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Mercury in Women of Childbearing Age in 25 Countries: Study Finds Harmful Levels of Mercury in Women Across The Globe

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Mercury highly toxic to human health

- Mercury is a potent neurotoxic metal that is especially damaging to the developing brain and can affect the developing fetus months after the mother's exposure.
- The harmful effects of mercury, that can pass from a mother's body to a developing fetus, include neurological impairment, IQ loss, and damage to the kidneys and cardiovascular system.
- High levels of mercury exposure can lead to brain damage, mental retardation, blindness, seizures and the inability to speak.

The Minamata Convention on Mercury – some background

- In 2001 the Governing Council of the UN requested that UNEP undertake a global study of mercury pollution impacts, health effects long range transport and control measures.
- In February 2009 the Governing Council decided that current measures to control global mercury pollution were insufficient and that a globally legally binding instrument was required.
- An international negotiating committee (INC) was formed to allow countries to negotiate and develop the text for a Convention.
- Over the course of 7 INC meetings, text was developed and at INC 7 in Jordan, draft text for the convention was finalised.
- On the 10th October 2013, at a Conference of Plenipotentiaries (Diplomatic Conference) in Kumamoto, Japan, the Convention was adopted and opened for signature.
- The Minamata Convention required 50 ratifications to enter into force and this occurred on 16 August 2017.
- Since that time the Conference of the Parties have met twice – COP 1 in Geneva in September 2017 and COP 2 in Geneva in November 2018.

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Key Features of the Minamata Convention

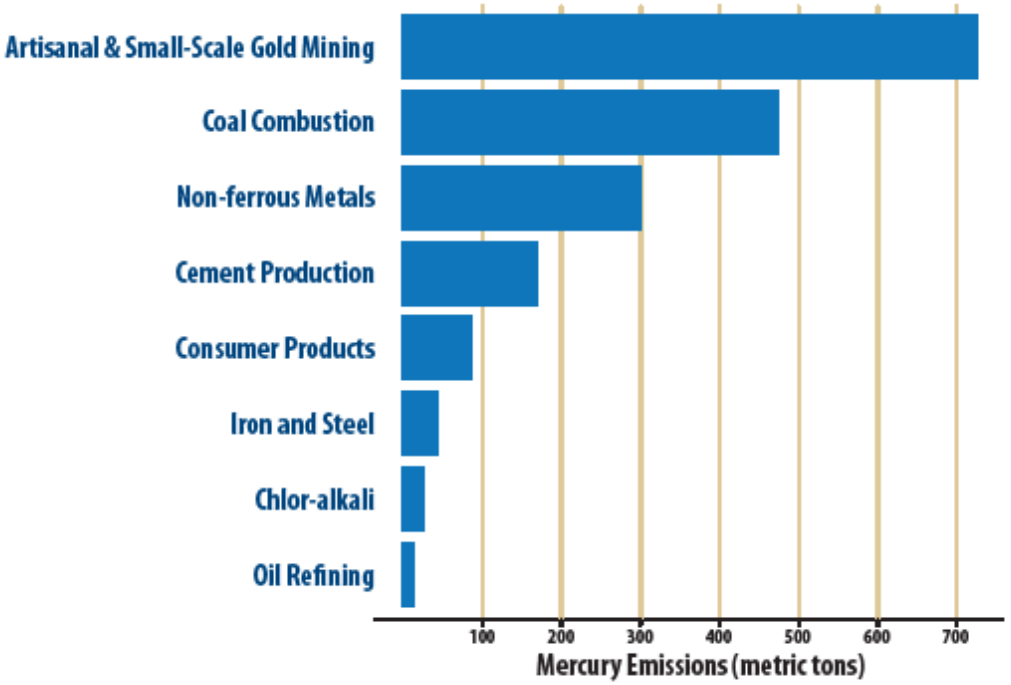
Objective: Protection of human health from man made mercury pollution.

