

Mercury exposure data in Europe

- *Human exposure & biomonitoring*
- *MercOx/SI-Hg*
- *MSCA ITN GMOSTrain*

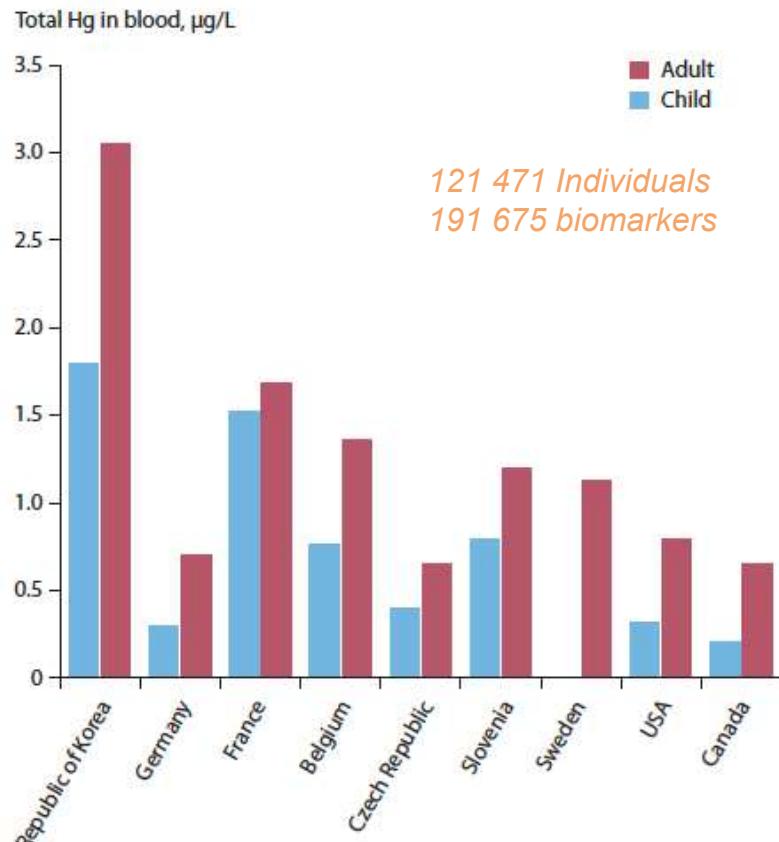
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HBM programmes

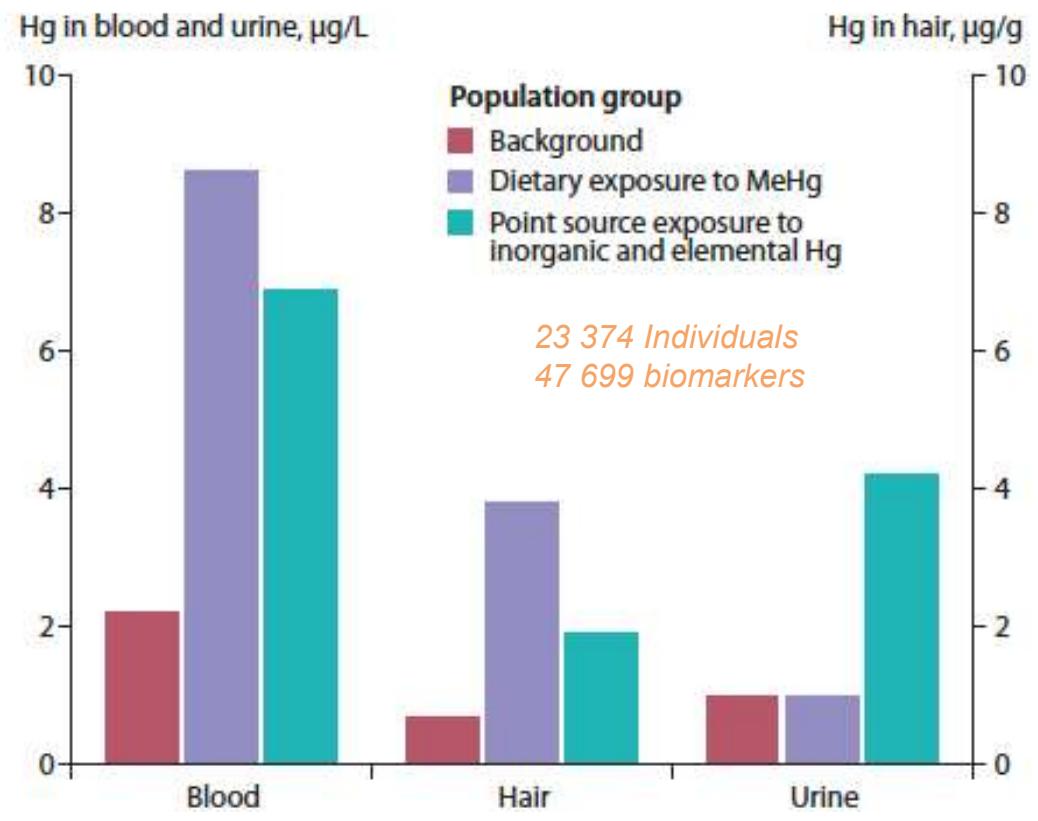
- USA, NHANES studies (1971 -)
- German Environmental Survey (ESB) (1985 -)
- Canada (2006-): Canadian Research on Environmental Health (NCP); Hg biomonitoring done
- Flemish study (FLESH): 2006 -
- Czech Republic, Slovakia, ...
- Recently started and on-going
- Europe: ESBIO, COPHES, ...



