



science and policy  
for a healthy future

# HBM4EU

## The European Human Biomonitoring Initiative

**Marike Kolossa-Gehring & team**

HBM4EU Coordinator

German Environment Agency

Umwelt  
Bundesamt



“For the health of our citizens, our children and grandchildren, Europe needs to move towards a zero-pollution ambition.

I will put forward a cross-cutting strategy to protect citizens’ health

from environmental degradation and pollution, addressing air and water quality, **hazardous chemicals**, industrial emissions, **pesticides and endocrine disruptors.**”

*Ursula von der Leyen,  
A Union that strives for more -  
My agenda for Europe*



# The European Green Deal

to “protect, conserve and enhance the EU’s natural capital, and protect the health and well-being of citizens from environment-related risks and impacts.”

Biodiversity Strategy 2030

New Circular Economy Action Plan

Farm to fork strategy

**Chemicals strategy for sustainability**

Protect citizens against dangerous chemicals with a new chemical strategy for a toxic-free environment

Zero pollution strategy

**Push for indicators:**  
Need to monitor ongoing trends in exposure!

Commission ambitions need to be **translated into policy** (co-decision with MS and EP)

**Let’s make HBM4EU the baseline against which progress should be evaluated!**

# The European Human Biomonitoring Initiative - HBM4EU

5 years (2017-2021)

European Joint Programme  
under Horizon 2020

Total budget: ~ 74 million €

30 countries and the  
European Environment  
Agency

120 Partner organisations

Coordinated by the  
German Environment Agency (UBA)

Umwelt  
Bundesamt

17/12/2020

HBM4EU



Answer open policy-  
relevant questions as  
defined by EU-Services  
and partner countries

Give policy makers a fast  
and easy access to results  
and data

World-wide unique  
approach

# HBM studies: Data, policy, communication

## Science-based facts for policy making and risk assessment

Strengthening  
Risk Assessment:



Exposure data  
Effect data

## Report on exposure levels / monitoring data

- Delivering results for information of manifold target groups (scientists, media, general public)
- Results for voluntary risk mitigation measures

## Opening doors for communication with general public

- Information about exposure sources and health impacts, recommendations for consumer decisions and behavioural choices
- Access to general public through direct contact with study participants





# The network at the science policy interface



## Grant Signatories from

- ~ 24 ministries and authorities
- ~ 11 research institutions
- 6 universities
- EEA

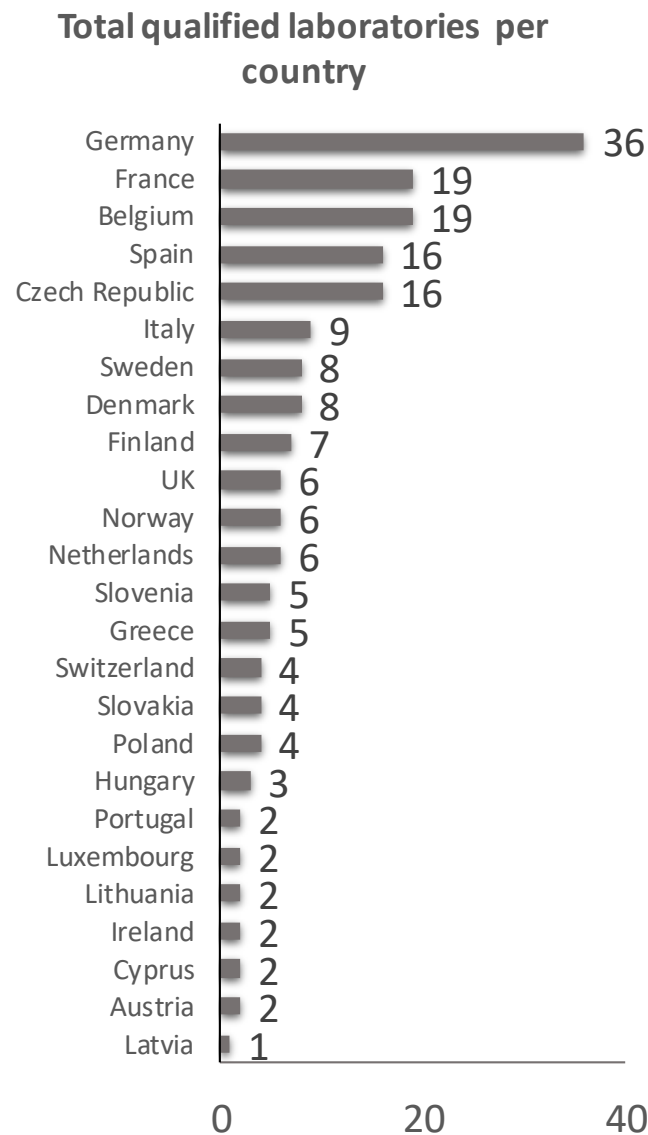
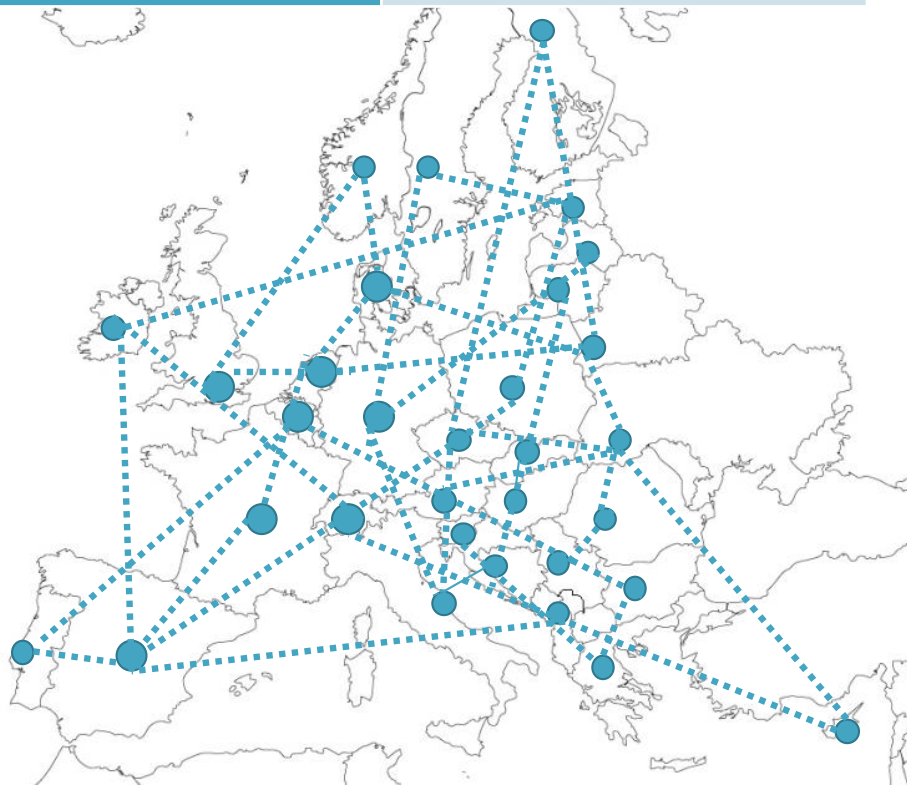
## National Hubs in all partner countries

