Abstract

Objectives: To describe the pattern of healthcare providers' advice on lifestyle modification to older adults, and identify correlates of receiving such advice.

Design: cross-sectional survey.

Setting and Participants: Data from the National Health and Nutrition Examination Survey study from 2007-2016 on adults ≥65 years (n=3,758) were analysed.

Methods: We estimated the weighted prevalence and correlates of receiving advice on the following lifestyle modifications: 1) increase physical activity, 2) reduce fat/calories, 3) control/lose weight and 4) a combination of control/lose weight and physical activity. Data were analysed according to level of comorbidity (number of chronic conditions including high blood pressure, high blood cholesterol, type 2 diabetes mellitus, coronary heart disease, and arthritis) and body mass index (BMI).

Results: Physical activity was the most widely prescribed lifestyle modification, reported by 15.7% of older adults free of chronic conditions and 28.9%, 35.4% and 52.6% of older adults with 1, 2 and ≥3 comorbidities. Advice on reducing fat/calories was reported by 9.2%, 18.5%, 26.3% and 40.9% of older adults with 0, 1, 2 and ≥3 comorbidities, respectively, and advice on weight loss/control was reported by 6.5%, 19.1%, 20.8% and 37.5% respectively. The combination of advice on weight loss/control and physical activity was least commonly reported: 5.1%, 13.5%, 16.6% and 32.0% respectively. Overall, lifestyle modifications were more frequently advised to older adults who were overweight, obese, or Hispanic.

Conclusions and implications: In the US, lifestyle modifications are not routinely recommended to older adults, particularly those free of chronic conditions, presenting a missed opportunity for chronic disease prevention and management. Among those advised to lose or manage weight, concurrent advice to increase physical activity is not consistently provided.

Key Words: older adults; NHANES; lifestyle advice; chronic illness

Introduction

Lifestyle factors, such as physical activity and diet, can aid in the prevention of non-communicable disease and extend active life years.[1,2] Around half of all American adults have one or more preventable chronic diseases, but seven of the ten most common diseases (e.g. diabetes type 2, coronary heart disease) can be improved by increasing physical activity,[1] and eating a healthy diet.[3] As such, promoting healthy lifestyles is an important strategy for chronic disease prevention and management.

According to US national physical activity recommendations,[1] older adults (≥65 years) should perform a multicomponent physical activity program. A weekly target of 150 minutes of moderate-intensity aerobic physical activity, 75 minutes of vigorous activity, or a combination of both is recommended. Additionally, muscle strengthening and balance training is suggested. These recommendations also apply to older people with chronic health conditions.[4,5] However, only 17% of older adults in the US meet these recommendations.[6] Barriers to participation in physical activity include a lack of motivation, poor health, and a lack of knowledge relating to the health benefits.[7] Another key lifestyle factor for healthy aging is a balanced diet,[2] with adequate energy and protein intake of particular importance.[8] Moreover, maintaining a balanced diet aids in weight control, and can help to reduce the risk of obesity-associated health conditions.

When considering lifestyle modification, the role of healthcare professionals is to promote and disseminate information on physical activity, nutrition, and maintenance of a healthy weight, to encourage patients, to set achievable goals and to identify barriers.[9,10] In previous research, a small to moderate increase in physical activity has been achieved through healthcare professionals or in the form of patient education.[11,12] [13] An umbrella review of nutritional interventions has shown that nutritional education given by healthcare staff has the potential to improve patients' health outcomes.[14] Moreover, one qualitative study has demonstrated the

importance of lifestyle advice to aid weight control.[15] Despite behavioral counseling interventions having been recommended by various institutions,[10,16] lifestyle advice has not been fully recognized in clinical practice.

