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### **Supplemental Material**

#### **A State-of-the-Science Review of Mercury Biomarkers in Human Populations Worldwide between 2000 and 2018**

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#### **References**

**Additional File** - Excel Document

**Table S1. Summary of national programs that conduct mercury human biomonitoring**

Country	Survey	Lead organization	Year started	# Cycles; Frequency	Size per cycle	Age (years); Sex	Biomarkers	Key reference
Belgium	FLEHS	Vlaanderen Departement Omgeving	2002	2; every 2 yrs	~5,000	1–65; female adults, children both sexes	Hair	Croes et al. 2014
Canada	CHMS	Statistics Canada	2007	4; every 2 yrs	~5,000	3–79; both	Blood, urine	Health Canada 2017
Czech Republic	CZ-EHMS	National Institute of Public Health	1994	16; ~every yr	~400	8–64; both	Blood, urine, hair	NIPH 2015; NIPH 2016; Puklová et al. 2010
France	Elfe	Santé publique France	2011	1	~1,800	18–47; pregnant women	Hair	Dereumeaux et al. 2016
France	ENNS	Santé publique France	2006	1	1364	3–17; both sexes	Hair	Fréry et al. 2011
Germany	GerES	German Federal Environment Agency	1985	5; variable	~2,000-5,000	3–79; both	Blood, urine	German Federal Environment Agency 2017
Germany	ESB	German Federal Environment Agency	1981	37; each year	500	20–29; both	Blood, urine	ESB Website (see footnote)
Republic of Korea	KoNEHS	Korean Ministry of Environment	2009	3; every 3 yrs	~6,000	3–19+; both	Blood, urine	Burm et al. 2016; Choi et al. 2017.
Slovenia	SLO-HBM	Jozef Stefan Institute	2008	2; every 2 yrs	~300 - ~900	18–49; both	Blood, urine, breast milk, hair	Snoj Tratnik et al. (in press)
Sweden	Riksmaten	Swedish National Food Agency	1990	2; variable	~300	18–80; both	Blood	Bjermo et al. 2013

USA	NHANES	Centers for Disease Control and Prevention	1999	6; every 2 yrs	~2,500 - 8,000	1-70+; both	Blood, urine	US CDC 2017
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Note: CHMS, Canadian Health Measures Survey; CZ-EHMS, Environmental Health Monitoring System of the Czech Republic; Elfe, French Longitudinal Study since Childhood ; ENNS, French national nutrition survey; ESB, Environmental specimen bank ([https://www.umweltprobenbank.de/en/documents/investigations/results/analytes?analytes=10003&sampling\\_areas=&sampling\\_years=&specimen\\_types=10004](https://www.umweltprobenbank.de/en/documents/investigations/results/analytes?analytes=10003&sampling_areas=&sampling_years=&specimen_types=10004)) ; FLEHS, Flemish Environment and Health Survey; GerES, German Environmental Health Survey; KoNEHS, Korean National Environmental Health Survey; NHANES, National Health and Nutrition Examination Survey; Riksmaten, Swedish food intake survey; SLO-HBM, National Human Biomonitoring Programme of Slovenia.

**Table S2. Number of individuals sampled and mercury biomarker measurements taken in the national biomonitoring studies.**

Country	Demographics					No. of mercury measurements				
	Total sample size <sup>a</sup>	No. children	No. adults	No. males	No. females	Total measurements taken	No. blood total Hg	No. blood MeHg	No. urine	No. hair
Belgium <sup>b</sup>	465	210	255	Not stated	255 (adults)	465	0	0	0	465
Canada	22,805	9,491	13,314	11,227	11,578	41,235	22,425	2,075	16,734	0
Czech Republic <sup>c</sup>	7,542	3,623	3,919	Not stated	Not stated	13,845	4,700	0	6,459	2,686
France <sup>d</sup>	1,799	0	1,799	0	1,799	1,799	0	0	0	1,799
Germany <sup>c</sup>	25,772	2,602	23,170	Not stated	Not stated	41,045	17,056	0	23,989	0
Republic of Korea <sup>c</sup>	14,688	2,346	12,342	Not stated	Not stated	14,688	14,688	0	0	0
Slovenia	1,095	0	1,095	553	542	3,523	1,085	0	1,020	947
Sweden	273	0		128	145	273	273	0	0	0
USA	46,974	19,086	27,888	23,292	23,682	75,778	46,974	13,016	15,788	0
<b>Totals</b>	<b>121,413</b>					<b>192,651</b>				

Note: Hg, mercury; MeHg, methylmercury.

