

Institut de recherche
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Mercury exposure and lifestyle of native Amerindian communities living along the Beni River

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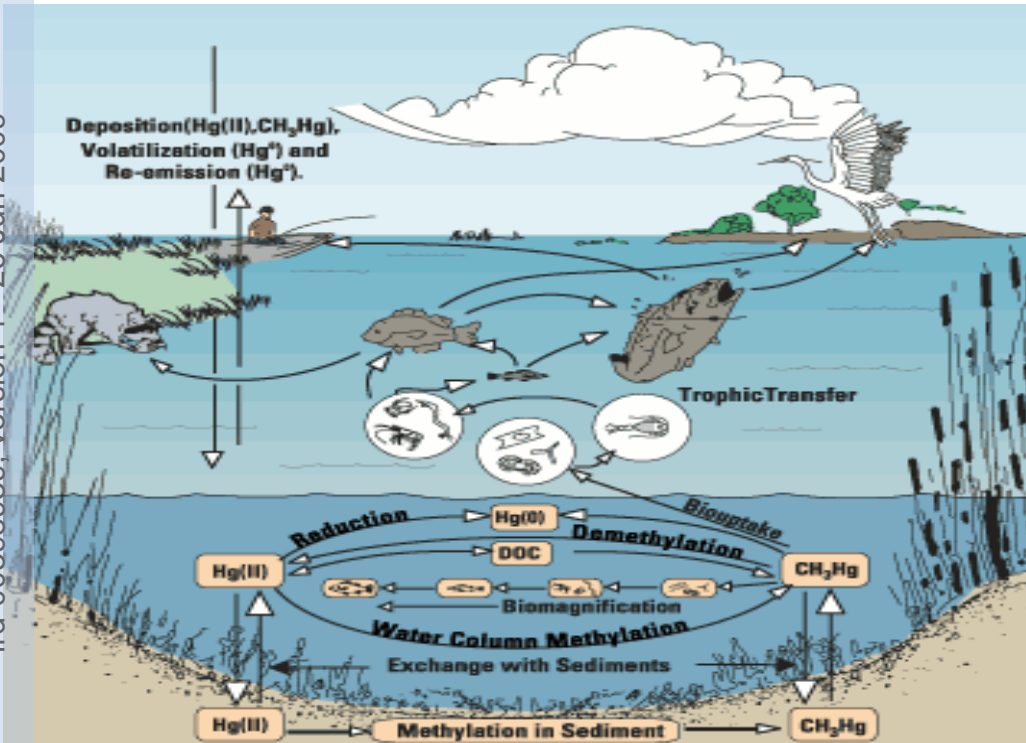
Context: Gold mining activity in the foot hill of the Andes

According to L Maurice Bourgoïn (2000):

- Extraction of 5 ~10 kg gold/month
 - Use of 250 ~ 500 kg / year of mercury
 - 50 ~ 70 % released into the environment



