



science and policy
for a healthy future

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Results of the interaction and surveys with the Environment Protection Agency network and the National Reference Centre on Environment & Health

Additional Deliverable Report

AD6.2

WP6 - Sustainability and capacity building

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2 Glossary

AT	Austria
BE	Belgium
BG	Bulgaria
CH	Switzerland
DE	Germany
DFI	Federal Office of Public Health
DOMG	Department Omgeving
EEA	European Environment Agency
Eionet	Environment information and observation network
EPA	Environment Protection Agency
EU	European Union
FR	France
HBM	Human Biomonitoring
IE	Ireland
INSA	National Institute of Health Dr. Ricardo Jorge (Instituto Nacional de Saúde Ricardo Jorge), Portugal
INSERM	French National Institute of Health and Medical Research (Institut national de la santé et de la recherche médicale)
IT	Italy
LV	Latvia
MOH-CY	Ministry of Health - Cyprus
MS	Member States
MT	Malta
NFP	National Focal Point
NRC	National Reference Centre
PT	Portugal
SE	Sweden
SK	Slovakia
TR	Turkey
WP	Work Package

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3 Abstract/Summary

The aim of this additional deliverable is to analyse the results of the interaction and surveys with the Environment Protection Agency network and the National Reference Centre on Environment & Health.

The consultation to both the EPA network and the NRCs was done through a similar targeted survey, with the aim of understanding their perception of the current HBM4EU and their ideas for a future Human Biomonitoring initiative. The online survey also explored if and how their institution would use HBM4EU results in their work and it also explored the focus that their institution considered a future initiative might take. This could be in terms of exploring exposure to new emerging risks or understanding exposure to known chemical risks, such as heavy metals. In addition, it explored interest in participating in a new initiative and openness towards sharing of best practice. This included questions regarding the possible role that the EPAs and NRCs might play in such an initiative.

The invitation was sent out to 29 EPA countries and 15 NRCs, from which 19 answers were obtained in total with 4 EPAs answered and 13 NRCs. One of the EPAs is also a HBM4EU partner, whereas from the 15 NRCs, 13 of those provided their countries/institution from which 7 are HBM4EU partners.

The survey produced quite interesting results, where it was pointed out that **HBM is the only instrument that can assess human exposure in an integrated and reliable way.**

From the institutions that are not part of HBM4EU, most of them were aware of the project. The ones that were already part of it would like to carry on as such if a future initiative is to take place.

Despite the fact that a slightly higher percentage of institutions do not use HBM at the moment in their work (53 % vs 47 %), all of the institutions recognised the value of HBM and plan on using it in the future.

All the NRCs and 75 % of the EPAs are interested in being part of a future initiative with a possible role in: **positioning Human Biomonitoring in the strategic agenda of implementation of environmental policy and state of the environment in Europe, supporting the activities of the HBM initiative through an existing interest group under the NRC Network, creating joint working initiatives with other relevant networks.**

It was clear from the answers given that HBM has triggered an interest and there is a willingness to be part of the future initiative.

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4 Introduction

In June 2018, Task 6.3 (longer-term needs and expectations of stakeholders) organised a workshop on stakeholder needs and expectations and delivered the first report on national needs, objectives of a long-term HBM4EU, inventory of funding mechanisms and recommendations for a sustainable HBM initiative in Europe and its organisation (Deliverable 6.3 Consultation on a sustainable HBM initiative in Europe).

In 2019, building on the outcomes of the 2018 work the partners in Task 6.3 organised targeted consultations regarding expectations for a future European HBM initiative. The work under this task is linked with activities under Task 4.1 (Mapping information needs from external bodies). Linking these tasks allows reaching out to 3 different target groups.

The first group that was targeted was the Environment Protection Agency (EPA) Network, a network of the heads and directors of the EPAs and similar bodies from across Europe that is coordinated by the EEA.

The EEA attended the plenary meeting of the EPA on February 22nd and 23rd 2019 in Oslo, introduced HBM4EU and the objective of establishing a sustainable future initiative, and addressed questions, with the aim of raising awareness. In advance of the meeting, the EEA contacted members of the EPA Network (including the HBM4EU ambassador) that are partners in the HBM4EU consortium in order to inform them of the upcoming session and to request their assistance in fostering linkages across the two networks.

EEA and partners in Task 6.3, then followed up by implementing a targeted survey building on the awareness and momentum created by introducing the work at the EPA Network meeting. The online survey explored how members of the network perceive the current HBM4EU, how they might use HBM4EU results in their work and what they would like to see covered by a future initiative. This included questions regarding the possible role that their institutions might play in such an initiative, including questions regarding the availability of national funds for Human Biomonitoring activities. The survey questions are available in Annex 1 – Survey Questions EPA/NRC.

The online survey was produced and put in the [HBM4EU Survey](#) section of the website in June with a deadline until July which was then extended to August due to the low number of answers likely due to summer holiday.

The EEA collated the results of the survey, and together with the task partners, analysed the results, producing short summaries against key questions (see section 5).

A second target group is the EEA's network of National Reference Centre on Environment and Health. The EEA had already presented the HBM4EU initiative to this network at their meeting in 2018, and consulted the NRCs through a similar targeted survey, with the aim of understanding their perception of the current HBM4EU and their ideas for a future Human Biomonitoring initiative, with a particular focus on the link to health. The survey was prepared and implemented by the EEA in April 2019. EEA and its partners analysed the results and produced this additional deliverable (AD6.2.) in November 2019.

The third group to be consulted on expectations for a future HBM4EU were citizens of three HBM4EU partner countries, building on the work of EEA in conducting a citizen's focus group in Austria in 2018. This work linked explicitly with the work on the mapping of needs, as described under Task 4.1, where EEA collaborated with EAA. The results of the focus groups are reported under Task 4.1 (AD 4.1).

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The Environment Protection Agency (EPA) Network, a network of the heads and directors of the EPAs and similar bodies from across Europe is coordinated by the EEA.

The National Reference Centre (NRC) are part of the European environment information and observation network (Eionet, Figure 1). The EEA had already presented the HBM4EU initiative to the National Reference Centre on Environment and Health at their meeting in 2018.

The EEA is responsible for developing Eionet and coordinating its activities. To do so, the EEA works closely with national focal points (NFPs), which are typically based in national environment agencies or environment ministries. NFPs are responsible for coordinating national networks, involving many institutions.

NFPs are responsible for coordinating networks of national reference centres (NRCs), bringing together experts from national institutions and other bodies involved in environmental information.

Apart from the NFPs and NRCs, the Eionet also covers seven European Topic Centres (ETCs) in the areas of Air Pollution, Transport, Noise and Industrial Pollution; Biological Diversity; Climate Change Impacts, Vulnerability and Adaptation; Climate Change Mitigation and Energy; Inland, Coastal and Marine Waters; Urban, Land and Soil Systems; Waste and Materials in Green Economy.

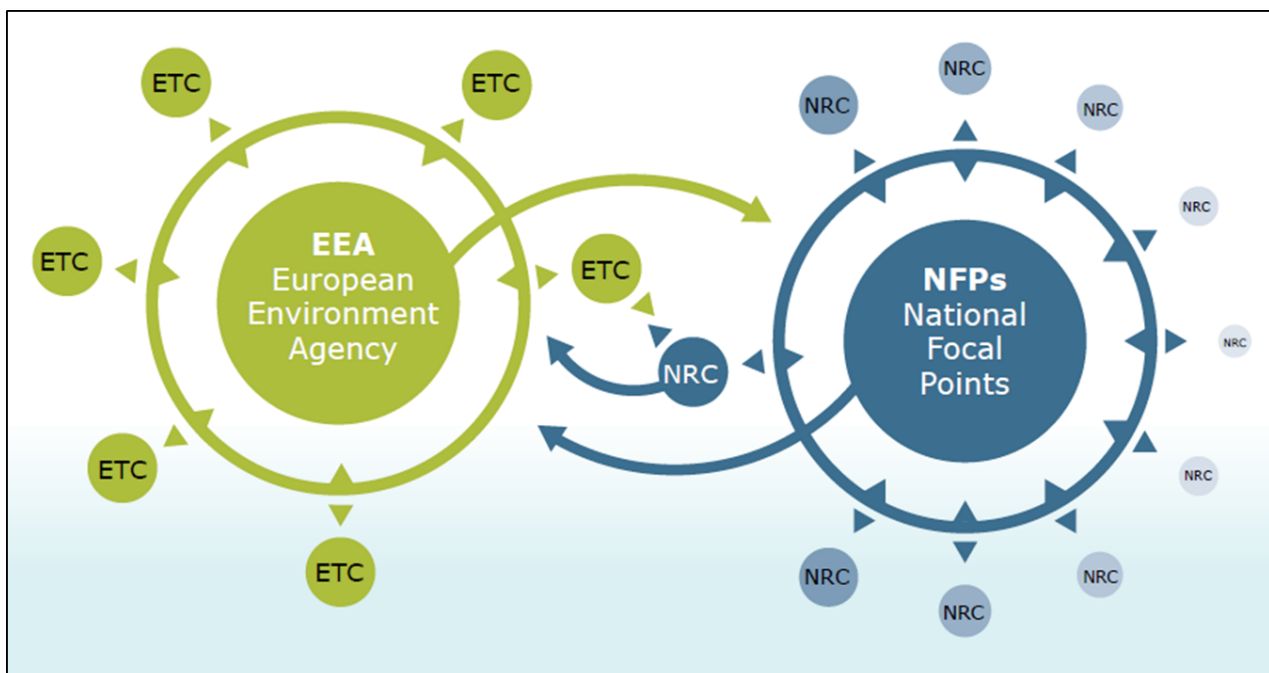


Figure 1: European environment information and observation network (Eionet)

The European Network of the Heads of Environment Protection Agencies (EPA Network) is an informal grouping bringing together the heads of environment protection agencies and similar bodies across Europe. The network exchanges views and experiences on issues of common interest to organisations involved in the practical day-to-day implementation of environmental policy and communication of environmental issues.

Plenary meetings are held twice a year in one of the member countries. The plenary sets the strategic direction of the Network and provides a platform for heads to meet and discuss current topics of interest. The plenary also deals with organisational issues of the network.

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The EPA Network arranges its work through various Interest Groups (IG). There are currently eight active Interest Groups:

1. Better Regulation
2. Citizen Science
3. Climate Change and Adaptation
4. Genetically Modified Organisms (GMO)
5. Green and Circular Economy
6. Noise abatement
7. Plastics
8. West Balkan

The EEA actively participates in the Network as well as in the organising Troika. The EPA Network Secretariat is located in the EEA premises in Copenhagen. For more information, please visit the [EPA network](#) website.

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5 Question results and analysis

5.1 Survey overview

The invitation was sent out to 29 EPA countries and 13 NRCs. The total number of respondents was 19, namely 13 NRCs (including 2 with no indication of country) and 4 from EPA.

From the 13 NRCs that provided their country, 7 are partners in the HBM4EU project. For the EPAs, we had 4 EPAs answering, (plus 2 if we consider the NRC's answer from Sweden and Germany as they are EPAs too). From the 4 EPAs that answered, 1 is a partner in HBM4EU.

For the following analysis, the NRC and the EPA answers were considered together.

A survey overview is provided in the following Figure 2, considering the quantifiable variables provided by questions numbers 1, 2, 3, 5, 6 and 7.

Overall, the respondents are aware of HBM and HBM4EU (more than 80 % and 70 %) with approximately 40 % being a partner of HBM4EU. Slightly more than 50 % of the institutions do not use HBM in RA, whereas 40 % do. In the future, almost 70 % of the respondents are planning on using HBM4EU results in future work against 5 % which are not, and 25 % who do not know. All of the institutions answered that HBM is a useful tool for the identification of chemical risks to human health.

