# Mercury in Breast Milk – a Health Hazard for Infants in Gold Mining Areas?

Beate Lettmeier

Stephan Böse-O'Reilly

Gustav Drasch


# Background

**Small scale gold mining worldwide:**

- in more than 50 countries
- 10 - 15 million artisanal gold miners with 80 - 100 million people depending on this activity

**Resulting Production of gold:**

- 500 - 800 tons of gold/a
  (20-30% of the global gold production)

# Background

**Resulting Hg Pollution:**

- 650 - 1000 tons of mercury/a are released to the environment

→ Negative effect on the environment

→ Health hazard for gold miners and people living in mining areas, especially infants

# Research Questions

- How high is the Hg exposure of the nursed infant via breast milk from mothers, burdened with Hg vapor in small scale gold mining areas?
- Is breast milk a good bio marker to assess the exposure of a very sensitive population?

# Project Design

Health Assessment of 131 mother child pairs

Preconditions:

- Child is breastfed at least partially
- Child is aged between 3 and 9 months

# Evaluation of Data

**Mother:**

- Anamnestic data
- Clinical and neurological examination
- Neuro-psychological tests

**Child:**

- Anamnestic data
- Clinical and neurological examination

# Examination Mother

**Anamnestic data**

- Personal data
- Breastfeeding data
- Health data
- Work exposure
- Dietary issues (fish consumption etc.)
- Confounders (e.g. alcohol)

# Examination Mother

**Clinical and neurological Examination**

- **Mouth and teeth**
- Ataxia
- Tremor (e.g. Intentional T.)
- Dysmetria
- Dysdiadochokinesia
- Reflexes (e.g. bizeps reflex)
- Others (e.g. Bradykinesia)

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# Examination Mother

**Psycho neurological tests**

- **Matchbox test**
- Pencil tapping test

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- Matchbox test
- **Pencil tapping test**

# Examination Child

**Anamnestic data**

- Personal data
- Health data
- Dietary issues (additional food)
- Vaccinations

# Examination Child

## Clinical and neurological examination

- **Mouth and teeth**
- Motor development (WHO)
- Child's emotional state (WHO)
- MFDT (Munich Functional Development Test)
- Reflexes
- Medical checkup