<sup>a</sup> Measures span the years 1996-2015

<sup>b</sup> Samples were collected from pregnant women and adolescents. Results for the adolescents were not broken down by sex. Only hair was sampled.

<sup>c</sup> Results were not broken down by sex.

<sup>d</sup> Study was carried out in pregnant women on hair samples only

**Table S3. Comparison of blood total mercury (Hg) concentrations ( $\mu\text{g/L}$ ) in adults and children from nine countries, reported in national biomonitoring programs**

Demographics	Belgium <sup>a</sup>	Canada	Czech Republic	France <sup>a</sup>	Germany	Republic of Korea	Slovenia	Sweden <sup>b</sup>	USA
	FLEHS2	CHMS Cycle 2	CZ-HBM	Elfe (Adults), ENNS (Children)	GerES-III (Adults), GerES-IV (Children)	KoNEHS-2 (Adults), KorEHS-C (Children)	SLO-HBM	Riksmaten	NHANES
<b>Adults</b>									
Year	2007-2011	2009-2011	2015	2011	1998	2014	2008-2012	2010-2011	2011-2012
Age	18-42	20-39	18-64	18-47	25-69	19+	18-49	18-80	20+
Sample Size	255	1313	302	1799	3973	6457	1,085	273	5030
Blood Hg (P50 concentration)	1.36	0.65	0.65	1.68	0.7	3.05	1.2	1.13	0.79
Blood Hg (P95 concentration)	3.44	5.2	2.5	5.56	2.4	9.05	4.78	3.45	5.02
<b>Children</b>									
Year	2007-2011	2009-2011	2008	2006-2007	2003-2006	2012-2014	2008	-	2011-2012
Age	14-16	6-11	8-10	3-17	6-14	3-18	6-11	-	6-11
Sample Size	210	961	198	1364	1240	2346	174	-	1048
Blood Hg (P50 concentration)	0.76	0.21	0.4	1.52	0.3	1.8	0.79	-	0.32
Blood Hg (P95 concentration)	1.88	2	1.4	4.8	1	3.68	2.19	-	1.4

Note. CHMS – Canadian Health Measures Survey (Health Canada 2017); CZ-EHMS – Environmental Health Monitoring System of the Czech Republic (NIPH 2009; NIPH 2016); Elfe - French Longitudinal Study since Childhood (Dereumeaux et al. 2016); ENNS - French National Nutrition and Health Survey (Fréry et al. 2011); FLEHS2 - Flemish Environment and Health Survey, second cycle (Croes et al. 2014); GerES - German Environmental Health Survey (German Federal Environment Agency 2017); KoNEHS - Korean National Environmental Health Survey (Choi et al. 2017); KorEHS-C - Korean Environmental Health Survey in Children and Adolescents (Burm et al. 2016); NHANES – National Health and Nutrition Examination Survey (US CDC 2017); Riksmaten – Swedish food intake survey (Bjermo et al. 2013); SLO-HBM - National Human Biomonitoring Programme of Slovenia (Snoj Tratnik et al. (in press)). P50, 50<sup>th</sup> percentile value; P95, 95<sup>th</sup> percentile value

To enable comparison, where possible data are presented from study cycles from similar time periods; Males and females are grouped together.

<sup>a</sup> For Belgium and France the blood mercury values were calculated from hair mercury levels in women (adults) and children (both sexes).

<sup>b</sup> In Sweden, the Riksmaten study only involved adults.

