Monitoring of environmental impacts on health
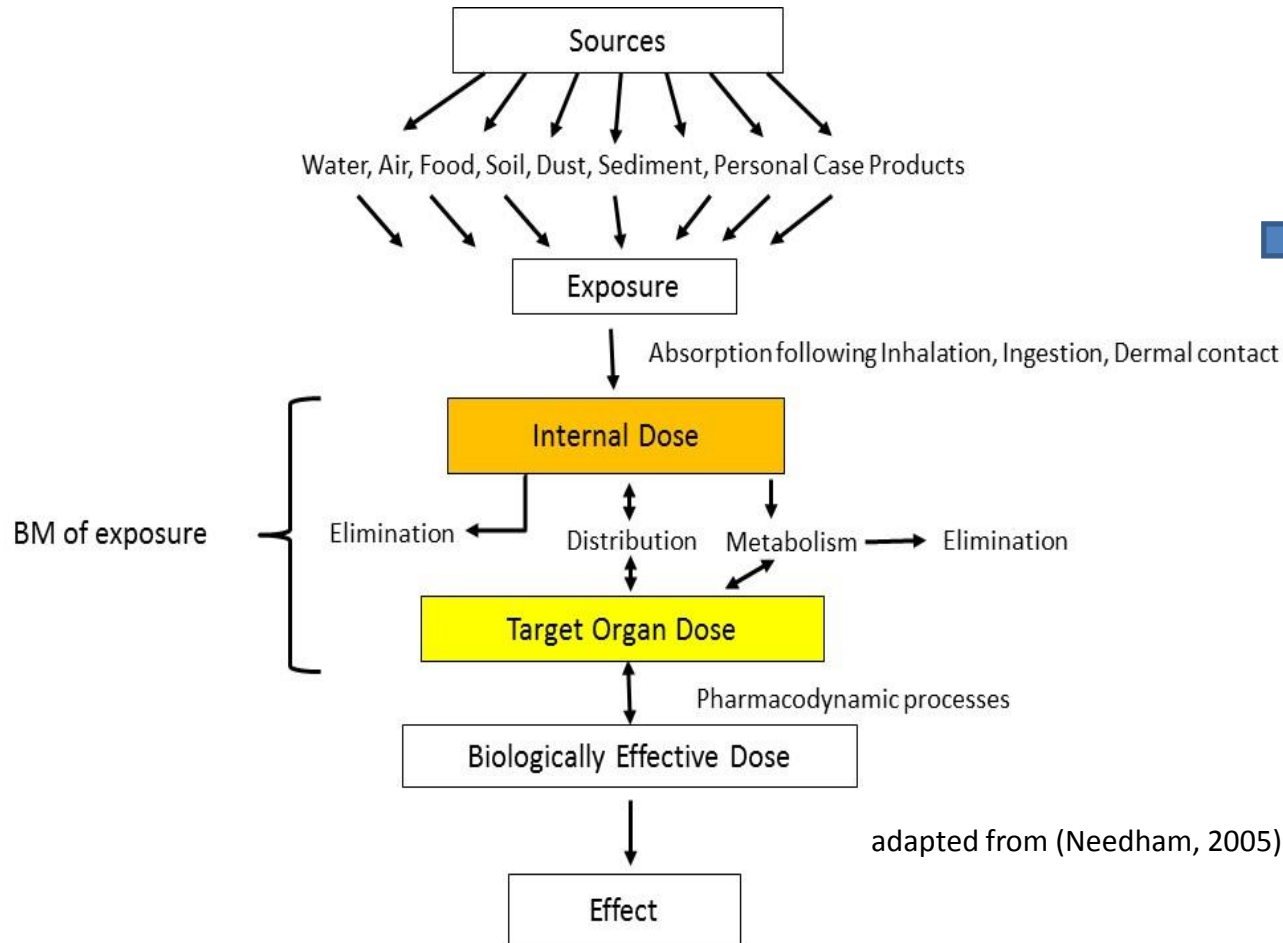
A Joas, MD PhD
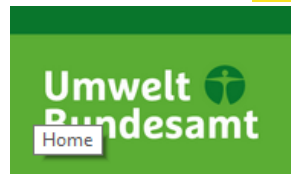
www.bridge-health.eu

Environmental health is defined to prevent human injury and illness and promoting well-being by identifying and evaluating environmental sources and hazardous agents and limiting exposures to hazardous physical, chemical, and biological agents in air, water, soil, food, and other environmental media or settings that may adversely affect human health (WHO, 2016).

