THE MEXICAN HEALTH AND AGING STUDY

(MHAS/ENASEM)

MHAS 2018 Heavy Metal Exposures Data Obtained from Hair Samples

Project Document
Version 1
August 31, 2023

The "MHAS 2018 Heavy Metal Exposures" data is a collaborative effort from the MHAS Workgroup, and the National Institute of Public Health (*Instituto Nacional de Salud Pública*, INSP) and the National Institute of Ecology and Climate Change (*Instituto Nacional de Ecología y Cambio Climático*, INECC) in Mexico.

The MHAS (Mexican Health and Aging Study) is partly sponsored by the National Institutes of Health/National Institute on Aging (grant number NIH R01AG018016) in the United States and the Instituto Nacional de Estadística y Geografía (INEGI) in Mexico. Data files and documentation are public use and available at www.MHASweb.org. We acknowledge that the secondary data files used for the linked file were provided by INEGI in Aguascalientes, México and by the Ministry of Health in Mexico. This linkage was possible through the collaboration with Marisa Rodriguez, independent consultant.

Introduction

This document describes the public-use data file of the Mexican Health and Aging Study (MHAS) 2018 with metal exposures measures from hair samples.

The MHAS 2018 is the fifth wave of the MHAS longitudinal study, consisting of a follow-up interview to all age-eligible subjects from previous surveys. In addition, the MHAS 2018 study added a representative sample of the population from the Born 1963-1968 birth cohort (50 to 55 years old in 2018), as well as their spouses/partners regardless of their age. In 2018, the study also included the collection of hair samples on a sub-sample of approximately 3,000 individuals. The sub-sample only included the sample in 5 states of Mexico. The states were selected to represent the national sample. The collection of the hair sample was completed by the National Institute of Statistics and Geography (INEGI) in Mexico using trained interviewers. Prior to the visit, the interviewers provided a brochure in all the selected states to explain the procedure as well as the relevance of this part of the study. During the interview, and after explaining the procedure, the interviewers requested oral or written consent and recorded the participation. Their participation was completely voluntary, and the subjects could refuse to complete the entire interview or only to this part of the study. The hair samples were examined for heavy metal exposures at the analytics laboratories of the National Institute of Ecology and Climate Change (*Instituto Nacional de Ecología y Cambio Climático*, INECC) under the supervision of the National Institute of Public Health (INSP) in Mexico.

Data File Description

In total, 2,686 hair samples from subjects aged 50 years and over were received and analyzed at the laboratories of the INECC. The determinations of heavy metals concentration in the hair samples were performed using mass spectrometry. Values for metal levels in the hair samples were reported in µg/Kg and transformed to µg/g for comparison with other studies.

The "**MHAS 2018 Metal Exposures**" includes only 2,671 observations. From the 2,686 collected hair samples, it was not possible to match the sample identification to the individual IDs in the MHAS data for 8 samples. In addition, 7 subjects provided two hair samples. Finally, among the 2,671 included in the final data file it is important to note that 13 subjects did not complete the MHAS 2018 interview but were included in the file because they had completed an interview in at least one previous wave.

The final data file contains the concentration of 14 metals measured in hair. Table 1 the information in this database.

Table 1. Data File Contents

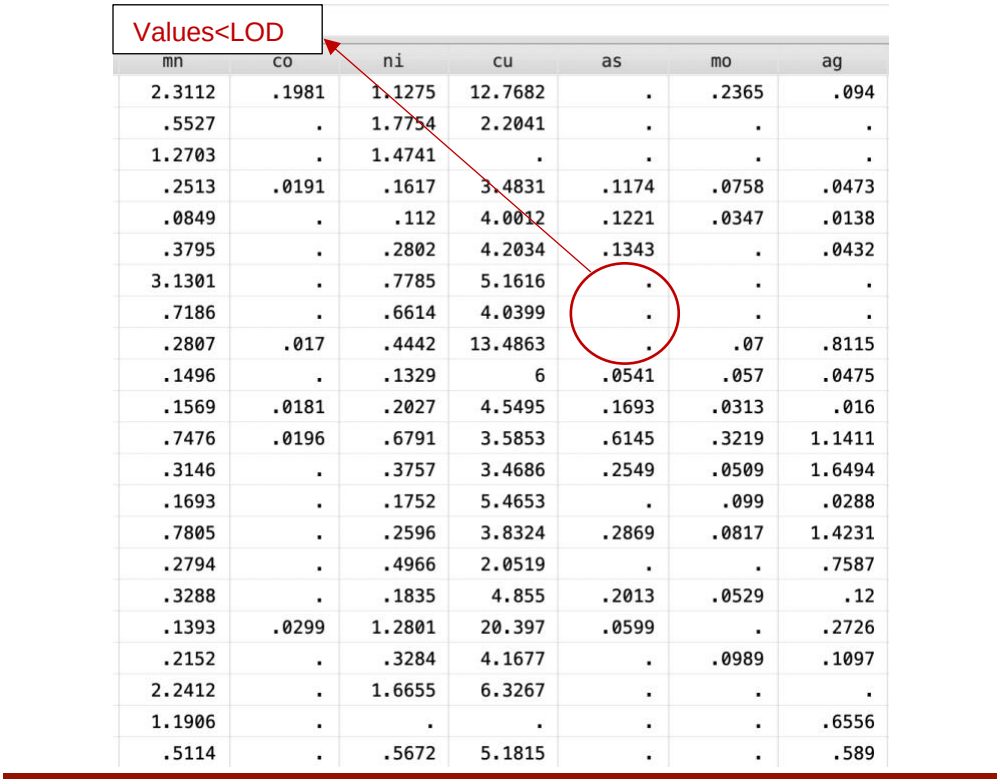
Variable	Label	Type	Format
peso	Hair sample weight (g)	float	%8.0g
ti	Titanium (µg/g)	float	%8.0g
v	Vanadium (µg/g)	float	%8.0g
cr	Chromium (µg/g)	float	%8.0g

