Supporting Information

Future Impacts of Hydroelectric Power Development on Methylmercury Exposures of Canadian Indigenous Communities

Ryan S.D. Calder[a,b*], Amina T. Schartup[a,b], Miling Li[a,b], Amelia P. Valberg[a], Prentiss Balcom[b], and Elsie M. Sunderland[a,b]

[a] Department of Environmental Health, Harvard T.H. Chan School of Public Health, Boston MA, 02215, USA
[b] Harvard John A. Paulson School of Engineering and Applied Sciences, Cambridge MA, 02138, USA

[*]Corresponding author: 29 Oxford St., Cambridge MA, 02138, United States. T: (617) 637-6484; F: (617) 495-4551. **ry.calder@mail.harvard.edu**

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Table S1. Methods used to calculate sediment-water exchange of MeHg.

J (ng m^{-2} s^{-1})	Flux of MeHg into the water column based on the mass transfer formulation of Steinberger and Hondzo (1)	$J = \frac{C_{pw} - C_w}{\delta_d} D$
D (m^2 s^{-1})	Molecular diffusivity for MeHg (2)	2x10^{-10} (macromolecular organic complexes)
dC_w/dt (ng L^{-1} s^{-1})	Rate of change of MeHg concentration in the water column determined by flux from flooded soil and outflow from river	$\frac{1}{V}\left(\frac{C_{pw} - C_w}{\delta_d} DA_f - QC_w + QC_{wb}\right) 10^3 \frac{L}{m^3}$
C_w (ng L^{-1})	Steady state (dC_w/dt = 0) concentrations of MeHg in reservoir water	$\frac{C_{pw} \cdot D \cdot A_f}{D \cdot A_f + \delta_d \cdot Q} + C_{wb}$
C_{pw} (ng L^{-1})	Concentration of MeHg in interstitial waters	Derived from empirical relationship in Figure 1 and K_d
C_{wb} (ng L^{-1})	Pre-impoundment riverine MeHg (3)	0.0175
log K_d [L kg^{-1}]	Sediment-water partition coefficient based on measurements (3)	2.93±0.16
A_f (m^2)	Land area flooded	Table S2
Q (m^3 s^{-1})	River flow	Table S2
δ_d (m)	Thickness of the diffusive sublayer controlled by turbulent action based on Peterson (4)	$\nu^{1-\frac{1}{n}} \cdot \frac{1}{\sqrt{\tau/\rho}} \cdot D^{\frac{1}{n}} \cdot c^{-\frac{1}{n}}$
ν (m^2 s^{-1})	Kinematic viscosity of water	1.3x10^{-6}
ρ (kg m^{-3})	Density of water	10^3
C (unitless)	Coefficient	0.000463
n (unitless)	Coefficient	3.38
τ (N m^{-2})	Post-impoundment shear stress at the sediment-water interface based on Wilcock (5)	$\left[U \cdot \kappa \Big/ \ln\left(\frac{h}{e \cdot a \cdot \frac{d_{90}}{30}}\right)\right]^2 \rho$
U (m s^{-1})	Average current velocity based on Muskrat Falls facility (6)	0.1
κ (unitless)	von Karman constant	0.41
d_{90} (mm)	90th percentile solids diameter based on the predominant soil type in the Muskrat Falls reservoir area (7, 8)	0.2
a (unitless)	Constant	2.85
h (m)	Height of the channel based on Muskrat Falls facility	16.8
e (unitless)	Base of the natural logarithm	2.718

Table S2. Distributions of uncertain parameters used to simulate MeHg enrichment in water and biota in flooded reservoirs. Table S1 contains the complete parameterization for sediment-to-water fluxes of MeHg.

Parameter	Distribution
90^{th} percentile solids diameter in reservoir (d_{90}, mm)[a]	Triangular: min = 0.005, max = 1, mode = 0.2
Sediment-water partition coefficient (log K_d, L kg^{-1})[b]	Normal: μ = 2.96, σ = 2.54
Degradation of MeHg during downstream transport to estuary (fraction lost)[c]	Uniform: min = 0.3, max = 0.5
Fraction of excess riverine MeHg demethylatable in Lake Melville[d]	Uniform: min = 0, max = 1
Estuarine fraction of lifespan for key marine species[e]	Uniform: min = 0, max = 0.5
Estuarine fraction of lifespan for key bird species[f]	Uniform: min = 0.5, max = 1
Riverine fraction of lifespan for seals[g]	Uniform: min = 0, max = 0.25

[a] Mode based on the dominant soil type (podzol) in the Muskrat Falls region (7); minimum and maximum values represent ranges across a variety of soil types (8).

[b] Probability distribution for site-wide mean derived from measurements (5).

[c] Maximum degradation is based on upper limit suggested by Schartup et al. (3); minimum is based on degradation rate measured by Jonsson et al. (9).

[d] MeHg complexed to terrestrial organic ligands may be resistant to degradation (9).

[e] Fraction of MeHg obtained from the estuarine environment during foraging and/or spawning is uncertain for Atlantic cod, Atlantic salmon, and rock cod.

[f] Seabirds (eider, tern, guillemot and gull) are found in both the marine and estuarine environments. Some birds consumed by Inuit may spend their entire life history foraging in the estuary (maximum) or in outer marine areas (minimum).

[g] Inuit hunters report seasonal seal foraging in the freshwater environment.

Table S3. Characteristics of planned hydroelectric power projects across Canada.

Hydroelectric Project (River, Province/Territory)	Flow (m^3 s^{-1})	Flood area (km^2)	Post-flood MeHg (ng L^{-1})	Capacity (MW)	Indigenous populations within 100 km[a]
False Canyon (Liard, YT)[b]	151	160	0.24	58	Liard
Middle Canyon (Liard, YT)[b]	160	90	0.21	38	Liard, Dease
Detour Canyon (Pelly, YT)[b]	257	135	0.22	65	Selkirk, Little Salmon
Granite Canyon (Pelly, YT)[b]	362	170	0.21	254	
Hoole Canyon (Pelly, YT)[b]	97	25	0.13	13	Ross River
Slate Rapids (Pelly, YT)[b]	53	136	0.35	42	
Fraser Falls (Stewart, YT)[b]	359	570	0.29	300	Nacho Nyak Dun, Selkirk
Two Mile Canyon (Stewart, YT)[b]	166	105	0.18	53	Nacho Nyak Dun
La Martre (La Martre, NT)[c]	31	0	•	13	Whati
Lutselk'e (Snowdrift, NT)[c]	42	0	•	1	Lutsel K'e Dene
Site C (Peace, BC)[d]	1251	53	0.04	1100	West Moberly, Saulteau, Doig River, Halfway River Blueberry River
Amisk (Peace, AB)[e]	1600	8	•	330	Duncan's, Horse Lake, Peavine Metis
Tazi Twé (Fond du Lac, SK)[f]	304	0	•	50	Black Lake, Fond du Lac
Keeyask (Nelson, MB)[g]	3100	45	0.06	695	Fox Lake, War Lake, York Factory, Tataskweyak, Bunibonibee
Conawapa (Nelson, MB)[h]	3100	5	0.04	500	Fox Lake
New Post Creek (Abitibi, ON)[i]	42	2	0.04	25	Taykwa Tagamou
Romaine 1 (La Romaine, QC)[j]	291	12	0.35	270	Quebec Innu (Ekuanitshit, Nutashkuan)
Romaine 2 (La Romaine, QC)[j]	291	85	0.38	640	
Romaine 3 (La Romaine, QC)[j]	291	37	0.20	395	
Romaine 4 (La Romaine, QC)[j]	291	144	0.55	245	
Muskrat Falls (Churchill, NL)[k]	1829	41	0.19	824	Labrador Inuit, Innu and Metis
Gull Island (Churchill, NL)[k]	1829	85	0.37	2250	