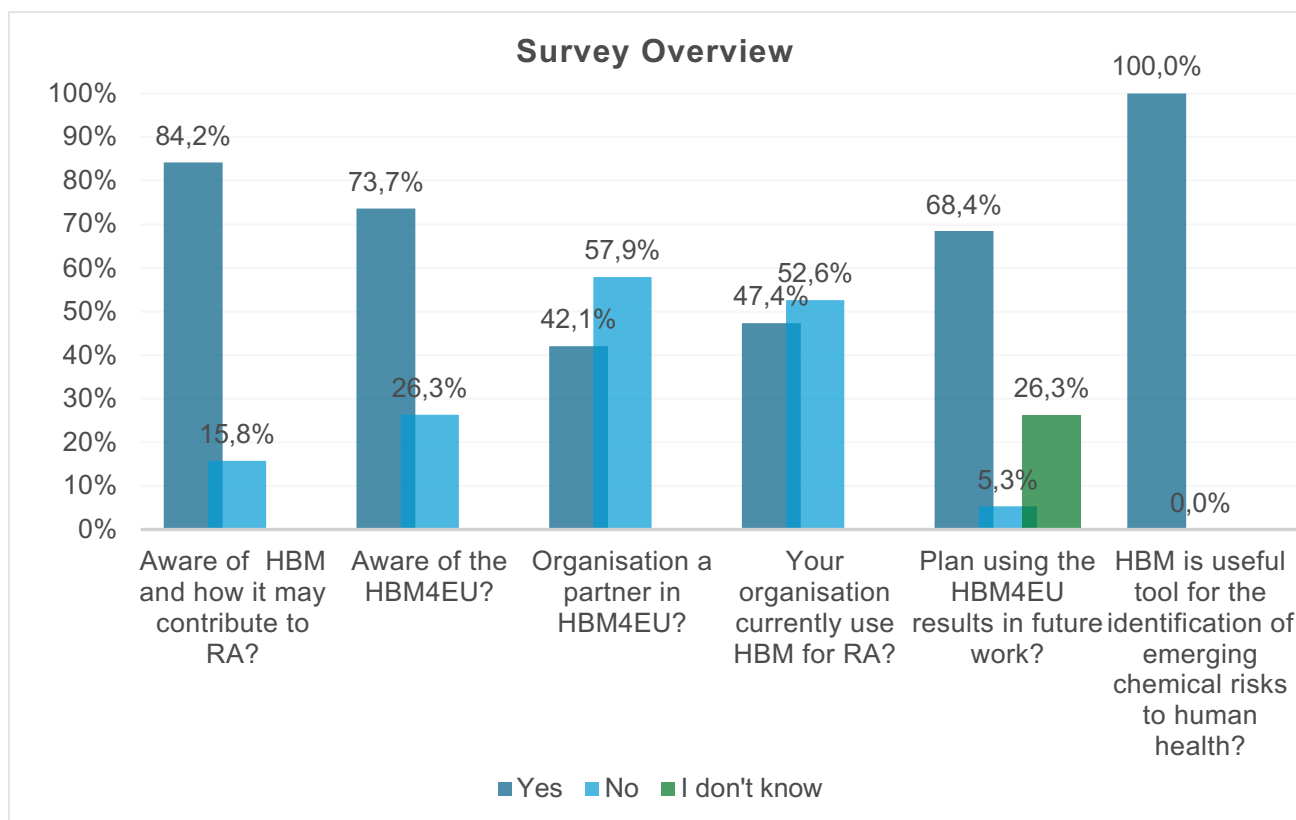


Figure 2: Survey answers overview, in percentage of total answers (19)

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The 11 questions in the survey have been grouped into 3 sections, namely:

- ▶ Awareness of HBM and HBM4EU (Questions 1 – 4);
- ▶ Use of HBM (Questions 5 – 7)
- ▶ Future HBM initiative (Questions 8 – 11)

Two of the questionnaires of NRCs were anonymous, hence we didn't take these into account in the analysis.

5.2 Awareness of HBM and HBM4EU

5.2.1 Q1 Are you aware of “Human Biomonitoring” and how it may contribute to the assessment of chemical risks?

Participants were asked to provide a range of awareness, from 1 (not aware) to 5 (very aware).

The following Figure 3 gives an overview of the answers on Q1 *Are you aware of “Human Biomonitoring” and how it may contribute to the assessment of chemical risks*.

All HBM4EU partners who answered the questionnaire (as NRC/EPA) **are aware** (score between 3 and 5) of **HBM and its capacity to contribute to chemical risk assessment**. Six out of nine institutes who are **not a partner in HBM4EU** make the same conclusion.

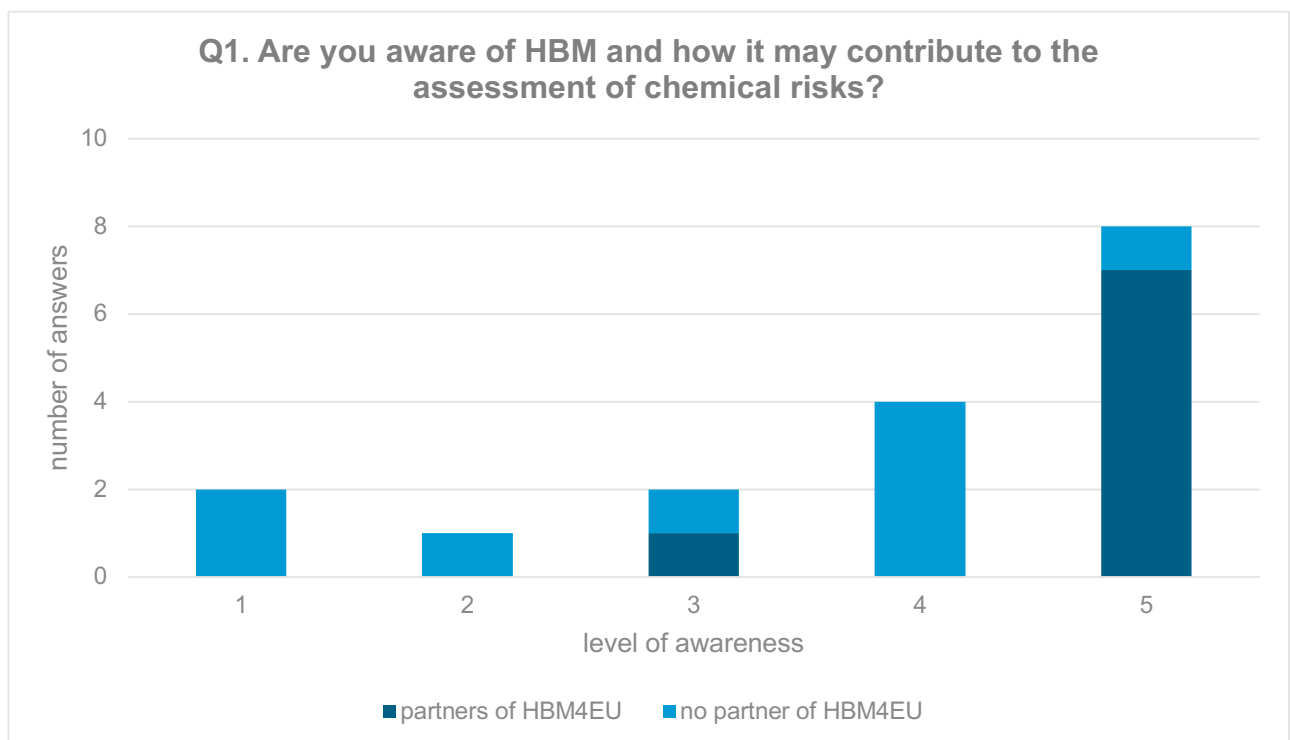


Figure 3: Results of answers on Q1 (1-2 = not aware; 3-5 = aware)

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5.2.2 Q2 Are you aware of the on-going HBM4EU project?

Based on answers on Q2 *are you aware of the on-going HBM4EU project* we can conclude (4) that:

- ▶ NRC/EPAs from countries that do not participate in HBM4EU are not aware of the project
- ▶ For NRC/EPAs that are no HBM4EU partner but originate from HBM4EU participating countries, the results are mixed:
 - 3 NRC/EPAs are aware of the project. One of them is a member of the GB, the other 2 might know about the project through their national hub as both countries organised a national hub meeting in 2018 (info from national hub end of year questionnaire, as input for performance indicators, task 6.5).
 - 3 other NRC/EPAs are not aware of the project (although a national hub meeting was organised in their country in 2018). This indicates the need to keep informing all relevant institutes at national level
- ▶ Logically, NRC/EPAs that are partner in HBM4EU are aware of the project

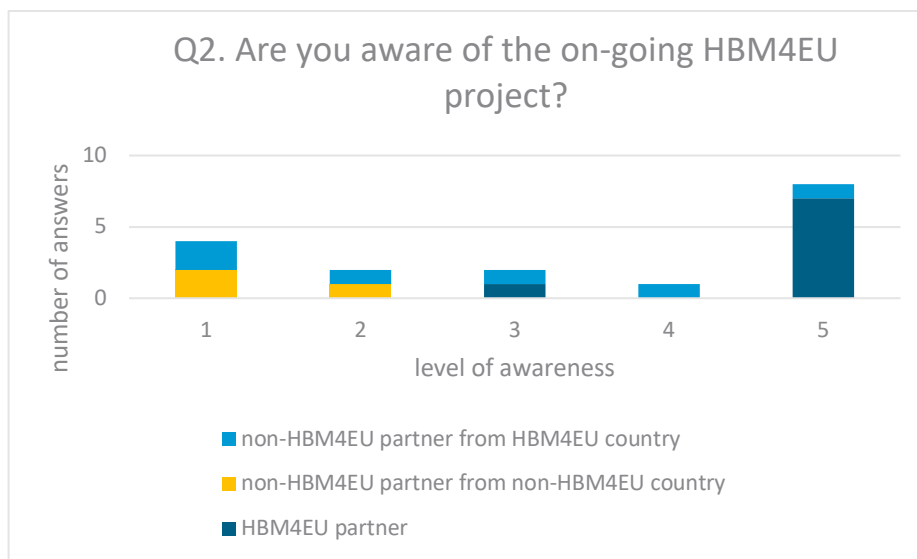


Figure 4: Results of answers on Q2 (1-2 considered as not aware; 3-5 is considered as aware)

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5.2.3 Q3 Is your organisation a partner in HBM4EU?

Participants were asked to give a [Yes] / [No] type of answer.

We received 15 answers of NRCs and 4 answers of EPAs. Two of the questionnaires of NRCs were anonymously, we didn't take these into account in the analysis. From the 13 NRCs, 7 are partners in the HBM4EU project. For EPAs, this is one out of four. Geographically, **there's a good scatter across Europe.**



Figure 5: Map of countries from which institutes participated to the questionnaire (some countries provided 2 answers from different institutions: one as EPA and one as NRC –SK and LV or 2 as NRC - IT) – Malta isn't on the map

5.2.4 Q4 Which organisation leads activities on Human Biomonitoring in your country?

Participants were given a choice between: [environment] / [health] / [research] / [I don't know] / [other – specify]. If they selected "Other" for this question, they were asked to specify.

A total of 18 responses were received for this question. Four responses were provided by EPAs (AT, LV, MT, SK) and 14 by NRCs (BE, BG, FR, DE, IE (is the national EPA), IT (2 responses from IT, one from Env. Protection National system), LV, PT, SK, SE (national EPA), CH, TR, 1 response without declaration of country name). The NRCs represented national authorities or institutions related to Health or the Environment. The spread of the responses, which were received for Question 4, is shown in Figure 6.

