

National Health and Nutrition Examination Survey

2015-2016 Data Documentation, Codebook, and Frequencies

Mercury: Inorganic, Ethyl and Methyl - Blood (IHGEM_I)

Data File: IHGEM_I.xpt

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Component Description

Inorganic, Ethyl and Methyl Mercury

Uncertainties exist regarding levels of exposure to methyl mercury from fish consumption and potential health effects resulting from this exposure. Past estimates of exposure to methyl mercury have been obtained from results of food consumption surveys and measures of methyl mercury in fish. Measures of a biomarker of exposure are needed for improved exposure assessments.

Blood measures of total and inorganic mercury are important for evaluating exposure to mercury in interior latex paints.

Eligible Sample

All examined participants aged 1-11 years, and a one-half sample from participants aged 12 years and older were eligible.

Description of Laboratory Methodology

Inorganic, Ethyl and Methyl Mercury

The mercuries in blood are measured using stannous chloride as a reductant, also utilizing microwave digestion. Mercury vapor (reduced from inorganic mercury compounds) is measured via the same quartz cell at 253.7 nm.

The difference between total and inorganic mercury represents the organic mercury in blood. Mercury analysis identifies cases of mercury toxicity. The main organs affected by mercury are the brain and kidneys. Psychic and emotional disturbances are the initial signs of chronic intoxication by elemental mercury vapor or salts. Parasthesia and neuralgia may develop. Renal disease, digestive disturbances, and ocular lesions can also develop. Kidney toxicity is an important consequence of exposure to mercury salts.

Refer to the Laboratory Method Files section for a detailed description of the laboratory methods used.

There were no changes to lab methods, lab equipment, or lab site for this component in the NHANES 2015-2016 cycle.

Laboratory Method Files

[Inorganic Mercury, Methyl Mercury, Ethyl Mercury Lab Procedure Manual](#) (June 2018)

Laboratory Quality Assurance and Monitoring

Whole blood samples are processed, stored, and shipped to the Division of Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, GA for analysis.

Detailed instructions on specimen collection and processing are discussed in the [NHANES Laboratory Procedures Manual \(LPM\)](#). Vials are stored under appropriate frozen (-30°C) conditions until they are shipped to National Center for Environmental Health for testing.

The NHANES quality assurance and quality control (QA/QC) protocols meet the 1988 Clinical Laboratory Improvement Act mandates. Detailed QA/QC instructions are discussed in the [NHANES LPM](#).

Mobile Examination Centers (MECs)

Laboratory team performance is monitored using several techniques. NCHS and contract consultants use a structured competency assessment evaluation during visits to evaluate both the quality of the laboratory work and the quality-control procedures. Each laboratory staff member is observed for equipment operation, specimen collection and preparation; testing procedures and constructive feedback are given to each staff member. Formal retraining sessions are conducted annually to ensure that required skill levels were maintained.

Analytical Laboratories

NHANES uses several methods to monitor the quality of the analyses performed by the contract laboratories. In the MEC, these methods include performing blind split samples collected on "dry run" sessions. In addition, contract laboratories randomly perform repeat testing on 2% of all specimens.

NCHS developed and distributed a quality control protocol for all the contract laboratories, which outlined the use of Westgard rules (Westgard et al., 1981) when running NHANES specimens. Progress reports containing any problems encountered during shipping or receipt of specimens, summary statistics for each control pool, QC graphs, instrument calibration, reagents, and any special considerations are submitted to NCHS quarterly. The reports are reviewed for trends or shifts in the data. The laboratories are required to explain any identified areas of concern.

All QC procedures recommended by the manufacturers were followed. Reported results for all assays meet the Division of Laboratory Sciences' quality control and quality assurance performance criteria for accuracy and precision, similar to the Westgard rules Caudill, et al., 2008).

Data Processing and Editing

The data were reviewed. Incomplete data or improbable values were sent to the performing laboratory for confirmation.

Three calculated variables were created in this data file. The formula for their derivation is as follows:

The inorganic mercury in $\mu\text{g/L}$ was converted to nmol/L by multiplying by 4.99.

The ethyl mercury in $\mu\text{g/L}$ was converted to nmol/L by multiplying by 4.99.

The methyl mercury in $\mu\text{g/L}$ was converted to nmol/L by multiplying by 4.99.

Analytic Notes

Refer to the [2015-2016 Laboratory Data Overview](#) for general information on NHANES laboratory data.

Subsample Weights

The appropriate sample weights are provided in the variable WTSH2YR in this data file for all participants and should be used when analyzing these data.

The analytes included in the dataset were measured for all examined participants aged 1-11 years, and in a one-half subsample of participants 12 years and older. For participants aged 1-11 years, their WTSH2YR are equivalent to their MEC exam sample weights. These 1-11 year old participants have completed at least one physical exam component in the MEC; therefore, they all have an exam sample weight larger than "0," regardless their lab test results. For participants 12 years and older, special sample weights were created for the subsample. These special weights accounted for the additional probability of selection into the subsample, as well as the additional nonresponse to these lab tests. Therefore, if a participant 12 years and older was selected as part of the one-half subsample, but did not provide a blood specimen, he/she would have the sample weight value assigned as "0" in his/her record.

