

National Health and Nutrition Examination Survey 2005–2006

Documentation, Codebook, and Frequencies

Blood Total Mercury and Blood Inorganic Mercury

Laboratory

Survey Years:
2005 to 2006

SAS Transport File:
THGIHG_D.XPT



April 2008

NHANES 2005–2006 Data Documentation

Laboratory Assessment: Blood Total Mercury and Blood Inorganic Mercury (THGIHG_D)

First Published: April 2008

Last Revised: N/A

Component Description

Total Blood Mercury, Inorganic 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 mercury levels will be assessed in two subpopulations particularly vulnerable to the health effects from mercury exposure: children 1–5 years old and women of childbearing age.

Blood measures of total and inorganic mercury will be important for evaluation of exposure from exposure to mercury in interior latex paints.

Eligible Sample

Total Blood Mercury and Inorganic Mercury

Participants aged 1 year and older who do not meet any of the exclusion criteria are eligible.

Description of Laboratory Methodology

Blood Total Mercury

Whole blood Hg concentrations are determined using inductively coupled plasma mass spectrometry. This multi-element analytical technique is based on quadrupole ICP-MS technology. Coupling radio frequency power into a flowing argon stream seeded with electrons creates the plasma. Predominate species in the plasma are positive argon ions and electrons. Diluted whole blood samples are converted into an aerosol using a nebulizer inserted within a spray chamber. A portion of the aerosol is transported through the spray chamber and then through the central channel of the plasma, where it experiences temperatures of 6000–8000 K. This thermal energy atomizes and ionizes the sample. The ions, along with the argon, enter the mass spectrometer through an interface that separates the ICP, operating at atmospheric pressure (approximately 760 torr), from the mass spectrometer, operating at approximately 10^{-5} torr. The mass spectrometer permits detection of ions at each mass-to-charge ratio in rapid sequence, allowing individual isotopes of an element to be determined. Once inside the mass spectrometer, the ions first pass

through the ion optics, then the mass analyzing quadrupole before being detected as they strike the surface of the detector. The ion optics focuses the ion beam using an electrical field. Electrical signals resulting from the detection of the ions are processed into digital information that is used to indicate the intensity of the ions and subsequently the concentration of the element. In this method, blood samples are diluted with 18 Mega-ohm water and with diluent, containing 1% v/v tetramethylammonium hydroxide (TMAH), 0.5% disodium ethylenediamine tetraacetate (EDTA), 10% ethyl alcohol, 0.05% Triton X-100. Au is added to reduce intrinsic Hg memory effects, Rh for internal standardization of Cd, and Bi for internal standardization of Hg and Pb. The samples were prepared with the following ratio:

Sample:Water:Diluent = 1:1:48 correspondingly.

Inorganic Mercury

Inorganic mercury in blood is 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.

There were no changes to the equipment or lab site from the previous 2 years.

Laboratory Quality Control and Monitoring

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 Laboratory/Medical Technologists Procedures Manual (LPM). Read the LABDOC file for detailed QA/QC protocols.

A detailed description of the quality assurance and quality control procedures can be found on the NHANES website.

Data Processing and Editing

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

Detailed specimen collection and processing instructions are discussed in the NHANES LPM. Vials are stored under appropriate frozen (-20°C) conditions until they are shipped to National Center for Environmental Health for testing.

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

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

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

Detection Limits

The detection limits were variable for the analytes in the data set. Two variables are provided for each of these analytes. The variable named LBD__LC indicates whether the result was below the limit of detection. There are two values: "0" and "1". "0" means that the result was at or above the limit of detection. "1" indicates that the result was below the limit of detection. The other variable named LBX__ provides the analytic result for that analyte. In cases, where the result was below the limit of detection, the value for that variable is the detection limit divided by the square root of two.

Detailed instructions on specimen collection and processing can be found on the NHANES website.

