National Health and Nutrition Examination Survey

2015-2016 Data Documentation, Codebook, and Frequencies

Body Measures (BMX_I)

Data File: BMX_I.xpt

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Last Revised: NA

Component Description

NHANES body measures data are used to monitor trends in infant and child growth, to estimate the prevalence of overweight and obesity in U.S. children, adolescents, and adults, and to examine the associations between body weight and the health and nutritional status of the U.S. population. The new collected Sagittal Abdominal Diameter (SAD) data will be used to establish population-based reference ranges, and to improve the health risk assessments associated with body weight and obesity.

The measurements and target age groups for the NHANES 2015–2016 body measures component are as follows:

- Weight: All ages
- Head circumference: birth through 6 months of age
- Recumbent length: birth through 47 months of age
- Standing height: 2 years and older
- Upper leg length: 8 years and older
- Upper arm length: 2 months of age and older
- Mid-upper arm circumference: 2 months of age and older
- Waist circumference: 2 years of age and older
- Sagittal abdominal diameter: 8 years of age and older

Eligible Sample

All survey participants were eligible for the body measures component. Pregnant women and persons who weighed more than 600 pounds were excluded from the sagittal abdominal diameter measurement. For all other measurements, there were no medical, safety, or other exclusions for the body measurements protocol. The health technicians used their discretion to obtain as many measures as practical for persons who used a wheelchair.

Protocol and Procedure

The body measures data were collected, in the Mobile Examination Center (MEC), by trained health technicians. The health technician was assisted by a recorder during the body measures examination. The participant's age at the time of the screening interview determined the body measures examination protocol. In some instances, the age at the screening interview and age at the time of the health examination differed by several weeks. The Demographics data file includes variables for age in years at screening (RIDAGEYR) for all participants. It also includes

variables for age in months at screening (RIDAGEMN) and age in months at examination (RIDEXAGM) for participants aged 0 to 24 months, and age in years at examination (RIDEXAGY) for participants aged 2 to 19 years. Data on age in months at screening and age in months at examination for participants in other age groups are available through the NCHS Research Data Center (RDC).

Arm and leg measurements were made on the right side of the body. If a participant had an amputation, medical condition, or medical appliance, such as a cast, that prevented measurements from being taken on the right side of the body, the health technician took measurements on the left side. The body measurements file does not identify participants who had amputations because that information may be considered identifiable and pose a disclosure concern. The body weight data for participants who had limb amputations were set to "missing".

This data file includes body measures for women who were pregnant at the time of their health examination. Pregnancy status at the time of the health examination is indicated by the variable, RIDEXPRG, in the Demographic data file. RIDEXPRG values are reported for women 20–44 years of age. RIDEXPRG for several pregnant women who were outside of this age range are not reported due to disclosure concerns. The body measures data for these participants are not reported. Please refer to the NHANES 2015-2016 Anthropometry Procedures Manual for further details on obtaining body measurements.

Quality Assurance & Quality Control

The NHANES health technicians completed a 2-day training program with survey staff and an expert anthropometrist. The training included an overview of the component, using the NHANES III anthropometry video, and demonstrations conducted by the expert examiner with volunteer subjects. The expert examiner reviewed and demonstrated the proper technique to use for each measurement. Supervised practice exercises followed, conducted with several volunteer subjects, including infants, children, and adults. The chief health technician, at each of the MECs, monitored staff performance in the field. Health technician performance was also monitored using direct observation, data reviews, and periodic expert examiner (gold standard comparison) evaluations.

The body measures examination rooms in each of the MECs were identical with respect to layout and equipment. Scheduled equipment calibration was performed by the health technicians and verified by supervisory staff. The Anthropometry Procedures Manual includes detailed descriptions of the quality assurance and quality control measures that are used in the NHANES anthropometry/body measures component.

Data Processing and Editing

The 2015–2016 data were reviewed for unusual and erroneous values. Review criteria were based on the NHANES 1999–2014 body measurement data. During the data review, values that were above the 99th percentile or below the 1st percentile, for a particular age or age-gender group, were flagged for review. When records were flagged, the entire body measurements record was reviewed for reasonableness. Subject characteristics, such as height, weight, age and gender were taken into consideration. Values that were determined to be unrealistic were deleted from the file. None of the original body measures data were changed and there are no imputed values in this file.

Body Mass Index (BMXBMI):
Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared, and then rounded to one decimal place.

