National Health and Nutrition Examination Survey

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

Plasma Fasting Glucose (GLU_L)

Data File: GLU_L.xpt

First Published: September 2024

Last Revised: NA

Component Description

According to the National Diabetes Statistics Report, in 2021, diabetes was the eighth leading cause of death in the United States (Centers for Disease Control and Prevention2024). More than 38 million Americans are living with diabetes, where almost 30 million were diagnosed and nearly 9 million were undiagnosed (American Diabetes Association, 2023). Also, more than 97 million are living with prediabetes, which is a serious health condition that increases a person's risk of type-2 diabetes and other chronic diseases (American Diabetes Association, 2023). The prevalence of diabetes and overweight, one of the major risk factors for diabetes, continues to increase. Recognized and accredited programs are available for people to prevent or manage diabetes, including the National Diabetes Prevention Program (Centers for Disease Control and Prevention, 2024) and diabetes self-management education and support services (Centers for Disease Control and Prevention, 2024).

Diabetes testing provides population data to: 1) determine a national estimate of diabetes prevalence (diagnosed and undiagnosed); 2) identify the risk factors; 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.

Eligible Sample

All examined participants 12 years and older were eligible.

Description of Laboratory Methodology

Glucose
In this enzymatic method glucose is converted 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.

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

There were no changes to the lab method, lab equipment, or lab site for this component in the NHANES August 2021–August 2023 cycle.

Laboratory Method Files

Plasma Fasting Glucose (September 2024)

Laboratory Quality Assurance and Monitoring

Plasma specimens are processed, stored, and shipped to the University of Missouri-Columbia, Columbia, MO for analysis.

Detailed instructions on specimen collection and processing are discussed in the NHANES Laboratory Procedure Manual (LPM). Vials are stored under appropriate frozen (−30°C) conditions until they are shipped to University of Missouri-Columbia for testing.

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

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 samples collected on "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.

One variable was created in this data file. The variable was created using the following formulas:

LBXGLU and LBDGLUSI:
The plasma fasting glucose value in mg/dL (LBXGLU) was converted to mmol/L (LBDGLUSI) by multiplying by 0.05551 (rounded to 3 decimals).

Analytic Notes

Refer to the August 2021–August 2023 Laboratory Data Overview for general information on

NHANES laboratory data.

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. The specimen availability can also vary by age or other population characteristics. For example, in August 2021–August 2023, 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. 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.

Subsample Weights

Plasma glucose was measured in a fasting subsample of participants 12 years and older. Special sample weights are required to analyze these data properly. Specific sample weights for this subsample are included in this data file and should be used when analyzing these data.

Participants included in the fasting subsample but did not provide a blood specimen (n=324) have an assigned sample weight value of "0" in their records. In addition, participants who provided blood specimen but did not meet the 8 to less than 24 hour fasting criteria (n=311) have the sample weight value assigned as "0" (WTSAF2YR=0) as well. Plasma fasting glucose measurements for these 311 participants are included in the dataset. However, to include these data in the analysis, a reweighting would be required.

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.

The Fasting Questionnaire File includes auxiliary information, such as fasting status, length of fast and the time of venipuncture.

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

Detection Limits

The detection limits were constant for all of the analytes in the data set. Two variables are provided for each of these analytes. The variable name ending "LC" (ex., LBDGLULC*)* indicates 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 other variable prefixed LBX (ex., LBXGLU*)* provides the analytic result for that analyte. For analytes with analytic results below the lower limit of detection (ex., LBDGLULC=1), 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]).

The lower limit of detection (LLOD, in mg/dL) for plasma fasting glucose:

Variable Name	Analyte Description	LLOD
LBXGLU	Plasma fasting glucose	2.0

Comparability with previous cycles

There were equipment changes during the 2015-2016, 2007-2008, and 2005-2006 survey cycles. For analysis involving 2015-2016 data and data collected prior to 2007-2008 cycle, please refer to the documentation accompanying those data for additional information on any needed adjustments to the data prior to analysis. If August 2021–August 2023 data are compared or combined with the 2015-2016 data, no adjustments are needed for equipment changes. As mentioned in the 2015-2016 documentation, most of the 2015-2016 samples were measured using the Cobas C311, which is the same instrument used in 2017-2023. Some of the samples were collected using the Cobas C501. Results for these specimens have already been adjusted using the forward regression equation for comparability. Please see the 2015-2016 plasma fasting glucose documentation for more information about using backwards or forwards regression models to account for equipment changes between cycles (GLU_I).

References

- Centers for Disease Control and Prevention (2024). Diabetes Self-Management Education and Support. About Diabetes Self-Management Education and Support | Diabetes | CDC. Accessed 09 September 2024.
- Centers for Disease Control and Prevention (2024). National Diabetes Prevention Program. About the National Diabetes Prevention Program | National Diabetes Prevention Program | CDC. Accessed 09 September 2024.
- Centers for Disease Control and Prevention. National Diabetes Statistics Report (2024).(2023). National Diabetes Statistics Report | Diabetes | CDC. Accessed 09 September 2024.
- 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.

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

WTSAF2YR - Fasting Subsample 2 Year MEC Weight

Variable Name: WTSAF2YR

SAS Label: Fasting Subsample 2 Year MEC Weight

English Text: Fasting Subsample 2 Year MEC Weight

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
11459.183689 to 561922.42956	Range of Values	3361	3361	
0	No Lab Result or Not Fasting for 8 to <24 hours	635	3996	
.	Missing	0	3996	

LBXGLU - Fasting Glucose (mg/dL)

Variable Name: LBXGLU

SAS Label: Fasting Glucose (mg/dL)

English Text: Fasting Glucose (mg/dL)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
59 to 561	Range of Values	3672	3672	
.	Missing	324	3996	

LBDGLUSI - Fasting Glucose (mmol/L)

Variable Name: LBDGLUSI

SAS Label: Fasting Glucose (mmol/L)

English Text: Fasting Glucose (mmol/L)

Target: Both males and females 12 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
3.28 to 31.1	Range of Values	3672	3672	
.	Missing	324	3996	