National Health and Nutrition Examination Survey

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

Standard Biochemistry Profile (BIOPRO_L)

Data File: BIOPRO_L.xpt

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Component Description

These series of measurements are used in the diagnosis and treatment of certain liver, heart, and kidney diseases; acid-base imbalance in the respiratory and metabolic systems; other diseases involving lipid metabolism; various endocrine disorders; as well as other metabolic or nutritional disorders.

Alanine Aminotransferase (ALT)

Alanine aminotransferase measurements are used in the diagnosis and treatment of certain liver diseases (e.g., viral hepatitis and cirrhosis) and heart diseases. Elevated levels of the transaminases can indicate myocardial infarction, hepatic disease, muscular dystrophy, or organ damage. Serum elevations of ALT activity are rarely observed, except in parenchymal liver disease since ALT is a more liver-specific enzyme than aspartate aminotransferase (AST).

Albumin

Albumin measurements are used in the diagnosis and treatment of diseases involving the liver and/or kidneys and are frequently used to assess nutritional status because plasma levels of albumin are dependent on protein intake.

Alkaline Phosphatase (ALP)

Alkaline phosphatase measurements are used in the diagnosis and treatment of liver, bone, and parathyroid disease.

Aspartate Aminotransferase (AST)

AST measurements are used in the diagnosis and treatment of certain types of liver and heart disease. Elevated levels of the transaminases can signal myocardial infarction, hepatic disease, muscular dystrophy, or organ damage.

Bicarbonate (HCO3)

Together with pH determination, bicarbonate measurements are used in the diagnosis and treatment of numerous potentially serious disorders associated with acid-base imbalance in the respiratory and metabolic systems.

Blood Urea Nitrogen (BUN)

BUN measurements are used in the diagnosis of certain renal and metabolic diseases. The determination of serum urea nitrogen is the most widely used test for the evaluation of kidney function. The test is frequently requested in conjunction with the serum creatinine test for the differential diagnosis of prerenal, renal, and post renal uremia. High BUN levels are associated with impaired renal function, increased protein catabolism, nephritis, intestinal obstruction, urinary obstruction, metallic poisoning, cardiac failure, peritonitis, dehydration, malignancy, pneumonia, surgical shock, Addison's disease, and uremia. Low BUN levels are associated with amyloidosis, acute liver disease, pregnancy, and nephrosis. Normal variations are observed according to a person's age and sex, the time of day, and their diet – particularly in their protein intake.

Creatinine

Creatinine measurements are useful in the diagnosis and treatment of renal diseases.

Creatine Phosphokinase (CPK)

Measurements of creatine phosphokinase are used in the diagnosis and treatment of myocardial infarction, skeletal muscle diseases, and diseases of the central nervous system.

Gamma-glutamyl Transaminase (GGT)

GGT measurements are principally used to diagnose and monitor hepatobiliary disease. It is currently the most sensitive enzymatic indicator of liver disease, with normal values rarely found in the presence of hepatic disease. It is also used as a sensitive screening test for occult alcoholism. Elevated levels are found in patients who chronically take drugs, such as phenobarbital and phenytoin.

Globulin

Globulins are a diverse group of proteins that transport various substances in the blood. They are also involved in various defense mechanisms within the body. Measurements of globulin are calculated **(Total protein - Albumin)** and are used to determine the serum globulin concentration.

Glucose

Glucose measurements are used in the diagnosis and treatment of pancreatic islet cell carcinoma and of carbohydrate metabolism disorders, including diabetes mellitus, neonatal hypoglycemia, and idiopathic hypoglycemia.

Iron

Iron (non-heme) measurements are used in the diagnosis and treatment of diseases, such as iron deficiency anemia, chronic renal disease, and hemochromatosis (a disease associated with widespread deposit in the tissues of two iron-containing pigments, hemosiderin and hemofuscin, and characterized by pigmentation of the skin).

Lactate Dehydrogenase (LDH)

LDH measurements are used in the diagnosis and treatment of liver diseases, such as acute viral hepatitis, cirrhosis, and metastatic carcinoma of the liver; cardiac diseases, such as myocardial infarction; and tumors of the lungs or kidneys.

Osmolality

Serum osmolality is a measure of the number of dissolved particles in a solution and is used to evaluate hydration status and detect potential toxins and foreign substances in the blood. (Osmolality is a calculated value on the chemistry analyzer: [(1.86*Na) + (GLUC/18) + (BUN/2.8) + 9].

Phosphorus

There is a reciprocal relationship between serum calcium and inorganic phosphorus. Any increase in the level of inorganic phosphorus causes a decrease in the calcium level by a mechanism not clearly understood. Hyperphosphatemia is associated with vitamin D hypervitaminosis, hypoparathyroidism, and renal failure. Hypophosphatemia is associated with rickets, hyperparathyroidism, and Fanconi syndrome.

Measurements of inorganic phosphorus are used in the diagnosis and treatment of various disorders, including parathyroid gland, kidney diseases, and vitamin D imbalance.

Potassium, Chloride, and Sodium

Hypokalemia (low serum potassium level) is associated with body potassium deficiency, excessive potassium loss caused by prolonged diarrhea or prolonged periods of vomiting and increased secretion of mineralocorticosteroids. Hyperkalemia (increased serum potassium level) is associated with oliguria, anuria, and urinary obstruction.

Low serum chloride values are associated with salt-losing nephritis; Addisonian crisis, prolonged vomiting, and metabolic acidosis caused by excessive production or diminished excretion of acids. High serum chloride values are associated with dehydration and conditions causing decreased renal blood flow, such as congestive heart failure.

Sodium measurements are used in the diagnosis and treatment of diseases involving electrolyte imbalance.

