

# Meta-analyses on Fish consumption for US general and American Indian populations

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# Introduction

- Concerns of health risks from fish consumption are a priority of tribes
- There are risks as well as benefits for fish consumption
- Important to assess fish intake and exposure of PCBs and MeHg
- Meta-analyses helps to integrate various studies for tribal fish consumption

## Daily fish intake for NHANES and Tribal populations

Group	g/kg bw/day			g/day		
	Mean	90th	95th	Mean	95th	99th
Mexican American (0-19)	0.18	0.00	1.05	6.0	36.7	146.5
Mexican American (20+)	0.24	0.73	1.74	17.9	128.0	297.8
Non-Hispanic White (0-19)	0.14	0.00	0.86	5.1	31.8	127.6
Non-Hispanic White (20+)	0.21	0.73	1.45	16.7	113.4	260.5
Non-Hispnaic Black (0-19)	0.22	0.41	1.55	8.3	55.8	168.7
Non-Hispnaic Black (20+)	0.26	0.91	1.59	21.7	133.0	291.6
Other Hispanic (0-19)	0.18	0.00	0.99	5.8	40.0	150.7
Other Hispanic (20+)	0.24	0.81	1.56	16.9	110.6	262.8
APNM (0-19)	0.33	0.96	2.20	10.3	62.8	184.1
APNM (20+)	0.46	1.69	2.53	30.7	167.8	327.9
Toy, K.A 1996	0.89	2.31	2.94			
Suquamish 2000	2.71	6.19	10.09			
Columbia River Inter-Tribal Fish Commission. (1994)				58.7	170.0	389.0

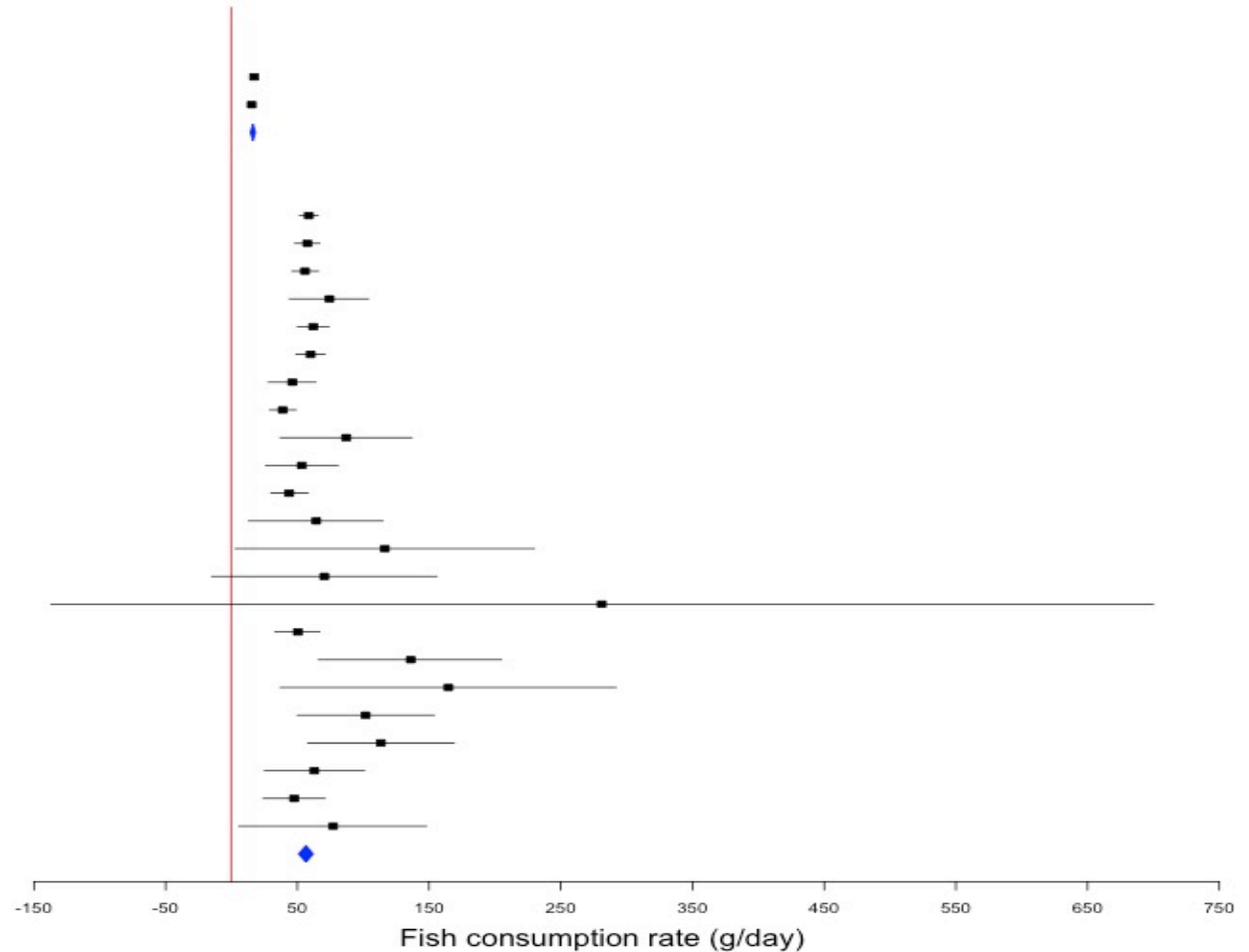
# Table 2

## Meta analysis for fish consumption of different age groups (g/day)

Age group	Population	Sample Size	Lower Limit	Upper Limit	Mean	Ratio
Adult	U.S. General population	70310	14.4	18.2	16.3	
	Tribal population	1972	50.9	62.4	56.6	3.47
Children	U.S. General population	33315	2.9	4.3	3.6	
	Tribal population	211	7.0	31.9	19.5	5.42
0 to 10	U.S. General population	43029	4.0	4.4	4.2	
	Tribal population	211	6.9	31.9	19.5	4.64
0 to 20	U.S. General population	66337	3.8	6.2	5.0	
	Tribal population	228	17.9	46.2	32.1	6.42
20 to 30	U.S. General population	11109	9.9	16.7	13.3	
	Tribal population	310	43.9	69.2	56.6	4.26
30 to 40	U.S. General population	11552	15.2	19.1	17.2	
	Tribal population	23	43.9	69.2	56.6	3.29
40 to 50	U.S. General population	11238	12.2	22.8	17.5	
	Tribal population	495	46.6	63.5	55.0	3.14
50 plus	U.S. General population	31007	16.1	19.0	17.5	
	Tribal population	264	47.5	70.7	59.1	3.38

