National Health and Nutrition Examination Survey

2015-2016 Data Documentation, Codebook, and Frequencies

Metals - Urine (UM_I)

Data File: UM_I.xpt

First Published: June 2018

Last Revised: NA

Component Description

Trace metals have been associated with adverse health effects in occupational studies or laboratory studies, but have not been monitored in general population groups.

This method is used to achieve rapid and accurate quantifications of multiple elements of toxicological and nutritional interest. The method is sensitive and rapid enough to analyze urine specimens from subjects suspected of being exposed to a number of important toxic elements, or to evaluate environmental or other non-occupational exposure to these same elements.

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 multiple metals in 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 NHANES 2015-2016 cycle.

Laboratory Method Files

Urinary Metals and Total Arsenic Laboratory 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 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 metals were measured in a full sample of participants ages 3-5 and a one-third subsample of participants 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 demographic variables. The NHANES 2015-2016 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.

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 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 in "LC" (ex., URDUBALC) 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., URDUBALC=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., URXUBA) provides the analytic result for that analyte.

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

Variable Name	SAS Label	LLOD
URXUBA	Urinary Barium	0.060
URXUCD	Urinary Cadmium	0.036
URXUCS	Urinary Cesium	0.086
URXUCO	Urinary Cobalt	0.023
URXUMN	Urinary Manganese	0.130
URXUMO	Urinary Molybdenum	0.800
URXUPB	Urinary Lead	0.030
URXUSB	Urinary Antimony	0.022
URXUSR	Urinary Strontium	2.340
URXUTL	Urinary Thallium	0.018
URXUSN	Urinary Tin	0.090
URXUTU	Urinary Tungsten	0.018
URXUUR	Urinary Uranium	0.002

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 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	

URXUBA - Barium, urine (ug/L)

Variable Name: URXUBA

SAS Label: Barium, urine (ug/L)

English Text: Barium, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.042 to 58.66	Range of Values	3061	3061	
.	Missing	218	3279	

URDUBALC - Urinary Barium Comment Code

Variable Name: URDUBALC

SAS Label: Urinary Barium Comment Code

English Text: Urinary Barium 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	3041	3041	
1	Below lower detection limit	20	3061	
.	Missing	218	3279	

URXUCD - Cadmium, urine (ug/L)

Variable Name: URXUCD

SAS Label: Cadmium, urine (ug/L)

English Text: Cadmium, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.025 to 3.141	Range of Values	3061	3061	
.	Missing	218	3279	