Total Bilirubin

Elevated levels are associated with hemolytic jaundice, paroxysmal hemoglobinuria, pernicious anemia, polycythemia, icterus neonatorum, internal hemorrhage, acute hemolytic anemia, malaria, and septicemia.

Low bilirubin levels are associated with aplastic anemia, and certain types of secondary anemia resulting from toxic therapy for carcinoma and chronic nephritis.

Total Calcium

Calcium measurements are used in the diagnosis and treatment of parathyroid disease, bone diseases, chronic renal disease, and tetany. Urinary calcium measurement is used in the differential diagnosis of hypercalciuria**.**

Total Cholesterol

An elevated cholesterol level is associated with diabetes, nephrosis, hypothyroidism, biliary obstruction, and those rare cases of idiopathic hypercholesterolemia and hyperlipidemia; low levels are associated with hyperthyroidism, hepatitis, and sometimes severe anemia or infection.

Total Protein

Total protein measurements are used in the diagnosis and treatment of a variety of diseases involving the liver, kidney, or bone marrow, as well as other metabolic or nutritional disorders.

Triglycerides

Triglyceride measurements are used in the diagnosis of diabetes mellitus, nephrosis, liver obstruction, and other diseases involving lipid metabolism and various endocrine disorders and in the treatment of patients with these diseases.

Uric Acid

Uric acid measurements are used in the diagnosis and treatment of numerous renal and metabolic disorders, including renal failure, gout, leukemia, psoriasis, starvation, or other wasting conditions and in the treatment of patients receiving cytotoxic drugs.

Eligible Sample

All examined participants aged 12 years and older were eligible.

Description of Laboratory Methodology

NOTE: Glucose, cholesterol, and triglyceride were analyzed 1) as part of the biochemistry profile in this dataset; and 2) at other institutions, which are considered the reference methods for these measures. The results in this dataset do not replace the reference method data. See the Analytical Notes section below for more detailed information.

All methods were measured on the Roche Cobas 8000 analyzer. See Laboratory Method Files for more detailed information about analyte methodologies, principles, and operating procedures.

Alanine Aminotransferase (ALT)

The method to measure alanine aminotransferase (ALT) catalyzes the reaction of alpha-ketoglutarate with L-alanine to form L-glutamate and pyruvate. Under the action of LDH, pyruvate converts to lactate, and NADH is converted to NAD. The decrease in absorbance of NADH, measured at 340 nm (secondary wavelength is 700 nm), is directly proportional to the serum activity of ALT. It is a kinetic rate reaction.

Albumin

The method to measure albumin concentration utilizes the dye bromcresol purple (BCP). When the dye binds selectively with albumin in a pH range of 5.2-6.8, a color change occurs that is measured at 600 nm. The secondary wavelength is 700 nm. This is a 2-point, endpoint reaction that is specific for albumin.

Aspartate Aminotransferase (AST)

Aspartate aminotransferase (AST) activity is determined by a modification of the method recommended by the International Federation of Clinical Chemistry (IFCC). AST catalyzes the reaction of alpha-ketoglutarate with L-aspartate to form L-glutamate and oxaloacetate. Under the action of malate dehydrogenase (MDH), oxaloacetate converts to malate, and NADH is oxidized to NAD. The decrease in absorbance of NADH, measured at 340 nm (secondary wavelength = 700 nm), is directly proportional to the serum activity of AST. It is a kinetic rate reaction.

Alkaline Phosphatase (ALP)

The method to measure alkaline phosphatase (ALP) utilizes a simple reaction wherein ALP acts upon a substrate (p-nitrophenol phosphate, or PNPP) in the presence of magnesium and zinc activators to form a colored product (p-nitrophenol) whose appearance is measured at 450 nm. The rate of p-nitrophenol formation is directly related to the amount of alkaline phosphatase in the specimen.

Bicarbonate (HCO_3)

The method to measure bicarbonate (HCO_3) utilizes an enzyme-based reaction.

Phosphoenolpyruvate (PEP) is added to the specimen containing bicarbonate. Under the action of phosphoenolpyruvate carboxylase (PEPC) the PEP accepts the bicarbonate and is converted to oxaloacetate. Then under the action of malate dehydrogenase, and in the presence of an NADH analog, the oxaloacetate is converted to malate, with the NADH analog converting to an NAD analog. The rate of disappearance of NADH analog is measured at 415 nm, and it is directly proportional to the amount of bicarbonate in the specimen.

Blood Urea Nitrogen (BUN)

The method to measure blood urea nitrogen utilizes a coupled enzyme reaction (urease, followed by glutamate dehydrogenase), with measurement of NADH (converting to NAD+) occurring at 340 nm.

Creatine Phosphokinase (CPK)

The method to measure creatine phosphokinase (CPK) or creatine kinase (CK) utilizes a coupled enzyme reaction. Creatine phosphate and adenosine diphosphate (ADP) are acted upon by CK in the serum specimen. Creatine and ATP are produced from this reaction, and ATP reacts with glucose under the action of hexokinase to produce glucose-6-phosphate and ADP. The glucose-6-phosphate reacts with NADP under the action of glucose-6-phosphate dehydrogenase to produce NADPH and a by-product. The photometrically (340 nm) measured rate of NADPH formation is directly proportional to the CK activity in the specimen.

Creatinine

Creatinine is measured using an enzymatic method in which creatinine is converted to creatine under the activity of creatininase. Creatine is then acted upon by creatinase to form sarcosine and urea. Sarcosine oxidase converts sarcosine to glycine and hydrogen peroxide, and the hydrogen peroxide reacts with a chromophore in the presence of peroxidase to produce a colored product that is measured at 546 nm (secondary wavelength = 700 nm). This is an endpoint reaction that agrees well with recognized HPLC methods, and it has the advantage over Jaffe picric acid-based methods that are susceptible to interferences from non-creatinine chromogens.