**Table S4. Count of sub-populations, individuals, and mercury biomarker measurements from the cross-sectional studies, grouped by WHO region, population group by source of exposure, and type of location**

Grouping	No. subpop.	No. individuals	No. measurements	Cord blood		Hair		Urine		Whole blood	
				No. subpop.	No. measurements	No. subpop.	No. measurements	No. subpop.	No. measurements	No. subpop.	No. measurements
<b>WHO REGION<sup>a</sup></b>											
Africa	23	3,266	4,533	3	511	10	1,156	9	1,425	9	1,441
Americas	113	43,119	49,638	6	2,429	57	23,627	15	4,049	54	19,533
E Medit	29	11,565	11,736	1	1,561	14	3,608	7	2,377	8	4,190
Europe	130	36,711	40,512	5	1,058	64	15,588	30	6,855	46	17,011
SE Asia	20	4,537	5,057	0	0	13	3,031	7	813	4	1,213
W Pacific	126	68,632	73,034	14	2,621	56	22,900	19	5,584	57	41,929
<i>Total for all pops<sup>a</sup> groups</i>	<b>441</b>	<b>167,830</b>	<b>184,510</b>	<b>29</b>	<b>8180</b>	<b>214</b>	<b>69,910</b>	<b>87</b>	<b>21,103</b>	<b>178</b>	<b>85,317</b>
<b>POPULATION GROUPS</b>											
<b>Point source</b>											
ASGM	30	7,800	10,842	0	0	23	5,561	17	3,463	10	1,818
Contam. sites	45	7,588	8,770	0	0	16	2,234	24	4,010	13	2,526
Dental workers	4	1,285	2,645	0	0	3	979	3	1,232	1	434
<i>Total (point source groups)</i>	<b>79</b>	<b>16,673</b>	<b>22,257</b>	<b>0</b>	<b>0</b>	<b>42</b>	<b>8,774</b>	<b>44</b>	<b>8,705</b>	<b>24</b>	<b>4,778</b>
<b>Diet</b>											
Fish consumer	40	13,550	15,393	0	0	23	8,398	3	680	23	6,315
Indigenous peoples	16	8,729	10,949	0	0	15	7,875	0	0	3	3,074
Arctic pop.	15	7,472	7,472	0	0	1	361	0	0	14	7,111
<i>Total (diet groups)</i>	<b>71</b>	<b>29,751</b>	<b>33,814</b>	<b>0</b>	<b>0</b>	<b>39</b>	<b>16,634</b>	<b>3</b>	<b>680</b>	<b>40</b>	<b>16,500</b>
<b>Fetus</b>											

Grouping	No. subpop.	No. individuals	No. measurements	Cord blood		Hair		Urine		Whole blood	
				No. subpop.	No. measurements	No. subpop.	No. measurements	No. subpop.	No. measurements	No. subpop.	No. measurements
General pop.	83	22,567	23,847	26	7,586	21	5,181	5	1,283	38	9,797
Fish consumer	6	1,188	1,474	3	594	3	286	0	0	3	594
Indigenous peoples	1	1,510	1,510	0	0	0	0	0	0	1	1,510
<b>Total (fetus groups)</b>	<b>90</b>	<b>25,265</b>	<b>26,831</b>	<b>29</b>	<b>8180</b>	<b>24</b>	<b>5,467</b>	<b>5</b>	<b>1,283</b>	<b>42</b>	<b>11,901</b>
<b>General pop</b>	201	96,141	101,606	0	0	109	39,035	35	10,435	72	52,136
<b>LOCATION TYPE</b>											
Inland-no water	179	55,088	60,271	11	3,527	86	21,138	46	9,792	64	25,814
Inland-river/lake	64	24,813	27,352	5	2,163	51	18,588	9	1,889	15	4,712
Coastal - Atlantic	28	11,357	11,618	3	516	10	4,487	2	359	14	6,256
Coastal - Pacific	85	35,855	38,040	7	1,356	43	19,757	14	3,528	30	13,399
Coastal - Arctic	19	10,757	13,046	0	0	3	2,581	1	69	18	10,396
Coastal - Mediterr	15	2,439	2,887	0	0	7	1,023	7	1,238	3	626
Coastal - other	7	1,213	1,213	0	0	6	914	0	0	1	299
SIDS	16	1,325	1,426	2	341	1	110	0	0	14	975
Multiple	25	24,524	27,528	1	277	6	967	6	3,851	17	22,433
Unknown	3	459	1,129	0	0	1	345	2	377	2	407
<b>Total (location groups)</b>	<b>441</b>	<b>167,830</b>	<b>184,510</b>	<b>29</b>	<b>8,180</b>	<b>214</b>	<b>69,910</b>	<b>87</b>	<b>21,103</b>	<b>178</b>	<b>85,317</b>