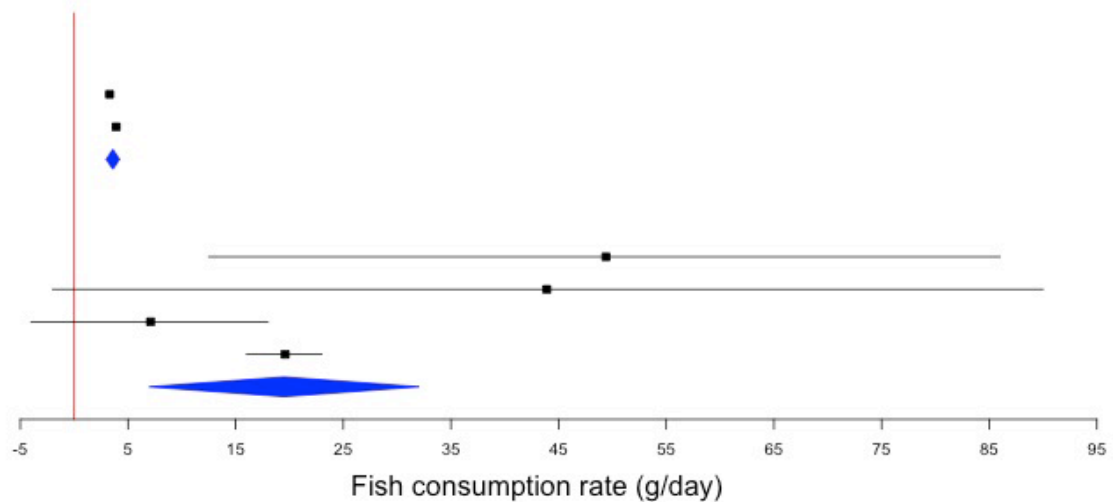
# Daily fish consumption rate of U.S. general and tribal adult (18+ years old) populations

Study	Mean
<b>US gen. pop.</b>	
nhanes_adult	17.2
csfii_adult	15.3
<b>Overall</b>	<b>16.3</b>
<b>Tribal pop.</b>	
umatilla_adults	58.7
umatilla_18_34	57.6
umatilla_40_59	55.8
umatilla_60plus	74.4
Dellinger_LH_adults	62.1
Dellinger_LS_adults	60.1
Dellinger_IN_adults	46.2
Dellinger_MN_adults	38.9
Dellinger_OR_adults	87.1
Inlet_st_adults	53.3
Inlet_st_40_59	43.8
Inlet_st_60plus	64.3
Inlet_pg_adults	116.4
inlet_pg_18_39	70.5
Inlet_pg_40_59	281.1
Inlet_pg_60plus	50.4
Inlet_nt_adults	136.1
inlet_nt_18_39	164.7
Inlet_nt_40_59	101.8
Inlet_nt_60plus	113.4
Inlet_tt_adults	62.9
inlet_tt_18_39	47.6
Inlet_tt_40_59	77.1
<b>Overall</b>	<b>56.6</b>



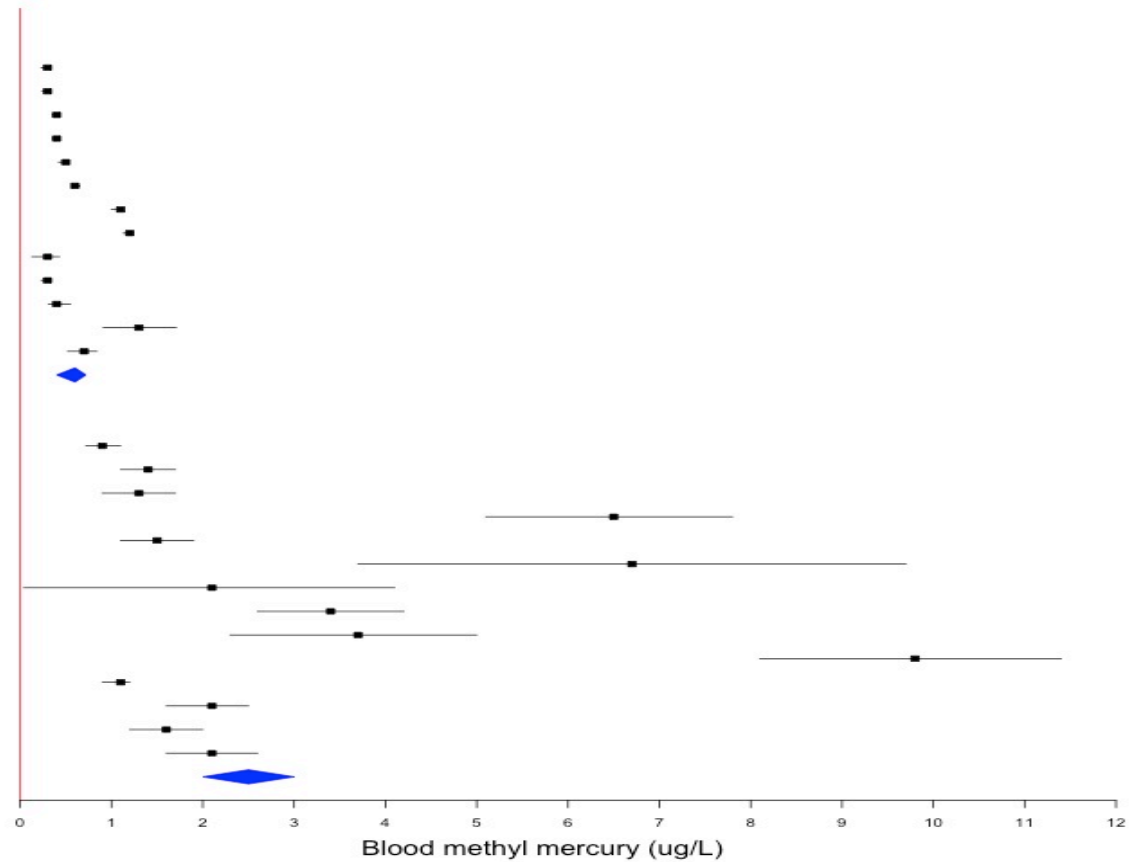
# Daily fish consumption rate of U.S. general and American Indian children (0-6 years old) populations

