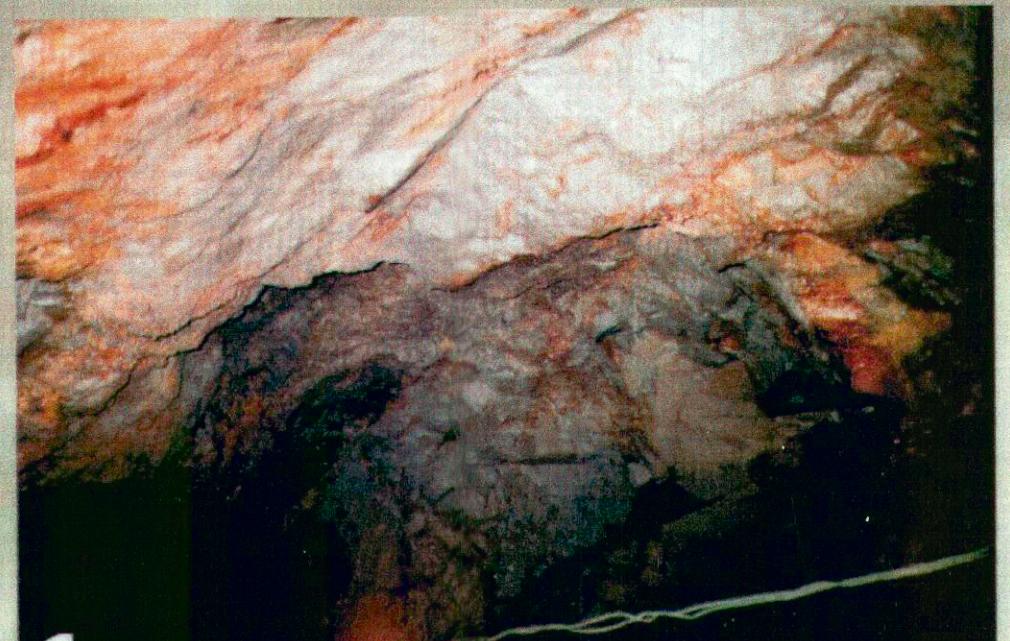


# PHIME: Public Health Impact of long-term, low level mixed element exposure in susceptible population strata.

## Integrated Project sponsored by the European Commission.



### WP I:8."Gene- environment interaction of elemental mercury"

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### The process of gold extraction in the mining areas in Ecuador.



The process to get gold in the mining areas in the South of Ecuador (El Oro , Azuay) is the following:

- 1) The gold is underground superficially. A tunnel is prepared to identify the gold in the stones.
- 2) The miners using some explosives must access to all the stripe of gold. They need to make some perforations to insert the dynamite that will explode and give them the stones with gold.
- 3) The stones are carried out of the tunnel and introduced in a Molino that grind it.
- 4) The sand produced in the Molino comes to some textiles where are washed and collected.
- 5) The very fine sand is then treated in a small bowl identifying the gold.
- 6) The sand with gold is combined with mercury and a ball comes with the amalgam.
- 7) The sand more thick is sent to a "chancha" or "chancadora" (mixing machine) where it is mixed with mercury and agitated. A combination of gold and mercury will come and converted in another ball.
- 8) Both balls are then burned to take out the mercury and to get only gold. This is the moment of a high exposure and it depends if they do that indoor or outside: anyway the exposure exists. The difference is also the frequency of burning the balls and the size of them.
- 9) Gold buyers burn the ball that miners want to sell, trying to take out some rest of mercury could be there and increase the weight and cost. They do that in small offices without ventilation and other protection devices.

### The Population



Workers in the mining areas are from different parts of Ecuador. Most of them are poor people that are looking for some income to survive. Commonly they are employed in small associations that belong to one owner. Sometimes they work independently.

They accept bad working conditions because they do not have other alternatives. They work under unsafe conditions and they need to work inside the tunnels but also outside in the associations but sometimes they combine it working independently an extra time trying to get some gold from the rest of the sand that due the primitive procedure remain there. They participate in the burning activities but it is not too frequent in the association. They burn their own amalgams obtained independently too, but the balls are small and it is not very often. Gold buyers are more frequently and highly exposed.

Miners have problems to bring their families because there are not schools for the children and life conditions are very difficult: no drinking water, no hygienic conditions, problems to get food, scarce transport, bad medical services when it exists. The isolated conditions of the miners lead them to a high alcohol consumption.