• Negligible increase from baseline.
[a] First Nations unless otherwise specified. Locations on Figure 2 are centroids of traditional lands (10, 11). First Nations populations are those living on their respective reserves and unceded lands (12).
[b] Comparative feasibility assessment ongoing (13).
[c] Under review (14).
[d] Construction began in 2015 and will continue through 2024 (15, 16).
[e] Permitting process ongoing. Peavine settlement is 169 km from project but traditional lands review is ongoing (17).
[f] Permitting process ongoing (18).
[g] Construction began in 2014 and will continue through 2021 (19, 20).
[h] Planning activities suspended pending results of resources planning review (21).
[i] Construction began in 2015 and will continue through 2018 (22).
[j] Construction began in 2009 and will continue through 2017 (Romaine 3) – 2020 (Romaine 4). Construction complete on Romaine 1 and 2. Nutashkuan (132 km from Romaine 1) and Ekuanitshit and are the indigenous communities found to use the land impacted by the development (23).
[k] Construction of Muskrat Falls began in 2013 and will continue through 2017 (24). A construction timetable for Gull Island has not been released. Labrador Metis (NunatuKavut) is not plotted on Figure 2 because it does not have a recognized land claim.

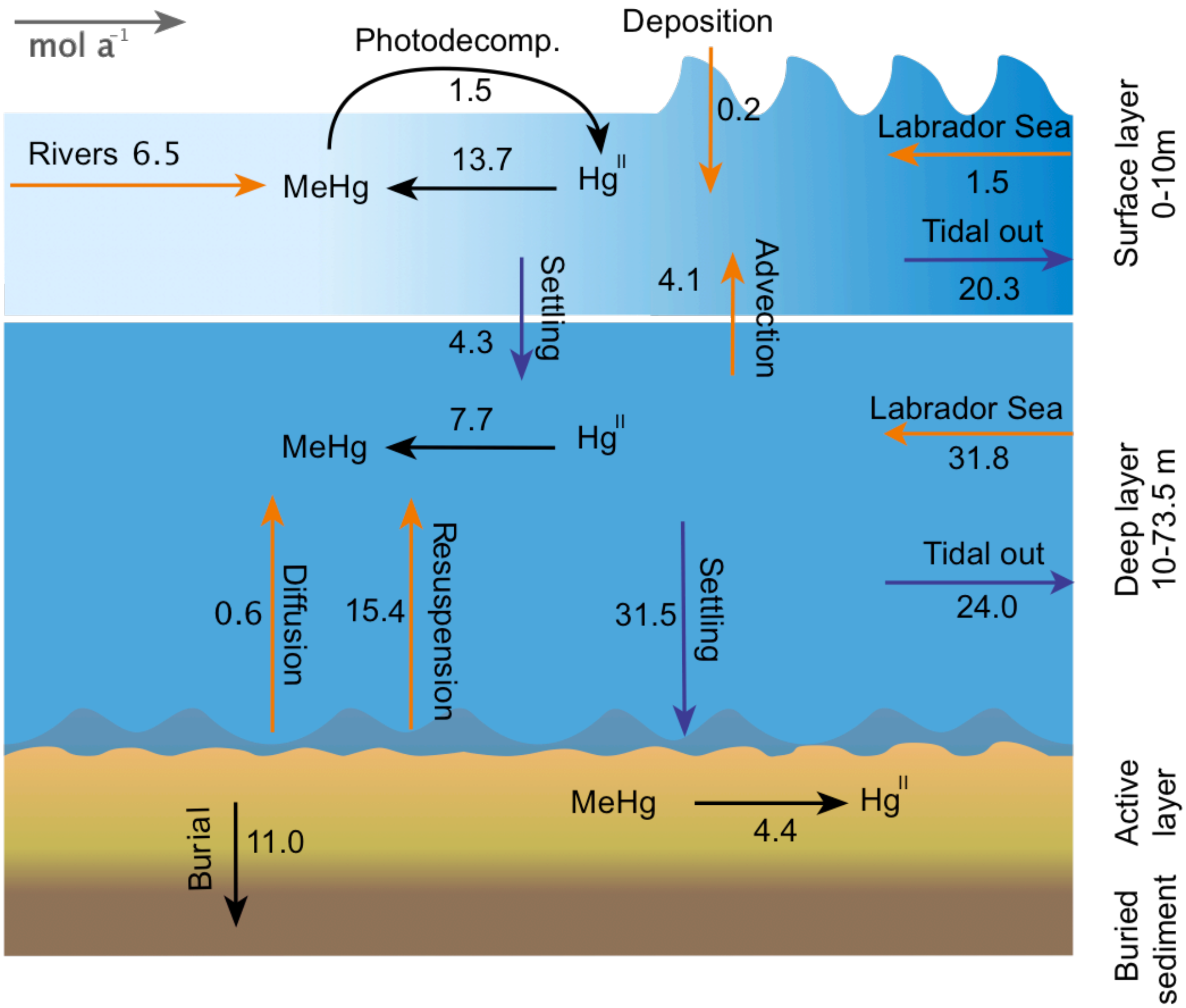

Figure S1. Schematic of model for mercury cycling the Lake Melville estuary Labrador adapted from Schartup et al. (3) for this analysis. Hydrodynamic data used to calculate mixing are from Lu et al. (25).

Table S4. Measured MeHg concentrations in the Churchill River between 2012-2015. Analytical procedures are described in Schartup et al. (3).

Season	Month - Year	Churchill River discharge ($m^3 day^{-1}$)	MeHg (pg L^{-1})	*n*	Weighted mean (pg L^{-1})	Weighted SD (pg L^{-1})
Winter					26.53	1.66
	Dec	1.56E+08	27.49[a]	–		
	Jan-15	1.56E+08	27.49	1		
	Feb-15	1.57E+08	24.62	1		
Spring					26.36	12.76
	Mar-15	1.47E+08	23.21	1		
	Apr-14	1.35E+08	11.83	1		
	May-14	2.31E+08	36.91	1		
Summer					4.99	1.15
	Jun-13/14	2.03E+08	5.91	2		
	Jul-14	1.45E+08	5.01	1		
	Aug-14	1.36E+08	3.61	1		
Fall					11.22	–
	Sep-12/14	1.32E+08	11.20	2		
	Oct	1.45E+08	11.20[a]	–		
	Nov	1.53E+08	11.20[a]	–		
Annual					**17.94**	**11.46**

[a] No data were available for this month so MeHg concentrations are based on a month with similar water discharges.