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# Bio monitors collected

**Mother:**

- Breastmilk
- Urine (spontaneous)
- Hair

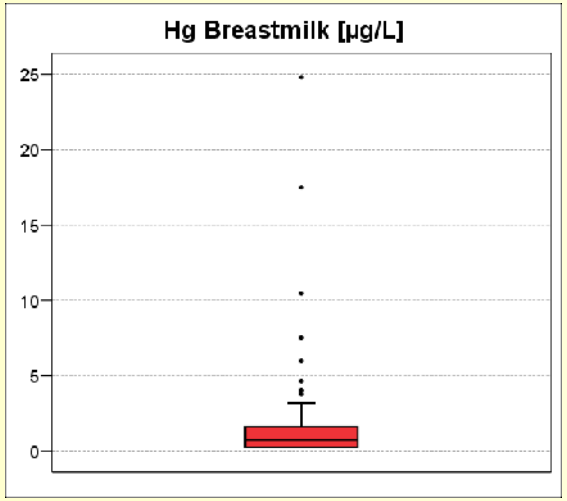
**Child:**

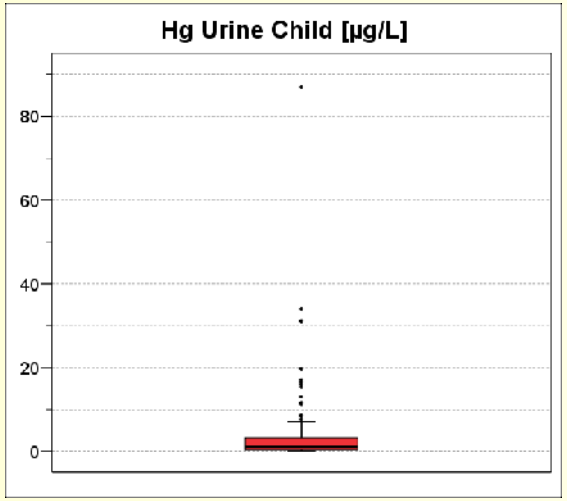
- Urine (spontaneous)
- Hair

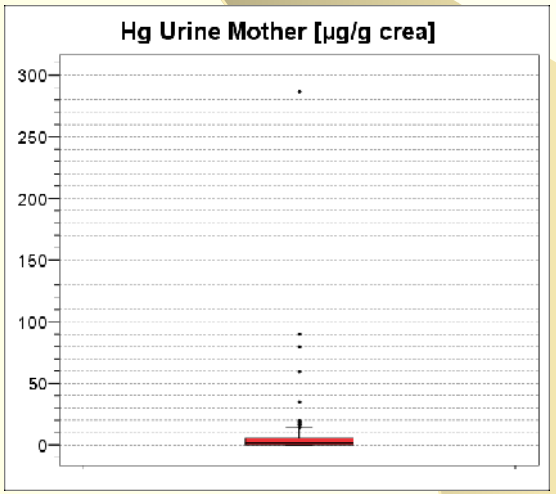
# In field determination of Hg in urine with the LUMEX mercury analyser

# Results

## Hg concentration in the different bio monitors



# Results

## Correlation between Hg concentration in the different bio monitors

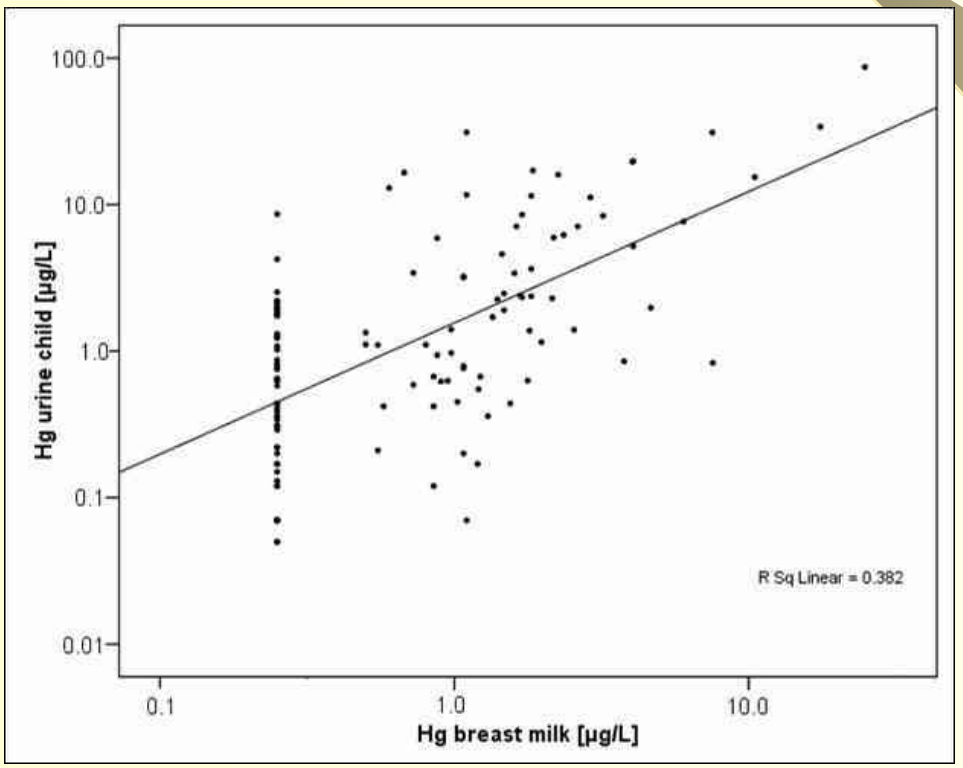
**Correlations**

| | | | Hg Breastmilk [µg/L] | total Hg in Urine [µg/L], child | total Hg urine mother [µg/g crea] |
|---|---|---|---|---|---|
| Spearman-Rho | Hg Breastmilk [µg/L] | Coefficient of correlation | 1.000 | .587** | .796** |
| | | Sig. (2-tailed) | . | .000 | .000 |
| | | N | 120 | 120 | 120 |
| | total Hg in Urine [µg/L], child | Coefficient of correlation | .587** | 1.000 | .759** |
| | | Sig. (2-tailed) | .000 | . | .000 |
| | | N | 120 | 120 | 120 |
| | total Hg urine mother [µg/g crea] | Coefficient of correlation | .796** | .759** | 1.000 |
| | | Sig. (2-tailed) | .000 | .000 | . |
| | | N | 120 | 120 | 120 |

