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Supplemental Material

Mercury Exposure and Health Impacts among Individuals in the Artisanal and Small-Scale Gold Mining Community: A Comprehensive Review

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Table S1. Studies that Reported Hair (μg/g) Mercury Among Residents of ASGM Communities, Miners, and Environmentally Exposed Populations.

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Barbieri et al. 2009	Bolivia	150	3.02 (0.42-15.65)	Y/Y	Sample of residents of intense gold mining community
Maurice-Bourgoin et al. 2000	Bolivia	80	9.81 (4.30-19.52)	Y/Y	Indigenous communities on banks of Beni River
Maurice-Bourgoin et al. 2000	Bolivia	80	0.28 (0.02-1.02)	Y/Y	Gold miners from the K'aka River
Monrroy et al. 2008	Bolivia	556	5.3±4.3 (0.08-34.1)	N/Y	Amerindian populations living along Beni River
Dorea et al. 2012	Brazil	33	3.95±1.8	N/Y	Itapuã; infants from former subsistence fisherman families
Dorea et al. 2012	Brazil	166	1.85±0.9	Y/Y	Bom Futuro; infants from families of cassiterite mining families
Dorea et al. 2012	Brazil	82	3.84±5.5	N/Y	Porto Velho; infants from urban families
Hacon et al. 2000	Brazil	75[b]	1.12±1.17 (0.05-8.20)	Y/N	Alta Floresta, Mato Grosso state (gold mining area); pregnant women who were patients at the prenatal Health Community Center
Barbosa et al. 1998	Brazil	28[b]	8.11±3.16 (0.8-13.70)	Y/Y	Indigenous women; Indians (Kayapó reservation, Fresco River)
Barbosa et al. 1998	Brazil	98[b]	14.08±12.80 (2.6-94.70)	Y/Y	Indigenous women; non-Indians (Madeira River)
Barbosa et al. 1998	Brazil	54	7.30±3.50 (2.0-20.40)	Y/Y	Indigenous children; Indians
Barbosa et al. 1998	Brazil	71	10.82±8.46 (0.8-44.4)	Y/Y	Indigenous children; non-Indians
Santos et al. 2002	Brazil	324	16.01±18.92 (4.50-90.40)	Y/Y	Sai Cinza, State of Para; Munduruku Indians
Malm et al. 1995	Brazil	10	25 (5.7-52)	Y/Y	Jacareacanga – on Tapajós River Basin, mercury-contaminated
Malm et al. 1995	Brazil	55	26 (4.7-151)	Y/Y	Brasília Legal – located 250 km downstream from gold mining
Malm et al. 1995	Brazil	46	12	Y/Y	Ponta de Pedra – small fishing village

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Malm et al. 1995	Brazil	10	2.7	Y/Y	Santarém – 800 km downstream from gold mining
Guimarães et al. 1999	Brazil	15	28	Y/Y	Amapá, Duas Bocas Lake; fishermen and families
Guimarães et al. 1999	Brazil	15	16.7	N/Y	Amapá, Pracuúba Lake; fishermen and families
Malm et al. 2010	Brazil	32[b]	THg: 15.8±8.3 MeHg: 11.4±4.7	Y/Y	Barreiras, Tapajós river basin mothers; 4 cm hair segment (corresponding with months 0-4 of study)
Malm et al. 2010	Brazil	49	THg: 11.4±4.6 MeHg: 8.6±3.5	Y/Y	Barreiras, Tapajós river basin, children (of mothers in the study); 4 cm hair segment (0-4 months)
Dórea et al. 2005a	Brazil	77	2.87±2.13	Y/N	Munduruku tribe members residing in Kuburua village
Dórea et al. 2005a	Brazil	86	4.76±2.09	Y/N	Munduruku tribe members residing in Cururu village
Dórea et al. 2005a	Brazil	40	16.55±11.44	Y/Y	Kayabi tribe members
Dórea et al. 2005b	Brazil	89	2.5±1.4	Y/N	Eastern Amazon indigenous tribe (Munduruku) located on river banks, Kaburua village residents
Dórea et al. 2005b	Brazil	138	3.7±1.6	Y/N	Cururu village residents
Dórea et al. 2005b	Brazil	22	6.0±2.9	Y/N	Terra Preta village residents
Dórea et al. 2005b	Brazil	47	12.8±7.0	Y/Y	Eastern Amazon indigenous tribe (Kayabi) located on river banks, Kayabi village residents
Pinheiro et al. 2005	Brazil	19[b]	8.25 (1.51-19.43)	Y/Y	Riverside communities of the Tapajós river basin; pregnant women
Pinheiro et al. 2005	Brazil	21[b]	9.39 (5.25-21.00)	Y/Y	Riverside communities of the Tapajós river basin; non-pregnant women
Pinheiro et al. 2007	Brazil	48	Males: 16.07±8.48 (1.99-38.80); Females: 13.39±9.08 (1.34-53.80)	Y/Y	São Luis do Tapajós residents; Tapajós river basin; mercury exposed region (children aged 1 mo. to 10 years)
Pinheiro et al. 2007	Brazil	84	Males: 9.13±4.71 (1.66-17.70); Females: 6.48±2.61 (1.33-12.10)	Y/Y	Barreiras, Tapajós river basin, residents; mercury exposed region (children aged 2 mo. to 11 years)
Pinheiro et al. 2007	Brazil	36	Males: 2.23±1.57 (0.39-5.16); Females: 2.74±0.96 (0.85-9.46)	N/Y	Panacauera, Tocantins river basin, residents; non-exposed region