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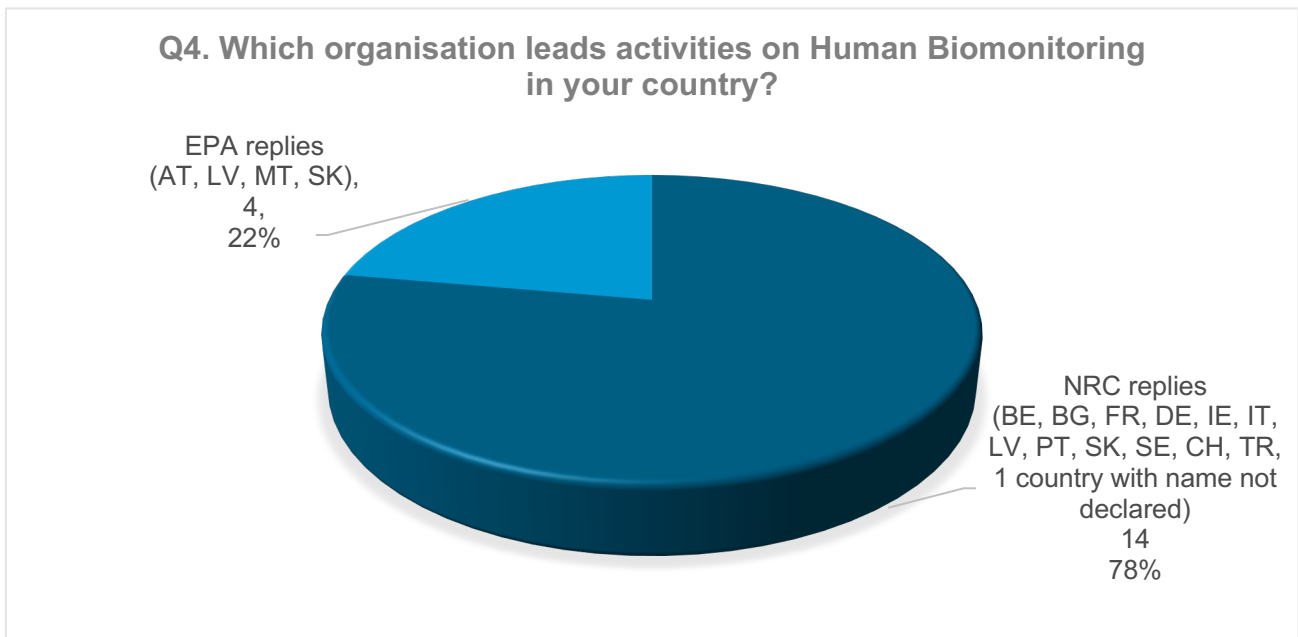


Figure 6: Responses received to Question 4 – “Which organisation leads HBM activities in your country?”

Most responders (N=6, coming from six countries: BG, CH, FR, IE, LV, SK) said that the HBM activities **are led at national level by their Ministry of Health**. It should be noted that two of the six countries who reported the **Ministry of Health as the leading force** (LV, SK), each submitted a second response (filled out by different organisations), in which they reported that the **Ministry of Research is also involved**.

Four responders from four different countries (AT, BE, DE, SE) reported that their **Ministry of the Environment is the leading force** in the country for HBM.

Two responders from two different countries (IT, PT) reported that **HBM is under the joint leadership of three Ministries (Health, Environment, Research)**. A second responder from IT and responders from MT, TR and an undeclared country said that they don't know which Ministry leads HBM efforts in their country.

These results are shown in Figure 7 and Figure 8.

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Figure 7: Types of organisations leading HBM efforts at national level

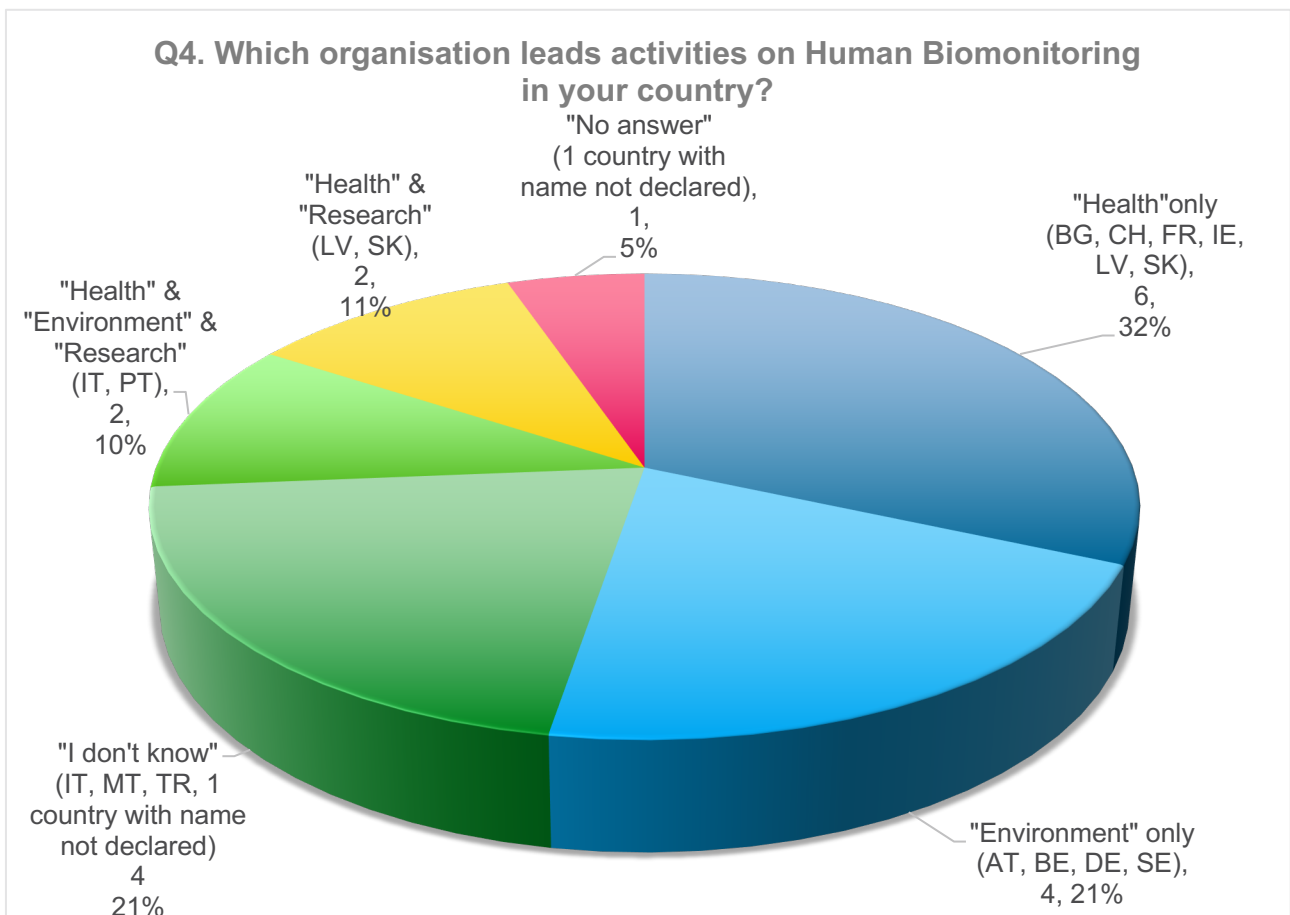


Figure 8: Types of organisations leading HBM efforts at national level

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5.3 Uses of HBM

5.3.1 Q5 Does your organisation currently use Human Biomonitoring data to assess human exposure to environmental stressors?

Participants were asked to give a [Yes] / [No] type of answer and **if yes, to please briefly describe how.**

A total of 19 responses were received. Four responses were from EPAs (AT, LV, MT, SK) and 15 by NRCs (BE, BG, FR, DE, IE (is the national EPA), IT (2 responses from IT, one was from Env. Protection National system), LV, PT, SK, SE (national EPA), CH, TR, 2 responses were without declaration of the country name). The NRCs represented national authorities or institutions related to Health or the Environment.

Most responses (N=10, from 6 reported countries: 1 response from each of MT, IE, TR and one undeclared country; 2 responses from IT, LV and SK) reported that their organisation doesn't currently use HBM to assess human exposure to environmental stressors. The results are shown in Figure 9.

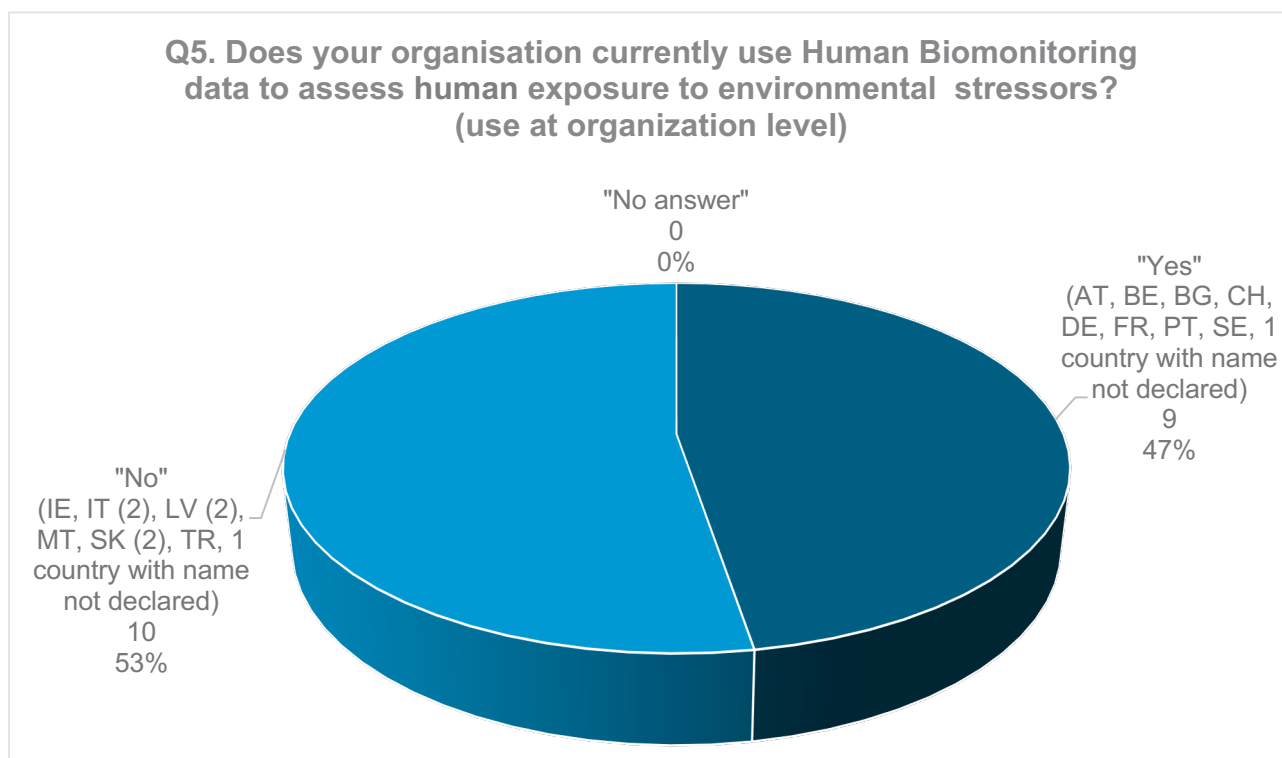


Figure 9: Reported use of HBM data for assessment of human exposure to environmental stressors at organisational level

However, if the results are analysed at country-level, out of the 14 declared countries (i.e.name of country provided: AT, BE, BG, CH, DE, FR, IE, IT, LV, MT, PT, SE, SK, TR) represented in the survey, 8 countries (AT, BE, BG, CH, DE, FR, PT, SE) reported that **they use HBM to assess human exposure to environmental stressors.**

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In total, nine responders (from AT, BE, BG, CH, DE, FR, PT, SE and 1 with no country name reported) answered that they currently use HBM to assess human exposure to environmental stressors. This is shown in Figure 10.