Table S5. Community-based monitoring of fish species from the Lake Melville region between 2014-2015. Analytical methods for total Hg and MeHg analysis are provided in Li et al. (26)

Sample	Location	Date	*n*	Sampled By
Smelt	Churchill River	September 2014	7	Inuit residents of North West River and Rigolet
Brook Trout	Lake Melville		20	Inuit residents of North West River and Rigolet
Lake Trout	Churchill River	June-July 2014	13	Field Research Coordinator
Stickleback	Churchill River and Lake Melville	July-Sept 2014	30	Field Research Coordinator
Salmon	Lake Melville (Rigolet area)	July 2014	3	Rigolet fishers
Long Nose Sucker	Lake Melville (between NWR/Rigolet	July-Aug 2014	20	Inuit fishers, North West River and Rigolet
Whitefish	Lake Melville (between NWR/Rigolet	July-Aug 2014	20	Inuit fishers, North West River and Rigolet
Flatfish	Lake Melville (between NWR/Rigolet	July-Aug 2014	20	Inuit fishers, North West River and Rigolet
Pike	Churchill River	July-Aug 2014 August 2015	13	Inuit fishers (HVGB)
Arctic Char	20 miles East of Rigolet	August 2015	10	Inuit fisher (Rigolet)
Atlantic Cod	St. Lewis Bay	September 2014	5	Labrador fisher
Mussels	Rigolet and NWR areas	June 2015	10	Inuit hunter
Misc. river fish	Churchill River above Muskrat Falls	August 2015	10	Inuit fishers

Table S6a. MeHg concentrations in aquatic species harvested from the Lake Melville region. Fish and bird concentrations are for fillets/muscle unless noted.

Species	MeHg (μg g^{-1}) Mean ± SD	*n*	Data Source
Seal (*Phoca hispida*)			
<1 year (80%) [a]			
Muscle	0.11 ± 0.09	34	This study
Liver	0.13 ± 0.16	50	This study
Kidney	0.24 ± 0.12	14	This study[b]
Seal 1-4 years (10%) [a]			
Muscle	0.21 ± 0.17	18	This study, Brown et al. (27)
Liver	0.28 ± 0.29	n/a	Mean of age classes < 1 year
Kidney	0.31 ± 0.15	n/a	and > 4 years.
Seal > *4 years (10%)* [a]			
Muscle	0.39 ± 0.51	68	This study, Brown et al. (27)
Liver	0.43 ± 0.37	3	This study
Kidney	0.38 ± 0.17	3	This study[b]
Atlantic Salmon (*Salmo salar*)			
Fillet	0.07 ± 0.02	12	Li et al. (26)
Roe	0.01 ± 0.004	n/a	This study[c]
Liver	0.09 ± 0.02	n/a	This study[d]
Atlantic cod (*Gadus morhua)*	0.19 ± 0.06	5	Li et al. (26)
Arctic char (*Salvelinus alpinus*)			
Fillet	0.06 ± 0.04	4	Li et al. (26)
Roe	0.01	n/a	This study[c]
Liver	0.08	n/a	This study[d]
Sculpin (*Myoxocephalus scorpius*)			
Fillet	0.23 ± 0.09	10	Li et al. (26)
Liver	0.11 ± 0.11	10	This study[e]
Brook trout (*Salvelinus fontinalis*)			
Fillet	0.10 ± 0.03	48	Li et al. (26)
Liver	0.10 ± 0.03	18	This study[f]
Roe	0.05 ± 0.02	17	This study
Ouananiche (*Salmo salar m. sebago*)	0.15 ± 0.11	18	Jacques Whitford Environment Ltd (28)
Lake trout (*Salvelinus namaycush*)	0.99 ± 0.46	28	Jacques Whitford Environment Ltd (28)

[a] Fraction of total seal harvest in each age class estimated by Inuit seal hunters in 2015.
[b] Fraction of total Hg as methylmercury in kidney estimated as 26% from Northern Quebec ringed seals; moisture content estimated as 29% (29).
[c] Estimated from salmon fillet:roe ratio (30).
[d] Estimated from salmon fillet:liver ratio (30).
[e] Estimated as 50% MeHg as a fraction of total Hg from literature values (31).
[f] Estimated 62% MeHg as a fraction of total Hg based on salmon liver (30).
[d] Estimated from salmon fillet:liver ratio (30).
[e] Based on 44% MeHg as a fraction of total Hg as for molluscs (32).
[f] Converted from dry weight using moisture content from gull samples.

Table S6b. MeHg concentrations in aquatic species harvested from the Lake Melville region. Fish and bird concentrations are for fillets/muscle unless noted.

Species	MeHg (μg g^{-1}) Mean ± SD	*n*	Data Source
Flatfish (*Pleuronectoide sp.*)	0.07 ± 0.04	20	Li et al. (26)
Capelin (*Mallotus villosus*)			
Fillet	0.02 ± 0.002	6	Li et al. (26)
Roe	0.002[a]		
Rainbow smelt (*Osmerus mordax*)	0.11 ± 0.05	18	Li et al. (26)
Mussels (*Mytilus edulis*)	0.004 ± 0.0005	6	Li et al. (26)
Porpoise (Phocoena phocoena)			
Muscle	0.60 ± 0.06[b]	20	Das et al. (33) (Atl. Norway)
Liver	1.22 ± 0.87[b,c]	21	Das et al. (33) (Atl. Norway)
Rock cod (*Gadus ogac*)			
Fillet	0.19 ± 0.06		Assumed equal to cod
Liver	0.23[d]		
Green sea urchin (*Strongylocentrotus droebachiensis*)	0.04	8	Noël et al. (34)
Periwinkle (*Littorina littorea*)	0.04	40	Noël et al. (34)
Clams (*Arctica islandica*)	0.01 ± 0.01	15	US FDA (35)
Scallops (*Amusium laurenti*)	0.01[e]	200	Karimi et al. (36)
Gull (*Rissa tridactyla*)			
Muscle	0.23 ± 0.27	7	Lavoie et al. (37)
Eggs	0.06 ± 0.01	20	Lavoie et al. (38)
Tern (*Sterna paradisaea*)			
Muscle	0.23 ± 0.25[f]	12	Clayden et al. (39)
Eggs	0.42 ± 0.25[f]	17	Clayden et al. (39)
Guillemot (*Cepphus grylle*)			
Muscle	0.27 ± 0.07	3	Braune et al. (40) (Nfld.)
Eggs	0.21 ± 0.01	20	Lavoie et al. (38)
Black duck (*Anas rubripes*)			
Muscle	0.11 ± 0.08	12	Braune et al. (40) (Nfld. + Labrador)
Eggs	0.03 ± 0.003		Schwarzbach and Adelsbach (41) – mallards, CA.
Eider (*Somateria mollissima*)			
Muscle	0.11 ± 0.03	8	Braune et al. (40) (Nfld. + Labrador)
Loon (*Gavia immer*)			
Eggs	0.90 ± 1.88	29	Evers et al. (42) (Maritimes)
Sandpiper (*Calidris pusilla*)			
Muscle	0.07 ± 0.01	19	Burger et al. (2014)

[a] Estimated from salmon fillet:roe ratio (30).
[b] Converted from dry weight using moisture content from seal.
[c] Based on 29% MeHg as a fraction of total Hg (43).
[d] Estimated from salmon fillet:liver ratio (30).
[e] Based on 44% MeHg as a fraction of total Hg as for molluscs (32).
[f] Converted from dry weight using moisture content from gull samples.

