

Blood and Urine Collection

Venipuncture

Public Health Objectives:

Venipuncture is performed to obtain laboratory results that provide prevalence estimates of disease, risk factors for exam components, and baseline information on health and nutritional status of the population.

Staff:

Certified Phlebotomist

Protocol:

Methods:

Blood is drawn from the examinee's arm. In the laboratory the blood is processed, stored and shipped to various laboratories for analysis. The complete blood count (CBC) results are reported in the MEC and all other results are reported from NCHS to the participant.

The volume of blood drawn by age follows.

- 1-2 years, 9 ml (0.3 ounces), 0.6 tablespoons
- 3-5 years, 20 ml (0.7 ounces), 1.3 tablespoons
- 6-11 years, 33 ml (1.1 ounces), 2.3 tablespoons
- 12+ 128 ml (4.3 ounces), 8.5 tablespoons

Time Allotment:

Depending on age of participant. Range 5-10 minutes.

Health Measures:

Laboratory test results.

Eligibility:

Sample persons aged 1 year and older who do not meet any of the exclusion criteria.

Exclusion Criteria:

- Hemophiliacs
- Participants who received chemotherapy within last 4 weeks
- The presence of the following on both arms: rashes, gauze dressings, casts, edema, paralysis, tubes, open sores or wounds, withered arms or limbs missing, damaged, sclerosed or occluded veins, allergies to cleansing reagents, burned or scarred tissue, shunt or IV.

Justification for using vulnerable populations:

- Minors are included in this component because they are an important target population group. Laboratory data are linked to other household interview and health component data and are used to track changes that occur in health over time.
- There is no reason to exclude mentally impaired or handicapped individuals because there is no contraindication.

Risks:

The following are known risks associated with venipuncture:

- Hematoma
- Swelling, tenderness and inflammation at the site
- Persistent bleeding
- Vasovagal response - dizziness, sweating, coldness of skin, numbness and tingling of hands and feet, nausea, vomiting, possible visual disturbance, syncope and injury fall from fainting.

Rare adverse effects:

- Thrombosis of the vein due to trauma.
- Infection which results in thrombophlebitis.

Special precautions:

- Sterile equipment issued with all sample persons.
- Physician on call in case an adverse affect occurs.

Report of Findings:

Reported in the MEC:

Complete Blood Count (CBC)

Reported from NCHS:

Other laboratory results

Urine Collection

Public Health Objectives:

Urine is collected to obtain laboratory results that provide prevalence estimates of disease, risk factors for exam components, and baseline information on health and nutritional status of the population.

Staff:

MEC Coordinator

Protocol:

Methods:

Urine is collected from participants aged 6 years and above.

Time Allotment:

2 minutes

Health Measures:

Laboratory test results.

Eligibility:

Sample persons aged 6 years and above.

Exclusion Criteria:

None

Justification for using vulnerable populations:

- Minors are included in this component because they are an important target population group. Laboratory data are linked to other household interview and health component data and are used to track changes that occur in health over time.
- There is no reason to exclude mentally impaired or handicapped individuals because there is no contraindication.

Risks:

None

Special precautions:

None

Report of Findings:

Reported in the MEC: Pregnancy Test

Reported from NCHS: Other laboratory results

Bone mineral status markers

Laboratory Measures:

Vitamin D

Public Health Objectives:

Evaluation of bone mineral status will utilize an evaluation of vitamin D status based on one analyte: serum 25-hydroxyvitamin D. Vitamin D is essential for active intestinal calcium absorption and plays a central role in maintaining calcium homeostasis and skeletal integrity. In addition, vitamin D has recently been linked to other non-skeletal conditions of public health significance, such as hypertension, and cancer. Vitamin D is derived mainly from cutaneous synthesis in the presence of ultraviolet sunlight while dietary intake constitutes a minor fraction. Serum 25(OH) D is the best indicator of vitamin D status. It is converted in the kidney, stimulated by parathyroid hormone (PTH), to the hormonally active metabolite 1, 25-dihydroxyvitamin D (1, 25 (OH)₂D).