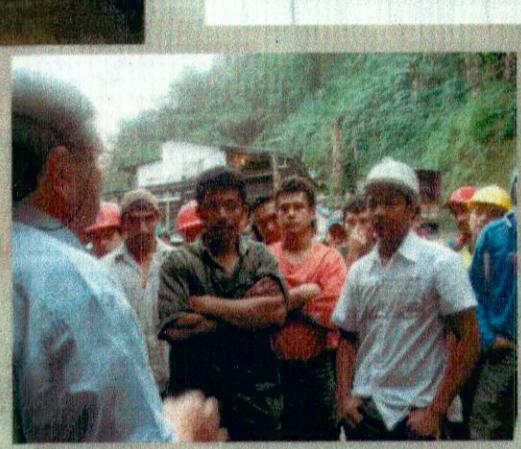
### The WP I:8 Project in PHIME



#### Blood Samples



#### Questionnaire



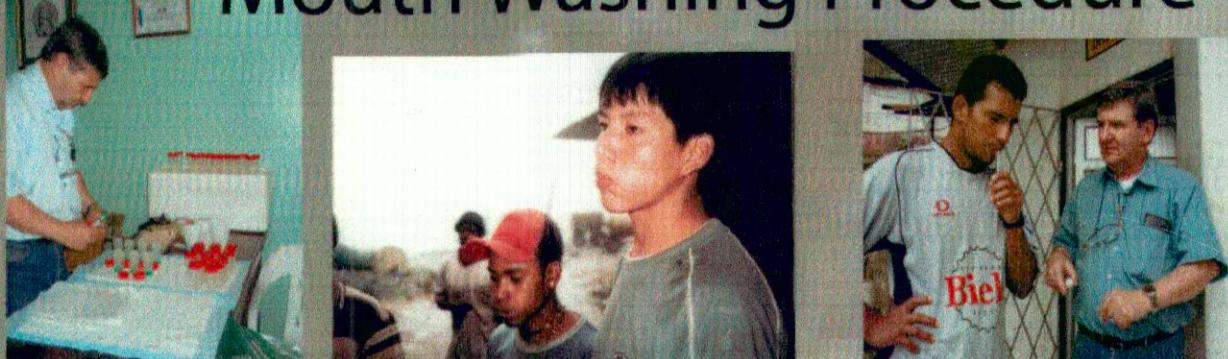
#### Urine Samples



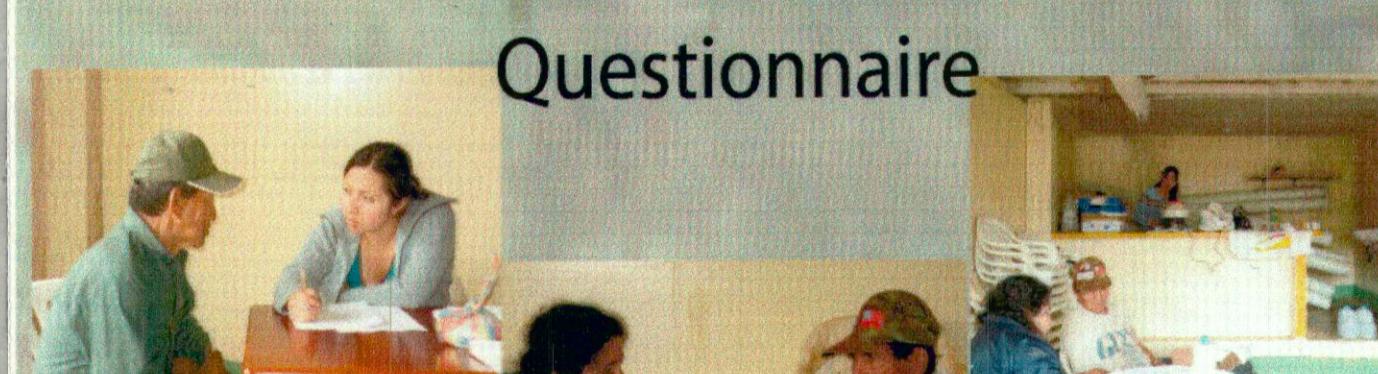
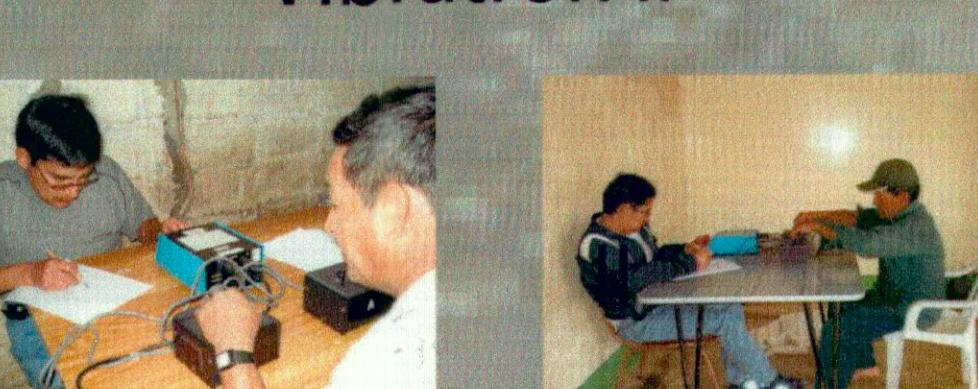
#### Catsys



