Documentation, Codebook, and Frequencies

Laboratory Component:
Ferritin and Transferrin Receptor

Survey Years:
2003 to 2004

SAS Export File:
L06TFR_C.XPT

nhanes

First Published: December 2006
Last Revised: December 2007

NHANES 2003–2004 Data Documentation

Laboratory Assessment: Lab06 – Ferritin and Transferrin Receptor

First Published: December 2006   **Last Revised:** December 2007

Component Description

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 effect of people's habits and behaviors such as physical activity and the use of alcohol, tobacco, and dietary supplements on people's 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. These data will be used to estimate deficiencies and toxicities of specific nutrients in the population and subgroups, to provide population reference data, and to estimate the contribution of diet, supplements, and other factors to serum levels of nutrients. Data will be used for research to further define nutrient requirements as well as optimal levels for disease prevention and health promotion.

Eligible Sample

Participants aged 1-5 years both genders and females 12 to 49 years who do not meet any of the exclusion criteria are eligible.

Description of Laboratory Methodology

Transferrin Receptor

The method principle for measurement of soluble transferrin receptor (sTfR) is immuno-turbidimetry using Roche kits on the Hitachi 912 clinical analyzer. Latex bound anti-sTfR antibodies react with the antigen in the sample to form an antigen/antibody complex. Following agglutination, this is measured turbidimetrically.

Ferritin

Two methods were used in 2003-2004. The National Center for Environmental Health analyzed all 2003 samples with a BioRad assay and all 2004 samples with a Roche/Hitachi assay.

1. BioRad assay:

Ferritin is measured by using the Bio-Rad Laboratories' "QuantImune Ferritin IRMA" kit, which is a single-incubation two-site immunoradiometric assay (IRMA) based on the general principles of

assays as described by Addison et al. and Miles and modified by Jeong et al. In this IRMA, highly purified 125I-labeled antibody to ferritin is the tracer, and the ferritin antibodies are immobilized on polyacrylamide beads as the solid phase. Serum or standards are mixed with the combined tracer/solid-phase antibody reagent, and the mixture is incubated. During incubation, both the immobilized and the 125I-labeled antibodies bind to the ferritin antigen in the serum or standards, thus creating a "sandwich."

2. Roche/Hitachi assay:

The method principle for measurement of Ferritin is immuno-turbidimetry using the Roche/Hitachi 912 clinical analyzer. Latex bound Ferritin antibodies react with the antigen in the sample to form an antigen/antibody complex. Following agglutination, this is measured turbidimetrically. Complexes formed are proportional to the Ferritin concentration, and were measured at 700nm (primary wavelength).

Laboratory Quality Control and Monitoring

The NHANES quality control and quality assurance protocols (QA/QC) meet the 1988 Clinical Laboratory Improvement Act mandates. Detailed quality control and quality assurance instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Read the LABDOC file for detailed QA/QC protocols.

A detailed description of the quality assurance and quality control procedures can be found at NHANES web site.

Data Processing and Editing

Serum specimens were processed, stored, and shipped to the Division of Environmental Health Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention for analysis.

Detailed specimen collection and processing instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Vials are stored under appropriate frozen (–20°C) conditions until they are shipped to National Center for Environmental Health for testing.

One derived variable (LBDFERSI) was created in this data file. The formula for its derivation is as follows:

The ferritin in ng/mL was converted to µg/L by multiplying by 1.0.

Detailed instructions on specimen collection and processing can be found at NHANES web page.

Analytic Notes	**Ferritin Regression for 2003-2004:**

Ferritin from NHANES 1999-2003 was performed using the BioRad method and the Hitachi (Roche) method was used to measure ferritin in 2004. The Hitachi method gave higher ferritin results than the BioRad method. For 2004, the mean ferritin was 44.7 ng/mL compared to a 2003 mean ferritin of 35.9 ng/mL, or an average increase of 24.5%.

