

**National Health and Nutrition  
Examination Survey 2005–2006**

---

**Documentation, Codebook,  
and Frequencies**

**HDL-Cholesterol**

**Laboratory**

**Survey Years:  
2005 to 2006**

**SAS Transport File:  
HDL\_D.XPT**



**First Published: December 2007  
Last Revised: April 2008**

## NHANES 2005–2006 Data Documentation

### Laboratory Assessment: HDL-Cholesterol (HDL\_D)

First Published: December 2007

Last Revised: April 2008

**Added note in the Analytical Notes Section; see:** “Change in Assay Methods Most Likely Responsible for Increased HDL Cholesterol values in NHANES 2003-2006 when compared to NHANES 1999-2002”.

---

#### **Component Description**

The data will be used to monitor the status of hyperlipidemia and the success of the National Cholesterol Education Program.

The main element of the cardiovascular disease laboratory component in NHANES is blood lipid levels. Cardiovascular disease is the leading cause of death in the United States. The data will be used to monitor the status of hyperlipidemia and the success of the National Cholesterol Education Program.

#### **Eligible Sample**

Participants aged 6 years and older were tested.

#### **Description of Laboratory Methodology**

HDL-Cholesterol is measured directly in serum. The apolipoprotein B containing lipoproteins in the specimen are reacted with a blocking reagent that renders them non-reactive with the enzymatic cholesterol reagent under conditions of the assay.

The procedure uses the Roche/Boehringer-Mannheim Diagnostics direct HDL method. The method uses sulfated alpha-cyclodextrin in the presence of Mg<sup>+2</sup>, which forms complexes with apoB containing lipoproteins, and polyethylene glycol-coupled cholesteryl esterase and cholesterol oxidase for the HDL-cholesterol measurement.

There was a change in the equipment from the Hitachi 717 to the Hitachi 912 during 2005-2006. The lab method was similar and the lab site was the same for HDL Cholesterol in NHANES 2003-2004. A detailed description of the laboratory method used can be found in Laboratory Procedures Manuals on the NHANES web site.

## Laboratory Quality Control and Monitoring

The NHANES quality assurance and quality control (QA/QC) protocols 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 QA/QC procedures can be found on the NHANES web site.

## Data Processing and Editing

Blood specimens were processed, stored, and shipped to Johns Hopkins Hospital, Baltimore, MD for analysis. Detailed specimen collection and processing instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Read the LABDOC file for detailed data processing and editing protocols. The analytical methods are described in the Description of the Laboratory Methodology section.

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

LBDHDDSI:

The HDL-cholesterol in mg/dL (LBXHDD) was converted to mmol/L (LBDHDDSI) by multiplying by 0.02586.

Detailed instructions on specimen collection and processing can be found on the NHANES web site.

## Analytic Notes

Change in Assay Methods Most Likely Responsible for Increased HDL Cholesterol values in NHANES 2003-2006 when compared to NHANES 1999-2002

Researchers are cautioned to interpret trends in HDL cholesterol for NHANES 1999-2006 in view of probable HDL cholesterol method effects.

The HDL cholesterol values showed an average increase of 3.0 mg/dL in NHANES 2003-2006 compared to NHANES 1999-2002. The HDL cholesterol was analyzed in 1999-2002 using two methods - heparin manganese precipitation and a direct HDL immunoassay depending on the participant age and amount of specimen. Most participants in 1999-2002 were measured by the precipitation method. Starting in 2003, all