Using nationally representative data from the National Health and Nutrition Examination Survey (NHANES) cycles 2007-2008, and 2011-2016, the aims of the present study were: 1) to describe the pattern of healthcare providers' advice to increase physical activity, reduce fat/calories, control/reduce weight, and a combination of control/reduce weight and increase physical activity among older adults, overall and in relation to the presence of highly prevalent chronic conditions (high blood pressure, cholesterol, arthritis, coronary heart disease and type 2 diabetes mellitus (T2DM); and 2) to examine the correlates of receiving lifestyle advice. Such knowledge is crucial for understanding and informing clinical practice and decision making in the medical setting in order to promote successful aging.

Methods

Study Populations

NHANES was designed to provide cross-sectional estimates of the prevalence of health, nutrition, and potential risk factors among the civilian non-institutionalized US population using a nationally representative complex, stratified multistage, probability clustered sample.[17] Data on sociodemographic characteristics, body measurements, medical conditions, and lifestyle characteristics in the four study cycles in 2007-2008 and from 2011-2012 to 2015-2016 were extracted. We excluded participants who were younger than 65 years.

Healthcare providers' advice on lifestyle modifications

Lifestyle advice queried in the NHANES interview were included in our analyses. Participants were asked: "To lower your risk of certain disease, during the past 12 months have you ever

been told by a doctor or health professional to: 1) increase your physical activity or exercise; 2) reduce the amount of fat/calories in your diet; 3) control weight or lose weight. Response options were yes (received lifestyle modification advice) and no (lifestyle modification advice not received). Additionally, we examined whether participants received a combination of advice on 4) control/lose weight and increase physical activity/exercise.

Chronic conditions

Five prevalent chronic conditions were included: high blood pressure, high blood cholesterol level, arthritis, coronary heart disease and T2DM.[18] All chronic conditions were identified through self-reported doctors' diagnoses. Laboratory examination data were additionally used to identify further cases. High blood pressure was determined if the mean of at least 3 blood pressure measurements was 140 mm Hg or higher for systolic, or 90 mm Hg or higher for diastolic.[19] High blood cholesterol was determined if the measured total cholesterol level was 6.2 mmol/L (240 mg/DL) or higher.[20] Arthritis included osteoarthritis or degenerative arthritis, rheumatoid arthritis, psoriatic arthritis and other. Coronary heart disease was defined based on participants' self-reported diagnoses of congestive heart failure, angina, heart attack, or coronary heart disease. Structured interview questions on chest pain were further used to classify angina based on existing Rose angina criteria.[21] Due to the high prevalence of chronic conditions in the elderly population, chronic conditions were categorized to free of chronic conditions, one chronic condition, two chronic conditions (comorbidity), and three or more chronic conditions (multimorbidity).[22]

Weight status

Weight and height were measured during a physical examination following standard procedures. Body mass index (BMI) was calculated as weight in kg/(height in meters)^2 and categorized into underweight (<18.5 kg/m^2), normal weight (18.5-<25.0 kg/m^2), overweight

(25.0-<30.0 kg/m^2), and obesity (≥30 kg/m^2) based on the standard classification.[23] For analytic purposes, we excluded those who were underweight due to potential underlying health conditions.

Covariates

Self-reported socio-demographic characteristics included age, gender, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian, and others), annual household income (<$25,000, $25,000-<$75,000, and ≥$75,000), health insurance status (non-Medicare beneficiary and Medicare beneficiary) and education (less than high school, high school, and above high school). Lifestyle characteristics included leisure-time physical activity and smoking status. Participants reported the number of days and minutes spent in moderate recreational and vigorous recreational activities in a typical week. We summarized the total number of minutes for both activities and classified participants as inactive (zero moderate-to-vigorous physical activity), and active (any moderate-to-vigorous physical activity). Smoking status was classified into: never smokers (did not smoke 100 cigarettes in life and do not smoke now), former smokers (smoked 100 cigarettes in life and do not smoke now), and current smokers (smoked 100 cigarettes in life and smoke now). Living with physical function limitation was defined as difficulty walking for a quarter of a mile or walking up ten steps.[24]