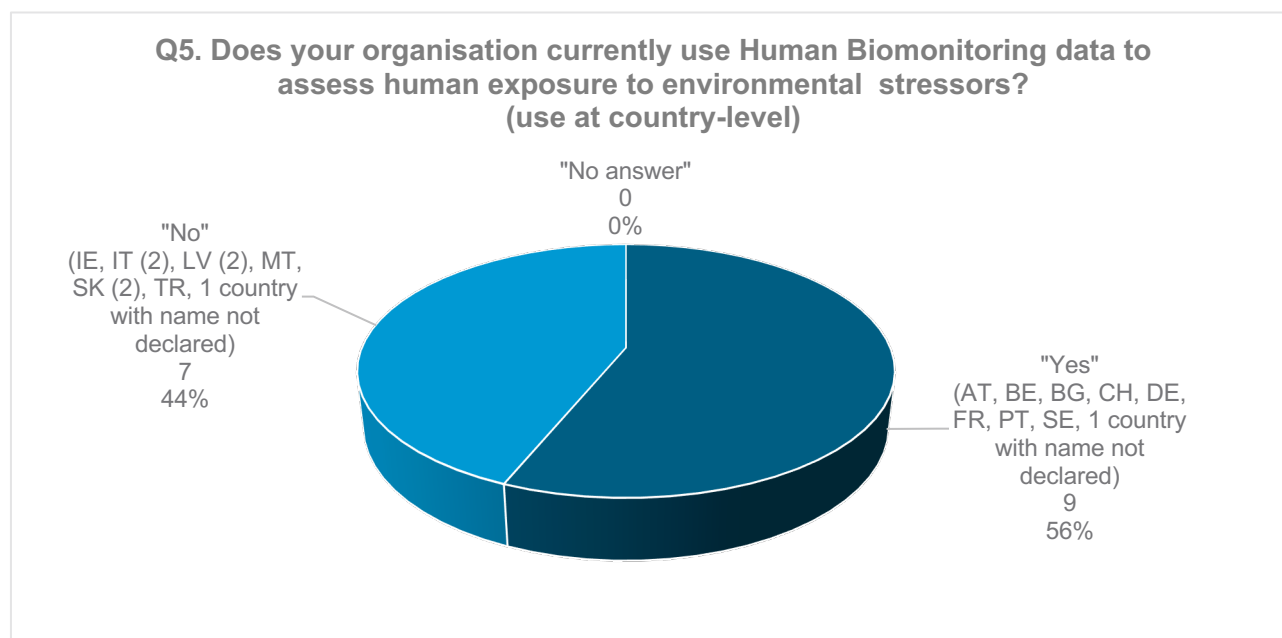


Figure 10: Reported use of HBM data for assessment of human exposure to environmental stressors at country-level

Seven countries, which stated that they use HBM data for assessment of human exposure to environmental stressors, provided a short description on how this is done. Although not all mentioned activities are HBM activities, the responses are given below as provided:

Austria: In Austria several HBM studies have been performed so far: ranging from national studies, research studies on priority substances, cohorts and HBM studies in hotspots.

Belgium: see FLEHS campaigns for more info.

Bulgaria: For occupational exposure assessment (Lead and cadmium in blood, Arsenic in urine, Mercury in blood and urine).

Germany: For three main purposes: (1) Information and education of the general public, multiplayers, media about chemical pollution levels and their health impact as well as on how to prevent/ reduce the individual exposure by following recommendations developed from results of our two major Federal HBM studies (population representative German Environmental Survey and German Environmental Specimen Bank), (2) Supplying information on background exposure to the Bundesländer / Federal States, public health services and medical doctors to interpret individual exposure results coming inter alia from chemical accidents, hot spots, schools or unclear health complaints, (3) chemical risk assessment and recommendations to the Ministry for the Environment, Nature Conservation and Nuclear Safety on the need for regulatory risk reduction measures, input to chemicals regulation on EU Level, control of the success of existing risk reduction measures / restrictions / bans.

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France: HBM data are part of the data which are used to carry out risk assessment in many different domains including dietary risk assessment. HBM data are also used to characterise exposure and risk in occupational settings.

Portugal: Within the participation in the following studies: (a) Detection and quantification of enterovirus, hepatitis A and E viruses in drinking water and wastewater, (b) Micro-elimination of hepatitis C in injecting drug users, followed up at Centers for Treatment of Addictive Behaviors and Dependencies, (c) Risk assessment of disinfection by-products in drinking water, (d) Development of a Pollution-related Environmental Health Index to evaluate and foresight the impact of pollution.

Sweden: The Swedish Environmental Protection Agency is responsible for the national Health related human monitoring program. This program is funded by the government and the program follows the chemical exposure of the Swedish population. Some of this data is used within HBM4EU. The data is also used to follow Swedish national environmental goals and for chemical regulation and regulation of dietary intake by other authorities in Sweden.

5.3.2 Q6 Do you anticipate using the Human Biomonitoring results emerging from the current European Human Biomonitoring Initiative, HBM4EU, in your future work?

Participants were asked to give a [Yes] / [No] / [I don't know] type of answer and if yes, to please indicate for what process: a) Risk Assessment, b) Risk Management, c) Risk Communication, d) Assessment of the effectiveness of existing legislations, e) Assessment of the need for new legislations, f) National needs or priorities [Please specify]: **If Yes, please indicate for what process [Please specify]: 6.1. If National needs or priorities (Please specify), 6.2. If Other (Please specify).**

The answers to this question are depicted in Figure 11.

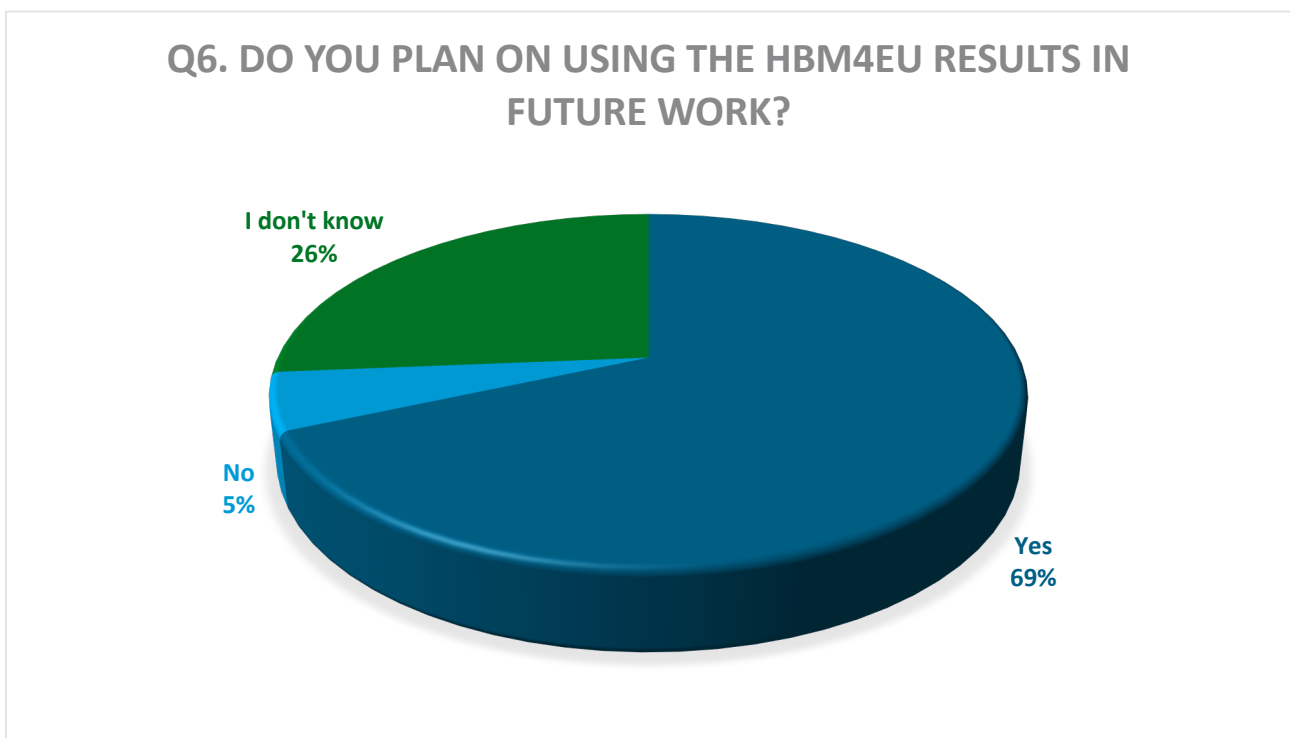


Figure 11: The plan to use the HBM4EU results in future work

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Most participants in the survey (**69 %**) considered using **Human Biomonitoring results** emerging from the current European Human Biomonitoring Initiative (HBM4EU) **in future work**, while **only 5.3 % did not consider it**. Among the 13 participants answering yes, 6 of them are partners in HBM4EU, while 7 (53%) are not.

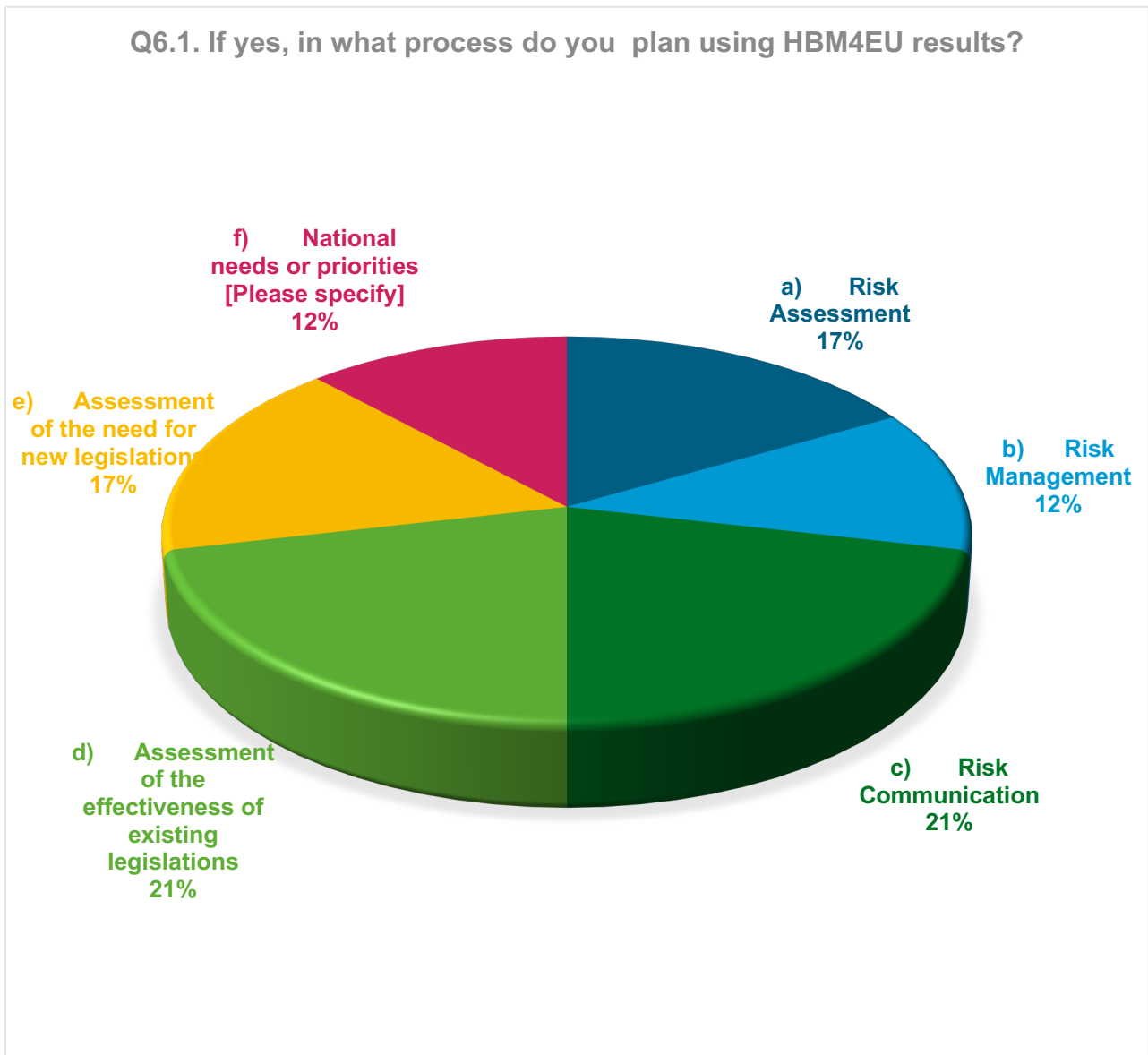


Figure 12: Distribution of processes where the respondents that answered yes to the question plan to use HBM4EU data

Among the 13 positive answers, most participants replied with more than one option. The options **c) Risk communication and d) Assessment of the effectiveness of existing literature**, were referred by 9 of the participants. The options **a) RA and e) Assessment of the need of new legislation**, were the second mostly referred by 7 participants.

