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MERCURY EXPOSURE SCENARIOS IN RIPARIAN COMMUNITIES IN THE MADEIRA RIVER IN THE WESTERN BRAZILIAN AMAZON

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Subsistence communities living along the banks of the Amazonian Rivers depend heavily on fish as the main protein source in their diet. Because of their heavy dependence on fish, Amazonian riparian women and their children are exposed to high levels of Me Hg. A hydroelectrical power plant will start to operate in the Madeira river in the end of 2011 and probably some changes are expected to occur in the ecosystem dynamic nest years, and increase the bioavailability of Hg in the food chain. The present study addresses the mercury exposure scenarios in riparian Madeira communities before the hydroelectrical power plant floods the areas downstream of Madeira river.

Methods

The hydroelectrical power plant is located approximately 10 km from the capital of the state of Rondônia, Brazil. It has a population of 382,830 inhabitants. The reservoir will have an area of 271 km², with a capacity of 3,150 MW. The Madeira river, the second largest and the main tributary river in the Amazon, is one of the great rivers of sediment load in the world. Its basin covers an area of 1.5 million km2 and about one fourth of the Brazilian Amazon (Garcia, 2008).

A longitudinal study was conducted covering 400 households and 460 individuals in different communities and 300 kilometers of the banks of Madeira river (Figure. 1) An extensive socioeconomic survey was conducted with the communities, including questions about their diet, cultural habits, exposure status and the self perception about their health. About 176 fish species were analyzed and 460 hair samples were analyzed by vapor atomic absorption. The

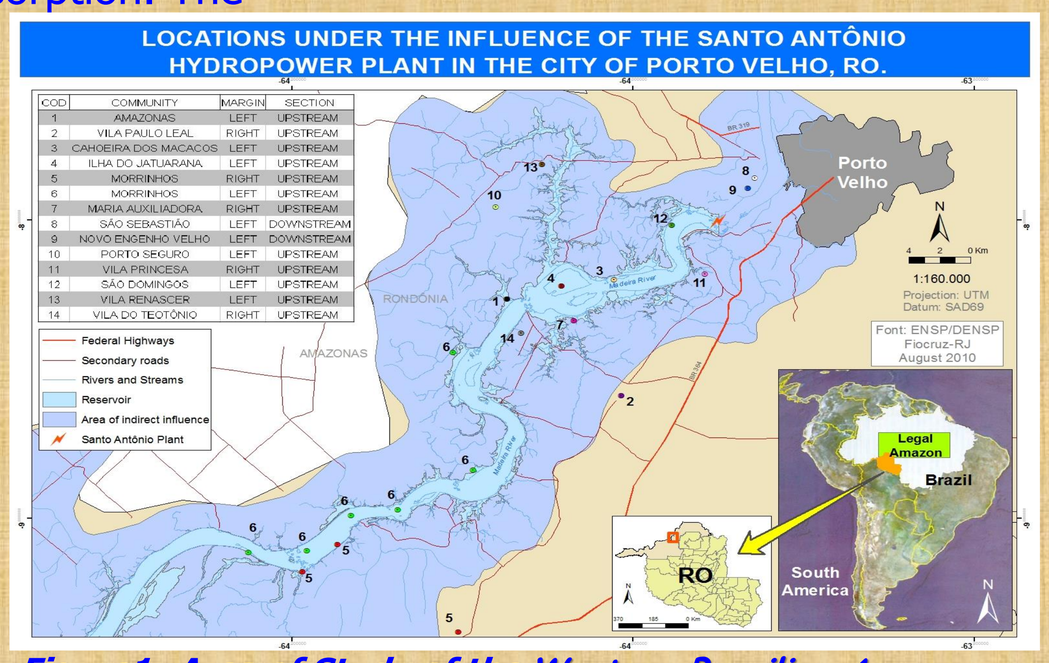
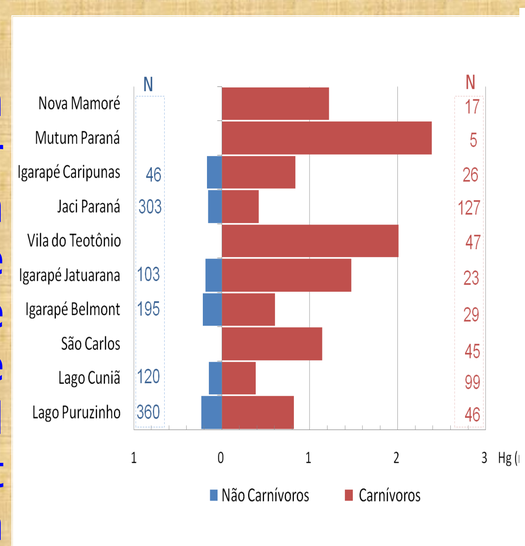


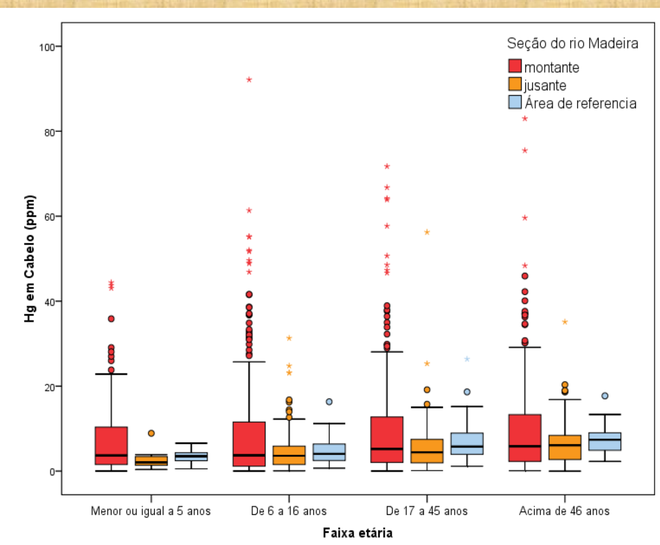
Figure1- Area of Study of the Western Brazilian Amazon.