Note. Biomarker measurements were not found for all populations grouped by exposure source or by location type. Where data were not found this is shown as a zero in the table.

Note. row totals for "No. subpop." may not reflect row count data for "No. subpop" associated with a given biomarker because some individuals had multiple biomarker measures taken (e.g., a given subpopulation included individuals with mercury measures in both hair and urine).

No. subpop., number of subpopulations studied; WHO, World Health Organization.

<sup>a</sup>all populations

WHO regions: E Medit, Eastern Mediterranean; SE Asia, South East Asia; W Pacific, Western Pacific.

Point Source: ASGM, individuals engaged in artisanal and small-scale gold mining; Contam. sites, individuals living at contaminated sites; Dental workers, individuals exposed from working in dental settings.

Diet: Fish consumer, non-Indigenous or non-Arctic groups that were identified in the study as being ones to consume relatively high amounts of seafood; Indigenous peoples, self-identified group by study authors and not including those from the Arctic and mainly comprised of populations from the Amazonian region; Arctic pop., populations living in the Arctic or Sub-Arctic region.

Fetus: General pop., general population without specific exposures to mercury; Fish consumer, see above under 'Diet'; Indigenous peoples, see above under 'Diet'.

Location type: Inland, populations living away from coastal regions, either living close to rivers or lakes from where they might take fish (river/lake) or not associated with any water (no water);

Coastal, populations living on the coast of various oceans (e.g., Mediterr, Mediterranean sea) from where they might take seafood; SIDS, populations living in small island developing states;

Multiple, studies where the populations were associated with different categories; unknown, not enough information provided in the study to assign a particular location.



**Table S5. Reference values for mercury biomarkers**

Source	Blood <sup>a</sup>	Hair <sup>a</sup>	Cord blood <sup>b</sup>	Urine
FAO/WHO Joint Expert Committee on Food Additives no observed adverse effect level – basis for estimation of the provisional tolerable weekly intake value) (JECFA 2004; 2007)	56 µg/L ( <i>maternal</i> )	14 µg/g ( <i>maternal</i> )	Not applicable	Not applicable
US EPA Reference Dose (US EPA 2001)	3.5 µg/L	1 µg/g	5.8 µg/L	Not applicable
Qualitative conclusions by expert panel on “High” Levels (Karagas et al. 2012)	>12 µg/L	>4 µg/g	>20 µg/L	Not applicable
Health Canada (2004)	20 µg/L (general adult population)	6 µg/g	Not applicable	Not applicable
Health Canada existing and proposed harmonized blood methylmercury guidance values – values below which no follow-up action is needed (Legrand et al. 2010)	8 µg/L (pregnant women); 20 µg/L (females birth–49 yrs, males <18 yrs)	2 µg/g; 6 µg/g;	13.6 µg/L; 29 µg/L;	Not applicable
Health Canada existing and proposed harmonized blood methylmercury guidance values – values for which immediate follow-up action is needed (Legrand et al. 2010)	>100 µg/L (females >50 yrs, males >18 yrs)	>25 µg/g	Not applicable	Not applicable
German HBM-1 (concentration of a substance in human biological material at which and below which, according to the current knowledge and assessment by the HBM-Commission, there is no risk of adverse health effects) (Schulz et al. 2007)	5 µg/L	1.25 µg/g	8.5 µg/L	7 µg/L
German HBM-2 (concentration of a substance in human biological material at which and above which adverse health effects are possible and, consequently, an acute need for the reduction of exposure and the provision of biomedical advice is given) (Schulz et al. 2007)	15 µg/L	3.75 µg/g	25.5 µg/L	25 µg/L
American Conference of Governmental Industrial Hygienists biological exposure index (concentration below which most workers should not experience adverse health effects) (ACGIH 2016)	15 µg/L (total inorganic mercury)	Not applicable	Not applicable	20 µg/g creatinine (total inorganic mercury)
Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (Germany) BAT value (Biologische Arbeitsstoff-Toleranzwerte – biological tolerance value) – concentration below which workers should not experience adverse health effects (Deutsche Forschungsgemeinschaft 2017)				25 µg/g creatinine (30 µg/L) (mercury and its inorganic compounds)

