



science and policy
for a healthy future

Overview of HBM initiatives around the globe and brief history of HBM4EU

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What is HBM?

“The method for assessing human exposure to chemicals or their effects by measuring these chemicals, their metabolites or reaction products in human specimens”

- CDC. Third National Report on Human Exposure to Environmental Chemicals. 2005



Overview of HBM initiatives around the globe



Types of HBM surveys

Cross-sectional surveys

To assess the internal concentrations at one moment of time

If done on a random sample of general population, will reflect nation-wide exposure information

Longitudinal surveys

Repeated measurements on sample individuals over time

Birth cohorts are one type of longitudinal survey

- To assess perinatal exposure and its health effects

HBM4EU inventory of HBM studies in Europe

Following the distribution of countries in the previous table, it can also be seen in Figure 3 that Belgium, Italy and Spain were the most frequent countries of data collection reported.

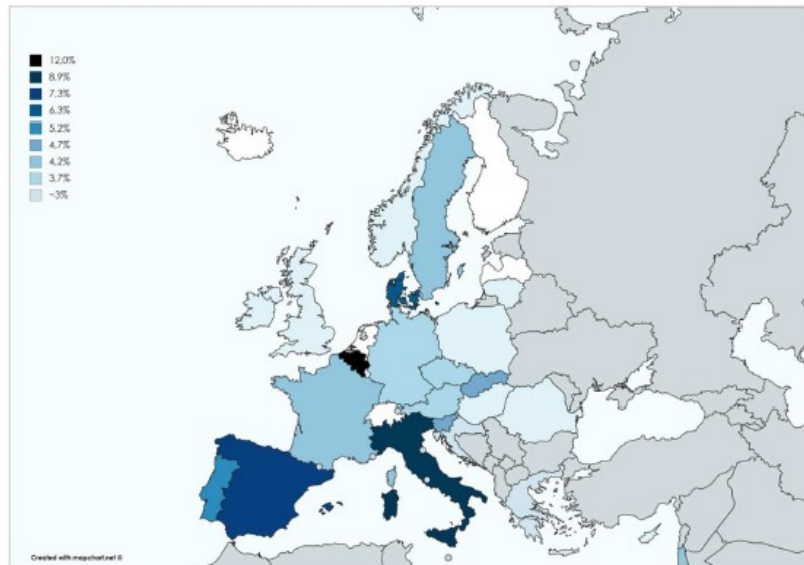


Figure 3: Country/countries where data were/are/will be collected

The studies captured with our survey had mainly a national or regional implementation level, although almost 11% of them were international, involving institutions from more than one country (Table 3).

- 2017: an inventory by WP7
- Total on 192 HBM surveys were reported from 29 European countries

Deliverable 7.1. at <https://www.hbm4eu.eu/deliverables/>

Study design

	European regions					Total
	North	West	South	East	Other	
Cross-sectional	10 (36%)	24 (55%)	23 (52%)	7 (44%)	3 (43%)	67
Case-control	3 (11%)	1 (2%)	9 (21%)	1 (6%)	1 (14%)	15
Longitudinal (cohort)	12 (43%)	16 (36%)	12 (27%)	7 (44%)	3 (43%)	50
Cross-sectional and longitudinal	3 (11%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	4
Pilot survey	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	1
Surveillance	0 (0%)	1 (2%)	0 (0%)	1 (6%)	0 (0%)	2

* North: Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, UK
West: Austria, Belgium, France, Germany, Luxembourg, The Netherlands, Switzerland
South: Croatia, Cyprus, Greece, Italy, Malta, Portugal, Slovenia, Spain
East: Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia
Other: Israel

Deliverable 7.1. at <https://www.hbm4eu.eu/deliverables/>

Target population

	European regions					Total
	North	West	South	East	Other	
Newborns	9 (32%)	13 (30%)	9 (21%)	11 (69%)	2 (29%)	44
Children	16 (57%)	26 (59%)	24 (55%)	14 (88%)	4 (57%)	84
Adolescent	7 (25%)	13 (30%)	6 (14%)	4 (25%)	0 (0%)	30
Adults	19 (68%)	18 (41%)	24 (55%)	9 (56%)	5 (71%)	75
Elderly	5 (18%)	5 (11%)	6 (14%)	4 (25%)	0 (0%)	20

