

Prevalence of Functional Limitations Among Adults 60 Years of Age and Over: United States, 1999–2002

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Abstract

In the 1999–2002 National Health and Nutrition Examination Survey (NHANES), participants were asked a series of questions designed to evaluate functional status. Some questions assessed performance on selected activities of daily living (ADLs) and instrumental activities of daily living (IADLs), while others assessed mobility, strength, endurance, and social participation. This report contains prevalence estimates and standard errors for adults, 60 years of age and over, who reported difficulty performing these activities without the aid of special equipment or who were not able to perform these activities. Results are reported by sex, age group, race and ethnicity, and body mass index (BMI). Assessment of functional status plays an important role in monitoring the health problems and needs of older Americans.

Keywords: ADLs/IADLs • functional limitations • older adults • elderly • National Health and Nutrition Examination Survey (NHANES)

Introduction

A variety of instruments have been developed to evaluate the functional status of people, especially elderly adults. One instrument, known as the activities of daily living (ADLs), assesses basic self-care activities. Another instrument, known as the instrumental activities of daily living (IADLs), assesses activities and skills needed to live independently in the community such as shopping, cooking, housekeeping, and handling finances (1,2). Additional questions have been developed to assess other functions such as mobility, range of motion, strength

and endurance, and social functioning (1,3). Evaluating functional status can help one understand the health problems and needs of the aging population (1).

One of the variables examined in relation to functional limitations was body mass index (BMI). Weight and BMI may affect a person's health and functional status. There is no consensus regarding optimal weight for older adults (4), but several researchers have reported that the relationship between BMI and mortality is U-shaped, with the greatest risks being in the lowest and highest percentiles of BMIs (5–7). Andres et al. (5) reported that, among adults over 50 years of age, BMIs in the

range of 22.5 kg/m² were associated with a higher mortality rate than those that were 10–20 percent higher than that value. Heiat et al. (6) found that the relationship between BMI and mortality in elderly adults, 65 years of age and over, begins to rise for BMIs of more than 31 to 32. Both Galanos et al. (8) and Cornoni-Huntley et al. (7) used the NHANES I Epidemiologic Followup Survey (NHEFS) to examine the relationship between BMI and functional capabilities or mortality. They found increased risk of both outcomes in older adults in the lowest and highest 15 percent of the distribution compared with the average or mid-range BMIs. In the Galanos paper (8) these limits corresponded to BMIs of 22 and 29 in males and 21 and 31 in females.

In the National Health and Nutrition Examination Survey (NHANES), participants were asked a series of questions during the household interview designed to evaluate functional status. These questions were phrased to assess the individual's level of difficulty in performing a variety of activities without using any special equipment. This report contains prevalence estimates for adults, 60 years of age and over, who reported some level of difficulty performing these activities or who were not able to perform them at all.



Methods

NHANES is a cross-sectional nationally representative health and nutrition examination survey conducted by the National Center for Health Statistics, Centers for Disease Control and Prevention. The survey design is a complex, stratified, multistage probability sample of the civilian, noninstitutionalized U.S. population. Beginning in 1999, the NHANES became a continuous survey. Each annual survey is based on a nationally representative sample, but 2 or more years of data are necessary to provide adequate sample sizes for subgroup analyses. NHANES 1999–2002 data were released in two 2-year datasets. A combined 4-year dataset was used for this report to provide robust sample sizes and more reliable statistical estimates. Adolescents 12–19 years of age, adults 60 years of age and over, Mexican Americans, black persons, low income persons, and pregnant women were oversampled in each 2-year dataset to improve the precision of the estimates for these groups. More information on the NHANES 1999–2000 and 2001–02 survey designs and data collection methods, as well as public-use microdata files, can be found at the NHANES website: <http://www.cdc.gov/nchs/nhanes.htm>.

Sample population

A total of 4,976 adults, 60 years of age and over, were eligible to participate in NHANES 1999–2002. The survey includes an interview conducted in the home and a subsequent health examination performed at a mobile examination center (MEC). Of the eligible sample, 3,706 adults 60 years of age and over, or 74 percent, participated in the household interview. Most of these respondents participated in both the household interview and the MEC exam, but 13 percent of them only participated in the household interview and did not receive the more in-depth diagnostic tests conducted at the MEC. One reason why the household interview only group may not have participated in the MEC exam could be because they were frailer and had more functional

limitations than those who participated in both parts of the survey. Analyses in this report are based on the household interviewed sample.