BMI Category – Children/Adolescents (BMDBMIC):
This variable was created for children and adolescents aged 2 to 19 years at examination. Cutoff criteria are based on the Centers for Disease Control and Prevention's sex-specific 2000 BMI-for-age growth charts for the United States. Age in months at examination was used to match age in months from BMI growth chart data, separately for males and females. There are

four codes:

1. Underweight (BMI < 5th percentile)
2. Normal weight (BMI 5th to < 85th percentiles)
3. Overweight (BMI 85th to < 95th percentiles)
4. Obese (BMI ≥ 95th percentile)

Average sagittal abdominal diameter (BMDAVSAD):
This variable was created by averaging up to four SAD readings. The majority of survey participants have two readings (BMXSAD1, and BMXSAD2); as such, these two readings were used to obtain mean of SAD value. If there were four SAD readings (BMXSAD1, BMXSAD2, BMXSAD3, and BMXSAD4) because the difference between the first and second SAD measurements was greater than 0.5 cm, then three closest SAD readings were used to obtain mean of SAD value (Stein AD et al, American Journal of Clinical Nutrition 2007; 85(3): 869-876). In a few instances where two outlying measurements are equally distant from the means of the two closest measurements, then all four readings were used to obtain mean of SAD value.

Sagittal abdominal diameter comment (BMDSADCM):
This variable was created by regrouping all comments for sagittal abdominal diameter measurement. BMDSADCM was coded as 1 if health technicians could not obtain sagittal abdominal diameter measurement. BMDSADCM were coded as 2, 3, and 4 sequentially if original comments recorded during the sagittal abdominal diameter measurement were "SP unable to comply with exam instruction," "SP discomfort," and "Use of positioning cushion." BMDSADCM was coded as 5 for all other comments, including scar or navel interfering with measures and problem of handing caliper or reading number.

Analytic Notes

Component status code: A final body measures component status code (BMDSTATS) provides analysts with a quick method of identifying survey participants with complete or partial body measurement data.

Unusual values: Unusual body measures values were noted during the review of the data. Typically, unusual values occurred when a subject was extremely short, tall, overweight or underweight. In addition, the upper arm length (BMXARML) and upper leg length (BMXLEG) values may be affected by extreme amounts of adipose tissue. Analysts should examine the distributions of the body measurements carefully and consider whether or not it is appropriate to include or exclude extreme values in a given analysis.

Comment codes: Comment codes were added by the health technicians, during data collection, to document problems or situations that arose during the body measures examination. For example, the variable BMIWT is a comment code for the body weight measurement. If a participant did not change into the NHANES exam gown, a code of BMIWT of "3" denoting "clothing worn" was made in the record. Analysts should review the comment code information for each of the body measures prior to data analysis.

Weight status classification: BMI, expressed as weight in kilograms divided by height in meters squared (kg/m2), is commonly used to classify weight status. The definitions of underweight, normal weight, overweight, and obesity in children and adolescents are not directly comparable with the definitions in adults. The age-and sex-specific 5th, 85th, and 95th percentiles of the 2000 CDC growth charts are usually used as cutoff criteria for children and adolescents. The variable BMDBMIC provides weight status categories for children and adolescents aged 2 to 19 years at examination, consequently BMDBMIC was not calculated for a few persons who were 19 years at the screening interview but became 20 years at the health examination. Information about age in years at screening and at examination for participants aged 2 to 19 years is available in the Demographic data file.

The SAS algorithm to calculate average SAD value from up to four readings:

```
** Mean of 2 measurements if only BMXSAD1 and BMXSAD2 are available **;
if (n(of bmxsad1-bmxsad4) = 2) then BMDAVSAD = round(mean(bmxsad1, bmxsad2), 0.1);
** If BMXSAD3 and BMXSAD4 are available **;
** Find the 3 closest SAD values and take their mean **;
** If the 3 closest SAD values could not be determined, take mean of all 4 values **;
else if (n(of bmxsad1-bmxsad4) = 4) then do;
range1 = round(range(bmxsad1, bmxsad2, bmxsad3), 0.1);
range2 = round(range(bmxsad1, bmxsad2, bmxsad4), 0.1);
range3 = round(range(bmxsad1, bmxsad3, bmxsad4), 0.1);
range4 = round(range(bmxsad2, bmxsad3, bmxsad4), 0.1);
if (smallest(1,of range1-range4) = smallest(2,of range1-range4))
then BMDAVSAD = round(mean(of bmxsad1-bmxsad4), 0.1);
else do;
  select(smallest(1, of range1-range4));
  when(range1) BMDAVSAD = round(mean(bmxsad1, bmxsad2, bmxsad3), 0.1);
  when(range2) BMDAVSAD = round(mean(bmxsad1, bmxsad2, bmxsad4), 0.1);
  when(range3) BMDAVSAD = round(mean(bmxsad1, bmxsad3, bmxsad4), 0.1);
  when(range4) BMDAVSAD = round(mean(bmxsad2, bmxsad3, bmxsad4), 0.1);
  end;
 end;
end;
```

Sample weights: The NHANES examination sample weights should be used to analyze the body measurement data. Please refer to the NHANES Analytic Guidelines and the online NHANES Tutorial for further details on the use of sample weights and other analytic issues.