Gamma-glutamyl Transaminase (GGT)

The method to measure gamma-glutamyl transaminase (GGT) is a slight modification (slightly different substrate) of the method introduced by Szasz in 1969 (Whitfield JB, et. al., 1972) In the presence of glycylglycine, L-gamma-glutamyl-3-carboxy-4-nitroanilide is converted by GGT to 5-amino-2-nitrobenzoate and L-gamma-glutamyl-glycylglycine. The rate of colored product formation is directly related to the amount of GGT in the specimen, and the rate of its appearance is measured at 415 nm (secondary wavelength 700 nm). This is a kinetic (Rate-A) reaction.

Glucose

The method to measure glucose utilizes an enzymatic method that converts glucose to glucose-6-phosphate (G-6-P) by hexokinase in the presence of ATP, a phosphate donor. Glucose-6-phosphate dehydrogenase then converts the G-6-P to gluconate-6-P in the presence of NADP+. As the NADP+ is reduced to NADPH during this reaction, the resulting increase in absorbance at 340 nm (secondary wavelength = 700 nm) is measured. This is an endpoint reaction that is specific for glucose.

Iron

The Roche method of iron measurement is a three-step process using the FerroZine reagent: Fe3+ is liberated from transferrin by acid/detergent, Fe3+ is reduced to Fe2+ by ascorbate, and the reduced iron then reacts with the FerroZine reagent to form a colored complex. The intensity of this final product is directly proportional to the iron concentration in the specimen.

Lactate Dehydrogenase (LDH)

The Roche method of LDH measurement is derived from the formulation recommended by the International Federation of Clinical Chemistry (IFCC) and is optimized for performance and stability. In the presence of cofactor NAD+, LDH converts L-lactate to pyruvate. NAD+ is reduced to NADH during this reaction. The initial rate of NADH formation is directly proportional to the catalytic LDH activity and is determined by measuring the increase in absorbance at 340 nm. This is a kinetic (Rate-A) reaction.

Phosphorus

The method used to measure phosphorus utilizes ammonium molybdate as the color-forming reagent. Measurement of the final product occurs at 340 nm (secondary wavelength 700 nm). Inorganic phosphate forms an ammonium phosphomolybdate complex having the formula (NH4)3[PO4(MoO3)12] with ammonium molybdate in the presence of sulfuric acid. The concentration of phosphomolybdate formed is directly proportional to the inorganic phosphate concentration.

Potassium, Chloride, & Sodium

An Ion-Selective Electrode (ISE) makes use of the unique properties of certain membrane materials to develop an electrical potential (electromotive force, EMF) for the measurements of ions in solution. The electrode has a selective membrane in contact with both the test solution and an internal filling solution. The internal filling solution contains the test ion at a fixed concentration. Because of the particular nature of the membrane, the test ions will closely associate with the membrane on each side. The membrane EMF is determined by the difference in concentration of the test ion in the test solution and the internal filling solution. The complete measurement system for a particular ion includes the ISE, a reference electrode, and electronic circuits to measure and process the EMF to give the test ion concentration. The

sodium and potassium electrodes are based on neutral carriers and the chloride electrode is based on an ion exchanger.

Chloride

The method used to measure Chloride is an indirect (specimen is diluted (1:31) by the instrument prior to analysis) ion-selective electrode (ISE) method for determination of the serum electrolyte concentrations.

Potassium

Potassium ion concentration is measured by electrolyte activity in solution. This method utilizes an indirect (specimen is diluted by the instrument prior to analysis) ion-selective electrode (ISE) method for determination of the serum electrolyte concentrations.

Sodium

The method used to measure sodium utilizes an indirect (specimen is diluted by the instrument prior to analysis) ion-selective electrode (ISE) method for determination of the serum electrolyte concentrations.

Total Bilirubin

The method to measure total bilirubin is coupled with 3,5-dichlorophenyl diazonium in the presence of a solubilizing agent in a strongly acidic medium. The intensity of the red azo dye formed is directly proportional to the total bilirubin and can be determined photometrically (546 nm).

Total Calcium

The method used to measure total calcium reacts with 5-nitro-5'methyl-BAPTA (NM-BAPTA) under alkaline conditions to form a complex. This complex then reacts with EDTA to form a colored product whose intensity is directly proportional to the concentration of calcium in the specimen. It is measured photometrically at 340 nm.

Total Cholesterol

The method used to measure cholesterol is an enzymatic method where esterified cholesterol is converted to cholesterol by cholesterol esterase. The resulting cholesterol is then acted upon by cholesterol oxidase to produce cholest-4-en-3-one and hydrogen peroxide. The hydrogen peroxide then reacts with 4-aminophenazone in the presence of peroxidase to produce a colored product that is measured at 505 nm (secondary wavelength = 700 nm). The final step is known as the Trinder reaction. This method is a single reagent, endpoint reaction that is specific for cholesterol.

Total Protein

The total protein method utilizes the biuret reaction with measurement of the final product at 546 nm. Divalent copper reacts in alkaline solution with protein peptide bonds to form the characteristic purple-colored biuret complex. Sodium potassium tartrate prevents the precipitation of copper hydroxide and potassium iodide prevents auto-reduction of copper. The color intensity is directly proportional to the protein concentration.

Triglycerides

The method used to measure triglyceride is based on the work by Wahlefeld using a lipoprotein lipase from microorganisms for the rapid and complete hydrolysis of triglycerides to glycerol followed by oxidation to dihydroxyacetone phosphate and hydrogen peroxide. The hydrogen peroxide produced then reacts with 4-aminophenazone and 4-chlorophenol under the catalytic action of peroxidase to form a red dyestuff (Trinder endpoint reaction). The color intensity of the red dyestuff formed is directly proportional to the triglyceride concentration and can be measured photometrically.

