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Biomonitoring of metals/elements in schoolchildren living near mining area of Zimapan, Mexico J. Guerrero-Arroyo<sup>1</sup>, C. Lucho-Constantino<sup>2</sup>, <u>G. García-Vargas<sup>3</sup></u>, A. Hernández-Barrera<sup>1</sup>, L.C. Sánchez-Peña<sup>1</sup>, and <u>L.M. Del Razo<sup>1</sup></u>. <sup>1</sup>Toxicología, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico, Mexico; <sup>2</sup>Area Académica de Ingeniería, Universidad Autónoma del Estado de

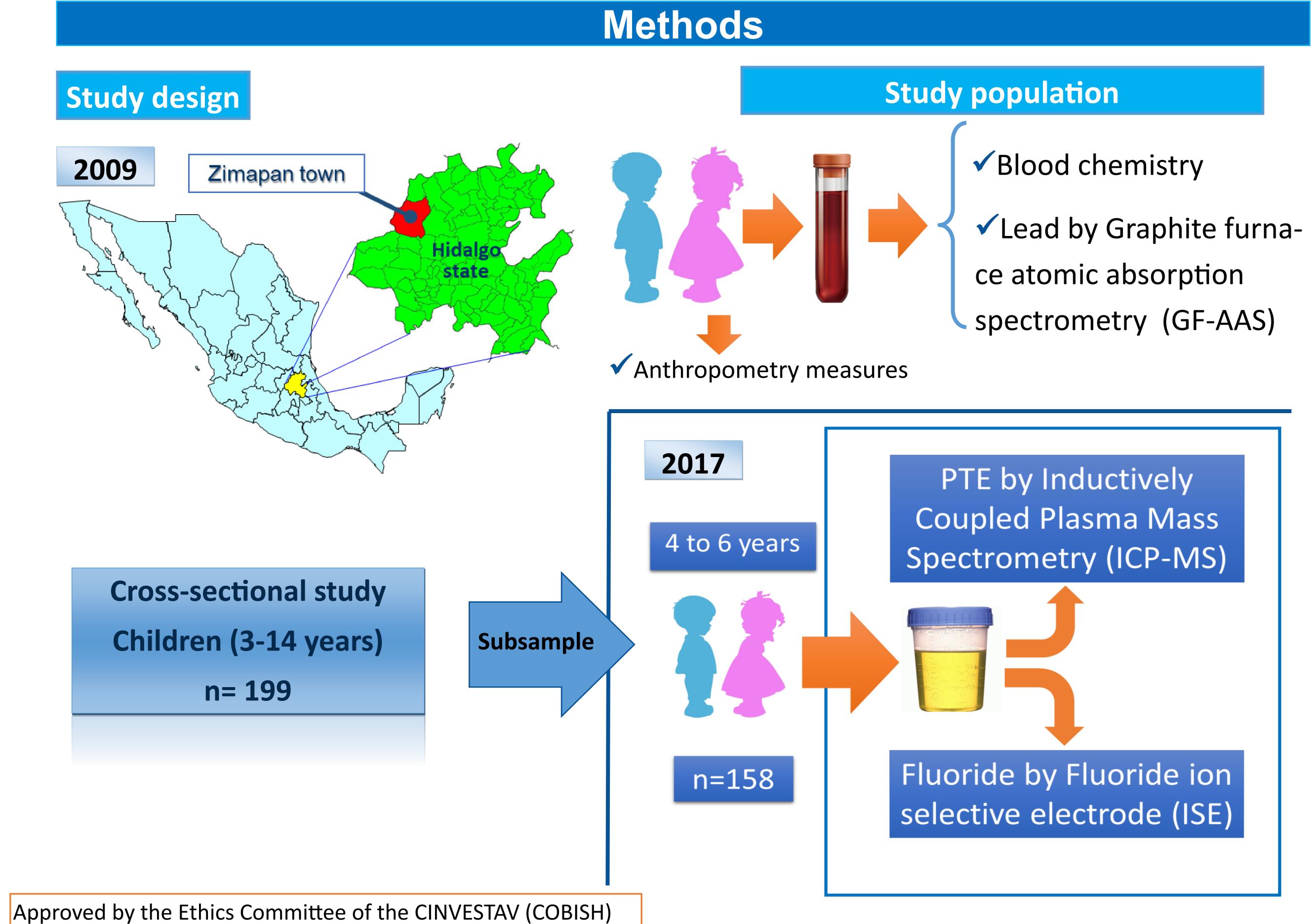
### Introduction

Zimapan is the most important mining municipality of the State of Hidalgo, due to this, the population is exposed to residues of mining origin present in the area, which contain large amounts of potentially toxic elements (PTE) such as Cd, Cu, Hg, Mn, Ni, Pb, Sb and Zn, additionally, exposure to As and ion Fluoride has been reported through geogenic sources.

