the European Green Deal's ambition to protect citizens' health and wellbeing from pollution and environmental deterioration by providing new evidence for better preventive policies.

We hope that this newsletter will be of interest to you and welcome any feedback you may have. In future editions, due twice yearly, we will share the latest developments and results from our research.

Martine Vrijheid and Irene van Kamp
EHEN Coordination Team

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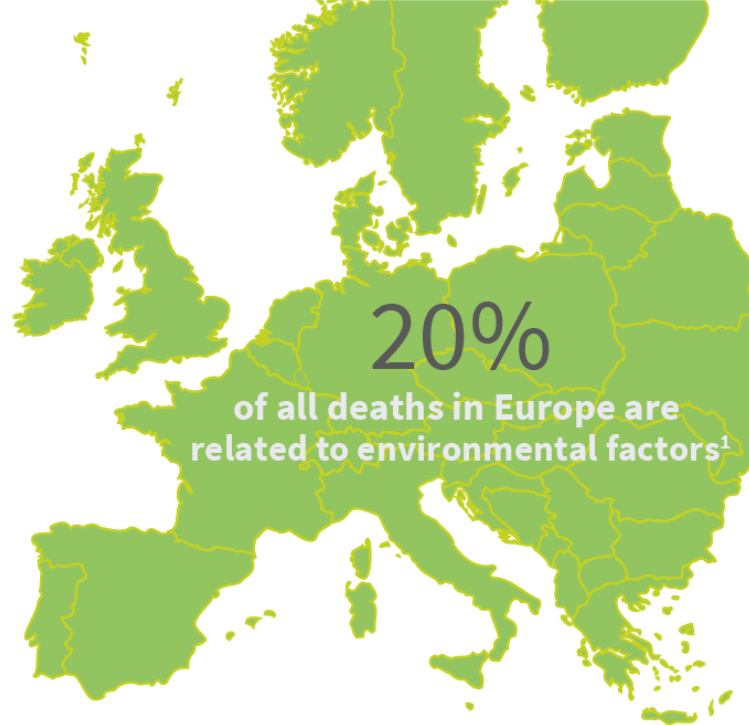
The Exposome Explained

Over 15 years ago, Dr Christopher Wild introduced the word *exposome* to the scientific community, articulating his vision for a field that provided the environmental complement to the genome. However, establishing an exposome field has progressed slowly. The exposome has been in its adolescent stage for the past several years, but its identity has been confused, falling between disciplines and not knowing quite where it sits.

The investment made by the European Commission in creating EHEN, the launch of other programmes and research centres across the world, and the recent establishment of a new journal dedicated to exposome research is helping to move things forward.

So what is the exposome?

The human exposome encompasses exposures to environmental factors throughout life, starting from conception and pregnancy. It refers to the totality of environmental exposures over a lifetime.



The exposome approach to research is more holistic, exploring multiple environmental factors affecting health. This moves away from studying using the more traditional 'one exposure, one disease' approach.

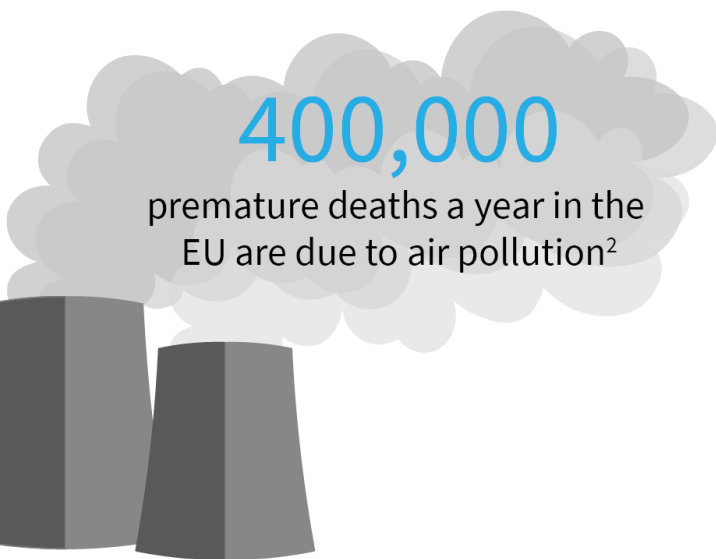
Why is exposome research so important?

Research on the human exposome is paramount to understanding the cause of common diseases such as cardiovascular and metabolic diseases, respiratory diseases, immunological disorders, mental health disorders, and non-communicable diseases.

It is important to be systematic and measure all of the exposures potentially affecting an individual's health with the same level of precision as we can for an individual's genome (DNA sequence).

Environmental exposures are diverse and interact with each other. These exposures can include: pollution, infections, chemicals, diet, urban, blue and green environments, socioeconomic factors and lifestyle e.g. occupational. All of these factors can impact our health and wellbeing.

EHEN's research will lead to better prediction of disease risk and the creation of an 'Exposome Toolbox', which will help enable the development of solid, cost-effective, preventative actions and policies.