Background: communities contaminated through fish ingestion



Bio concentration along the aquatic food chain

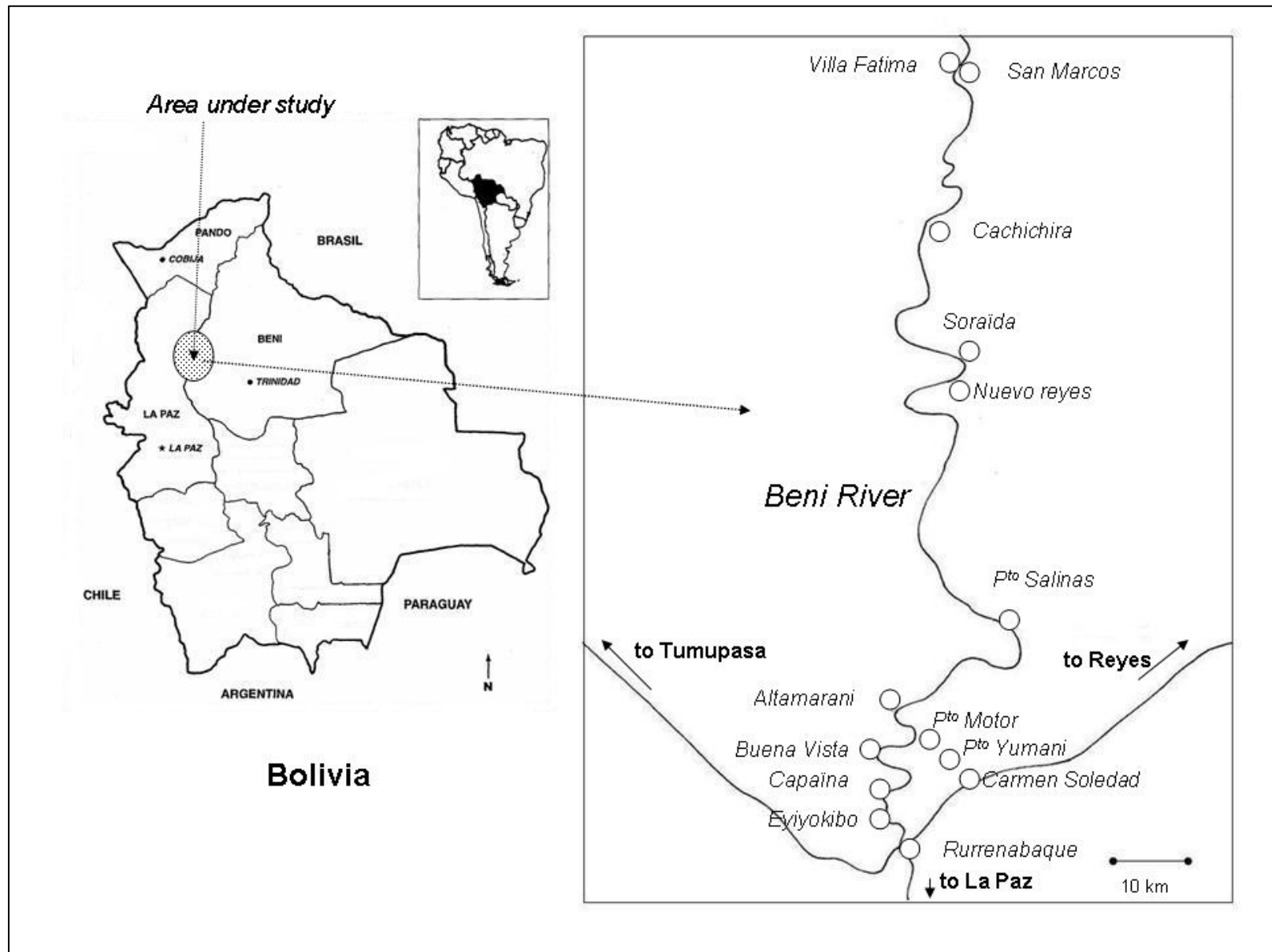
Objectives of the study

- To document mercury contamination in riverside communities
- To examine associated risk factors risk factors
(importance of fish consumption)
- To analyze possible interaction with the nutritional status of that communities

Study context



Study area



Subjects and sampling



- Study area: Beni flood plain
- 14000 inhabitants
 - 4000 along the riverside
- 173 mothers and 458 children (<15 yo)
- Ethical clearance

Field procedures



- Informed consent
- Dietary survey



Clinical examination



Anthropometry



Iron deficiency anemia



Parasitological examination



Hair strand cut 8

Mercury content analysis

Rinsing: EDTA 0,01%
and H₂O Milli Q

Weighing

Mineralization



Measurement with atomic absorption
spectrometry (PERKIN ELMER 3110)