– The 3rd EU Health Programme (2014-2020) identified the following core priorities challenges:

- sustainable health monitoring and reporting,
- elimination of health and health information inequalities,
- healthy aging,
- identification of major determinants of health,
- quality principles, standards and legislation,
- awareness raising on health threats,
- eHealth
- transboundary health care

=Connected to environmental health

BRIDGEHEALTH
BRidging Information and Data Generation
for Evidence-based Health Policy and Research

This project is funded by the Health Programme of the European Union

Sources

Water, Air, Food, Soil, Dust, Sediment, Personal Case Products

Exposure

Absorption following Inhalation, Ingestion, Dermal contact

Internal Dose

BM of exposure

Elimination   Distribution   Metabolism ⟶ Elimination

Target Organ Dose

Pharmacodynamic processes

Biologically Effective Dose

adapted from (Needham, 2005)

Effect

causal interference of exposure and disease

BRIDGEHEALTH
BRidging Information and Data Generation
for Evidence-based Health Policy and Research

Special features and limitations of HBM

Features

- Internal human exposure or effects to exposure

- May identify particularly vulnerable or exposed sub-groups

- May associate body burden/reactions to health effects

➡ „Determinants of Health"

Limitations

- Costs

- Time

- Need to be combined with other data and tools

For which stressors can HBM tell about health impacts?

Classical POPs: PCDD/PCDF, PCBs

Metals: lead, arsenic, mercury, cadmium

Biocides: pesticides, herbicides, fungicides - organophosphates, pyrethroids

Flame retardants: polybrominated/fluorinated diphenyl ethers (PBDEs), PBBs,

Plastic compounds: phthalates, phenols

Coatings: perfluorinated compounds (Teflon)

Personal care compounds: Polycyclic musks, desinfection (triclosan, parabens), trihalo-

methans, Sunscreens

(semi)Volatile organic compounds (VOCs and sVOCs): benzene, PAHs

BRIDGEHEALTH

BRidging Information and Data Generation
for Evidence-based Health Policy and Research

How strong is the evidence for causal effects?

	Fetal growth & preterm birth	Neuro-development	Respiratory and immune health
Outdoor air pollutants - NO_2, PM, ozone, SO_2, CO, PAHs	+++	++	+++
Heavy metals - Pb, Hg, Cd, As	++	+++	0
Organochlorine compounds - PCBs, DDT/DDE, HCB, dioxins	++ (+++ for PCBs)	+++	++
PBDEs	+	++	0
Currently used pesticides - organophosphates, pyrethroids	+	+++	0

Vrijheid et al 2016

BRIDGEHEALTH

BRidging Information and Data Generation for Evidence-based Health Policy and Research

This project is funded by the Health Programme of the European Union

Where do HBM and environmental data collection match?

Indicators and/or relevant information	Biomarkers	Classical POPs	Heavy Metals	Biocides	Flame retardants	Plastic compounds	Coatings	Personal care compounds	Smoking	VOCs	Acrylamide
exposure PM10 (ECHI55)			x							x	
Indoor air (IPChem)		x	x		x	x	x		x	x	
Soil (national databases)		x	x	x						x	
chemical contaminants (EFSA)		x	x			x	x			x	x
Consumer goods non food (REACH[1])					x	x	x	x			
work-related health risks (ECHI53)		x	x	x	x	x	x			x	

BRIDGEHEALTH
BRidging Information and Data Generation for Evidence-based Health Policy and Research

This project is funded by the Health Programme of the European Union

Indicators and/or relevant information within European programs	BM	Classical POPs	Heavy Metals	Biocides	Flame retardants	Plastic compounds	Coatings	Personal care compounds	Smoking	VOCs	Acrylamide
blood pressure (ECHI 43)			x						x	x	
cancer incidence (ECHI 20)		x	x	x					x	x	x
diabetes (ECHI 21A and B)		x	x	x	x	x	x	x		x	
total fertility rate (ECHI 4)		x	x	x	x	x	x	x			
asthma (ECHI 26A and B)		x	x	x	x	x	x		x	x	x
COPD (ECHI 27A and B)		x	x	x	x	x	x	x	x	x	x
dementia/Alzheimer (ECHI 22)			x	x	x	x				x	
depression (ECHI23A and B)			x	x	x	x				x	
(low) birth weight (ECHI28)		x	x	x	x	x			x	x	x
Apgar score at 5 minutes (R2)		x	x	x	x	x	x	x	x	x	x
severe maternal morbidity (R6)		x	x	x	x	x	x	x	x	x	x
body mass index (ECHI42)		X			x	x	x	x	X		

BRIDGEHEALTH
BRidging Information and Data Generation for Evidence-based Health Policy and Research

This project is funded by the Health Programme of the European Union

Challenges in interlinking HBM, health, and environmental registries

– Main challenges for linkage of exposure (food, air, water, soil) and health data are:

> – the level of detail available to (external) users
>
> – the geographical resolution

– the diversity of platforms/where the data are stored

– the extend of harmonization of data generation and reporting

– gaps in specific human biomarker, food, and exposure data in certain countries and/or for certain age groups

European Core Health Indicators (ECHIs) Database

In health information, priority elements are better information about health status and health systems performance. For this, among others, European Core Health Indicators (ECHIs) are used:

Currently:

- 88 established indicators, only a few are related to environ. Health:
  - smoking
  - consumption of fruit and vegetable
  - work-related health risks
  - particular matter (PM) exposure.

