National Health and Nutrition Examination Survey 2005–2006

Documentation, Codebook, and Frequencies

Laboratory Component:
Urinary Iodine

Survey Years:
2005 to 2006

SAS Export File:
UIO_D.XPT

First Published: July 2008
Last revised: N/A

NHANES 2005–2006 Data Documentation

Laboratory Assessment: Urinary Iodine (UIO_D)

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

Component Description	Iodine(1), 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, spontaneous abortions, miscarriages, 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. This method achieves rapid and accurate quantification of iodine content in urine.

Eligible Sample	Participants aged 6 years and older on a 1/3 sample were tested.

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 (5) and includes DRC™ technology (6, 7). 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 < 0.1 µg/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. The urinary iodine method was modified from the previous 2 years. Urine iodine concentrations were determined by Inductively coupled plasma-mass spectrometry (ICP-MS) during NHANES 2003-2004. Urine iodine concentrations were determined by ICP-DRC-MS (Inductively Coupled Plasma Dynamic Reaction Cell Mass Spectroscopy during NHANES 2005-2006.

Laboratory Quality Control and Monitoring	Specimens were processed, stored and shipped to Division of Laboratory Sciences, National Center for Environmental Health. The NHANES quality assurance and quality control protocols (QA/QC) 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.

Data Processing and Editing	**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. The NHANES QA/QC protocols meet the 1988 Clinical Laboratory Improvement Act mandates. Detailed QA/QC instructions are discussed in the NHANES LPM. **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. 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 iodine 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** This laboratory data file can be linked to the other NHANES 2005-2006 data files using the unique survey participant identifier SEQN. **Detection Limits** All the urinary iodine measures were above the limit of detection (1.0 µg/L) for all samples. The detection limit divided by the square root of 2 is the value that is provided for results that are below the limit of detection. Please refer to the Analytic Guidelines for further details on the use of sample weights and other analytic issues.

References	1. Hollowell JG, Staehling NW, Hannon WH, et al. 1998 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). J Clin Endocrinol Metab 1998; 83:3401-8. 2. Thomas R, Practical Guide to ICP-MS. New York: Marcel Dekker; 2004. 3. Tanner SD, Baranov VI., Theory, design and operation of a DRC™ for ICP-MS. Atomic Spectroscopy 1999; 20(2): 45-52. 4. 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 Iodine (UIO_D)

Contact Number: 1-866-441-NCHS

Years of Content: 2005–2006

First Published: July 2008

Revised: N/A

Access Constraints: None

Use Constraints: None

Geographic Coverage: National

Subject: Urinary Iodine

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 Iodine (UIO_D)
Person Level Data

July 2008

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

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

Code or Value	Description	Count	Cumulative	Skip to Item
2.9 to 1406700	Range of Values	2649	2649	
.	Missing	107	2756	

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 678	Range of Values	2671	2671	
.	Missing	85	2756	

WTSC2YR	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Two-year MEC weights of subsample C
English Text: Two-year MEC weights of subsample C	
English Instructions:	

Code or Value	Description	Count	Cumulative	Skip to Item
0 to 475173.70936	Range of Values	2756	2756	
.	Missing	0	2756	