**. p<0.01: significant correlation (2-tailed)

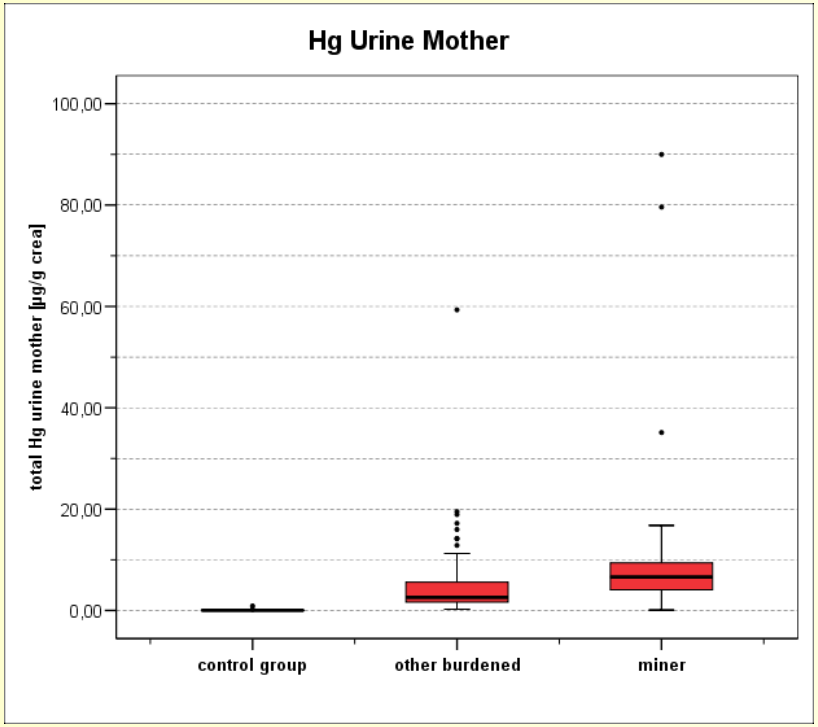
# Results

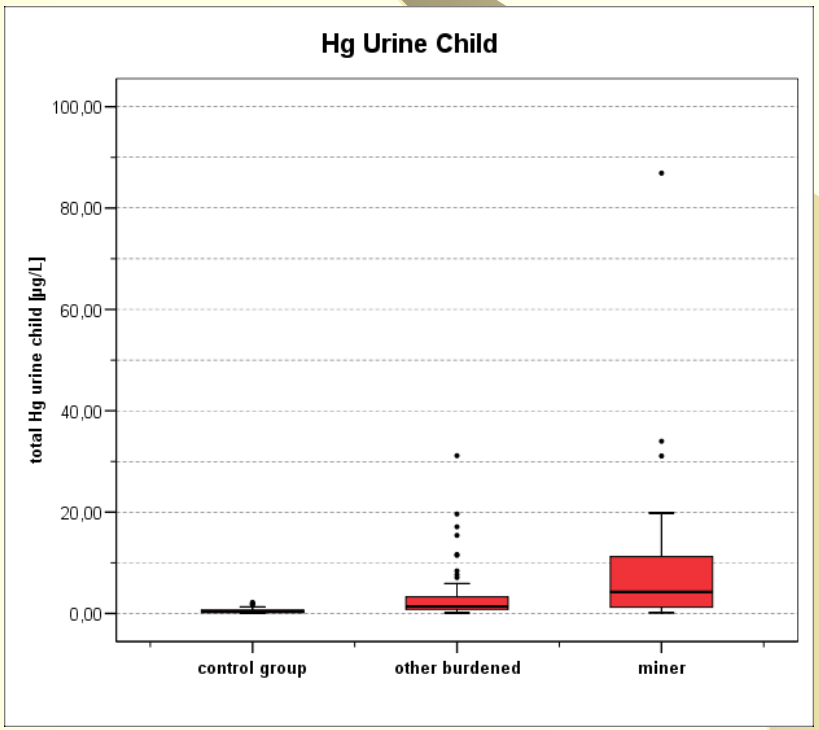
## Correlation between Hg in breast milk and Hg in children's urine