Uric Acid

In this method uric acid is oxidized by uricase. Then the peroxide produced from this reaction is acted upon by peroxidase in the presence of 4 aminophenazone to produce a measurable colored product. It is a two-point, endpoint reaction, with measurement occurring at 546 nm (secondary wavelength 700 nm).

There were no changes to the lab method in the NHANES August 2021-August 2023 cycle for These series of measurements. However, the lab equipment used for the measurements was updated from the Cobas 6000 Analyzer to Cobas 8000. Please refer to the Analytic Notes section for additional information.

Refer to the Laboratory Method Files section for a detailed description of the laboratory methods used.

Laboratory Method Files

Albumin (September 2025)

ALP (September 2025)

ALT (September 2025)

AST (September 2025)

Bicarbonate (September 2025)

BUN (September 2025)

Chloride (September 2025)

CPK (September 2025)

Creatinine (September 2025)

GGT (September 2025)

Glucose (September 2025)

Iron (September 2025)

LDH (September 2025)

Magnesium (September 2025)

Phosphorus (September 2025)

Potassium (September 2025)

Sodium (September 2025)

Total Bilirubin (September 2025)

Total Calcium (September 2025)

Total Cholesterol (September 2025)

Total Protein (September 2025)

Triglycerides (September 2025)

Uric acid (September 2025)

Laboratory Quality Assurance and Monitoring

Serum specimens are processed, stored, and shipped to the University of Minnesota – Advanced Research Diagnostics Laboratory (ARDL), Minneapolis, MN for analysis.

Detailed instructions on specimen collection and processing are discussed in the NHANES Laboratory Procedures Manuals (LPMs). Vials were stored under appropriate refrigerated (2-8°C) conditions until they are shipped to ARDL for testing.

The NHANES quality assurance and quality control (QA/QC) protocols meet the 1988 Clinical Laboratory Improvement Amendment mandates. Detailed QA/QC instructions are discussed in the NHANES LPMs.

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 specimens 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.

Data Processing and Editing

The data were reviewed. Incomplete data or improbable values were sent to the performing laboratory for confirmation.

There were 13 additional variables created in this data file to convert the analyzed values into International System of Units (SI). These variables were created using the following formulas:

LBXSAL conversion to LBDSALSI

Albumin in g/dL (LBXSAL) was converted to g/L (LBDSALSI) by multiplying by **10**

LBXSBU conversion to LBDSBUSI

Blood urea nitrogen (BUN) in mg/dL (LBXSBU) was converted to mmol/L (LBDSBUSI) by multiplying by **0.357**

LBXSCA conversion to LBDSCASI

Calcium in mg/dL (LBXSCA) was converted to mmol/L (LBDSCASI) by multiplying by **0.250**

LBXSCH conversion to LBDSCHSI

Cholesterol in mg/dL (LBXSCH) was converted to mmol/L (LBDSCHSI) by multiplying by **0.0259**

LBXSCR conversion to LBDSCRSI

Creatinine in mg/dL (LBXSCR) was converted to µmol/L (LBDSCRSI) by multiplying by **88.4**

LBXSGL conversion to LBDSGLSI

Glucose in mg/dL (LBXSGL) was converted to mmol/L (LBDSGLSI) by multiplying by **0.0555**

LBXSIR conversion to LBDSIRSI

Iron in µg/dL (LBXSIR) was converted to µmol/L (LBDSIRSI) by multiplying by **0.1791**

LBXSPH conversion to LBDSPHSI

Phosphorus in mg/dL (LBXSPH) was converted to mmol/L (LBDSPHSI) by multiplying by **0.323**

LBXSTB conversion to LBDSTBSI

Total bilirubin in mg/dL (LBXSTB) was converted to µmol/L (LBDSTBSI) by multiplying by **17.1**

LBXSTP conversion to LBDSTPSI

Total protein in g/dL (LBXSTP) was converted to g/L (LBDSTPSI) by multiplying by **10**

LBXSTR conversion to LBDSTRSI

Triglycerides in mg/dL (LBXSTR) were converted to mmol/L (LBDSTRSI) by multiplying by **0.0113**

LBXSUA conversion to LBDSUASI

Uric acid in mg/dL (LBXSUA) was converted to µmol/L (LBDSUASI) by multiplying by **59.48**

LBXSGB conversion to LBDSGBSI

Globulin in g/dL (LBXSGB) was converted to g/L (LBDSGBSI) by multiplying by **10**

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.

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 further 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 August 2021-August 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.

This laboratory data file can be linked to the other NHANES data files using the unique survey participant identifier (i.e., SEQN).

Glucose (LBXSGL)

This glucose value was obtained from the standard battery of biochemical assessments. Use of the laboratory test result from the reference method (LBXGLU), rather than the standard battery of biochemical assessments value (LBXSGL), is generally recommended. These serum glucose values (LBXSGL) reported in this data file should not be used to determine undiagnosed diabetes or prediabetes. Instead, plasma glucose values (LBXGLU) should be used, which are based on the reference analytic method in the **GLU_L** data file. Special weights included in the **GLU_L** data file should be used when analyzing these data.

Total Cholesterol (LBXSCH)

This total cholesterol value was obtained from the standard battery of biochemical assessments. Use of the laboratory test result from the reference method (LBXTC), rather than the standard battery of biochemical assessments value (LBXSCH), is generally recommended. For most serum cholesterol analyses, the appropriate variable to use will be (LBXTC) in the **TCHOL_L** data file. The (LBXSCH) value from the standard biochemistry profile should not be used routinely.