Survey questions

Participants were asked a series of questions on the household questionnaire designed to measure performance on a variety of functional activities. Some of these questions assessed functioning on ADL and IADL activities, while others assessed mobility, strength, endurance, and social participation. Respondents rated their ability to perform each activity, without the aid of any special equipment, using a scale ranging from no difficulty, some or much difficulty, to unable to perform the activity. For the analyses in this report, participant's responses were dichotomized into having no difficulty performing each activity versus having any difficulty or not being able to perform it.

Results are reported by sex, age group, race and ethnicity, and BMI. The age categories used were the same ones listed in the NHANES III Analytic Guidelines (9). These age groups were 60–69-year-olds, 70–79-year-olds, and 80 years of age and over. These three age categories were also used to age-adjust prevalence estimates for sex, race and ethnicity, and BMI using the direct method of age adjustment to the total U.S. resident population, 60 years and over, estimated by the U.S. Census Bureau in the year 2000.

BMI was calculated using self-reported height and weight from the household interview. While these values are not as accurate as those based on measured height and weight, they are only used in this report to examine functional status in terms of low, high, and mid-range BMIs. BMI was calculated by dividing weight by height squared (kg/m^2). Three categories were created based on the weighted distribution of these BMIs for this sample: less than the 15th percentile, 15th–85th percentile, and greater than the 85th percentile. The 15th percentile corresponded to a BMI of 22.3 and the 85th percentile corresponded to a BMI of 32.4. These lower and upper limits

closely correspond to those used by other researchers (5–8).

Statistical analysis

The percentage of respondents having difficulty performing an activity and the standard errors of the percentages were weighted using the NHANES 4-year household interview sample weights to produce national estimates. The sample weights incorporate the differential probabilities of selection and include adjustments for oversampling of certain populations, noncoverage, and nonresponse. Standard errors were estimated using the Taylor series linearization, a method that incorporates the sample weights and accounts for the sample design (10). The relative standard error (RSE) is the statistical criterion used to determine the reliability of the estimates and is calculated as the ratio of the standard error of the mean to the mean multiplied by 100. The larger the RSE, the less reliable the estimates are. A RSE greater than 30 percent is often recommended to define estimates that are not reliable (11). All of the estimates presented in these tables have RSEs less than 25 percent and are considered to be statistically reliable. All data analyses were performed using SAS version 9.1 (SAS Institute, Cary, NC) and SUDAAN release 9.0 (RTI, Research Triangle Park, NC).

Two-tailed *t*-tests were performed on the age-adjusted or age specific values to assess significant differences in the estimates, but no adjustments were performed for multiple comparisons. The critical value used to compare the estimates at the .05 level was 1.96. All differences were statistically significant unless otherwise stated.

Findings

Both crude and age-adjusted prevalence estimates are presented for results stratified by sex, race and ethnicity, and BMI (Tables 1, 3, and 4), and age-specific estimates are presented in Table 2. Age-adjusted estimates are discussed in these findings.

- Only 6 percent of older adults reported some level of difficulty using eating utensils and drinking vessels, and 7 percent reported some level of difficulty doing things to relax at home or for leisure (Table 1). In contrast, slightly more than 40 percent of older adults reported some level of difficulty being on their feet for 2 hours, and over one-half of them (51%) reported some level of difficulty stooping, crouching, or kneeling.
- Females were more likely than males to report some level of difficulty performing most of these functional activities (Table 1). There were no significant differences between the sexes for the following activities: managing money, preparing one's own meals, using eating utensils and drinking vessels, dressing oneself, and doing things to relax at home or for leisure.
- More adults in the two oldest age groups (70–79 years old and 80 years and over) reported having difficulties performing these activities than those in the youngest age group (60–69 years old), with those in the oldest age group having the highest prevalence of difficulties (Table 2). There were no significant differences between 60–69-year-olds and 70–79-year-olds for the following activities: getting in or out of bed, dressing oneself, reaching up over one's head, and doing things to relax at home or for leisure. There were no significant differences between the youngest age group and the two oldest age groups sitting for about 2 hours.
- Non-Hispanic black and Mexican American persons were more likely than non-Hispanic white persons to report difficulties performing most of these functional activities (Table 3). There was no significant difference between non-Hispanic white and non-Hispanic black persons for using eating utensils and drinking vessels. There were no significant differences between non-Hispanic white and Mexican American persons for the following activities: walking for a quarter of a mile, walking up 10 steps without resting, and standing or being

on one's feet for about 2 hours. There were no significant differences between non-Hispanic white persons and the other two race and ethnicity groups for the following activities: stooping, crouching, or kneeling; and using one's fingers to grasp or hold small objects.