❗→ no indicator for impacts of chemicals on health at EU level❗

BRIDGEHEALTH
BRidging Information and Data Generation
for Evidence-based Health Policy and Research

This project is funded by the Health Programme of the European Union

Integration of Impacts of environmental chemicals in Health Information

- Start reporting on impacts of environmental chemicals.

- Collect HBM data routinely.

- Facilitate interpretation and avoid double work.

How ?

⟹ Implement HBM-based indicators, integrate HBM with EHES, adjust disease registries, to allow tracing of exposures sources

BRIDGEHEALTH
BRidging Information and Data Generation
for Evidence-based Health Policy and Research

This project is funded by
the Health Programme of
the European Union

Added value of synergies!
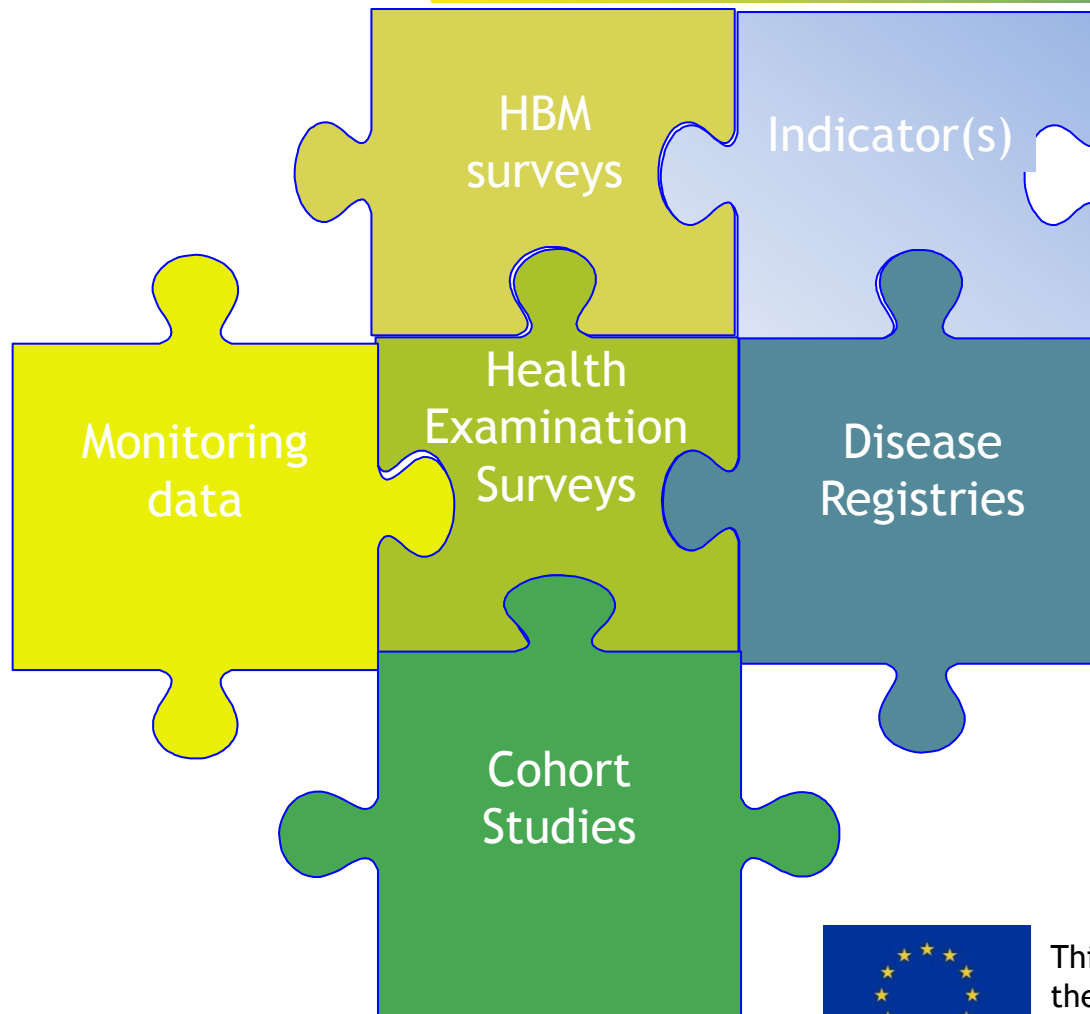
HBM surveys

Indicator(s)

Monitoring data

Health Examination Surveys

Disease Registries

Cohort Studies

BRidging Information and Data Generation
for Evidence-based Health Policy and Research

This project is funded by
the Health Programme of
the European Union

The next steps – HBM4EU

https://www.hbm4eu.eu/

„Coordinating and advancing Human Biomonitoring in Europe to provide evidence for chemical policy making"

- Running from **2017 to 2021**, HBM4EU will generate knowledge to inform the safe management of chemicals and so protect human health in Europe.

