Evaluating and Mitigating the Damaging Effects of Mercury-based Artisanal and Small-Scale Gold Mining in South America

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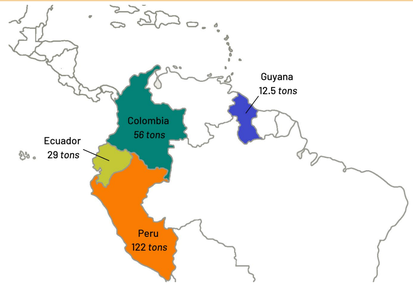
Artisanal and small-scale gold mining is the largest source of anthropogenic mercury

Millions of artisanal and small-scale gold miners (ASGM) use mercury (Hg) to extract gold from ore, generating Hg emissions and waste that threaten environments and public health. Our research team aims to evaluate and mitigate the damaging effects of mercury-based ASGM in Peru, Ecuador, Colombia, and Guyana.



Mining Expansion in the Ecuadorian Amazon

Environmental and Human Health monitoring of the Napo basin:

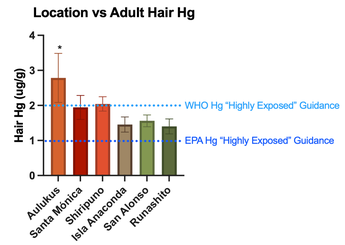
- Alluvial gold mining is rapidly expanding along the Napo river in the Ecuadorian Amazon.
- In July 2023, we partnered with the Indigenous Federation of Napo to monitor water quality and mercury contamination in the Napo river basin.

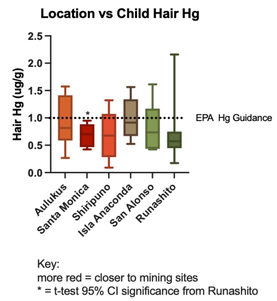
Active gold mining along the Napo river.

- Results illustrate that that mining jeopardizes water quality by increasing the amount of suspended sediment as well as mercury in the water relative to unaffected areas.

Photo: Rodrigo Abd (AP)

- In November, 2023, we collected hair, urine, and blood from 60 households across 10 communities along the Napo river; data entry and preliminary analysis began this spring.
- The data from cognitive development surveys conducted with children under 6 did not show significant correlation with hair mercury levels.

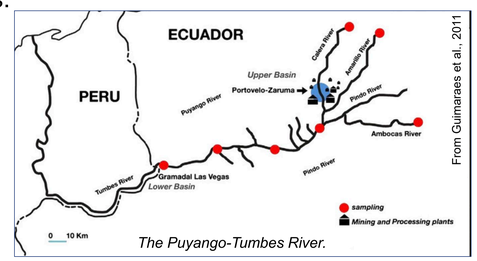




- Gold mining is relatively new to the Napo region which likely explains the containment of 'high exposure' hair mercury levels to locations near mining sites. Human health research emphasizes the current opportunity for preventative policy intervention to slow widespread mercury exposure and bioaccumulation trends.

Mining Upstream of Peruvian Agricultural Land

- The Puyango-Tumbes river drains the major Ecuadorian gold-mining hub, Portovelo then flows across the border into Peru where it provides irrigation water to the rice-growing region of Tumbes.



The Puyango-Tumbes River.

- Rice is particularly vulnerable to mercury contamination because low oxygen, carbon-rich environments like rice paddies are good environments for transforming inorganic mercury to a highly toxic and easily bioaccumulated form, methylmercury.

Rice grown with water from the Tumbes River

- We partnered with the Tumbes Global Health Center to determine extent of metals contamination as well as uptake in the river, irrigation water, as well as grains of rice.

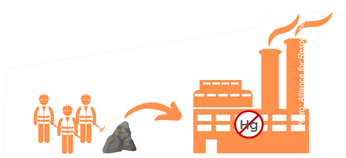
Economics & Policy Analysis

Formalization

- Formalization is the process by which ASGM organizations enter the formal economy. This oftentimes entails going through an onerous administrative process that is time-consuming, costly, and cognitively demanding. While formalization is a pre-requisite for mining groups to participate in ore-selling and certification (below), among other mercury solutions, it is not always designed in such a way that takes miners' preferences into account.
- We are conducting a discrete choice experiment in Colombia to elicit miner preferences for formalization design to inform a USAID program.

Ore-Selling

- We are researching the feasibility of substituting mercury use by allowing miners to sell raw ore to mercury-free processing plants. This policy solution requires new collaborations between artisanal miners and large-scale plants; to succeed ore-selling must be designed to foment trust within mining communities and convince miners that they will make higher profits.
- We have projects in Ecuador and Peru to understand the history of an ore-selling offer, elicit female artisanal miner preferences for ore-selling design, and evaluate the impact of ore-selling on miners' income and local development.



Certification

- On the supply side: we are comparing the approaches of several actors to explore which models of rewarding miners for improved environmental and social behavior will be most effective and most inclusive
- On the demand side: In a previous Bass project, we designed a survey to elicit the preferences of US consumers for certified gold, asking them what aspects of certification programs matter most.

Fairmined Eco Gold

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