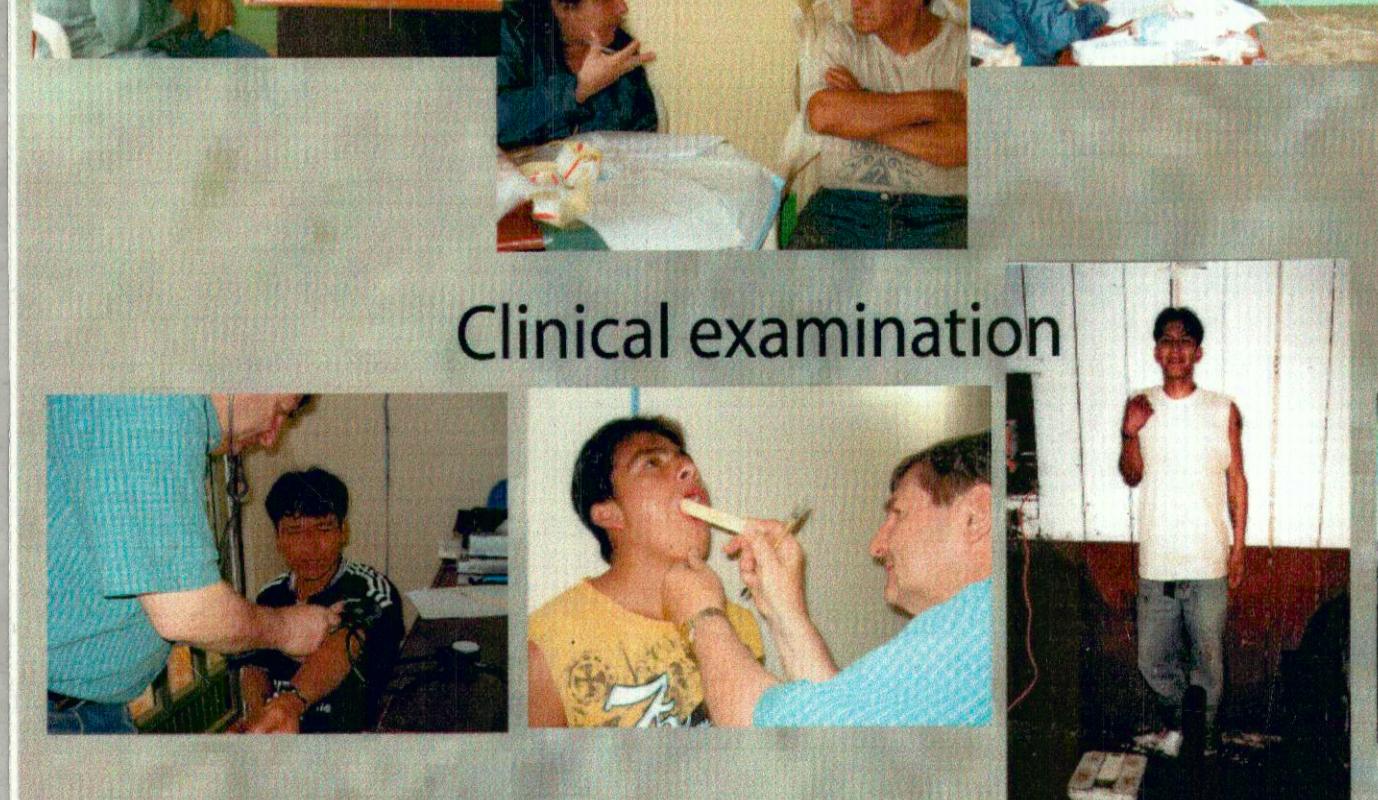
#### Mouth Washing Procedure



#### Vibratron II



#### Clinical examination



The project looks for the identification of elemental mercury exposure and neurological effects. Gene- environment interaction is studied to analyze the probably genetic influence in the mercurial metabolism. Markers of oxidative stress will be analysed.

Different tests are applied to get information:

- Questionnaire
- Clinical examination
- Blood and urine samples
- Mouth washing procedure
- Neurological tests for tremor, equilibrium, coordination and reaction time (CATSYS)
- A test for peripheral sensitivity (Vibratron II)

Information will be inserted in a data base and statistical analyses will be done. Results will be part of the general PHIME Project and results will be presented to the subjects participating in the study