Demographic and Other Related Variables

The analysis of NHANES laboratory data must be conducted using the appropriate survey design and demographic variables. The [NHANES 2015-2016 Demographics File](#) contains demographic data, health indicators, and other related information collected during household interviews as well as the sample design variables. The recommended procedure for variance estimation requires use of stratum and PSU variables (SDDMVSTRA and SDMVPSU, respectively) in the demographic data file.

The [Fasting Questionnaire File](#) includes auxiliary information, such as fasting status, length of fast and the time of venipuncture.

This laboratory data file can be linked to the other NHANES data files using the unique survey participant identifier (i.e., SEQN).

Detection Limits

The detection limits were constant for all of the analytes in the data set. Two variables are provided for each of these analytes. The variable name ending "LC" (ex., LBXIHGLC) indicates whether the result was below the limit of detection: the value "0" means that the result was at or above the limit of detection, "1" indicates that the result was below the limit of detection. For analytes with analytic results below the lower limit of detection (ex., LBXIHGLC=1), an imputed fill value was placed in the analyte results field. This value is the lower limit of detection divided by the square root of 2 ($LLOD/\sqrt{2}$). The other variable prefixed LBX (ex., LBXIHG) provides the analytic result for that analyte.

The lower limit of detection (LLOD, in $\mu\text{g/L}$) for Inorganic, Ethyl and Methyl Mercury:

Variable Name	Item ID	LLOD
LBXIHG	Mercury, inorganic	0.27
LBXBGE	Mercury, ethyl	0.16
LBXBGM	Mercury, methyl	0.12

Please refer to the NHANES [Analytic Guidelines](#) and the on-line NHANES [Tutorial](#) for further details on the use of sample weights and other analytic issues.

References

- Caudill, S.P., Schleicher, R.L., Pirkle, J.L. Multi-rule quality control for the age-related eye disease study. *Statist. Med.* (2008) 27(20):4094-40106.
- Westgard J.O., Barry P.L., Hunt M.R., Groth T. A multi-rule Shewhart chart for quality control in clinical chemistry. *Clin Chem.* 1981 Mar; 27(3):493-501.


Codebook and Frequencies

SEQN - Respondent sequence number

Variable Name:	SEQN
SAS Label:	Respondent sequence number
English Text:	Respondent sequence number.
Target:	Both males and females 1 YEARS - 150 YEARS

WTSH2YR - Blood metal weights

Variable Name: WTSH2YR
SAS Label: Blood metal weights
English Text: Blood metal weights
Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
5099.649848 to 499733.23816	Range of Values	5597	5597	
0 	Participants 12+ years with no lab specimen	218	5815	
.	Missing	0	5815	

LBXIHG - Mercury, inorganic (ug/L)

Variable Name: LBXIHG**SAS Label:** Mercury, inorganic (ug/L)**English Text:** Inorganic mercury, blood (ug/L)**Target:** Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.19 to 5.9	Range of Values	4938	4938	
.	Missing	877	5815	

LBDIHGSI - Mercury, inorganic (umol/L)

Variable Name: LBDIHGSI
SAS Label: Mercury, inorganic (umol/L)
English Text: Mercury, inorganic (umol/L)
Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.95 to 29.44	Range of Values	4938	4938	
.	Missing	877	5815	

LBDIHGLC - Mercury, inorganic comment code

Variable Name: LBDIHGLC
SAS Label: Mercury, inorganic comment code
English Text: Mercury, inorganic comment code
Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	736	736	
1	Below lower detection limit	4202	4938	
.	Missing	877	5815	

LBXBGE - Mercury, ethyl (ug/L)

Variable Name: LBXBGE**SAS Label:** Mercury, ethyl (ug/L)**English Text:** Mercury, ethyl (ug/L)**Target:** Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.11 to 0.5	Range of Values	4936	4936	
.	Missing	879	5815	

LDBGELC - Mercury, ethyl comment code

Variable Name: LDBGELC
SAS Label: Mercury, ethyl comment code
English Text: Mercury, ethyl comment code
Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	53	53	
1	Below lower detection limit	4883	4936	
.	Missing	879	5815	

LBXBGM - Mercury, methyl (ug/L)

Variable Name: LBXBGM**SAS Label:** Mercury, methyl (ug/L)**English Text:** Mercury, methyl (ug/L)**Target:** Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.08 to 39.45	Range of Values	4938	4938	
.	Missing	877	5815	

LBDBGMLC - Mercury, methyl comment code

Variable Name: LBDBGMLC
SAS Label: Mercury, methyl comment code
English Text: Mercury, methyl comment code
Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	3595	3595	
1	Below lower detection limit	1343	4938	
.	Missing	877	5815	