Supplemental Information on Seal Mercury Analyses

MeHg concentrations in seal liver and muscle were measured at the Environment Canada laboratory in Burlington, Ontario. Samples were freeze dried and homogenized, then digested with 5N HNO_3 solution at 55 °C overnight. Digested samples were buffered with acetate and ethylated using sodium tetraethylborate (NaTEB). Ethylated MeHg was purged onto a Tenax packed column, separated by gas chromatography, and detected by cold vapor atomic fluorescence spectroscopy using a Brooks Rand MERX automated MeHg analyzer following established methods (44, 45). The average recovery for the DOLT 5 Certified Reference Material (CRM) included in each digestion cycle was 96.8±5.6% (SD; n=8). Precision, estimated by replicate analysis of duplicate samples was on average 6% ($n=6$).

Table S7a. Bioaccumulation factors (BAFs) between aquatic MeHg concentrations and measured concentrations in biota and the estimated fraction of lifespan for each species spent in the freshwater environment (River), Lake Melville (Estuary) and outer marine regions (Marine).

Species	log BAF	River	Estuary	Marine	References
Arctic char		0.5	0.5	0	Dunbar (46), Bradbury et al. (47)[a,b]
Muscle	6.6				
Liver	6.6				
Roe	5.6				
Atlantic cod	7.7	0	0–0.50	0–0.50	Li et al. (26)[c,d]
Atlantic salmon		0	0–0.50	0–0.50	Li et al. (26)[c,d]
Muscle	7.3				
Liver	7.4				
Roe	6.4				
Brook trout		0.5	0.5	0	Backus (48), Pilgrim et al. (49)[a,e]
Muscle	6.8				
Liver	6.7				
Roe	6.5				
Capelin		0	0.25	0.75	Li et al. (26)[c]
Muscle	6.0				
Roe	5.1				
Clams	5.8	0	1	0	Harvest location[f]
Black duck		0.5	0.5	0	Longcore et al. (50)[g]
Muscle	6.8				
Eggs	6.2				
Eider		0	0.5–1	0.5–1	BirdLife International (51)[d,g]
Muscle	6.9				
Flatfish	6.6	0	1	0	Armstrong and Starr (52)[a]
Green sea urchin	6.4	0	1	0	Harvest location[f]
Guillemot		0	0.5–1	0.5–1	Butler et al. (53)[d]
Muscle	7.4				
Eggs	7.2				
Gull		0	0.5–1	0.5–1	Baird et al. (54)[g]
Muscle	7.3				
Eggs	6.7				

[a] Stable Hg isotopes suggest mixed habitat (26).
[b] Time spent in open ocean is short (several weeks per year) (46, 47).
[c] Habitat is predominantly offshore and fish migrate into the estuary to feed and/or spawn.
[d] Habitats modeled probabilistically (see Table 2). Reported BAF is expected value.
[e] Habitat is predominantly freshwater. Radiotelemetry monitoring in the Churchill River revealed short (90% < 10 km) seasonal displacements (55).
[f] Sessile and low-motility species are based on predominant fishing location.
[g] Increased MeHg following flooding is scaled by time spent in region (0.5) for migratory species.

Table S7b. Bioaccumulation factors (BAFs = MeHg biota/aqueous MeHg) and the estimated fraction of lifespan for each species spent in the freshwater environment (river), Lake Melville (estuary) and outer marine regions (marine).

Species	log BAF	River	Estuary	Marine	Reference
Lake trout	6.8	1	0	0	Black et al. (56)
Loon		0.5	0.5	0	McIntyre et al. (57)[a]
Eggs	7.7				
Mussels	5.3	0	1	0	Harvest location[b]
Ouananiche	6.9	1	0	0	Bradbury et al. (47)
Periwinkles	6.4	0	1	0	Harvest location[b]
Porpoise		0	0.25	0.75	Read and Westgate (58)[c]
Muscle	8.1				
Liver	8.4				
Rainbow smelt	6.8	0	1	0	FishBase (59)[d]
Rock cod		0	0–0.50	0–0.50	Ferguson et al. (60)[e,f]
Muscle	7.7				
Liver	7.5				
Sandpiper	6.6	0.5	0.5	0	Gratto-Trevor et al. (61)[a]
Scallops	6.1	0	1	0	Harvest location[b]
Sculpin		0	0.25	0.75	Li et al. (26)[c]
Muscle	7.7				
Liver	7.2				
Seal		0–0.25	0.5–0.75	0.25	Sikumiut Environmental Management Ltd. (62)[f,g]
Muscle	7.1				
Liver	7.1				
Kidney	7.3				
Tern		0	0.5–1	0.5–1	Hatch et al. (63)[a,f]
Muscle	7.3				
Eggs	7.5				

[a] Increased MeHg following flooding is scaled by time spent in region (0.5) for migratory species.
[b] Sessile and low-motility species are based on predominant fishing location.
[c] Habitat is predominantly offshore and fish migrate into the estuary to feed and/or spawn. Habitat fraction is modeled probabilistically (see Table S2). Reported BAF is expected mean.
[d] Hg isotope signature in adults indicates mixed habitat (26).
[e] Same $\delta^{13}C$ and $\delta^{15}N$ stable isotope signature as Atlantic cod.
[f] Habitat fraction modeled probabilistically (see Table S2). Reported BAF is expected mean.
[g] Pups are found in sea ice in estuarine environment.