Study	Mean
<b>US gen. pop.</b>	
nhanes_child	3.3
csfii_child	3.9
<b>Overall</b>	<b>3.6</b>
<b>Tirbal pop.</b>	
Inlet_pg_0_5	49.4
Inlet_nt_0_5	43.9
Inlet_tt_0_5	7.1
Colimbia_river_0-5	19.6
<b>Overall</b>	<b>19.5</b>



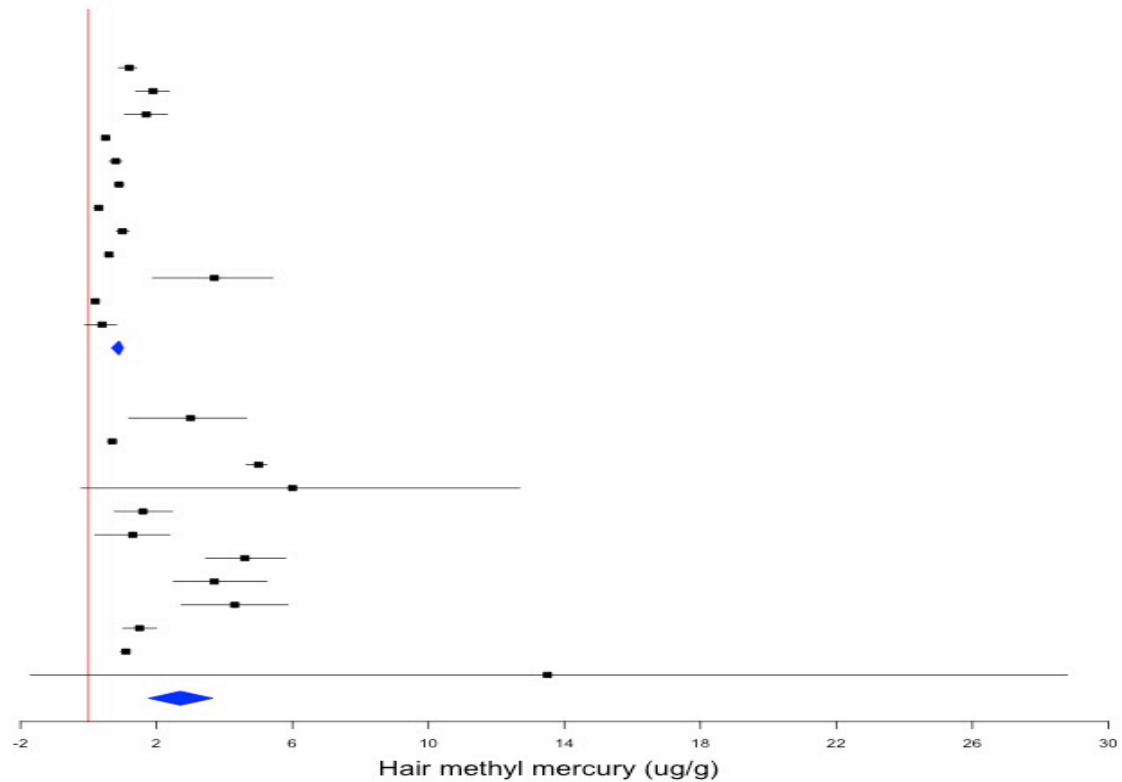
# Blood MeHg level of U.S. general and tribal populations

Study	Mean
<b>US gen. pop.</b>	
Xue_1_2	0.3
Xue_2_3	0.3
Xue_3_6	0.4
Xue_6_11	0.4
Xue_11_16	0.5
Xue_16_21	0.6
Xue_21_50	1.1
Xue_50plus	1.2
Wolkin_18_25	0.3
Wolkin_26_35	0.3
Wolkin_36_45	0.4
Wolkin_45plus	1.3
Gallagher	0.7
<b>Overall</b>	<b>0.6</b>
<b>Tribal pop.</b>	
Egeland_Caucasian	0.9
Egeland_Metis	1.4
Egeland_other	1.3
Egeland_Bethel	6.5
Egeland_Barrow	1.5
Egeland_Baffin	6.7
Egeland_inuvik	2.1
Egeland_Kiti	3.4
Egeland_Kiva	3.7
Egeland_Nunavik	9.8
Dellinger_LH	1.1
Dellinger_IN	2.1
Dellinger_LS	1.6
Dellinger_MN	2.1
<b>Overall</b>	<b>2.5</b>