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Concerning Q6.2, “If National needs or priorities (Please specify)”, requiring open text, there were 5 text answers, as follows:

- ▶ The **outcome of HBM4EU** is important for several Swedish authorities to take part of, to use within our **national HBM and for example the Swedish Chemicals Agency** in their work regarding the use of **Chemicals in Products**.
- ▶ Possibly informing **future research in this area for the Irish population**.
- ▶ HBM4EU helps to set: **priorities in FLEHS, priorities in other monitoring campaigns eg soil, priorities for indoor air monitoring, priorities for regional policy actions**.
- ▶ At the beginning of this year we **implemented HBM as long-term goal within our new National Environment and Health Action Plan (NEHAP V.)**. Its name is "Implementation of the National Program to establish Human Biomonitoring in Slovak Republic". It means that it was approved by our government in January 2019. To achieve this goal **we defined sub-activities to support it**.
- ▶ Exposure in **hotspot areas, research on health effects and adverse outcomes of chemicals, identification of exposure pathways and determinants**.

National needs or priorities were identified for **Sweden, Ireland, Belgium and Slovak Republic**, while one answer was focused on more general concerns.

Using the text from these answers for word cloud analysis, the result is presented in the following Figure 13.



Figure 13: Word cloud analysis of the text answers in Q6.2

In this analysis, the most frequently used word was “Priorities” (4 times), followed by “monitoring”, “Chemicals”, “research”, “National”, “Swedish”, “HBM4EU”, “goal”, and “HBM”, that were used twice.

Concerning Q6.3, no answers were obtained.

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5.3.3 Q7 Do you consider Human Biomonitoring to be a useful tool for the identification of emerging chemical risks to human health?

Participants were asked to give a [Yes] / [No] type of answer and if **yes, to please briefly describe how.**

All the 19 participants (100%) answered yes to this question.

Excluding 1 invalid text answer, 4 in blank, we received 14 valid text answers describing how, namely:

- ▶ It is important to **measure emerging chemicals in human matrixes** and through the research connect exposure with health effects and **to find indicators to follow within HBM**. This to be used in regulations of chemicals and to protect humans.
- ▶ **HBM is the only instrument that can assess human exposure in an integrated and reliable way.**
- ▶ **Define the exposure to certain chemical substances** in subjects **residing in areas characterised by presumable incremental exposure to these pollutants** compared to the control population residing in another geographical area, since food can also contribute to determining the body burden of the selected pollutants, in the study it is possible to also include groups of operators of agricultural and livestock farms located in the Municipalities concerned that presumably consume their own production.
- ▶ There is still **lack of data related to emerging chemical risks to human health**. HBM is very good tool to examine this exposure.
- ▶ The experience from a **cooperation between Ministry for the Environment and the German Industry Assosiation (VCI) showed that chemicals of concern and their meaning for the General public can excellently be identified by HBM**, also the process of substitution of restricted/banned chemicals by new (often less well investigated) chemicals. Chemicals of concern where identified by the 3 scientific agencies responsible for chemicals regulation in Germany. Second approach is the non-target or suspect screening which helped already (study conducted by Environmental Research Center Leipzig-UFZ Leipzig- on behalf of UBA) which can help to identify chemicals which should be analysed by targeted HBM analyses.
- ▶ **Current biomonitoring surveys** based on an initial list of compounds to be investigated are **not very useful to identify emerging chemicals**. However, other approaches, such as **non-targeted analyses**, could be used to **help identify emerging compounds**.
- ▶ **Biomonitoring studies give direct information on the concentration of xenobiotics in accessible biological matrices** (blood, urine, brest milk), **providing biomarkers of exposure** serving as early warning tools to highlight the biological response to emerging environmental contaminants. The **results can be included in toxicokinetics modeling, predicting, the distribution of chemicals** and their metabolites in human body as well as their concentrations in human tissues and organs, in order to sustain the quantitative estimating of human risk. The integration of environmental and Human Biomonitoring data would contribute to a better understanding of the pathway leading to adverse effects in humans and biota as the consequence of the exposure to environmental stressors.
- ▶ As an objective tool for internal exposure measurement; could indicate elevated health risk/impaired biological system.

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- ▶ Useful for **recognition of risks and setting priorities**.
- ▶ By the **general exposure assessment of whole population** and/or specific target population.
- ▶ It's important to **assess effects on human health**.
- ▶ Any **Human Biomonitoring information** is useful for **assessment including identification of emerging chemical risks to human health**, however cost-benefit ratios should be taken into account.
- ▶ **Health is crucial for the human wellbeing; physical and mental as well** and actually we do not know how chemicals, influence, will influence and are influencing our health.
- ▶ The **long-term objective would be to have a non-toxic environment** and a **circular green economy**, where **exposure to chemicals, is negligible**. It is quite a way to reach this. In the foreseeable future, **Human Biomonitoring is needed to identify exposure to chemicals, their health effects and adverse outcomes in order to protect human health and the environment**.

Applying word cloud analysis, the resulting Figure 14 is obtained:

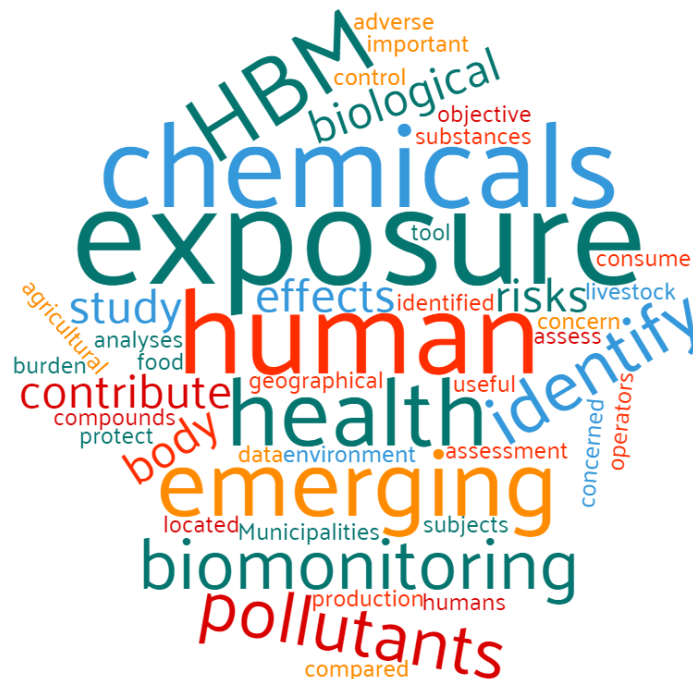


Figure 14: Word cloud analysis of the text answers concerning how Human Biomonitoring can be a useful tool for the identification of emerging chemical risks to human health

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In this analysis, the most frequently used words are presented in Table 1.

Table 1: Word frequency concerning how Human Biomonitoring can be a useful tool for the identification of emerging chemical risks to human health

Word	Word frequency
exposure	13
human	13
chemicals	12
health	8
emerging	6
HBM	5
biomonitoring	4
pollutants	4
population	4
chemical	4
identify	4
effects	4
environmental	3
biological	3
risks	3
body	3

Several issues were referred in these answers that can be summarised briefly:

- ▶ HBM is adequate for realistic exposure measurements
- ▶ Can be used in regulations of chemicals and to protect human health
- ▶ Valuable for integrated information on chemical body burden
- ▶ General population and occupational settings can be addressed using HBM
- ▶ Important for emerging chemical risks
- ▶ Has been used for identifying chemicals of concern, including the approach of non-target or suspect screening
- ▶ Use as early warning tools
- ▶ Cost-benefit ratios should be taken into account
- ▶ Protection of human and environmental health.

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5.4 Future HBM initiative

5.4.1 Q8 What exposure routes would you like to see covered by a future European Human Biomonitoring initiative?

Participants were asked to choose between:

- a) The skin (dermal absorption)
- b) The respiratory tract (inhalation)
- c) The digestive tract (ingestion)
- d) Other Routes of Exposure (eg. Injection, medical application, etc).

A total of 19 responses were received for both questions 8 and 9. However, 2 responders did not declare their country. Therefore, their answers have been omitted. Thus, 17 responses have been included in the analysis below.

The 13 responses provided by NRCs were from the following countries: SE, PT, TR, IE, BE, IT (with 2 responses), SK, DE, FR, BU, CH and LV. The other 4 responses were provided by EPAs from MT, LV, SK and AT.

Figure 15 represents the percentage of answers for the different proposed routes of chemical exposure that a future European Human Biomonitoring initiative should focus on. The 3 most reported exposure routes are: **digestive tract (ingestion) and respiratory tract (inhalation)** with equal 33 %, **followed by skin (dermal absorption) (26 %)**. Other **routes of exposure (e.g. injection, medical application, etc.)** was the less reported.

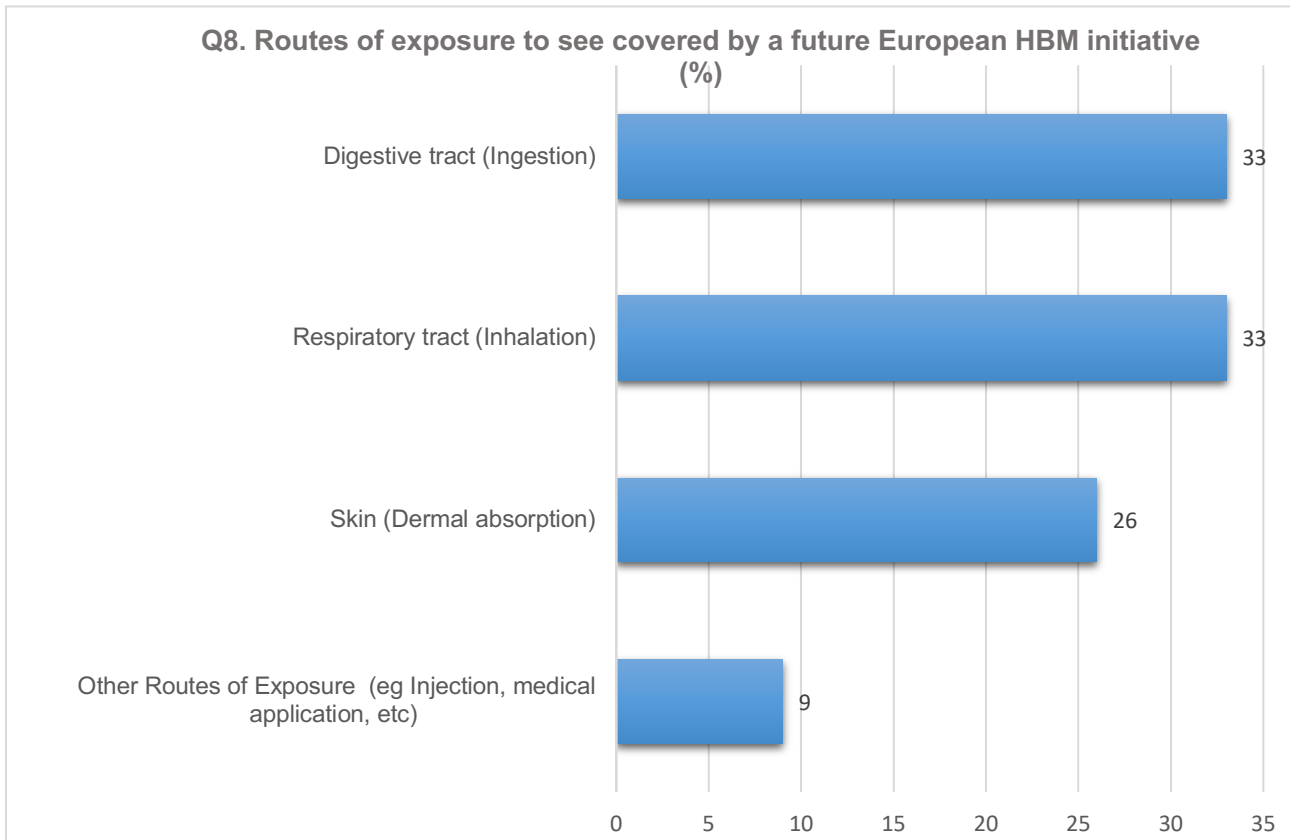


Figure 15: Routes of exposure to see covered by a future European Human Biomonitoring initiative in percent

As shown in Figure 16, fourteen responders from twelve different countries reported more than one option for their preference on the routes of exposure.