Analysis

Survey analysis procedures were used to account for the sample weights, stratification and clustering of the complex sampling design to ensure nationally representative estimates.[25] The unweighted sample size was calculated in relation to chronic conditions and participants' characteristics. Due to the small sample size of "other" racial/ethnical group, those participants were excluded in further analyses to avoid biased estimations due to insufficient power to detect relevant effect sizes. To estimate the prevalence of lifestyle modification advices, we calculated

the weighted proportion and 95% CI of participants who reported receiving lifestyle advice (increase physical activity/exercise, reduced fat/calories, control/lose weight, and control/lose weight + increase physical activity/exercise) overall, by number of chronic conditions, and by BMI category.

We used multivariable adjusted logistic regression models to identify correlates of receiving each of the four forms of lifestyle advice. Multivariable adjustments included number of chronic conditions, age (continuous), gender, BMI category, race/ethnicity, household income, health insurance status, education level, leisure-time physical activity, smoking status and physical function limitation. As the prevalence of advice on increasing physical activity has increased from 2007-2008 to 2011-2016, we also adjusted for study cycle. All statistical analyses were performed using STATA version 14.0 (STATA Corp., College Station. Texas. USA). All statistical significance was set at $P<0.05$. P values were not adjusted for multiple tests and should be interpreted as exploratory analyses.

Results

Data on 3,758 older adults were analysed. Table 1 shows the unweighted sample size overall, and by BMI, race/ethnicity, health insurance status, physical activity, smoking status, and physical function limitations according to number of chronic conditions. A total of 247 (weighted proportion: 5.3%) older adults were free of chronic conditions; 936 (weighted proportion: 21.4%) older adults had one chronic condition, 1368 (weighted proportion: 31.6%) had two and 1207 (weighted proportion: 41.7%) had three or more chronic conditions, respectively.

Prevalence of advice on lifestyle modifications given by healthcare providers

The prevalence of lifestyle modifications advised by healthcare providers are summarized in Table 2, presented as weighted proportions and 95% CIs in the overall population, and by

chronic conditions and BMI category. The most commonly reported lifestyle advice was to increase physical activity (41.4%, 39.5-43.3), followed by to reduce fat/calories (32.1%, 29.8-34.5), control/lose weight (28.7%, 26.7-30.8), and a combination of control/lose weight and increase physical activity (23.3%, 21.4-25.4). The prevalence of each form of lifestyle modification advice showed a graded association with BMI in the overall population (all P for trend <.001).

Patterns of lifestyle modification advice according to chronic conditions were similar to those in the overall population. Among older adults free of chronic conditions, reports of having received lifestyle modification advice were comparatively lower (increase physical activity: 15.7%, 9.6-24.6; reduce fat/calories: 9.2%, 4.6-17.5; control/lose weight: 6.5%, 2.6-15.3; and control/lose weight and increase physical activity: 5.1%, 1.6-14.9), and the likelihood of physical activity advice did not increase linearly with BMI, with no difference between those with a normal weight BMI (13.1%) and those with an overweight BMI (13.2%) (p for trend=0.197).

Among older adults living with chronic conditions, advice to increase physical activity was reported by 28.9% (25.0-33.1), 35.4% (31.9-39.0), and 52.6% (48.8-56.3) of those with one, two (comorbidity) and three or more (multimorbidity) chronic conditions, respectively. A similar pattern was observed for advice to reduce fat/calories and control/lose weight. Importantly, across all chronic conditions, not all older adults who were advised to control/lose weight received concurrent advice to increase physical activity (free of chronic conditions: 6.5%, 2.6-15.3 vs. 5.1%,1.6-14.9; one chronic condition: 19.1%, 16.1-22.6 vs. 13.5, 11.0-16.5; comorbidity: 20.8%, 18.1-23.9 vs. 16.6%, 13.9-19.7; multimorbidity: 37.5%, 33.7-41.4 vs. 32.0%, 28.7-35.5).