Inclusion of serum 25(OH) D in NHANES will allow us to continue to assess vitamin D status in the population. Interest in vitamin D status in the US has increased significantly in recent year. For example, questions have been raised recently about the extent of vitamin D deficiency and insufficiency in the U.S. population. Furthermore, the adequacy of the 1997 Dietary Reference Intake recommendations for vitamin D in the U.S. are now being questioned, especially since new data suggests that optimal serum 25(OH)D levels may be noticeably higher than previously thought. Finally, recent studies have clarified that rickets still occurs in the U.S. Thus, it is important to include these two measures of vitamin D status in the NHANES survey. In addition, this measure can be linked with other measures included in the survey, such as blood pressure and bone mineral density, in order to evaluate its role in both skeletal and nonskeletal conditions.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level		
			1	2	3
Vitamin D	1 and older	300-500 uL			

Vitamin D deficiency leads to a decrease in calcium absorption in the gastrointestinal tract and overproduction of parathyroid hormone.

Diabetes Profile

Laboratory Measures:

Fasting Glucose, Insulin, Glycohemoglobin and Oral Glucose Tolerance Test

Public Health Objectives:

Diabetes mellitus will be assessed by fasting measures of plasma glucose, insulin, glycohemoglobin and an oral glucose tolerance test in examinees aged 12 years and over.

Diabetes is a large, growing, and costly public health problem in the United States and disproportionately affects racial and ethnic minorities. About 17 million Americans have diabetes and over 1 million new cases of diabetes are diagnosed each year. Diabetes is the leading cause of kidney failure, non-traumatic lower extremity amputation, and blindness in working-age adults, and an estimated \$135 billion were spent on direct and indirect medical costs for diabetes in 2002. Alarming, type 2 diabetes (formerly considered an adult disease) is now being diagnosed in children and adolescents and there has been a large increase in diagnosed diabetes among adults <40 years of age.

Information on the prevalence of diabetes disease, especially in its early stages, and associated risk factors will be used to help develop early intervention and prevention programs for the disabling consequences of this condition. Specifically, the diabetes disease examination will provide population data to:

1. determine a national estimate of diabetes disease prevalence (diagnosed and undiagnosed), including those at high risk for the late complications of the disease;
2. identify the risk factors of diabetes disease;
3. permit a national cohort to be established for follow-up studies of this condition; and
4. provide critical information to clinicians and public health officials for the development of preventive care and community-based interventions.

In NHANES 2007, an oral glucose tolerance test continued in the survey to reassess the prevalence of diabetes and IGT in the US population. Because of the increasing occurrence of diabetes in younger ages, our collaborators, the National Institute of Diabetes, Digestive and Kidney Diseases and the Division of Diabetes Translation at CDC have proposed that NHANES conduct the OGTT in participants aged 12 and older.

Persons with impaired glucose tolerance (IGT) – 15.6% of the U.S. population – are at high risk for developing diabetes. Also, IGT is an important risk factor for a number of other adverse health conditions and mortality. IGT is defined on the basis of an abnormal oral glucose tolerance test (OGTT). Persons without diabetes but with an OGTT 2-hr value of 140-199 mg/dL are considered to have IGT. Recent national and international randomized controlled trials have shown that diabetes can be delayed or prevented among persons with IGT. Furthermore, NHANES III data indicate a tremendous opportunity for the prevention of diabetes - over 12 million persons aged 45-74 have pre-diabetes (defined as overweight persons with either IGT or impaired fasting glucose metabolism). These data also indicated that over 50% of persons with pre-diabetes are only detected by IGT findings. As risk factors for diabetes, IGT, and pre-diabetes increase (e.g., physical inactivity, obesity, and aging), consequently the prevalence of these conditions is also likely to increase.