Triglycerides (LBXSTR)

This triglyceride value was obtained from the standard battery of biochemical assessments. Use of the laboratory test result from the reference method (LBXTR), rather than the standard battery of biochemical assessments value (LBXSTR), is generally recommended. For most triglyceride analyses, the appropriate variable to use is (LBXTR) in the **TRIGLY_L** data file. The value from the standard biochemistry profile (LBXSTR) should not be used routinely.

Detection Limits

The detection limits were constant for all of the analytes in the data set. Variable prefixed LBX (ex., LBXSATSI) provides the analytic result for that analyte. For analytes with analytic results below the lower limit of detection, 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]). A variable name ending in "LC" (ex. LBDSATLC) is included for these analytes to indicate 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.

The lower limit of detection (LLOD) for the Standard Biochemistry Profile:

Variable Name	ANALYTE DESCRIPTION	LLOD
LBXSATSI	Alanine Aminotransferase (ALT) (IU/L)	3
LBXSAL	Albumin, refrigerated serum (g/dL)	0.2
LBXSAPSI	Alkaline Phosphatase (ALP) (IU/L)	5
LBXSASSI	Aspartate Aminotransferase (AST) (IU/L)	5
LBXSC3SI	Bicarbonate (mmol/L)	2
LBXSBU	Blood Urea Nitrogen (mg/dL)	1.4
LBXSCLSI	Chloride (mmol/L)	N/A
LBXSCK	Creatine Phosphokinase (CPK) (U/L)	7
LBXSCR	Creatinine, refrigerated serum (mg/dL)	0.06
LBXSGTSI	Gamma-Glutamyl Transferase (GGT) (IU/L)	3
LBXSGL	Glucose, refrigerated serum (mg/dL)	2
LBXSIR	Iron, refrigerated serum (µg/dL)	5
LBXSLDSI	Lactate Dehydrogenase (LDH) (IU/L)	10
LBXMAGN	Magnesium (mg/dL)	0.2
LBXSPH	Phosphorus (mg/dL)	0.3
LBXSKSI	Potassium (mmol/L)	N/A
LBXSNASI	Sodium (mmol/L)	N/A
LBXSTB	Total Bilirubin (mg/dL)	0.15
LBXSCA	Total Calcium (mg/dL)	0.8
LBXSCH	Total Cholesterol, refrigerated serum (mg/dL)	3.86
LBXSTP	Total Protein (g/dL)	0.2
LBXSTR	Triglycerides, refrigerated serum (mg/dL)	9
LBXSUA	Uric Acid (mg/dL)	0.2

Standard Biochemistry Profile regression equations to compare 2017-March 2020 and August 2021-August 2023 data:

A method validation (bridging) studies were performed to compare results from an instrument change in the August 2021-August 2023 cycle: the Cobas 6000 Chemistry Analyzer was upgraded to the Cobas 8000 Chemistry Analyzer. Randomly selected serum samples (n=152) from previous NHANES were measured using both instruments and the results were used to conduct the analysis.

The table below provides the results from the bridging study for each analyte. It includes mean differences (% Diff) and correlation coefficients (r) between the two measurements. When an adjustment is recommended, the regression model used for the adjustment as well as the forward and backward adjustment equations are also included in the table. When the differences between the two measurements were proportional to concentration, Weighted Deming regressions were chosen to adjust the results. When differences were constant across the interval of concentration, a non-weighted Deming regression was chosen. No adjustment is recommended if both the slope and the intercept of the regression equation are not

significant (i.e., 95% confidence interval [CI] for slope included 1 and for intercept included 0). All analyses were performed using Analyse-it, v4.30.4.

It is recommended that these equations be used when examining trends among standard biochemistry profile data across 1999-2018 and August 2021-August 2023 cycles, or when combining August 2021-August 2023 data with previous cycles. For more detailed information on the standard biochemistry profile data files in the previous cycles, please refer to the documentations accompanying these datasets.

VARIABLE NAME (unit)	**STATISTICAL ADJUSTMENT METHOD**	**FORWARD EQUATIONS** [95% CI]	**BACKWARD EQUATIONS** [95% CI]	**% DIFF**	**r**
LBXSAL (g/dL)	Adjustment Not Recommended	N/A	N/A	1.48	0.969
LBXSAPSI[1] (IU/L)	Weighted Deming	$\mathbf{Y_{Cobas\ 8000}}$ = **-0.6745** [-1.513, 0.1641] **+ 1.106** [1.092, 1.120] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **0.6098** [-0.1414, 1.361] **+ 0.9041** [0.8927, 0.9156] * $\mathbf{X_{Cobas\ 8000}}$	9.68	0.997
LBXSASSI (IU/L)	Adjustment Not Recommended	N/A	N/A	0.59	0.995
LBXSATSI (IU/L)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **1.477** [95% CI:1.203 to 1.751] **+ 0.9663** [95% CI: 0.9507 to 0.9820] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **-1.529** [95% CI: -1.834 to -1.224] **+ 1.035** [95% CI: 1.018 to 1.052] * $\mathbf{X_{Cobas\ 8000}}$	6.96	0.998
LBXSBU[3] (mg/dL)	Weighted Deming	$\mathbf{Y_{Cobas\ 8000}}$ = **-0.09197** [95% CI: -0.2188 to 0.03483] **+ 0.9798** [95% CI:0.9693 to 0.9903] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **0.09386** [95% CI: -0.03454 to 0.2223] **+ 1.021** [95% CI:1.010 to 1.031] * $\mathbf{X_{Cobas\ 8000}}$	-2.72	0.997
LBXSC3SI (mmol/L)	Weighted Deming	$\mathbf{Y_{Cobas\ 8000}}$ = **-1.341** (95% CI: -2.421 to -0.2606] **+ 0.9788** [95% CI: 0.9340 to 1.024] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **1.37** (95% CI: 0.3202 to 2.419] **+ 1.022** [95% CI: 0.9746 to 1.069] * $\mathbf{X_{Cobas\ 8000}}$	-7.65	0.968
LBXSCA (mg/dL)	Adjustment Not Recommended	N/A	N/A	0.84	0.846
LBXSCH (mg/dL)	Adjustment Not Recommended	N/A	N/A	0.61	0.996
LBXSCK[2] (IU/L)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **-0.5307** [95% CI: -2.293 to 1.232] **+ 1.017** [95% CI: 1.003 to 1.031] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **0.522** [95% CI: -1.206 to 2.250] **+ 0.9836** [95% CI: 0.9699 to 0.9973] * $\mathbf{X_{Cobas\ 8000}}$	1.05	0.999
LBXSCLSI[3] (mmol/L)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **-9.942** [95% CI: -19.37 to -0.5140] **+ 1.088** [95% CI: 0.9965 to 1.180] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **9.137** [95% CI: 1.232 to 17.04] **+ 0.919** [95% CI: 0.8415 to 0.9965] * $\mathbf{X_{Cobas\ 8000}}$	-0.80	0.891
LBXSCR (mg/dL)	Adjustment Not Recommended	N/A	N/A	1.25	0.984
LBXSGB (g/dL)	CALCULATED	N/A	N/A	N/A	N/A
LBXSGL (mg/dL)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **0.8089** [95% CI: -0.7978 to 2.416] **+ 1.034** [95% CI: 1.017 to 1.051] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **-0.7821** [95% CI: -2.350 to 0.7852] **+ 0.9669** [95% CI: 0.9509 to 0.9830] * $\mathbf{X_{Cobas\ 8000}}$	4.31	0.999