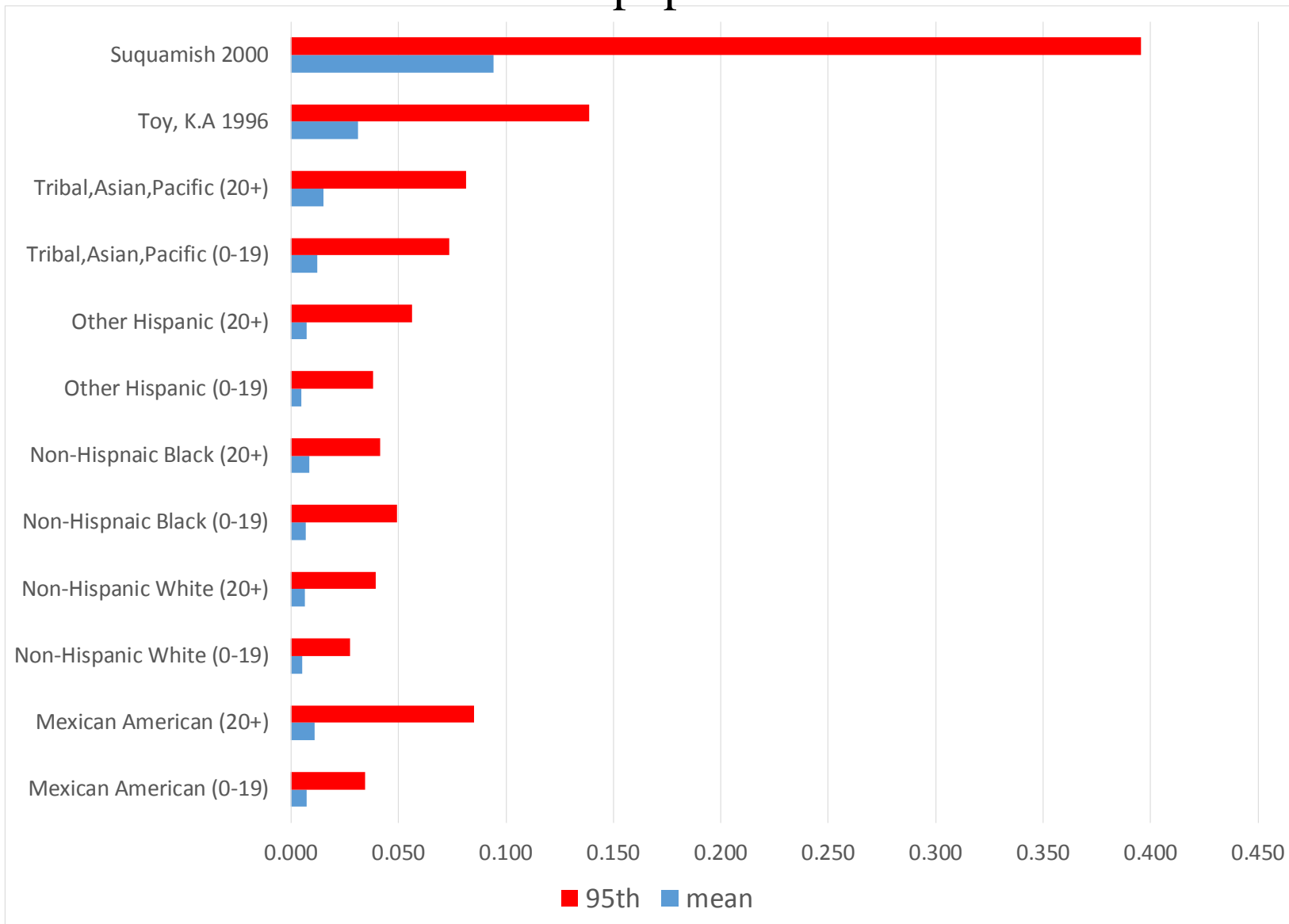
# Hair MeHg level of U.S. general and tribal populations

Study	Mean
<b>US gen. pop.</b>	
Schaefer_18_40	1.2
Schaefer_41_60	1.9
Schaefer_60plus	1.7
Knobeloch_18_39	0.5
Knobeloch_40_54	0.8
Knobeloch_55plus	0.9
Knobeloch_asian	0.3
Knobeloch_white	1
Knobeloch_hispanic	0.6
Egeland_sample6	3.7
Egeland_sample20	0.2
Egeland_sample18	0.4
<b>Overall</b>	<b>0.9</b>
<b>Tribal pop.</b>	
Edward	3
Hightower	0.7
Egeland_PI1	5
Egeland_PI2	6
Egeland_juneau	1.6
Egeland_ykriver	1.3
Egeland_ykcostal	4.6
Egeland_ykinterior	3.7
Egeland_urban	4.3
Egeland_napakiak	1.5
Egeland_ancho	1.1
Dellinger_2003	13.5
<b>Overall</b>	<b>2.7</b>