mn	Manganese (µg/g)	float	%8.0g
co	Cobalt (µg/g)	float	%8.0g
ni	Nickel (µg/g)	float	%8.0g
cu	Copper (µg/g)	float	%8.0g
as	Arsenic (µg/g)	float	%8.0g
mo	Molybdenum (µg/g)	float	%8.0g
ag	Silver (µg/g)	float	%8.0g
cd	Cadmium (µg/g)	float	%8.0g
sb	Antimony (µg/g)	float	%8.0g
pb	Lead (µg/g)	float	%8.0g
hg	Mercury (µg/g)	float	%8.0g

In the database you will find some observations with missing values ("."). The observations were marked as missing values in all the cases that were not reported by the laboratory because they value were below the lower limit of detection (LOD); the lowest amount that can be quantitatively determined with acceptable precision and accuracy. We left these observations blank and let the user decide how to handle these missing values (Fig. 1).[1]

Figure 1. Values below the lower limit of quantification

[1] For more information on how to handle values below the LOD we recommend reviewing the following article: Martin A. Cohen & P. Barry Ryan (1989) Observations Less than the Analytical Limit of Detection: A New Approach, JAPCA, 39:3, 328-329, DOI: 10.1080/08940630.1989.10466534 To link to this article: https://doi.org/10.1080/08940630.1989.10466534.



mn	co	ni	cu	as	mo	ag
2.3112	.1981	1.1275	12.7682	.	.2365	.094
.5527	.	1.7754	2.2041	.	.	.
1.2703	.	1.4741	.	.	.	.
.2513	.0191	.1617	3.4831	.1174	.0758	.0473
.0849	.	.112	4.0012	.1221	.0347	.0138
.3795	.	.2802	4.2034	.1343	.	.0432
3.1301	.	.7785	5.1616	.	.	.
.7186	.	.6614	4.0399	.	.	.
.2807	.017	.4442	13.4863	.	.07	.8115
.1496	.	.1329	6	.0541	.057	.0475
.1569	.0181	.2027	4.5495	.1693	.0313	.016
.7476	.0196	.6791	3.5853	.6145	.3219	1.1411
.3146	.	.3757	3.4686	.2549	.0509	1.6494
.1693	.	.1752	5.4653	.	.099	.0288
.7805	.	.2596	3.8324	.2869	.0817	1.4231
.2794	.	.4966	2.0519	.	.	.7587
.3288	.	.1835	4.855	.2013	.0529	.12
.1393	.0299	1.2801	20.397	.0599	.	.2726
.2152	.	.3284	4.1677	.	.0989	.1097
2.2412	.	1.6655	6.3267	.	.	.
1.1906	.	.	.	.	.	.6556
.5114	.	.5672	5.1815	.	.	.589

Table 2 shows the total number of observations with acceptable values for each metal, as well as the number of samples that were below the LOD.

Table 2. Number of samples for analyzed by mass spectrometry (N=2,671)

Metal	n	Percentage from total sample (n/N)	n <LOD	% <LOD
Ti	2,645	99.0%	26	1.0%
V	2,114	79.1%	557	20.9%
Cr	2,499	93.6%	172	6.4%
Mn	2,584	96.7%	87	3.3%
Co	1,497	56.0%	1174	44.0%
Ni	2,557	95.7%	114	4.3%
Cu	2,645	99.0%	26	1.0%
As	663	24.8%	2008	75.2%
Mo	1,555	58.2%	1116	41.8%
Ag	1,826	68.4%	845	31.6%
Cd	1,185	44.4%	1486	55.6%
Sb	712	26.7%	1959	73.3%
Pb	2,624	98.2%	47	1.8%
Hg	2,302	86.2%	369	13.8%

Additional documentation

The following technical documents presenting the procedures used to determine the measurements of metals in the hair samples, are available from the MHAS project upon request:

- Acid_digestion_of_sediments,_sludges,_and_soils.pdf (in English)
- Digestión_de_Muestras_por_Microondas.pdf (in Spanish)
- Información_sobre_desempeño_de_muestras_de_cabello.pdf (in Spanish)
- Microwave_assisted_acid_digestion.pdf (in English)