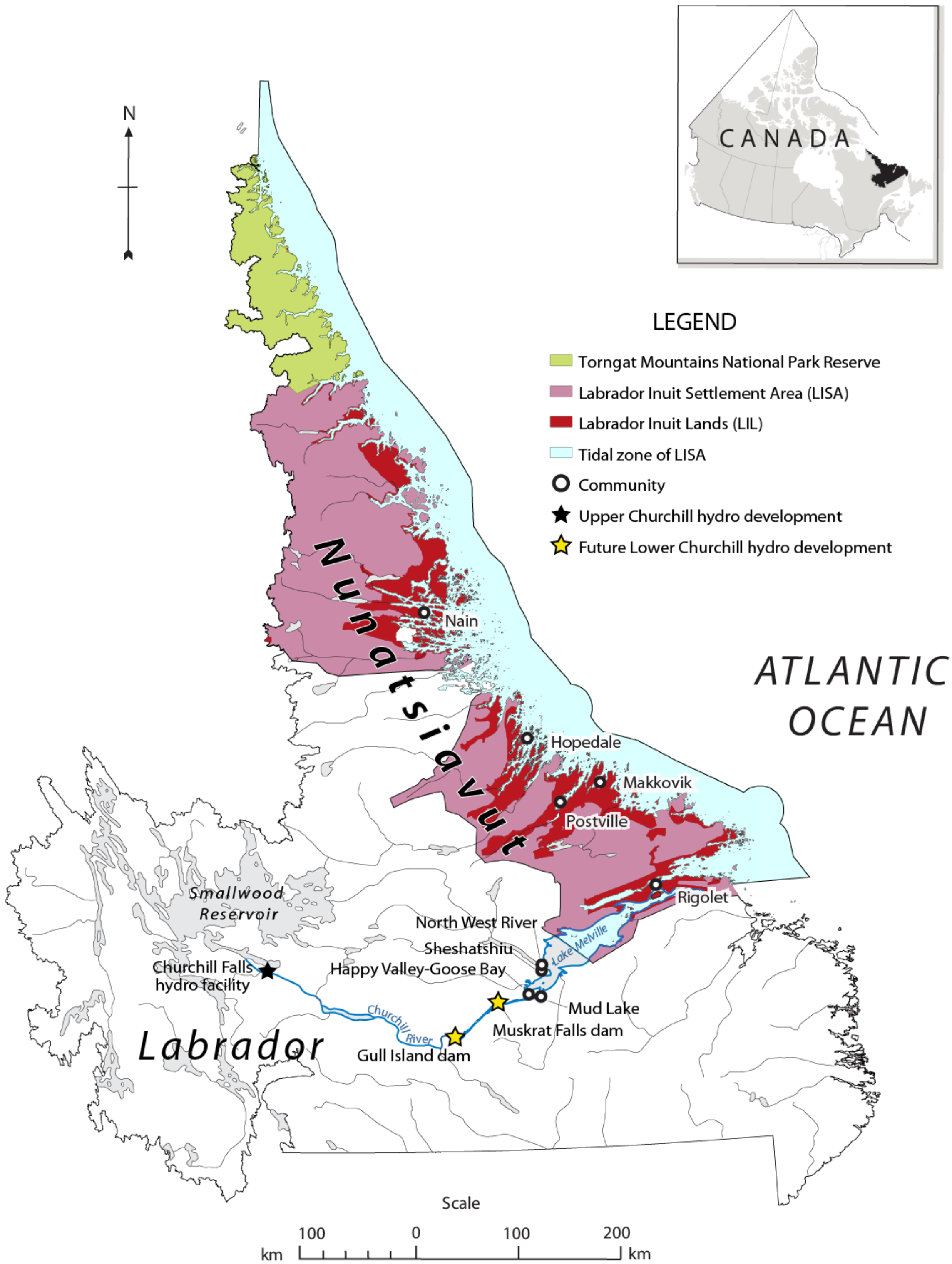

Figure S2. Map of the Labrador Inuit Settlement Area, existing and future hydroelectric developments on the Churchill River, and locations of indigenous communities. Source: Durkalec et al. (64). Reprinted with permission from Nunatsiavut Government.

Table S8. Hair mercury sampling from Inuit individuals in the communities downstream of the Muskrat Falls reservoir in June/July (spring/summer) and September/October (fall) 2014.

Demographic Group	Spring/ Summer (*n*)	Fall (*n*)	Total (*n*)	Unique Individuals (Percent Inuit Population[a])
All individuals	157	499[b]	656[b]	571[b]
Non-Inuit household members[c]	21	84	105	94
Inuit individuals	136	412	548	474 (19%)
Communities				
Happy Valley–Goose Bay[d]	96	265	361	325 (13%)
North West River	37	133	170	139 (37%)
Rigolet	24	101	125	107 (40%)
Demographic Group[e]				
Women of childbearing age (16-49)[f]	52	149	201	173
Children ≤ 12 years	15	29	44	40
Women of childbearing age (16-49 & children ≤ 12 in Rigolet	12	36	48	39
All male >12 years	56	174	230	200
All female >49 years	27	140	167	147

[a] Hair was collected for some individuals during both sampling periods. Total Inuit population is based on the 2011 Census and National Household Survey (65, 66).
[b] Including three individuals who did not report Inuit status
[c] Hair samples were collected from non-Inuit individuals if they shared a residence with registered Inuit beneficiary identified by the Nunatsiavut Government.
[d] Includes the nearby community of Mud Lake (n=22).
[e] Combined data for all three communities.
[f] As defined by the U.S. National Health and Nutrition Examination Survey (67).

Table S9. Food frequency questionnaire (FFQ) data collected from Inuit individuals from the communities downstream from the Muskrat Falls reservoir in March/April (winter), June/July (spring/summer) and September/October (fall) 2014. Dietary survey data collection overlapped with hair sampling (Table S8) in the spring and fall.

Demographic Group	Winter (*n*)	Spring/ Summer (*n*)	Fall (*n*)	Total (*n*)	Unique Individuals (Percent Inuit Population[a])
All individuals	231	294	1054[b]	1579[b]	1145[b]
Non-Inuit household[c] members	34	49	167	250	188
Inuit individuals	197	245	882	1324	952 (38%)
<u>Communities</u>					
Happy Valley-Goose Bay[d]	170	217	667	1054	745 (31%)
North West River	30	34	158	222	167 (43%)
Rigolet	31	43	229	303	233 (87%)
<u>Demographic Group</u>[e]					
Women of childbearing age (16-49)	59	77	278	414	306
Children ≤12 years	55	59	166	280	179
Women of childbearing age (16-49 & children ≤ 12 in Rigolet	15	19	100	134	101
All male >12 years	74	108	387	569	406
All female > 49 years[f]	28	37	191	256	200

[a] Data from some individuals are for multiple survey periods. Total Inuit population is based on the 2011 Census and National Household Survey (65, 66).
[b] Total includes three individuals who did not report Inuit status.
[c] Non-Inuit individuals who share a household with a registered Inuit beneficiary identified by the Nunatsiavut Government were included in the survey.
[d] Includes the nearby community of Mud Lake (*n*=22).
[e] Combined data for all three communities.
[f] As defined by the U.S. National Health and Nutrition Examination Survey (67).

Table S10. MeHg concentrations in aquatic foods harvested outside the Lake Melville region. Commercial market categories rather than species names are listed for store-bought seafood.

