NHANES 1999–2000 Public Release Dataset

Laboratory 13AM – Triglycerides and LDL-Cholesterol (September 2003)

Description

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

Eligible Sample
Data for participants aged 3 years and older who do not meet any of the exclusion criteria were sampled.

Data Collection Methods
Blood specimens are processed, stored, and shipped to the Johns Hopkins University Lipoprotein Analytical Lab for testing.

Examination Protocol
Detailed specimen collection and processing instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Vials were stored under appropriate frozen (-20 degrees Centigrade) conditions until they were shipped to the Johns Hopkins University Lipoprotein Analytical Lab for testing.

Analytic Methodology

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 measured as described for total cholesterol. Absorbance is measured at 500 nm. The reaction sequence is as follows:

$$\text{Triglycerides} + 3H_2O \xrightarrow{\text{lipase}} \text{glycerol} + \text{fatty acids}$$

$$\text{Glycerol} + \text{ATP} \xrightarrow{\text{glycerokinase}} \text{glycerol-3-phosphate} + \text{ADP}$$

$$\text{Glycerol-3-phosphate} + O_2 \xrightarrow{\text{glycerophosphate oxidase}} \text{dihydroxyacetone phosphate} + H_2O_2$$

$$H_2O_2 + \text{4-aminophenazone} + \text{4-chlorophenol} \xrightarrow{\text{peroxidase}} \text{4-(p-benzoquinone-monoimino)-phenazone} + 2H_2O + HCl.$$

High levels of serum triglycerides help determine the risk for CHD and peripheral atherosclerosis. High triglycerides are associated with increased risk for CAD in patients with other risk factors, such as low HDL-cholesterol, some patient groups with elevated apolipoprotein B concentrations, and patients with forms of LDL-cholesterol 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: greater than or equal to 500 mg/dL. Very high triglycerides can result in pancreatitis. Triglycerides are also measured because the value is used to calculate low-density lipoprotein (LDL)-cholesterol concentrations. In NHANES, triglycerides are only measured in specimens from fasting participants, i.e., those sampled in the morning examination session.

LDL-Cholesterol

Most of the circulating cholesterol is found in three major lipoprotein fractions: Very low density lipoproteins (VLDL), low density lipoproteins (LDL) and high density lipoproteins (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 only for triglycerides less than 400 mg/dL.

LDL carries most of the circulating cholesterol in man 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 participants (greater than 8.5 hours) who were examined in the morning examination session.

Analytic Notes

LBXTR
Serum triglyceride levels were measured on NHANES examinees that were examined in the morning session only. The distribution of serum triglycerides should be estimated on examinees who fasted at least 8.5 hours. Eligible NHANES examinees were randomly assigned to the morning fasting sample.

The Laboratory 13AM data file contains laboratory test results for triglycerides (LBXTR), which uses the reference analytic method. However, the NHANES Laboratory 18 biochemistry profiles also include measurements of triglycerides (Laboratory 18 variable name: LBXSTR). In general, for most analyses, the appropriate triglyceride variable to use is LBXTR. The triglyceride value from the biochemistry profile (LBXSTR) should not be used routinely.

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

LBDLDL
Serum LDL-cholesterol levels were measured on examinees that were examined in the morning session. The distribution of serum LDL-cholesterol should be estimated on examinees who fasted at least 8.5 hours. 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 only less than 400 mg/dL.

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

Sample Weights
Use the full sample morning fasting sample weight (WTSAM2YR) and the jackknife replicate morning fasting sample weights (WTSAM01-WTSAM52) for serum triglycerides and low density lipoprotein (LDL) cholesterol analyses.

The full sample weights are used to estimate means, percentages, medians and other percentiles and regression coefficients.

The 52 jackknife replicate weights are used to estimate standard errors of these statistics.

Special Notes for this Dataset

The analysis of NHANES 1999-2000 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 1999-2000 Household Questionnaire data files contain demographic data, health indicators, and other related information collected during the household components. The Household Questionnaire data files include all of the 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.