A crossover study was performed to establish a regression to compare BioRad and Hitachi results. Split specimens were analyzed with the two assays. The overall regression based on the crossover study showed a good correlation, however, the correlation was poor at low ferritin concentrations (<15 ng/mL). Therefore, an alternate approach was used to compare BioRad and Hitachi ferritin values. A piecewise linear regression based on comparing percentile values (P0 - P99 incremented by 1 and P99.1 to P100 incremented by 0.1) of sample persons' ferritin distributions in 2003 versus 2004 was done. The correlation for this regression was much improved compared to that seen for the crossover study especially at low ferritin concentrations, so the regression equation from this approach was used to adjust the 2003 sample person ferritin values to compare with that of the 2004 sample person values. Trends in sample person ferritin data during 1999-2004 were analyzed after applying the 2003-2004 regression to the ferritin data collected using the BioRad assay in 1999-2002 to evaluate the effectiveness of the data adjustment procedure based on percentiles. The distributions appeared to be consistent across the years 1999-2004.

The piecewise linear regression equations used to adjust the 2003 ferritin data to be comparable to the 2004 ferritin (ng/mL) data were as follows:

Ferrtin ≤ 25: $Y(Hitachi) = 1.2534 * X(BioRad) + 1.4683$
25 < Ferritin ≤ 65: $Y(Hitachi) = 1.2001 * X (BioRad) + 1.4693$
Ferritin > 65: $Y(Hitachi) = 1.0791 * X (BioRad) + 4.8183$

Note: Analysts who wish to examine trends in ferritin data during the period 1999-2004 can use these regression equations to adjust the 1999-2002 ferritin data (measured using BioRad) to compare with the 2003-2004 data released in this file.

General Analytical Note:

The analysis of NHANES 2003–2004 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2003–2004 Household Questionnaire Data Files contain demographic data, health indicators, and other related information collected during household interviews. The Household Questionnaire Data Files also contain all survey design variables and sample weights required to analyze these data. The Phlebotomy Examination file includes auxiliary information on duration of fasting, the time of day of the venipuncture, and the conditions precluding venipuncture. The Household Questionnaire and Phlebotomy Exam files may be linked to the laboratory data file using the unique survey participant identifier SEQN.

Please refer to the Analytic Guidelines for further details on the use of sample weights and other analytic issues.

References   None

Locator Fields

Title: Tranferrin Receptor and Ferritin

Contact Number: 1-866-441-NCHS

Years of Content: 2003–2004

First Published: December 2006

Revised: December 2007

Access Constraints: None

Use Constraints: None

Geographic Coverage: National

Subject: Tranferrin Receptor and Ferritin

Record Source: NHANES 2003–2004

Survey Methodology: NHANES 2003–2004 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 (2003-2004)

Ferritin and Transferrin Receptor (L06TFR_C)
Person Level Data

First Published: December 2006
Last Revised: December 2007

SEQN	Target
	B(1 Yrs. to 5 Yrs.) F(12 Yrs. to 49 Yrs.)
Hard Edits	**SAS Label**
	Respondent sequence number

English Text: Respondent sequence number.

English Instructions:

LBXTFR	Target
	B(1 Yrs. to 5 Yrs.) F(12 Yrs. to 49 Yrs.)
Hard Edits	**SAS Label**
	Transferrin receptor (mg/L)

English Text: Transferrin receptor (mg/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
1.3 to 28.9	Range of Values	2831	2831	
.	Missing	734	3565	

LBDFER	Target			
	B(1 Yrs. to 5 Yrs.) F(12 Yrs. to 49 Yrs.)			
Hard Edits	**SAS Label**			
	Ferritin(ng/mL)			

English Text: Ferritin(ng/mL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
3 to 2460	Range of Values	2978	2978	
2	Below Detection Limit Fill Value	3	2981	
.	Missing	584	3565	

LBDFERSI	Target			
	B(1 Yrs. to 5 Yrs.) F(12 Yrs. to 49 Yrs.)			
Hard Edits	**SAS Label**			
	Ferritin in SI unit (ug/L)			

English Text: Ferritin in SI unit (ug/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
3 to 2460	Range of Values	2978	2978	
2	Below Detection Limit Fill Value	3	2981	
.	Missing	584	3565	