- Review national needs
- Feedback from and into HBM4EU
- Strengthen national coordination

The foundation for a sustainable HBM in Europe  
→ To further improve the EU Chemicals policy

# HBM4EU – A sustainable network of laboratories

Number of qualified labs for	Number of biomarkers
At least 1 biomarker	74
<5 biomarkers	26
5-10 biomarkers	23
11-20 biomarkers	10
>20 biomarkers	15



Prioritised list of biomarkers, matrices and analytical methods for the 1<sup>st</sup> prioritisation round of substances

Deliverable Report

D 9.2

WP9 - Laboratory analysis and quality assurance

Deadline: September, 2017

Upload by Coordinator: 15 September 2017

Entity	Name of person responsible	Short name of institution	Received v1.0/v1.1
Coordinator	Marika Kolossa	UBA	15.06.2017/30.08.2017
Grant Signatory	Geir Bukholm	NIPH	06.06.2017/15.08.2017
Pillar Leader	Argelia Castaño and Greet Schoeters	ISCIII VITO	15.06.2017/18.08.2017
Work Package Leader	Argelia Castaño and Maria Esteban López	ISCIII	09.06.2017/18.08.2017
Task leader	Cathrine Thomsen	NIPH	08.06.2017/15.08.2017

Responsible author	Cathrine Thomsen (NIPH)	E-mail	Cathrine.Thomsen@nhi.no
Short name of institution		Phone	+4721076546
Co-authors	Enrique Cequear, Octavio Pérez Luzzardo, Monika Kasper-Sonnenberg, Holger Koch, Line S. Haug		

# Example Bisphenol A

Substance	Biomarker	Matrix (amount)	Analytical Method	MDL
<b>Category A</b>				
Bisphenol A	BPA	Urine (0.5 mL)	LC-MS-MS	0.02 ng/mL
<b>Category B</b>				
Bisphenol S	BPS	Urine (NA)	LC-MS-MS	0.03 ng/mL
Bisphenol F	BPF	Urine (NA)	LC-MS-MS	0.03 ng/mL

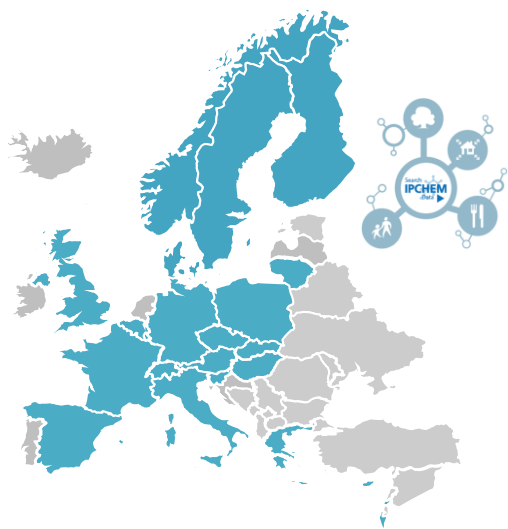
Monitoring risk of sample contamination: by field & laboratory blanc controls -  
Development of analytical method for direct measurement of **BPx conjugates** (**WP16**)

**3 rounds ICI/EQUAS** (organized within **WP9**) → the **laboratories qualified** to analyze specific exposure biomarkers in the samples in the frame of HBM4EU:

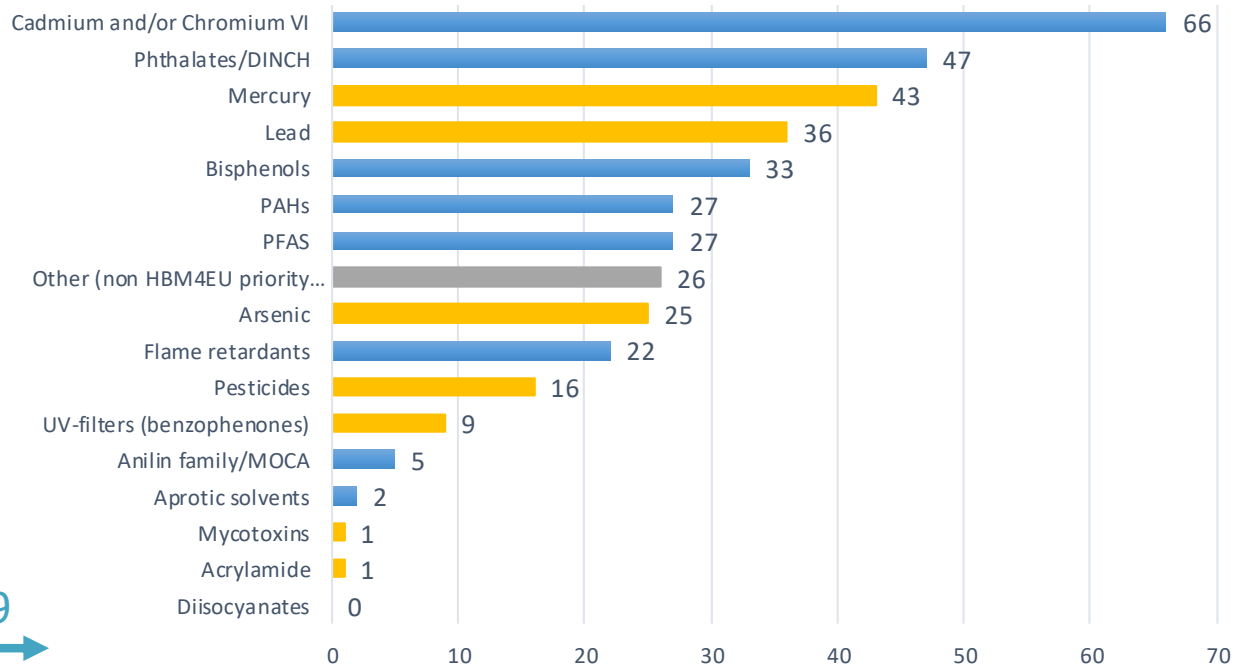
- ✓ **22** laboratories for **BPA**
- ✓ **16** laboratories for **BPS**
- ✓ **10** laboratories for **BPF**