- Seeks major reductions and control on the global supply and trade of mercury
- Phase-out and substitution of mercury-added products
- Measures to eliminate the use of mercury in small scale gold mining
- Tighter controls on mercury emissions and releases from industrial processes such as coal burning for energy, cement kilns, chlor-alkali plants and metallurgy
- Banning the mining of mercury and related compounds (cinnabar)
- Definition and controls on mercury waste
- Identification of contaminated sites

Outcomes of COP 2

Establishment or reorganisation of expert groups developing guidance on:

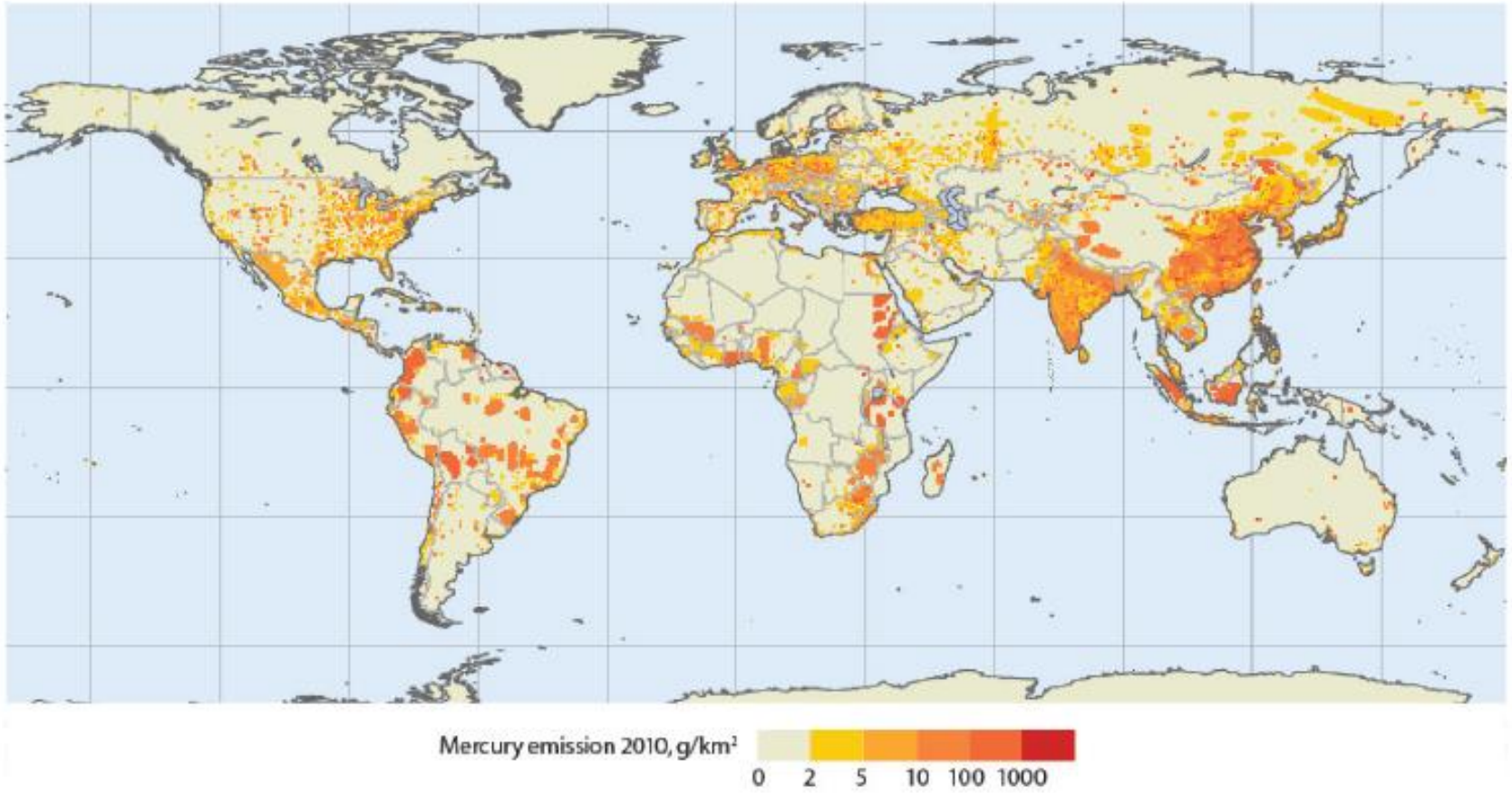
- Mercury waste thresholds;
- Contaminated Sites
- Effectiveness evaluation and harmonised framework development for air, soil and water sampling as well as biomonitoring.
- Mercury Releases – A controversial issue with inventory guidance development preceding guidance on reducing releases.
- Specific international program (SIP) for funding of mercury pollution reduction, technology transfer and capacity building now established but for parties only.