The inclusion of OGTTs on NHANES will allow estimation of the prevalence of IGT and, thus, pre-diabetes in the U.S. population, surveillance of trends in the prevalence and awareness of these conditions, study of the risk factors for IGT and pre-diabetes, and examination of IGT as a risk factor for health conditions and mortality. Timely data on IGT and pre-diabetes are particularly important as the nation initiates efforts to prevent diabetes among persons with pre-diabetes. These data on IGT and pre-diabetes are critical to targeting, designing, and evaluating prevention efforts, such as DHHS's STEPS program and efforts by the National Diabetes Education Program.

A fasting glucose blood test is performed on all participants 12 years and older who are examined in the morning session after a 9-hour fast. After the venipuncture, participants are asked to drink 75 milligrams of Trutol® and to have a second venipuncture 2 hours (plus or minus 15 minutes) after the first venipuncture.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level		
			1	2	3
Glucose	12 and older	500uL		Y	Y
OGTT	12 and older	500uL		Y	Y
Insulin	12 and older	1 mL			
Glycohemoglobin	12 and older	400 uL		Y	Y

Infectious Disease Profile

Laboratory Measures:

Hepatitis viruses

New test for 2007 is hepatitis C genotyping.

Public Health Objectives:

Viruses that primarily infect the liver constitute a major public health problem because of the morbidity and mortality associated with the acute and chronic consequences of these infections. New immunization strategies have been developed to eliminate transmission of hepatitis B and hepatitis A viruses in the United States. Because of the high rate of asymptomatic infection with both viruses, NHANES will provide the best means for determining the age-specific effectiveness of immunization strategies to prevent these infections. In addition, NHANES provides the means to better define the epidemiology of hepatitis viruses that were recently characterized, such as hepatitis C and G virus along with D and possibly F. In NHANES testing for markers of infection with the hepatitis viruses will be used to determine secular trends in infection rates across most age and racial/ethnic groups, and will provide a national picture of the epidemiologic determinants of these infections.

Among children aged 2-5 years anti-HBs (a marker of immunity) testing will be performed to assist in the evaluation of the hepatitis B immunization program. If sufficient sera are available, other hepatitis markers will be measured.

Hepatitis C (HCV) genotyping is the only change in the infectious disease assessment protocol. The determination of HCV genotypes in NHANES will provide a nationally representative assessment of genotype distribution of circulating HCV genotypes. Monitoring changes in this distribution over time will provide insight into epidemiologic patterns of HCV infection in the U.S. In addition, the efficacy of available treatments differs by genotype, and a snapshot of the nationwide distribution of HCV genotypes may provide information on what the expected impact of treatment might be. Participants ages 6 and older are eligible for Hepatitis C assessments.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level		
			1	2	3
Hepatitis viruses	2-5 (anti-HBs), 6+ all other viruses	400uL 1.5 ml		Y	

Miscellaneous Laboratory Assays

Laboratory Measures:

C-reactive protein, Thyroid Profile, and Standard Biochemical Profile includes Alanine Aminotransferase (ALT), Albumin, Alkaline Phosphatase (ALP), Aspartate Aminotransferase (AST), Bicarbonate (HCO_3), Blood Urea Nitrogen (BUN), Calcium, Cholesterol, Creatinine, Gamma Glutamyltransaminase (γ -GT), Glucose, Iron, Lactate Dehydrogenase (LDH), Phosphorus, Sodium, Potassium, and Chloride, Total Bilirubin, Total Protein, Triglycerides, and Uric Acid.

Public Health Objectives:

C-reactive protein

C-reactive protein is considered to be one of the best measures of the acute phase response to an infectious disease or other cause of tissue damage and inflammation. It is used to correct the iron status measures which are affected by inflammation. It can also be used to measure the body's response to inflammation from chronic conditions, such as arthritis, and environmental exposures to agents such as tobacco smoke.