End of digestion

Digestion



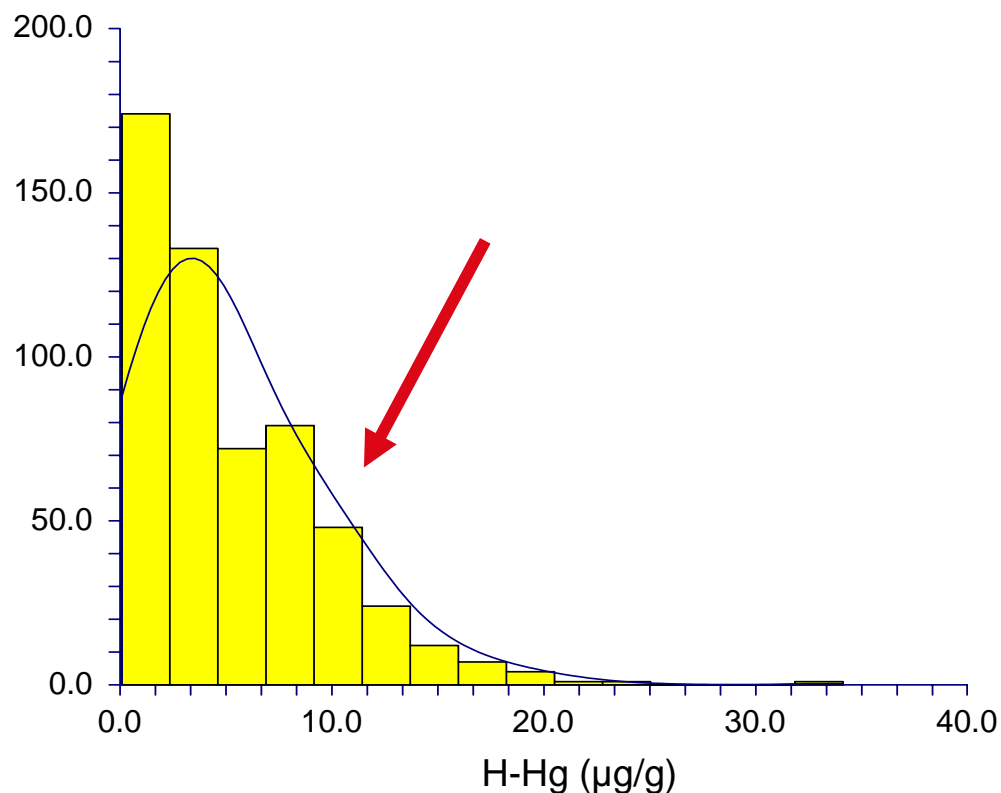
Results

Health characteristics: general

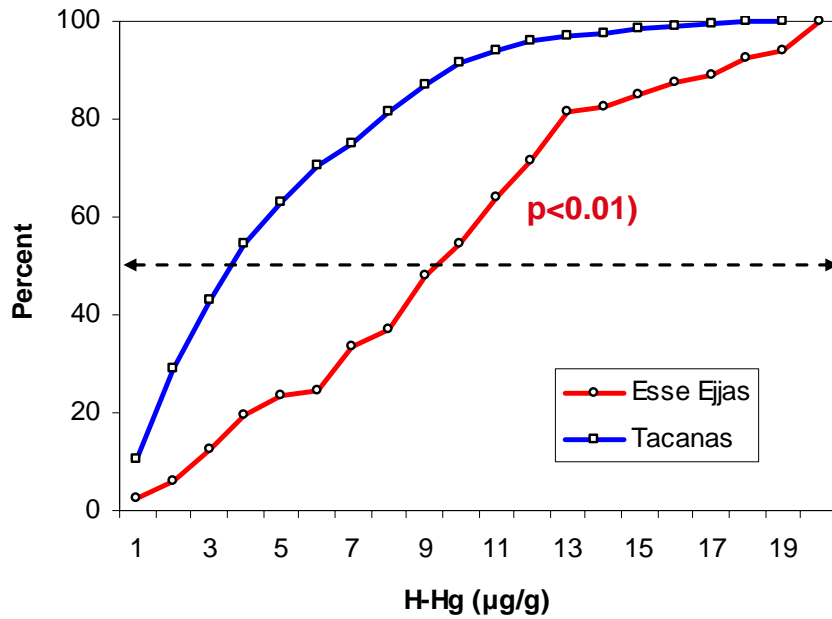
- 70% of mothers gave birth without medical assistance
- High mortality rate
- Anemia prevalence (women): 42 %
- Chronic malnutrition (preschoolers): 41%
- Intestinal parasitism (children): 85%
- Acute infections: 30%