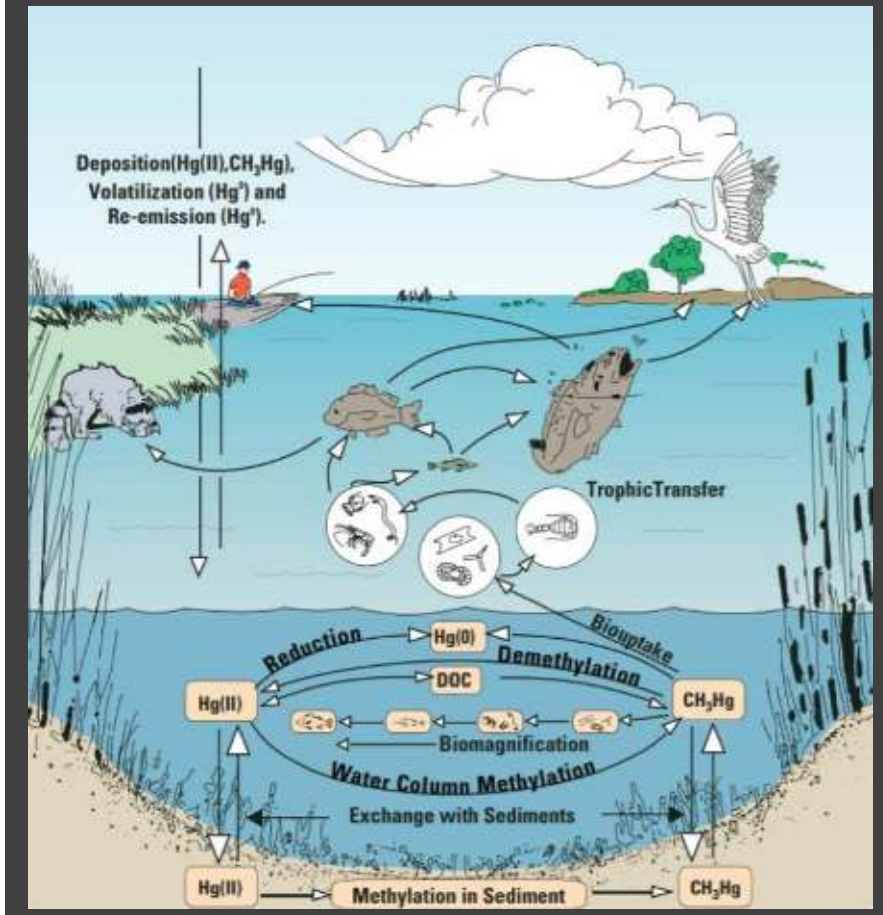


Key sources of Hg pollution- ASGM and Coal burning

Global Hg emissions surge 20% in 5 years. 2010-2015

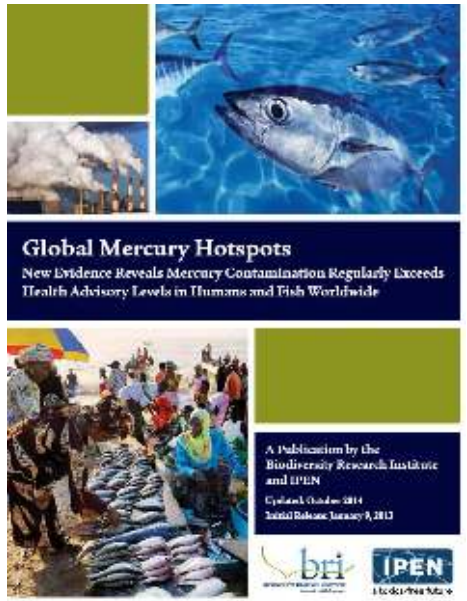
2010 map of the global distribution of mercury emissions to air due to human activity shows the heavy emissions from coal fired power plant activity most heavily concentrated in South East Asia, India, and China.
From UNEP, 2013. Global Mercury Assessment