# Results

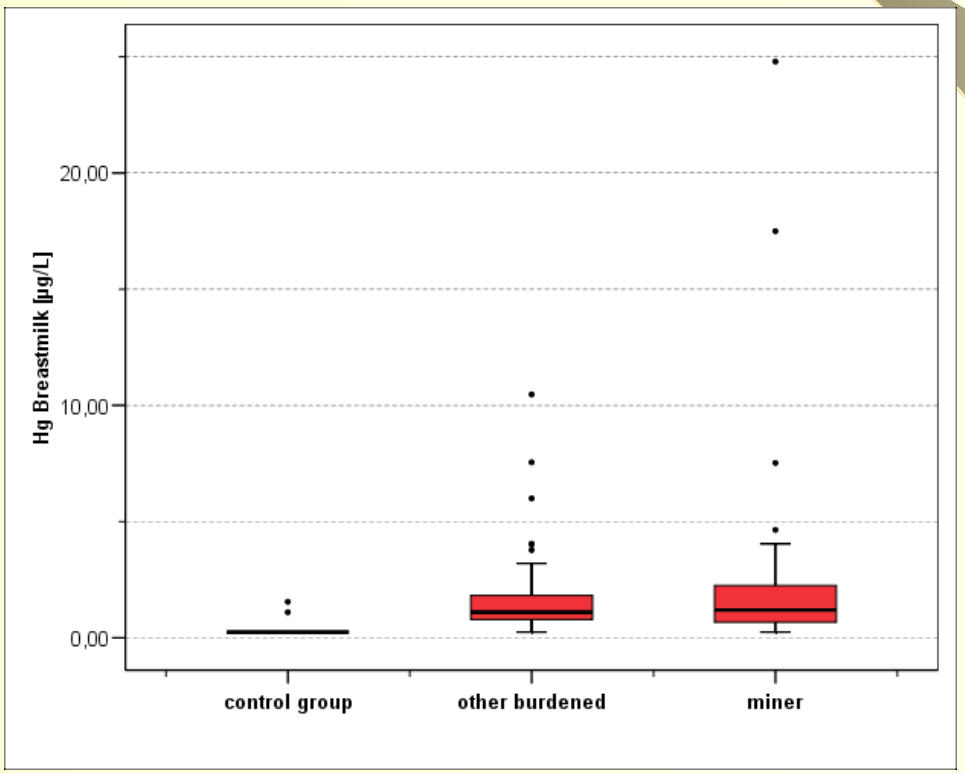
## Hg in urine of mother and child



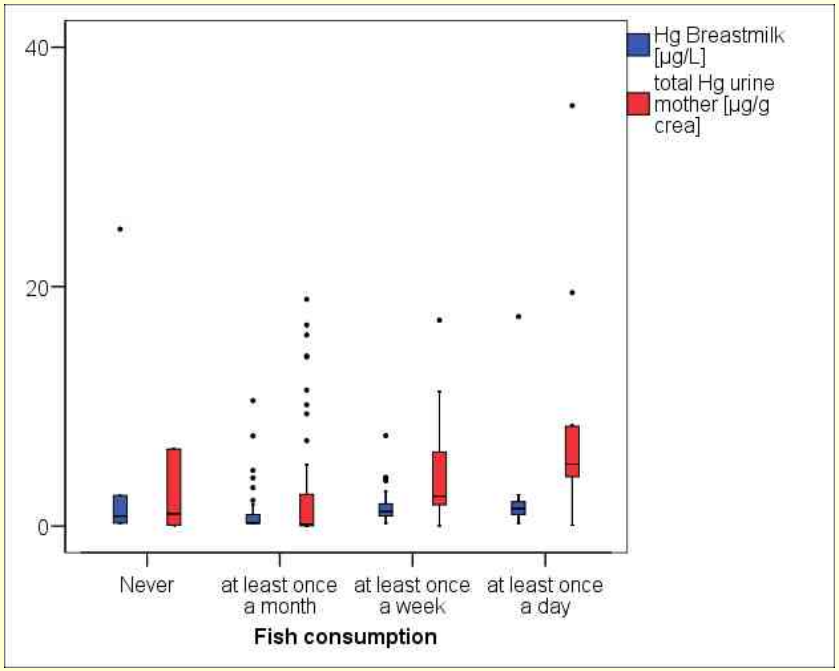
# Results

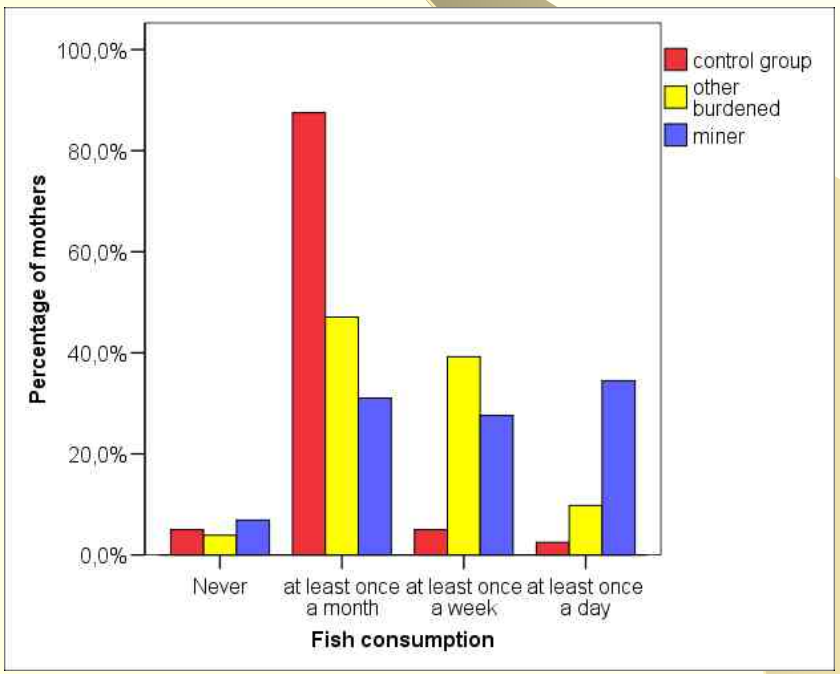