Most responders (N=8, coming from seven countries: AT, CH, BG, FR, SK, IT and BE) selected the skin (dermal absorption), the respiratory tract (inhalation) and the digestive tract (ingestion) as the routes of exposure they wish to see covered by a future HBM initiative.

LT and TR are the only countries having reported all 4 proposed exposure routes.

Three countries reported 2 options: SK and IT prioritised both routes the respiratory tract (inhalation) and the digestive tract (ingestion), and SE the skin (dermal absorption) and the digestive tract (ingestion).

MT prioritised option b) *Respiratory tract (Inhalation)*, and DE and PT option d) *Other routes of Exposure*.

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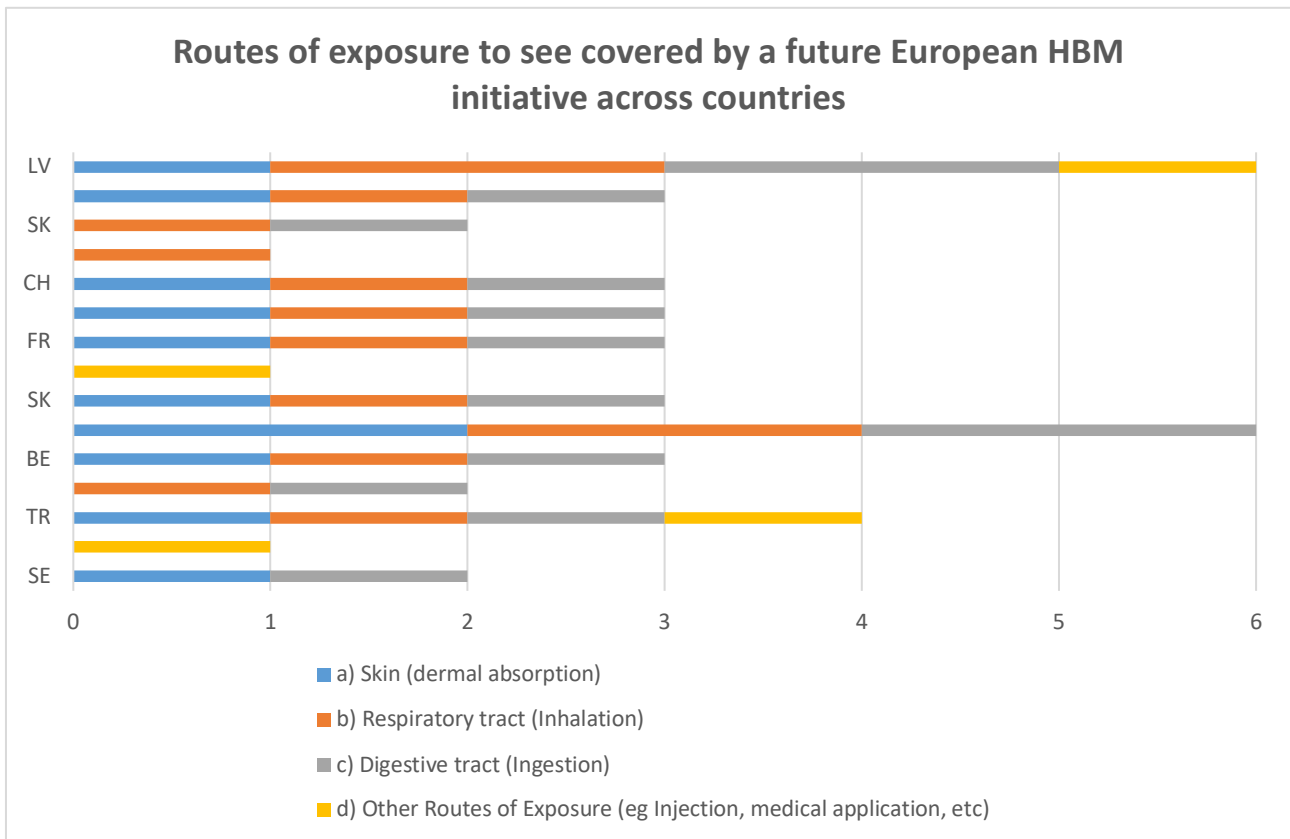


Figure 16: Routes of exposure to see covered by a future European Human Biomonitoring initiative across countries

5.4.2 Q8.1 What sources of exposure would you like to see covered by a future European Human Biomonitoring initiative?

Participants were asked to choose between:

- a) Environmental air
- b) Drinking water
- c) Food and Feed
- d) Consumer products (eg cosmetics, clothes, toys, etc)
- e) Occupational

In Figure 17, the answers for the different proposed sources of chemical exposure that a future European Human Biomonitoring initiative should focus on are shown in percentages. **The 3 prioritised exposure sources are: consumer products, followed by drinking water and environmental air with equal %, and food and feed. Occupational was the less reported source.**

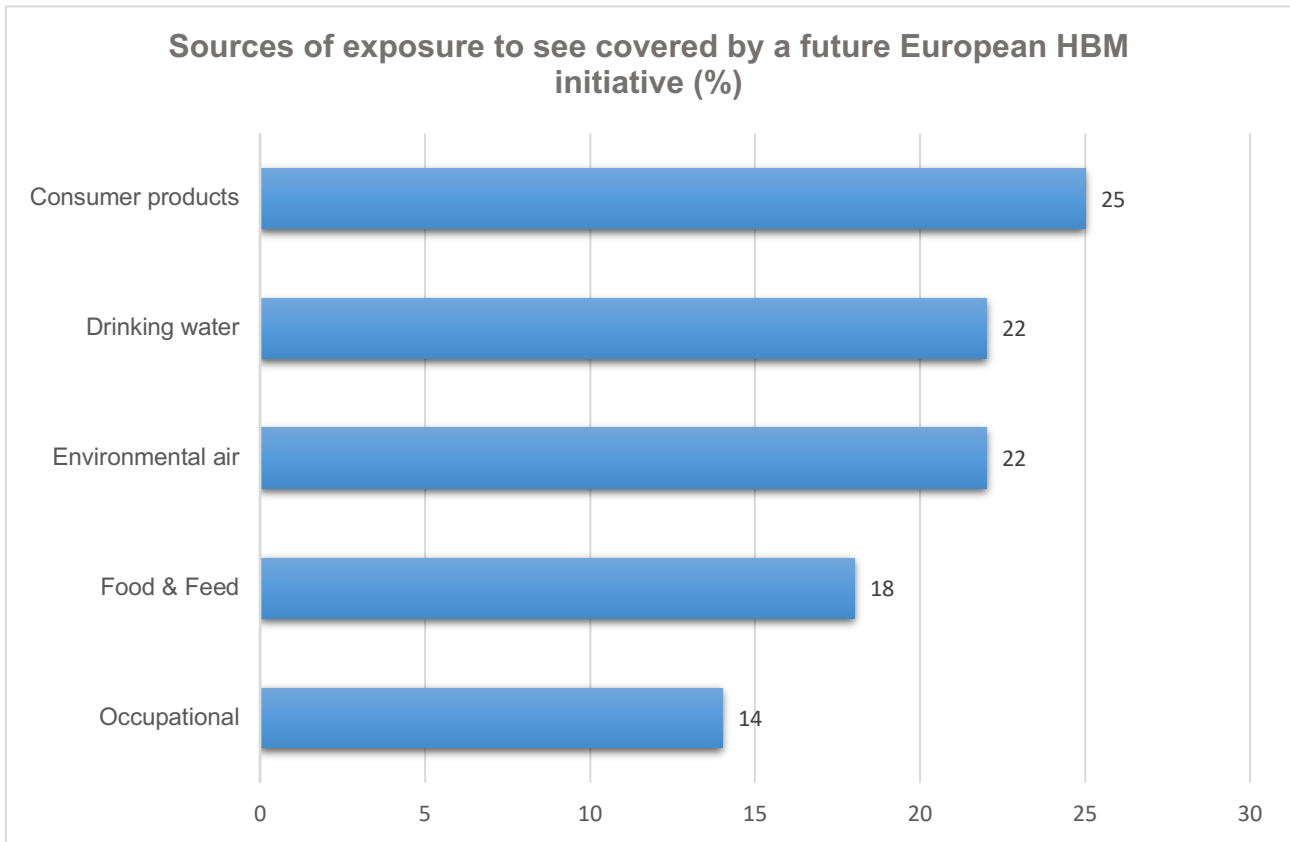


Figure 17: Sources of exposure to see covered by a future European Human Biomonitoring initiative in percent

As shown in Figure 18, fourteen responders from twelve different countries reported more than two options for their preference on the sources of exposure.

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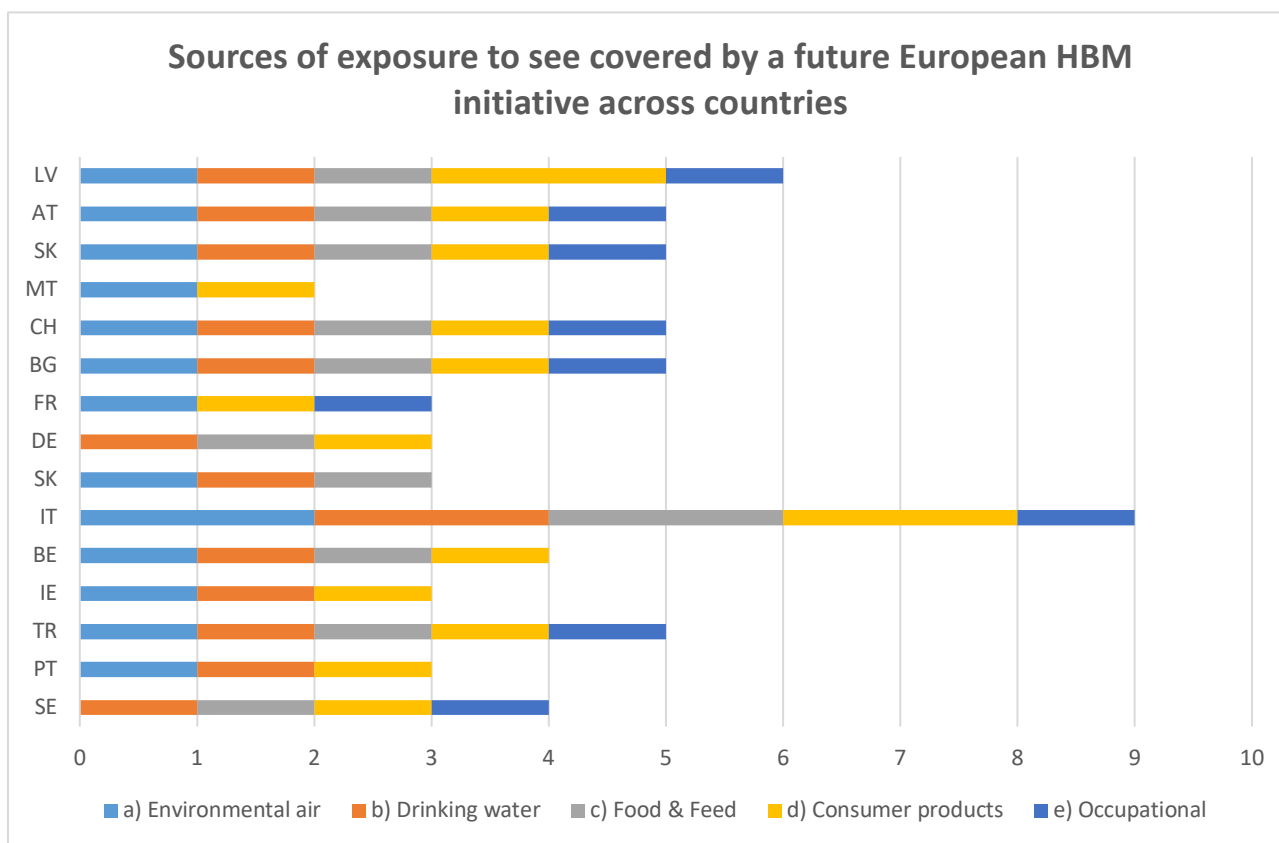


Figure 18: Sources of exposure to see covered by a future European Human Biomonitoring initiative across countries

Most responders, coming from seven countries: LT, AT, SK, CH, BG, IT, TR and SE, have reported all 5 proposed exposure sources.