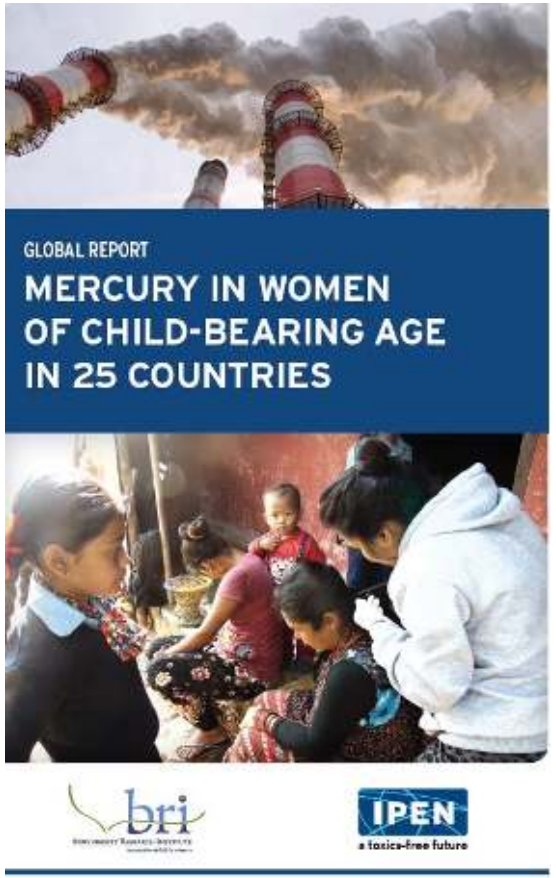


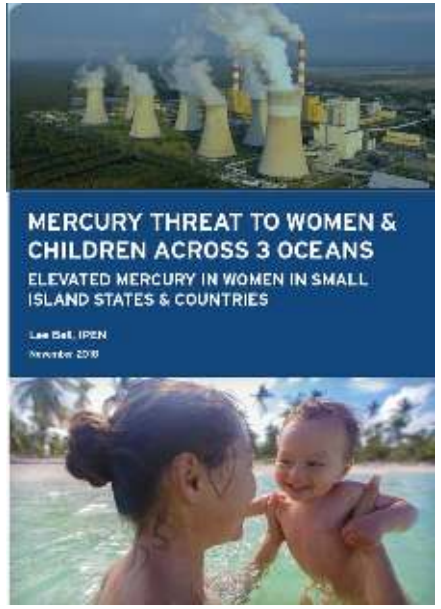


Global mercury pollution cycles

IPEN mercury biomonitoring







Mercury pollution in Alaska

Global distillation processes result in volatile contaminants such as persistent organic pollutants and mercury depositing at northern latitudes, contaminating wildlife, seafood and the food chain.

