NHANES 2001–2002 Data Release
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Documentation for Laboratory Results

Laboratory 13AM - Triglycerides and LDL-Cholesterol

(1) Documentation File Date – June 2005

(2) Documentation File Name – Laboratory 13AM - Triglycerides and LDL-Cholesterol

(3) Survey Years Included in this File Release – 2001–2002

(4) Component Description

The goals of this component are: 1) to monitor the prevalence and trends in major cardiovascular conditions and risk factors in the U.S.; and 2) to evaluate prevention and treatment programs targeting cardiovascular disease in the U.S.

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. An estimated 4.8 million Americans have congestive heart failure. Increasing prevalence, hospitalizations, and deaths have made congestive heart failure a major chronic condition in the United States. The data will be used to monitor the status of hyperlipidemia and the success of the National Cholesterol Education Program.

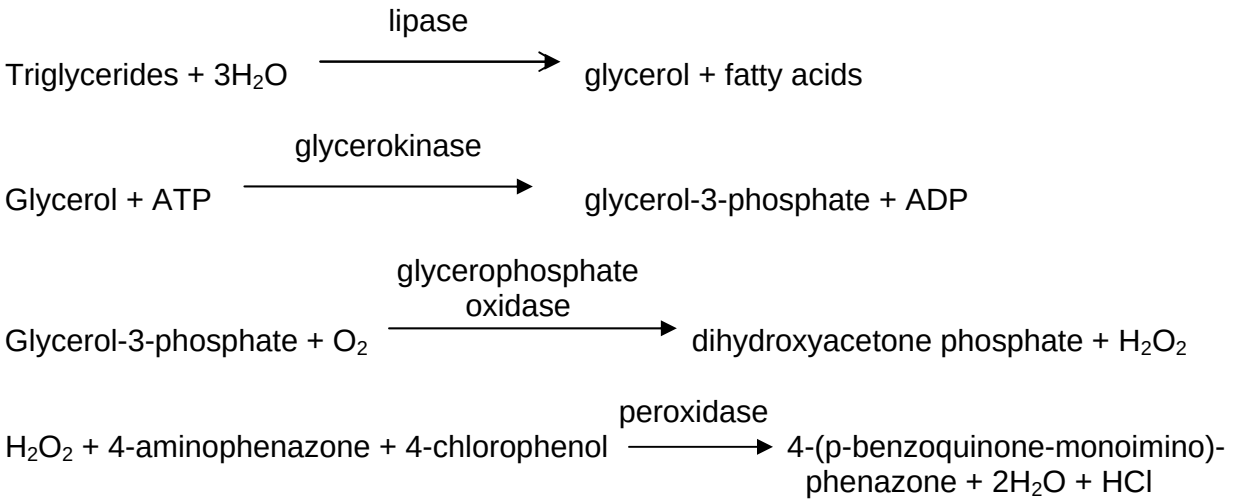
(5) Sample Description:

5.1 Eligible Sample

Participants aged 3 years and older who were examined in the morning session were tested. Fasting weights are available for sample persons ages 12 years and above who were fasting at least 8 hours or more but less than 24 hours. Morning (non-fasting) weights are also provided for participants ages 3–11.

(6) Description of the Laboratory Methodology

6.1 Triglycerides
Triglycerides are measured enzymatically in serum or plasma using a series of coupled reactions in which triglycerides are hydrolyzed to produce glycerol. Glycerol is then oxidized using glycerol oxidase, and H_2O_2, one of the reaction products, is converted via peroxidase to a phenazone. Absorbance is measured at 500 nm. The reaction sequence is as follows:



High levels of serum triglycerides help determine the risk for coronary heart disease (CHD) and peripheral atherosclerosis. High triglycerides are associated with increased risk for coronary artery disease (CAD) in patients with other risk factors, such as low high-density lipoproteins (HDL)-cholesterol, some patient groups with elevated apolipoprotein B, and patients with forms of low-density lipoproteins (LDL) that may be particularly atherogenic. Desirable fasting triglyceride levels are considered to be those below 150 mg/dL and are further categorized as Borderline High, 150–199 mg/dL; High, 200–499 mg/dL; and Very High, > 500 mg/dL. Very high triglycerides can result in pancreatitis. Triglycerides are also measured because the value is used to calculate LDL-cholesterol concentrations. In NHANES, triglycerides are only measured in specimens from the morning session. Sample persons ages 12 and above and fasting at least 8 hours or more but less than 24 hours have values and have non-zero fasting sample weights. Morning (non-fasting) weights are provided for participants ages 3–11 years.

6.2 LDL-Cholesterol

Most of the circulating cholesterol is found in three major lipoprotein fractions: Very low-density lipoproteins (VLDL), LDL, and HDL. LDL-cholesterol is calculated from measured values of total cholesterol, triglycerides, and HDL-cholesterol according to the Friedewald calculation:

[LDL-cholesterol] = [total cholesterol] – [HDL-cholesterol] – [triglycerides/5]

where [triglycerides/5] is an estimate of VLDL-cholesterol and all values are expressed in mg/dL. The calculation is valid for triglycerides less than or equal to 400 mg/dL.

