

# National Health and Nutrition Examination Survey

## 2015-2016 Data Documentation, Codebook, and Frequencies

### Copper, Selenium & Zinc - Serum (CUSEZN\_I)

Data File: CUSEZN\_I.xpt

First Published: December 2018

Last Revised: NA

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## 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 three elements of toxicological and nutritional interest. The method is sensitive and rapid enough to screen serum specimens from subjects suspected to be exposed to a number of important toxic elements, or to evaluate environmental or other non-occupational exposure to these same elements.

## Eligible Sample

Examined participants aged 6 years and older from a one-third subsample were eligible.

## Description of Laboratory Methodology

Inductively coupled plasma dynamic reaction cell mass spectrometry (ICP-DRC-MS) is a multi-element analytical technique capable of trace level elemental analysis. This ICP-DRC-MS method is used to measure the entire panel of the 3 elements, or any subgroup of these. Liquid samples are introduced into the ICP through a nebulizer and spray chamber carried by a flowing argon stream. By coupling radio-frequency power into flowing argon, plasma is created and the sample passes through a region of the plasma, the thermal energy atomizes the sample and then ionizes the atoms. The ions, along with the argon, enter the mass spectrometer through an interface that separates the ICP from the mass spectrometer. The ions pass through a focusing region, the dynamic reaction cell (DRC), the quadrupole mass filter, and finally are counted in rapid sequence at the detector allowing individual isotopes of an element to be determined. The isotopes measured by this method include zinc (m/z 64), copper (m/z 65), and selenium (m/z 78) and the internal standard gallium (m/z 71). Serum samples are diluted 1+1+28 with water and diluent containing gallium (Ga) for multi-internal standardization.

Refer to the Laboratory Method Files section for a detailed laboratory procedure manual(s) of the methods used.

There were no changes to lab equipment, lab methods, or lab site in the 2015-2016 cycle.

## Laboratory Method Files

[Zinc, Copper and Selenium Lab Procedure Manual](#) (December 2018)

## Laboratory Quality Assurance and Monitoring

Serum specimens 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 ( $-20^{\circ}\text{C}$ ) 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 the 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' 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**

Serum copper, selenium, and zinc were measured in a one-third subsample of participants aged 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 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.

The [Fasting Questionnaire File](#) includes auxiliary information, such as fasting status, length of fast and the time of venipuncture.

This laboratory data file can be linked to the other NHANES data files using the unique survey participant identifier (i.e., 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 "LC" (ex., LBXSCULC) 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., LBXSCULC = 1) an imputed fill value was placed in the analyte results field. The value is the lower limit of detection divided by the square root of 2 ( $LOD/\sqrt{2}$ ). The other variable prefixed LBX (ex., LBXSCU) provides the analytic result for that analyte.

The lower limit of detection (LLOD) for copper, zinc, and for selenium is:

Variable Name	SAS Label	LLOD
LBXSCU	Serum Copper	2.5 (µg/dL)
LBXSSE	Serum Selenium	4.5 (µg/dL)
LBXSZN	Serum Zinc	2.9 (µg/dL)

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. Stat 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

<b>Variable Name:</b>	SEQN
<b>SAS Label:</b>	Respondent sequence number
<b>English Text:</b>	Respondent sequence number
<b>Target:</b>	Both males and females 6 YEARS - 150 YEARS

## WTS2YR - Subsample A weights

**Variable Name:** WTS2YR  
**SAS Label:** Subsample A weights  
**English Text:** Subsample A weights  
**Target:** Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
16357.767797 to 708844.24678	Range of Values	2644	2644	
0 	No lab specimen	48	2692	
.	Missing	0	2692	

## LBXSCU - Serum Copper (ug/dL)

**Variable Name:** LBXSCU**SAS Label:** Serum Copper (ug/dL)**English Text:** Serum Copper (ug/dL)**Target:** Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
52.9 to 306.6	Range of Values	2436	2436	
.	Missing	256	2692	

## LBDSCUSI - Serum Copper (umol/L)

**Variable Name:** LBDSCUSI  
**SAS Label:** Serum Copper (umol/L)  
**English Text:** Serum Copper (umol/L)  
**Target:** Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
8.31 to 48.14	Range of Values	2436	2436	
.	Missing	256	2692	

## LBXSSE - Serum Selenium (ug/L)

**Variable Name:** LBXSSE**SAS Label:** Serum Selenium (ug/L)**English Text:** Serum Selenium (ug/L)**Target:** Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
58.1 to 217.8	Range of Values	2436	2436	
.	Missing	256	2692	



## LBDSSSESI - Serum Selenium (umol/L)

**Variable Name:** LBDSSSESI  
**SAS Label:** Serum Selenium (umol/L)  
**English Text:** Serum Selenium (umol/L)  
**Target:** Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.74 to 2.77	Range of Values	2436	2436	
.	Missing	256	2692	

## LBXSZN - Serum Zinc (ug/dL)

**Variable Name:** LBXSZN**SAS Label:** Serum Zinc (ug/dL)**English Text:** Serum Zinc (ug/dL)**Target:** Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
31.4 to 150.7	Range of Values	2436	2436	
.	Missing	256	2692	

## LBDSZNSI - Serum Zinc (umol/L)

**Variable Name:** LBDSZNSI  
**SAS Label:** Serum Zinc (umol/L)  
**English Text:** Serum Zinc (umol/L)  
**Target:** Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
4.8 to 23.06	Range of Values	2436	2436	
.	Missing	256	2692	