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Harada et al. 2001	Brazil	76	16.4±10.6 (1.8-53.8)	Y/Y	Barreiras – Tapajós river fishing village residents
Harada et al. 2001	Brazil	12	14.1±9.3 (3.1-34.5)	Y/Y	Rainha - Tapajós river fishing village residents
Harada et al. 2001	Brazil	44	20.8±10.6 (5.1-42.2)	Y/Y	São Luis do Tapajós - Tapajós river fishing village residents
Leino & Lodenius 1995	Brazil	125	35 (0.9-240)	Y/Y	Exposed and referent groups combined; near Tucuruí water reservoir
Pinheiro et al. 2006	Brazil	32	14.8±2.2	Y/Y	São Luis do Tapajós residents
Pinheiro et al. 2006	Brazil	37	15.1±2.8	Y/Y	Barreiras, Tapajós river basin, residents
Pinheiro et al. 2006	Brazil	22	3.0±0.3	N/Y	Panacauera residents
Pinheiro et al. 2006	Brazil	43	7.1±2.1	N/Y	Pindobal Grande residents
Crompton et al. 2002	Brazil	205	Males: 11.0; Females: 6.7	Y/Y	Jacareacanga residents
Grandjean et al. 1999	Brazil	105	3.8 (0.5-12.4)	N/Y	Comparison/referent – Santana do Ituqui children
Grandjean et al. 1999	Brazil	91	11.9 (0.7-35.8)	Y/Y	Brasilia Legal children (less exposed)
Grandjean et al. 1999	Brazil	87	25.4 (0.6-83.5)	Y/Y	São Luis do Tapajós children (more exposed)
Grandjean et al. 1999	Brazil	71	17.7 (7.3-63.8)	Y/Y	Sai-Cinza children (more exposed)
Barbosa et al. 1997	Brazil	55	34.2 (93% above 10)	Y/Y	Apiacas Reserve and surrounding area residents
Lebel et al. 1997	Brazil	96	Males: 15.7 (median); Females: 11.2 (median)	Y/Y	Brasilia Legal residents, many fishermen; downstream from gold mining
Olivero-Verbel et al. 2011	Colombia	1328	1.56±0.06 (0.01-20.14)	Y/Y	Cauca and Magdalena rivers; various distances from the Bolivar gold mining area
Peplow & Augustine 2012	Suriname	158	14.0±6.0	Y/Y	Puleowime (Apetina) residents
Peplow & Augustine 2012	Suriname	106	9.0±4.0	Y/Y	Kawemhakan (Anapayke) residents
Fujimara et al. 2012	French Guiana	387	Males: 9.4 (2.3-26.4); Females: 9.9 (1.6-26.6)	Y/Y	Upper Maroni; Amerindians
Fujimara et al. 2012	French Guiana	77	2.6	N/Y	Referent group; Atlantic coast
Cordier et al. 2002	French Guiana	104	12.7	Y/Y	Upper Maroni (high exposure)
Cordier et al. 2002	French Guiana	115	2.8	Y/Y	Awala (medium exposure)

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Cordier et al. 2002	French Guiana	51	6.7	Y/Y	Camopi (low exposure)
Cordier et al. 1998	French Guiana	255	3.4 (0.2-22.0)	Y/Y	Adult residents selected from maternity hospitals and health centers
Cordier et al. 1998	French Guiana	109[b]	1.6 (0.2-16.0)	Y/Y	Pregnant residents
Cordier et al. 1998	French Guiana	136	2.5 (0.2-31.0)	Y/Y	Child residents
Fréry et al. 2001	French Guiana	165	11.4±4.3 (maximum: 27.20)	Y/Y	Wayana Amerindian population living along the upper Maroni River
Ashe 2012	Peru	104	Males: 3.39; Females: 2.23	Y/Y	Puerto Maldonado (less likely to be involved in mining)
Ashe 2012	Peru	100	Males: 2.30; Females: 1.37	Y/Y	Sample of residents from mining regions in Madre de Dios
Counter et al. 2005	Ecuador	80	6.0	Y/N	Nambija; Andean children of Saraguro and Metizo gold miners
Lasut et al. 2010	Indonesia	28	2.9±0.7 (0.5-7.8)	Y/Y	Buyat Pante village residents; submarine tailings disposal site for industrial gold mine
Lasut et al. 2010	Indonesia	29	1.0±0.3 (0.4-1.5)	N/Y	Bajo Village in North Sulawesi, reference group
Sakamoto 2004	Indonesia	35	THg: 2.65 (0.77-7.64); MeHg: 2.42 (0.53-7.73)	Y/Y	Villagers living nearby Buyat Bay; tailings are being deposited into the bay
Sakamoto 2004	Indonesia	16	THg: 3.72 (1.54-9.65); MeHg 3.22 (0.61-9.60)	Y/Y	Villagers living nearby Totok Bay; reference group
Umbangtalad et al. 2007	Thailand		1.07±0.5 (SE)	N/N	Individuals residing in non-gold mining areas with no exposure; control group
Umbangtalad et al. 2007	Thailand	17	1.22±0.04	Y/N	Phanom Pha; miners who worked in the amalgamation process
Umbangtalad et al. 2007	Thailand	62	1.16±0.01	Y/N	Phanom Pha; miners who worked in the ore preparation area
Umbangtalad et al. 2007	Thailand	40	0.95±0.02	Y/N	Phanom Pha; elementary school students – involved directly or indirectly in gold mining activities
Umbangtalad et al. 2007	Thailand	19	0.90±0.03	Y/N	Phanom Pha; elementary school students not involved or associated with mining

