National Health and Nutrition Examination Survey

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

Complete Blood Count with 5-Part Differential in Whole Blood (CBC_L)

Data File: CBC_L.xpt

First Published: September 2024

Last Revised: NA

Component Description

The complete blood count (CBC) with 5-part differential counts red blood cells (RBCs), white blood cells (WBCs), and platelets, measures hemoglobin; estimates the red cells' volume; and sorts the WBCs into subtypes. A CBC is a routine blood test used to evaluate your overall health and detect a wide range of disorders, including anemia, infection, and leukemia.

These 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 whole blood levels of nutrients. Data will be used for research to further define nutrient requirements as well as optimal levels for disease prevention and health promotion.

Eligible Sample

Examined participants aged 1 year and over were eligible.

Description of Laboratory Methodology

The methods used to derive CBC parameters are based on the Beckman Coulter methodology of counting and sizing, in combination with an automatic diluting and mixing device for sample processing, and a single beam photometer for hemoglobinometry. The WBC differential uses Volume Conductivity Scatter (VCS) technology. The VCS technology uses three measurements to provide cell-by-cell information, the measurements are individual cell volume, high-frequency conductivity, and laser-light scatter. (Beckman Coulter, 2020)

The Beckman Coulter DxH 800 instrument in the NHANES mobile examination center (MEC) produces a CBC on blood specimens and provides a distribution of blood cells for all participants.

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

Complete Blood Count (September 2024)

Laboratory Quality Assurance and Monitoring

Whole blood specimens were analyzed in the NHANES Mobile Examination Center.

Detailed instructions on specimen collection and processing are discussed in the NHANES Laboratory Procedures Manual (LPM).

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)

NHANES uses several methods to monitor the quality of the analyses performed by the MEC analytical laboratory. These methods include performing blind split samples collected during "dry run" sessions in the MEC. NCHS developed a QC protocol for the MEC laboratory, which outlined the use of Westgard rules (Westgard, et. al., 1981) when testing NHANES specimens. Progress reports containing any problems encountered during the analysis of the specimens, summary statistics for each control pool, QC graphs, instrument calibration, reagents, and any special considerations are submitted to NCHS on an on-going basis. The reports are reviewed for trends or shifts in the data.

In the MEC, the CBC results are measured in duplicate and averaged. The averaged results are reported to the participant and released in this dataset.

Data Processing and Editing

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

Five derived variables were created in this data file. The variables were created using the following formulas:

LBDLYMNO = LBXWBCSI * LBXLYPCT/100 (round to 1 decimal)
LBDMONO = LBXWBCSI * LBXMOPCT/100 (round to 1 decimal)
LBDNENO = LBXWBCSI * LBXNEPCT /100 (round to 1 decimal)
LBDEONO = LBXWBCSI * LBXEOPCT/100 (round to 1 decimal)
LBDBANO = LBXWBCSI * LBXBAPCT/100 (round to 1 decimal)

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. The specimen availability can also vary by age or other population characteristics. 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 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 file.

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

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

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 ending in "LC" (ex., LBDHGBLC) 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 LBXHGB provides the analytic result for that analyte. For analytes with analytic results below the lower limit of detection (ex., LBDHGBLC = 1), an imputed 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 and upper limits of detection for CBC:

Variable Name	Analyte Description	LLOD	ULOD	Range
LBXWBCSI	White blood cell count	0.000	337.700	x 10^3 cells/uL
LBXLYPCT	Lymphocyte percent	0.00	100.00	%
LBXMOPCT	Monocyte percent	0.00	100.00	%
LBXNEPCT	Segmented neutrophils percent	0.00	100.00	%
LBXEOPCT	Eosinophils percent	0.00	100.00	%
LBXBAPCT	Basophils percent	0.00	100.00	%
LBXRBCSI	Red blood cell count	0.00	8.11	x 10^6 cells/uL
LBXHGB	Hemoglobin	0.00	24.00	g/dL
LBXMCVSI	Mean cell volume	50.00	150.00	fL
LBXRDW	Red cell distribution width	10.00	40.00	%
LBXPLTSI	Platelet count	0.0	4857.0	x 10^3 cells/uL
LBXMPSI	Mean platelet volume	5.00	25.00	fL

References

- Beckman Coulter. UniCel DxH Series with System Manager Software: Instructions for Use. April 2020. Downloaded from B26647AG.book on February 1, 2024. beckmancoulter.com
- 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 1 YEARS - 150 YEARS

WTPH2YR - Phlebotomy 2 Year Weight

Variable Name: WTPH2YR

SAS Label: Phlebotomy 2 Year Weight

English Text: Phlebotomy 2 Year Weight

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
4391.8220579 to 253478.77765	Range of Values	7626	7626	
0	No blood sample provided	1101	8727	
.	Missing	0	8727	

LBXWBCSI - White blood cell count (1000 cells/uL)

Variable Name: LBXWBCSI

SAS Label: White blood cell count (1000 cells/uL)

English Text: White blood cell count (1000 cells/uL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2.1 to 20.8	Range of Values	7593	7593	
400	400 and over	0	7593	
.	Missing	1134	8727	

