Hair mercury level of residents in interior communities of Guyana

C La Fleur[1], R Couture[2], S Gordon[1], J Osborne[1],

C Mc Almont[1]

[1]Ministry of Health, [2]Natural Resources Canada

Introduction

Introduction

- Mercury is widely distributed & persistent in the environment
- High levels of Hg cause permanent neurological & kidney impairment
- Exposure of pregnant women to Hg hazardous to the foetus
- Hg levels in humans measured in blood, urine or hair

Introduction

- Hair Hg good marker for serum Hg levels and of Hg toxicity
- Mean hair Hg of healthy adults 0.4-6.5 μg/g
- In pregnant women toxic effects on foetus occurs at maternal hair Hg of 10-20 μg/g
- Hair Hg levels associated with neurological damage in adults > 50 μg/g

Introduction

- Widespread Hg use in gold mining in Guyana
- Studies done in neighbouring countries have shown high hair Hg content in residents of mining communities
- Recent Guyanese studies suggest mining might be contributing to elevated Hg levels among indigenous people

Methodology

- Study type:- Cross sectional
- Objectives of the study:-
  - To determine the hair Hg content in residents of interior communities
  - To determine risk factors for high Hg levels

Methodology

- Selection of communities based on mining practices:- gold mining and non-mining
- Recruitment of study participants:-
  - Participation was voluntary
  - Informed consent sought from participants for hair samples
  - Questionnaires to gather risk factor information applied by researchers

Methodology

- Hair samples taken, labelled and stored in plastic sampling bags
- Samples transported to Canada for Hg determination

Methodology

- Data management
  - Electronic database developed (SPSS version 10 for Windows)
  - Description of sociodemographic characteristics of participants
  - Mean hair Hg content of all participants

Methodology

- Data management con't
  - Description of hair Hg content by epidemiological characteristics using Students t-test for determination of statistical significance:-
    - Gender
    - Age group
    - Permanent residence (interior vs coastland)
    - Ethnicity
    - Region & Community
    - Duration of time in community
    - Main source of protein

Results

Communities visited and # of samples taken:-

- 108 samples taken in 8 communities
- Region 1
  - Eyelash 5
- Region 7
  - Kurupung 19
  - Paruima 18
  - Isseneru 8
- Region 8
  - Mahdia 11
  - Tumatumari 16
  - Micobie 15
- Region 9
  - Gunns 16

Results

Sociodemographic characteristics of the sample population

- Gender
  - Females 58.3 % (63)
  - Male 41.7 % (45)
- Ethnicity
  - Amerindians 70.1 % (75)
  - Mixed 15.0 % (16)
  - AfroGuyanese 11.2 % (12)
  - IndoGuyanese 3.7 % (4)
- Permanent residence
  - Interior 85.2 % (92)
  - Coast 14.8 % (16)