Children and adults (2003-2014): HBM programmes



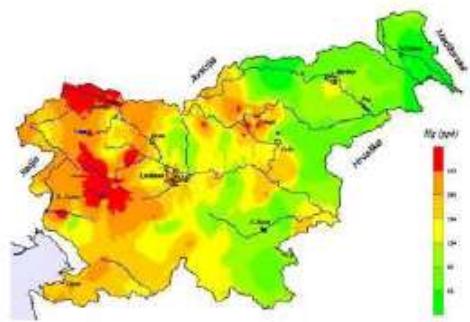
Cross-sectional studies



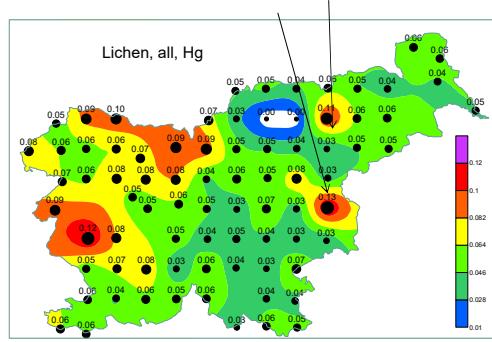
Basu, Horvat, Evers, Zastenskaya, Weihe, Tempowski, GMA, 2018 and EHP, 2019

HBM in Slovenia – 2007-2014

Hg in soil - Slovenia

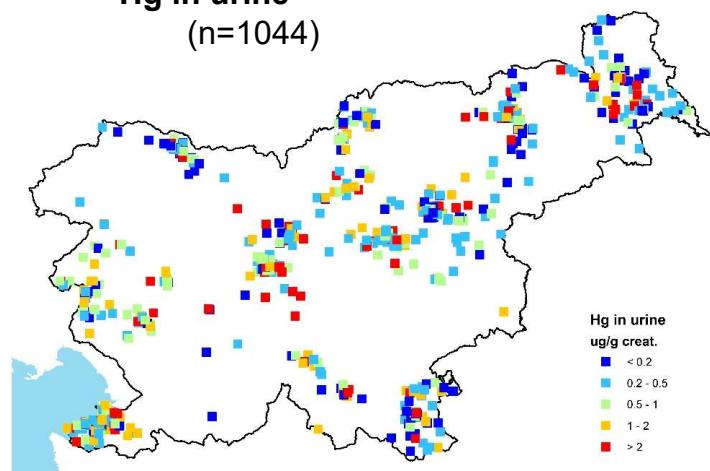


Hg emission sources,
coal burning



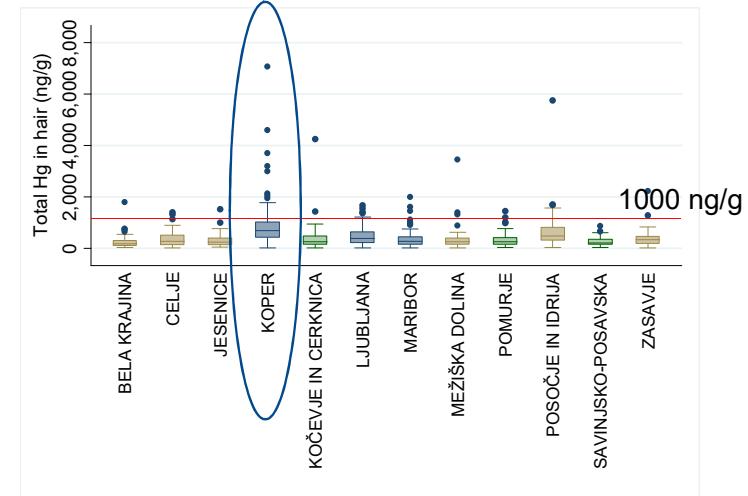
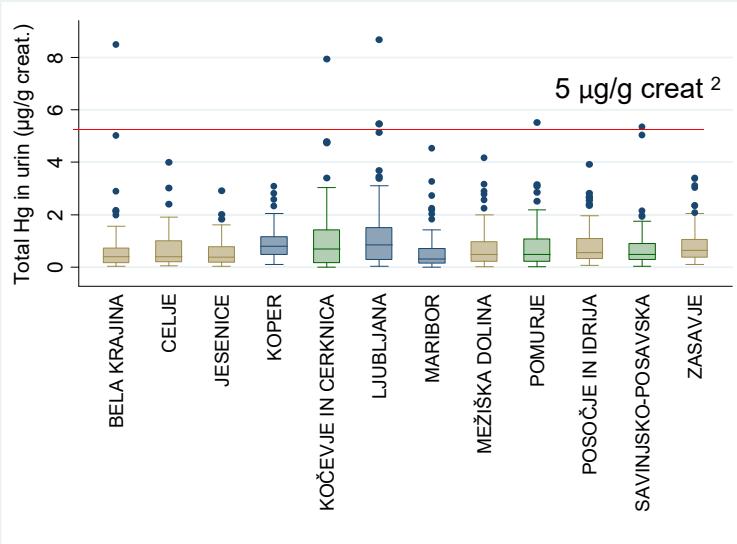
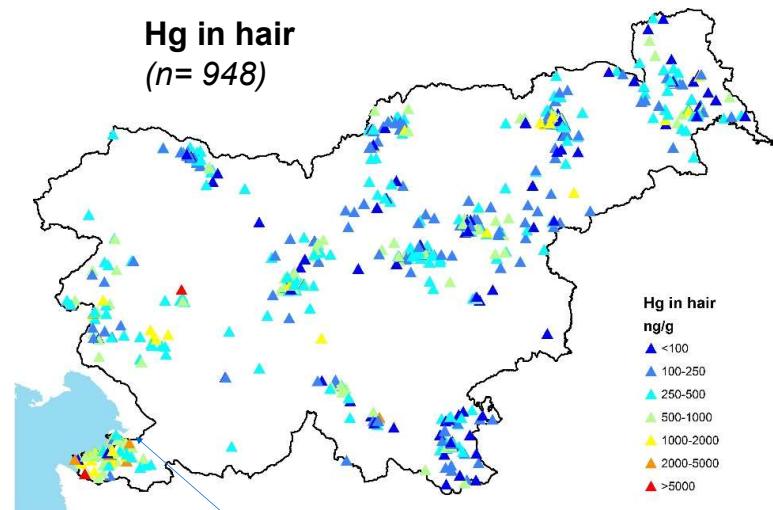
Hg in urine