Biomonitoring in St Lawrence Island, Alaska

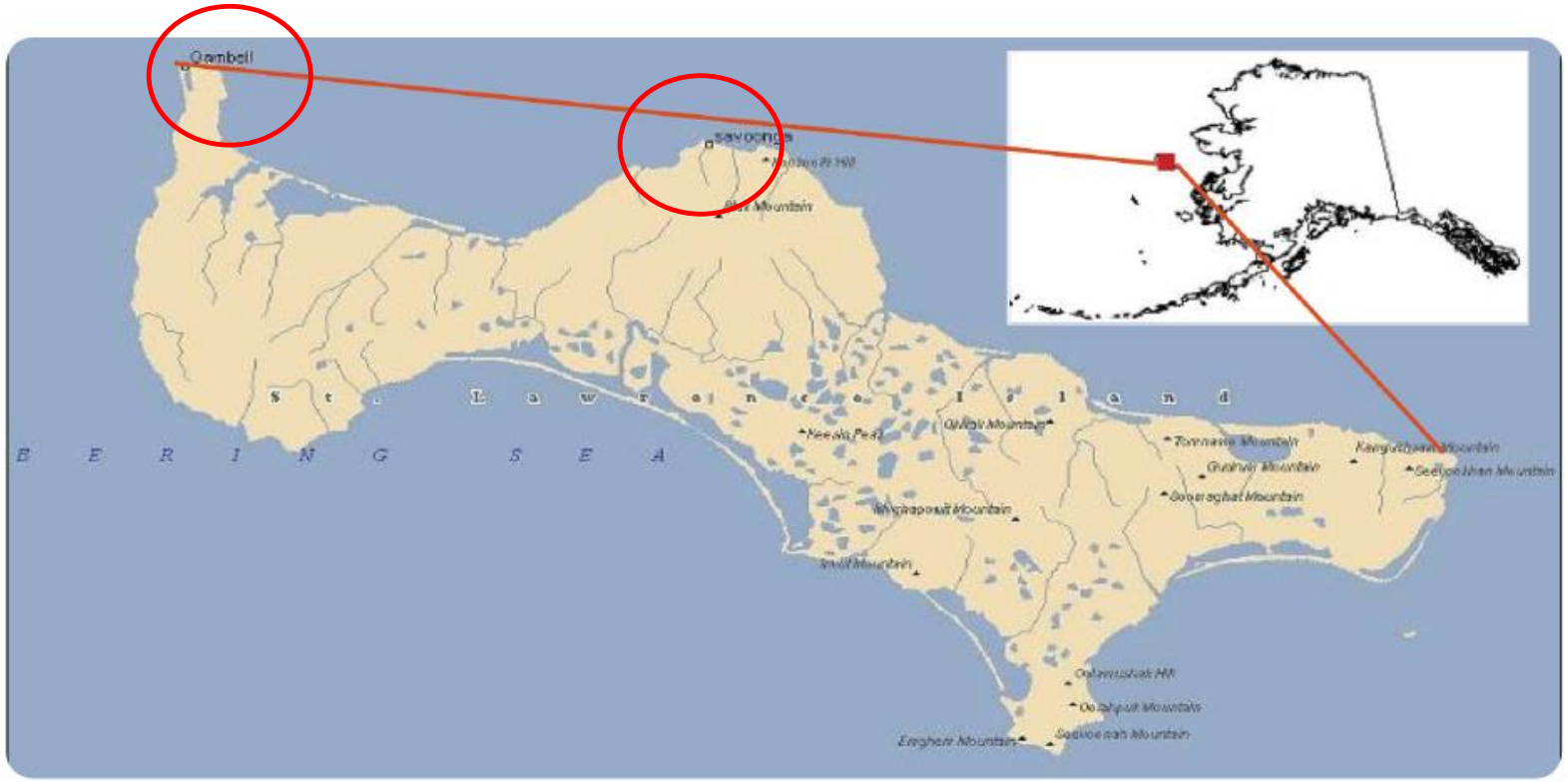
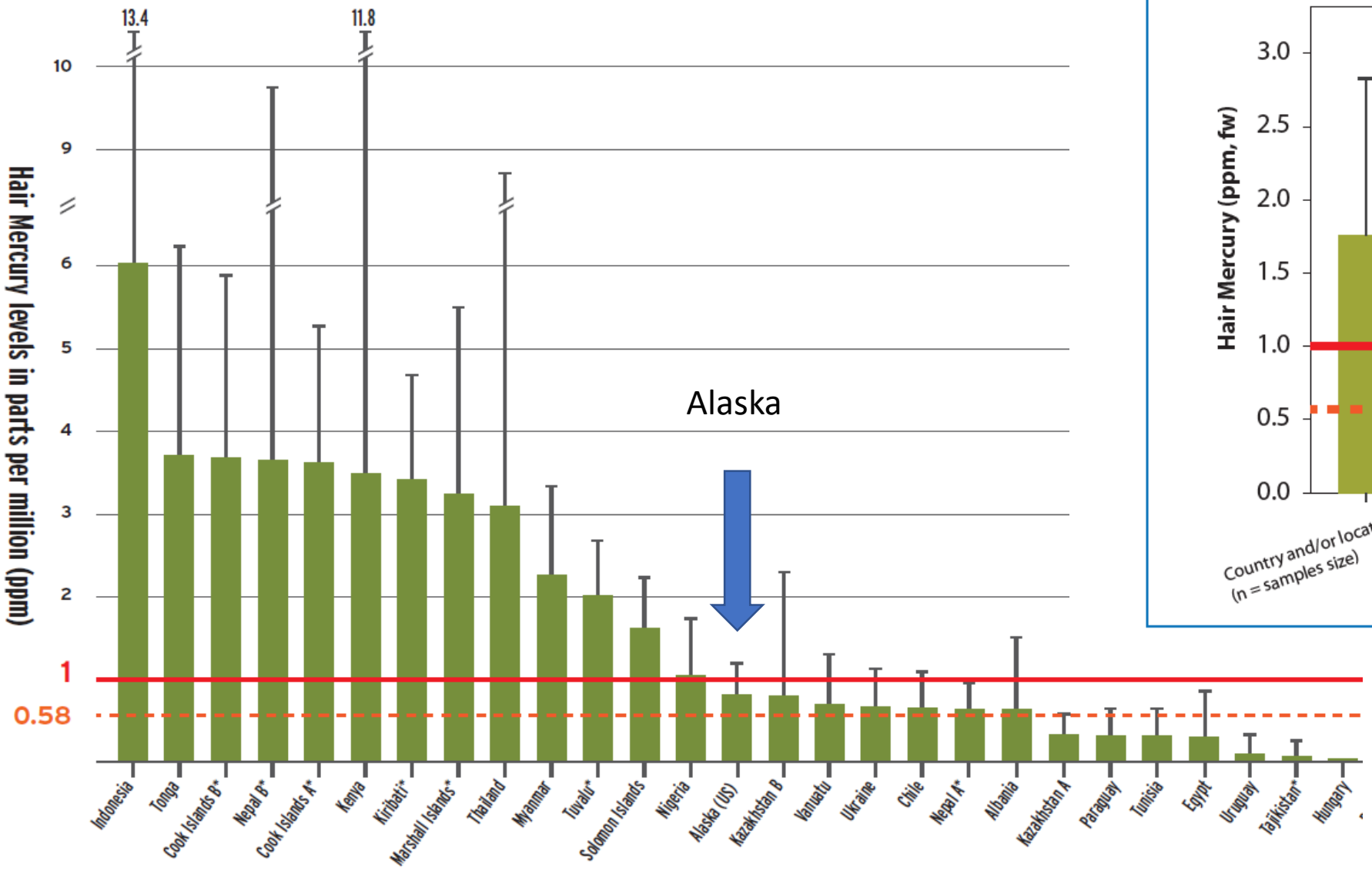