Hair mercury content H-Hg ($\mu\text{g/g}$)

Group	Median (IC _{95%})
Overall sample (n=556)	4.0 (3.6 ~4.4)
Children (n=393)	3.9 (3.4 ~4.4)
Mothers (n=163)	4.4 (3.5 ~5.4)
Pregnant (n=18)	3.3 (1.3 ~3.9)
Lactating (n=57)	5.5 (4.4 ~6.4)
Non-pregnant non-lactating women (n=93)	4.1 (3.0 ~5.4)



H-Hg and community characteristics (1)

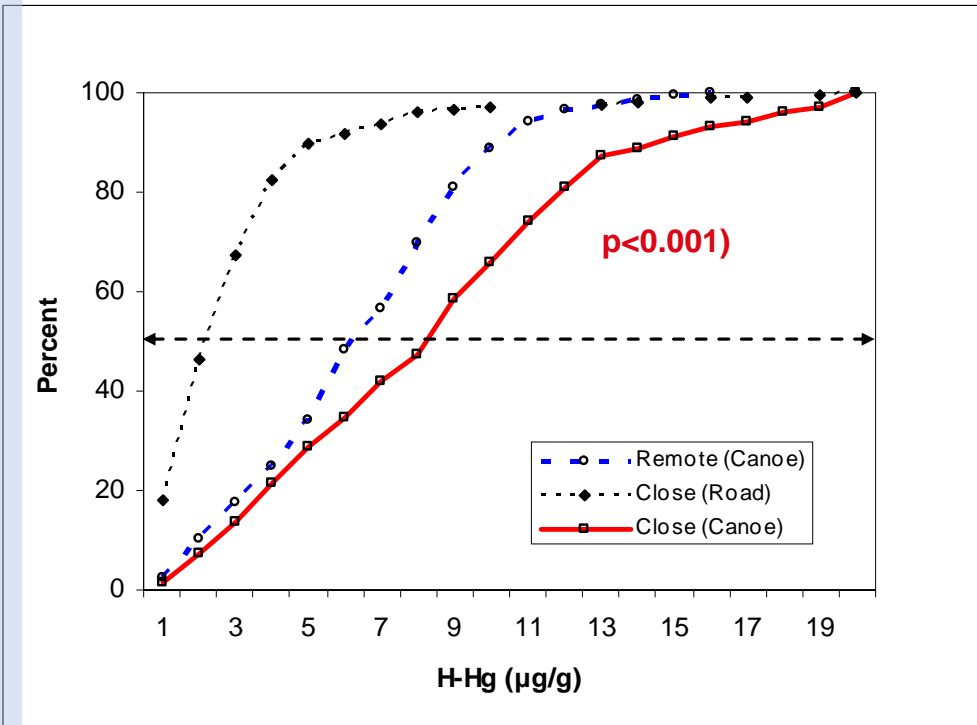


Cumulative distribution of H-Hg according to ethnicity



H-Hg and community characteristics (2)