IE and PT selected environmental air, drinking water and consumer products as the sources of exposure they wish to see covered by a future HBM initiative. For FR environmental air, consumer products and occupational were the prioritised sources whereas Germany selected drinking water, food & feed and consumer products.

MT is the only country having reported 2 exposure sources, namely environmental air and consumer products.

5.4.3 Q9 In terms of chemical exposure, Human Biomonitoring should focus on exposure

Possible answers were:

- a) to emerging chemicals
- b) to persistent chemicals (e.g. heavy metals)
- c) to mixtures
- d) to food contaminants
- e) to environmental contaminants
- f) to illicit drugs

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- g) to consumer goods
- h) hotspots
- i) accidental exposure

A total of 19 responses were received for this question. Since ranking was not possible for this first part of the question, but included in 9.1, for the evaluation of this question all nominations received the same weight. The results are reported in percent: 100% means that all responders considered that HBM should focus on the respective subject.

Four responses were provided by EPAs (AT, LV, MT, SK) and 15 by NRCs (BE, BG, FR, DE, IE (is the national EPA), IT (2 responses from IT, one from Env. Protection National system), LV, PT, SK, SE (national EPA), CH, TR, 2 responses without declaration of country name). The NCRs represented national authorities or institutions related to Health or the Environment. The spread of the responses, which were received for Question 9, is shown in Figure 19 below.

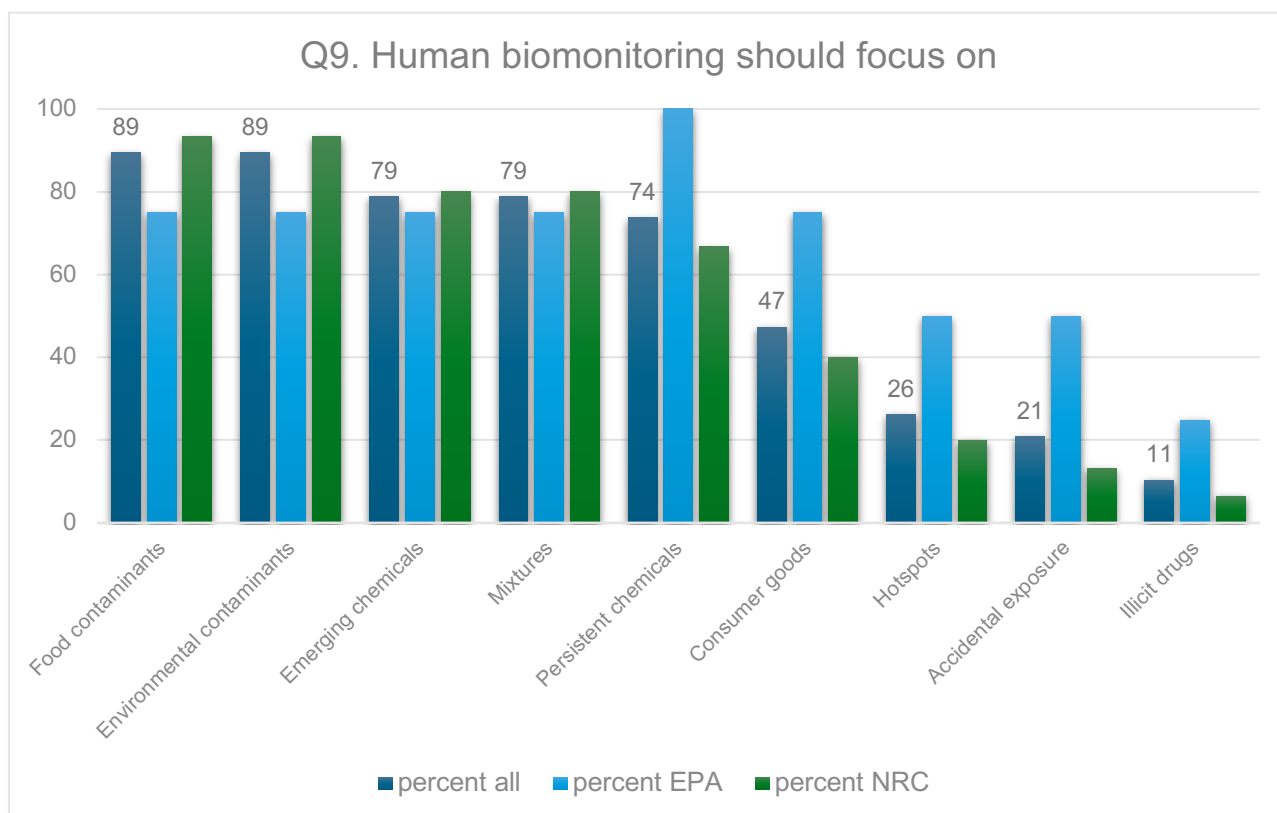


Figure 19: Responses received (%) for Question 9 – “In terms of chemical exposure, Human Biomonitoring should focus on exposure to...” (100% corresponds to selection by all responders)

The broadest interest of the respondents is in **food contaminants, environmental contaminants, emerging chemicals, mixtures and persistent chemicals**. Approximately half of the respondent is also interested in **consumer goods**. The interest in the other three categories (hotspots, accidental exposure, illicit drugs) is mainly driven by the EPA’s, who generally show a broader interest than the NRC respondents. Apart from that, the trend is the same for EPA and NRC.

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5.4.4 Please rank the types of exposure that you have selected with "1" being the most preferred and "5" being the least:

For question 9.1, a total of 17 responses were received from the same responders as for 9, apart from Sweden and Turkey. Responders ranked the categories by giving the highest rank among the 5 first. For the evaluation, the first rank was assigned a weight of "5", the second a weight of "4" etc. The resulting rank gives the sum of scores, i.e. the overall rank position and an approximate distance between ranks.

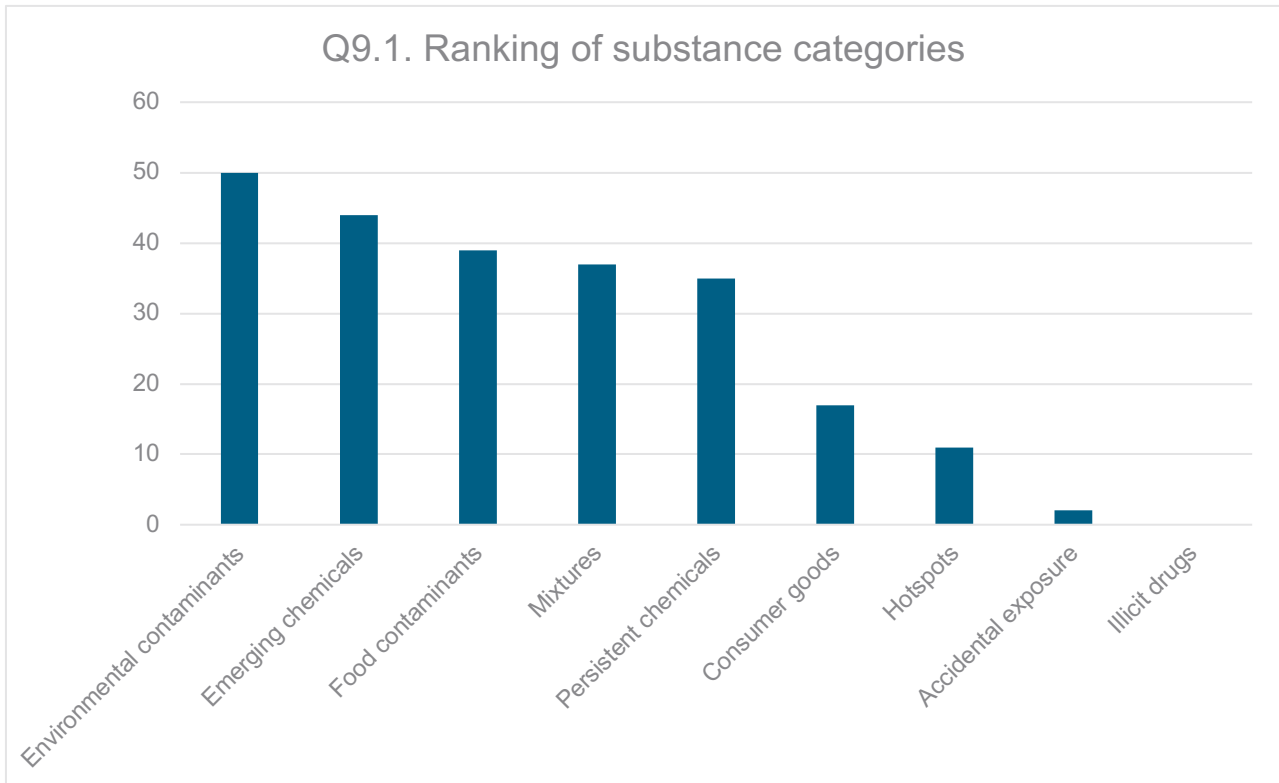


Figure 20: Ranking of substance categories for biomonitoring according to the sum of weights

The ranking for question 9.1 confirmed the overall results for question 9 **with environmental chemicals receiving the highest score**. Since differences between EPA and NRC were small, they are presented together. The only difference is that the **EPA's put a higher score to food contaminants compared to NRCs**.

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5.4.5 Q10 Would your institution be interested in sharing best practices regarding a. the use of Human Biomonitoring data for chemical risk assessment and management, b. understanding environmental risks, c. other



Figure 21: Interest in sharing best practices (in percent)

Out of 19 institutions (the same as for question 9), **15 institutions are willing to share best practices regarding the use of Human Biomonitoring data for chemical risk assessment and management (79 %)**. With **14 out of 19 institutions (75%) willing to share best practices for understanding environmental risks**.

Three institutions responded **other**: Austria is willing to share best practices regarding **risk communication and citizen's dialogue**, Belgium is willing to **share best practices regarding all other aspects of HBM**, and Germany is willing to **share best practices regarding communication materials, technical knowledge and data**.

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5.4.6 Q11 Would your institution be interested in playing a role in a future Human Biomonitoring initiative?

In case of a [yes] answer, participants were asked to select the possible options:

- a) Supporting the activities of the HBM initiative through an existing interest group under the NRC Network.
- b) Supporting the activities of the HBM initiative through a new interest group (e.g. chemicals)
- c) Supporting the initiative towards better policy implementation by contributing to the connection between the initiative and the European Commission
- d) Positioning Human Biomonitoring in the strategic agenda of implementation of environmental policy and state of the environment in Europe
- e) Improving the positioning of HBM4EU at national level in NRC network member countries
- f) Creating joint working initiatives with other relevant networks
- g) Other (Please specify below)

If you have selected "Other", please specify

All the NRCs and 3 out of the 4 EPAs answered this question, showing their willingness to play a role in a future initiative. With a total of 40 replies (some institutions provided more than one answer), the three most answered options were: **d) Positioning Human Biomonitoring in the strategic agenda of implementation of environmental policy and state of the environment in Europe (28 %)**, **a) Supporting the activities of the HBM initiative through an existing interest group under the NRC Network (25 %)** and **f) Creating joint working initiatives with other relevant networks (18 %)**.

Since the question was not institution specific, the answers for both NRC and EPA were analysed together.

Results are presented in Figure 22.

Five countries (3 NRCs and 2 EPAs) answered "g) other" and they would be interested in playing another role than the one mentioned as:

SE: The Swedish EPA is the NHCP in Sweden and is in that way already contributing but is of course interested also as NRC member to contribute at all levels.