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Note. HBM, health-related human biomonitoring values.

<sup>a</sup> Values in italics for hair concentration have been calculated based a methylmercury hair-to-blood ratio of 250 that the Joint Food and Agriculture Organization (FAO) and WHO Expert Committee on Food Additives (JECFA 2004) established. For further information see text.

<sup>b</sup> Values in italics for cord blood concentration have been calculated based on the assumption that cord blood concentrations are 70% higher than maternal blood concentrations. For further information see text.

**Table S6. Central and upper median hair mercury levels ( $\mu\text{g/g}$ ) from the cross-sectional studies grouped by WHO region, population group (source of exposure), and type of location**

Grouping	No. subpop.	No. individuals	Hair (central value)			Hair (upper value)		
			25%	50%	75%	25%	50%	75%
<b>WHO REGION</b>								
<b>All pops<sup>a</sup></b>								
Africa	10	1,156	0.40	0.69	1.25	1.10	7.05	29.10
Americas	57	23,627	0.69	2.02	4.30	4.98	15.40	34.10
E Mediterranean	14	3,608	0.45	1.68	3.08	3.57	11.34	14.30
Europe	64	15,588	0.17	0.30	0.70	0.62	1.51	3.76
South-East Asia	13	3,031	0.73	3.10	5.80	10.60	21.00	38.89
Western Pacific	56	22,900	0.67	1.40	1.98	1.95	6.32	17.76
<i>Total for all pops<sup>a</sup> groups</i>	<b>214</b>	<b>69,910</b>	<b>0.45</b>	<b>0.99</b>	<b>2.49</b>	<b>1.79</b>	<b>6.15</b>	<b>19.92</b>
<b>General pops<sup>b</sup></b>								
Africa	2	162	0.07	0.21	0.34	0.60	0.63	0.65
Americas	8	3,308	0.30	0.44	1.30	3.82	5.85	17.68
E Mediterranean	8	2,087	0.56	1.42	3.01	5.59	11.34	19.38
Europe	49	12,917	0.14	0.25	0.57	0.55	1.32	2.86
South-East Asia	6	2,144	0.67	0.73	2.50	2.60	9.55	17.60
Western Pacific	36	18,417	0.76	1.47	1.85	2.15	7.80	19.18
<i>Total for general pops<sup>b</sup> groups</i>	<b>109</b>	<b>39,035</b>	<b>0.28</b>	<b>0.68</b>	<b>1.66</b>	<b>1.26</b>	<b>4.08</b>	<b>12.52</b>
<b>POPULATION GROUPS</b>								
<b>Point source</b>								
ASGM	23	5,561	1.18	2.60	3.26	14.40	22.90	40.95
Contaminated sites	16	2,234	0.55	0.99	2.51	1.58	4.05	11.00
Dental workers	3	979	0.59	0.69	3.03	3.71	6.15	8.38