# Metadata of 124 data collections



## Chemical exposure covered by HBM datasets identified via IPCHEM



Time period covered:

1981

2019

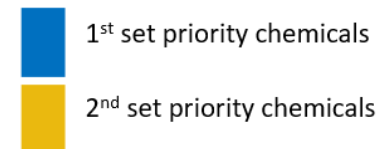


HBM4EU datasets can be searched and identified via IPCHEM

<https://ipchem.jrc.ec.europa.eu/RDSIdiscovery/ipchem/index.html>

Search by:

Chemical, Sample medium, country, time period, study population



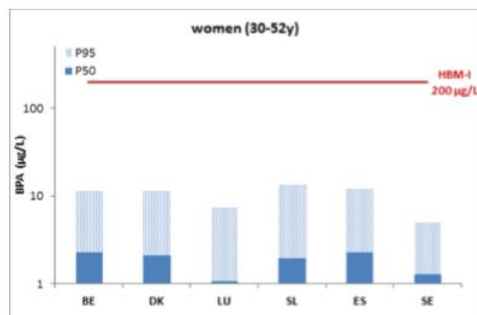
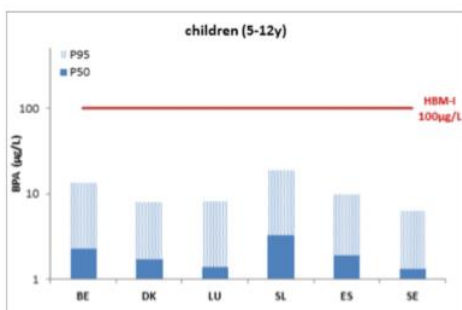
# Policy questions – and HBM4EU answers

## What do we learn from previous surveys

### Case study on HBM indicators from DEMOCOPHES data for BPA

Exposure levels in the population [weighted geometric mean (95% CI)]:

- **Children:** Urinary levels BPA-equivalents = 1,97 µg/L (1.91-2.15)
- **Mothers:** Urinary levels BPA-equivalents = 1,78 µg/L (1.62-1.94)





Ref: Awq077905008 - 11/12/2017

HORIZON2020 Programme  
Contract No. 733032 HBM4EU

Scoping paper on the development of an indicator on chemical exposure in the European population

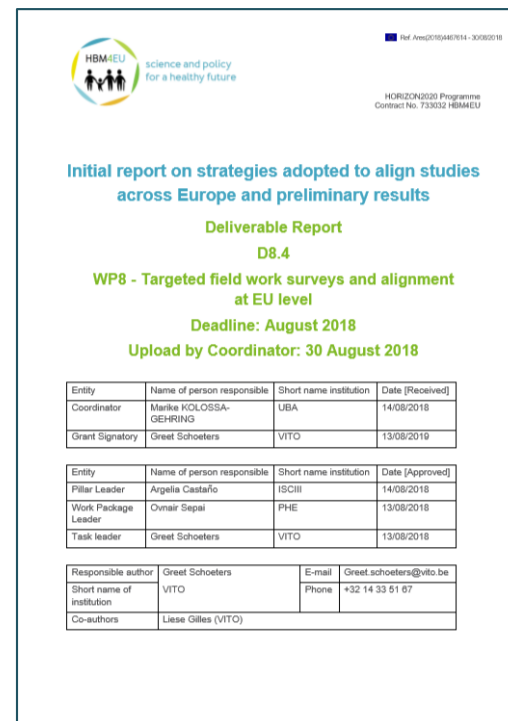
Deliverable Report  
D 5.3  
WP 5 – Translation of results into policy  
Deadline: December 2017  
Upload by Coordinator: 11 December 2017

Entity	Name of person responsible	Short name of institution	Received
Coordinator	Marika KOLOSSA-GEHRING	UBA	08.12.2017
Grant Signatory	Hans BRUYNINGXX	EEA	06.12.2017
Pillar Leader	Greet SCHOETERS	VITO	04.12.2017
Work Package Leader	Greet SCHOETERS	VITO	04.12.2017
Task leader	Xenia TRIER	EEA	04.12.2017

Responsible author	Xenia TRIER	E-mail	xenia.trier@eea.europa.eu
Short name of institution	EEA	Phone	+45 33 36 71 02
Co-authors	Jurgen BUEKERS (VITO), Maden DAVID (UBA), Gudrun KOPPEN (VITO), Jos BESSEMS (VITO), Martin SCHERINGER (MU)		

# Survey planning and harmonisation

- ✓ Established a sampling frame for Europe to align ongoing/planned studies to collect HBM data of the prioritised samples with EU wide coverage.
  - ✓ Focus on specific chemicals per age group
  - ✓ Samples collected in 11 different European countries
- ✓ For Bisphenols (A, S, F)
    - Adults (20-39 years)



The image shows the cover page of a report. At the top left is the HBM4EU logo with the text 'science and policy for a healthy future'. At the top right is the reference number 'Ref. Am021046764 - 3080218'. Below that is the 'HORIZON2020 Programme Contract No. 733032 HBM4EU'. The main title is 'Initial report on strategies adopted to align studies across Europe and preliminary results'. Below the title is 'Deliverable Report D8.4', followed by 'WP8 - Targeted field work surveys and alignment at EU level'. The deadline is 'August 2018' and the upload date is '30 August 2018'. There are three tables: one for the Coordinator (Marika KLOSSA-GEHRING, UBA, 14/08/2018), one for the Grant Signatory (Greet Schoeters, VITO, 13/08/2019), and one for the Pillar Leader (Argelia Castaño, ISCIII, 14/08/2018). There is also a table for the Work Package Leader (Omar Sepai, PHE, 13/08/2018) and a table for the Task leader (Greet Schoeters, VITO, 13/08/2018). At the bottom, there is a table for the Responsible author (Greet Schoeters, VITO, E-mail: greet.schoeters@vito.be, Phone: +32 14 33 51 67) and a table for the Co-authors (Liese Gilles (VITO)).