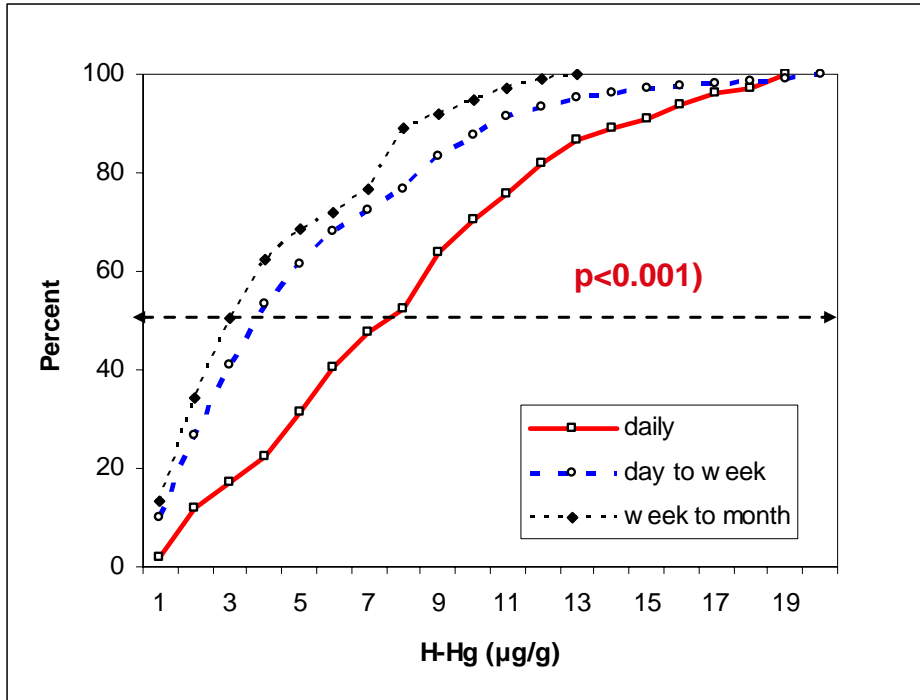
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Cumulative distribution of H-Hg according to village accessibility



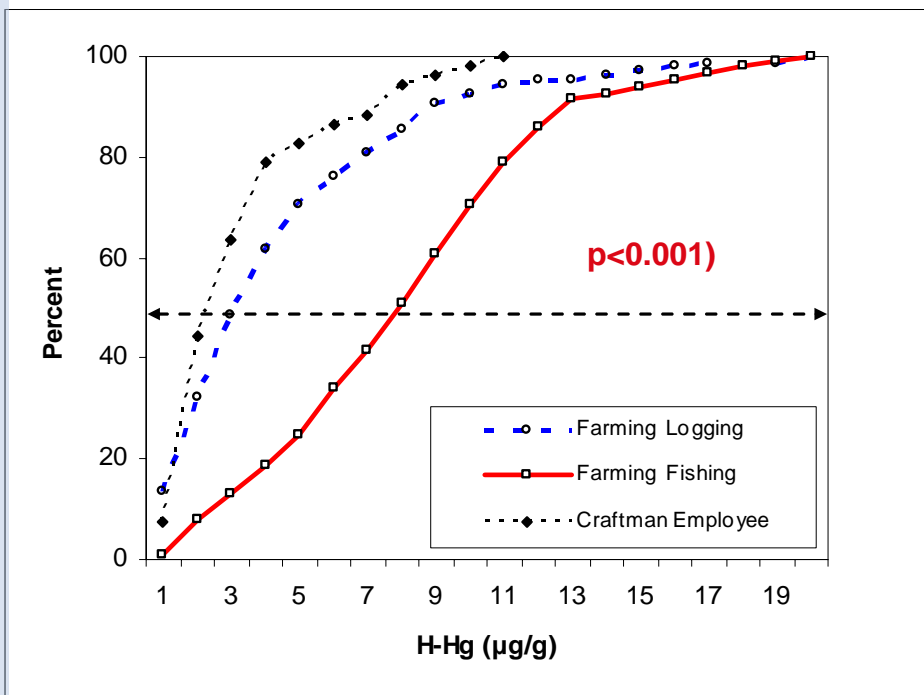
H-Hg and community characteristics (3)