Thyroid Profile

The thyroid profile contains thyroglobulin antibody, thyroxine (T3), thyroxine (T4), free, thyroglobulin, thyroid stimulating hormone, thyroid peroxidase (TPO) antibody, thyroxine (T3), total, and thyroxine (T4), total. Serum thyroid levels will be used to assess thyroid function and will provide population-based reference information on these hormone levels. Thyroid function will be examined in relation to measures of exposure to endocrine disrupting substances, which are hypothesized to effect thyroid function (see laboratory protocol for environmental exposure assessments).

Standard biochemical profile

This battery 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 and various endocrine disorders as well as other metabolic or nutritional disorders.

a. 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).

b. Albumin

Albumin measurements are used in the diagnosis and treatment of numerous diseases primarily involving the liver or kidneys.

c. Alkaline Phosphatase (ALP)

Increased ALP activity is associated with two groups of diseases: those affecting liver function and those involving osteoblastic activity in the bones. In hepatic disease, an increase in ALP activity is generally accepted as an indication of biliary obstruction. An increase in serum phosphatase activity is

associated with primary hyperparathyroidism, secondary hyperparathyroidism owing to chronic renal disease, rickets, and osteitis deformans juvenilia due to vitamin D deficiency and malabsorption or renal tubular dystrophies. Increased levels of ALP are also associated with Von Recklinghausen's disease with bone involvement and malignant infiltrations of bone. Low levels are associated with hyperthyroidism, and with the rare condition of idiopathic hypophosphatasia associated with rickets and the excretion of excess phosphatidyl ethanolamine in the urine.

d. 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.

e. Bicarbonate (HCO_3)

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.

f. 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 postrenal 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 diet, particularly protein intake.

g. Calcium

Elevated total serum calcium levels are associated with idiopathic hypercalcemia, vitamin D intoxication, hyperparathyroidism, sarcoidosis, pneumocystic carinii pneumonia and blue diaper syndrome. Low calcium levels are associated with hypoparathyroidism, pseudohypoparathyroidism, chronic renal failure, rickets, infantile tetany, and steroid therapy.

h. 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.

i. Creatinine

Creatinine measurement serves as a test for normal glomerular filtration. Elevated levels are associated with acute and chronic renal insufficiency and urinary tract obstruction. Levels below 0.6 mg/dL are of no significance.

j. Gamma Glutamyltransaminase (γ -GT)

Γ -GT measurement is 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.

k. 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.

l. 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).

m. 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.

n. 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 and kidney diseases and vitamin D imbalance.

o. Sodium, Potassium, and Chloride

Hyponatremia (low serum sodium level) is associated with a variety of conditions, including severe polyuria, metabolic acidosis, Addison's disease, diarrhea, and renal tubular disease. Hyponatremia (increased serum sodium level) is associated with Cushing's syndrome, severe dehydration due to primary water loss, certain types of brain injury, diabetic coma after therapy with insulin, and excess treatment with sodium salts.

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.

p. 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.

q. 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.

r. 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.

s. 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.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level		
			1	2	3
C-reactive protein	1 and older	300 uL			
Thyroid profile	12 and older	1 mL		Y	Y
Biochemistry Profile	12+	800 uL			
ALT				Y	Y
AST				Y	Y
Albumin				Y	Y
Alkaline Phosphatase					Y
Bicarbonate				Y	Y
BUN				Y	Y
Calcium				Y	Y
Cholesterol				*	*
Creatinine				Y	Y
GGT					Y
Glucose				*	*
Iron					*
LDH					Y
Phosphorus				Y	Y
Sodium				Y	Y
Potassium				Y	Y
Chloride				Y	Y
Total Bilirubin				Y	Y
Total Protein				Y	Y
Triglycerides				*	*
Uric Acid				Y	Y

* Value may be reported from different assay

Kidney Disease Profile

Laboratory Measures:

Serum creatinine, blood urea nitrogen, urinary albumin and creatinine

Public Health Objectives:

The purpose of the kidney and urologic diseases portion of the NHANES is to determine prevalence of specific nephrologic and urologic conditions in the population; to determine the association between health conditions such as diabetes and hypertension and the development of kidney and urologic diseases; to monitor trends in the prevalence of these diseases and their risk factors over time. These data will be used to assist in planning for initiatives and other programs for the prevention and treatment of nephrologic and urologic diseases.