¹<https://op.europa.eu/en/publication-detail/-/publication/1815a409-367b-11ea-ba6e-01aa75ed71a1/>

²<https://www.eea.europa.eu/highlights/cutting-air-pollution-in-europe>

Meet the EHEN Team

Each of the nine Project Coordinators form the EHEN Board, the decision-making body of the network. The EHEN Board also includes five external advisory board members who provide independent advice and support.

Coordination of EHEN activities is done by the Network Coordination Team, consisting of two or three of the Project Coordinators at any one time, on a rotational basis. During the first 15 months, this was done by Professor Roel Vermeulen (EXPANSE) and Professor Joakim Dillner (HEAP).



In April 2021, the baton was passed to Professor Martine Vrijheid (ATHLETE) and Dr Irene van Kamp (EQUAL-LIFE) who will coordinate EHEN until the end of June 2022.



Between July 2022 and September 2023, the role will be taken on by Professor Peter Hoet (EXIMIOUS) and Professor Sylvain Sebert (LongITools).



The final period of the project, between October 2023 to the end of 2024, will be coordinated by Dr Anjoeka Pronk (EPHOR), Professor Heikki Hyöty (HEDIMED) and Dr Sophie Lanone (REMEDIA).



Working Groups



Communication and Dissemination (C&D)

The C&D working group is mostly made up of the people leading communication and dissemination activity, an essential dimension, within the projects. Each of the nine projects is represented and the group also includes EHEN Advisory Board member Jacqueline Bowman-Busato of The European Association for the Study of Obesity (EASO).

The group supported the development of EHEN's communication and dissemination strategy. An updated website, new visual branding and logos, a project led by Heather Coombs from HEAP, were launched earlier this year. The group has a key role to play in ensuring EHEN maximises the collective impact of the nine projects and will continue to meet at least twice a year.



Metadata

The Metadata working group first met in early 2021 to synergise areas of activity within projects. There is a consensus between the projects and an aim to harmonise data across projects, where possible.

Four main sub-categories of metadata have been pinpointed, and four leads for the different sub-groups identified in order further to focus on specific areas of expertise. Those areas and the sub-group leads are:

- Omics data - Roxana Martinez from HEAP
- Chemical exposome - Richard Hůlek from EXPANSE
- Medical and clinical data - Justiina Ronkainen from LongITools
- EHEN data catalogue - Morris Swertz from ATHLETE and LongITools.



Law and Ethics

The Law and Ethics Working Group first met in April 2021. The group will be focusing on specific issues such as cross-border sharing of human tissues and consents, along with larger themes including how exposome research can contribute to individual wellbeing, health and social equity.



23 partners from 11 countries

Children are particularly vulnerable to environmental hazards. **ATHLETE** will measure many environmental exposures (urban, chemical, lifestyle and social risk factors) during pregnancy, childhood, and adolescence. This “early-life exposome” will then be linked to children’s biological responses and cardiometabolic, respiratory, and mental health. The results will help us to better understand and prevent health damage from environmental agents and their mixtures, from the earliest parts of the life course onward.

Coordinator: ISGlobal, Spain.



19 partners from 12 countries

The total burden of disease caused by occupational exposure is estimated at 5-7%. Within **EPHOR** we will develop methods and tools to characterize the working-life exposome, defined as all occupational and related non-occupational exposures (e.g., lifestyle, behaviour) throughout the course of life. By applying these, we will obtain better and more complete knowledge of the working-life exposome.

Coordinator: Netherlands Organization for Applied Scientific Research (TNO), Netherlands.



21 partners from 11 countries

EQUAL-LIFE will develop and test combined exposure data using a novel approach to multi-modal exposures and their impact on children’s mental health and development. A combination of birth-cohort data with new sources of data will provide insight into aspects of physical and social exposures hitherto untapped. It will do this at different scale levels and timeframes while accounting for the distribution of exposures in social groups based on gender, ethnicity and social vulnerability.

Coordinator: National Institute for Public Health and the Environment (RIVM), Netherlands.



15 partners from 7 countries

Immune-mediated non-communicable diseases, such as autoimmune diseases, allergic diseases and asthma, are chronic disorders in which the interaction between the exposome and immune system plays a pivotal role. The **EXIMIUS** consortium will extensively map the exposome and the immune system (immunome), together with other omics, clinical and socio-economic data. The integrated data analysis will allow the construction of ‘immune fingerprints’ that reflect a person’s lifetime exposome and health status of his/her immune system (individual predictors of disease).

Coordinator: Catholic University of Leuven



19 partners from 13 countries

EXPANSE will address one of the most pertinent questions for urban planners, policymakers, and European citizens: “How to maximise one’s health in a modern urban environment?” We will do this by bringing together the exposome and health data of more than 55 million Europeans and by applying a novel approach to agnostically screen for chemicals in 10,000 blood samples collected from these individuals. We will study the impact of (changes in the) urban exposome on the burden of cardio-metabolic and pulmonary disease.

Coordinator: Utrecht University, Netherlands.