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Murphy et al. 2008	Cambodia	59	4.01±0.36	N/Y	Mekong River residents; adults
Murphy et al. 2008	Cambodia	19	3.38±0.27	N/Y	Mekong River residents; children
Murphy et al. 2008	Cambodia	3	2.93±1.1	Y/N	O Tron mine workers
Murphy et al. 2008	Cambodia	13	2.33±0.43	Y/N	Prey Meas mine workers
Murphy et al. 2008	Cambodia	9	5.02±1.34	Y/N	Phnom Penh goldsmiths
Saeki et al. 1996	Papua New Guinea	31	0.55 (0.19-1.10)	N/N	Wau-Bulolo area, Morube province; Manki compound residents
Saeki et al. 1996	Papua New Guinea	49	0.55 (0.25-1.10)	N/N	Wau-Bulolo area, Morube province; Wandumi and Kaisenik compunds (upstream from mining)
Saeki et al. 1996	Papua New Guinea	35	0.84 (0.39-1.90)	Y/N	Misbut and Kiroro compounds (part-time gold mining workers)
Saeki et al. 1996	Papua New Guinea	23	0.9 (0.49-2.00)	Y/N	Sambio compound (part-time gold mining workers)
Saeki et al. 1996	Papua New Guinea	24	1.8 (0.93-3.00)	Y/N	Namie and Kapin compounds (mostly full-time mining workers)
Saeki et al. 1996	Papua New Guinea	22	1.4 (0.68-2.2)	Y/N	Chiatz compound (downstream from mining activities but not involved)
Williams et al. 2000	Philippines	48	Males: 2.8 (0.31-13.00)	Y/N	Apokon, Mindanao residents; small-scale gold mining area
Williams et al. 2000	Philippines	130	3.7 (<0.1-148.5)	Y/N	Honda Bay area, Palawan residents
Donkor et al. 2006	Ghana	123	1.11±0.63 (0.39-4.13)	Y/Y	Pra River Basin; volunteers from environmental testing sites, mostly miners (Rainy Season)
Donkor et al. 2006	Ghana	7	3.20±2.03 (0.89-6.50)	Y/Y	Pra River Basin; volunteers from environmental testing sites, mostly miners (Dry Season)
Kwaansa-Ansah et al. 2010	Ghana	40	2.14±1.53 (0.57-6.07)	Y/Y	Dunkwa-On-Offin; miners
Kwaansa-Ansah et al. 2010	Ghana	54	2.35±1.58 (0.63-7.19)	Y/Y	Sample of farmers