Blood specimens will be used to obtain measures of serum creatinine and blood urea nitrogen. Urinary albumin and creatinine will be measured. Self-reported information on chronic analgesic use and incontinence will be collected.

The incidence of end stage kidney failure is increasing rapidly in the U.S. in adults of all age groups which implies that the prevalence of progressive renal impairment is also increasing. However, little information is known about the prevalence of chronic renal impairment on a national level. Urologic disease, including urinary incontinence affects a large proportion of the population. Little nationally representative data on the prevalence and risk factors associated with these conditions are available.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level		
			1	2	3
Serum Creatinine/blood urea nitrogen	12 and older	1 mL		Y	Y
Urinary albumin and creatinine	6 and older	3 mL			

Pregnancy Test and Prostate Specific Antigen (PSA)

Laboratory Measures:

Pregnancy test., PSA

New test for 2007 is complexed PSA.

Public Health Objectives:

a. Pregnancy test

Information on current pregnancy status will be used to exclude participants from the DXA examination and the OGTT test and for interpretation of current nutritional status and body measures.

b. PSA test

Prostate cancer is the most common non-skin malignancy among men with approximately 180,000 new cases diagnosed and 37,000 deaths in 1999. The total and free PSA tests have been recognized as tumor markers for the screening, diagnosis and management of prostate cancer. The total PSA is not specific for prostate cancer. Mildly elevated total PSA (above the cutoff of 4 ng/mL) can be seen in benign prostatic hypertrophy and prostatitis. Falsely low PSA may be seen in men treated with finasteride or taking herbals such as Saw Palmetto. The more recent free PSA assay is recommended to increase the specificity when the total PSA is between 4-10 ng/mL. A percent free PSA (free/total PSA X 100%) of less than 25% suggests prostate cancer

Additionally, in 2007 we will add complexed PSA (cPSA) to the PSA profile to establish national age and race specific population reference values.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level 1	Report of Findings Level 2	Report of Findings Level 3
Urine: Pregnancy Test	8 B 59 females	1 mL			Y
PSA test	Males 40 +	1 ml		Y	Y

Report of Findings:

PSA: Male survey participants tested for PSA will receive test results in their Final Report of Findings. If the result is greater than 4 ng/mL, an early reporting letter will be sent.

Pregnancy testing: Details and ethical considerations of reporting pregnancy test results are in **Attachment 30 – Pregnancy Testing.**

Nutritional Biochemistries and Hematologies

Laboratory Measures:

- Complete blood count
- Serum folate
- RBC folate
- Serum ferritin
- Transferrin receptor (TfR)
- Serum vitamin B₆

Vitamin C, vitamin A, vitamin E, retinyl esters, vitamin B₁₂, serum carotinoids, methylmalonic acid, erythrocyte protoporphyrin and homocysteine will be cycled out in 2007. This data has been collected for multiple years. Discontinuing data that has been collected for several years is part of the mechanism that allows new content to be cycled into the survey.

Public Health Objectives:

HANES 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.

Complete blood counts, serum folate, RBC folate, ferritin, transferrin receptor, vitamin B₆, and vitamin D will continue in 2007.

