National Health and Nutrition Examination Survey

2017-March 2020 Data Documentation, Codebook, and Frequencies

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

Data File: P_CBC.xpt

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Component Description

The NHANES program suspended field operations in March 2020 due to the coronavirus disease 2019 (COVID-19) pandemic. As a result, data collection for the NHANES 2019-2020 cycle was not completed and the collected data are not nationally representative. Therefore, data collected from 2019 to March 2020 were combined with data from the NHANES 2017-2018 cycle to form a nationally representative sample of NHANES 2017-March 2020 pre-pandemic data. These data are available to the public. Please refer to the Analytic Notes section for more details on the use of the data.

The complete blood count (CBC) with 5-part differential: counts red blood cells (RBCs), white blood cells (WBCs), and platelets; measures hemoglobin; estimates the RBC's 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

All examined participants 1 year and older, in the NHANES 2017-March 2020 pre-pandemic sample, were eligible.

Description of Laboratory Methodology

The Beckman Coulter DxH 800 instrument, in the NHANES mobile examination center (MEC), was used to measure the CBC on blood specimens and provide a distribution of blood cells for all participants.

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 VCS (volume, conductivity and scatter) technology.

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

Laboratory Method Files

Complete Blood Count (September 2019)

Complete Blood Count (June 2021)

Laboratory Quality Assurance and Monitoring

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

Detailed instructions on specimen collection and processing are discussed in the NHANES 2017-2018 and

2019-2020 Laboratory Procedures Manuals (LPM).

The NHANES quality assurance and quality control (QA/QC) protocols meet the 1988 Clinical Laboratory Improvement Act 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.

MEC Analytical Laboratory

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 twice and averaged. The averaged results are reported to participants and released in this dataset.

Data Processing and Editing

The data were reviewed. Incomplete data or improbable values were reviewed for confirmation.

Five additional variables were created in this data file to convert the analyzed values into absolute counts (1000 cells/uL). These variables were created using the following formulas:

LBXLYPCT conversion to LBDLYMNO:

Lymphocyte in percent (LBXLYPCT) was divided by 100 and rounded to 1 decimal, then multiplied by the WBC count in 1000 cells/uL (LBXWBCSI) to convert to 1000 cells/uL (LBDLYMNO)

LBXMOPCT conversion to LBDMONO:

Monocyte in percent (LBXMOPCT) was divided by 100 and rounded to 1 decimal, then multiplied by the WBC count in 1000 cells/uL (LBXWBCSI) to convert to 1000 cells/uL (LBDMONO)

LBXNEPCT conversion to LBDNENO:

Segmented neutrophils in percent (LBXNEPCT) was divided by 100 and rounded to 1 decimal, then multiplied by the WBC count in 1000 cells/uL (LBXWBCSI) to convert to 1000 cells/uL (LBDNENO)

LBXEOPCT conversion to LBDEONO:

Eosinophils in percent (LBXEOPCT) was divided by 100 and rounded to 1 decimal, then multiplied by the WBC count in 1000 cells/uL (LBXWBCSI) to convert to 1000 cells/uL (LBDEONO)

LBXBAPCT conversion to LBDBANO:

Basophils in percent (LBXBAPCT) was divided by 100 and rounded to 1 decimal, then multiplied by the WBC count in 1000 cells/uL (LBXWBCSI) to convert to 1000 cells/uL (LBDBANO)

Analytic Notes

The COVID-19 pandemic required suspension of NHANES 2019-2020 field operations in March 2020 after data were collected in 18 of the 30 survey locations in the 2019-2020 sample. Data collection was cancelled for the remaining 12 locations. Because the collected data from 18 locations were not nationally representative, these data were combined with data from the previous cycle (2017-2018) to create a 2017-March 2020 pre-pandemic data file. A special weighting process was applied to the 2017-March 2020 pre-pandemic data file. The resulting sample weights in the present file should be used to calculate estimates from the combined cycles. These sample weights are not appropriate for independent analyses of the

2019-2020 data and will not yield nationally representative results for either the 2017-2018 data alone or the 2019-March 2020 data alone. Please refer to the NHANES website for additional information for the NHANES 2017-March 2020 pre-pandemic data, and for the previous 2017-2018 public use data file with specific weights for that 2-year cycle.

Refer to the 2017-2018 and 2019-2020 Laboratory Data Overview documents 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 2017-March 2020, approximately 76% of children aged 1-17 years who were examined in the MEC provided a blood specimen through phlebotomy, while 95% of examined adults age 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.

Demographic and Other Related Variables

The analysis of NHANES laboratory data must be conducted using the appropriate survey design and demographic variables. The NHANES 2017-March 2020 Pre-Pandemic DemographicsFile 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 NHANES 2017-March 2020 Fasting Questionnaire File includes auxiliary information, such as fasting status, the 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 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 LBX (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 with units for the CBC:

Variable Name	Analyte Description	LLOD	ULOD	Units
LBXWBCSI	White blood cell count	0.020	363.000	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	8.20	x 10^6 cells/uL
LBXHGB	Hemoglobin	0.00	24.30	g/dL
LBXMCVSI	Mean cell volume	50.00	150.00	fL
LBXRDW	Red cell distribution width	10.00	40.00	%
LBXPLTSI	Platelet count	3.0	4596.0	x 10^3 cells/uL
LBXMPSI	Mean platelet volume	5.00	25.00	fL

References

- 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

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
1.9 to 74.2	Range of Values	12155	12155	
400	400 and over	1	12156	
.	Missing	1616	13772	

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 89.7	Range of Values	12151	12151	
.	Missing	1621	13772	

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
0.7 to 57.2	Range of Values	12151	12151	
.	Missing	1621	13772	

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
8.4 to 92.8	Range of Values	12151	12151	
.	Missing	1621	13772	

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 29.1	Range of Values	12151	12151	
.	Missing	1621	13772	

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
0.1 to 4.8	Range of Values	12151	12151	
.	Missing	1621	13772	

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 358.8	Range of Values	12151	12151	
.	Missing	1621	13772	

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 6.7	Range of Values	12151	12151	
.	Missing	1621	13772	

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
0.4 to 35.2	Range of Values	12151	12151	
.	Missing	1621	13772	

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 3.8	Range of Values	12151	12151	
.	Missing	1621	13772	

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 0.5	Range of Values	12151	12151	
.	Missing	1621	13772	

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
2.32 to 7.97	Range of Values	12156	12156	
.	Missing	1616	13772	

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
5.4 to 19.9	Range of Values	12156	12156	
.	Missing	1616	13772	

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
21.1 to 58.8	Range of Values	12156	12156	
.	Missing	1616	13772	

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
35.4 to 114.6	Range of Values	12156	12156	
.	Missing	1616	13772	

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
25.2 to 38.4	Range of Values	12156	12156	
.	Missing	1616	13772	

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
10.2 to 39.8	Range of Values	12156	12156	
.	Missing	1616	13772	

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
11.3 to 36.5	Range of Values	12156	12156	
.	Missing	1616	13772	

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
8 to 1021	Range of Values	12156	12156	
.	Missing	1616	13772	

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
5.4 to 13	Range of Values	12156	12156	
.	Missing	1616	13772	

LBXNRBC - Nucleated red blood cells

Variable Name: LBXNRBC

SAS Label: Nucleated red blood cells

English Text: Nucleated red blood cells

Target: Both males and females 1 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0 to 3	Range of Values	12151	12151	
.	Missing	1621	13772	