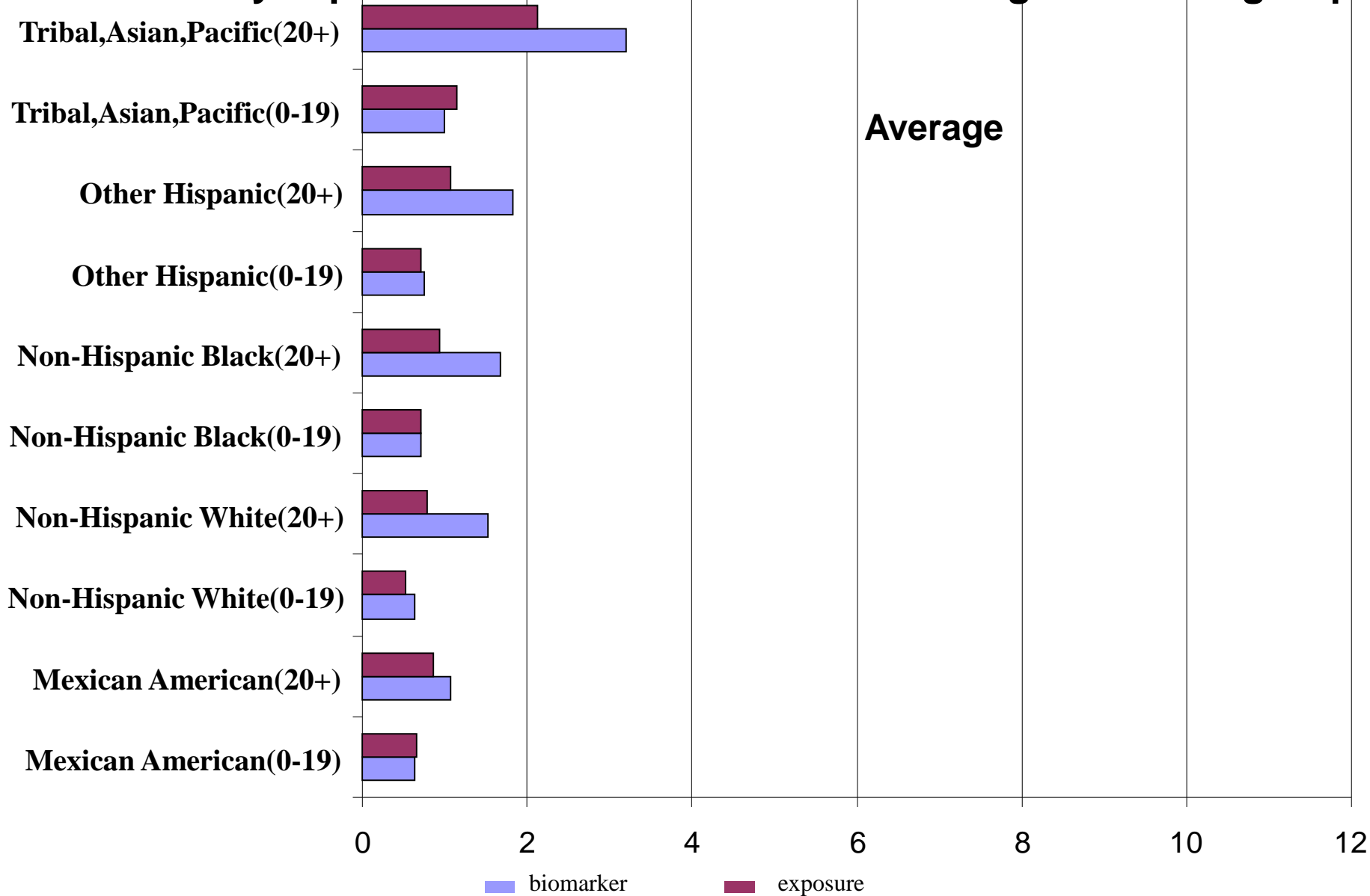




# Total PCBs exposures by percentiles for U.S. (NHANES) and Tribal populations



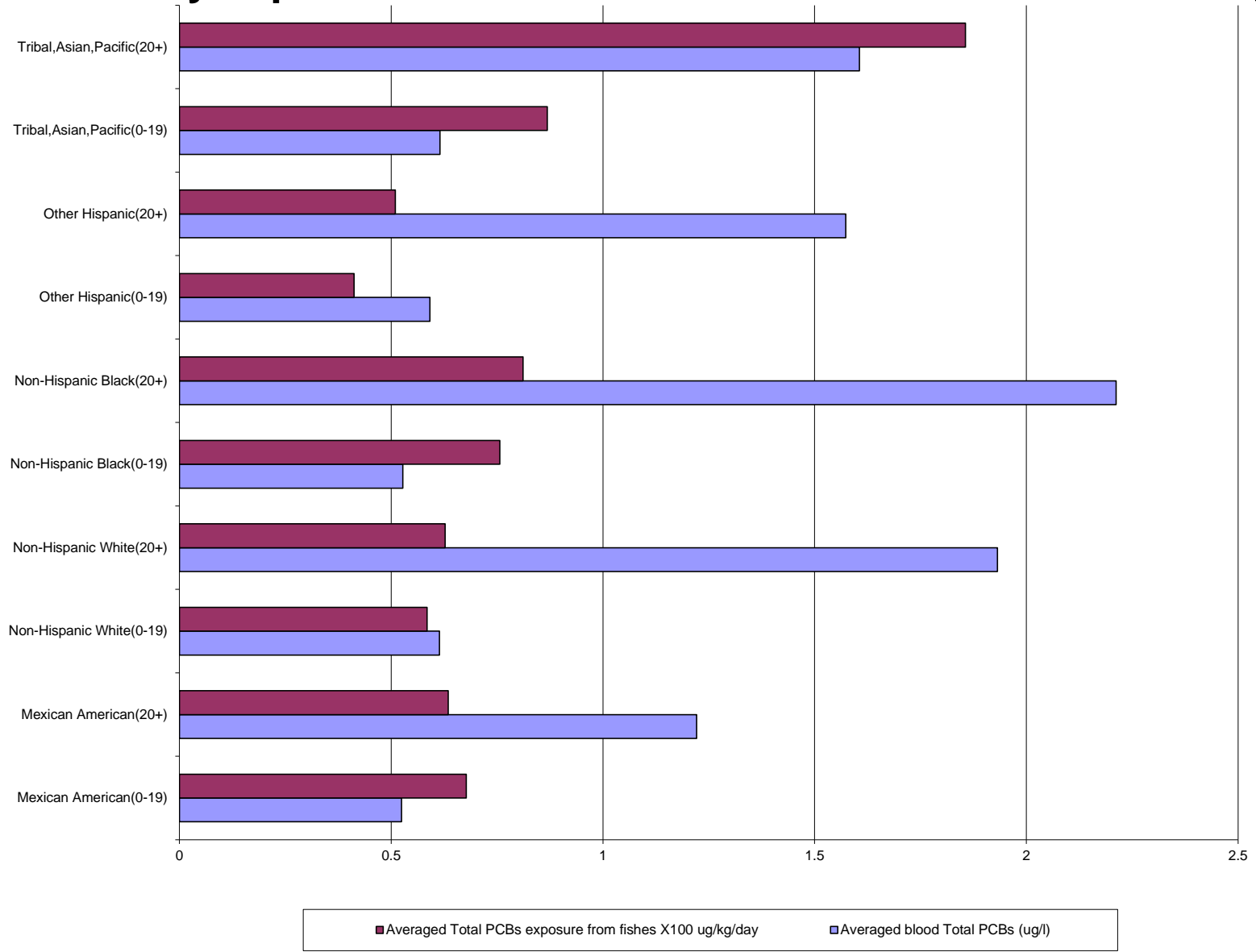
# Dietary exposure and Blood level of total MeHg in various groups



