National Health and Nutrition Examination Survey

2017-March 2020 Data Documentation, Codebook, and Frequencies

Iodine - Urine (P_UIO)

Data File: P_UIO.xpt

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Last Revised: NA

Component Description

The NHANES program suspended field operations in March 2020 due to the coronavirus disease 2019 (COVID-19) pandemic. As a result, data collection for the NHANES 2019-2020 cycle was not completed and the collected data are not nationally representative. Therefore, data collected from 2019 to March 2020 were combined with data from the NHANES 2017-2018 cycle to form a nationally representative sample of NHANES 2017-March 2020 pre-pandemic data. These data are available to the public. Please refer to the Analytic Notes section for more details on the use of the data.

Iodine

Iodine, an essential element for thyroid function, is necessary for normal growth, development, and functioning of the brain and body. Iodine-deficiency disorder (IDD) is a well-documented global health problem, affecting more than a billion people worldwide. Consequences of IDD include goiter, cretinism, intellectual impairment, brain damage, mental retardation, stillbirth, congenital deformities, and increased perinatal mortality. Progress toward eliminating IDDs has been substantial; an estimated 70% of the world's edible salt currently is iodized. Most excess iodine is excreted, and most people can tolerate fairly large amounts without experiencing problems. People with a tendency toward autoimmune thyroid disease are less tolerant of excess iodine. If a person has previously been iodine-deficient, that person may be at risk for iodine-induced hyperthyroidism. Excessive iodine intake by a mother can pose a reproductive risk. Since urinary iodine values directly reflect dietary iodine intake, urinary iodine analysis is the recommended and most common method for biochemically assessing the iodine status of a population (Hollowell, et al., 1998).

Eligible Sample

All examined participants aged 3 to 5 years and a one-third subsample of examined participants aged 6 years and older in the NHANES 2017-March 2020 pre-pandemic sample were eligible.

Description of Laboratory Methodology

This method directly measures the iodine and mercury content of urine specimens using inductively coupled plasma mass spectrometry (ICP-MS) after a simple dilution sample preparation step. Liquid samples are reduced to small droplets in an argon aerosol via a nebulizer, and then the droplets enter the ICP where the thermal energy atomizes the sample and then ionizes the atoms. The ions are pulled into the mass spectrometer where they are focused through the dynamic reaction cell (DRC), the quadrupole mass filter, and finally are selectively counted in rapid sequence at the detector according to their mass-to-charge (m/z) ratio. When detecting iodine, the DRC is vented to vacuum. Quantification of iodine is accomplished by comparing the blank-subtracted counting rate of iodine from a sample, ratioed to an internal standard, to the counting rate, ratioed to an internal standard, of blank-subtracted, matrix-matched, external calibrators, tested within the same analytical run.

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

Laboratory Method Files

Iodine and Mercury, Urine Lab Procedure Manual (October 2020)

Iodine and Mercury, Urine Lab Procedure Manual (November 2021)

Laboratory Quality Assurance and Monitoring

Urine specimens were 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 2017-2018 and 2019-2020 NHANES Laboratory Procedures Manuals (LPMs). 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 Amendments mandates. Detailed QA/QC instructions are discussed in the NHANES LPMs.

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 QC 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 QC protocol for all CDC and 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’ QA/QC 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

The COVID-19 pandemic required suspension of NHANES 2019-2020 field operations in March 2020 after data were collected in 18 of the 30 survey locations in the 2019-2020 sample. Data collection was cancelled for the remaining 12 locations. Because the collected data from 18 locations were not nationally representative, these data were combined with data from the previous cycle (2017-2018) to create a 2017-March 2020 pre-pandemic data file. A special weighting process was applied to the 2017-March 2020 pre-pandemic data file. The resulting sample weights in the demographic data file should be used to calculate estimates from the combined cycles. These sample weights are not appropriate for independent analyses of the 2019-2020 data and will not yield nationally representative results for either the 2017-2018 data alone or the 2019-March 2020 data alone. Please refer to the NHANES website for additional information for the NHANES 2017-March 2020 pre-pandemic data, and for the previous 2017-2018 public use data file with specific weights for that 2-year cycle.

Refer to the 2017-2018 and 2019-2020 Laboratory Data Overview documents for general information on NHANES laboratory data.

There are over 800 laboratory tests performed on NHANES participants. However, not all participants provided biospecimens or enough volume for all the tests to be performed. The specimen availability can also vary by age or other population characteristics. Analysts should evaluate the extent of missing data in the dataset related to the outcome of interest as well as any predictor variables used in the analyses to

determine whether additional re-weighting for item non-response is necessary.

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.

Subsample Weights

The analytes included in this dataset were measured in all examined participants aged 3-5 years, and in a one-third subsample of participants 6 years and older. Special sample weights are required to analyze these data properly. Variable (WTSAPRP) encoding of the specific sample weights for this subsample is included in this data file and should be used when analyzing these data. These special sample weights were created to account for the subsample selection probability, as well as the additional nonresponse to these lab tests. Therefore, if participants were eligible for the subsample, but did not provide a urine specimen, they would have the sample weight value assigned as “0” in their records.

Demographic and Other Related Variables

The analysis of NHANES laboratory data must be conducted using the appropriate survey design and demographic variables. The NHANES 2017- March 2020 Pre-Pandemic 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 (SDMVSTRA and SDMVPSU, respectively) in the demographic data file.

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

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.

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., URDUIOLC) 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. The other variable prefixed URX (ex., URXUIO) provides the analytic result for that analyte. For analytes with analytic results below the lower limit of detection (ex., URDUIOLC=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 lower limit of detection (LLOD, in ug/L) for urinary iodine is:

Variable Name	Analyte Description	LLOD
URXUIO	Urinary Iodine (ug/L)	2.4

References

- Caudill SP, Schleicher RL, Pirkle JL. Multi-rule quality control for the age-related eye disease study. Statist Med 2008;27(30):4094-4106.
- Hollowell, J.G., et al., Iodine nutrition in the United States. Trends and public health implications: Iodine excretion data from National Health and Nutrition Examination Surveys I and III (1971-1974 and 1988-1994). Journal of Clinical Endocrinology & Metabolism, 1998. 83(10): p. 3401-3408.
- 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

WTSAPRP - Subsample A Weights Pre-Pandemic

Variable Name: WTSAPRP

SAS Label: Subsample A Weights Pre-Pandemic

English Text: Subsample A Weights Pre-Pandemic

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2395.195359 to 955677.30961	Range of Values	4727	4727	
0	No Lab Specimen	163	4890	
.	Missing	0	4890	

URXUIO - Iodine, urine (ug/L)

Variable Name: URXUIO

SAS Label: Iodine, urine (ug/L)

English Text: Iodine, urine (ug/L)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2.6 to 24623.7	Range of Values	4600	4600	
.	Missing	290	4890	

URDUIOLC - Iodine, urine comment code

Variable Name: URDUIOLC

SAS Label: Iodine, urine comment code

English Text: Iodine, 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 detection limit	4600	4600	
1	Below lower detection limit	0	4600	
.	Missing	290	4890	