- Those in the highest BMI category (>32.4) reported more difficulties performing virtually all these functional activities compared with those in the mid-range BMIs (22.3–32.4) (Table 4). There was no significant difference between these two groups in terms of using eating utensils and drinking vessels. In contrast, there were only a few significant differences between the lowest BMI category (<22.3) and the mid-range group in the percentages reporting difficulties performing these functional activities. The only significant differences were for the following activities: managing money, lifting or carrying something as heavy as 10 pounds, doing household chores, preparing one's own meals, and using one's fingers to grasp or hold small objects.

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Table 1. Percentage of adults, 60 years and over, having any difficulty performing selected functional activities or who were unable to perform these activities by sex: NHANES, 1999–2002

Functional activities	Both sexes			Male			Female		
	Sample size	Percent	Standard error of the percent	Sample size	Percent	Standard error of the percent	Sample size	Percent	Standard error of the percent
Age-adjusted estimates ¹									
Managing money.	3,694	11	0.7	1,781	10	0.8	1,913	12	0.9
Walking for a quarter of a mile	3,319	30	1.2	1,599	24	1.4	1,720	34	1.6
Walking up 10 steps without resting	3,312	26	1.0	1,596	18	1.4	1,716	31	1.3
Stooping, crouching, or kneeling	3,702	51	1.3	1,788	45	1.7	1,914	55	1.4
Lifting or carrying something as heavy as 10 pounds	3,693	29	1.1	1,784	19	1.2	1,909	36	1.4
Doing chores around the house	3,695	28	1.1	1,781	20	1.3	1,914	33	1.1
Preparing one's own meals	3,694	13	0.6	1,779	12	0.9	1,915	14	0.7
Walking between rooms on the same floor	3,702	12	0.7	1,787	10	0.8	1,915	13	0.8
Standing up from armless chair.	3,701	26	0.9	1,788	22	1.2	1,913	29	1.1
Getting in or out of bed	3,703	17	0.8	1,788	15	1.0	1,915	19	1.3
Holding a fork, cutting food, or drinking from a glass.	3,703	6	0.5	1,788	6	0.7	1,915	6	0.9
Dressing oneself	3,702	14	0.7	1,788	14	1.1	1,914	14	0.7
Standing or being on one's feet for about 2 hours	3,667	42	0.9	1,764	37	1.4	1,903	47	1.2
Sitting for about 2 hours	3,697	21	0.7	1,787	18	1.0	1,910	24	0.8
Reaching up over one's head	3,700	18	1.0	1,788	15	1.2	1,912	19	1.2
Using one's fingers to grasp or hold small objects	3,701	17	0.8	1,788	15	1.0	1,913	18	1.2
Going out to do things like shopping, movies, or sporting events . . .	3,697	22	0.9	1,783	18	1.2	1,914	25	1.2
Participating in social activities	3,692	18	0.7	1,781	16	1.0	1,911	20	1.0
Doing things to relax at home or for leisure	3,698	7	0.5	1,786	7	0.8	1,912	7	0.7
Crude estimates									
Managing money.	3,694	11	0.8	1,781	9	0.8	1,913	12	0.9
Walking for a quarter of a mile	3,319	29	1.2	1,599	23	1.4	1,720	34	1.6
Walking up 10 steps without resting	3,312	25	1.1	1,596	16	1.4	1,716	31	1.4
Stooping, crouching, or kneeling	3,702	50	1.4	1,788	43	1.9	1,914	55	1.5
Lifting or carrying something as heavy as 10 pounds	3,693	29	1.2	1,784	18	1.2	1,909	37	1.5
Doing chores around the house	3,695	27	1.2	1,781	19	1.4	1,914	34	1.2
Preparing one's own meals	3,694	12	0.6	1,779	11	0.8	1,915	14	0.8
Walking between rooms on the same floor	3,702	11	0.7	1,787	9	0.8	1,915	13	0.8
Standing up from armless chair.	3,701	25	0.9	1,788	20	1.2	1,913	29	1.2
Getting in or out of bed	3,703	17	0.8	1,788	14	1.1	1,915	19	1.4
Holding a fork, cutting food, or drinking from a glass.	3,703	6	0.5	1,788	5	0.7	1,915	6	0.9
Dressing oneself	3,702	14	0.7	1,788	13	1.1	1,914	14	0.7
Standing or being on one's feet for about 2 hours	3,667	42	1.1	1,764	35	1.5	1,903	47	1.4
Sitting for about 2 hours	3,697	21	0.8	1,787	17	1.1	1,910	24	0.8
Reaching up over one's head	3,700	17	1.0	1,788	15	1.3	1,912	19	1.3
Using one's fingers to grasp or hold small objects	3,701	17	0.8	1,788	14	1.0	1,913	18	1.2
Going out to do things like shopping, movies, or sporting events . . .	3,697	21	1.0	1,783	17	1.3	1,914	25	1.3
Participating in social activities	3,692	18	0.8	1,781	15	1.1	1,911	20	1.1
Doing things to relax at home or for leisure	3,698	7	0.4	1,786	6	0.7	1,912	7	0.6