Grouping	No. subpop.	No. individuals	Hair (central value)			Hair (upper value)		
			25%	50%	75%	25%	50%	75%
<i>Total (point source groups)</i>	<b>42</b>	<b>8,774</b>	<b>0.78</b>	<b>1.91</b>	<b>3.08</b>	<b>4.13</b>	<b>14.40</b>	<b>35.90</b>
<b>Diet</b>								
Fish consumer	23	8,398	0.71	3.04	8.00	3.20	11.67	47.00
Indigenous peoples Arctic pop.	15	7,875	1.86	4.45	5.80	10.90	17.08	39.55
<i>Total (diet groups)</i>	<b>39</b>	<b>16,634</b>	<b>0.76</b>	<b>3.80</b>	<b>6.74</b>	<b>4.74</b>	<b>14.60</b>	<b>41.00</b>
<b>Fetus</b>								
General pop.	21	5,181	0.22	0.48	1.26	0.83	1.70	5.30
Fish consumer	3	286	1.70	1.80	3.60	26.33	32.95	47.68
<i>Total (fetus groups)</i>	<b>24</b>	<b>5,467</b>	<b>0.23</b>	<b>0.52</b>	<b>1.51</b>	<b>0.89</b>	<b>2.73</b>	<b>8.13</b>
<b>General pop</b>	109	39,035	0.28	0.68	1.66	1.26	4.08	12.52
<b>LOCATION TYPE</b>								
Inland-no water	86	21,138	0.19	0.43	0.78	0.64	1.70	5.82
Inland-river/lake	51	18,588	0.70	2.29	4.68	6.30	16.28	37.45
Coastal - Atlantic	10	4,487	0.46	0.62	0.91	3.03	4.36	5.30
Coastal - Pacific	43	19,757	1.40	1.75	2.50	6.30	11.30	21.36
Coastal - Arctic	3	2,581	0.63	0.74	1.08	3.41	5.20	23.60
Coastal - Mediterr	7	1,023	0.62	0.88	1.47	2.87	8.70	9.68
Coastal - other	6	914	1.89	2.49	3.55	8.97	13.75	24.46
SIDS	1	110						
Multiple	6	967	0.60	0.70	0.80	1.28	2.59	6.60
Unknown	1	345						
<i>Total (location groups)</i>	<b>214</b>	<b>69,910</b>	<b>0.45</b>	<b>0.99</b>	<b>2.49</b>	<b>1.79</b>	<b>6.15</b>	<b>19.92</b>

Note. No. subpop., number of subpopulations studied; WHO, World Health Organization.

<sup>a</sup> all populations, i.e. both those with probable high exposures and those with no known exposures to mercury

<sup>b</sup> general populations only, i.e. those with no known exposures to mercury

WHO regions: E Medit, Eastern Mediterranean; SE Asia, South East Asia; W Pacific, Western Pacific.

Point Source: ASGM, individuals engaged in artisanal and small-scale gold mining; Contam. sites, individuals living at contaminated sites; Dental workers, individuals exposed from working in dental settings.

Diet: Fish consumer, non-Indigenous or non-Arctic groups that were identified in the study as being ones to consume relatively high amounts of seafood; Indigenous peoples, self-identified group by study authors and not including those from the Arctic and mainly comprised of populations from the Amazonian region; Arctic pop., populations living in the Arctic or Sub-Arctic region.

Fetus: General pop., general population without specific exposures to mercury; Fish consumer, see above under 'Diet'.

Location type: Inland, populations living away from coastal regions, either living close to rivers or lakes from where they might take fish (river/lake) or not associated with any water (no water);

Coastal, populations living on the coast of various oceans (e.g., Mediterr, Mediterranean sea) from where they might take seafood; SIDS, populations living in small island developing states;

Multiple, studies where the populations were associated with different categories; unknown, not enough information provided in the study to assign a particular location.