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Cross-sectional surveys in Europe - Examples

Belgium: The Flemish Environment and Health Study (FLEHS)

- Conducted periodically since 2001
- Covers all age groups from newborns to adults
- <http://www.milieu-en-gezondheid.be/en/homepage-eng>

France: Étude de santé sur l'environnement, la biosurveillance, l'activité physique et la nutrition (ESTEBAN)

- Conducted in 2014-2016
- Covers children, adolescents and adults
- <http://invs.santepubliquefrance.fr//Dossiers-thematiques/Environnement-et-sante/Esteban>

Germany: The German Environmental Surveys (GerESs)

- Conducted periodically since 1985
- Covers children, adolescents and adults
- <https://www.umweltbundesamt.de/en/topics/health/assessing-environmentally-related-health-risks/german-environmental-survey-geres>

Longitudinal surveys in Europe - Examples

Switzerland: Swiss study on Air Pollution and Lung Disease in adults (SAPALDIA)

- Initiated in 1991, follow-up at 2002
- Almost 10 000 participants aged 18-60 years at baseline
- <http://www.sapaldia.ch/en/>

Iceland: Age, Gene/Environment Susceptibility study (AGES Reykjavik Study)

- Baseline recruitment in 1967-1994
- Over 20 000 participants
- <http://www.hjartarannsokn.is/index.aspx?GroupId=346>

Birth cohorts in Europe - Examples

France: French Longitudinal Study of Children (ELFE)

- Recruited in 2011 and includes 20 000 children followed from birth to adulthood
- <https://www.ined.fr/en/research/research-projects/P1016>

Denmark: Danish National Birth Cohort (DNBC)

- Recruited in 1996-2002 and includes 100 000 pregnant women and children
- <https://www.ssi.dk/English/RandD/Research%20areas/Epidemiology/DNBC/>

Norway: Norwegian Mother and Child Cohort Study (MoBa)

- Recruited in 1999-2008 and includes 110 000 pregnant women and their children
- <https://www.fhi.no/en/studies/moba/>

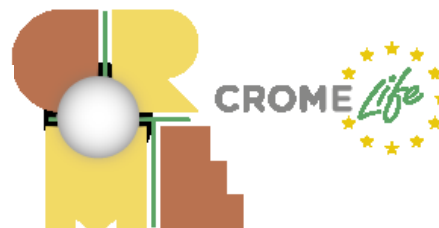
Spain: Spanish Environment and Childhood Research Network (INMA)

- Recruited in 1997-2008 and is a collection of several Spanish cohorts of pregnant women and their children around the country
- http://www.proyectoinma.org/presentacion-inma/en_index.html

International/multinational initiatives - Examples



A tiered strategy for risk assessment of mixtures of multiple chemicals





National Health and Nutrition Examination Survey

The NHANES program began in the early 1960s and has been conducted as a series of surveys focusing on different population groups or health topics. In 1999, the survey became a continuous program that has a changing focus on a variety of health and nutrition measurements to meet emerging needs. The survey examines a nationally representative sample of about 5,000 persons each year. These persons are located in counties across the country, 15 of which are visited each year



<https://www.cdc.gov/nchs/nhanes/index.htm>

Cycle 1 (2007-2009): Report on Human Biomonitoring of Environmental Chemicals in Canada (2010)

Cycle 2 (2009-2011): Second Report on Human Biomonitoring of Environmental Chemicals in Canada (2013)

Cycle 3 (2012-2013): Third Report on Human Biomonitoring of Environmental Chemicals in Canada (2015)