In 2007 measurement of omega-3 fatty acids for participants 3 and older will be added to the laboratory component. In recent years, mounting scientific evidence has led to recommendations for increased consumption of omega-3 fatty acids. There are at least 10 ongoing NIH-funded studies testing the effects of omega-3 fatty acids for conditions such as bipolar disorder, cancer, anorexia/cachexia, retinitis pigmentosa, arrhythmias and stress. The reference data from NHANES will be useful for evaluation of the concentrations achieved in these intervention studies.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level		
			1	2	3
Complete blood count	1 and older	1.5mL		Y	Y
Serum folate	1 and older	700 uL-1 mL		Y	Y
RBC folate	1 and older	100 uL		Y	Y
Serum ferritin/TfR	1-5 & 12-59 F	300-500uL		Y	Y
Serum vitamin B ₆	1 and older	500uL-700 uL			

Sexually Transmitted Disease Profile

Laboratory Measures:

Chlamydia trachomatis, Neisseria gonorrhoeae, Herpes simplex 1 and 2, HIV, Human papillomavirus virus (HPV) (antigen from vaginal swabs, females age 14-59 years and HPV 16 antibody, all, age 14-59 years)

Public Health Objectives:

***Chlamydia trachomatis* and *Neisseria gonorrhoeae* (Urine Test)**

Sexually transmitted infections caused by *Chlamydia trachomatis* and *Neisseria gonorrhoeae* may lead to pelvic inflammatory disease, ectopic pregnancy, infertility, and chronic pelvic pain in women. They may also increase the risk of HIV transmission in women. Pregnant women may transmit infection to their newborn causing serious medical complications. At the present the prevalence of chlamydial and gonococcal infection in the general population of the United States is unknown. NHANES offers an opportunity to assess the prevalence of chlamydial and gonococcal infection in the general population and to monitor trends in prevalence as prevention programs are established and expanded.

Herpes simplex 1 and 2 (Blood Test)

Sera from NHANES subjects ages 14-49 will be tested for antibody to Herpes simplex 1 and 2 (HSV-1/2) to continue to monitor the prevalence of HSV-1/2 infection in the U.S. HSV-1 is a common chronic infection that is associated with lower socioeconomic status. HSV-2 is an index of sexually transmitted infections. In addition, questions about those sexual behaviors that are risk factors for sexually transmitted infections and that are the focus of major national HIV and sexually transmitted diseases risk reduction efforts will be included. The joint availability of sexually transmitted infection and risk factor data in a national sample on a periodic basis is a unique and invaluable resource for evaluation of national HIV/STD risk reduction efforts and for risk-based modeling of the frequency and trends of sexually transmitted infections.

HSV-2 infections are rarely life threatening, but morbidity due to recurrent genital ulcerations is substantial. Just as important, HSV-2 infection is the best current marker of sexual behavior risk factors leading to sexually transmitted infections, generally, because: (a) HSV-2 infections are common and, thus, HSV-2 rates are a sensitive measure of sexually transmitted infection risk factors; (b) HSV-2 infection is almost always a result of sexual transmission and, thus, a specific measure of sexually transmitted infection; (c) HSV-2 infections are not curable and, thus, HSV-2 risk is not influenced by health care seeking factors; and (d) sensitive, specific, and relatively inexpensive tests for HSV-2 antibody are available. HSV-2 is a very important index of the success of large national efforts, motivated by the acquired immunodeficiency epidemic, to reduce risky sexual behaviors.

HIV antibody (Blood Test)

The estimated prevalence of human immunodeficiency virus (HIV) infection in the United States population is an important measure of the extent of the medical and financial burden the nation faces due to this virus. NHANES III data on HIV infection during 1988-94 will serve as a baseline for monitoring the changes in the epidemic over time in the general population of the United States. NHANES is now the only national survey collecting blood on a population based sample, therefore it will be a key element in future estimates.