Results

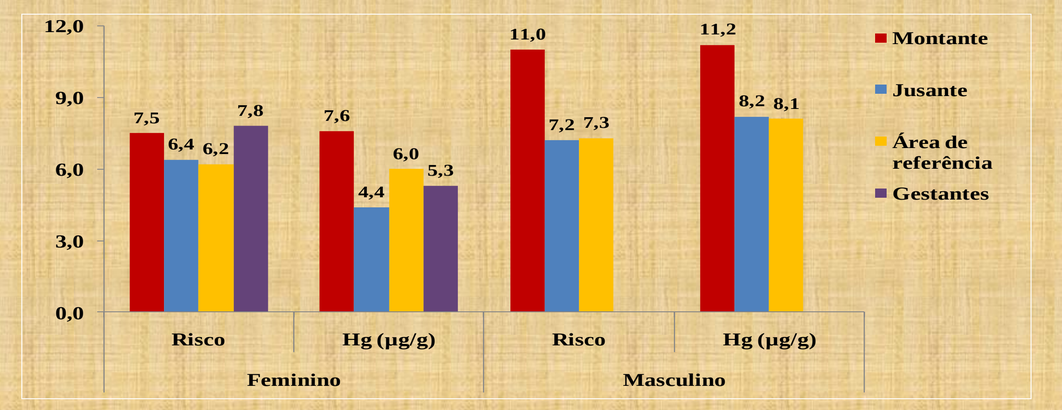
The study is being conducted on both banks of the Madeira River. In the left margin, some communities do not have energy, water supply, neither have access to health services, and some others services. The housing is rudimentary with no sanitation. Some communities are isolated with difficult access to urban area. The communities on the right bank have access to major social needs, but they do not have sanitation system and the access to the health services is very deficient.



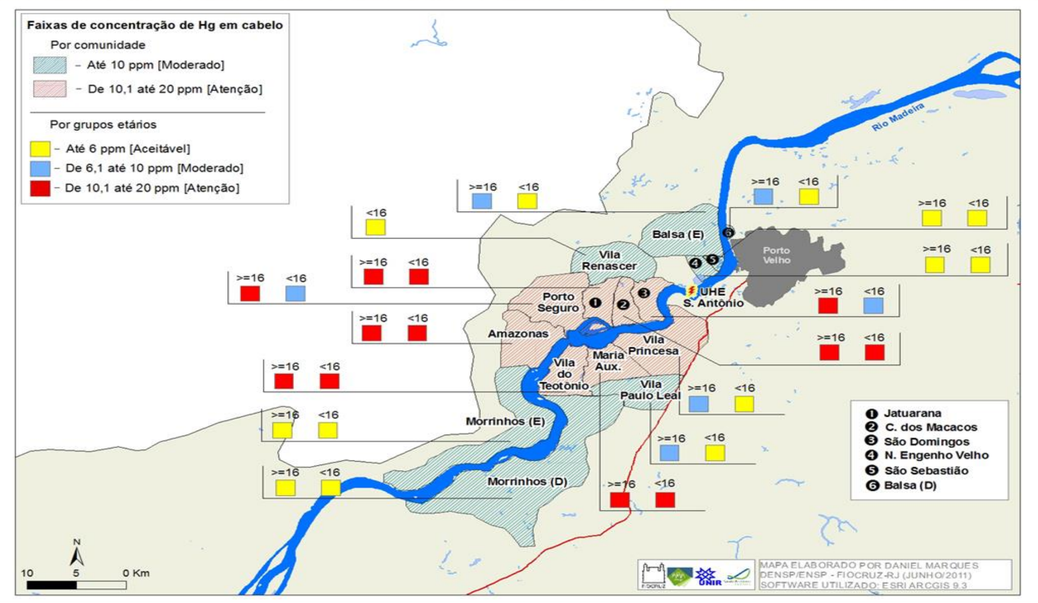
Mercury levels in fish more consumed by the riparian communities



Hair mercury levels in riparian communities.



Mercury exposure scenarios by gender and internal dose upstream and downstream in the Madeira river



Classification of risk to human health in the* riparian Madeira *communities

CONCLUSION

When comparing the results of mercury in hair from the different age groups with risk quotient by gender, including the pregnant women from the Madeira river communities, the prenatal groups presented the highest risk quotient 7.8. There is no difference between Hg in hair and quotient risk for the male group. For female the results showed difference significant. Boys presented higher mercury concentrations than girls, probably due to the amount and type of fish Ingested. The multiple linear regression model showed adjusted R2 of 17.3% (R2 = 44%, F = 9.70 p = 0.000) and included the following variables: Exposure time (p = 0.007), fish consumption (p = 0.000), duration of breastfeeding (0.260), smoking during pregnancy (p = 0.001) timing for child to sit alone (p = 0.002), malaria (p =0.010); failure in school (p = 0.027), and difficulty walking (p=0.419) Hg exposure. The study show that there is an ample difference in mercury levels between the different communities groups, as well as inter-individual variations. The trophic level and the amount of fish species consumed, as well as MeHg concentrations in these fish, are relevant factors regarding the intake of mercury in these fish-eating groups. The seasonality of the region may also explain the variability of hair Hg levels in these riverside communities and the linear relationship between fish consumption and Hg levels in hair.

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