Cumulative distribution of H-Hg according to fish consumption



H-Hg and community characteristics (4)



Cumulative distribution of H-Hg according to economic activity

Multivariate analysis

- Village accessibility
 - Fish consumption
- } ***Significant predictive effect***

- Ethnicity
 - Subsistence activity
- } ***No significant effect***

Significant interactions between:

- ***Accessibility * Fish consumption***
- ***Subsistence * Fish consumption***

Nature of fish consumed

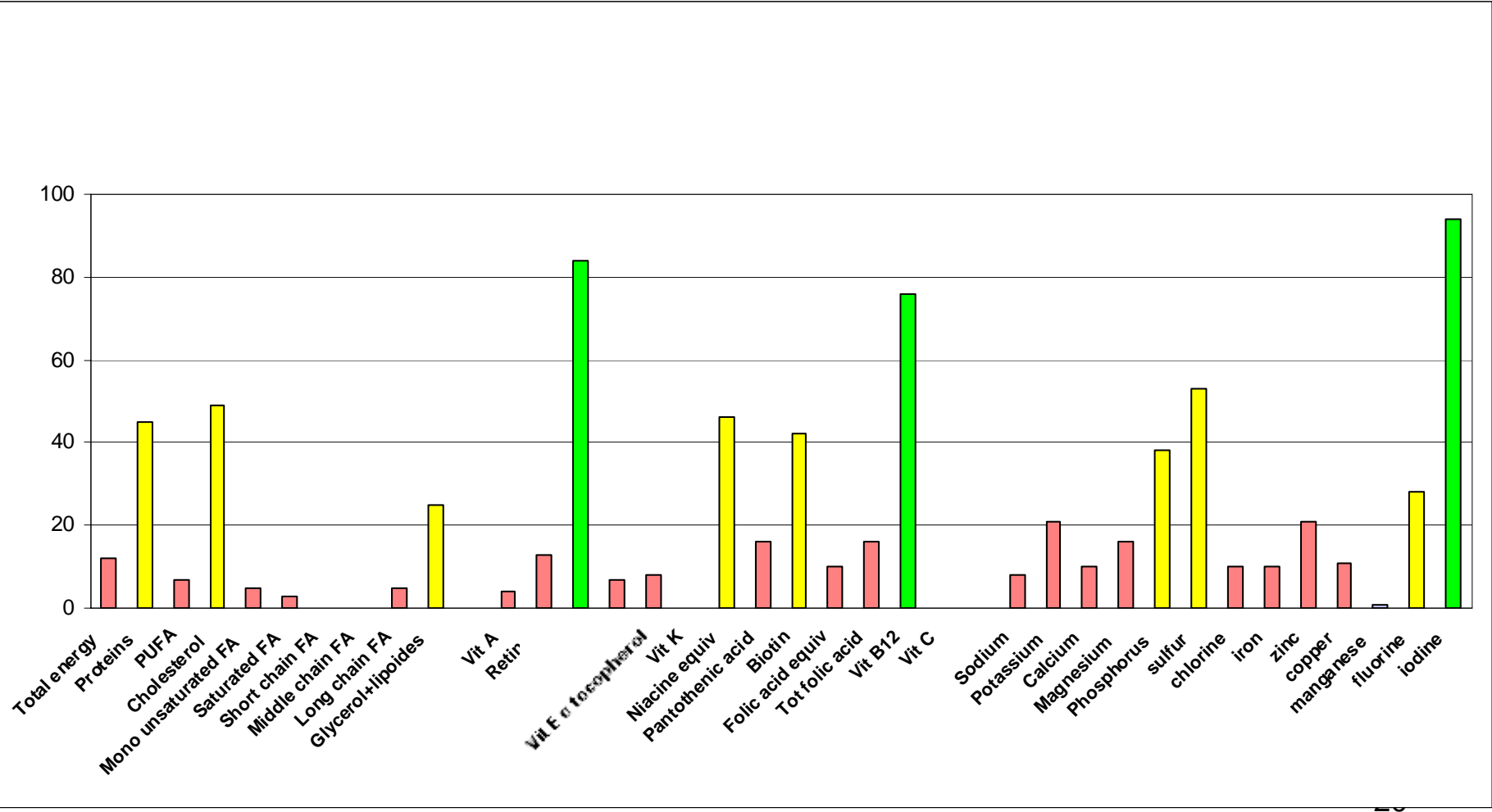
Scientific name	Common name	Feeding Behavior	Consumption (%)
<i>Prochilodus nigricans</i>	Sábalo	herbivorous	43.5
<i>Leiarius marcocatus</i>	Tujuno	piscivorous	11.7
<i>Colossoma brachypomum</i>	Pacú		9.1
<i>Pseudoplatystoma fasciatum</i>	Pintado		9.1
<i>Astronotus ocellatus</i> o <i>Pygocentrus nattereni</i>	Palometa	carnivorous	6.4
<i>Schizodon fasciatum</i>	Ruta		3.9
<i>Plagioscion squamosissimus</i>	Curbina		3.9
<i>Mylossoma duriventre</i>	Jatara		2.6
<i>Brachyplatystoma filamentosum</i>	Dorado		1.9
<i>Hoplias malabaricus</i>	Benton		1.9
<i>Pimelodus maculatus blochii</i>	Griso	omnivorous	1.3
<i>Serubim lima</i>	Tahuaya		1.2
<i>Hoplerythrinus unitaeniatus</i>	Yayu		0.7
<i>Brycom s.p.</i>	Mamuri		0.7
<i>Triplostheus sp</i> o <i>Markiana nigripinis</i>	Sardina		0.7
<i>Serrasalmus spp</i>	Piraña		0.7
<i>Pseudoplatystoma tigrinum</i>	Surubí		0.7