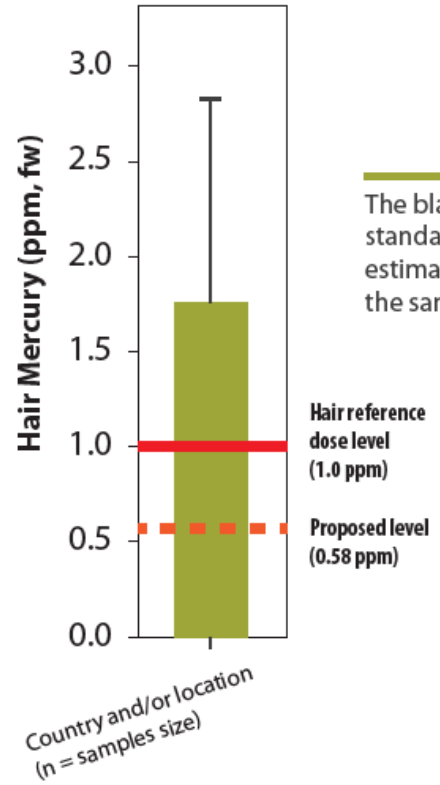
Figure 8. Map of St Lawrence Island noting sampling locations at Gambell and Savoonga.



1 ppm Mercury level

0.58 ppm Mercury level (Grandjean et al. 2012)

Interpreting the hair mercury concentration chart



Hair mercury concentrations are shown in green.

The black T line represents the standard deviation—an estimate of the variation in the sample data set.

U.S. EPA's reference dose for mercury in human hair. Mercury concentrations above 1.0 ppm in hair have been related to neurological impairments and other adverse effects.

Selected IPEN global report data including St. Lawrence Island, Alaska

Location	Number of samples	Mean Hg Concentration (ppm)	Number of samples greater than 1 ppm[a]	Percent greater than 1 ppm	Percent greater than 0.58 ppm[b]	Highest Hg level (ppm)
Thailand A Map Ta Phut	34	4.339 ± 7.608	23	68	97	35.29
Thailand B Tha Tum	34	1.814 ± 1.720	27	79	100	10.09
Tonga	30	3.677 ± 2.573	29	97	97	14.74
Ukraine	35	0.708 ± 0.442	7	20	51	1.91
United States Alaska	33	0.824 ± 0.450	10	30	70	1.90

Food chain impacts: Seals, salmon walrus and whales.

