National Health and Nutrition Examination Survey

August 2021-August 2023 Data Documentation, Codebook, and Frequencies

Transferrin Receptor (TFR_L)

Data File: TFR_L.xpt

First Published: September 2024

Last Revised: NA

Component Description

Soluble transferrin receptor (sTfR) is a measure of iron deficiency and is particularly useful in persons with inflammation, infection, or chronic disease, where ferritin levels do not correlate with true iron levels. Low storage of iron can lead to iron deficiency anemia. High levels of iron storage, also called iron overload, occurs when excess iron is accumulated in the body, primarily the liver.

The objectives of this component are: 1) to provide data for monitoring secular trends in measures of nutritional status in the U.S. population; 2) to evaluate the effects of people's habits and behaviors, such as physical activity and the use of alcohol, tobacco, and dietary supplements on nutritional status; and 3) to evaluate the effect of changes in nutrition and public health policies, including welfare reform legislation, food fortification policy, and child nutrition programs on the nutritional status of the U.S. population. Data will be used for research to further define nutrient requirements as well as optimal levels for disease prevention and health promotion.

Eligible Sample

Examined participants aged 1 to 5 years and females aged 12-49 years were eligible.

Description of Laboratory Methodology

The method principle for measurement of sTfR is a particle enhanced immunoturbidimetric assay that uses Roche kits on the Cobas® c501 clinical analyzer. Latex particles coated with anti-sTfR antibodies react with the antigen in the sample to form an antigen/antibody complex. Following agglutination, the precipitate is determined photometrically.

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 August 2021–August 2023 cycle.

Laboratory Method Files

Tina-quant Soluble Transferrin Receptor (September 2024)

Laboratory Quality Assurance and Monitoring

Serum samples 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 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 Amendments 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 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 during "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 testing 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 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.

One variable was created in this data file. The variable LBDTFRSI was created using the following:

LBDTFRSI: The transferrin receptor value in mg/L (LBXTFR) was converted to nmol/L (LBDTFRSI) by multiplying LBXTFR by 11.8.

Analytic Notes

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 details on the use of sample weights and other analytic issues.

Phlebotomy Weights

For the August 2021-August 2023 cycle, analysis of nonresponse patterns for the phlebotomy component in the MEC examination revealed differences by age group and race/ethnicity, among other characteristics. For example, approximately 67% of children aged 1-17 years who were examined in the MEC provided a blood specimen through phlebotomy, while 95% of examined adults aged 18 and older provided a blood specimen. Therefore, an additional phlebotomy weight, WTPH2YR, has been included in this data release to address possible nonresponse bias. Participants who are eligible but did not provide a blood specimen have their phlebotomy weight assigned a value of "0" in their records. The phlebotomy weight should be used for analyses that use variables derived from blood analytes, and is included in all relevant data files.

Demographic and Other Related Variables

The analysis of NHANES laboratory data must be conducted using the appropriate survey design and demographic variables. The NHANES Aug. 2021–Aug. 2023 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 in "LC" (ex., LBDTFRLC) 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., LBDTFRLC =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 LBX (ex., LBXTFR, provides the analytic result for that analyte.

The lower limit of detection (LLOD in mg/L) for LBXTFR:

Variable Name	SAS Label	LLOD
LBXTFR	Transferrin receptor	0.5 mg/L

References

- Caudill, S.P., Schleicher, R.L., Pirkle, J.L. Multi-rule quality control for the age-related eye disease study. Statist. Med. (2008) 27(20):4094-40106.
- 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 1 YEARS - 5 YEARS
Target:	Females only 12 YEARS - 49 YEARS

WTPH2YR - Phlebotomy 2 Year Weight

Variable Name: WTPH2YR

SAS Label: Phlebotomy 2 Year Weight

English Text: Phlebotomy 2 MEC Weight

Target: Both males and females 1 YEARS - 5 YEARS

Target: Females only 12 YEARS - 49 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
6213.3002375 to 253478.77765	Range of Values	2051	2051	
0	No blood sample provided	513	2564	
.	Missing	0	2564	

LBXTFR - Transferrin receptor (mg/L)

Variable Name: LBXTFR

SAS Label: Transferrin receptor (mg/L)

English Text: Transferrin receptor (mg/L)

Target: Both males and females 1 YEARS - 5 YEARS

Target: Females only 12 YEARS - 49 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.41 to 29.4	Range of Values	1949	1949	
.	Missing	615	2564	

LBDTFRSI - Transferrin receptor (nmol/L)

Variable Name: LBDTFRSI

SAS Label: Transferrin receptor (nmol/L)

English Text: Transferrin receptor (nmol/L)

Target: Both males and females 1 YEARS - 5 YEARS

Target: Females only 12 YEARS - 49 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
16.6 to 347	Range of Values	1949	1949	
.	Missing	615	2564	