**Table S7. Comparison of urinary total mercury (Hg) measurement ( $\mu\text{g/L}$ ) in adults and children in five countries reported in national biomonitoring programs**

Demographics	Canada CHMS Cycle 3	Czech Republic CZ-HBM	Germany GerES-III (Adults), GerES-IV (Children)	Slovenia SLO-HBM	USA NHANES
<b>Adults</b>					
Year	2012–2013	2015	1998	2008–2012	2013–2014
Age (yrs)	20–39	18–64	18–69	18–49	20+
Sample Size	1048	234	4052	1020	1813 (1812) <sup>a</sup>
Urine Hg (P50 concentration)	0.20 (0.22) <sup>b</sup>	0.91 (0.91) <sup>b</sup>	0.4	0.45 (0.47) <sup>b</sup>	0.24 (0.30) <sup>b</sup>
Urine Hg (P95 concentration)	1.1 (1.20) <sup>b</sup>	6.34 (4.67) <sup>b</sup>	3.00	3.47 (2.48) <sup>b</sup>	1.76 (1.76) <sup>b</sup>
<b>Children</b>					
Year	2012–2013	2008	2003–2006	2008	2013–2014
Age (yrs)	6–11	8–10	3–14	6–11	6–11
Sample Size	1010	318	1734	164	401
Urine Hg (P50 concentration)	<LoD (LoD=0.20) <LoD <sup>b</sup> (LoD=0.20) <sup>b</sup>	0.20 <sup>b</sup>	<0.1 (LoD=0.1)	0.76 (0.73) <sup>b</sup>	<LoD (LoD=0.13); <LoD <sup>b</sup> (LoD=0.13) <sup>b</sup>
Urine Hg (P95 concentration)	0.93 (1.9) <sup>b</sup>	1.10 <sup>b</sup>	0.5	4.64 (4.15) <sup>b</sup>	0.89 (1.11) <sup>b</sup>

Note. CHMS – Canadian Health Measures Survey, 3<sup>rd</sup> cycle (Health Canada 2017); CZ-EHMS – Environmental Health Monitoring System of the Czech Republic (NIPH 2009; NIPH 2016); GerES - German Environmental Survey (German Federal Environment Agency 2017); NHANES – National Health and Nutrition Examination Survey (US CDC 2017); SLO-HBM - National Human Biomonitoring Programme of Slovenia (Snoj Tratnik et al. (in press));

P50, 50<sup>th</sup> percentile value; P95, 95<sup>th</sup> percentile value

LoD, limit of detection by the analytical method used

To enable comparison, where possible data are presented from study cycles from similar time periods. Males and females are grouped together.

<sup>a</sup> number of samples for which creatinine-adjusted values are available

<sup>b</sup> creatinine-adjusted values

**Table S8. Central and upper median urinary mercury levels ( $\mu\text{g/L}$ ) from the cross-sectional studies, grouped by WHO region, population group (source of exposure), and type of location**

Grouping	No. subpop.	No. individuals	Urine (central value)			Urine (upper value)		
			25%	50%	75%	25%	50%	75%
<b>WHO REGION</b>								
<b>All pops<sup>a</sup></b>								
Africa	9	1,425	2.0	3.9	15.9	41.8	541.0	1451.0
Americas	15	4,049	0.9	1.8	5.6	4.2	17.0	116.0
E Mediterranean	7	2,377	0.9	2.8	4.4	4.3	4.8	15.7
Europe	30	6,855	0.5	1.0	1.3	3.5	6.2	16.2
South-East Asia	7	813	5.9	8.2	14.4	22.8	35.7	177.2
Western Pacific	19	5,584	0.9	1.3	2.9	3.0	6.7	33.2
<i>Total for all pops<sup>a</sup> groups</i>	<b>87</b>	<b>21,103</b>	<b>0.82</b>	<b>1.4</b>	<b>5.2</b>	<b>3.4</b>	<b>10</b>	<b>46.5</b>
<b>General pops<sup>b</sup></b>								
Africa	1	151						
Americas	4	910	0.3	0.4	1.0	2.5	4.2	7.8
E Mediterranean	5	1,669	1.0	2.8	4.4	4.8	4.8	15.6
Europe	16	4,706	0.5	0.8	1.1	5.0	6.3	11.6
South-East Asia	2	184						
Western Pacific	7	2,815	1.2	1.4	1.6	3.1	4.9	16.6
<i>Total for general pops<sup>b</sup> groups</i>	<b>35</b>	<b>10,435</b>	<b>0.6</b>	<b>1.0</b>	<b>1.5</b>	<b>3.9</b>	<b>6.1</b>	<b>13.5</b>
<b>POPULATION GROUPS</b>								
<b>Point source</b>								
ASGM	17	3,463	2.9	5.9	14.4	78.5	188.0	374.0
Contaminated sites	24	4,010	1.1	3.0	8.3	3.1	18.6	42.5
Dental workers	3	1,232	1.2	1.3	4.8	5.9	9.3	16.0
<i>Total (point source groups)</i>	<b>44</b>	<b>8,705</b>	<b>1.4</b>	<b>4.2</b>	<b>10.9</b>	<b>8.6</b>	<b>41.3</b>	<b>188.0</b>