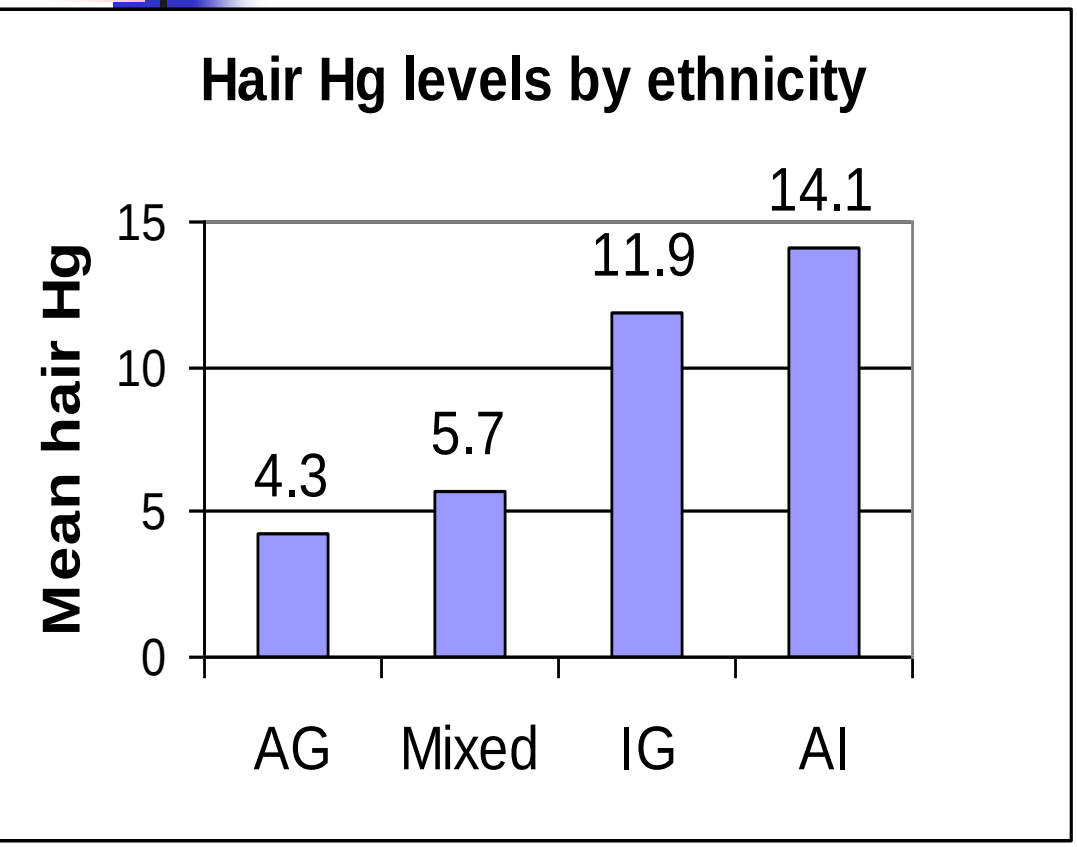
Results

- Hair Hg content for all participants (n=108)
  - Mean 11.6 μg/g
  - Minimum 0.5 μg/g
  - Maximum 35.8 μg/g
- 46.3 % had mean hair Hg levels > 10 μg/g
  - 47.6 % of women

Results

Gender	Mean Hg level	p-value
Male	12.4 μg/g	ns
Female	11.0 μg/g	-
Age group		
13-19	13.1 μg/g	-
20-45	10.2 μg/g	ns
46-76	14.2 μg/g	ns
Permanent residence		
Interior	12.4 μg/g	0.005
Coast	6.5 μg/g	-