References

- Centers for Disease Control and Prevention, National Center for Health Statistics, NHANES III anthropometry video.
- Lohman TG, Roche AF, Martorell R, editors. Anthropometric Standardization Reference Manual. Abridged ed. Champaign, IL: Human Kinetics Books; 1988.
- Stein AD, Kahn HS, Rundle A, Zybert PA, van der Pal-de Bruin K, Lumey LH. Anthropometric measure in middle age after exposure to famine during gestation: evidence from the Dutch famine. American Journal of Clinical Nutrition 2007; 85(3): 869-876.

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 0 YEARS - 150 YEARS

BMDSTATS - Body Measures Component Status Code

Variable Name: BMDSTATS

SAS Label: Body Measures Component Status Code

English Text: Body Measures Component status Code

Target: Both males and females 0 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Complete data for age group	8687	8687	
2	Partial: Only height and weight obtained	366	9053	
3	Other partial exam	411	9464	
4	No body measures exam data	80	9544	
.	Missing	0	9544	

remove

BMXWT - Weight (kg)

Variable Name: BMXWT

SAS Label: Weight (kg)

English Text: Weight (kg)

Target: Both males and females 0 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
3.6 to 198.9	Range of Values	9445	9445	
.	Missing	99	9544	

BMIWT - Weight Comment

Variable Name: BMIWT

SAS Label: Weight Comment

English Text: Weight Comment

Target: Both males and females 0 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	14	14	
3	Clothing	406	420	
4	Medical appliance	23	443	
.	Missing	9101	9544	

BMXRECUM - Recumbent Length (cm)

Variable Name: BMXRECUM

SAS Label: Recumbent Length (cm)

English Text: Recumbent Length (cm)

Target: Both males and females 0 YEARS - 47 MONTHS

Code or Value	Value Description	Count	Cumulative	Skip to Item
49.3 to 116.7	Range of Values	1073	1073	
.	Missing	8471	9544	

BMIRECUM - Recumbent Length Comment

Variable Name: BMIRECUM

SAS Label: Recumbent Length Comment

English Text: Recumbent Length Comment

Target: Both males and females 0 MONTHS - 47 MONTHS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	33	33	
3	Not straight	0	33	
.	Missing	9511	9544	

BMXHEAD - Head Circumference (cm)

Variable Name: BMXHEAD

SAS Label: Head Circumference (cm)

English Text: Head Circumference (cm)

Target: Both males and females 0 YEARS - 6 MONTHS

Code or Value	Value Description	Count	Cumulative	Skip to Item
36.2 to 48.5	Range of Values	215	215	
.	Missing	9329	9544	

BMIHEAD - Head Circumference Comment

Variable Name: BMIHEAD

SAS Label: Head Circumference Comment

English Text: Head Circumference Comment

Target: Both males and females 0 MONTHS - 6 MONTHS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	0	0	
.	Missing	9544	9544	

BMXHT - Standing Height (cm)

Variable Name: BMXHT

SAS Label: Standing Height (cm)

English Text: Standing Height (cm)

Target: Both males and females 2 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
80.7 to 202.7	Range of Values	8769	8769	
.	Missing	775	9544	

BMIHT - Standing Height Comment

Variable Name: BMIHT

SAS Label: Standing Height Comment

English Text: Standing Height Comment

Target: Both males and females 2 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	37	37	
3	Not straight	68	105	
.	Missing	9439	9544	

BMXBMI - Body Mass Index (kg/m**2)

Variable Name: BMXBMI

SAS Label: Body Mass Index (kg/m**2)

English Text: Body Mass Index (kg/m**2)

Target: Both males and females 2 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
11.5 to 67.3	Range of Values	8756	8756	
.	Missing	788	9544	

BMDBMIC - BMI Category - Children/Youth

Variable Name: BMDBMIC

SAS Label: BMI Category - Children/Youth

English Text: BMI Category - Children/Youth

Target: Both males and females 2 YEARS - 19 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Underweight	86	86	
2	Normal weight	2041	2127	
3	Overweight	561	2688	
4	Obese	652	3340	
.	Missing	6204	9544	