## Hg in Breast Milk



# Results

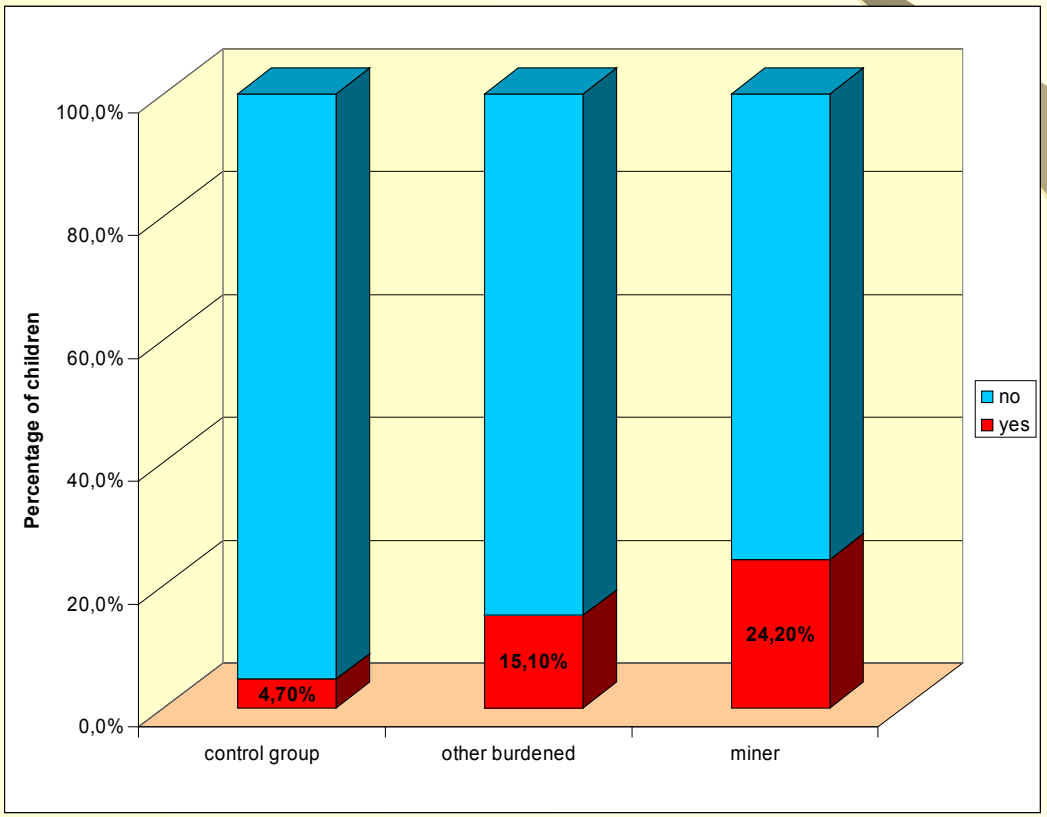
## Consumption of fish – another source of burden in this area?