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Paruchuri et al. 2010	Ghana	120	1.1±3.2 (0.0-22.29)	Y/N	Talensi-Nabdam district, Upper East region; miners and residents
van Straaten 2000	Tanzania	36	0.1-0.6	Y/Y	Sample of populations around small scale gold mining camps (Northern Tanzania) and the southern shores of Lake Victoria
van Straaten 2000	Tanzania	2	18.5-288	N/Y	Control group: people from outside the mining area; selected samples (THg levels most likely from banned skin and hair cosmetics)
Harada et al. 1999	Tanzania	21	81.9±241 (0.38-953)	Y/Y	Employees at gold mines around Lake Victoria; Imwelv
Harada et al. 1999	Tanzania	18	3.35±3.47 (0.38-9.7)	Y/Y	Imwelv (outliers excluded)
Harada et al. 1999	Tanzania	17	1.31±1.58 (0.33-7.0)	Y/Y	Chipaka
Harada et al. 1999	Tanzania	7	1.01±0.52 (0.29-1.8)	Y/Y	Mutakuja
Harada et al. 1999	Tanzania	22	5.42±10.8 (0.61-51.0)	Y/Y	Katoma
Harada et al. 1999	Tanzania	21	3.29±3.64 (0.61-14.3)	Y/Y	Katoma (outliers excluded)
Harada et al. 1999	Tanzania	14	3.62±5.52 (0.83-22.0)	Y/Y	Buckleef
Harada et al. 1999	Tanzania	15	2.00±2.08 (0.73-9.5)	Y/Y	Ikungu
Harada et al. 1999	Tanzania	18	9.00±21.6 (0.57-94.3)	Y/Y	Simbasirori
Harada et al. 1999	Tanzania	17	4.03±4.12 (0.57-13.5)	Y/Y	Simbasirori (outliers excluded)
Harada et al. 1999	Tanzania	18	1.02±1.12 (0.31-5.1)	Y/Y	Employees at a gold mine (Dodoma) inland a long distance from Lake Victoria (first visit)
Harada et al. 1999	Tanzania	18	12.1±44.4 (0.28-190)	Y/Y	Dodoma (second visit)
Harada et al. 1999	Tanzania	17	1.61±2.03 (0.28-8.6)	Y/Y	Dodoma (second visit-outliers excluded)
Harada et al. 1999	Tanzania	15	8.23±19.6 (0.40-70.4)	Y/N	Sample of population from three fishing villages on the shore of Lake Victoria; Seweya (first visit)
Harada et al. 1999	Tanzania	14	3.79±9.87 (0.40-37.9)	Y/N	Seweya (first visit-outliers excluded)
Harada et al. 1999	Tanzania	20	28.9±98.2 (0.54-416)	Y/N	Seweya (second visit)
Harada et al. 1999	Tanzania	17	1.75±1.12 (0.54-3.9)	Y/N	Seweya (second visit-outliers excluded)
Harada et al. 1999	Tanzania	22	2.08±3.62 (0.42-17.4)	Y/N	Burgorola

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Harada et al. 1999	Tanzania	26	1.00±0.60 (0.32-2.7)	Y/N	Hurseni
Harada et al. 1999	Tanzania	20	1.00±0.99 (0.29-5.1)	Y/N	Sample of population from a fishing village (Hombolo) facing a lake near Dodoma
Harada et al. 1999	Tanzania	19	59.1±129 (0.48-474)	Y/N	Sample of population of the city of Mwanza
Harada et al. 1999	Tanzania	15	3.44±6.98 (0.48-27.7)	Y/N	-Mwanza (outliers excluded)
Ikingura and Akagi 1996	Tanzania	22	0.947 (0.156-5.433)	Y/Y	Mugusu and Nungwe Bay area residents, Lake Victoria goldfields
Ikingura and Akagi 1996	Tanzania	2	34.212-214.188	Y/Y	Outliers from sampled residents; expected to be high due to extreme external contamination
Mohan et al. 2005	Suriname	39[b]	0.80 (0.10-15.40) (median)	Y/N	Mothers who delivered at Lands Hospitaal in Paramibo
Mohan et al. 2005	Suriname	39	1.60 (0.00-19.60) (median)	Y/N	Newborns born to mothers

[a]Data are geometric means, standard deviations, and ranges unless otherwise specified. [b]Females only.

Table S2. Studies that Reported Hair (µg/g) & Blood (µg/L) Mercury Concentrations Among Residents of ASGM Communities, Miners, and Environmentally Exposed Populations.

Source	Location	N	Media	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Baeuml et al. 2011	Indonesia, Philippines, Tanzania, Zimbabwe & Mongolia	1174	Hair	5.71 (<LOD-792); 1.60 (median)	Y/Y	Participants ranged from individuals living in areas without gold mining to individuals with low, medium and high exposure to mercury from mining activities; Participants in Indonesia and the Philippines are more likely to be fish-consumers; participants in Tanzania, Zimbabwe and Mongolia consume less fish
Baeuml et al. 2011	Indonesia, Philippines, Tanzania, Zimbabwe & Mongolia	1121	Blood	11.1 (<LOD-429); 5.12 (median)	Y/Y	Participants ranged from individuals living in areas without gold mining to individuals with low, medium and high exposure to mercury from mining activities; Participants in Indonesia and the Philippines are more likely to be fish-consumers; participants in Tanzania, Zimbabwe and Mongolia consume less fish
Dolbec et al. 2000	Brazil	68	Hair	Males: 12.2±6.8; Females: 9.9±5.6	Y/Y	Tapajós riverbank village, 250 km downstream from gold mining
Dolbec et al. 2000	Brazil	68	Blood	Males: 40.7±23.32; Females: 33.0±27.6	Y/Y	Tapajós riverbank village, 250 km downstream from gold mining
Akagi et al. 1995	Brazil	27	Hair	THg: 24.6±17.8 MeHg: 24.1±17.8	Y/Y	Jacareacanga, Tapajós River basin residents; located downstream from Alta Floresta
Akagi et al. 1995	Brazil	19	Blood	THg: 90.4±71.5 MeHg: 90.0±76.6	Y/Y	Jacareacanga, Tapajós River basin residents; located downstream from Alta Floresta
Akagi et al. 1995	Brazil	14	Hair	THg: 37.4±17.1 MeHg: 36.4±17.1	Y/Y	Vila Sao Martins residents; isolated fishing village downstream from Alta Floresta
Akagi et al. 1995	Brazil	8	Blood	THg: 149.8±49.5 MeHg: 149.2±52.5	Y/Y	Vila Sao Martins residents; isolated fishing village downstream from Alta Floresta