BE: We would like to play a role as active partner in the new initiative.

FR: This could be carried out within the framework of a potential co-funded European Partnership for Chemicals Risk Assessment under Horizon Europe.

SK: Yes, we are interested and discussions between relevant institutions are ongoing. The NRC in Health/Environment colleagues in Slovakia are part of HBM4EU. National environmental report contained chapter on Health issues.

AU: Human Biomonitoring, Toxicology and Risk assessment

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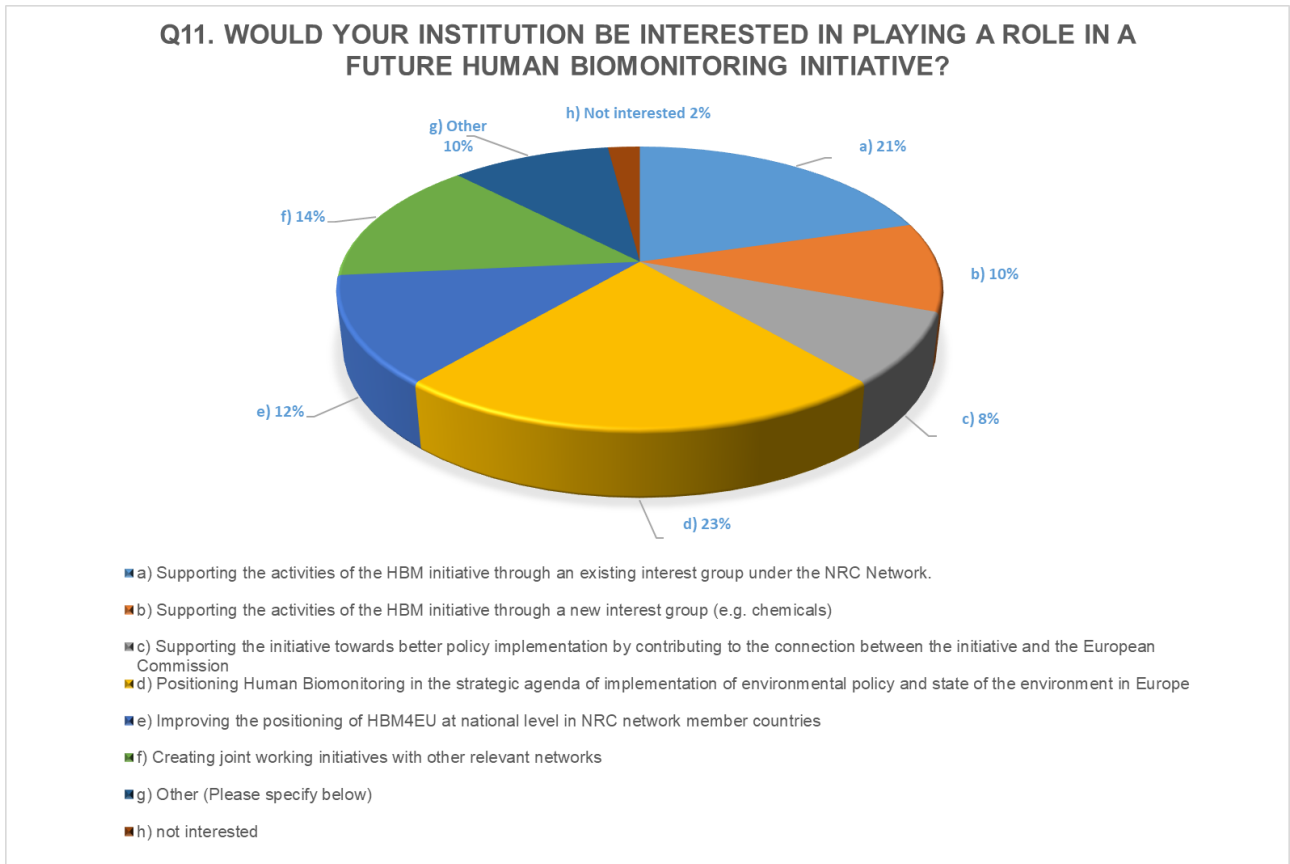


Figure 22: Q11. Would your institution be interested in playing a role in a future Human Biomonitoring initiative?

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6 Overall conclusions

The aim of this survey was to analyse the results of the interaction and surveys with the Environment Protection Agency network and the National Reference Centre on Environment & Health. This consultation also aimed at understanding their perception of the current HBM4EU and their ideas for a future Human Biomonitoring initiative

The invitation was sent out to 29 EPA countries and 15 NRCs, from which 19 answers were obtained in total with 4 EPAs answered and 13 NRCs. One of the EPAs was also a HBM4EU partner, whereas from the 14 NRCs, 13 of those provided their countries/institution from which 7 are HBM4EU partners. This means a total of 8 HBM4EU partners out of 19 answered the survey (50 %).

From the analysis of this survey, it was quite clear that HBM has an important role to play in chemical and risk assessment, environmental and food monitoring, emerging chemicals, mixtures and persistent chemicals. It is also noteworthy to mention that, despite not all institutions being HBM users at the moment all of them realised its potential and would like to use it in the future. Most institutions have shown willingness to collaborate and share best practices in the field.

All HBM4EU as well as the non-HBM4EU **partners** who answered the questionnaire (as NRC/EPA) **are fully aware** (score between 3 and 5) of **HBM and of its capacity to contribute to chemical risk assessment**. Geographically, **there's a good scatter across Europe** of interested institutions.

Depending on the country, HBM activities **are led at national level by the Ministry of Health, the Ministry of Research or/and the Ministry of the Environment**.

Despite the fact that most institutions do not **currently use HBM to assess human exposure to environmental stressors**, if the data is analysed country-wise a bit more than half the countries represented reported that **they use HBM to assess human exposure to environmental stressors**.

From the countries that do use it, that is done to perform national and research studies, information to the general public; chemical risk assessment and recommendations to interested Ministries on the need for regulatory risk reduction measures; chemical exposure of the population, national environmental goals and chemical regulation.

Most participants in the survey (**68 %**) **considered using Human Biomonitoring results** emerging from the current European Human Biomonitoring Initiative (HBM4EU) **in future work**, while **only 5.3 % did not consider it**. The ones that would consider it for national needs would use it for **risk communication** and **assessment of the effectiveness of existing literature**, as well as **risk assessment** and **assessment of the need of new legislation**. As for other needs, these were mainly in chemical agencies at national level; and set priorities in monitoring campaigns; implement HBM in their national legislation (e.g. Slovakia in their National Environment and Health Action Plan); exposure in hotspot areas, research on health effects and adverse outcomes of chemicals, identification of exposure pathways and determinants.

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All participants answered that **HBM is a useful tool**, with the relevant answers summarised below emphasising that: A

- ▶ HBM is important to **measure emerging chemicals in human matrixes** and through the research connect exposure with health effects and **to find indicators to follow within HBM**. This to be used in regulations of chemicals and to protect humans.
- ▶ **HBM is the only instrument that can assess human exposure in an integrated and reliable way.**
- ▶ **HBM defines the exposure to certain chemical substances** in subjects **residing in areas characterised by presumable incremental exposure to these pollutants** compared to the control population residing in another geographical area.
- ▶ There is still **lack of data related to emerging chemical risks to human health**. HBM is very good tool to examine this exposure.
- ▶ The **long-term objective would be to have a non-toxic environment** and a **circular green economy**, where **exposure to chemicals, is negligible**. It is quite a way to reach this. In the foreseeable future, **Human Biomonitoring is needed to identify exposure to chemicals, their health effects and adverse outcomes in order to protect human health and the environment.**

Most responders selected the **skin (dermal absorption), the respiratory tract (inhalation) and the digestive tract (ingestion)** as the routes of exposure they **wish to see covered by a future HBM initiative**.

In terms of proposed **sources of chemical exposure** that a future European Human Biomonitoring initiative should focus the 3 prioritised ones are: **consumer products, followed by drinking water and environmental air with equal percentage, and food and feed**. Occupational was the less reported source.

Concerning the chemical exposure that HBM should focus on, the **broadest interest** of the respondents is in **food contaminants, environmental contaminants, emerging chemicals, mixtures and persistent chemicals**.

About 79 % of the institutions are **willing to share best practices** regarding the use of Human Biomonitoring data **for chemical risk assessment and management** with 75% **willing to share best practices for understanding environmental risks**.

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7 Annex 1 – Survey Questions EPA/NRC

The survey included 11 questions, with an initial consent request.

CONSENT: I give my consent to HBM4EU to make use of the information that I provide to this survey:

- a. [yes, allows completion of survey /
 - b. no, cannot proceed]
1. Are you aware of “Human Biomonitoring” and how it may contribute to the assessment of chemical risks?
Please provide a range of awareness, from 1 (not aware) to 5 (very aware)
 2. Are you aware of the on-going European Human Biomonitoring Initiative (HBM4EU, <https://www.hbm4eu.eu/>)?
Please provide a range of awareness, from 1 (not aware) to 5 (very aware)
 3. Is your organisation a partner in HBM4EU? [Yes] / [No]
 4. Which organisation leads activities on Human Biomonitoring in your country? [environment] / [health] / [research] / [I don't know] / [other – specify]
 - 4.1 If you have selected "Other" for 4, please specify:
 5. Does your organisation currently use Human Biomonitoring data to assess human exposure to environmental stressors? [Yes] / [No]
 - 5.1 If yes, please briefly describe how.
 6. Do you anticipate using the Human Biomonitoring results emerging from the current European Human Biomonitoring Initiative, HBM4EU, in your future work? [Yes] / [No] / [I don't know]
If yes, please indicated for what process:
 - a) Risk Assessment
 - b) Risk Management
 - c) Risk Communication
 - d) Assessment of the effectiveness of existing legislations
 - e) Assessment of the need for new legislations
 - f) National needs or priorities [Please specify]
 - Other [Please specify]
 - 6.1. If National needs or priorities (Please specify)
 - 6.2. If Other (Please specify)
 7. Do you consider Human Biomonitoring to be a useful tool for the identification of emerging chemical risks to human health? If yes, please briefly describe how.

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7.1. If Yes, please briefly describe how.

8. What exposure routes would you like to see covered by a future European Human Biomonitoring initiative?

- a) The skin (dermal absorption)
- b) The respiratory tract (inhalation)
- c) The digestive tract (ingestion)
- d) Other Routes of Exposure (eg. Injection, medical application, etc).

8.1. What sources of exposure would you like to see covered by a future European Human Biomonitoring initiative?

- a) Environmental air
- b) Drinking water
- c) Food and Feed
- d) Consumer products (eg cosmetics, clothes, toys, etc)
- e) Occupational

9. In terms of chemical exposure, Human Biomonitoring should focus on exposure (rank by order of importance).

- a) to emerging chemicals
- b) to persistent chemicals (e.g. heavy metals)
- c) to mixtures
- d) to food contaminants
- e) to environmental contaminants
- f) to illicit drugs
- g) to consumer goods
- h) hotspots
- i) accidental exposure

9 Please rank the types of exposure that you have selected with "1" being the most preferred and "5" being the least:

1st - most preferred - 5th - least preferred

10 Would your institution be interested in sharing best practices regarding:

- a) the use of Human Biomonitoring data for chemical risk assessment and management
- b) understanding environmental risks
- c) Other

10.1 If you have selected "Other", please specify here.

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11. Would your institution be interested in playing a role in a future Human Biomonitoring initiative? If yes, please select the possible options:
- a) Supporting the activities of the HBM initiative through an existing interest group under the NRC Network.
 - b) Supporting the activities of the HBM initiative through a new interest group (e.g. chemicals)
 - c) Supporting the initiative towards better policy implementation by contributing to the connection between the initiative and the European Commission
 - d) Positioning Human Biomonitoring in the strategic agenda of implementation of environmental policy and state of the environment in Europe
 - e) Improving the positioning of HBM4EU at national level in NRC network member countries
 - f) Creating joint working initiatives with other relevant networks
 - g) Other (Please specify below)

11.1 If you have selected "Other", please specify here.