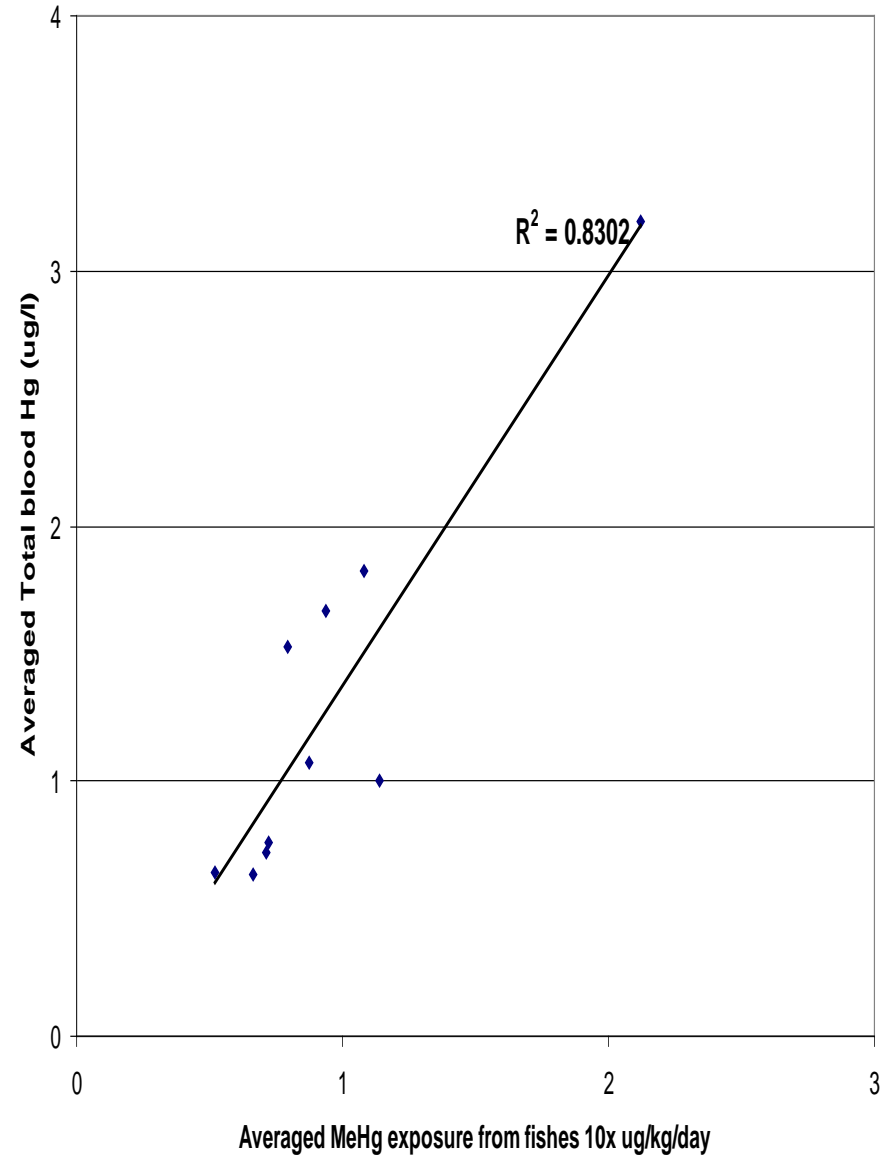
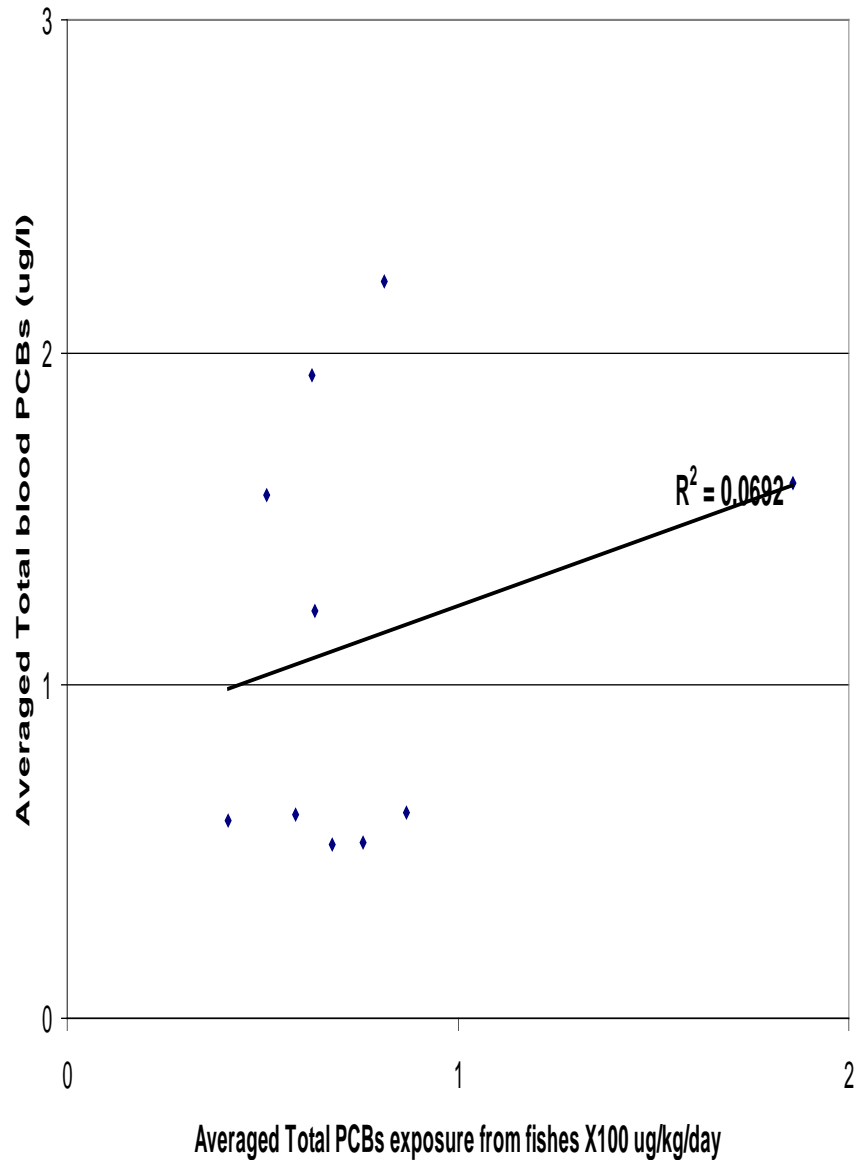
**Biomarker:** total blood hg (ug/l)