(n=1044)



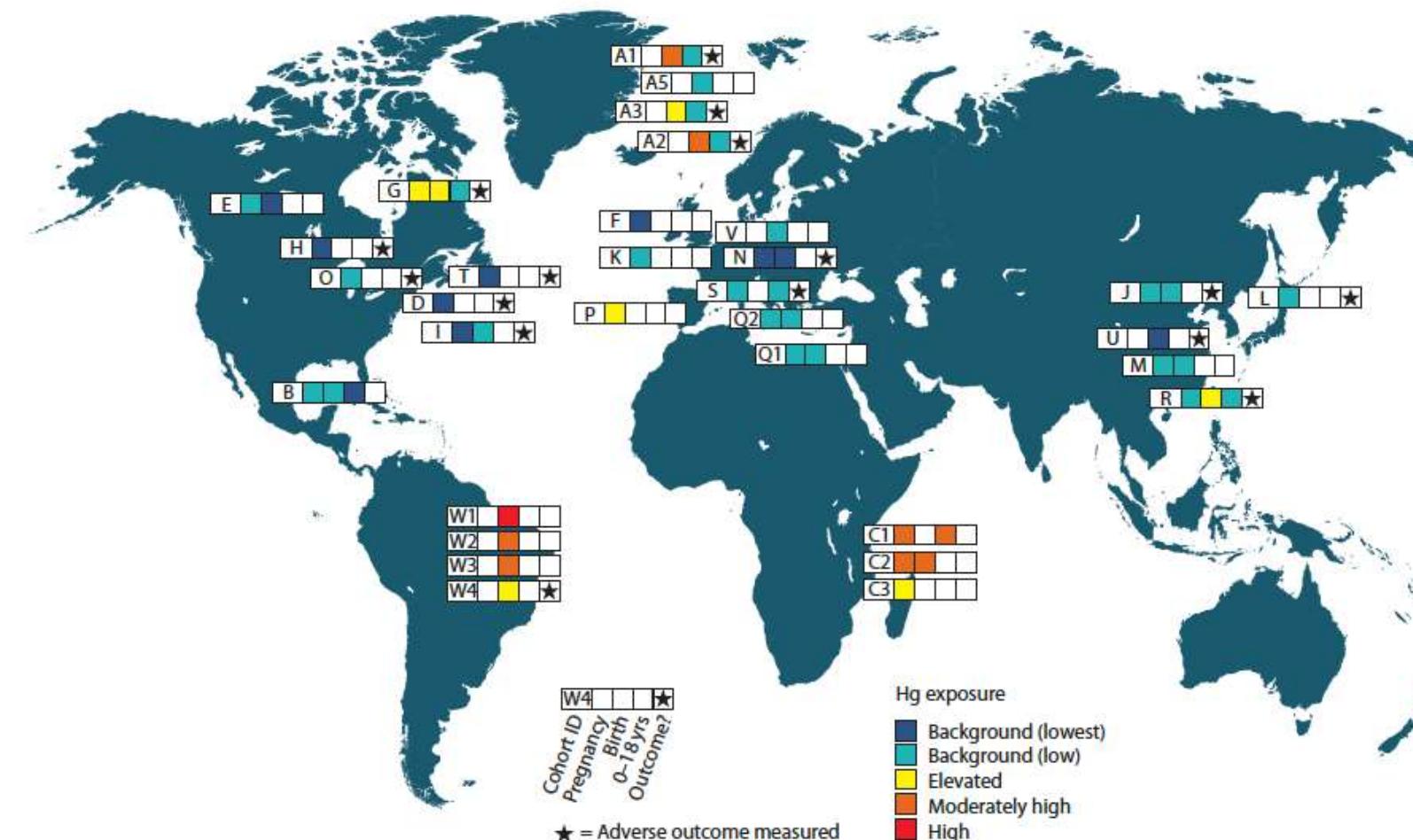
Hg in hair

(n= 948)