Fish consumed

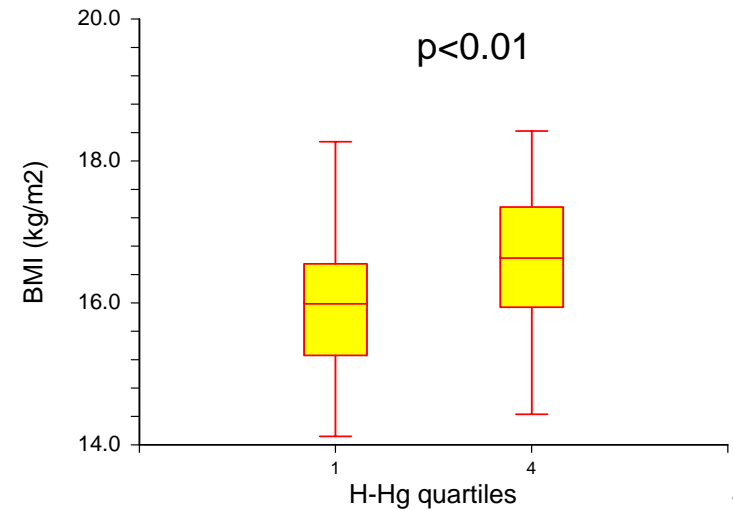
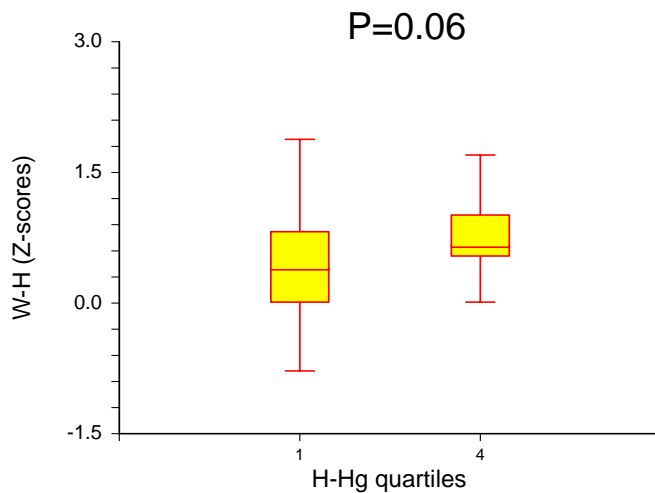
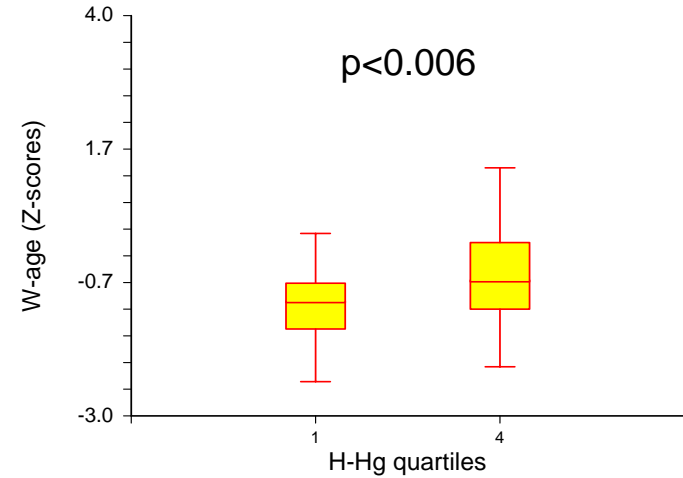
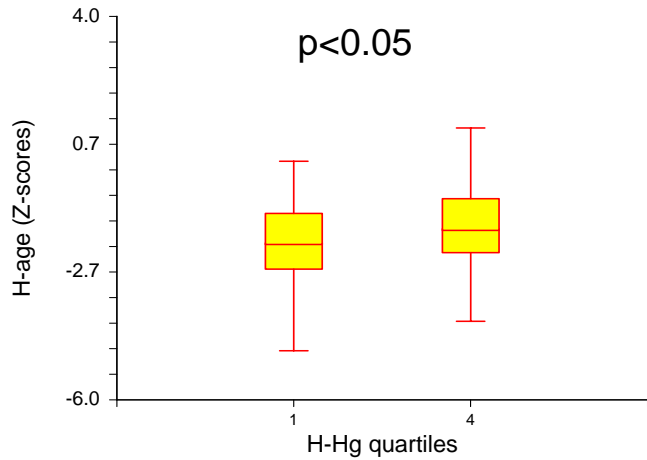
- 63% herbivorous and omnivorous
- 37% piscivorous and carnivorous
- No differences between ethnic groups but
- **Remote communities consumed significantly more carnivorous fish than the others**

Nutritional importance of fish: percent of energy and nutrients provided by fish

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Relationships between H-Hg and anthropometric indices in 5-10-year-old children



Conclusions

1) Mercury exposure

- H-Hg seems relatively low by comparison with other Amazonian areas (ex Tapajos basin): 86% of subjects < 10 µg/g
- But greater exposure of “traditional” and more vulnerable groups of population
 - Isolated
 - Less access to health and schooling facilities
 - Higher consumption of contaminated fish

2) Fish consumption

- Important for the nutritional balance of the diet
 - Macro nutrients (proteins) vitamins and micronutrients (iodine, sulfur...)
- Isolated groups consumed more carnivorous (i.e. Hg contaminated) fish than the others

3) Nutritional status

- H-Hg acts as a bio-indicator of fish consumption
- Positive effect on nutritional indices of school age children
 - Fish consumption is the intermediate link
- Public health: Does the advantage of a fish based diet overcome the risk of Hg poisoning?

Recommendations

- Mercury will not disappear and will continue to bio accumulate unless severe law enforcement is applied
- Fish consumption is very important for certain groups of population
- Advice aiming at reducing consumption of harmful fish should be cautious
- A regular assessment of the Hg content of the most frequently consumed species is required

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