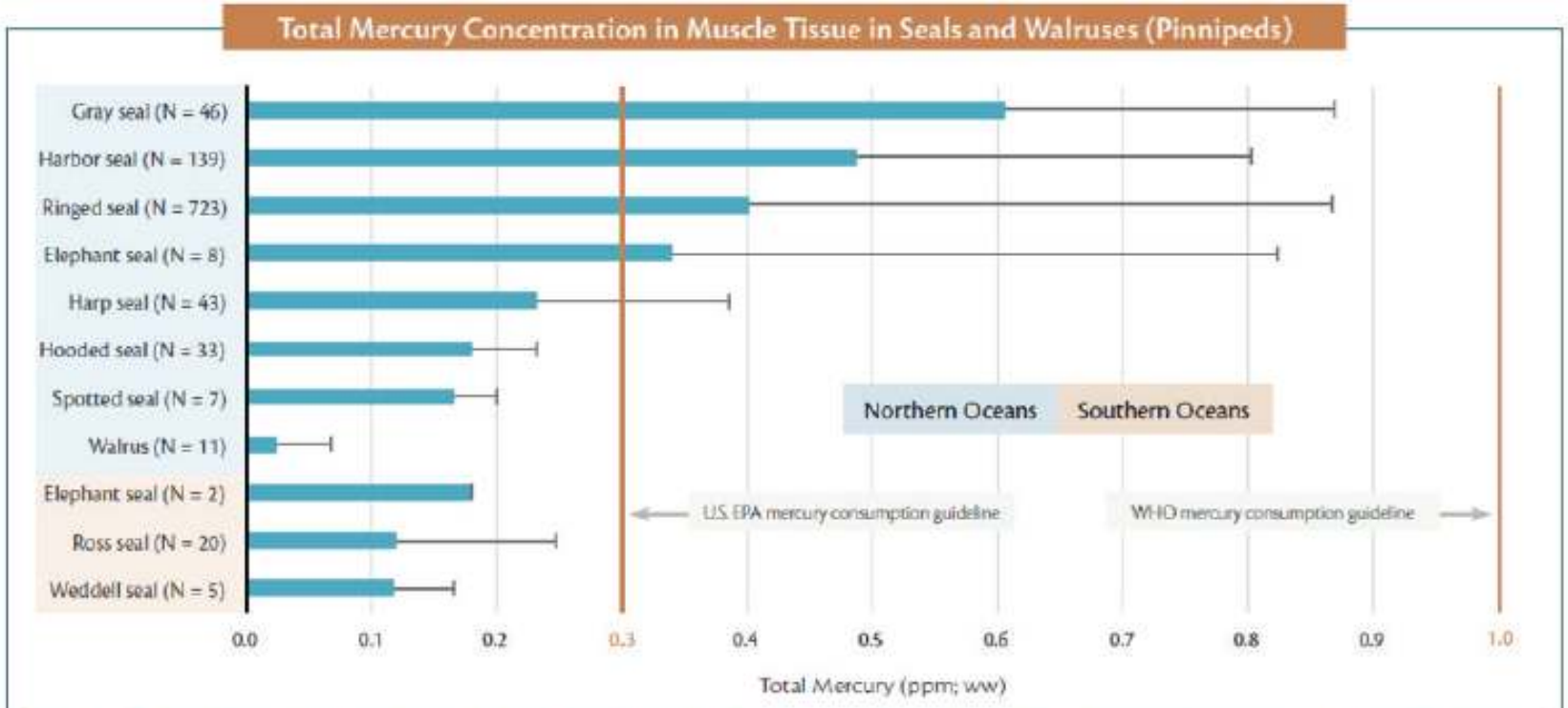


Figure 3. Average (+/– S.D.) total mercury concentrations of muscle tissue for several pinniped species. Antarctic or southern ocean species show lower mercury concentrations when compared to species of similar trophic position in northern oceans.