Analytic Notes The analysis of NHANES 2005–2006 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2005–2006 Household Questionnaire Data Files contain demographic data, health indicators, and other related information collected during household interviews. The Household Questionnaire Data Files also contain all survey design variables and sample weights required to analyze these data. The Phlebotomy Examination file includes auxiliary information on duration of fasting, the time of day of the venipuncture, and the conditions precluding venipuncture. The Household Questionnaire and Phlebotomy Exam files may be linked to the laboratory data file using the unique survey participant identifier SEQN.

References N/A

Locator Fields

Title: Blood Total Mercury and Blood Inorganic Mercury

Contact Number: 1-866-441-NCHS

Years of Content: 2005–2006

First Published: April 2008

Last Revised: N/A

Access Constraints: None

Use Constraints: None

Geographic Coverage: National

Subject: Blood Total Mercury and Blood Inorganic Mercury

Record Source: NHANES 2005–2006

Survey Methodology: NHANES 2005–2006 is a stratified multistage probability sample of the civilian non-institutionalized population of the U.S.

Medium: NHANES Web site; SAS transport files

**National Health and Nutrition Examination Survey
Codebook for Data Production (2005-2006)**

Blood Total Mercury and Blood Inorganic Mercury (THGIHG_D)

April 2008



SEQN	Target
	B(1 Yrs. to 150 Yrs.)
Hard Edits	SAS Label
	Respondent sequence number
English Text: Respondent sequence number.	
English Instructions:	

LBXTHG	Target
	B(1 Yrs. to 150 Yrs.)
Hard Edits	SAS Label
	Mercury, total (ug/L)
English Text: Mercury, total (ug/L)	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0.2 to 33.2	Range of Values	6267	6267	
0.14	First Below Detection Limit Fill Value	33	6300	
0.23	Second Below Detection Limit Fill Value	2107	8407	
.	Missing	1033	9440	

LBDTHGSI		Target		
		B(1 Yrs. to 150 Yrs.)		
Hard Edits		SAS Label		
		Mercury, total (umol/L)		
English Text: Mercury, total (umol/L)				
English Instructions:				
Code or Value	Description	Count	Cumulative	Skip to Item
1 to 165.67	Range of Values	6267	6267	
0.7	First Below Detection Limit Fill Value	33	6300	
1.15	Second Below Detection Limit Fill Value	2107	8407	
.	Missing	1033	9440	

LBDTHGLC		Target		
		B(1 Yrs. to 150 Yrs.)		
Hard Edits		SAS Label		
		Mercury, total comment code		
English Text: Mercury, total comment code				
English Instructions:				
Code or Value	Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	6267	6267	
1	Below lower detection limit	2140	8407	
.	Missing	1033	9440	

LBXIHG		Target		
		B(1 Yrs. to 150 Yrs.)		
Hard Edits		SAS Label		
		Mercury, inorganic (ug/L)		
English Text: Mercury, inorganic (ug/L)				
English Instructions:				
Code or Value	Description	Count	Cumulative	Skip to Item
0.35 to 15	Range of Values	2116	2116	
0.25	First Below Detection Limit Fill Value	6141	8257	
0.28	Second Below Detection Limit Fill Value	114	8371	
.	Missing	1069	9440	

LBDIHGSI		Target		
		B(1 Yrs. to 150 Yrs.)		
Hard Edits		SAS Label		
		Mercury, inorganic (umol/L)		
English Text: Mercury, inorganic (umol/L)				
English Instructions:				
Code or Value	Description	Count	Cumulative	Skip to Item
1.75 to 74.85	Range of Values	2116	2116	
1.4	First Below Detection Limit Fill Value	114	2230	
1.25	Second Below Detection Limit Fill Value	6141	8371	
.	Missing	1069	9440	

LBDIHGLC		Target		
		B(1 Yrs. to 150 Yrs.)		
Hard Edits		SAS Label		
		Mercury, inorganic comment code		
English Text: Mercury, inorganic comment code				
English Instructions:				
Code or Value	Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2116	2116	
1	Below lower detection limit	6255	8371	
.	Missing	1069	9440	