National Health and Nutrition Examination Survey 2005–2006

Documentation, Codebook, and Frequencies

Urinary Mercury

Laboratory

Survey Years:
2005 to 2006

SAS Transport File:
UHG_D.XPT

nhanes

August 2008

NHANES 2005–2006 Data Documentation

Laboratory Assessment: – Urinary Mercury (UHG_D)

First Published: August 2008 **Last Revised:** N/A

Component Description

Mercury is widespread in the environment and originates from natural and anthropogenic sources. The general population may be exposed to three forms of mercury: elemental, inorganic, or organic (primarily methylmercury). The concentration of total mercury in urine is a biomeasure of exposure primarily to elemental and inorganic mercury. Elemental and inorganic mercury exposure can result from mercury spills, dental amalgams, and occupational exposures. Both elemental and inorganic mercury are nephrotoxic and neurotoxic. Health effects related to low exposure in the general population are not well defined. In the 1999-2002 NHANES, urine mercury levels were measured in all women aged 16-49 years. In 2003-2004 and 2005-2006, urine mercury levels are measured in a one-third subsample of participants aged 6 years and older.

Eligible Sample

Participants aged 6 years and older on an one-third sample.

Description of Laboratory Methodology

Urine iodine and mercury concentrations are determined by ICP-DRC-MS (Inductively Coupled Plasma Dynamic Reaction Cell Mass Spectroscopy). This multielement analytical technique is based on quadrupole ICP-MS technology (1) and includes DRC™ technology (2, 3). Coupling radio frequency power into a flowing argon stream seeded with electrons creates the plasma, the heat source, which is ionized gas suspended in a magnetic field. Predominant species in the plasma are positive argon ions and electrons. Diluted urine samples are converted into an aerosol using a nebulizer inserted within the spray chamber. A portion of the aerosol is transported through the spray chamber and then through the central channel of the plasma, where it is exposed to temperatures of 6000-8000 °K. This thermal energy atomizes and ionizes the sample. The ions and the argon enter the mass spectrometer through an interface that separates the ICP, which is operating at atmospheric pressure (approximately 760 torr), from the mass spectrometer, which is operating at approximately 10^{-5} torr. The mass spectrometer permits detection of ions at each mass-to-charge ratio in rapid sequence, which allows the determination of individual isotopes of an element. Once inside the mass spectrometer, the ions pass through the ion optics, then through DRC™, and finally through the mass-analyzing quadrupole before being detected as they strike the surface of the detector. The ion optics uses an electrical field to focus the ion beam into the DRC™. The DRC™ component is pressurized with an appropriate reaction gas and contains a quadrupole. 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. Traditionally ICP-MS has been a trace analysis technique and the typical measurement ranges from 0.1µg/L to around 100 µg/L. DRC technology provides additional control of ICP-MS sensitivity; therefore appropriate adjustments of the reaction cell parameters can significantly extend the useful concentration measurement range. In this method, iodine (isotope mass 127), tellurium (isotope mass 130), mercury (isotope mass 202) and bismuth (isotope mass 209) are measured in urine by ICP-DRC-MS using 100% argon as the Dynamic Reaction Cell™ (DRC) gas utilizing collisional focusing. Urine samples are diluted 1+1+ 8 (sample+ water + diluent) with water and diluent containing tellurium and bismuth for internal standardization.

Laboratory Quality Control and Monitoring

Specimens were processed, stored and shipped to Division of Laboratory Sciences, National Center for Environmental Health, National Centers for Disease Control and Prevention, Atlanta, Georgia.

The NHANES quality control and quality assurance protocols (QA/QC) meet the 1988 Clinical Laboratory Improvement Act mandates. Detailed quality control and quality assurance instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Read the LABDOC file for detailed QA/QC protocols.

Mobile Examination Centers (MECs)

Laboratory team performance is monitored using several techniques. NCHS and contract consultants use a structured quality assurance evaluation during unscheduled visits to evaluate both the quality of the laboratory work and the quality-control procedures. Each laboratory staff person is observed for equipment operation, specimen collection and preparation; testing procedures and constructive feedback are given to each staff. 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 2.0% of all specimens.

NCHS developed and distributed a quality control protocol for all the contract laboratories which outlined the Westgard rules used 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 and Westat quarterly. The reports are reviewed for trends or shifts in the data. The laboratories are required to explain any identified areas of concern.

There were no changes to the site or laboratory from the previous two year cycle. Beginning in 2005 urinary iodine and mercury were tested from the same instrument.

All QC procedures recommended by the manufacturers were followed. Reported results for all assays meet the Division of Laboratory Science’s quality control and quality assurance performance criteria for accuracy and precision (similar to specifications outlined by Westgard, 1981).

Analytic Notes

Subsample weights

Measures of urinary mercury were measured in a one third subsample of persons 6 years and over. Special sample weights are required to analyze these data properly. Specific sample weights for this subsample are included in this data file and should be used when analyzing these data.

Variance estimation

The analysis of NHANES 2005-2006 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2005-2006 Demographic Data File contains demographic and sample design variables. The recommended procedure for variance estimation requires use of stratum and PSU variables (SDMVSTRA and SDMVPSU, respectively) in the demographic data file.

Links to NHANES Data Files

This laboratory data file can be linked to the other NHANES 2005-2006 data files using the unique survey participant identifier SEQN.

Detection Limits

Urinary mercury has two detection limits in the data set. Two variables are provided for this analyte. The variable named LBDUHGLC 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. There are two valid fill values of 0.08 and 0.10.

Please refer to the Analytic Guidelines for further details on the use of sample weights and other analytic issues.

References

1. Thomas R,Guide to ICP-MS. New York: Marcel Dekker; 2004.
2. Tanner SD, Baranov VI., Theory, design and operation of a DRC™ for ICP-MS. Atomic Spectroscopy 1999; 20(2): 45-52.
3. Tanner SD, Baranov VI, Bandura DR, Reaction cells and collision cells for ICP-MS: a tutorial review. Spectrochimica Acta part B 57, 2002: 1361-1452.

Locator Fields

Title: Urinary Mercury

Contact Number: 1-866-441-NCHS

Years of Content: 2005–2006

First Published: August 2008

Revised: N/A

Access Constraints: None

Use Constraints: None

Geographic Coverage: National

Subject: Urinary 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)

Urinary Mercury (UHG_D)
Person Level Data

August 2008

SEQN	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Respondent sequence number
English Text: Respondent sequence number.	
English Instructions:	

URXUHG	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Mercury, urine (ng/mL)
English Text: Urinary Mercury	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0.06 to 25.48	Range of Values	2578	2578	
.	Missing	114	2692	

URDUHGLC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Urinary mercury comment code
English Text: Urinary mercury comment code	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2387	2387	
1	Below lower detection limit	191	2578	
.	Missing	114	2692	

URXUCR	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Creatinine, urine (mg/dL)
English Text: Creatinine, urine (mg/dL)	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
7 to 534	Range of Values	2608	2608	
.	Missing	84	2692	

WTSA2YR	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Environmental A 2 year weights
English Text: Environmental A 2 year weights	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0 to 412940.77909	Range of Values	2692	2692	
.	Missing	0	2692	