Correlates of receiving advice on lifestyle modifications

Multivariable-adjusted logistic regression analyses showed that older adults with multimorbidity were more likely to receive advice to increase physical activity (OR=5.8, 95% CI: 3.2-10.5), reduce fat/calories (OR=8.3, 95% CI: 3.7-18.6), control/lose weight (OR=8.0, 95% CI: 3.2-20.5), and a combination of weight control/loss with physical activity (OR=7.4, 95% CI: 2.3-23.4), compared with those who were free of chronic conditions (table 3). BMI was another influencing factor; older adults with a BMI ≥30 kg/m^2 had 17.0 (95% CI: 10.3-28.1) higher odds of receiving advice to control/lose weight and 12.0 (95% CI: 7.0-20.4) higher odds of receiving advice to control/lose weight with concurrent advice to increase physical activity. Additionally, odds of receiving lifestyle modification advice were consistently higher among Hispanic comparing with Non-Hispanic whites (for ORs and 95% CIs of all forms of lifestyle modification advice see table 3).

Prevalence of lifestyle modifications by chronic conditions

Among analysed common chronic conditions, the most prevalent were high blood pressure (70.3%), high blood cholesterol (61.2%) and arthritis (53.3%), with relatively lower prevalence in coronary heart disease (22.4%) and T2DM (18.7%) (Supplemental table). However, advice to increase physical activity was reported by the majority of older adults with T2DM (60.5%, 56.0-64.8), compared with less than half of those with high blood pressure (45.1%, 42.6-47.7). Across all chronic conditions, the prevalence of advice on lifestyle modification increased with BMI category (all P for trend <.001). In addition, advice on weight control/loss with concurrent advice to increase physical activity was reported by 44.0% (39.5-48.7) older adults with T2DM and 26.0% (23.6-28.5) of those with high blood pressure, lower than the advice on weight control/loss (T2DM: 51.3%, 44.6-56.0; high blood pressure: 31.8%, 29.4-34.3) (Supplemental table).

Discussion

In a large, representative sample of older adults in the US, increasing physical activity was the most widely prescribed lifestyle modification. However, while the prevalence of receiving advice on increasing physical activity was high among those with multimorbidity, substantially fewer older adults free of chronic conditions reported receiving such advice. Lifestyle modification advice was also more commonly reported by those with overweight or obesity, and Hispanics. Importantly, when older adults were advised to control/lose weight, concurrent advice to increase physical activity was not consistently given.

In light of the fact that life expectancy at birth in the US has declined for the past three years in a row[26] and more than 80% of chronic diseases are preventable through healthy lifestyle,[1] the importance of lifestyle modification is increasing. When comparing the prevalence of advice on lifestyle modification with previous surveys of US primary care physicians, there seems to be a discrepancy between our (patient-reported) results and physician-reported data. In previous studies, 30% of primary care physicians reported giving physical activity guidance "always" and 56% "often" to patients without chronic disease, and 49% and 45% to patients with chronic disease.[27] Looking at different countries, in Canada, 70% of primary health physicians reported carrying out verbal counselling, and 16% reported using written prescriptions.[28] In Denmark 95.5% reported giving physical activity advice at least weekly.[29] Common barriers to giving advice on physical activity to patients reported by healthcare providers were lack of time, knowledge, materials, system support, resources, incentives/reimbursement, and the fact that patients often ignore given advice.[10]

Our results showed that lifestyle advice, irrespective of whether it concerned physical activity or diet, was given more frequently to those with multimorbidity and/or high BMI. This disparity by chronic condition is in line with an analysis of younger adults (20-64 years) within the same data set.[30] In that analysis, 74.6% (69.8-78.8) of T2DM adults received advice to increase physical activity, while only 20.1% (18.4-21.9) of chronic disease-free adults received such

advice.[30] In support, another study underlines the fact that individuals at risk of chronic disease were more likely to receive lifestyle advice.[10] Considering the rising prevalence of chronic conditions is a consequence of inadequate health behaviors, there is a clear need for lifestyle modifications even among people free of chronic conditions.[2] Particularly in the aging population, preventive measures are in demand to prevent the decline in muscle mass,[31] muscle strength,[32] and frailty,[33] and to ensure the affordability of health care systems.[34]