Species	MeHg ($\mu g\ g^{-1}$) Mean ± SD	*n*	Data Source
Minke whale (*Balaenoptera acutorostrata*)[a]	0.075 + 0.021	4	Riget et al. (68)
Polar bear (*Ursus maritimus*)	0.07 ± 0.05	23	Woshner et al. (69)
Cod	0.11 ± 0.07	115	US FDA (35)
Clams	0.01 ± 0.002	15	US FDA (35)
Scallops	0.02 ± 0.01[b]	200	Karimi et al. (36)
Mussels	0.02 ± 0.01[b]	134	Karimi et al. (36)
Catfish	0.04 ± 0.02[b]	103	Karimi et al. (36)
Crab	0.06 ± 0.03[b]	151	Karimi et al. (36)
Haddock	0.06 ± 0.03[b]	78	Karimi et al. (36)
Herring	0.02 ± 0.01[b]	115	Karimi et al. (36)
Lobster	0.04 ± 0.02[b]	149	Karimi et al. (36)
Oysters (canned)	0.003 ± 0.003[b,c]	361	Karimi et al. (36)
Pollock (fish sticks)	0.02 ± 0.01[b]	131	Karimi et al. (36)
Brook trout	0.09 ± 0.04[b,d]	44	Karimi et al. (36)
Rainbow trout	0.03 ± 0.02[b]	71	Karimi et al. (36)
Sardines	0.03 ± 0.02[b]	246	Karimi et al. (36)
Shrimp	0.03 ± 0.02[b]	361	Karimi et al. (36)
Skate	0.12 ± 0.05[b]	13	Karimi et al. (36)
Sole	0.10 ± 0.04[b]	51	Karimi et al. (36)
Tilapia	0.02 ± 0.01[b]	114	Karimi et al. (36)
Fresh Tuna	0.44 ± 0.25[d]	295	US FDA (35)
Canned tuna	0.16 ± 0.13[e]	1002	US FDA (35)
Fresh salmon	0.04 ± 0.02[b]	504	Karimi et al. (36)
Canned salmon	0.04 ± 0.04[f]	61	Karimi et al. (36)[e]

[a] Converted from dry weight using moisture content from seal muscle.
[b] Standard deviation of distribution modeled following Carrington and Bolger (70).
[c] Based on all market oysters.
[d] Based on all unspecified freshwater.
[e] Yellowfin, bigeye and albacore weighted according to relative landings reported by Sunderland (71).
[f] Relative consumption of light and white canned tuna calculated from Sunderland (71).

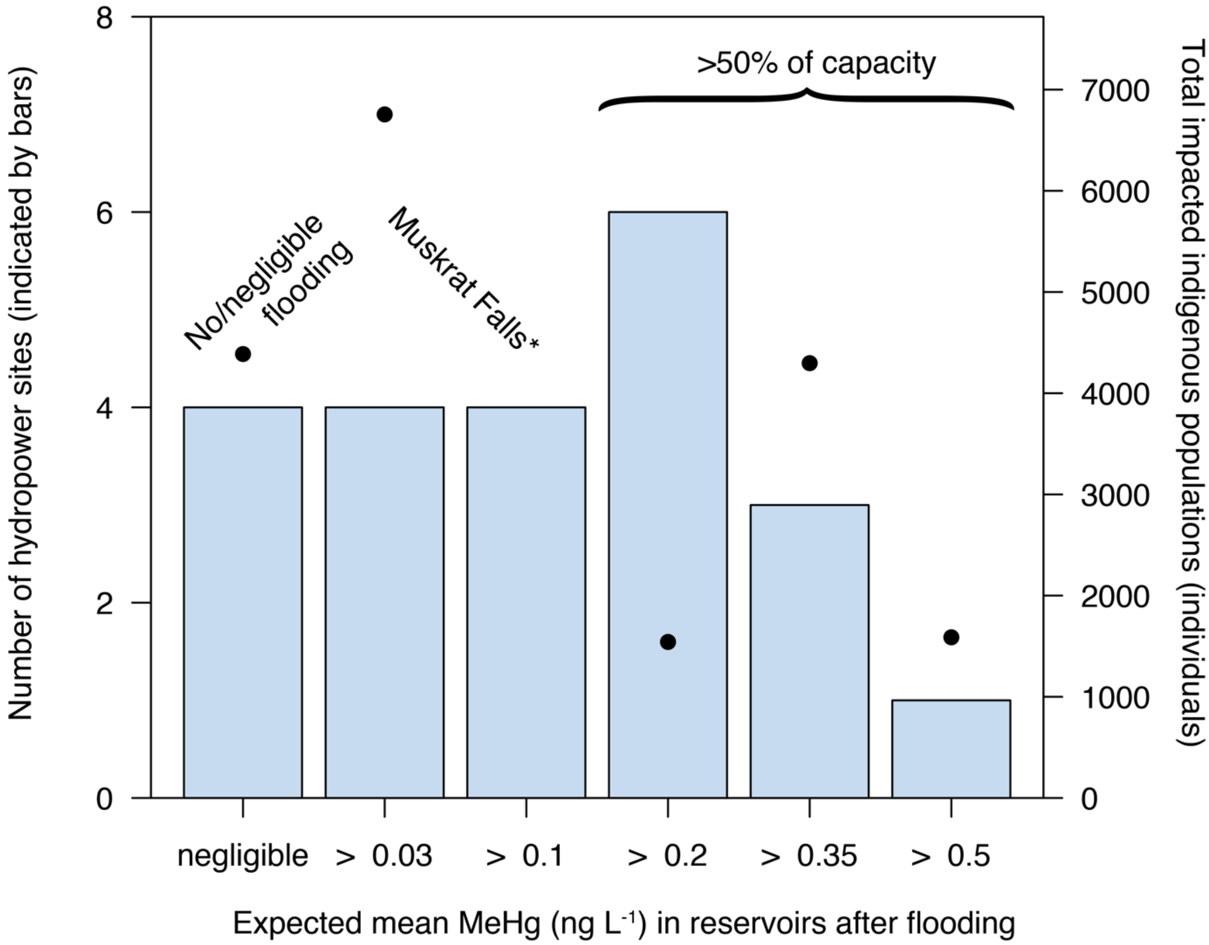

Figure S3. Number of planned hydroelectric power sites with forecasted reservoir MeHg concentrations above and below the Muskrat Falls reservoir and corresponding indigenous populations potentially impacted (circles). * Inuit population downstream from Muskrat Falls is included in the >0.35 bin because it is also potentially impacted by planned Gull Island facility.

Table S11a. Modeled MeHg concentrations in country foods after flooding of the Muskrat Falls reservoir.