LBXSGTSI (IU/L)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **-1.031** [95% CI: -1.879 to -0.1829] **+ 1.059** [95% CI: 1.022 to 1.096] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **0.9735** [95% CI: 0.2018 to 1.745] **+ 0.9444** [95% CI: 0.9110 to 0.9778] * $\mathbf{X_{Cobas\ 8000}}$	0.74	1.000
LBXSIR (ug/dL)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **1.693** [95% CI: 0.3131 to 3.074] **+ 1.008** [95% CI: 0.9898 to 1.027] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **-1.679** [95% CI: -3.082 to -0.2773] **+ 0.9918** [95% CI: 0.9736 to 1.010] * $\mathbf{X_{Cobas\ 8000}}$	3.57	0.997
LBXSKSI (mmol/L)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **-0.2283** [95% CI: -0.5240 to 0.06729] **+ 1.083** [95% CI: 1.013 to 1.154] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **0.2108** [95% CI: -0.04559 to 0.4671] **+ 0.923** [95% CI: 0.8636 to 0.9825] * $\mathbf{X_{Cobas\ 8000}}$	2.69	0.922
LBXSLDSI (IU/L)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **-2.513** [95% CI: -4.947 to -0.07941] **+ 1.021** [95% CI: 1.006 to 1.037] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **2.46** [95% CI: 0.1125 to 4.808] **+ 0.979** [95% CI: 0.9643 to 0.9937] * $\mathbf{X_{Cobas\ 8000}}$	0.50	0.996
LBXSNASI (mmol/L)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **-60.07** [95% CI: -98.03 to -22.10] **+ 1.432** [95% CI: 1.162 to 1.702] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = **41.95** [95% CI: 23.31 to 60.59] **+ 0.6983** [95% CI: 0.5667 to 0.8300] * $\mathbf{X_{Cobas\ 8000}}$	0.60	0.645
LBXSOSSI (mmol/Kg)	CALCULATED	N/A	N/A	N/A	N/A
LBXSPH (mg/dL)	Adjustment Not Recommended	N/A	N/A	-2.23	0.974
LBXSTB (mg/dL)	Deming Regression	$\mathbf{Y_{Cobas\ 8000}}$ = **-0.01772** [95% CI: -0.02548 to -0.009959] **+ 0.9881** [95% CI: 0.9702 to 1.006] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = 0.01793 [95% CI: 0.01038 to 0.02548] + 1.012 [95% CI: 0.9938 to 1.030] * $\mathbf{X_{Cobas\ 8000}}$	-6.60	0.997
LBXSTP (g/dL)	Adjustment Not Recommended	N/A	N/A	3.13	0.960
LBXSTR (mg/dL)	Weighted Deming	$\mathbf{Y_{Cobas\ 8000}}$ = **0.8567** [95% CI: 0.07287 to 1.641] **+ 1.012** [95% CI: 1.003 to 1.021] * $\mathbf{X_{Cobas\ 6000}}$	$\mathbf{Y_{Cobas\ 6000}}$ = -0.8463 [95% CI: -1.628 to -0.06476] + 0.9879 [95% CI: 0.9791 to 0.9967] * $\mathbf{X_{Cobas\ 8000}}$	2.22	0.999
LBXSUA (mg/dL)	Adjustment Not Recommended	N/A	N/A	-0.04	0.997

1. Four of the data points were deemed an extreme outlier, therefore only data from 148 serum samples were used in the analysis for ALP (LBXSAPSI).

2. Two of the data points were deemed an extreme outlier, therefore only data from 150 serum samples were used in the analysis for Creatine Phosphokinase (LBXSCK).

3. One of the data points was deemed an extreme outlier, therefore only data from 151 serum samples were used in the analysis for BUN (LBXSBU), Chloride (LBXSCLSI).

References

- Wahlefeld, August W. Triglycerides Determination after Enzymatic Hydrolysis. Methods of Enzymatic Analysis (2nd English Edition). 1974. 4:1831-1835.
- 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.
- Whitfield JB, Pounder RE, Neale G, et al. Serum γ-glutamyl transpeptidase activity in liver disease. Gut 1972;13:702-708.