Ref. Am021046764 - 3080218

HORIZON2020 Programme  
Contract No. 733032 HBM4EU

**Initial report on strategies adopted to align studies across Europe and preliminary results**

**Deliverable Report**  
**D8.4**

**WP8 - Targeted field work surveys and alignment at EU level**

**Deadline: August 2018**  
**Upload by Coordinator: 30 August 2018**

Entity	Name of person responsible	Short name institution	Date [Received]
Coordinator	Marika KLOSSA-GEHRING	UBA	14/08/2018
Grant Signatory	Greet Schoeters	VITO	13/08/2019

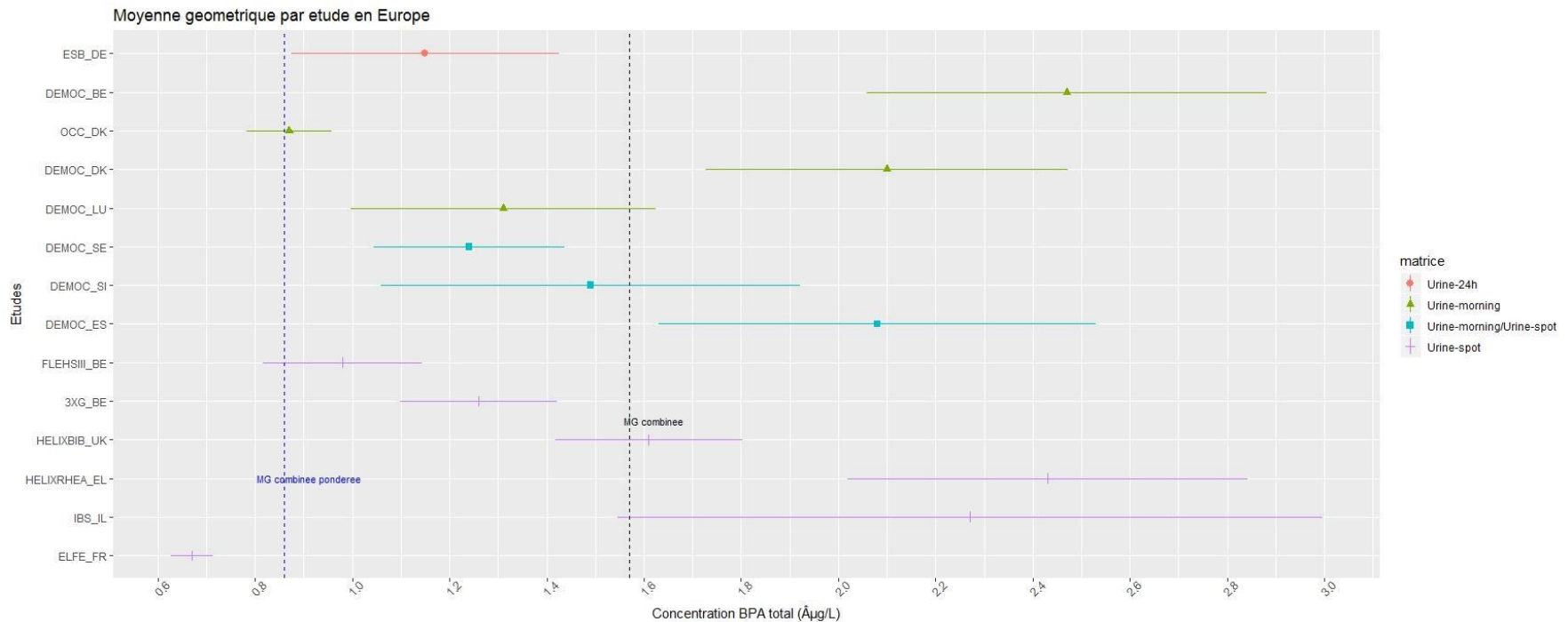
Entity	Name of person responsible	Short name institution	Date [Approved]
Pillar Leader	Argelia Castaño	ISCIII	14/08/2018
Work Package Leader	Omar Sepai	PHE	13/08/2018
Task leader	Greet Schoeters	VITO	13/08/2018

Responsible author	Greet Schoeters	E-mail	Greet.schoeters@vito.be
Short name of institution	VITO	Phone	+32 14 33 51 67
Co-authors	Liese Gilles (VITO)		

# Exposure levels: preliminary results

→ Urinary levels of BPA among EU women

Overview of **BPA levels among 14 European studies** collected and urine matrices  
-> 4250 women with available BPA measure, between 2007-2015

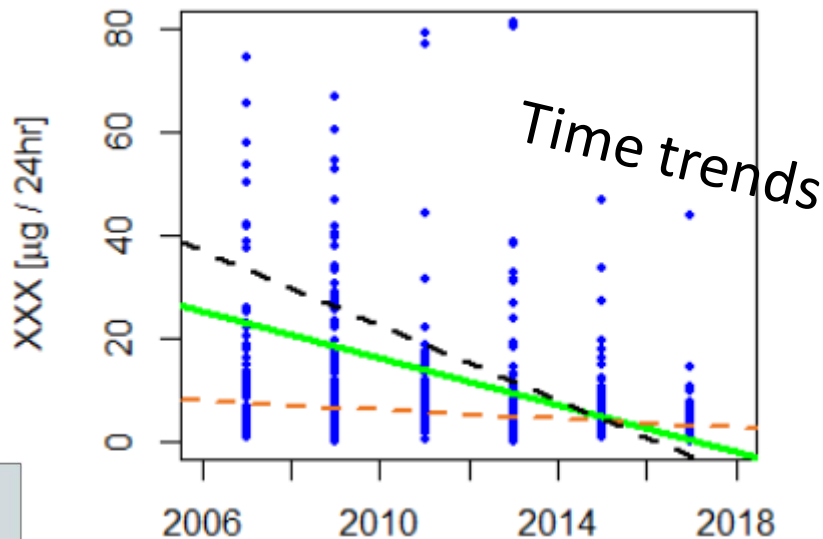
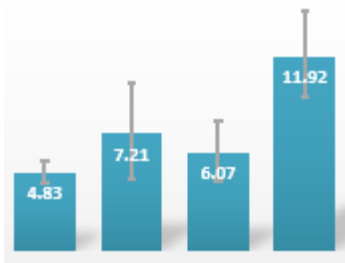


