



science and policy
for a healthy future

HBM4EU project

What are the PFAS levels and health effects in vulnerable population groups

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1. Focus – vulnerable populations

2. Strategy:

- What data is available
- What exposure data we want
- Identification of limitations
- Specific research questions
- What do we need and what do we have - variables
- The next steps
- Timeline

Vulnerable populations

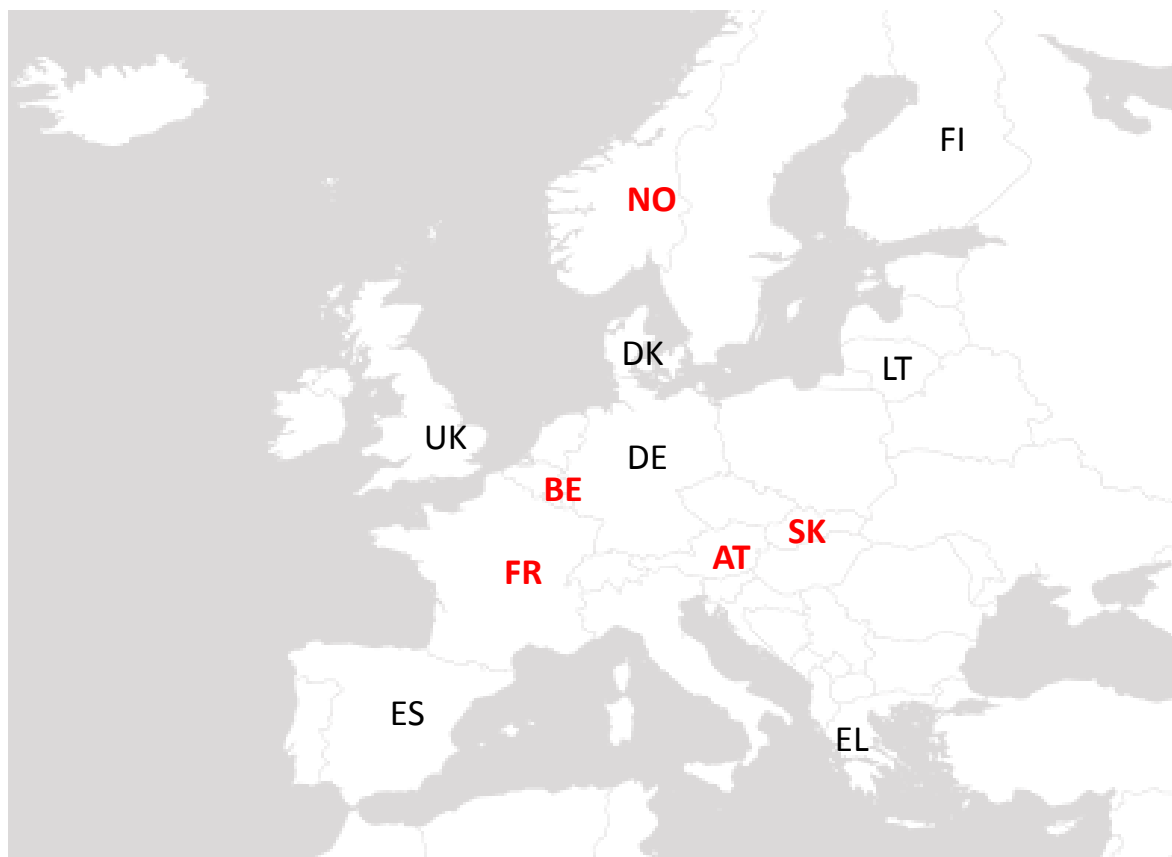
1. Newborns, children / teenagers
2. Pregnant women / women of reproductive age
3. Population of elderly



Cooperation with the Task 13.2

Newborns / pregnant women

What data is available - IPChem



Total number of studies in IPChem – 23 studies

Both, national and international (e.g. HELIX) studies

Some countries – more cohorts

Pregnant women / newborns - 5 countries – 2 x B, F, SK, A, N

What data is available – HBM4EU overview

- 17 EU birth cohort studies; 16 EU
 - Inclusion criteria:
 - PFASs biomonitoring data available in vulnerable populational subgroups
 - Individual biomonitoring data preferred
 - Cord blood / maternal blood/serum (2 missings-DK)

Matrix	N of studies
Cord blood	4
Maternal blood	10

Region	N of studies
North	4 x D, N, 2 x UK
East	SK
South	3 x E
West	A, 3 x B, F

- Geographical distribution 
- Type of surveys - prospective / cross-sectional surveys
national / regional surveys
- Willingness participate?