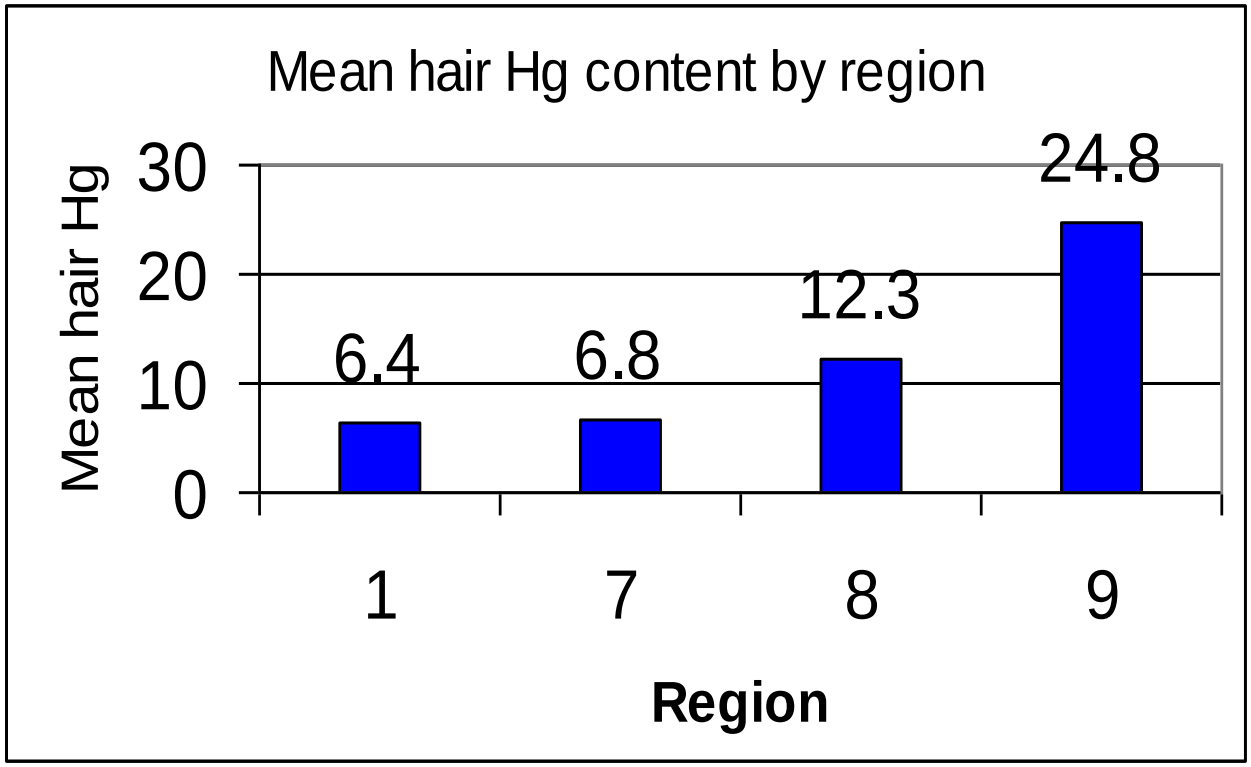
Results



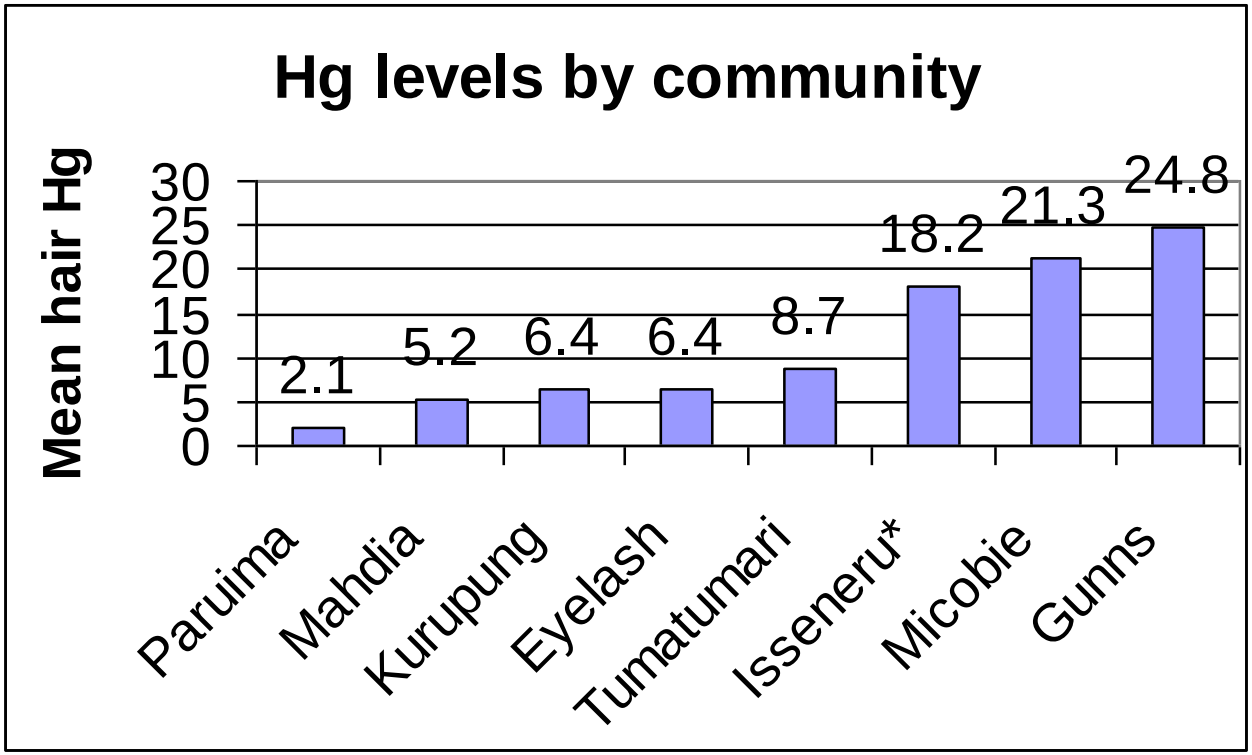
Hg of Amerindians
>Afroguyanese
& persons of mixed descent
(p value < 0.05)