¹Prevalence estimates are age-adjusted using the three age groups shown in Table 2 based on the direct method of adjustment to the total U.S. resident population, 60 years and over, estimated by the U.S. Census Bureau in 2000.

Table 2. Percentage of adults, 60 years and over, having any difficulty performing selected functional activities or who were unable to perform these activities by age: NHANES, 1999–2002

Functional activities	60–69 years old			70–79 years old			80 years and over		
	Sample size	Percent	Standard error of the percent	Sample size	Percent	Standard error of the percent	Sample size	Percent	Standard error of the percent
Managing money.	1,555	6	0.8	1,180	10	1.2	956	24	1.9
Walking for a quarter of a mile	1,418	21	1.6	1,070	30	1.7	831	49	2.4
Walking up 10 steps without resting	1,421	18	1.6	1,066	26	1.6	825	41	1.9
Stooping, crouching, or kneeling	1,556	42	2.3	1,183	52	1.9	963	66	1.7
Lifting or carrying something as heavy as 10 pounds	1,555	22	1.5	1,180	28	1.6	958	46	2.5
Doing chores around the house	1,555	20	1.4	1,180	28	1.6	960	44	2.7
Preparing one's own meals	1,554	8	0.8	1,179	12	1.0	961	27	1.8
Walking between rooms on the same floor	1,557	7	0.7	1,183	11	1.2	962	24	1.5
Standing up from armless chair.	1,556	17	1.1	1,183	26	1.4	962	45	1.9
Getting in or out of bed	1,557	14	1.1	1,183	15	1.2	963	28	2.4
Holding a fork, cutting food, or drinking from a glass.	1,557	3	0.6	1,183	6	0.9	963	11	1.4
Dressing oneself	1,557	10	1.0	1,182	13	1.2	963	24	1.7
Standing or being on one's feet for about 2 hours	1,544	32	1.9	1,171	43	1.4	952	63	2.1
Sitting for about 2 hours	1,556	20	1.5	1,180	22	1.5	961	21	1.6
Reaching up over one's head	1,557	16	1.7	1,181	15	1.1	962	26	2.5
Using one's fingers to grasp or hold small objects	1,557	12	1.0	1,182	17	1.4	962	25	1.7
Going out to do things like shopping, movies, or sporting events	1,556	15	1.4	1,180	21	1.4	961	39	2.0
Participating in social activities	1,552	13	1.1	1,179	16	1.2	961	34	1.8
Doing things to relax at home or for leisure	1,556	5	0.6	1,181	5	0.8	961	14	1.2

Table 3. Percentage of adults, 60 years and over, having any difficulty performing selected functional activities or who were unable to perform these activities by race and ethnicity: NHANES, 1999–2002