Species	Post-flooding distribution of values			
	Expected mean	75th percentile	90th percentile	95th percentile
Arctic char				
Muscle	0.41	0.51	0.78	1.0
Liver	0.49	0.58	0.70	0.80
Roe	0.05	0.06	0.07	0.08
Atlantic cod	0.41	0.50	0.65	0.76
Atlantic salmon				
Muscle	0.16	0.20	0.25	0.29
Liver	0.20	0.23	0.28	0.31
Roe	0.020	0.023	0.027	0.031
Black duck				
Muscle	0.44	0.55	0.83	1.1
Eggs	0.11	0.13	0.16	0.18
Brook trout				
Muscle	0.68	0.84	1.1	1.3
Liver	0.62	0.76	1.0	1.2
Roe	0.34	0.42	0.58	0.70
Capelin				
Muscle	0.04	0.05	0.06	0.07
Roe	0.01	0.01	0.01	0.01
Clams	0.03	0.03	0.04	0.04
Eider				
Muscle	0.20	0.24	0.30	0.34
Flatfish	0.17	0.22	0.32	0.40
Green sea urchin	0.10	0.12	0.14	0.16
Guillemot				
Muscle	0.68	0.82	1.0	1.2
Eggs	0.53	0.61	0.74	0.84
Gull				
Muscle	0.41	0.46	0.54	0.59
Eggs	0.15	0.18	0.21	0.24
Lake trout	1.0	1.3	1.8	2.2
Loon				
Eggs	5.6	5.7	13.3	20.9
Minke whale	0.07	0.09	0.10	0.11
Mussels	0.01	0.01	0.01	0.01
Ouananiche	1.5	1.9	3.0	3.9
Periwinkles	0.10	0.12	0.14	0.16

Table S11b. Modeled MeHg concentrations in country foods after flooding of the Muskrat Falls reservoir

Species	Post-flooding distribution of values			
	Expected mean	75th percentile	90th percentile	95th percentile
Porpoise				
Muscle	1.4	1.8	2.7	3.5
Liver	2.8	3.6	5.2	6.8
Rock cod				
Muscle	0.42	0.50	0.65	0.77
Liver	0.50	0.58	0.70	0.79
Sandpiper	0.26	0.30	0.37	0.42
Scallops	0.06	0.07	0.08	0.09
Sculpin				
Muscle	0.54	0.66	0.88	1.0
Liver	0.20	0.24	0.42	0.58
Seal[a]				
Muscle	0.66	0.82	1.3	1.6
Liver	0.67	0.84	1.3	1.7
Kidney	1.0	1.2	1.6	1.9
Smelt	0.29	0.36	0.48	0.58
Tern	0.41	0.50	0.86	1.2

[a] Weighted by age range (Table S6a).

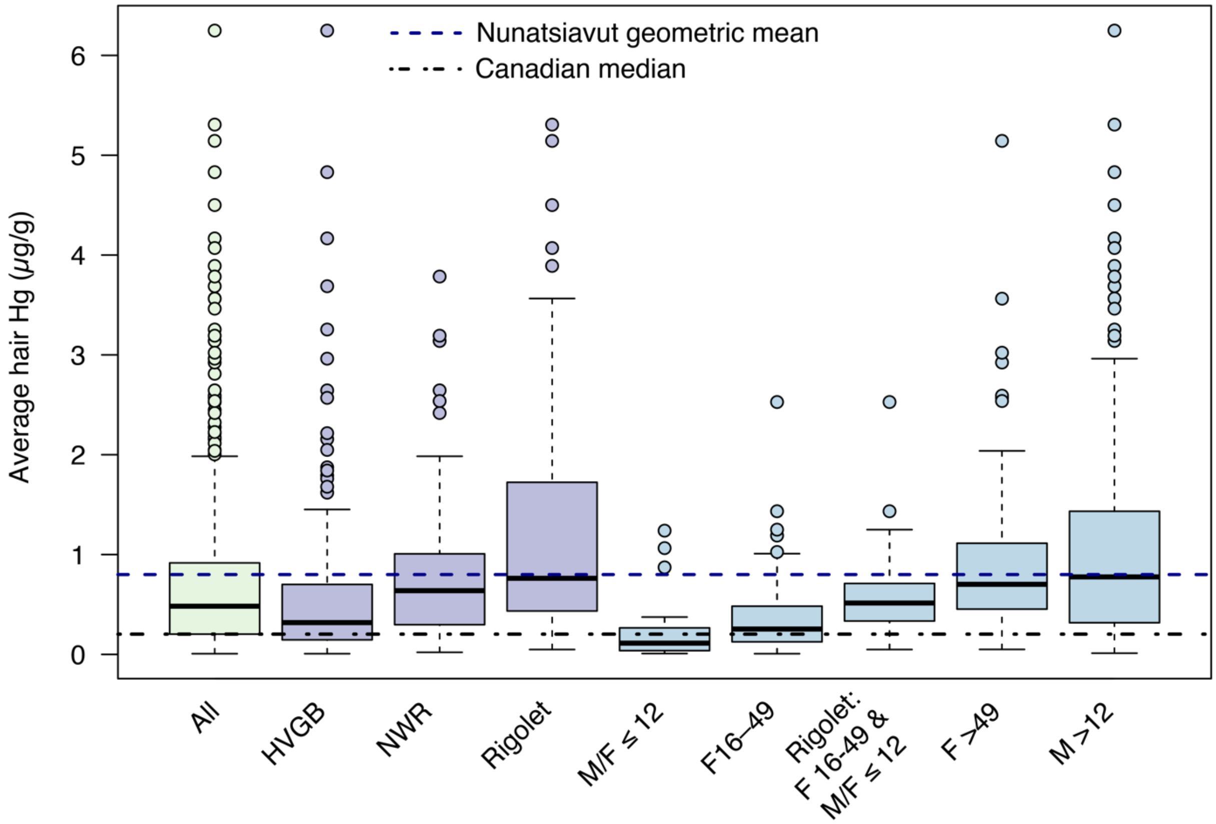

Figure S4. Measured concentrations of total Hg in hair samples from individuals in three Inuit communities downstream from the Muskrat Falls hydroelectric facility (HVGB = Happy Valley – Goose Bay; NWR = North West River) and among demographic groups (all communities together). Canadian median (6–79 years old) (72) and Nunatsiavut mean (73) are estimated using a mean blood-to-hair partition coefficient of 250 L g^{-1} (74). Most of the Hg in hair is present as MeHg (>90%) and potential demethylation in the hair follicle means that total Hg is the best indicator of internal MeHg exposure (75). At least one method blank and one certified hair reference materials (GBW-07601 and ERM-DB001) were tested every 10 samples and all recoveries were within certified ranges. Precision, calculated by replicate analysis of the duplicate hair samples (RSD) was better than 8.6%.