<u>Amerindians 15 & 10 times more likely to have Hg>10 μg/g than Afroguyanese</u>
(OR 15.6 95 % CI 1.9-127.5)
& persons of mixed race
(OR 9.9 95 % CI 2.1-47.6)

Results

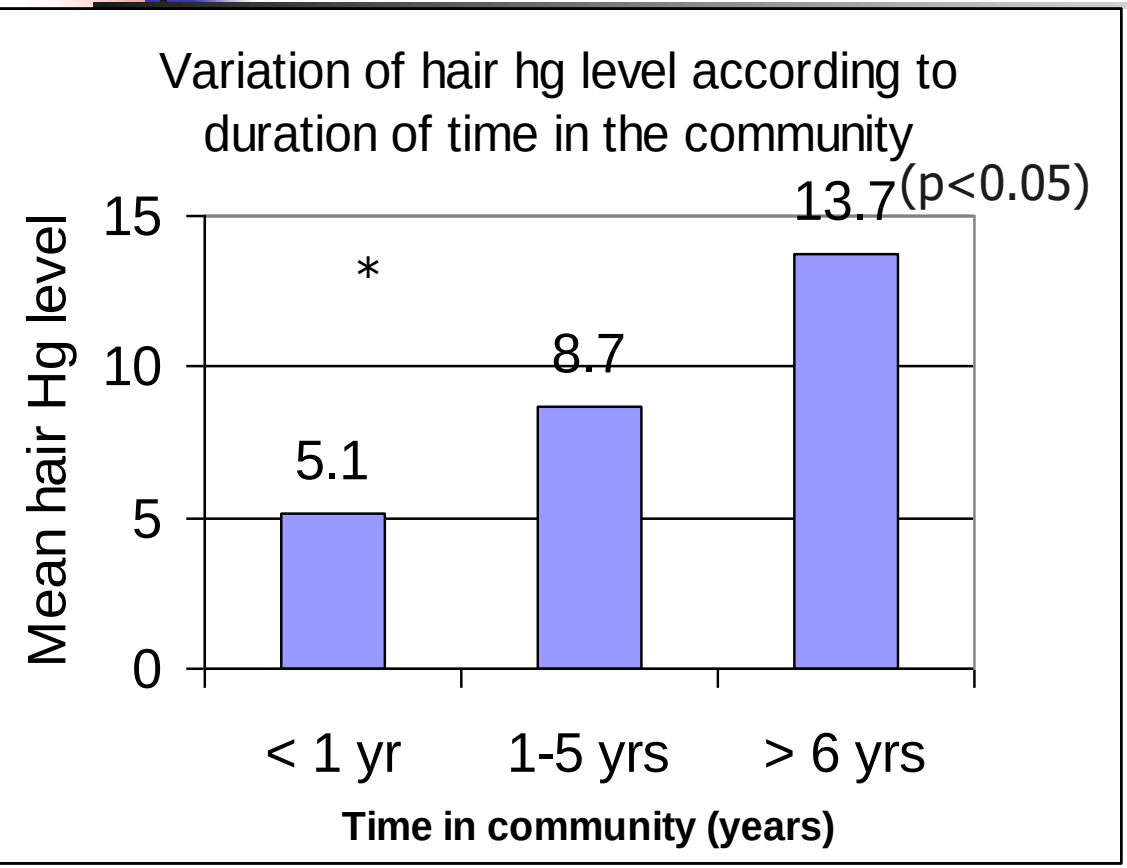

Mean hair Hg content by region
Mean hair Hg
30
20
10
0
6.4
6.8
12.3
24.8
1
7
8
9
Region