Multi-elemental analysis from human biomonitoring is an ideal tool to monitor population exposed for timely intervention. The evaluation of health significance of these findings that could disrupt developmental processes with possible lifelong effects is assured.

# Objetive

To evaluate multi-elemental exposure in children's urine samples, through biomonitoring in school children living near a mining area.



### Characteristics of the study population of children

Min, minimum value; Max, maximum value.

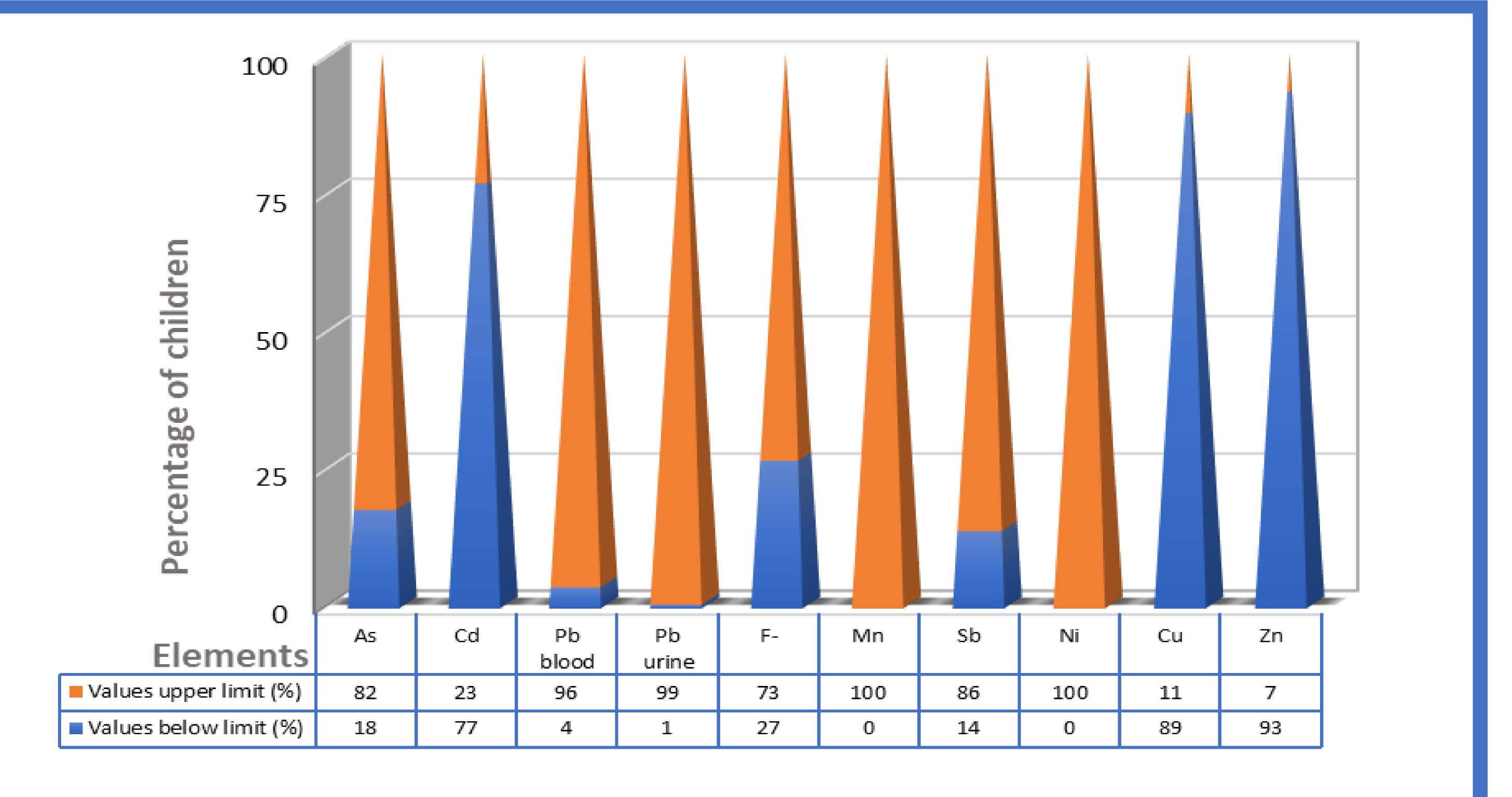
Variable Male [%] Age (years) [GM (RIQ)] Weight z-score [GM (RIQ)] Height z-score [GM (RIQ)] Plasma analysis Total Cholesterol [mg/dL] HDL [mg/dL] Triglycerides [mg/dL] **BMI categories**<sup>D</sup> Recomended [%] Underweight [%] Overweight [%] Obesity [%] Hypertension classification (n=144) Normotensive [%] Prehypertension [%] Hypertension [%] GM, geometric mean; IQR, Interquartile range; b, Hypertension classification according to NHBPE program criteria; BMI, Body mass index;