LBXLYPCT - Lymphocyte percent (%)

Variable Name: LBXLYPCT

SAS Label: Lymphocyte percent (%)

English Text: Lymphocyte percent (%)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
3.1 to 78.9	Range of Values	7582	7582	
.	Missing	1145	8727	

LBXMOPCT - Monocyte percent (%)

Variable Name: LBXMOPCT

SAS Label: Monocyte percent (%)

English Text: Monocyte percent (%)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.3 to 25.9	Range of Values	7582	7582	
.	Missing	1145	8727	

LBXNEPCT - Segmented neutrophils percent (%)

Variable Name: LBXNEPCT

SAS Label: Segmented neutrophils percent (%)

English Text: Segmented neutrophils percent (%)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
12.4 to 92.1	Range of Values	7582	7582	
.	Missing	1145	8727	

LBXEOPCT - Eosinophils percent (%)

Variable Name: LBXEOPCT

SAS Label: Eosinophils percent (%)

English Text: Eosinophils percent (%)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0 to 46.7	Range of Values	7582	7582	
.	Missing	1145	8727	

LBXBAPCT - Basophils percent (%)

Variable Name: LBXBAPCT

SAS Label: Basophils percent (%)

English Text: Basophils percent (%)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0 to 4.2	Range of Values	7582	7582	
.	Missing	1145	8727	

LBDLYMNO - Lymphocyte number (1000 cells/uL)

Variable Name: LBDLYMNO

SAS Label: Lymphocyte number (1000 cells/uL)

English Text: Lymphocyte number (1000 cells/uL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.2 to 9.8	Range of Values	7582	7582	
.	Missing	1145	8727	

LBDMONO - Monocyte number (1000 cells/uL)

Variable Name: LBDMONO

SAS Label: Monocyte number (1000 cells/uL)

English Text: Monocyte number (1000 cells/uL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.1 to 1.8	Range of Values	7582	7582	
.	Missing	1145	8727	

LBDNENO - Segmented neutrophils num (1000 cell/uL)

Variable Name: LBDNENO

SAS Label: Segmented neutrophils num (1000 cell/uL)

English Text: Segmented neutrophils number (1000 cell/uL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.5 to 16.1	Range of Values	7582	7582	
.	Missing	1145	8727	

LBDEONO - Eosinophils number (1000 cells/uL)

Variable Name: LBDEONO

SAS Label: Eosinophils number (1000 cells/uL)

English Text: Eosinophils number (1000 cells/uL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0 to 6	Range of Values	7582	7582	
.	Missing	1145	8727	

LBDBANO - Basophils number (1000 cells/uL)

Variable Name: LBDBANO

SAS Label: Basophils number (1000 cells/uL)

English Text: Basophils number (1000 cells/uL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0 to 0.3	Range of Values	7582	7582	
.	Missing	1145	8727	

LBXRBCSI - Red blood cell count (million cells/uL)

Variable Name: LBXRBCSI

SAS Label: Red blood cell count (million cells/uL)

English Text: Red blood cell count (million cells/uL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2.44 to 7.08	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXHGB - Hemoglobin (g/dL)

Variable Name: LBXHGB

SAS Label: Hemoglobin (g/dL)

English Text: Hemoglobin (g/dL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
6.3 to 18.6	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXHCT - Hematocrit (%)

Variable Name: LBXHCT

SAS Label: Hematocrit (%)

English Text: Hematocrit (%)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
19.9 to 54.9	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXMCVSI - Mean cell volume (fL)

Variable Name: LBXMCVSI

SAS Label: Mean cell volume (fL)

English Text: Mean cell volume (fL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
52.5 to 116.7	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXMC - Mean Cell Hgb Conc. (g/dL)

Variable Name: LBXMC

SAS Label: Mean Cell Hgb Conc. (g/dL)

English Text: Mean cell hemoglobin concentration (g/dL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
27.8 to 40.5	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXMCHSI - Mean cell hemoglobin (pg)

Variable Name: LBXMCHSI

SAS Label: Mean cell hemoglobin (pg)

English Text: Mean cell hemoglobin (pg)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
15.6 to 41.1	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXRDW - Red cell distribution width (%)

Variable Name: LBXRDW

SAS Label: Red cell distribution width (%)

English Text: Red cell distribution width (%)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
11.2 to 37.5	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXPLTSI - Platelet count (1000 cells/uL)

Variable Name: LBXPLTSI

SAS Label: Platelet count (1000 cells/uL)

English Text: Platelet count (1000 cells/uL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
46 to 787	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXMPSI - Mean platelet volume (fL)

Variable Name: LBXMPSI

SAS Label: Mean platelet volume (fL)

English Text: Mean platelet volume (fL)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
5.5 to 12.9	Range of Values	7593	7593	
.	Missing	1134	8727	

LBXNRBC - Nucleated red blood cells (/100 WBC)

Variable Name: LBXNRBC

SAS Label: Nucleated red blood cells (/100 WBC)

English Text: Nucleated red blood cells (/100 WBC)

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0 to 4	Range of Values	7582	7582	
.	Missing	1145	8727	