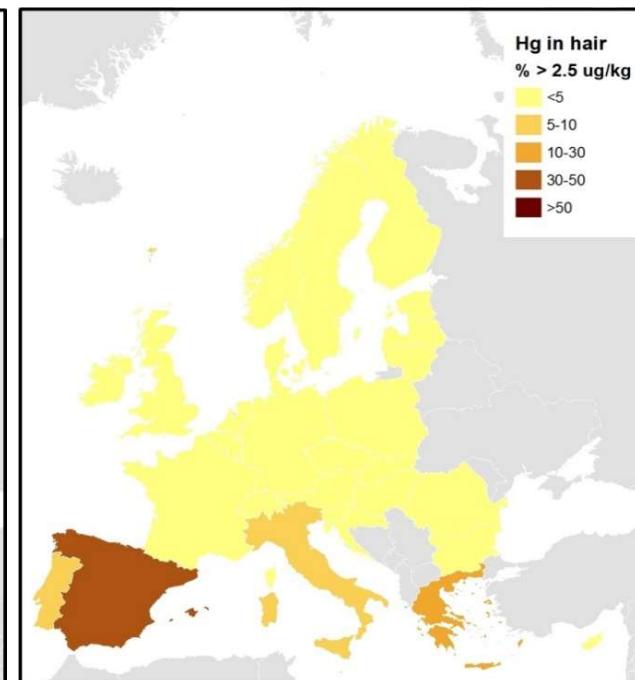
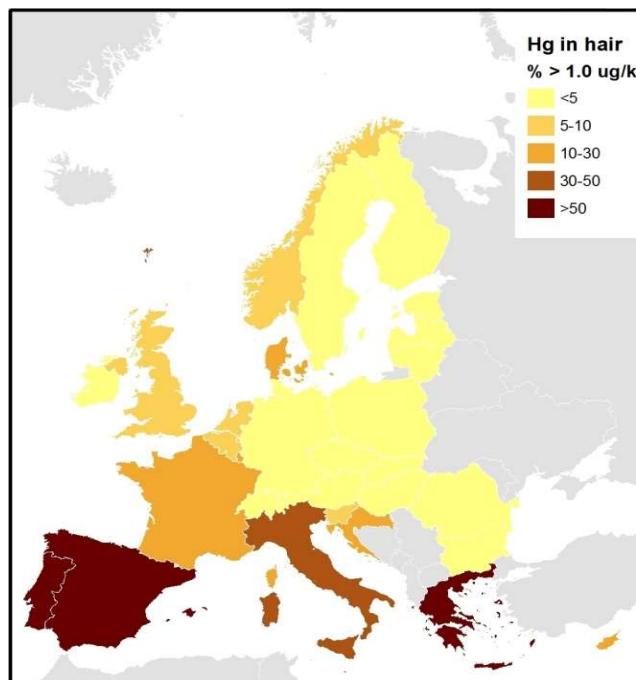
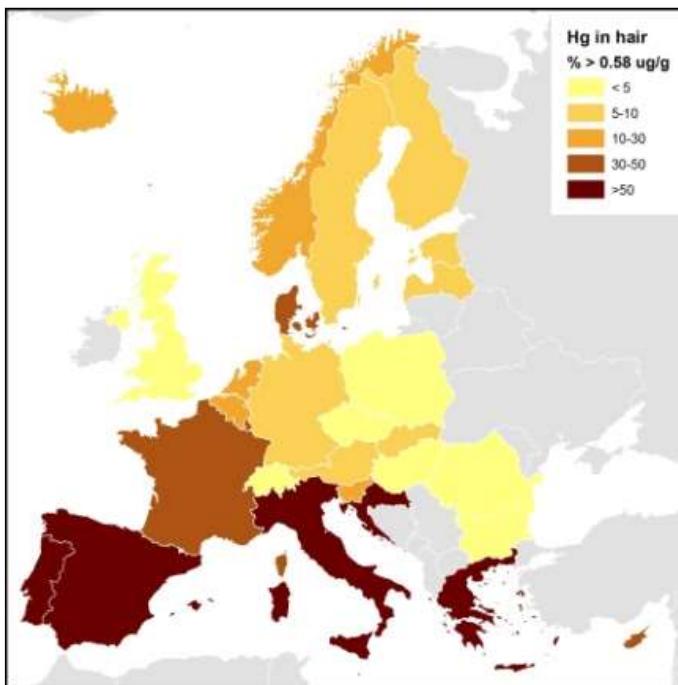
Birth cohort studies