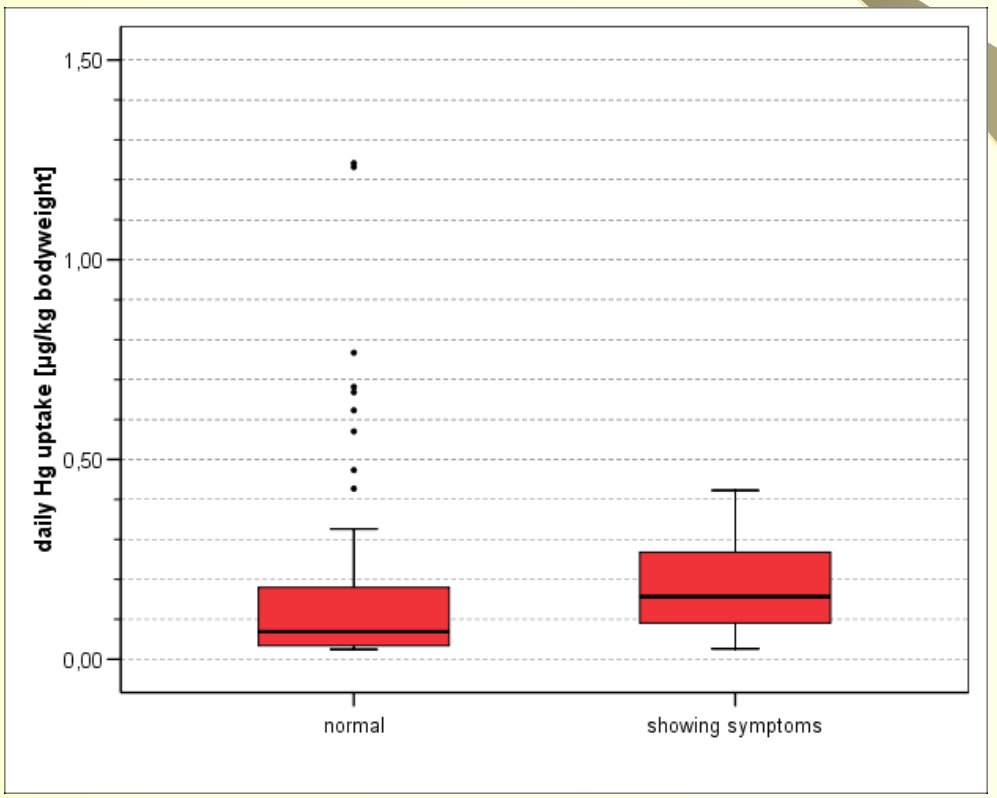
# Results

## Percentage of children showing symptoms



# Results

## Daily Hg Uptake via Breast Milk



# Conclusion

- Significant correlation between the different bio monitors of mother and child
- Hg levels in the bio monitors are significantly higher in the group of miners

# Conclusion

- 24,2% of infants breastfed by mothers, working with Hg showed symptoms (distinctly higher percentage of infants than in other groups)
- Infants showing symptoms had a higher calculated daily uptake of Hg

# Acknowledgement

We would like to thank all who have rendered possible this project, especially Dr. Dennis Shoko, co-workers from the Panner's Association of Zimbabwe and moreover to the local nurses from the Kadoma District Hospital and Chikwaka Hospital for their engaged assistance.


Thank you for your attention!