Source	Location	N	Media	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Akagi et al. 1995	Brazil	10	Hair	THg: 28.8±13.0 MeHg: 27.3±12.1	Y/Y	Vila Nova Sitio residents; isolated fishing village downstream from Alta Floresta
Akagi et al. 1995	Brazil	7	Blood	THg: 130.7±78.4 MeHg: 131.9±84.2	Y/Y	Vila Nova Sitio residents; isolated fishing village downstream from Alta Floresta
Akagi et al. 1995	Brazil	3	Hair	T-Hg: 4.1±1.3; MeHg: 3.1±0.7	Y/N	Alta Floresta, one of the main gold trading centers in the Tapajos River basin; gold shop workers
Akagi et al. 1995	Brazil	25	Blood	THg: 12.2±8.2 MeHg: 9.0±6.7	Y/N	Alta Floresta, one of the main gold trading centers in the Tapajos River basin; gold shop workers
Nyland et al. 2011	Brazil	232	Hair	Median 14.1	Y/Y	Tapajós River residents
Nyland et al. 2011	Brazil	232	Blood	Mean 42.5; Median 53.5	Y/Y	Tapajós River residents
Counter et al. 2006	Ecuador	73	Hair	8.5±22.8 (1.0-135.0)	Y/N	Nambija and Portovelo gold mining areas; Andean children
Counter et al. 2006	Ecuador	73	Blood	5.1±2.4 (1.0-10.0)	Y/N	Nambija and Portovelo gold mining areas; Andean children
Bose-O'Reilly et al. 2008	Indonesia & Zimbabwe	31	Hair	1.23±0.81 (0.02-3.46)	N/N	Sulawesi, Indonesia & Kadoma, Zimbabwe; control group of children living in non-exposed areas
Bose-O'Reilly et al. 2008	Indonesia & Zimbabwe	31	Blood	2.95±2.21 (<0.20-7.94)	N/N	Sulawesi, Indonesia & Kadoma, Zimbabwe; control group of children living in non-exposed areas
Bose-O'Reilly et al. 2008	Indonesia & Zimbabwe	22	Hair	2.27±0.83 (0.42-4.16)	Y/N	Sulawesi, Indonesia & Kadoma, Zimbabwe children living in mercury-contaminated mining areas
Bose-O'Reilly et al. 2008	Indonesia & Zimbabwe	22	Blood	5.52±2.39 (1.28-12.40)	Y/N	Sulawesi, Indonesia & Kadoma, Zimbabwe children living in mercury-contaminated mining areas
Bose-O'Reilly et al. 2008	Indonesia & Zimbabwe	51	Hair	4.08±7.07 (0.45-52.96)	Y/N	Sulawesi, Indonesia & Kadoma, Zimbabwe children living in the mining area and working at least part-time with immediate contact to mercury
Bose-O'Reilly et al. 2008	Indonesia & Zimbabwe	51	Blood	12.40±14.66 (1.00-100.80)	Y/N	Sulawesi, Indonesia & Kadoma, Zimbabwe children living in the mining area and working at least part-time with immediate contact to mercury

Source	Location	N	Media	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Bose-O'Reilly et al. 2010a	Indonesia	95	Hair	9.72 (0.58-239.04)	Y/N	Tatelu, Sulawesi residents (adults living in the mining area; adults working with mercury incl. mineral processors and amalgam-burners)
Bose-O'Reilly et al. 2010a	Indonesia	95	Blood	21.38 (3.42-186.00)	Y/N	Tatelu, Sulawesi residents (adults living in the mining area; adults working with mercury incl. mineral processors and amalgam-burners)
Bose-O'Reilly et al. 2010a	Indonesia	21	Hair	1.64 (0.83-3.72)	N/N	Air Mandidi, Sulawesi; control group
Bose-O'Reilly et al. 2010a	Indonesia	21	Blood	4.92 (2.36-10.12)	N/N	Air Mandidi, Sulawesi; control group
Bose-O'Reilly et al. 2010a	Indonesia	165	Hair	17.75 (0.33-792.45)	Y/N	Galangan, Kalimantan residents (adults living in the mining area; adults working with mercury incl. mineral processors and amalgam-burners)
Bose-O'Reilly et al. 2010a	Indonesia	165	Blood	25.12 (1.45-429.00)	Y/N	Galangan, Kalimantan residents (adults living in the mining area; adults working with mercury incl. mineral processors and amalgam-burners)
Bose-O'Reilly et al. 2010b	Tanzania	31	Hair	0.36 (0.08-0.68 (95th percentile 0.65))	N/N	Katoro residents; control group
Bose-O'Reilly et al. 2010b	Tanzania	31	Blood	1.05 (0.22-2.29)	N/N	Katoro residents; control group
Bose-O'Reilly et al. 2010b	Tanzania	52	Hair	0.85 (0.12-15.75)	Y/N	Living in exposed area but no work contact with mercury
Bose-O'Reilly et al. 2010b	Tanzania	52	Blood	1.51 (0.45-5.84)	Y/N	Living in exposed area but no work contact with mercury
Bose-O'Reilly et al. 2010b	Tanzania	34	Hair	0.84 (0.24-4.07)	Y/N	Working with mercury but not smelting
Bose-O'Reilly et al. 2010b	Tanzania	34	Blood	1.98 (0.71-6.06)	Y/N	Working with mercury but not smelting
Bose-O'Reilly et al. 2010b	Tanzania	104	Hair	2.69 (0.16-48.74)	Y/N	Working with mercury including smelting