Functional activities	Non-Hispanic white			Non-Hispanic black			Mexican American		
	Sample size	Percent	Standard error of the percent	Sample size	Percent	Standard error of the percent	Sample size	Percent	Standard error of the percent
Age-adjusted estimates ¹									
Managing money.	2,114	10	0.6	623	16	1.7	734	17	1.4
Walking for a quarter of a mile	1,927	30	1.3	541	38	2.0	650	32	2.5
Walking up 10 steps without resting	1,919	25	1.2	541	36	2.8	651	22	1.9
Stooping, crouching, or kneeling	2,119	51	1.5	622	54	2.2	737	54	2.1
Lifting or carrying something as heavy as 10 pounds	2,115	27	1.2	621	40	2.1	736	35	2.3
Doing chores around the house	2,114	27	1.4	622	35	2.1	735	33	2.3
Preparing one's own meals	2,119	12	0.7	623	18	1.8	731	21	1.9
Walking between rooms on the same floor	2,118	11	0.8	623	20	2.7	737	16	2.1
Standing up from armless chair.	2,117	25	1.1	623	33	2.5	737	32	2.0
Getting in or out of bed	2,119	16	0.8	623	21	1.8	737	26	2.5
Holding a fork, cutting food, or drinking from a glass.	2,119	6	0.6	623	8	1.2	737	10	1.2
Dressing oneself	2,119	13	0.8	623	19	2.2	737	20	1.6
Standing or being on one's feet for about 2 hours	2,104	42	1.1	616	48	2.7	727	44	2.4
Sitting for about 2 hours	2,118	20	0.9	620	26	1.6	736	28	2.2
Reaching up over one's head	2,119	16	1.1	623	25	2.1	735	25	2.7
Using one's fingers to grasp or hold small objects	2,118	17	1.0	623	20	2.0	737	18	1.7
Going out to do things like shopping, movies, or sporting events	2,116	21	1.1	623	29	2.5	736	29	2.0
Participating in social activities	2,114	17	0.8	622	26	2.6	734	26	2.7
Doing things to relax at home or for leisure	2,116	6	0.4	622	12	2.1	737	15	1.9
Crude estimates									
Managing money.	2,114	10	0.8	623	15	1.5	734	15	1.3
Walking for a quarter of a mile	1,927	29	1.4	541	36	2.2	650	29	2.1
Walking up 10 steps without resting	1,919	25	1.3	541	33	2.9	651	19	1.9
Stooping, crouching, or kneeling	2,119	50	1.7	622	52	2.1	737	52	2.1
Lifting or carrying something as heavy as 10 pounds	2,115	26	1.3	621	37	1.9	736	33	2.1
Doing chores around the house	2,114	26	1.5	622	33	2.0	735	30	2.1
Preparing one's own meals	2,119	12	0.8	623	17	1.7	731	18	2.0
Walking between rooms on the same floor	2,118	10	0.8	623	19	2.4	737	15	1.9
Standing up from armless chair.	2,117	25	1.1	623	31	2.2	737	30	1.8
Getting in or out of bed	2,119	16	0.9	623	20	1.7	737	25	2.4
Holding a fork, cutting food, or drinking from a glass.	2,119	5	0.6	623	7	1.1	737	9	1.1
Dressing oneself	2,119	13	0.8	623	17	2.0	737	18	1.4
Standing or being on one's feet for about 2 hours	2,104	41	1.3	616	45	2.5	727	42	2.7
Sitting for about 2 hours	2,118	20	0.9	620	25	1.5	736	28	2.2
Reaching up over one's head	2,119	16	1.2	623	24	1.9	735	24	2.4
Using one's fingers to grasp or hold small objects	2,118	17	1.0	623	18	1.9	737	16	1.9
Going out to do things like shopping, movies, or sporting events	2,116	21	1.2	623	27	2.1	736	26	2.2
Participating in social activities	2,114	16	0.9	622	24	2.1	734	23	2.7
Doing things to relax at home or for leisure	2,116	6	0.4	622	11	1.8	737	13	1.8

¹Prevalence estimates are age-adjusted using the three age groups shown in Table 2 based on the direct method of adjustment to the total U.S. resident population, 60 years and over, estimated by the U.S. Census Bureau in 2000.