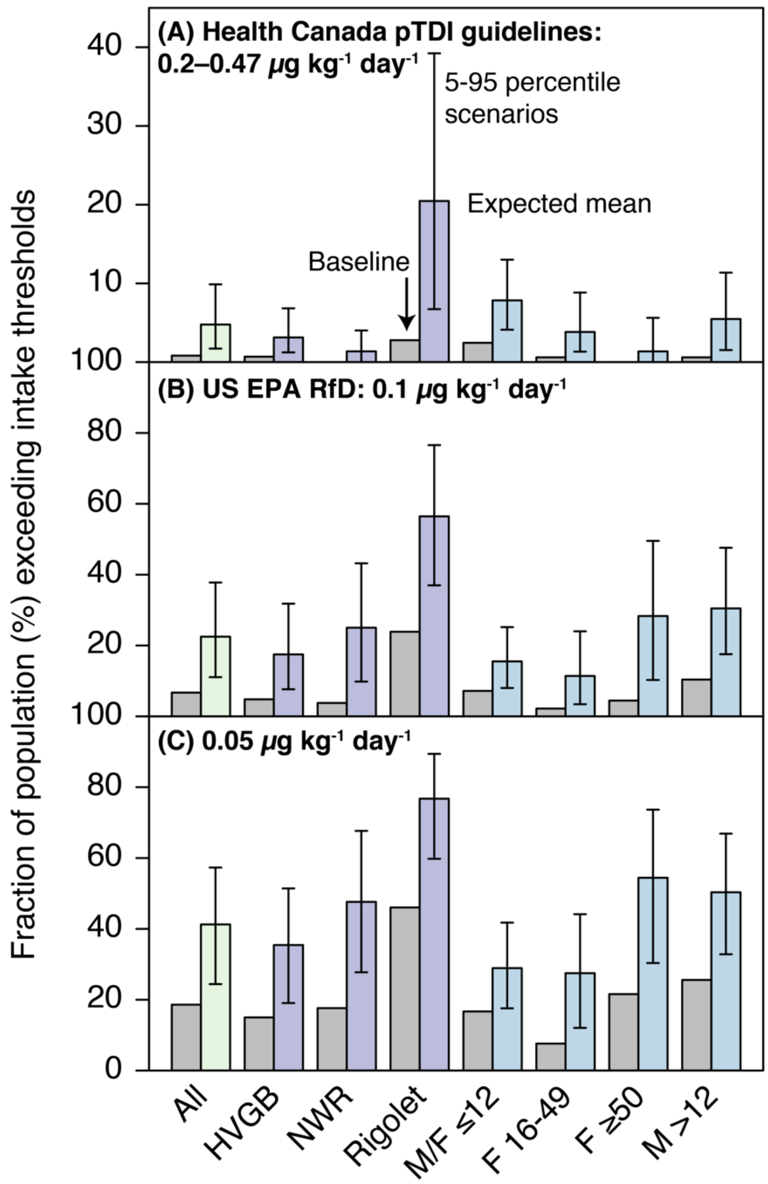

Figure S5. Fraction of population exceeding exposure thresholds in 2014 (measured) and post-flooding (modeled) by community (HVGB = Happy Valley – Goose Bay, NWR = North West River) and age/gender. anel (A) shows the population that exceeds Health Canada provisional tolerable daily intake (pTDI) guidelines for MeHg of 0.20 µg kg^{-1} day^{-1} for women of childbearing age and children 12 years and under and 0.47 µg kg^{-1} day^{-1} for others (76). Panel (B) shows the population that exceeds the U.S. Environmental Protection Agency's Reference Dose (RfD) (77), and panel (C) indicates the proportion of the population exceeding the RfD calculated based on more recent epidemiological research on neurotoxicity (78, 79).

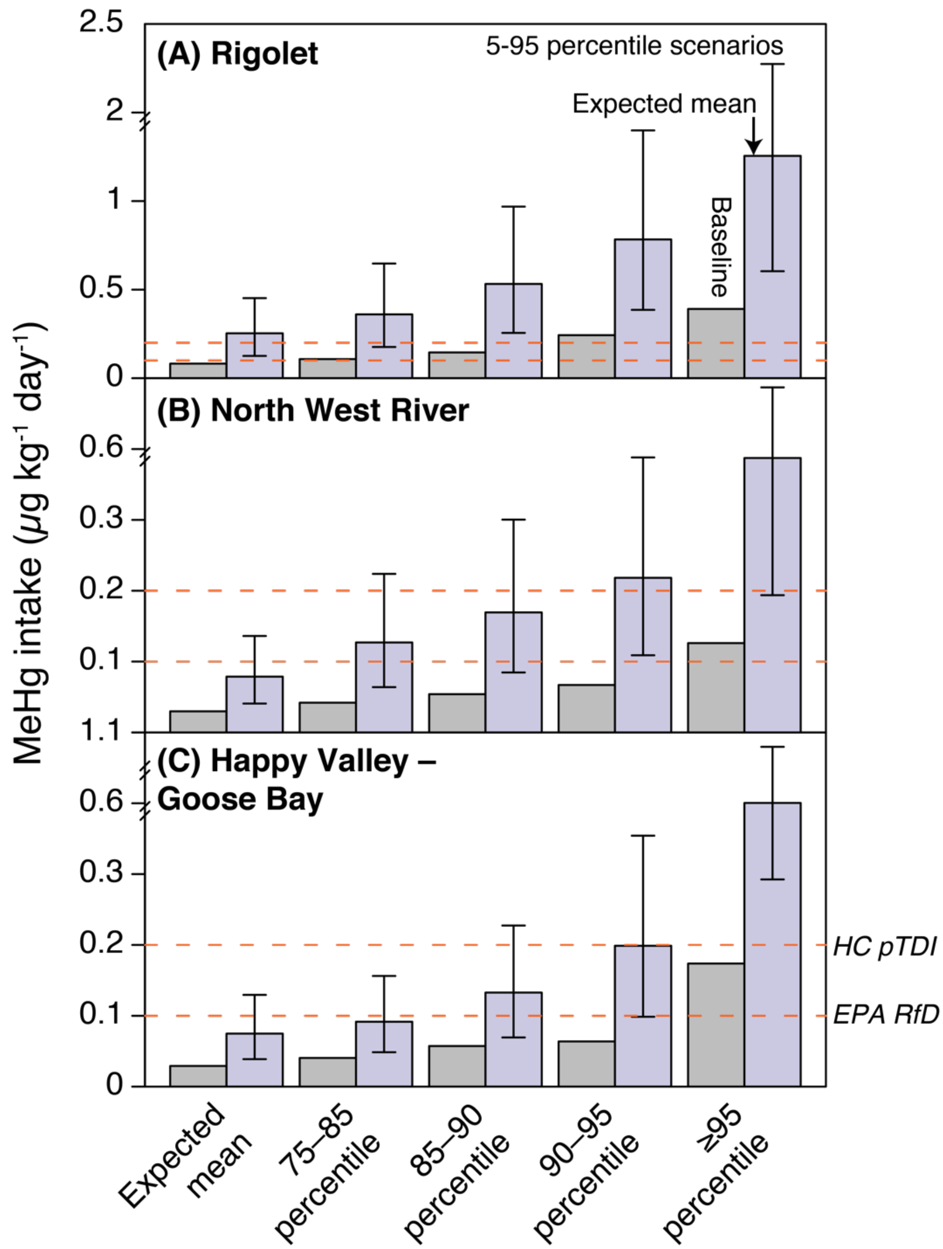

Figure S6. Baseline (measured) and post-flooding (modeled) MeHg intake relative to the Health Canada (HC) provisional tolerable daily intake (pTDI) and the U.S. EPA reference dose (RfD) for the communities of (A) Rigolet, the largest per-capita consumer of country foods, (B) North West River and (C) Happy Valley – Goose Bay

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