Source	Location	N	Media	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Bose-O'Reilly et al. 2010b	Tanzania	104	Blood	4.62 (0.73-33.30)	Y/N	Working with mercury including smelting
Steckling et al. 2011	Mongolia	92[b]	Hair	0.24 (0.10-1.61)	Y/N	Residents with low exposure (environmental, no occupational)
Steckling et al. 2011	Mongolia	92[b]	Blood	0.32 (<LOD -7.60)	Y/N	Residents with low exposure (environmental, no occupational)
Steckling et al. 2011	Mongolia	64[b]	Hair	0.34 (0.10-2.71)	Y/N	Residents with active occupational exposure
Steckling et al. 2011	Mongolia	64[b]	Blood	0.55 (<LOD -9.60)	Y/N	Residents with active occupational exposure
Steckling et al. 2011	Mongolia	35[b]	Hair	0.13 (0.10-0.62)	N/N	Kuhshaat sum residents; control group
Steckling et al. 2011	Mongolia	42[b]	Blood	0.3 (<LOD -3.60)	N/N	Kuhshaat sum residents; control group
Akagi et al. 2000	Philippines	162	Hair	THg: 0.99±1.6 (0.33-20.39); MeHg: 0.80±1.45 (0.19-18.47) (µg/g)	Y/N	Gold processing and refining area; elementary school children
Akagi et al. 2000	Philippines	162	Blood	THg: 0.0038±0.0046 (0.00076-0.057); MeHg: 0.006±0.0083 (0.0014-0.047) (µg/g)	Y/N	Gold processing and refining area; elementary school children
Drasch et al. 2001	Philippines	316	Hair	4.14 (AM), 2.72 (median), (0.03-37.76)	Y/Y	Gold mining workers, inhabitants of a gold mining area, individuals living downstream and controls
Drasch et al. 2001	Philippines	323	Blood	11.48 (AM), 8.2 (median), (<0.25-107.60)	Y/Y	Gold mining workers, inhabitants of a gold mining area, individuals living downstream and controls
Ramirez et al. 2003	Philippines	48	Hair	1.28±0.30	Y/Y	Tagum (small-scale gold mining area) infants
Ramirez et al. 2003	Philippines	48	Blood	2.60±0.27	Y/Y	Tagum (small-scale gold mining area) infants
Ramirez et al. 2003	Philippines	88	Hair	0.66±0.05	N/Y	Saranggani, no known sources of industrial, chemical, or pesticide pollution; children

Source	Location	N	Media	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Ramirez et al. 2003	Philippines	88	Blood	3.25±0.22	N/Y	Saranggani, no known sources of industrial, chemical, or pesticide pollution; children
Cortes-Maramba et al. 2006	Philippines	18	Hair	0.008±0.016 (0.0018-0.069)	Y/N	Sibutad (small-scale gold mining community); individuals directly exposed by blow torching or amalgam squeezing
Cortes-Maramba et al. 2006	Philippines	18	Blood	14.89±6.44 (5.82-29.48)	Y/N	Sibutad (small-scale gold mining community); individuals directly exposed by blow torching or amalgam squeezing
Cortes-Maramba et al. 2006	Philippines	20	Hair	0.0025±0.001 (0.001-0.005)	Y/N	Indirect exposure to mercury
Cortes-Maramba et al. 2006	Philippines	20	Blood	9.26±4.45 (3.38-20.57)	Y/N	Indirect exposure to mercury
Adimado & Baah 2002	Ghana	50	Hair	1.61±1.33 (0.15-5.86)	Y/Y	Anwiaso (upstream), Ankobra river basin residents
Adimado & Baah 2002	Ghana	50	Blood	102.0±55.8 (30.2-218)	Y/Y	Anwiaso (upstream), Ankobra river basin residents
Adimado & Baah 2002	Ghana	50	Hair	0.62±0.41 (0.32-2.19)	Y/Y	Sahuma (downstream); Ankobra river basin residents
Adimado & Baah 2002	Ghana	50	Blood	13.4±15.3 (2.1-68.1)	Y/Y	Sahuma (downstream); Ankobra river basin residents
Adimado & Baah 2002	Ghana	51	Hair	4.27±6.26 (0.06-28.3)	Y/Y	Tanoso (upstream), Tano river basin residents
Adimado & Baah 2002	Ghana	51	Blood	16.5±10.7 (2.1-57.2)	Y/Y	Tanoso (upstream), Tano river basin residents
Adimado & Baah 2002	Ghana	66	Hair	1.21±0.65 (0.07-3.19)	Y/Y	Elubo (downstream), Tano river basin residents
Adimado & Baah 2002	Ghana	66	Blood	39.5±16.2 (1.8-70.4)	Y/Y	Elubo (downstream), Tano river basin residents

Abbreviation: AM, arithmetic mean

[a]Data are geometric means, standard deviations, and ranges unless otherwise specified. [b]Females only.