HDL cholesterol samples were analyzed using the direct HDL cholesterol immunoassay method. The heparin-manganese precipitation method and direct immunoassay method for 1999-2000, 2001-2002 and 2005-2006 showed an undesirable bias (>4%) when compared to the laboratory's HDL-cholesterol quality controls (Solomon Park Research Laboratories, Kirkland, WA) that were assigned values established by the Centers for Disease Control and Prevention. The CDC HDL cholesterol reference method uses heparin-manganese to precipitate HDL-cholesterol and the Abell-Kendall method to measure cholesterol. The HDL cholesterol for 1999-2000, 2001-2002 and 2005-2006 were adjusted using: Corrected HDL = [(Solomon Park assigned HDL value) x (Participant HDL)] / (Quality Control HDL value associated with participant sample). The bias for the HDL cholesterol method for 2003-2004 was acceptable (<4%) and the participant results were not corrected. In addition, there was a change in instrumentation in 2005-2006 and there were several modifications of the direct HDL cholesterol method. To control for these differences in methods and instrumentation, the HDL cholesterol was corrected using the Solomon Lab quality controls as described above.

Despite this correction procedure, all age, gender, and race-ethnicity groups showed an increase in mean HDL cholesterol after 2003. It is most likely that the change from the precipitation method to the direct method in 2003 was responsible for the increase in HDL cholesterol values. Other covariates (body mass index, medications, physical exercise, smoking and alcohol consumption) may explain some of the HDL cholesterol increased values, but it is unlikely to account for the majority of the mean increase in HDL cholesterol. Further investigations will be done to attempt to explain the increased HDL cholesterol values and provide further guidance on the interpretation of HDL cholesterol for NHANES 1999-2006.

#### Correction of the HDL Cholesterol Method:

The HDL was corrected for the 2005-2006 data. The method showed an unacceptable bias of -5% (bias < -4%) when compared to known HDL-cholesterol controls (Solomon Park Research Laboratories, Kirkland, WA) with assigned values established by reference methods at the Centers for Disease Control and Prevention. The CDC HDL-cholesterol reference method uses heparin-manganese to precipitate HDL and the Abell-Kendall method to measure cholesterol.

The participants' HDL-cholesterol values for HDL cholesterol method was corrected as follows:

$$\text{Corrected HDL} = \frac{(\text{Solomon Park assigned HDL value}) \times (\text{Participant HDL})}{(\text{HDL QC value associated with participant sample})}$$

A batch of participants' HDL-cholesterol values was run with Solomon Park quality controls during 2005-2006. Each participant's HDL-cholesterol was adjusted by comparing the associated Solomon Park quality control value to the assigned HDL-cholesterol value.

General Notes:

The analysis of NHANES 2005–2006 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2005–2006 Household Questionnaire Data Files contain demographic data, health indicators, and other related information collected during household interviews. They also contain all survey design variables and sample weights for these age groups. The phlebotomy file includes auxiliary information such as the conditions precluding venipuncture. The household questionnaire and phlebotomy 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**      N/A

## Locator Fields

**Title:** HDL-Cholesterol

**Contact Number:** 1-866-441-NCHS

**Years of Content:** 2005–2006

**First Published:** December 2007

**Last Revised:** April 2008

**Access Constraints:** None

**Use Constraints:** None

**Geographic Coverage:** National

**Subject:** HDL-Cholesterol

**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)**

**HDL-Cholesterol (HDL\_D)  
Person Level Data**

December 2007



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

<b>LBDHDD</b>	<b>Target</b>
	B(6 Yrs. to 150 Yrs.)
<b>Hard Edits</b>	<b>SAS Label</b>
	Direct HDL-Cholesterol (mg/dL)
<b>English Text:</b> Direct HDL-Cholesterol (mg/dL)	
<b>English Instructions:</b>	

Code or Value	Description	Count	Cumulative	Skip to Item
15 to 188	Range of Values	7360	7360	
.	Missing	726	8086	

<b>LBDHDDSI</b>	<b>Target</b>
	B(6 Yrs. to 150 Yrs.)
<b>Hard Edits</b>	<b>SAS Label</b>
	Direct HDL-Cholesterol (mmol/L)
<b>English Text:</b> Direct HDL-Cholesterol (mmol/L)	
<b>English Instructions:</b>	

Code or Value	Description	Count	Cumulative	Skip to Item
0.39 to 4.86	Range of Values	7360	7360	
.	Missing	726	8086	