Our results also indicated a high prevalence of receipt of advice to control/lose weight. Again, advice was more commonly provided to those with a higher BMI, although in the available literature BMI has been largely criticized as a health indicator.[35,36,37] Moreover, the obesity paradox phenomenon suggests that overweight and mild obesity may be related to the lowest all-cause mortality rate in older adults and specifically those with chronic conditions.[38,39] There is also limited evidence of the benefits of weight loss, as approximately one-quarter of all weight lost, when one embarks on a weight loss program, is lean body mass.[40] This loss of muscle mass may contribute to the development of sarcopenia,[41,42] and sarcopenia predicts all-cause mortality.[43] Tucker and colleagues[44] reported that maintaining muscle mass is one of the most important preventative interventions in maintaining health in older adults. As research evidence has shown that weight loss in combination with improved fitness could improve physical function and multiple health indicators,[45] weight management should always be done in consideration with functional status and comorbidities.[38] Therefore, a combination of both, is recommended.[42 46 47] However, in our population, 9.8% (7.9-12.2) of older adults with a BMI $\geq$30 km/m^2 received advice to control/lose weight alone, with no information on increasing physical activity. Consequently, our data revealed a critical gap in the current practice of lifestyle modification.

A strength of this study is the use of a nationally representative data set. One limitation is the cross-sectional design, and thus causal relationships could not be addressed. Moreover, the

cognitive test was only available in cycles 2011-2012 and 2013-2014. Therefore, people with dementia might also be included in the sample, which might bias the results. Finally, the generalization to older adults in other countries is limited due to differences in healthcare systems and cultural and social aspects influencing lifestyle and aging. Therefore, comparable investigations should also be initiated in other countries.

Conclusions and Implications

The present study has shown that advice on lifestyle modification is mainly given to older adults with multimorbidity and those who are overweight/obese, missing an opportunity to disseminate primary prevention strategies among apparent healthy older adults through lifestyle changes. Given the global demographic trends, such primary prevention strategies will be necessary to sustain social and health care systems. Future studies should test intervention feasibility of health care provider lifestyle behavior counseling in older adults free of chronic conditions.

Conflict of interest: none

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Table 1. Sample Size for Chronic Condition Status in US older adults (65+ years) in NHANES 2007-2008, 2011-2016

	Free of chronic conditions[a]		One chronic condition		Comorbidity (2 chronic conditions)		Multimobidity (≥3 chronic conditions)	
	unweighted n	weighted %	unweighted n	weighted %	unweighted n	weighted %	unweighted n	weighted %
Overall	247		936		1368		1207	
Gender								
Men	153	54.0	507	46.1	653	42.7	586	45.9
Women	94	46.0	429	53.9	715	57.3	621	54.1
BMI kg/m^2								
<25	118	51.2	317	35.6	392	28.7	266	21.7
25-<30	87	31.4	354	37.9	538	42.8	446	36.8
≥30	37	17.4	246	26.5	411	28.5	470	41.5
Race/ethnicity								
Non-Hispanic white	126	78.9	496	79.6	714	79.5	647	79.2
Non-Hispanic black	34	5.6	158	6.8	265	8.1	238	8.2
Hispanic	62	8.7	190	7.2	261	6.6	236	7.1
Other	25	6.8	92	6.4	128	5.9	86	5.4
Health insurance status								
Non-medicare beneficiary	45	16.6	209	17.6	245	14.8	201	12.9
Medicare beneficiary	202	83.4	724	82.4	1121	85.2	1001	87.1
Physical activity								
Inactive	151	55.9	564	53.5	816	51.7	768	58.5
Active	96	44.1	372	46.5	552	48.3	439	41.5
Smoking status								
Never	144	63.2	479	52.5	675	50.7	609	48.4
Former	70	25.4	364	39.0	567	42.5	508	45.1
Current	33	11.4	90	8.5	125	6.9	89	6.5
Physical function limitation								
No	217	90.4	763	84.3	1079	81.7	828	72.5
Yes	30	9.6	173	15.7	289	18.3	379	27.5