**Wide variability** in BPA exposure levels both between data collections and countries

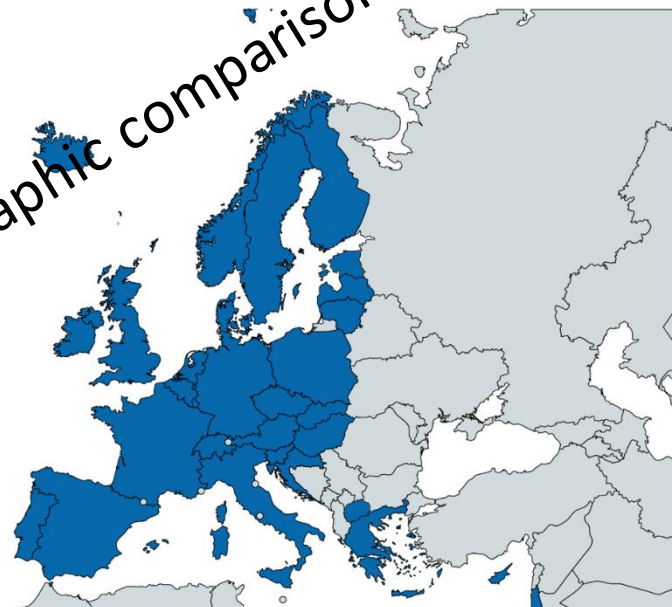
→ **several intrinsic factors could be involved** based on the heterogeneity of the data collected: sampling years, analytical methods, age ranges...

# Case studies on HBM data:

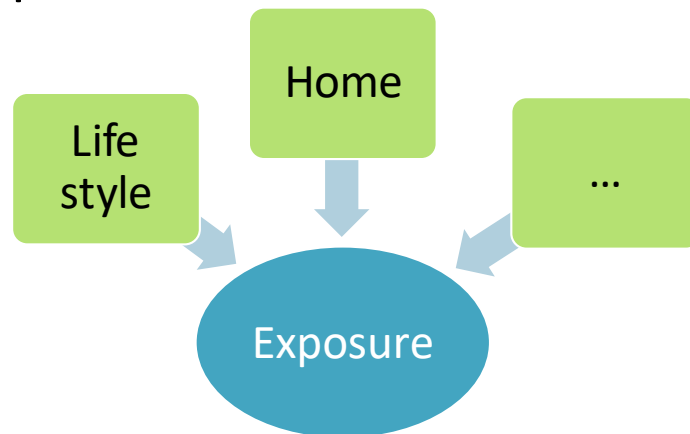
## Exposure distributions



## Geographic comparisons



## Exposure determinants

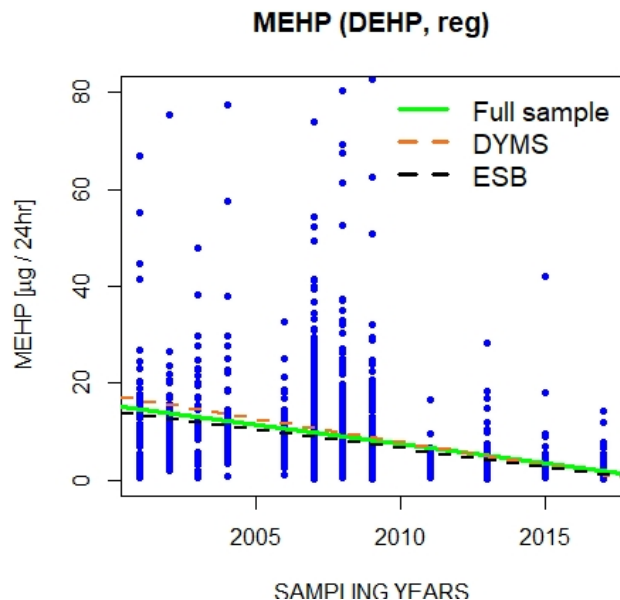




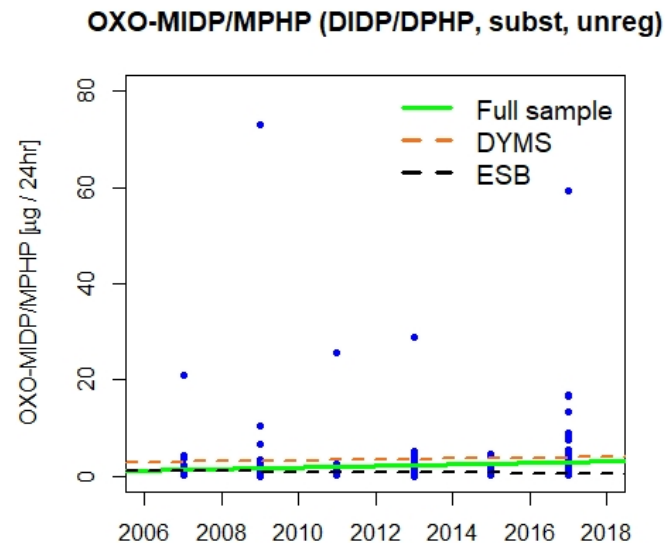
# Time trends in phthalates in Danish and German Young Adults between 2000 and 2017

Preliminary results from regression analyses:

- **Controlled** for sex, age, education, bmi, crt
- For **several metabolites no differences** between studies in level of concentration and trend over time
- Some indication that **regulated phthalates decrease**, less regulated do not change