**Exposure:** MeHg exposure from fishes 10 x ug/kg bw/day

# Dietary exposure and Blood level of total PCBs in various groups



# Correlations between dietary intakes and blood biomarkers



# Total PCBs absorption estimated by SHEDS from 5 schools in NYC

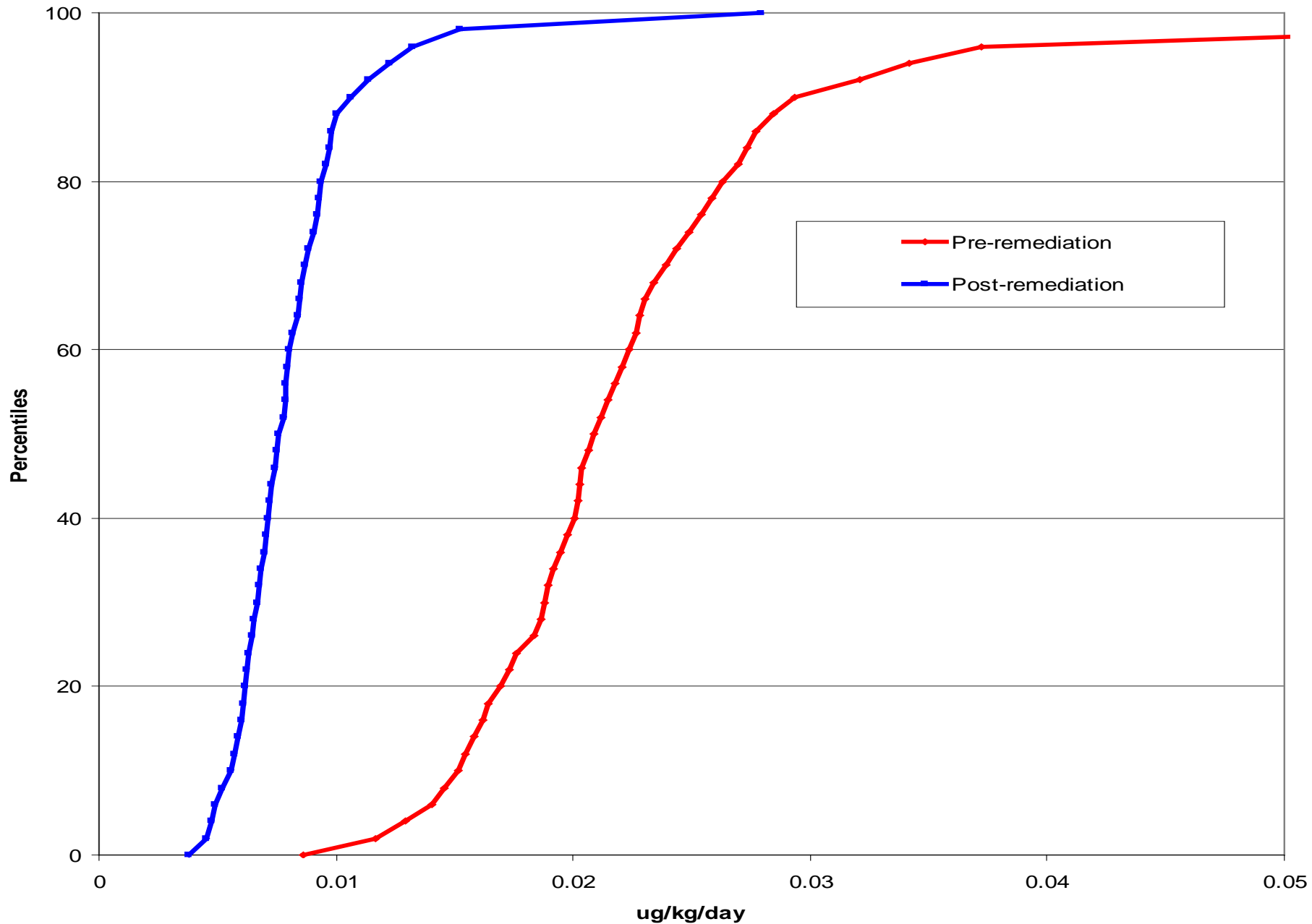
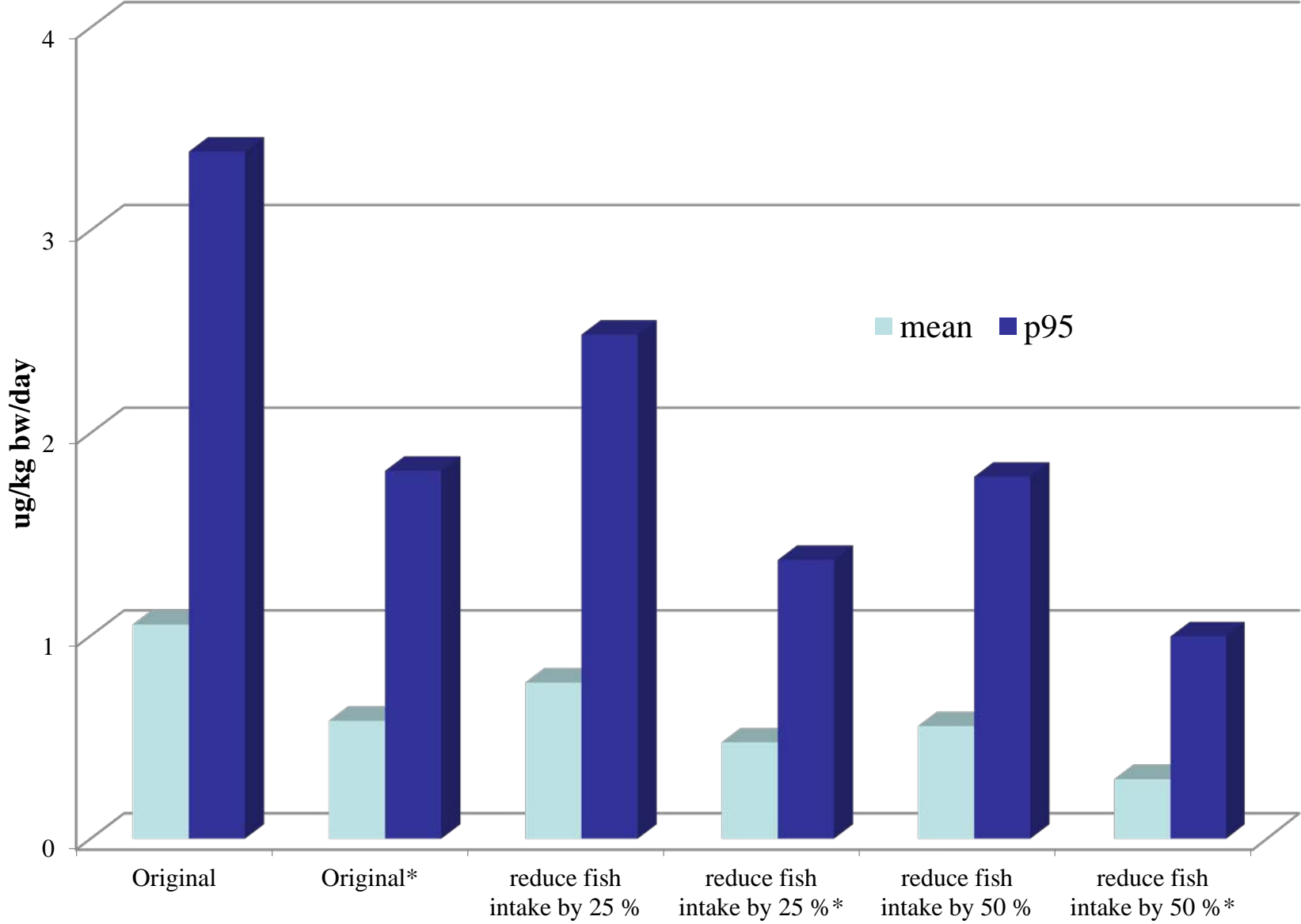
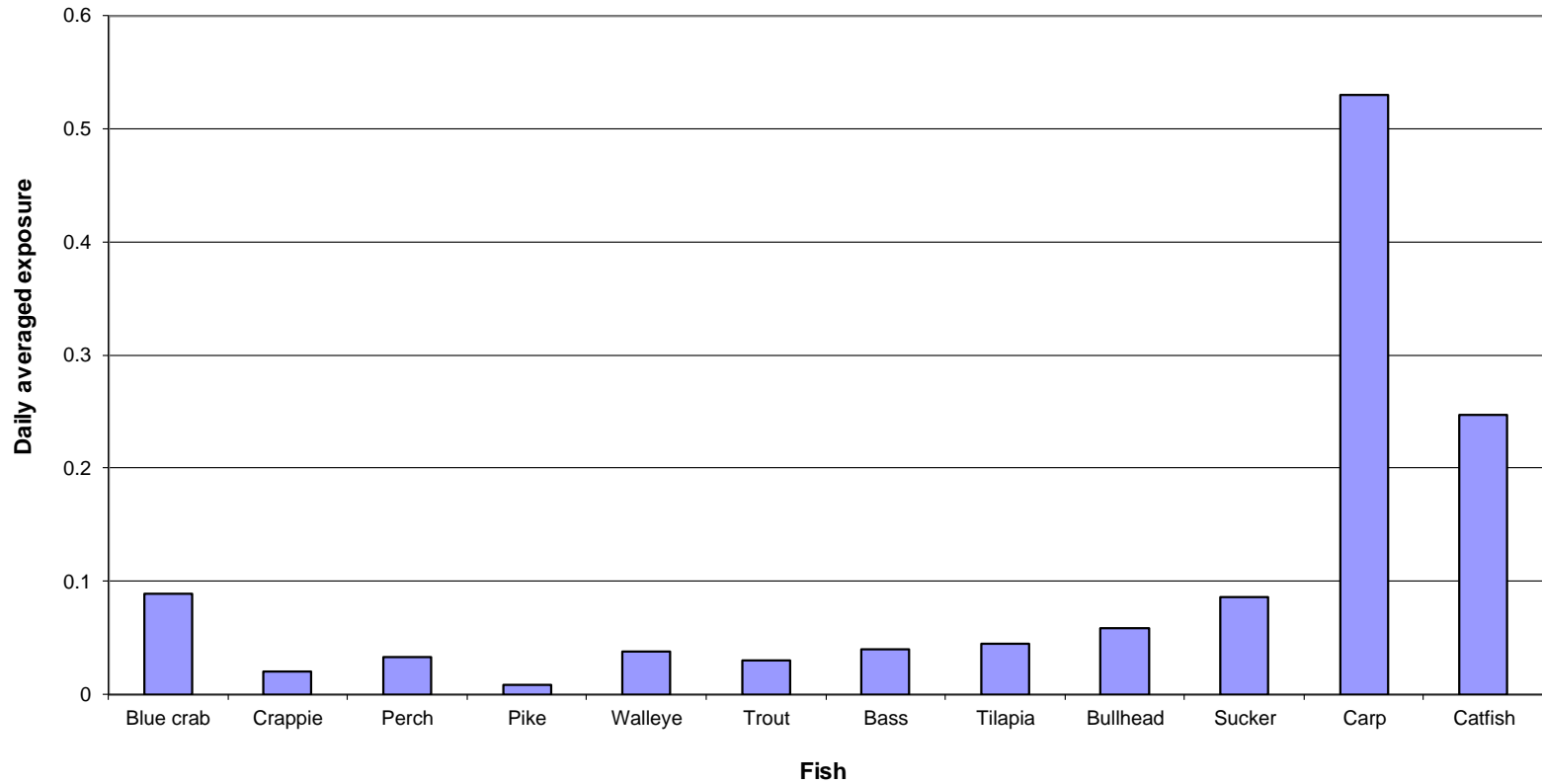


Figure 4



\*High-concentrated MeHg fishes such as bowfin and walleye are removed

### Averaged exposure of PCBs by fish (ug/kg bw/day) for Tribal population



Simulation with averaged fish intake and distribution of various fish PCB concentration

# Conclusions

- Fish consumption rate of tribal populations about 3-5 times of US general population
- Exposure of PCBs and MeHg of tribal populations is 3 times of US general population
- Biomarkers of MeHgs in tribal pop'n is about 3 times of US general pop'n
- Fish intake could be main pathway of MeHg exposure
- Avoiding eating carp and cat fish could reduce PCBs dietary exposure, shark and sword fish and other fishes can reduce the exposure of MeHg



# Future analyses

- Detailed fish consumption data focus on fish species
- Cost-benefit analyses on fish consumption
- Holistic assessment of cumulative risks for tribal population