Results



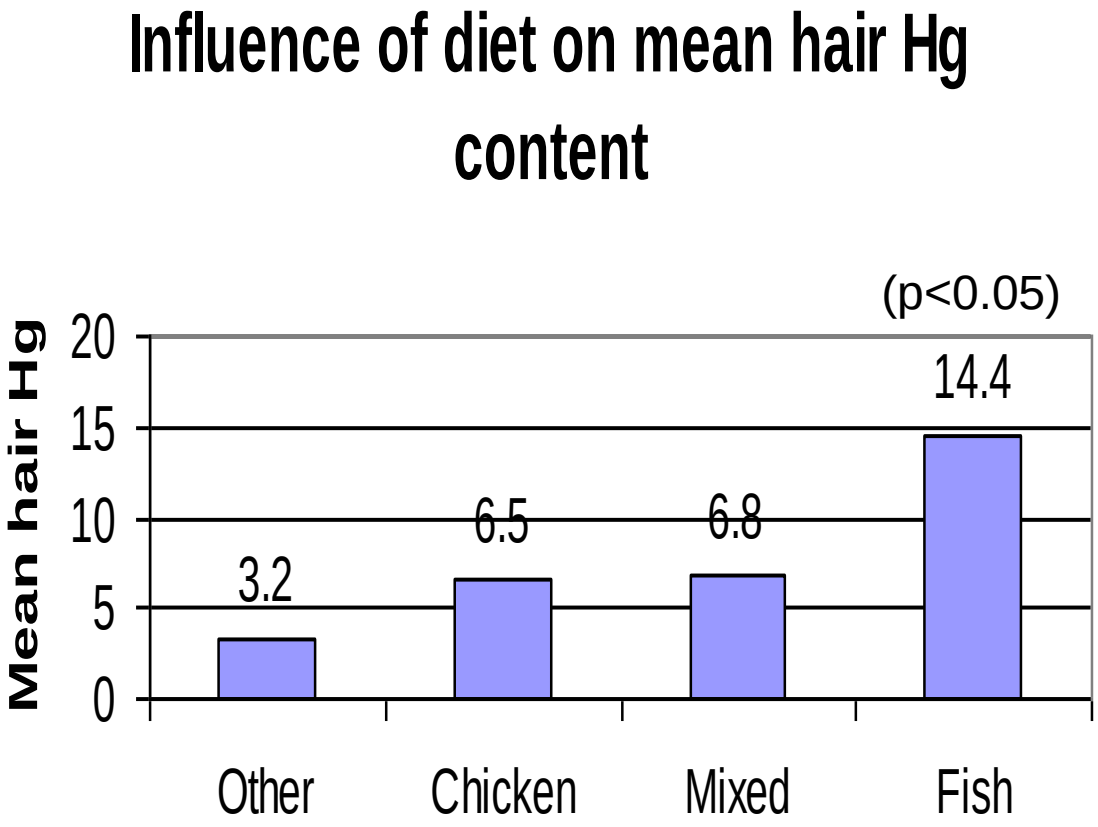
Mean hair Hg Paruima significantly < other communities ($p < 0.05$)
Mean hair Hg Gunns > others except Iss & Micobie ($p<0.05$)

Results



Long term residents 7 times as likely to have Hg > 10 μg/g than newcomers
OR 7.4 95 % CI 2.0-27.6

Results



Persons whose main source of protein was fish 6 times as likely to have Hg>10 μg/g in comparison to those who consumed chicken (OR 6.1 95 % CI 1.9-20.0)