- **Declining trend ( $p < 0.01$ )**
- **Studies do not differ sign.**



- **No sign. change**
- **Studies do not differ sign.**

# HBM Guidance values

correspond to internal exposure levels below which health risks are not expected

derived by experts on the basis of toxicological and epidemiological data

promote use of HBM data to facilitate communication by interpreting health impacts

Transparent and inclusive: developed in consultation with national experts (National Hubs) and the EU Policy Board

## HBM GV for the general population and/or workers have been derived

**Apel P., Rousselle C., Lange R., Sissoko, F., Kolossa-Gehring M., Ougier E. (2020):** Human biomonitoring initiative (HBM4EU) – Strategy to derive human biomonitoring guidance values (HBM-GVs) for health risk assessment, Doi: 10.1016/j.ijheh.2020.113622

# HBM GV for the general population and/ or workers have been derived

## Adopted within HBM4EU

- Plasticisers: 5 phthalates + Hexamoll® DINCH,
- Plastic ingredient: BPA
- Cadmium

## Consultation completed

- Aprotic Solvents: NMP, NEP
- Plasticisers: BPS, BPF

## Consultation coming soon

- Insecticides: Deltamethrin
- Solvents: DMF (on oing), DMAc

## Planned for 2021

- Pesticides: Cyfluthrin
- Mycotoxin: Deoxynivalenol (DON)
- Mercury
- Chromium VI
- Toluene diisocyanate (TDI)

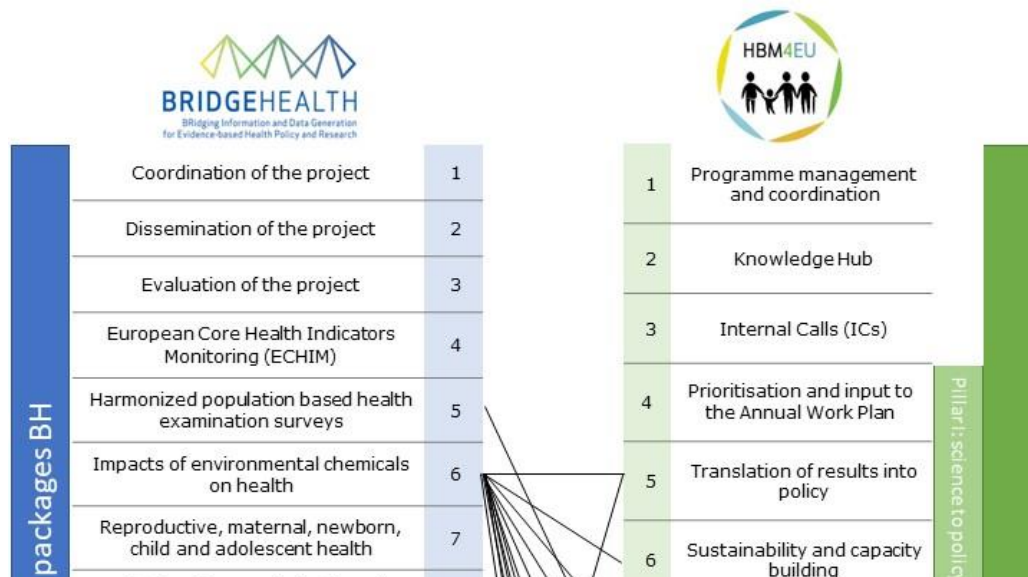
# HBM4EU for better health information

David, Madlen et al. *Archives of Public Health* 78, Nr. 1 (Dezember 2020): 78.  
<https://doi.org/10.1186/s13690-020-00460-9>.

## HBM4EU integrates public health and environmental health issues

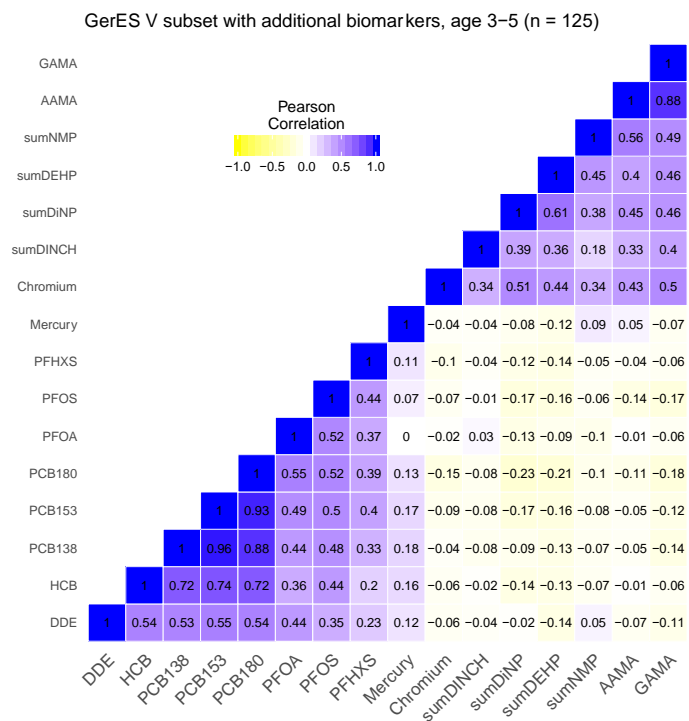
- based on previous work and knowledge transfer of relevant networks

➤ Bringing together public health and environmental health allows for better research on people's health and well-being



# Mixtures in human biomonitoring

- Analyzing existing individual HBM data of multiple chemicals
- **5 case studies on mixtures and health outcomes (i.a. reproduction, cancer)**
- SPECIMEn Joint Survey on Pesticide Mixtures, targeted and non-targeted HBM