URDUCDLC - Urinary Cadmium Comment Code

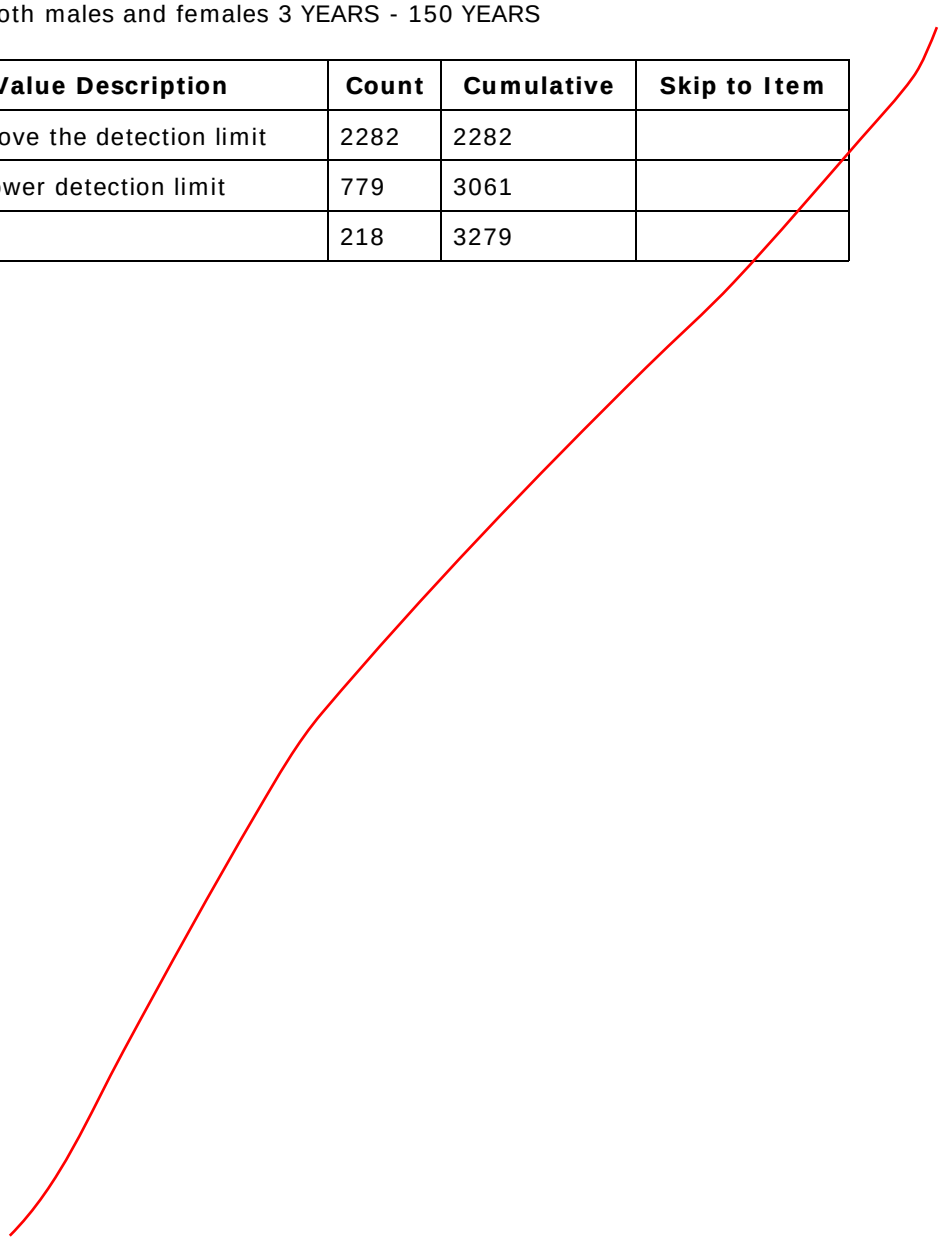
Variable Name: URDUCDLC

SAS Label: Urinary Cadmium Comment Code

English Text: Urinary Cadmium 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	2282	2282	
1	Below lower detection limit	779	3061	
.	Missing	218	3279	



URXUCO - Cobalt, urine (ug/L)

Variable Name: URXUCO

SAS Label: Cobalt, urine (ug/L)

English Text: Cobalt, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.016 to 33.661	Range of Values	3061	3061	
.	Missing	218	3279	

URDUCOLC - Urinary Cobalt Comment Code

Variable Name: URDUCOLC

SAS Label: Urinary Cobalt Comment Code

English Text: Urinary Cobalt Comment Code

Target: Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	3058	3058	
1	Below lower detection limit	3	3061	
.	Missing	218	3279	

URXUCS - Cesium, urine (ug/L)

Variable Name: URXUCS

SAS Label: Cesium, urine (ug/L)

English Text: Cesium, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.061 to 110.873	Range of Values	3061	3061	
.	Missing	218	3279	

URDUCSLC - Urinary Cesium Comment Code

Variable Name: URDUCSLC

SAS Label: Urinary Cesium Comment Code

English Text: Urinary Cesium 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	3060	3060	
1	Below lower detection limit	1	3061	
.	Missing	218	3279	

URXUMO - Molybdenum, urine (ug/L)

Variable Name: URXUMO

SAS Label: Molybdenum, urine (ug/L)

English Text: Molybdenum, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.18 to 1023.13	Range of Values	3060	3060	
.	Missing	219	3279	

URDUMOLC - Urinary Molybdenum Comment Code

Variable Name: URDUMOLC

SAS Label: Urinary Molybdenum Comment Code

English Text: Urinary Molybdenum 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	3060	3060	
1	Below lower detection limit	0	3060	
.	Missing	219	3279	