Figure 25. Mercury concentrations in Pinnipeds of the polar regions.
Evers et al. 2016

Age related factors

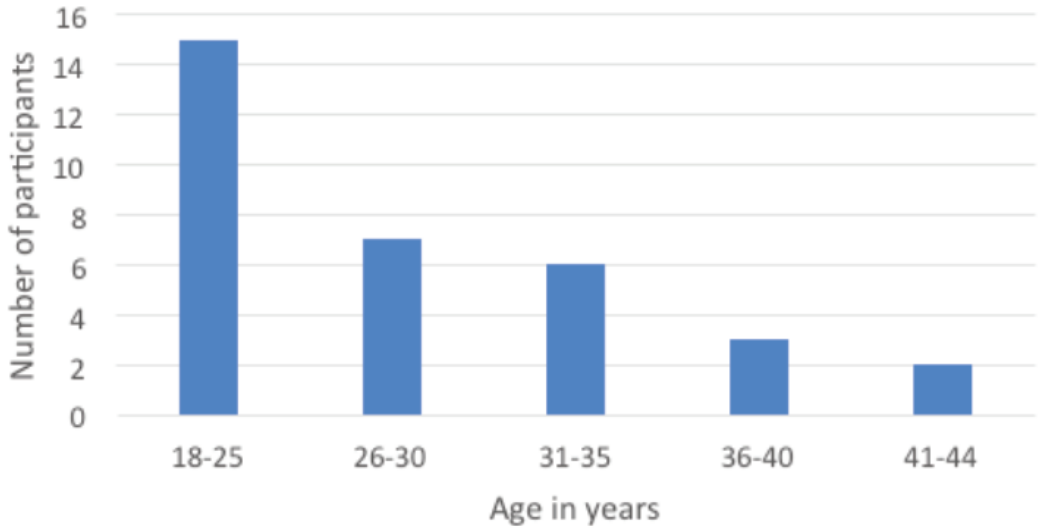


Figure 26. Female Alaskan sampling participants by age group (n-33).

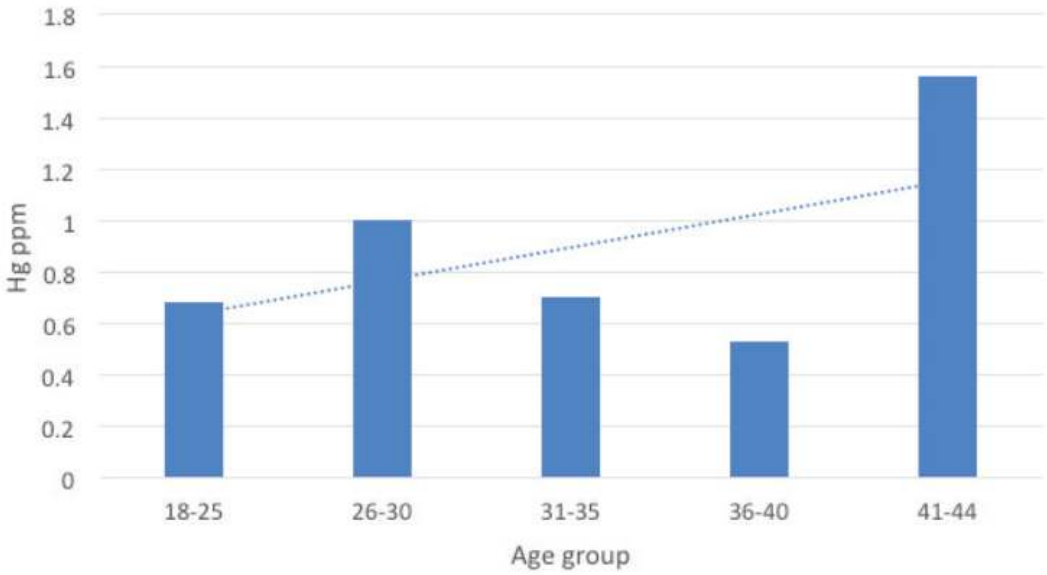


Figure 27. Hair mercury (Hg) trends by age bracket: Alaska (mean).

Conclusions

- Diet and age key factors in Hg accumulation.
- Frequency of consumption of seal meat a significant factor
- Walrus less likely to accumulate mercury
- Sockeye salmon not heavily contaminated
- Data on halibut limited but larger fish (>40 pounds) will have higher accumulation levels of mercury than younger fish.
- Consideration of combined POPs and Hg contamination is an issue.