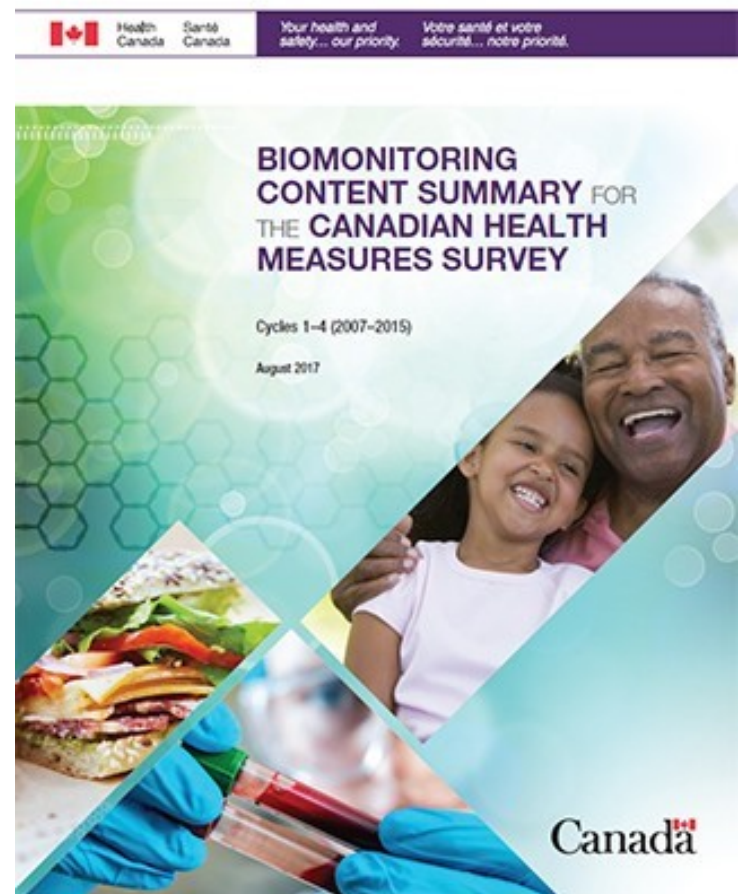
Cycle 4 (2014-2015): Fourth Report on Human Biomonitoring of Environmental Chemicals in Canada (2017)

Maternal-Infant Research on Environmental Chemicals (The MIREC Study)

<https://www.canada.ca/en/health-canada/services/environmental-workplace-health/environmental-contaminants/human-biomonitoring-environmental-chemicals/maternal-infant-research-environmental-chemicals-mirec-study.html>

Northern Contaminants Program - Human Health

http://www.science.gc.ca/eic/site/063.nsf/eng/h_79826059.html



Stage 1 (2009-2011): 16 chemical compounds
in blood and urine of 6,000 participants