Table S3. Studies that Reported Blood Mercury Concentrations (μg/L) Among Residents of ASGM Communities, Miners, and Environmentally Exposed Populations.

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Yard et al. 2012	Peru	103	Males: 2.60; Females: 1.91	Y/Y	Residents of Huaypetu, an artisanal mining town
Ramirez et al. 2000	Philippines	12	53.3±37.49 (20-130)	Y/Y	Tagum (small-scale gold mining area); fetal cord blood
Ramirez et al. 2000	Philippines	5	24±5.47 (20-30)	Y/Y	mothers
de Kom et al. 1998	Suriname	25	18.1±11.0	Y/N	Sillakreek mining area workers
de Kom et al. 1998	Suriname	16	26.8±14.6	Y/N	Control group; residents of Djumu
Oosthuizen et al. 2010	South Africa	20	2.35 (median) (<0.5-24.0)	Y/Y	Community in Mpumalanga; in a gold-mining area
Harari et al. 2012	Ecuador	200	30.1 (4.4-89)	Y/N	Gold miners (product gold amalgam and intermittently burn gold amalgam)
Harari et al. 2012	Ecuador	37	5.3 (0.7-100)	Y/N	Gold merchants (burn amalgam daily)
Harari et al. 2012	Ecuador	72	5.0 (2.0-13)	N/N	Referents (workers in a factory refining gold by a non-mercury method or workers with other jobs not occupationally exposed to mercury)

[a]Data are geometric means, standard deviations, and ranges unless otherwise specified.

Table S4. Studies that Reported Urinary Mercury Concentrations (µg/g-Cr unless otherwise specified) Among Residents of ASGM Communities and Miners.

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Baeuml et al. 2011	Indonesia, Philippines, Tanzania, Zimbabwe & Mongolia	1178	18.6 (<LOD-1697) 3.08 (median)	Y/Y	Participants ranged from individuals living in areas without gold mining to individuals with low, medium and high exposure to mercury from mining activities; Participants in Indonesia and the Philippines are more likely to be fish-consumers; participants in Tanzania, Zimbabwe and Mongolia consume less fish
Yard et al. 2012	Peru	102	M 5.74 F 5.19	Y/Y	Residents of Huaypetu, an artisanal mining town (total)
Yard et al. 2012	Peru	30	7.36	Y/Y	Individuals involved in mixing mercury with gold ore
Yard et al. 2012	Peru	72	4.84	Y/Y	Individuals not involved in mixing mercury with gold ore
Yard et al. 2012	Peru	30	8.81	Y/Y	Individuals who heat gold-mercury amalgams
Yard et al. 2012	Peru	72	4.49	Y/Y	Individuals who do not heat gold-mercury amalgams
Harari et al. 2012	Ecuador	200	3.3 (0.3-170)	Y/N	Gold miners (product gold amalgam and intermittently burn gold amalgam)
Harari et al. 2012	Ecuador	37	36.9 (3.2-420)	Y/N	Gold merchants (burn amalgam daily)
Harari et al. 2012	Ecuador	72	1.6 (0.2-13)	N/N	Referents (workers in a factory refining gold by a non-mercury method or workers with other jobs not occupationally exposed to mercury)
Tomicic et al. 2011	Burkina Faso	52	299.1 (AM), 174.3 (GM)	Y/N	Unrefined gold dealers
Tomicic et al. 2011	Burkina Faso	33	73.3 (AM), 37.7 (GM)	Y/N	Workers involved with ore washing and amalgamation
Tomicic et al. 2011	Burkina Faso	8	14.6 (AM), 12.4 (GM)	Y/N	Other workers involved with crushing, grinding and washing
de Kom et al. 1998	Suriname	28	27.5±21.1	Y/N	Sillakreek mining area workers
de Kom et al. 1998	Suriname	17	5.2±2.9	Y/N	Control group; residents of Djumu