22 partners from 12 countries

HEDIMED will identify exposomic determinants, which are driving the rapid increase of immune-mediated diseases (IMDs) such as type 1 diabetes, celiac disease, allergies and asthma. The project is based on data and samples from large clinical cohorts and trials from countries with either high or low IMD incidence. Exposomic disease determinants and the underlying biological pathways will be identified using advanced omics, multiplex and data-mining technologies.

Coordinator: Tampere University, Finland.



11 partners from 6 countries

The Human Exposome Assessment Platform (HEAP) is a powerful informatics platform, currently in development, for handling, analysing and combining large data sets on environmental exposures and their health effects. Scientific research groups provide the pilot data for HEAP, which are sourced from population-based cohorts, national health registries, consumer purchases, wearable sensors, and metagenomic and epigenomic analysis of biosamples.

Coordinator: Karolinska Institutet, Sweden.



18 partners from 8 countries

LongITools is studying the interactions between the environment, lifestyle and health in determining the risks of chronic cardiovascular and metabolic diseases such as obesity, type 2 diabetes, heart disease and atherosclerosis. The team will study and measure how exposure to air and noise pollution and the built environment contribute to the risk of developing such diseases through a person's life. The project will take an exposome or holistic approach to determine the best points in life to intervene to reduce these risks.

Coordinator: Centre for Life-Course Health Research at the University of Oulu, Finland.



13 partners from 9 countries

The overall objective of the **REMEDIA** project is to determine how and to what extent the exposome affects the severity and morbidity of Chronic Obstructive Pulmonary Disease (COPD) and Cystic Fibrosis (CF), throughout the disease. Its unique methodology relies on using atmospheric simulation chambers, integrating a unified clinical data repository and applying advanced machine learning approaches. REMEDIA will provide a toolbox with recommendations and treatment guidelines for the design of more tailored prevention and care programs.

Coordinator: National Institute of Health and Medical Research (INSERM), France.

Upcoming Events 2021

EXIMIOUS-EPHOR Symposium, 11th-15th September 21

The EXIMIOUS-EPHOR Joint Symposium will take place during the **International Occupational Health Association (IOHA) 2021 Conference**. The symposium will present the EXIMIOUS/EPHOR experience of developing and applying exposome tools for exposure assessment in the exposome context. [Download flyer](#) for more information.

LongITools Policy Forum, 29th September 21

'**The Clean Air Debate: The Lifelong Impact of Air Pollution**' is the second in a series of events to connect science and policy. The forum will provide the opportunity to network and engage with other policy and research stakeholders and to share knowledge and best practice. This forum will specifically focus on air pollution and its effects across the life-course. For more information and to register, please visit the [website](#).

Latest News

Exposome Journal

Exposome, a new journal, is now accepting submissions. The editor, Gary Miller, wants "daring science and submissions from investigators who understand that the exposome is manifestly important and attempt to perform experiments that are seemingly impossible." The journal is not requesting that researchers cut corners, rather that they re-engineer the corners. Creativity is needed "to deliver the type of science that will transform our understanding of how our complex environment influences our health."

EHEN Symposium

EHEN held a symposium at the International Society of Environmental Epidemiology conference in August 2021. The presenting team demonstrated the power of FAIR EU cohorts to decode the environmental exposome in ethical ways and the importance of replication and triangulation to question causality for effective policy impact.

The ongoing EHEN working groups are clear examples showing that things are moving forward into the right direction.

Highlights from the EHEN Conference

“Decoding the exposome: the biggest influencer on health” took place on Friday, 11th June 2021. The conference was attended by 350 participants, featured three key note presentations, two panel discussions, a poster session and 13 inspiring break-out sessions, enabling participants to hear from each of the nine EHEN projects.

Keynote speaker Dr Rick Woychik, Director of the National Institute of Environmental Health Sciences, talked about the challenges to defining the exposome, the need to operationalise on a global scale and the aspiration of a global exposome project.

During the policy stakeholder panel session, messages included:

- Only by understanding the human exposome can we create better prevention strategies.
- We have to substantially enhance our knowledge of risk factors, since only 50% of them are known.
- Researchers can help to find where policies can be strengthened.
- Policymakers need to be open to research and endorse it.

Annette Peters (Helmholtz Zentrum München), another keynote speaker, talked about the key characteristics of environmental risks, combined with some insights from HERA regarding the future outlook.

The final keynote was Michael Snyder of Stanford University who talked about his work on big data, trying to identify personal exposures and seeing how they associate with human health.

Overall, there was a general feeling that exposome science has matured; people are recognising that this is different to what came before, and we are moving away from one exposure, one disease. However, although exposome research is holistic, stakeholders such as regulation agencies still operate in silos, which makes it difficult to operate collectively.

The conference was organised by the EXPANSE project coordination team, facilitated by Anya Sitaram and hosted from Utrecht University.



For more information visit the website:

<https://www.humanexposome.eu/>

And for details of upcoming exposome-related events visit:

<https://www.humanexposome.eu/events/>

This newsletter only reflects the author's view and the European Commission is not responsible for any use that may be made of the information it contains.



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