BRIDGEHEALTH
BRidging Information and Data Generation
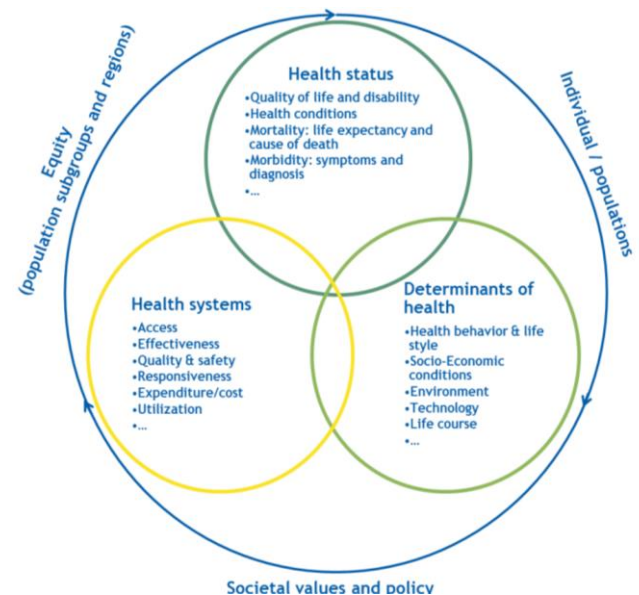for Evidence-based Health Policy and Research

HBM4EU priorities

- Harmonise procedures for HBM across the 26 participating countries;

- Linking data on internal exposure to chemicals to aggregate external exposure;

- Generating scientific evidence on the causal links to health outcomes;

- Providing tools to detect emerging chemicals and chemical mixtures of highest concern;

- Adapting chemical risk assessment methodologies to use human biomonitoring data;

- Feeding information on exposure pathways into targeted policy measures to reduce exposure.

BRIDGEHEALTH
BRidging Information and Data Generation
for Evidence-based Health Policy and Research

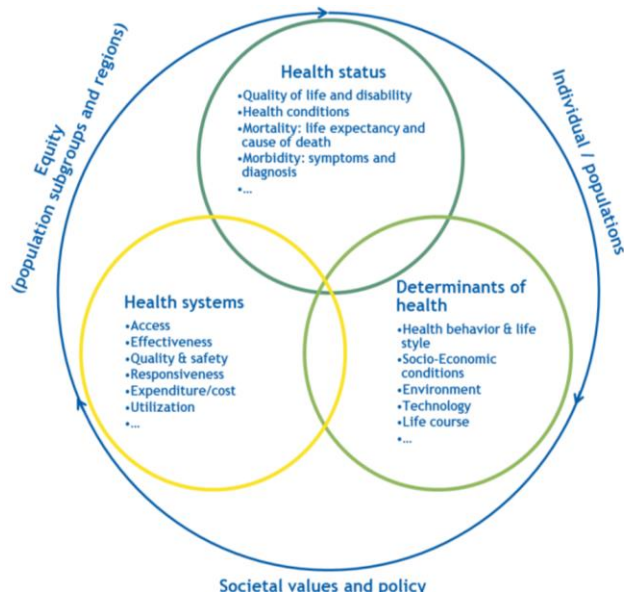This project is funded by the Health Programme of the European Union

A Joint Action or European Research Infrastructure Consortium (ERIC):

(1) indicator development for improved

reporting

(2) Registry adaptation

(3) HES adaptation

(4) Linkage of data repositories

(5) Data equality

adapted from Petronille Bogaert

BRIDGEHEALTH
BRidging Information and Data Generation
for Evidence-based Health Policy and Research

The next steps – HIREP ERIC & HBM4EU

→ best available knowledge to improve the well-being and health of EU citizens and populations

BRIDGEHEALTH
BRidging Information and Data Generation
for Evidence-based Health Policy and Research

This project is funded by
the Health Programme of
the European Union

With my great thanks to all collaborator in WP6!

– L.E. Knudsen, M. Schoepel, A. Polcher, G. Koppen, M.David, M. Casas, M. Esteban, M. Kolossa-Gehring, A.Castano-Calvo, G. Schoeters, M.Vrijheid

Anke.Joas@bipro.de

AJO@ramboll.com