Comparison between the reference values and the PTE found in the children of Zimapan, Hi- dalgo (n=158).			
PTE	GM (IQR)	Reference value	Dependence
Zn (µg/g of creatinine)	596.8 (363.3 - 861.1)	700 μg/g of creatinine	BEI®
Cd (µg/g of creatinine)ر	3.5 (1.8 - 4.7)	5.0 μg/g of creatinine	BEI®
<sub>U</sub> As (µg/L)	59.9 (22.7 - 234.8)	29.6 µg/L	BE
<sub>∪</sub> F⁻(mg/L)	1.3 (0.4 - 2.8)	1.0 mg/L	BE
<sub>υ</sub> Cu (μg/L)	22.7 (16.3 - 30.8)	29.0 µg/L	CHMS
<sub>υ</sub> Mn (μg/L)	16.1 (1.8 - 20.5)	0.08 µg/L	CHMS
<sub>υ</sub> Sb (μg/L)	2.3 (0.9 - 4.9)	0.4 μg/L	CHMS
<sub>υ</sub> Ni (μg/L)	11.8 (2.6 - 34.4)	1.1 μg/L	CHMS
<sub>υ</sub> Pb (μg/L)	15.9 (9.4 - 21.5)	1.7 μg/L	CHMS
<sub>B</sub> Pb (μg/dL)	6.0 (1.4 - 20.9)	5.0 μg/dL	SSA

GIVI, geometric mean; TQR, interquartile range; U, determined in urine; B, determined in total blood; BE, Biomonitoring equivalents; BEI®, Biological exposure indices; CHMS, Canadian Health Measures Survey (2007-2009); NOM, Norma Oficial Mexicana-199-SSA-2004.

### Results

n from Zimapan, Hidalgo (n=158).			
Value			
53			
5 (4 - 6)			
20 (16 - 33)			
1.13 (1.03 - 1.28)			
150 (114 - 214)			
51 (35 - 87)			
68 (32 - 150)			
72.8			
1.9			
19.6			
5.7			
97			
2.3			
0.7			
rding to NHBPF program criteria: BML Body mass index:			



Percentage of children with EPT urine concentrations above the reference values and blood lead concentration.

The multi-elemental biomonitoring in children identified concentrations above the reference value for urinary As, F<sup>-</sup>, Mn, Ni and Pb in blood.

Given the potential of adverse health effects, related to contaminated drinking water and soil, immediate measures should be taken to reduce the children exposure.

Biomonitoring information is important for the risk assessment to human in general and especially for susceptible population.

Biomonitoring in children, could improve our understanding of exposure to potentially toxic elements in environments and allow trends in exposure to selected toxins to be monitored.

### References



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## Conclusions

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