Human papillomavirus (HPV) (Vaginal s swab – DNA test; Blood test for antibody HPV)

Genital human papillomavirus (HPV) infection is likely the most common sexually transmitted infection in the U.S., and cervical infection with certain types of HPV, especially HPV-16, is the single strongest risk factor for cervical cancer. No surveillance systems exist for HPV infections, the majority of which are subclinical. Serum from participants aged 14-59 years will be tested for antibody to HPV-16, the antigenic type most linked with cervical cancer to estimate the percentage of individuals of both genders who have ever been infected with this virus. Testing of HPV DNA from vaginal swabs from women 14-59 will provide an estimate of current infection. Vaginal swabs will be tested for HPV DNA by the FDA approved Hybrid Capture II method (Digene) and by consensus PCR with type specific analysis. The Hybrid Capture assay will detect overall high risk HPV types, but cannot identify specific types. The PCR will allow identification of specific HPV type. Participants will be notified of their Hybrid Capture results and specific messages will be developed to explain the implications of the findings based on their age group.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level 1	Report of Findings Level 2	Report of Findings Level 3
Chlamydia trachomatis/ Neisseria gonorrhoeae	14-39	10mL		*	Y
Herpes 1 and 2 antibody	14-49	200 uL		*	Y
HPV DNA test	Females 14-59	Vaginal swab		*	Y
HPV 16 antibody	14-59	500uL		*	
HIV antibody	18-49	500 uL		*	Y

* Persons with positive STD or HIV findings will be referred for counseling and treatment.

Justification for using vulnerable populations:

- Teenagers are included because they are at increasing risk for STD's. A pilot study in NHANES III demonstrated an increased prevalence in chlamydial infection starting at age 14 years (whites 4%, blacks 12% Mexican Americans 6%).
- Mentally impaired persons will be excluded from the STD profile due to NCHS' inability to provide adequate support and counseling to this group with the test result.

Report of Findings: See section on STD/HIV reporting in **Reporting Examination Findings, Section IV, J.**

Blood lipids

Laboratory Measures:

Total Cholesterol, HDL- Cholesterol, LDL-Cholesterol, Triglycerides, and Apo B

Public Health Objectives:

The goals of this component are to:

- 1) Monitor the prevalence and trends in major cardiovascular conditions and risk factors in the U.S.;
- 2) 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.

One serum lipoprotein sub-fraction may emerge as independent risk factors for coronary heart disease--Apolipoprotein B. -The test was last measured in NHANES III in 1988-91 and 1991-94, respectively.

The data will be used to:

- 1) Monitor the status of hypertension prevalence, awareness, treatment and control and the success of the National HBP Education Program;
- 2) monitor the status of hyperlipidemia and the success of the National Cholesterol Education Program;
- 3) Estimate the prevalence of congestive heart failure and compare to the baseline data from the NHANES I.

Health Measures, Eligibility, Report of Findings:

Health Measure	Eligibility	Volume Required	Report of Findings Level 1	Report of Findings Level 2	Report of Findings Level 3
Total cholesterol	6 and older	+++		Y	Y
HDL-cholesterol LDL-Cholesterol	6 and older	+++			Y
LDL -cholesterol*	12 and older	calculated			Y
Triglycerides *	12 and older	+++		Y	Y
Apo B*	12 and older	+++			

+++ for all 4 assays 2ml used for persons 6 years and older

*Triglycerides, LDL, and Apo B are only done on fasting morning sample. Only individuals age 12 and older are asked to fast.

Biologic Specimen Banking:

Serum, plasma and urine will continue to be stored for future research. Collection of a genetic specimen will resume in 2007 after a four year hiatus

The availability of stored biologic specimens from a representative sample of the U.S. population provides the scientific research community with a potential resource for the measurement of new and evolving laboratory tests for emerging diseases, risk factors, and environmental exposures. With the present explosion of gene determinations associated with disease, the penetrance of susceptible genes in the population can only be determined from a representative sample such as NHANES. The additional data collected during the survey, both biochemical and questionnaire, provide phenotypic information that can be associated with these genes.

NCHS will solicit proposals for use of the stored specimens. A technical panel will review and approve all proposals. Proposals for performing genetic research will be evaluated by the NHANES Genetic Technical Panel. All uses of stored specimens are subject to review and approval by the NCHS Ethics Review Board and the NCHS Confidentiality Officer.

All unused serum from laboratories will be stored for potential additional analyses.