23,374 mother-child pairs
47,699 biomarker measurements



H	POUCH (Michigan)	R	Hong Kong
N	Poland	L	Tohoku
E	MIREC	P	INMA
D	VIVA	T	Massachusetts
F	ALSPAC	C3	Seychelles
U	Shanghai	A3	Faroe Islands
O	Oswego	G	Nunavik Child Development
K	EDEN	A2	Faroe Islands
I	World Trade Center	I	Faroe Islands
S	Italy	C1	Seychelles
B	ELEMENT	W4	Madeira R (Tin Mine)
J	MOCEH (Korea)	C2	Seychelles
V	PELAGIE	W2	Madeira R (Urban)
A5	Faroe Islands	W3	Madeira R (Rural)
Q1	PHIME-Italy	W1	Madeira R (Riverine)
M	Zhoushan		
Q2	PHIME-Greece		

THg in hair – DEMOCOPHES study (based on data from Bellanger et al., 2013)



- Percent of population exceeding **0.58 µg/g**, **1.0 µg/g** and **2.5 µg/g** THg levels in hair
- Exposure assessed on country level from harmonized study
- Only ~120 subjects (mother-children)/country
- Local variations blended



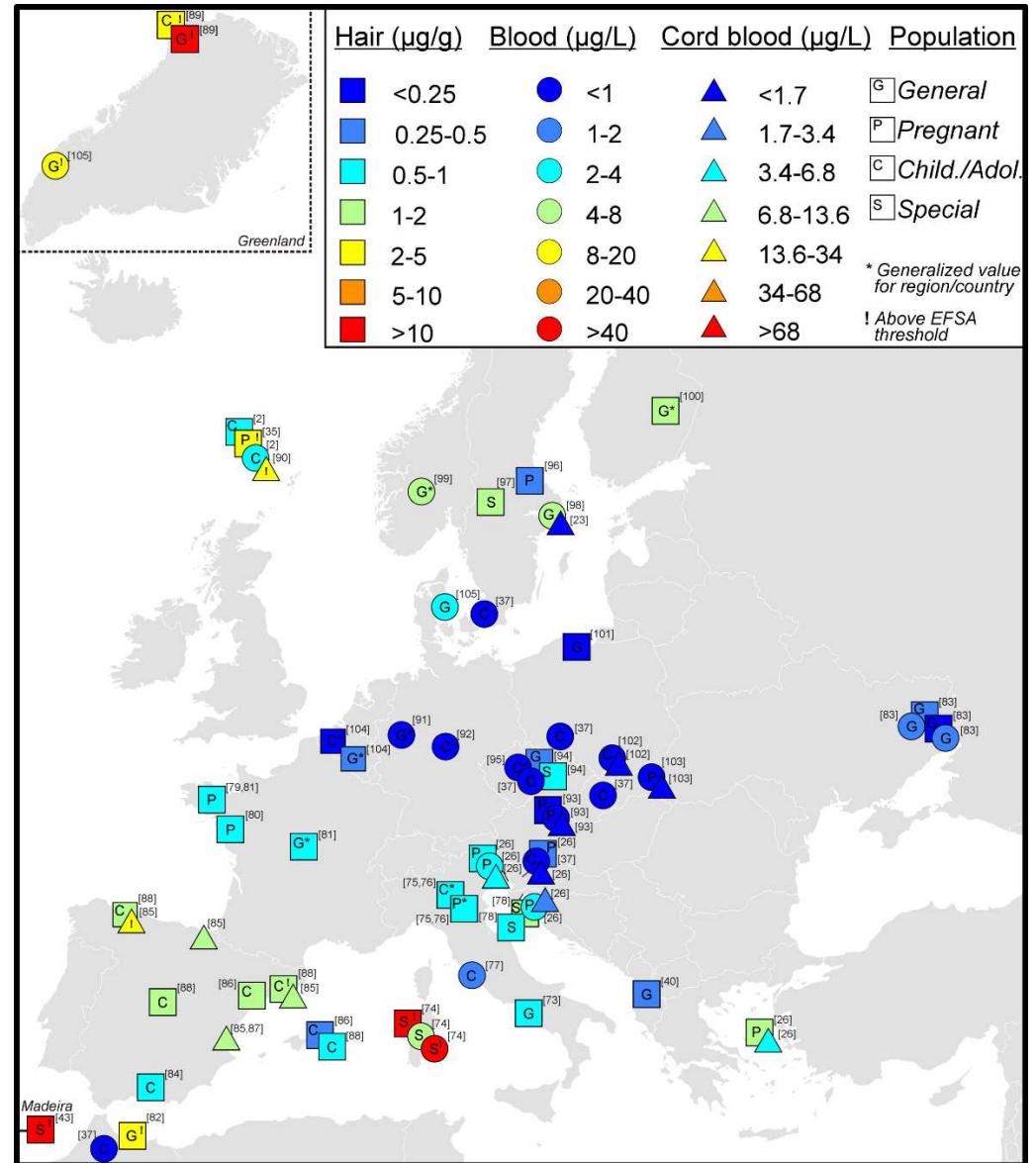
Hg levels in biomarkers hair & blood (2000-2013)

- ~50 studies included (12000 people from 21 countries involved)