Grouping	No. subpop.	No. individuals	Urine (central value)			Urine (upper value)		
			25%	50%	75%	25%	50%	75%
<b>Diet</b>								
Fish consumer	3	680	0.8	1.0	3.3	3.2	3.5	19.8
Indigenous peoples								
<b>Total (diet groups)</b>	<b>3</b>	<b>680</b>	<b>0.8</b>	<b>1.0</b>	<b>3.3</b>	<b>3.2</b>	<b>3.5</b>	<b>19.8</b>
<b>Fetus</b>								
General pop.	5	1,283	0.4	0.7	0.8	1.3	1.7	2.3
Fish consumer								
<b>Total (fetus groups)</b>	<b>5</b>	<b>1,283</b>	<b>0.4</b>	<b>0.7</b>	<b>0.8</b>	<b>1.3</b>	<b>1.7</b>	<b>2.3</b>
<b>General pop</b>	<b>35</b>	<b>10,435</b>	<b>0.6</b>	<b>1.0</b>	<b>1.5</b>	<b>3.9</b>	<b>6.1</b>	<b>13.5</b>
<b>LOCATION TYPE</b>								
Inland-general	46	9,792	0.7	1.3	4.3	3.4	9.4	60.5
Inland-river/lake	9	1,889	5.5	8.6	10.9	36.1	147.0	188.0
Coastal - Atlantic	2	359						
Coastal - Pacific	14	3,528	0.8	1.5	4.9	1.7	13.3	26.3
Coastal - Arctic	1	69						
Coastal - Mediterr	7	1,238	0.8	0.9	1.4	6.2	8.4	16.2
Coastal - other								
Multiple	6	3,851	1.1	1.2	1.3	3.2	4.9	6.1
Unknown	2	377	0.6	1.7	2.8	3.0	10.0	17.0
<b>Total (location groups)</b>	<b>87</b>	<b>21,103</b>	<b>0.82</b>	<b>1.4</b>	<b>5.2</b>	<b>3.4</b>	<b>10</b>	<b>46.5</b>

Note. No. subpop., number of subpopulations studied; WHO, World Health Organization.

<sup>a</sup> all populations, i.e. both those with probable high exposures and those with no known exposures to mercury

<sup>b</sup> general populations only, i.e. those with no known exposures to mercury

WHO regions: E Medit, Eastern Mediterranean; SE Asia, South East Asia; W Pacific, Western Pacific.

Point Source: ASGM, individuals engaged in artisanal and small-scale gold mining; Contam. sites, individuals living at contaminated sites; Dental workers, individuals exposed from working in dental settings.

Diet: Fish consumer, non-Indigenous or non-Arctic groups that were identified in the study as being ones to consume relatively high amounts of seafood; Indigenous peoples, self-identified group by study authors and not including those from the Arctic and mainly comprised of populations from the Amazonian region.



Fetus: General pop., general population without specific exposures to mercury; Fish consumer, see above under 'Diet'.

Location type: Inland, populations living away from coastal regions, either living close to rivers or lakes from where they might take fish (river/lake) or not associated with any water (no water);

Coastal, populations living on the coast of various oceans (e.g., Mediterr, Mediterranean sea) from where they might take seafood; Multiple, studies where the populations were associated with different categories; unknown, not enough information provided in the study to assign a particular location.

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