BMXLEG - Upper Leg Length (cm)

Variable Name: BMXLEG

SAS Label: Upper Leg Length (cm)

English Text: Upper Leg Length (cm)

Target: Both males and females 8 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
24 to 51.5	Range of Values	7110	7110	
.	Missing	2434	9544	

BMILEG - Upper Leg Length Comment

Variable Name: BMILEG

SAS Label: Upper Leg Length Comment

English Text: Upper Leg Length Comment

Target: Both males and females 8 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	402	402	
.	Missing	9142	9544	

BMXARML - Upper Arm Length (cm)

Variable Name: BMXARML

SAS Label: Upper Arm Length (cm)

English Text: Upper Arm Length (cm)

Target: Both males and females 2 MONTHS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
10 to 47.4	Range of Values	8976	8976	
.	Missing	568	9544	

BMIARML - Upper Arm Length Comment

Variable Name: BMIARML

SAS Label: Upper Arm Length Comment

English Text: Upper Arm Length Comment

Target: Both males and females 2 MONTHS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	420	420	
.	Missing	9124	9544	

BMXARMC - Arm Circumference (cm)

Variable Name: BMXARMC

SAS Label: Arm Circumference (cm)

English Text: Arm Circumference (cm)

Target: Both males and females 2 MONTHS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
10.1 to 58.4	Range of Values	8976	8976	
.	Missing	568	9544	

BMIARMC - Arm Circumference Comment

Variable Name: BMIARMC

SAS Label: Arm Circumference Comment

English Text: Arm Circumference Comment

Target: Both males and females 2 MONTHS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	421	421	
.	Missing	9123	9544	

BMXWAIST - Waist Circumference (cm)

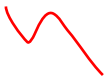
Variable Name: BMXWAIST

SAS Label: Waist Circumference (cm)

English Text: Waist Circumference (cm)

Target: Both males and females 2 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
40 to 171.6	Range of Values	8313	8313	
.	Missing	1231	9544	



BMIWAIST - Waist Circumference Comment

Variable Name: BMIWAIST

SAS Label: Waist Circumference Comment

English Text: Waist Circumference Comment

Target: Both males and females 2 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	489	489	
.	Missing	9055	9544	

BMXSAD1 - Sagittal Abdominal Diameter 1st (cm)

Variable Name: BMXSAD1

SAS Label: Sagittal Abdominal Diameter 1st (cm)

English Text: Sagittal Abdominal Diameter 1st (cm)

Target: Both males and females 8 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
9.5 to 40.7	Range of Values	6983	6983	
.	Missing	2561	9544	

BMXSAD2 - Sagittal Abdominal Diameter 2nd (cm)

Variable Name: BMXSAD2

SAS Label: Sagittal Abdominal Diameter 2nd (cm)

English Text: Sagittal Abdominal Diameter 2nd (cm)

Target: Both males and females 8 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
9.7 to 40.9	Range of Values	6983	6983	
.	Missing	2561	9544	

BMXSAD3 - Sagittal Abdominal Diameter 3rd (cm)

Variable Name: BMXSAD3

SAS Label: Sagittal Abdominal Diameter 3rd (cm)

English Text: Sagittal Abdominal Diameter 3rd (cm)

Target: Both males and females 8 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
11.3 to 39.5	Range of Values	353	353	
.	Missing	9191	9544	

BMXSAD4 - Sagittal Abdominal Diameter 4th (cm)

Variable Name: BMXSAD4

SAS Label: Sagittal Abdominal Diameter 4th (cm)

English Text: Sagittal Abdominal Diameter 4th (cm)

Target: Both males and females 8 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
11.1 to 39.8	Range of Values	353	353	
.	Missing	9191	9544	

BMDAVSAD - Average Sagittal Abdominal Diameter (cm)

Variable Name: BMDAVSAD

SAS Label: Average Sagittal Abdominal Diameter (cm)

English Text: Average Sagittal Abdominal Diameter (cm)

Target: Both males and females 8 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
9.6 to 40.8	Range of Values	6983	6983	
.	Missing	2561	9544	

BMDSADCM - Sagittal Abdominal Diameter Comment

Variable Name: BMDSADCM

SAS Label: Sagittal Abdominal Diameter Comment

English Text: Sagittal Abdominal Diameter Comment

Target: Both males and females 8 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Could not obtain	436	436	
2	SP unable to comply with exam instruction	2	438	
3	SP discomfort	3	441	
4	Use of positioning cushion	1	442	
5	Other	4	446	
.	Missing	9098	9544	