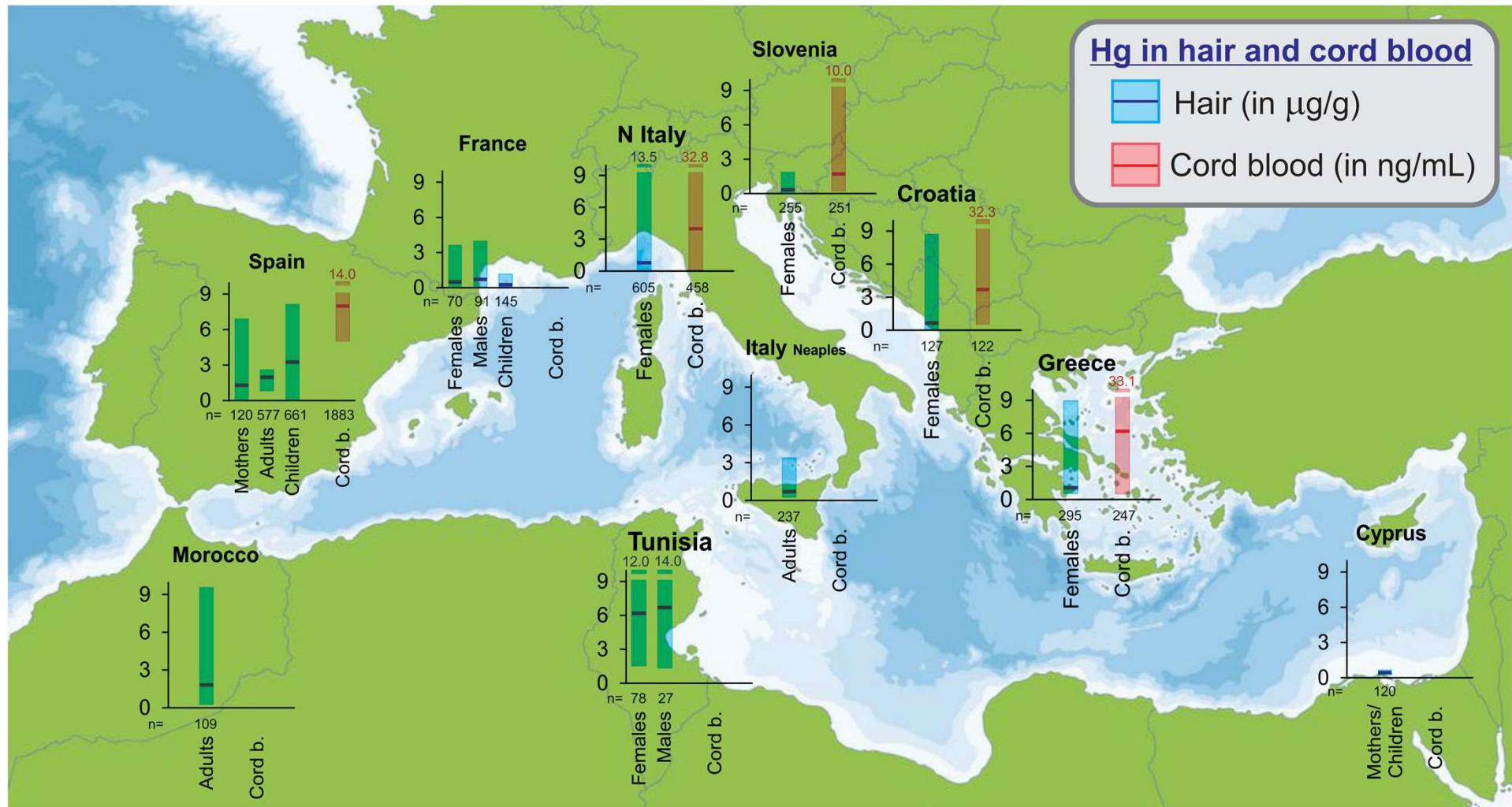
Dilemma:

- Study designs (population, biomarkers)
- Comparability of data (spatial, temporal)