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Steckling et al. 2011	Mongolia	85	7.83 (0.16-78.7)	Y/N	Residents with low exposure (environmental, no occupational)
Steckling et al. 2011	Mongolia	58	18.81 (0.15-311)	Y/N	Residents with medium to high exposure (active occupational exposure)
Kwaansa-Ansah et al. 2010	Ghana	40	1.23±0.86 (0.32-3.62) µg/L	Y/Y	Dunkwa-On-Offin; miners
Kwaansa-Ansah et al. 2010	Ghana	54	0.69±0.39 (0.075-2.31) µg/L	Y/Y	Sample of farmers
Paruchuri et al. 2010	Ghana	120	17±77.3 (0.2-708.0) µg/L	Y/N	Talensi-Nabdam district, Upper East region; miners and residents
Oosthuzien et al. 2010	South Africa	28	6.2 (median) (0.5-63.5)	Y/Y	Community in Mpumalanga; in a gold-mining area
Bose-O'Reilly et al. 2008	Indonesia & Zimbabwe	50	0.35±0.26	N/N	Sulawesi, Indonesia & Kadoma, Zimbabwe; control group of children living in non-exposed areas
Bose-O'Reilly et al. 2008	Indonesia & Zimbabwe	36	9.16±11.32	Y/N	Sulawesi, Indonesia & Kadoma, Zimbabwe children living in mercury-contaminated mining areas
Bose-O'Reilly et al. 2008 (cont.)	Indonesia & Zimbabwe	80	36.50±93.06	Y/N	Sulawesi, Indonesia & Kadoma, Zimbabwe children living in the mining area and working at least part-time with immediate contact to mercury (i.e., panning or amalgam burning)
Umbangtalad et al. 2007	Thailand	n/a	5.34±0.10	N/N	Individuals residing in non-gold mining areas with no exposure; control group
Umbangtalad et al. 2007	Thailand	17	32.02±0.20	Y/N	Phanom Pha; miners who worked in the amalgamation process
Umbangtalad et al. 2007	Thailand	62	20.04±0.49	Y/N	Phanom Pha; miners who worked in the ore preparation area
Umbangtalad et al. 2007	Thailand	40	15.82±0.04	Y/N	Phanom Pha; elementary school students – involved directly or indirectly in gold mining activities
Umbangtalad et al. 2007	Thailand	19	9.95±0.07	Y/N	Phanom Pha; elementary school students not involved or associated with mining

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Counter et al. 2005	Ecuador	80	10.9±21.7 (1-166) µg/L	Y/N	Nambija; Andean children of Saraguro and Metizo gold miners
Counter et al. 2006	Ecuador	73	13.3±25.9 (1-166) µg/L	Y/N	Nambija and Portovelo gold mining areas; Andean children
Drake et al. 2001	Venezuela	8	11.9±16.1 (2.5-49.9)	Y/N	Large mining company employees
Drake et al. 2001	Venezuela	21	148±240 (2.5-912)	Y/N	Informal or "self-employed" miners
Drake et al. 2001	Venezuela	4	39.1±58.9 (2.5-127)	Y/N	Jewelers
Bose-O'Reilly et al. 2010b	Tanzania	31	0.24 (0.04-0.92)	N/N	Control group
Bose-O'Reilly et al. 2010b	Tanzania	52	0.77 (0.05-11.62)	Y/N	Living in exposed area but no work contact with mercury
Bose-O'Reilly et al. 2010b	Tanzania	34	1.21 (0.11-7.00)	Y/N	Working with mercury but no smelting
Bose-O'Reilly et al. 2010b	Tanzania	104	6.15 (0.12-36.77)	Y/N	Working with mercury including smelting
Bose-O'Reilly et al. 2010a	Indonesia	21	0.43 (0.09-1.35)	N/N	Sulawesi; control group
Bose-O'Reilly et al. 2010a	Indonesia	66	10.44 (0.46-355.30)	Y/N	Kalimantan; only living in exposed area
Bose-O'Reilly et al. 2010a	Indonesia	18	2.70 (0.70-9.84)	Y/N	Sulawesi; only living in exposed area
Bose-O'Reilly et al. 2010a	Indonesia	30	15.65 (0.47-261.94)	Y/N	Kalimantan; worker (panning)
Bose-O'Reilly et al. 2010a	Indonesia	17	5.58 (0.83-22.95)	Y/N	Sulawesi; worker (panning)
Bose-O'Reilly et al. 2010a	Indonesia	69	69.35 (0.72-1697.39)	Y/N	Kalimantan; worker (smelting)
Bose-O'Reilly et al. 2010a	Indonesia	60	31.89 (0.48-232.82)	Y/N	Sulawesi; worker (smelting)

Source	Location	N	Geometric Mean Hg ± SD (Range)[a]	Mining/Fish Consumers	Population Notes
Drasch et al. 2001	Philippines	42	1.4 (median); 9.3 (maximum)	N/N	Control group; residents of Davao
Drasch et al. 2001	Philippines	100	1.4 (median); 5.2 (maximum)	N/Y	Individuals living in the Monkayo area, downstream of Mt. Diwata
Drasch et al. 2001	Philippines	63	4.1 (median); 76.4 (maximum)	N/Y	Individuals living in Diwalwal, but no occupational exposure
Drasch et al. 2001	Philippines	102	11.0 (median); 294.2 (maximum)	Y/Y	Individuals living in Diwalwal with occupational exposure working with gold

Abbreviations: AM, arithmetic mean; GM, geometric mean

[a]Data are geometric means, standard deviations, and ranges unless otherwise specified.

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