Conclusion

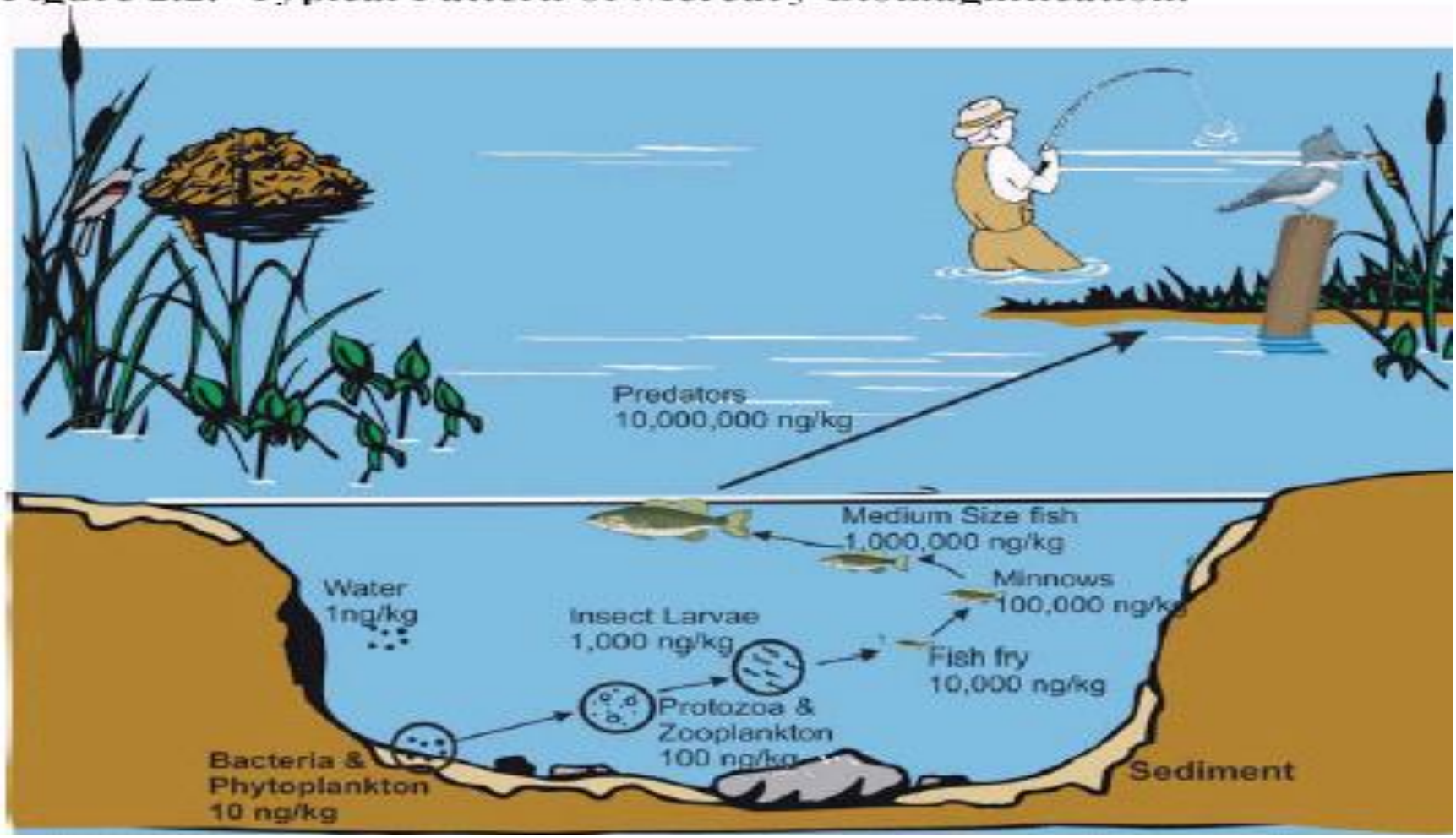
- Mean hair Hg content significantly higher among residents of:
  - Isseneru, Micobie and Gunns when compared to other communities
  - Amerindian ethnicity as compared to other ethnic groups

Conclusion

- Mean hair Hg content significantly higher among long term residents when compared to newcomers
- Diet was the most important determinant of elevated hair Hg levels
  - Persons with high dietary intake of fish were significantly more likely to have high hair Hg levels

Pathway of Hg in the environment

Figure 2.2. Typical Pattern of Mercury Biomagnification.



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