Table 4. Percentage of adults, 60 years and over, having any difficulty performing selected functional activities or who were unable to perform these activities by body mass index (BMI): NHANES, 1999–2002

Functional activities	BMI less than 15th percentile			BMI 15th-85th percentile			BMI greater than 85th percentile		
	Sample size	Percent	Standard error of the percent	Sample size	Percent	Standard error of the percent	Sample size	Percent	Standard error of the percent
Age-adjusted estimates ¹									
Managing money.	540	15	1.7	2,457	9	0.7	518	15	2.4
Walking for a quarter of a mile	488	27	2.7	2,231	26	1.2	442	57	2.7
Walking up 10 steps without resting	484	26	2.8	2,228	21	0.8	443	49	3.1
Stooping, crouching, or kneeling	540	43	3.0	2,464	46	1.6	517	78	1.9
Lifting or carrying something as heavy as 10 pounds	539	33	2.3	2,460	25	1.1	518	43	3.3
Doing chores around the house	539	30	2.6	2,459	22	1.1	517	50	3.3
Preparing one's own meals	540	16	1.5	2,456	10	0.9	518	21	2.5
Walking between rooms on the same floor	540	12	1.9	2,463	9	0.7	518	27	2.2
Standing up from armless chair.	540	19	2.2	2,463	23	0.9	518	49	2.8
Getting in or out of bed	540	15	1.9	2,464	14	1.0	518	33	2.6
Holding a fork, cutting food, or drinking from a glass.	540	7	1.5	2,464	5	0.6	518	7	1.6
Dressing oneself	540	13	1.9	2,464	12	0.7	518	25	2.4
Standing or being on one's feet for about 2 hours	535	37	3.0	2,439	38	1.2	516	67	2.7
Sitting for about 2 hours	539	16	2.1	2,460	19	1.0	518	34	2.3
Reaching up over one's head	540	17	2.0	2,462	15	0.9	518	28	3.4
Using one's fingers to grasp or hold small objects	540	20	2.6	2,463	14	0.7	518	25	2.4
Going out to do things like shopping, movies, or sporting events	539	22	2.4	2,462	18	0.9	517	42	3.1
Participating in social activities	538	18	1.7	2,458	15	0.9	516	34	2.9
Doing things to relax at home or for leisure	539	7	1.5	2,461	5	0.5	518	12	2.0
Crude estimates									
Managing money.	540	17	2.0	2,457	9	0.7	518	12	2.0
Walking for a quarter of a mile	488	29	2.5	2,231	24	1.1	442	50	3.5
Walking up 10 steps without resting	484	27	2.7	2,228	20	0.9	443	43	3.6
Stooping, crouching, or kneeling	540	46	3.2	2,464	45	1.6	517	74	2.6
Lifting or carrying something as heavy as 10 pounds	539	35	2.6	2,460	24	1.0	518	39	3.8
Doing chores around the house	539	32	2.7	2,459	22	1.0	517	44	3.6
Preparing one's own meals	540	18	1.8	2,456	9	0.8	518	18	2.1
Walking between rooms on the same floor	540	13	2.1	2,463	8	0.6	518	22	2.0
Standing up from armless chair.	540	22	2.4	2,463	22	0.8	518	43	3.1
Getting in or out of bed	540	16	1.9	2,464	14	0.9	518	29	2.9
Holding a fork, cutting food, or drinking from a glass.	540	8	1.7	2,464	5	0.6	518	6	1.3
Dressing oneself	540	15	2.0	2,464	11	0.7	518	23	2.1
Standing or being on one's feet for about 2 hours	535	40	3.2	2,439	37	1.2	516	62	3.3
Sitting for about 2 hours	539	16	2.0	2,460	19	1.0	518	34	2.3
Reaching up over one's head	540	18	2.1	2,462	15	1.0	518	26	3.1
Using one's fingers to grasp or hold small objects	540	22	2.8	2,463	14	0.7	518	21	2.0
Going out to do things like shopping, movies, or sporting events.	539	24	2.3	2,462	17	0.9	517	36	3.3
Participating in social activities	538	20	1.7	2,458	14	0.9	516	29	3.1
Doing things to relax at home or for leisure	539	8	1.7	2,461	5	0.5	518	10	1.7

¹Prevalence estimates are age-adjusted using the three age groups shown in Table 2 based on the direct method of adjustment to the total U.S. resident population, 60 years and over, estimated by the U.S. Census Bureau in 2000.

NOTE: BMI was calculated using self-reported heights and weights from the household interview.

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