# How can mixture effects of human PFASs mixtures be estimated?

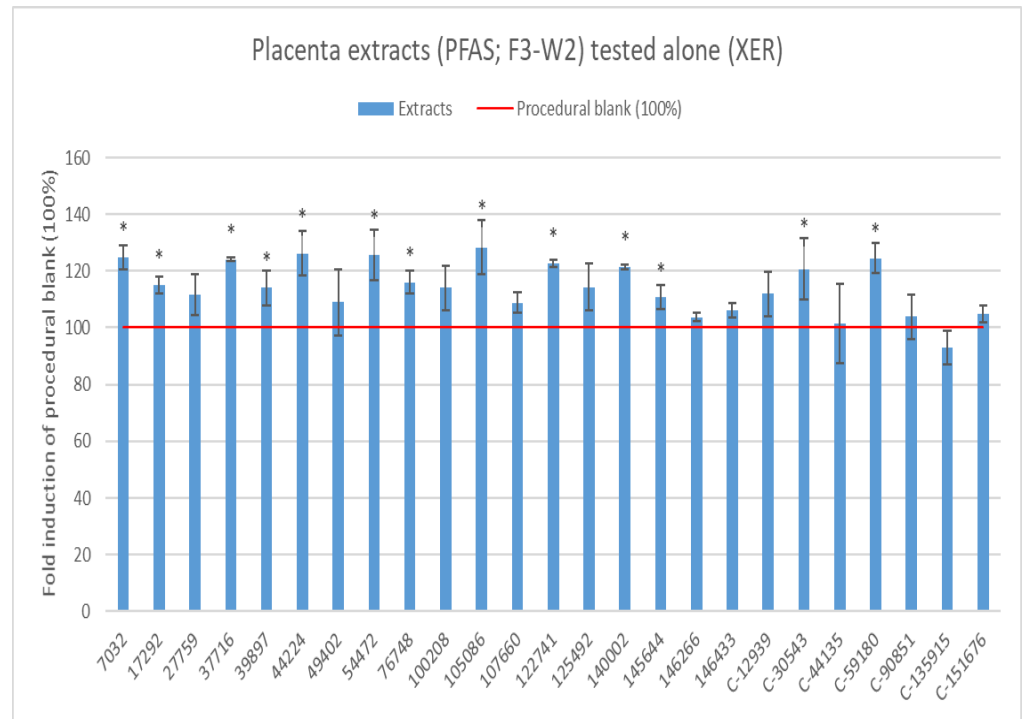
## Target isolation of PFAS mixtures from human samples

Direct chemical extraction and biological assessment:

AU (Bonfeld-Jorgensen's lab) has developed a protocol to extract real-world PFAS from human placentas.

The extracts test for *in vitro* combined xenoestrogenic trans-activity bioassays to assess biological activities of PFAS mixtures.

**Relevance:** The implementation of bioassays evaluating this PFAS-extract in epidemiologic studies could inform risk assessment procedures.



**Figure 1. Estrogen receptor transactivity of placenta extracts tested alone.**

\* Transactivity of the sample significantly different from the procedural blank.

**Original publication:** Determination of perfluoroalkyl substances in placenta using a simple extraction procedure suitable for exposure assessment (Talanta, 2021) *Collaboration with WP16*

2nd Annual Forum on Endocrine Disruptors

# HBM4EU to support occupational safety

Tiina Santonen, Occupational chromate study

HBM4EU study on occupational chromate exposure – aimed to reply the main policy questions on Cr(VI)

**Best biomarkers** to assess Cr(VI) exposure? All exposure biomarkers showed increased exposure of workers. RBC- and EBC-Cr can be used to complement U-Cr in biomonitoring of exposure

Dermal exposure contributes to total exposure!

Further occupational studies planned for 2020-2021:

Exposure to diisocyanates

Exposures in E-waste processing

# Policy questions – and HBM4EU answers

*Examples from the occupational study on chromates:*



## HBM4EU policy question:

*What is the level of exposure occupationally relevant to Cr(VI) in the EU population? What are the groups of risk?*

➔ All studied occupational groups showed higher exposure than control population, chrome platers having highest levels

## HBM4EU policy question:

*Has the regulation under REACH had a favorable impact (like a reduction of concentrations)?*

➔ Regardless of REACH authorization, chrome plating is still showing elevated exposure.



# HBM4EU input to policy processes

Policy processes 2020	HBM4EU input
Directive on the sustainable use of pesticides	<a href="#">HBM4EU input on pesticides</a>
ECHA call for evidence on PFAS	<a href="#">HBM4EU input on PFAS</a>
Farm to Fork Strategy	<a href="#">HBM4EU input on farm to fork strategy roadmap</a>
DG SANTE	Report on copper – rapid response
EFSA	Workshop with EFSA
Chemicals strategy	<a href="#">Letter to commissioners</a> <a href="#">HBM4EU input on chemicals strategy for sustainability roadmap</a>

# Rapid Response Mechanism

## Background:

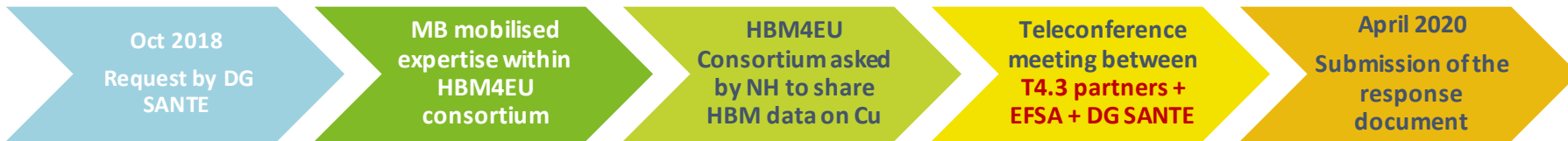
DG Sante

Request

## Information about Cu compounds

(context: renewal of approval of Cu compounds as active substances used as plant protection products)

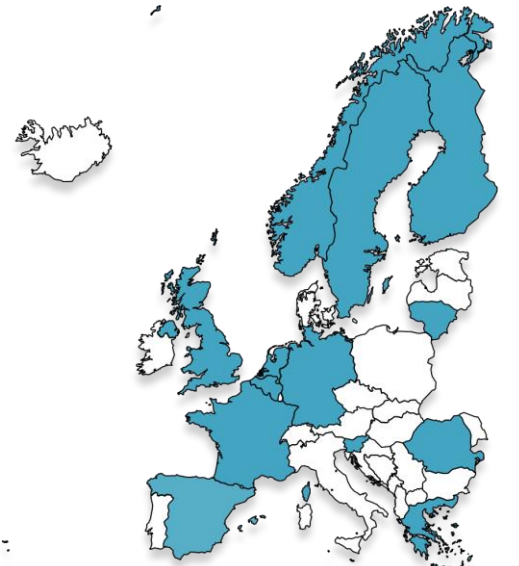
## Process:



## Outcome:



**35** HBM data collections from **13** countries :  
33 for the general population  
2 for occupational population





# HBM4EU letter to Commissioners

**Main point:** Europe needs a human biomonitoring surveillance system grounded in European Union legislation

## Support for:

- “One substance – one assessment”
- Approaches to explicitly avoid regrettable substitution
- Chemical grouping
- Combined exposure determination



science and policy  
for a healthy future

HORIZON2020 Programme  
Contract No. 733032 HBM4EU

Frans Timmermans, Vice-President of the European Commission  
Mariya Gabriel, Commissioner for Innovation, Research, Culture, Education and Youth  
Virginijus Sinkevičius, Commissioner for the Environment, Oceans and Fisheries  
Stella Kyriakidis, Commissioner for Health and Food safety  
Thierry Breton, Commissioner for the Internal Market, Industry, Entrepreneurship and SMEs  
Nicolas Schmit, Commissioner for Jobs and Social Rights  
European Commission  
B-1049 Brussels

Paris 21/08/2020

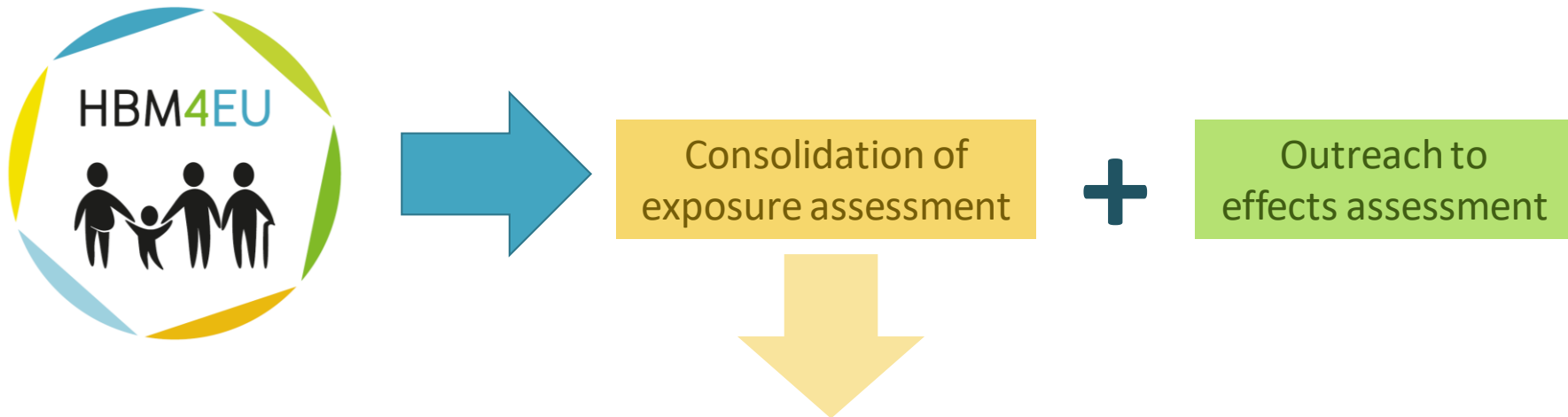
### **Open Letter: Human Biomonitoring as a tool to support Europe's Chemical Strategy for Sustainability**

Dear Vice-President Timmermans, Commissioner Gabriel, Commissioner Sinkevičius, Commissioner Kyriakides, Commissioner Breton and Commissioner Schmit,

We write on behalf of [HBM4EU](#) to express our strong support for the forthcoming Chemicals Strategy for Sustainability and the zero pollution agenda in the frame of the European Green Deal.

17/12/2020

# Risk assessment: added value



**Traditional approaches:** HBM, linking internal and external exposure

**Innovative approaches:** systematically (via AOPs) identifying effect markers, *targeted and non-targeted* HBM, development of new methods- and application in the mixture study SPECIMEn (n= 100 Children)

# Communication tools (lead EEA)



[www.hbm4eu.eu](http://www.hbm4eu.eu)

- HBM4EU Website
- Leaflet
- Newsletter
- Online Library
- Scoping documents
- Introduction for Stakeholders
- Deliverables
- Fact Sheets
- Introductory video

The screenshot shows the HBM4EU website interface. At the top, there is a navigation bar with the HBM4EU logo and tagline. Below this is a search bar and a decorative banner with various icons representing different aspects of the program. The main content area is titled 'DELIVERABLES' and is divided into two columns. The left column contains a sidebar menu with items like 'ABOUT HBM4EU', 'THE PROJECT', 'STAKEHOLDERS', 'CITIZEN'S CORNER', 'PRIORITISATION STRATEGY', 'HBM4EU PRIORITY SUBSTANCES', 'RESULTS', 'DELIVERABLES', 'FACTSHEETS', 'INDICATORS OF SUCCESS', 'BRIEFS AND REPORTS', 'PUBLICATIONS', 'NEWSLETTERS', 'POSTERS', 'VIDEOS', 'TRAINING', 'CONTACTS', and 'SURVEYS'. The right column displays a list of deliverables under the heading 'DELIVERABLES'. Each deliverable entry includes a title, a description, a publication date, and a 'Download' button. The deliverables listed are: 'Work package 1: Programme management and coordination' (Grant agreement, November 2016), 'Deliverable 1.2 Establishment of Governing Board, August 2019', 'Deliverable 1.8 Establishment of Stakeholder Forum and Advisory Board', 'Deliverable 1.5 Legal and Ethics Policy Paper, September 2018', 'Work package 2: Knowledge hub' (Deliverable 2.12 2020 Programme of training activities, materials and capacity building mechanisms), 'Deliverable on the HBM4EU website', and 'Deliverable 2.11 2nd Review of Training Methods'. To the right of the deliverables list is a 'CALENDAR | SEP 2020' section with a calendar grid. Below the calendar is a 'HIGHLIGHTS' section with a green arrow icon, containing text about a course offered by the Institute of Environmental Medicine, Karolinska Institutet, in autumn 2020. At the bottom right, there are social media icons for Twitter, Facebook, and LinkedIn, and a page number '26' inside a circular graphic.



Thank you very much  
for your attention!

**Our gratitude to the  
HBM4EU Management  
Board and to all our  
wonderfull partners!**



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