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 12 YEARS - 150 YEARS

LBXSATSI - Alanine Aminotransferase (ALT) (IU/L)

Variable Name: LBXSATSI

SAS Label: Alanine Aminotransferase (ALT) (IU/L)

English Text: Alanine Aminotransferase (ALT) (IU/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
3 to 350	Range of Values	6321	6321	
.	Missing	878	7199	

LBXSAL - Albumin, refrigerated serum (g/dL)

Variable Name: LBXSAL

SAS Label: Albumin, refrigerated serum (g/dL)

English Text: Albumin, refrigerated serum (g/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2.2 to 5.5	Range of Values	6366	6366	
.	Missing	833	7199	

LBDSALSI - Albumin, refrigerated serum (g/L)

Variable Name: LBDSALSI

SAS Label: Albumin, refrigerated serum (g/L)

English Text: Albumin, refrigerated serum(g/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
22 to 55	Range of Values	6366	6366	
.	Missing	833	7199	

LBXSAPSI - Alkaline Phosphatase (ALP) (IU/L)

Variable Name: LBXSAPSI

SAS Label: Alkaline Phosphatase (ALP) (IU/L)

English Text: Alkaline Phosphatase (ALP) (IU/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
20 to 731	Range of Values	6327	6327	
.	Missing	872	7199	

LBXSASSI - Aspartate Aminotransferase (AST) (IU/L)

Variable Name: LBXSASSI

SAS Label: Aspartate Aminotransferase (AST) (IU/L)

English Text: Aspartate Aminotransferase (AST) (IU/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
6 to 518	Range of Values	6308	6308	
.	Missing	891	7199	

LBXSC3SI - Bicarbonate (mmol/L)

Variable Name: LBXSC3SI

SAS Label: Bicarbonate (mmol/L)

English Text: Bicarbonate (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
15 to 37	Range of Values	6325	6325	
.	Missing	874	7199	

LBXSBU - Blood Urea Nitrogen (mg/dL)

Variable Name: LBXSBU

SAS Label: Blood Urea Nitrogen (mg/dL)

English Text: Blood Urea Nitrogen (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
4 to 74	Range of Values	6326	6326	
.	Missing	873	7199	

LBDSBUSI - Blood Urea Nitrogen (mmol/L)

Variable Name: LBDSBUSI

SAS Label: Blood Urea Nitrogen (mmol/L)

English Text: Blood Urea Nitrogen (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.4 to 26.4	Range of Values	6326	6326	
.	Missing	873	7199	

LBXSCLSI - Chloride (mmol/L)

Variable Name: LBXSCLSI

SAS Label: Chloride (mmol/L)

English Text: Chloride (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
82 to 133	Range of Values	6329	6329	
.	Missing	870	7199	

LBXSCK - Creatine Phosphokinase (CPK) (U/L)

Variable Name: LBXSCK

SAS Label: Creatine Phosphokinase (CPK) (U/L)

English Text: Creatine Phosphokinase (CPK) (U/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
10 to 16837	Range of Values	6321	6321	
.	Missing	878	7199	

LBXSCR - Creatinine, refrigerated serum (mg/dL)

Variable Name: LBXSCR

SAS Label: Creatinine, refrigerated serum (mg/dL)

English Text: Creatinine, refrigerated serum (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.33 to 15.17	Range of Values	6326	6326	
.	Missing	873	7199	

LBDSCRSI - Creatinine, refrigerated serum (umol/L)

Variable Name: LBDSCRSI

SAS Label: Creatinine, refrigerated serum (umol/L)

English Text: Creatinine, refrigerated serum (umol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
29.17 to 1341.03	Range of Values	6326	6326	
.	Missing	873	7199	

LBXSGB - Globulin (g/dL)

Variable Name: LBXSGB

SAS Label: Globulin (g/dL)

English Text: Globulin (g/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.7 to 5.7	Range of Values	6364	6364	
.	Missing	835	7199	

LBDSGBSI - Globulin (g/L)

Variable Name: LBDSGBSI

SAS Label: Globulin (g/L)

English Text: Globulin (g/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
17 to 57	Range of Values	6364	6364	
.	Missing	835	7199	

LBXSGL - Glucose, refrigerated serum (mg/dL)

Variable Name: LBXSGL

SAS Label: Glucose, refrigerated serum (mg/dL)

English Text: Glucose, refrigerated serum (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
40 to 898	Range of Values	6357	6357	
.	Missing	842	7199	

LBDSGLSI - Glucose, refrigerated serum (mmol/L)

Variable Name: LBDSGLSI

SAS Label: Glucose, refrigerated serum (mmol/L)

English Text: Glucose, refrigerated serum (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2 to 50	Range of Values	6357	6357	
.	Missing	842	7199	

LBXSGTSI - Gamma Glutamyl Transferase (GGT) (IU/L)

Variable Name: LBXSGTSI

SAS Label: Gamma Glutamyl Transferase (GGT) (IU/L)

English Text: Gamma Glutamyl Transferase (GGT) (IU/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2 to 1541	Range of Values	6327	6327	
.	Missing	872	7199	

LBDSGTLC - GGT Comment Code

Variable Name: LBDSGTLC

SAS Label: GGT Comment Code

English Text: Gamma Glutamyl Transferase (GGT) Comment Code

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above detection limit	6326	6326	
1	Below lower detection limit	1	6327	
.	Missing	872	7199	

LBXSIR - Iron, refrigerated serum (µg/dL)

Variable Name: LBXSIR

SAS Label: Iron, refrigerated serum (µg/dL)

English Text: Iron, refrigerated serum (µg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
8 to 379	Range of Values	6364	6364	
.	Missing	835	7199	