LDL carries most of the circulating cholesterol and, when elevated, contributes to the development of coronary atherosclerosis. LDL-cholesterol is measured to assess risk for CHD and to follow the progress of patients being treated to lower LDL-cholesterol concentrations. Desirable levels of LDL-cholesterol are below 130 mg/dL, borderline high is from 130–159 mg/dL, high is 160–189 mg/dL and very high LDL-cholesterol is greater than or equal to 190 mg/dL. LDL-cholesterol is reported only for fasting (at least 8 hours or more

but less than 24 hours) participants aged 12 and above who were examined in the morning sessions.

(7) 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.

(8) Data Processing and Editing

Blood specimens were processed, stored and shipped to Johns Hopkins Hospital, Baltimore, Maryland for analysis. Detailed specimen collection and processing instructions are discussed in the NHANES 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.

(9) Data Access:

All data are publicly available.

(10) Analytic Notes for Data Users:

10.1 NHANES 2001–2002 laboratory data
The analysis of NHANES 2001–2002 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2001–2002 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.

10.2 LBXTR
Serum triglyceride levels were measured on examinees that were examined in the morning session only. The distribution of serum triglycerides should be estimated only on examinees ages 12 and above who fasted at least 8 hours or more but less than 24 hours, were examined in the morning, and were randomly assigned to the morning fasting sample.

The Laboratory 13AM data file contains laboratory test results for triglycerides (LBXTR) derived from the reference analytic method. However, the NHANES Lab 40 biochemistry profiles also include measurements of triglycerides (Lab 40 variable name is LBXSTR). The appropriate variable to use is LBXTR from Lab 13AM.

10.3 LBDTRSI
The triglycerides value in mg/dL (LBXTR) was converted to mmol/L (LBDTRSI) by multiplying by 0.01129.

10.4 LBDLDL
Serum LDL-cholesterol levels were measured on examinees that were examined in the morning session only. The distribution of serum LDL-cholesterol should be estimated only on examinees ages 12 and above who fasted at least 8 hours or more but less than 24 hours, were examined in the morning, and were randomly assigned to the morning fasting sample. LDL-cholesterol is calculated from measured values of total cholesterol, triglycerides, and HDL-cholesterol according to the Friedewald calculation:

[LDL-cholesterol] = [total cholesterol] – [HDL-cholesterol] – [triglycerides/5]

where all values are expressed in mg/dL. The calculation is valid for triglycerides less than or equal to 400 mg/dL.

10.5 LBDLDLSI
The LDL-cholesterol in mg/dL (LBDLDL) was converted to mmol/L (LBDLDLSI) by multiplying by 0.02586.

10.6 SAMPLING WEIGHTS

WTSAF4YR and WTSAF2YR (4-year and 2-year fasting weights for participants 12+ years and morning weights for 3-11 years):
One-half of the participants were sampled to attend the morning session. Those participants ages 12 and older appointed to attend the morning session were instructed to fast at least 9 hours prior to their appointment time. Participants ages 3-11 years were not required to fast.

Subsample weights were required for analysis since the analysis of interest involves only those sampled persons ages 12 and older examined in the morning. Because fasting is a key characteristic of this subsample, this data item is called “fasting” weight. Fasting weights were generated for the diabetes laboratory testing (Laboratory 10AM) and were also used for triglycerides and LDL cholesterol (Laboratory 13AM) because multiple sets of fasting weights were not desirable. Non-zero fasting weights were generated for sample persons 12 years and older who fasted 8 to 24 hours and had plasma glucose values and diabetics who fasted but had missing plasma glucose values. Diabetics who did not fast have zero weights.

Subsample weights are also provided for participants aged 3–11 years. The analyst should use these weights for 3-11 years with great caution. Many of these participants were not fasting and these weights were not adjusted for nonresponse in this age group. Weights (WTSAF4YR or WTSAF2YR) for ages 3-11 are referred to as “morning” weights because they were not adjusted for nonresponse or non-fasting. The analyst may wish to consider the issue of re-weighting the data for 3-11 years. Therefore, when considering the analysis of data for ages 3 and over, the analyst should analyze the data with great caution because

of the different weighting methodology and fasting protocols for the participants between ages 3-11 and ages 12 and over.

The analyst is strongly encouraged to use the 4-year fasting weights (WTSAF4YR) to analyze 1999-2002 data for participants 12 years and older. The 2-year fasting weights (WTSAF2YR) should be used when analyzing NHANES 2001-2002. The use of the full sample MEC examined weights (WTMEC4YR or WTMEC2YR) should not be used to analyze the data if the outcome of interest is only measured on the morning fasting sample.

See the Analytic Guidelines regarding applying weights for analysis of data.

(11) References

1. N/A