Miklavčič et al, 2014



Hg exposure in the Mediterranean – recent studies



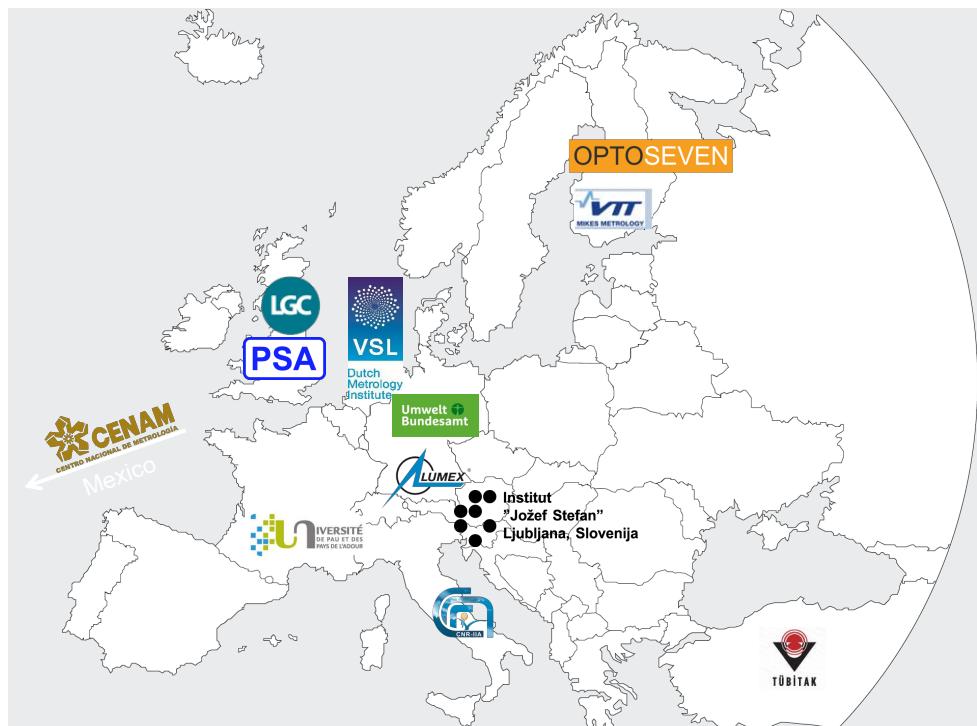
Conclusions

- *All populations* are exposed to mercury to some extent.
- For many communities worldwide, *dietary consumption* of fish, shellfish, marine mammals, is the most important source of exposure.
- Exposures to *elemental and inorganic Hg* mainly occurs in *occupational settings* via contact with *products* containing Hg and from *environmental contamination* and the use of *amalgams*.
- There is *great variability* in Hg exposure worldwide.
- Concern remains about Hg exposure in *vulnerable groups* that are sensitive owing to *extrinsic* (e.g., high exposures) and *intrinsic* (e.g., genetic) factors
- Assessing *Hg exposure* is relatively straightforward by the use of *biomarkers*. Mercury can be measured in *blood, hair and urine*.
- Mercury in *hair* and *urine: non-invasive sampling*, the results can be *interpreted against guideline values*, over different spatial and temporal scales, and following interventions to gauge their effectiveness.



EMPIR project

Traceability of oxidised mercury - MercOx project (2017-2021)



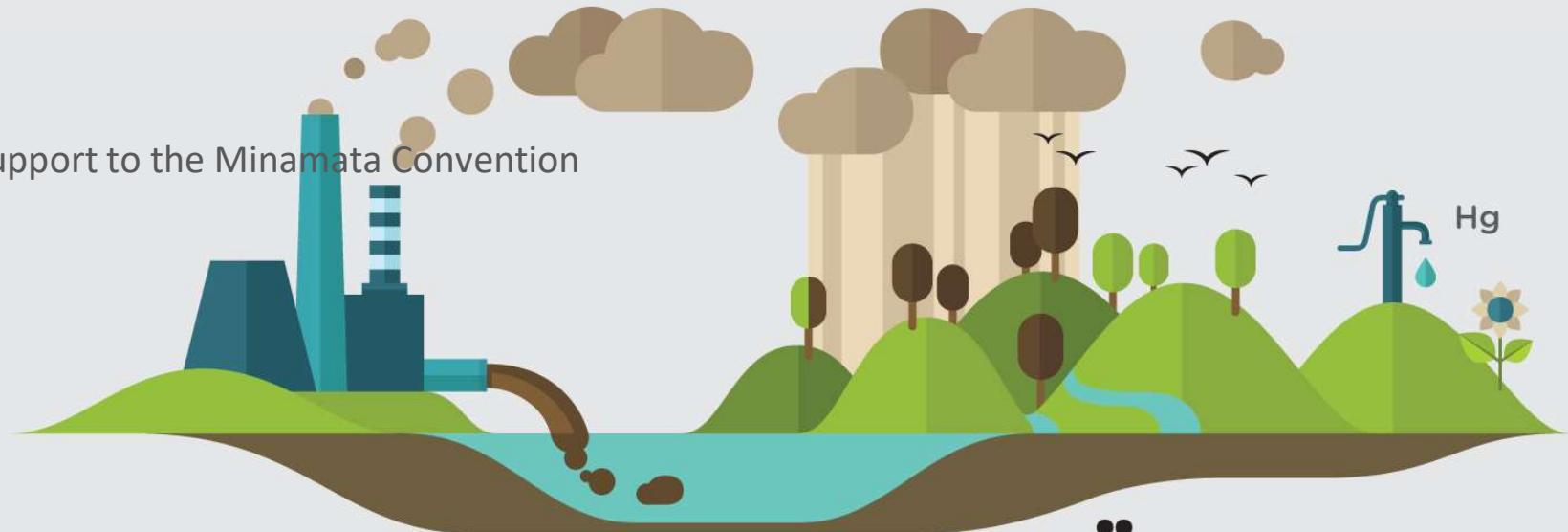
- validated calibrations for elemental and gaseous Hg species
- Validated sampling and analyses of oxidised Hg species in flue gas emissions and in the atmosphere.
- Improved uncertainty and comparability of measurement results.