[a] Free of high blood pressure, high blood cholesterol, arthritis, type 2 diabetes, coronary heart disease

Table 2. Weighted Prevalence (%) of Lifestyle Prescription according to Weight status and Chronic Condition Status among US older adults (65+ years) in NHANES[ab]

NUMBER OF CHRONIC CONDITIONS	Increase physical activity		Reduce fat/calories		Control/lose weight		Control/lose weight+physical activity	
Overall	41.4	(39.5 to 43.3)	32.1	(29.8 to 34.5)	28.7	(26.7 to 30.8)	23.3	(21.4 to 25.4)
BMI <25 kg/m^2	25.3	(22.7 to 28.1)	16.7	(13.9 to 20.0)	5.7	(3.8 to 8.6)	5.0	(3.1 to 7.9)
BMI 25-<30 kg/m^2	35.9	(32.4 to 39.6)	25.3	(22.0 to 28.8)	19.8	(17.5 to 22.4)	15.5	(13.5 to 17.9)
BMI ≥30 kg/m^2	61.0	(57.2 to 64.8)	52.0	(48.1 to 56.0)	57.4	(53.5 to 61.2)	47.6	(43.4 to 51.8)
P for trend		<.001		<.001		<.001		<.001
Free of chronic conditions[c]	15.7	(9.6 to 24.6)	9.2	(4.6 to 17.5)	6.5	(2.6 to 15.3)	5.1	(1.6 to 14.9)
BMI <25 kg/m^2	13.1	(6.0 to 26.3)	2.4	(1.0 to 5.9)	2.6	(0.4 to 15.2)	2.6	(0.4 to 15.2)
BMI 25-<30 kg/m^2	13.2	(5.1 to 30.2)	7.4	(3.2 to 16.5)	3.2	(1.1 to 8.9)	3.2	(1.1 to 8.9)
BMI ≥30 kg/m^2	28.5	(10.4 to 57.8)	32.5	(11.9 to 63.2)	24.2	(7.1 to 57.2)	16.1	(2.5 to 58.7)
P for trend		0.197		0.002		0.015		0.062
One chronic condition	28.9	(25.0 to 33.1)	18.5	(15.2 to 22.4)	19.1	(16.1 to 22.6)	13.5	(11.0 to 16.5)
BMI <25 kg/m^2	20.3	(14.9 to 26.9)	10.5	(6.8 to 15.8)	5.7	(2.9 to 10.8)	4.3	(2.0 to 9.2)
BMI 25-<30 kg/m^2	27.6	(19.9 to 37.0)	13.4	(9.3 to 18.9)	15.0	(11.2 to 19.8)	12.3	(8.5 to 17.4)
BMI ≥30 kg/m^2	42.7	(34.8 to 51.0)	37.3	(28.9 to 46.5)	44.0	(35.9 to 52.3)	28.1	(21.1 to 36.3)
P for trend		<.001		<.001		<.001		<.001
Comorbidity[d]	35.4	(31.9 to 39.0)	26.3	(23.1 to 29.8)	20.8	(18.1 to 23.9)	16.6	(13.9 to 19.7)
BMI <25 kg/m^2	24.3	(19.1 to 30.5)	15.8	(11.5 to 21.4)	5.1	(2.3 to 10.7)	4.5	(1.9 to 10.4)
BMI 25-<30 kg/m^2	33.1	(26.9 to 40.0)	21.3	(16.5 to 27.2)	15.9	(12.0 to 20.8)	12.1	(8.5 to 17.1)
BMI ≥30 kg/m^2	50.9	(45.1 to 56.6)	43.9	(37.9 to 50.0)	44.2	(37.9 to 50.7)	36.3	(30.1 to 43.0)
P for trend		<.001		<.001		<.001		<.001
Multimorbidity[e]	52.6	(48.8 to 56.3)	40.9	(37.2 to 44.7)	37.5	(33.7 to 41.4)	32.0	(28.7 to 35.5)
BMI <25 kg/m^2	35.3	(28.2 to 43.1)	28.2	(21.4 to 36.2)	7.2	(4.0 to 12.4)	6.5	(3.5 to 11.8)
BMI 25-<30 kg/m^2	43.4	(38.5 to 48.5)	32.1	(27.5 to 37.1)	23.4	(19.0 to 28.5)	18.5	(15.0 to 22.5)
BMI ≥30 kg/m^2	70.4	(64.7 to 75.6)	56.2	(49.3 to 62.9)	66.4	(60.8 to 71.4)	58.0	(52.1 to 63.7)
P for trend		<.001		<.001		<.001		<.001

