National Health and Nutrition Examination Survey

2015-2016 Data Documentation, Codebook, and Frequencies

Mercury - Urine (UHG_I)

Data File: UHG_I.xpt

First Published: June 2018

Last Revised: NA

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 methyl mercury). The concentration of total mercury in urine is a bio-measure of exposure primarily to elemental and inorganic mercury, although some mercury in urine comes from de-methylation of methyl mercury in blood (Abe et al., 1995). 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 1999-2002 NHANES measured urine mercury levels in all women aged 16-49 years. Since 2003-2004, urine mercury levels have been measured in a one-third subsample of participants aged 6 years and older.

Eligible Sample

All examined participants aged 3 to 5 years were eligible and participants aged 6 years and older from a one-third subsample were eligible.

Description of Laboratory Methodology

This method directly measures the mercury content of urine specimens using mass spectrometry after a simple dilution sample preparation step. Liquid samples are introduced into the mass spectrometer through the inductively coupled plasma (ICP) ionization source, reduced to small droplets in an argon aerosol via a nebulizer, and then the droplets enter the ICP. The ions first pass through a focusing region, followed by the dynamic reaction cell (DRC), the quadrupole mass filter, and finally are selectively counted in rapid sequence at the detector, allowing individual isotopes of an element to be determined.

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

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

Laboratory Method Files

Iodine and Mercury, Urine Lab Procedure Manual (June 2018)

Laboratory Quality Assurance and Monitoring

Urine 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 the 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 CDC and contract laboratories, which outlined the use of Westgard rules (Westgard et al., 1981) 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 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.

Analytic Notes

Refer to the 2015-2016 Laboratory Data Overview for general information on NHANES laboratory data.

Subsample Weights

Urinary mercury was measured in a one third subsample of persons 6 years and older. 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.

Demographic and Other Related Variables

The analysis of NHANES laboratory data must be conducted using the appropriate survey design and basic demographic variables. The NHANES 2015-2016 Demographic Data File contains demographic data, health indicators, and other related information collected during the household interviews as well as the sample design variable. The recommended procedure

for variance estimation requires use of stratum and PSU variables (SDMVSTRA and SDMVPSU, respectively) in the demographic data file.

Starting in the 2015-2016 NHANES cycle, the variable URXUCR (urine creatinine) will not be reported in this file. URXUCR can be found in the data file titled Albumin & Creatinine - Urine.

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

Detection Limits

The detection limit was constant for the analyte in the data set. Two variables are provided for each of these analytes. The variable named ending in "LC" (ex., URDUHGLC) 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., URDUHGLC=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 URX (ex., URXUHG) provides the analytic result for the analyte.

The lower limit of detection (LLOD, in µg/L) for the urinary metals in the data set is:

Variable Name	SAS Label	LLOD
URXUHG	Urinary mercury (ug/L)	0.13

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

- Abe T, Ohtsuka R, Hongo T, Suzuki T, Tohyama C, Nakano A, et al. Arch Environ Health (1995) 50:5, 367-73.
- Caudill SP, Schleicher RL, Pirkle JL. Multi-rule quality control for the age-related eye disease study. Statist Med 2008;27:4094-106.
- 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) 27:493-501.

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 3 YEARS - 150 YEARS

WTSA2YR - Subsample A weights

Variable Name: WTSA2YR

SAS Label: Subsample A weights

English Text: Subsample A weights

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
6552.119284 to 708844.24678	Range of Values	3231	3231	
0	Participants 6+ years with no lab specimen	48	3279	
.	Missing	0	3279	

URXUHG - Urine Mercury (ng/mL)

Variable Name: URXUHG

SAS Label: Urine Mercury (ng/mL)

English Text: Urine Mercury (ng/mL)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.09 to 29.35	Range of Values	3080	3080	
.	Missing	199	3279	

URDUHGLC - Mercury, Urine Comment Code

Variable Name: URDUHGLC

SAS Label: Mercury, Urine Comment Code

English Text: Mercury, Urine Comment Code

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	1282	1282	
1	Below lower detection limit	1798	3080	
.	Missing	199	3279	