MSCA ITN

Global Mercury Observation Training Network

• (2020-2024)

- in Support to the Minamata Convention



This project will receive funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement no. 860497

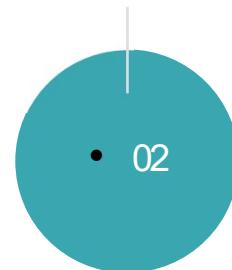
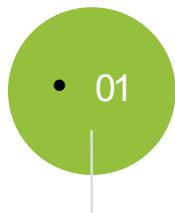


Jožef Stefan Institute, Ljubljana, Slovenia

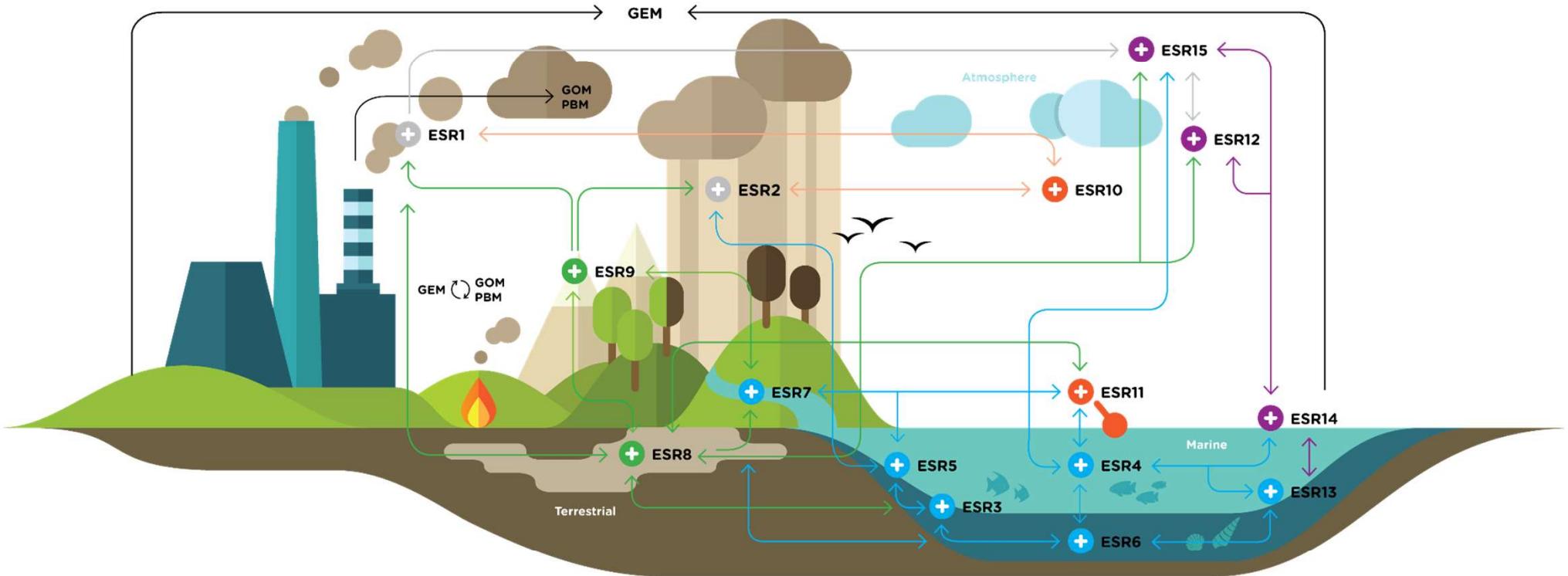
- GMOS-Train

The overall objectives of the GMOS-Train network are

- to provide urgently needed training in Hg science within the context of the UNEP Minamata Convention
- to fill key knowledge gaps in biogeochemical Hg cycling linking anthropogenic emissions and Hg in marine food webs.



ITN GMOS-Train will provide urgently needed training for 15 PhDs (ESRs) in Hg science within the context of the UNEP Minamata Convention to fill key knowledge gaps in biogeochemical Hg cycling linking anthropogenic emissions and Hg in marine food webs.



Legend 1

- WP1 (ESRs 1-2) Atmospheric processes
- WP2 (ESRs 3-7) Marine processes
- WP3 (ESRs 8-9) Terrestrial-land-water systems
- WP4 (ESRs 10-11) Traceability & sensors
- WP5 (ESRs 12-13) & WP6 (ESRs 14-15) Modeling

Legend 2

- | | | | | | |
|------|--|-------|----------------------------|-------|----------------------------|
| ESR1 | Oxidants and RM | ESR6 | Lower food web | ESR11 | Sensors |
| ESR2 | Kinetics/deposition/re-emission | ESR7 | Land water interactions | ESR12 | Regional models |
| ESR3 | C/Hg compound specific analyses | ESR8 | Permafrost | ESR13 | Ecosystem model |
| ESR4 | Ocean speciation/cruises | ESR9 | Terrestrial/canopy | ESR14 | Ocean/atmosphere exchanges |
| ESR5 | Coastal dynamics Methylation/demethylation | ESR10 | Traceability/comparability | ESR15 | Global models |



15 PhD positions filled in 2020

10 Beneficiaries: **recruitments**



13 Partners: **secondments**

AMAP	Norway
UNEP	Switzerland
MIT	USA
Harvard	USA
IRD	France
SPRS	Sweden
EEB	Belgium
Tekran	Canada
Lumex	Germany/Russia
VSL	The Netherlands
AUTH	Greece
EMEP/MSC-E	Russia
PSAnalytical	UK