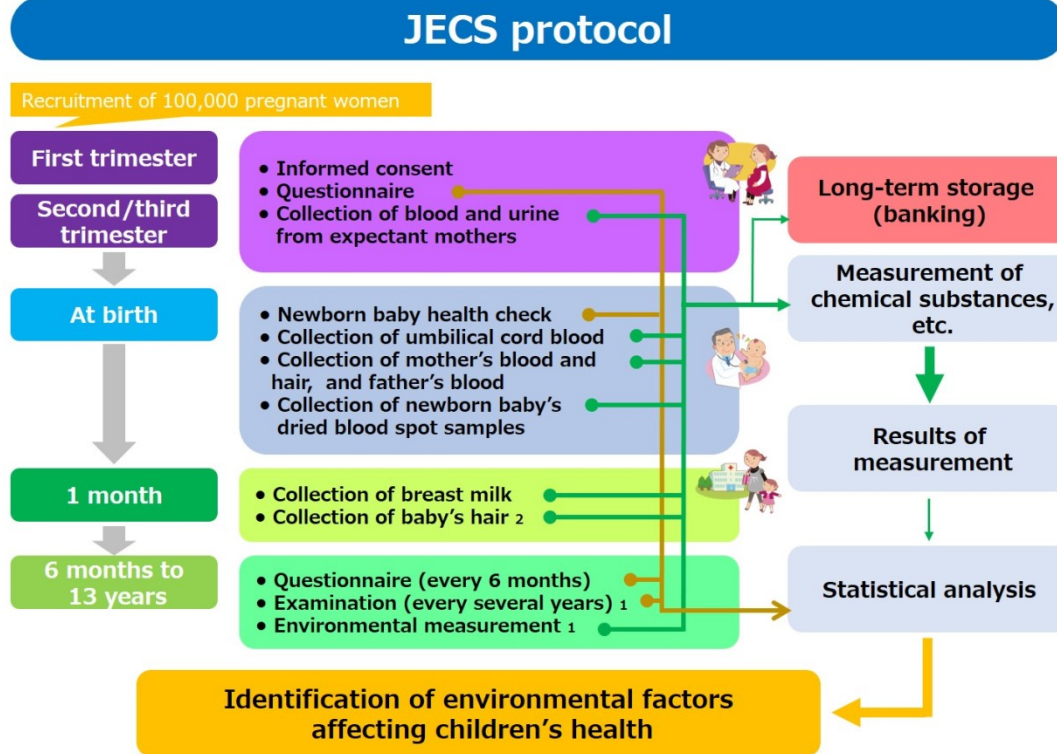
Stage 2 (2012-2014): 21 chemical compounds
and 19 clinical tests on blood and urine



Korean National Environmental Health Survey (KoNEHS)
<http://eng.me.go.kr/eng/web/index.do?menuId=335>

JECS

Japan Environment and Children's Study



¹ A subgroup of participants

² A few strands cut with scissors



<http://www.env.go.jp/chemi/ceh/en/researcher/publications.html>

A brief description of HBM4EU

Why HBM4EU was established?

- Lack of data on aggregate exposure to single substances and to combinations of chemical substances.
- Insufficient evidence-based knowledge on the link between external exposure via different routes, internal level and health.



Urban



Environment



Drinking Water



Cosmetics



Consumer Products



Indoor Air



Diet

Why HBM4EU is needed

- Better understand the consequences of **human exposure to various chemicals**, a key aspect of environmental health
- Bridge the gap between **science and policy making**
- Share **evidence of use** from national programs
- **Share existing experience** in the EU and to share the burden
- Generate better evidence for **better regulation**
- Give better access by a new data-infrastructure - **IPChem**
- **Include aggregate exposure** in the health risk assessment

What is HBM4EU?

- A joint effort of 28 countries, the European Environment Agency and the European Commission, co-funded under Horizon 2020.
- Represents a novel collaboration between scientists and chemical risk assessors and risk managers, including several Commission services, EU agencies and national representatives.
- Runs for five years, from 2017 to 2021.
- Budget ~74M €

Who are the HBM4EU partners?

Countries:

- 24 EU Member States
- 3 Associated States
- Switzerland
- EEA

Coordinated by UBA,
Germany

Consortium partners



■ EU Member States

■ Associated States

■ Associated to
parts of H2020

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[http://philarcher.org/
diary/2013/euromap/](http://philarcher.org/diary/2013/euromap/)

What are the HBM4EU objectives?

- **Harmonise** procedures and tools for HBM at EU level;
- **Provide** and, where missing, **generate** internal **exposure data** and link this data to aggregate external exposure and the relevant exposure pathways;
- **Develop novel methods** to identify human internal exposure to environmental and occupational chemicals and establish the causal link with human health effects;
- **Provide** policy-makers and the general population **science-based knowledge** on the health risks associated with chemicals exposure; and
- **Improve chemical risk assessment** in the EU through the effective use of HBM data.

More information about HBM4EU at
<http://www.hbm4eu.eu>

Speakers's information

Hanna Tolonen, PhD, Adjunct Professor, works as Research manager at the National Institute for Health and Welfare, Finland. She received training in statistics, public health and epidemiology. In HBM4EU she is a member of the Management Board and the Ethics Board, and the leader of WP11 Linking HBM, health surveys and registers.



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