LBDSIRSI - Iron, refrigerated serum (umol/L)

Variable Name: LBDSIRSI

SAS Label: Iron, refrigerated serum (umol/L)

English Text: Iron, refrigerated serum (umol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1 to 68	Range of Values	6364	6364	
.	Missing	835	7199	

LBXSLDSI - Lactate Dehydrogenase (LDH) (U/L)

Variable Name: LBXSLDSI

SAS Label: Lactate Dehydrogenase (LDH) (U/L)

English Text: Lactate Dehydrogenase (LDH) (U/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
42 to 837	Range of Values	4740	4740	
.	Missing	2459	7199	

LBXMAGN - Magnesium (mg/dL)

Variable Name: LBXMAGN

SAS Label: Magnesium (mg/dL)

English Text: Magnesium (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.7 to 2.8	Range of Values	6324	6324	
.	Missing	875	7199	

LBXSOSSI - Osmolality (mmol/Kg)

Variable Name: LBXSOSSI

SAS Label: Osmolality (mmol/Kg)

English Text: Osmolality (mmol/Kg)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
240 to 334	Range of Values	6322	6322	
.	Missing	877	7199	

LBXSPH - Phosphorus (mg/dL)

Variable Name: LBXSPH

SAS Label: Phosphorus (mg/dL)

English Text: Phosphorus (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.6 to 7	Range of Values	6322	6322	
.	Missing	877	7199	

LBDSPHSI - Phosphorus (mmol/L)

Variable Name: LBDSPHSI

SAS Label: Phosphorus (mmol/L)

English Text: Phosphorus (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.52 to 2.26	Range of Values	6322	6322	
.	Missing	877	7199	

LBXSKSI - Potassium (mmol/L)

Variable Name: LBXSKSI

SAS Label: Potassium (mmol/L)

English Text: Potassium (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2.5 to 6.4	Range of Values	6281	6281	
.	Missing	918	7199	

LBXSNASI - Sodium (mmol/L)

Variable Name: LBXSNASI

SAS Label: Sodium (mmol/L)

English Text: Sodium (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
120 to 167	Range of Values	6366	6366	
.	Missing	833	7199	

LBXSTB - Total Bilirubin (mg/dL)

Variable Name: LBXSTB

SAS Label: Total Bilirubin (mg/dL)

English Text: Total Bilirubin (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.11 to 14.2	Range of Values	6325	6325	
.	Missing	874	7199	

LBDSTBSI - Total Bilirubin (umol/L)

Variable Name: LBDSTBSI

SAS Label: Total Bilirubin (umol/L)

English Text: Total Bilirubin (umol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
3.42 to 242.82	Range of Values	6193	6193	
.	Missing	1006	7199	

LBDSTBLC - Total Bilirubin Comment Code

Variable Name: LBDSTBLC

SAS Label: Total Bilirubin Comment Code

English Text: Total Bilirubin Comment Code

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above detection limit	6193	6193	
1	Below lower detection limit	132	6325	
.	Missing	874	7199	

LBXSCA - Total Calcium (mg/dL)

Variable Name: LBXSCA

SAS Label: Total Calcium (mg/dL)

English Text: Total Calcium (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
7.5 to 11.7	Range of Values	6362	6362	
.	Missing	837	7199	

LBDSCASI - Total Calcium (mmol/L)

Variable Name: LBDSCASI

SAS Label: Total Calcium (mmol/L)

English Text: Total Calcium (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.9 to 2.9	Range of Values	6362	6362	
.	Missing	837	7199	

LBXSCH - Cholesterol, refrigerated serum (mg/dL)

Variable Name: LBXSCH

SAS Label: Cholesterol, refrigerated serum (mg/dL)

English Text: Total Cholesterol, refrigerated serum (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
63 to 454	Range of Values	6328	6328	
.	Missing	871	7199	

LBDSCHSI - Cholesterol, refrigerated serum (mmol/L)

Variable Name: LBDSCHSI

SAS Label: Cholesterol, refrigerated serum (mmol/L)

English Text: Total Cholesterol, refrigerated serum (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.63 to 11.76	Range of Values	6328	6328	
.	Missing	871	7199	

LBXSTP - Total Protein (g/dL)

Variable Name: LBXSTP

SAS Label: Total Protein (g/dL)

English Text: Total Protein (g/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
5 to 9.1	Range of Values	6364	6364	
.	Missing	835	7199	

LBDSTPSI - Total Protein (g/L)

Variable Name: LBDSTPSI

SAS Label: Total Protein (g/L)

English Text: Total Protein (g/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
50 to 91	Range of Values	6364	6364	
.	Missing	835	7199	

LBXSTR - Triglycerides, refrig serum (mg/dL)

Variable Name: LBXSTR

SAS Label: Triglycerides, refrig serum (mg/dL)

English Text: Triglycerides, refrigerated serum (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
24 to 1724	Range of Values	6359	6359	
.	Missing	840	7199	

LBDSTRSI - Triglycerides, refrig serum (mmol/L)

Variable Name: LBDSTRSI

SAS Label: Triglycerides, refrig serum (mmol/L)

English Text: Triglycerides, refrigerated serum (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.27 to 19.48	Range of Values	6359	6359	
.	Missing	840	7199	

LBXSUA - Uric acid (mg/dL)

Variable Name: LBXSUA

SAS Label: Uric acid (mg/dL)

English Text: Uric acid (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.1 to 13.2	Range of Values	6329	6329	
.	Missing	870	7199	

LBDSUASI - Uric acid (umol/L)

Variable Name: LBDSUASI

SAS Label: Uric acid (umol/L)

English Text: Uric acid (umol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
65.4 to 785.1	Range of Values	6329	6329	
.	Missing	870	7199	