What exposure data do we want

Variable	Chemical substance
PFOS	Perfluorooctane sulphonate
PFOA	Perfluorooctanoic acid
PFHxS	Perfluoro-1-hexanesulfonate
PFDS	Perfluoro-1-decanesulfonate
PFBA	Perfluoro-n-butanoic acid
PFPeA	Perfluoro-n-pentanoic acid
PFHxA	Perfluoro-n-hexanoic acid
PFHpA	Perfluoro-n-heptanoic acid
PFNA	Perfluoro-n-nonanoic acid
PFDA	Perfluoro-n-decanoic acid
PFU(n)dA	Perfluoro-n-undecanoic acid
PFDoA	Perfluoro-n-dodecanoic acid
PFTTrDA	Perfluoro-n-tridecanoic acid
PFTeDA	Perfluoro-n-tetradecanoic acid
FOSA	Perfluoro-1-octaperfluoro-1-octanesulphonamide
N-MeFOSA	N-methylperfluoro-1 octanesulphonamide
N-EtFOSA	N-ethylperfluoro-1-octanesulphonamide

limits of detection (LOD),
limits of quantification
(LOQ)

Identification of limitations

- Analytical method used
- Biological matrix – breast milk?
- Different time periods Probably not a problem
- Different sampling times (pregnant women/mothers)
- Small studies Probably not a problem
- Individual data needed for the assessment:
 - Exposure assessment - NO
 - Health determinants vs exposure - YES

Specific research questions

Research Q10a. What are PFASs levels in vulnerable populations?

Research Q10b. Do subgroups of vulnerable populations belong among highly exposed population groups?

Research Q10c: What are determinants of PFASs exposure in vulnerable populations and are they different from general population? (in cooperation with RQs on exposures)

Research Q10d : What are associated health effects?

Literature - metabolic pathways, immune functions, thyroid functions

..... Link to task 13.2 – Birth weight

Thyroid functions

Variables needed

Obligatory variables:

Variables essential for analysis are gender, gestational age, age of child, maternal age and educational level of mother.

Optional variables:

If available, birth weight, parity, breastfeeding, maternal BMI before pregnancy and ethnicity could be used in analysis as well.

Newborns

Variable	Description of variable	Unit / score	OPT / OBL	Comment
PFASs	Levels of PFASs	ng/mL	OBL	Levels in cord blood
LODs	Levels of detection	ng/mL	OBL	
Gender	Male/Female		OBL	
Gestational age at birth		Weeks	OBL	
Birth weight		Grams	OPT	
Maternal age	Age at delivery	Years	OBL	
Ethnicity	Categories		OPT	Depending on country – to be specified
Education of mother/parents	Categorized education	Levels of education	OBL	Depending on country – to be specified
Parity		Primiparous // multiparous	OPT	
BMI of mother	Maternal BMI before pregnancy	kg/m ²	OPT	

Variables needed

Pregnant women/mothers

Variable	Description of variable	Unit / score	OPT / OBL	Comment
PFASs	Levels of PFASs	ng/mL	OBL	Levels in breast milk/blood serum
LODs	Levels of detection	ng/mL	OBL	
Age	Age at sampling	Years	OBL	
Ethnicity	Categories		OBL	Depending on country – to be specified
Education	Categorized education	Levels of education	OBL	Depending on country – to be specified
Parity		Primiparous // multiparous	OPT	
Breastfeeding history		Weeks / months	OPT	Duration of breastfeeding for each child
Source of drinking water	tap water, bottled water, private well		OPT	at home / at work
Smoking exposure	active / passive smoking	Yes / no	OPT	
Take away/fast food/beverages; Ready meals		freq	OPT	How often and material (cardboard box, paper box/cup, polystyrene foam)
BMI of mother	Maternal BMI before pregnancy	kg/m ²	OPT	

Availability of variables?

Statistical analysis

- Aggregated data – specific descriptive statistics for each survey (exposure)
- Individual data – pooling of data, analyses of 1 big sample (health data vs. exposure)
- Distribution of variables
- Extreme values and missing values (imputation)
- Descriptive statistics + % of detection for exposure variables.
- Each PFAS - bivariate analysis with each covariate (regression models)
- Each PFAS - multiple linear regression using all selected covariates ($p < 0.20$).
- Elimination of variables by backward selection.
- If imputed data used – sensitivity analysis
- Collinearity in model - Variance Inflation Factor (VIF).

The next steps / Timeline

- To invite data owners / data providers to share individual, or aggregated data – December 2018
- Data transfer (DTA) – January – February 2019
- Building a database – March 2019
- Data analysis by specific RQs: April – June 2019
 - PFAS levels in vulnerable populations ... Highly exposed ?
 - Determinants of PFASs exposure in vulnerable populations vs. general populations
 - Health effects – Birth weight, Thyroid functions (Task 13.2)
- Circulation of preliminary results + Discussion: July – Sept. 2019
- Additional statistical analyses – October 2019
- Publication
 - Draft circulated November 2019
 - Final submission December 2019 – January 2020



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