URXUMN - Manganese, urine (ug/L)

Variable Name: URXUMN

SAS Label: Manganese, urine (ug/L)

English Text: Manganese, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.092 to 18.17	Range of Values	3061	3061	
.	Missing	218	3279	

URDUMNLC - Urinary Mn Comment Code

Variable Name: URDUMNLC

SAS Label: Urinary Mn Comment Code

English Text: Urinary Mn 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	967	967	
1	Below lower detection limit	2094	3061	
.	Missing	218	3279	

URXUPB - Lead, urine (ug/L)

Variable Name: URXUPB

SAS Label: Lead, urine (ug/L)

English Text: Lead, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.02 to 18.53	Range of Values	3061	3061	
.	Missing	218	3279	

URDUPBLC - Urinary Lead Comment Code

Variable Name: URDUPBLC

SAS Label: Urinary Lead Comment Code

English Text: Urinary Lead 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	3049	3049	
1	Below lower detection limit	12	3061	
.	Missing	218	3279	

URXUSB - Antimony, urine (ug/L)

Variable Name: URXUSB

SAS Label: Antimony, urine (ug/L)

English Text: Antimony, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.016 to 14.291	Range of Values	3061	3061	
.	Missing	218	3279	

URDUSBLC - Urinary Antimony Comment Code

Variable Name: URDUSBLC

SAS Label: Urinary Antimony Comment Code

English Text: Urinary Antimony 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	2530	2530	
1	Below lower detection limit	531	3061	
.	Missing	218	3279	

URXUSN - Tin, urine (ug/L)

Variable Name: URXUSN

SAS Label: Tin, urine (ug/L)

English Text: Tin, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.064 to 86.39	Range of Values	3060	3060	
.	Missing	219	3279	

URDUSNLC - USN Comment Code

Variable Name: URDUSNLC

SAS Label: USN Comment Code

English Text: USN 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	2921	2921	
1	Below lower detection limit	139	3060	
.	Missing	219	3279	

URXUSR - Strontium, urine (ug/L)

Variable Name: URXUSR

SAS Label: Strontium, urine (ug/L)

English Text: Strontium, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.655 to 927.71	Range of Values	3061	3061	
.	Missing	218	3279	

URDUSRLC - USR Comment Code

Variable Name: URDUSRLC

SAS Label: USR Comment Code

English Text: USR 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	3056	3056	
1	Below lower detection limit	5	3061	
.	Missing	218	3279	

URXUTL - Thallium, urine (ug/L)

Variable Name: URXUTL

SAS Label: Thallium, urine (ug/L)

English Text: Thallium, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.013 to 7.658	Range of Values	3061	3061	
.	Missing	218	3279	

URDUTLLC - Urinary Thallium Comment Code

Variable Name: URDUTLLC

SAS Label: Urinary Thallium Comment Code

English Text: Urinary Thallium 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	3053	3053	
1	Below lower detection limit	8	3061	
.	Missing	218	3279	

URXUTU - Tungsten, urine (ug/L)

Variable Name: URXUTU

SAS Label: Tungsten, urine (ug/L)

English Text: Tungsten, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.013 to 8.164	Range of Values	3060	3060	
.	Missing	219	3279	

URDUTULC - Urinary Tungsten Comment Code

Variable Name: URDUTULC

SAS Label: Urinary Tungsten Comment Code

English Text: Urinary Tungsten 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	2744	2744	
1	Below lower detection limit	316	3060	
.	Missing	219	3279	

URXUUR - Uranium, urine (ug/L)

Variable Name: URXUUR

SAS Label: Uranium, urine (ug/L)

English Text: Uranium, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.0014 to 0.7696	Range of Values	3061	3061	
.	Missing	218	3279	

URDUURLC - Urinary Uranium Comment Code

Variable Name: URDUURLC

SAS Label: Urinary Uranium Comment Code

English Text: Urinary Uranium 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	2489	2489	
1	Below lower detection limit	572	3061	
.	Missing	218	3279	