[a] All estimates were weighted to be nationally representative.

[b] P values for trend were calculated using logistic regressions modelling BMI as a continuous variable.

[c] Free of high blood pressure, high blood cholesterol, arthritis, type 2 diabetes, coronary heart disease

[d] 2 chronic conditions; [e] ≥3 chronic conditions

Table 3. Weighted Multivariable Adjusted Logistic Regression Models (OR, 95% CI) of US older adults (65+ Years) Receiving Healthcare Providers' Advice on Lifestyle Modification, NHANES

	Increase physical activity	Reduce fat/calories	Control/lose weight	Control/lose weight+physical activity
Number of chronic conditions				
Free of chronic conditions[b]	Reference	Reference	Reference	Reference
One chronic condition	2.1 (1.2 to 3.9)	2.3 (1.0 to 5.4)	3.1 (1.3 to 7.4)	2.5 (0.8 to 8.0)
Comorbidity[c]	3.1 (1.7 to 5.6)	3.6 (1.6 to 8.0)	3.2 (1.2 to 8.2)	3.1 (0.9 to 10.1)
Multimorbidity[d]	5.8 (3.2 to 10.5)	8.3 (3.7 to 18.6)	8.0 (3.2 to 20.5)	7.4 (2.3 to 23.4)
Age	1.0 (0.9 to 1.0)	0.9 (0.9 to 1.0)	0.9 (0.9 to 0.9)	0.9 (0.9 to 0.9)
Gender				
Men	Reference	Reference	Reference	Reference
Women	1.0 (0.9 to 1.2)	1.1 (0.9 to 1.3)	0.8 (0.7 to 0.9)	0.9 (0.7 to 1.0)
BMI kg/m^2				
<25	Reference	Reference	Reference	Reference
25-<30	1.5 (1.2 to 1.9)	1.5 (1.1 to 2.0)	3.2 (1.9 to 5.4)	2.8 (1.6 to 4.8)
≥30	3.3 (2.5 to 4.3)	4.1 (3.2 to 5.3)	17.0 (10.3 to 28.1)	12.0 (7.0 to 20.4)
Race/ethnicity				
Non-Hispanic white	Reference	Reference	Reference	Reference
Non-Hispanic black	1.4 (1.2 to 1.7)	1.6 (1.2 to 2.0)	1.1 (0.9 to 1.5)	1.2 (0.9 to 1.5)
Hispanic	1.6 (1.2 to 2.1)	2.1 (1.5 to 2.9)	1.4 (1.0 to 1.9)	1.4 (1.0 to 2.0)
Other	1.1 (0.7 to 1.6)	1.3 (0.9 to 1.9)	1.2 (0.7 to 2.2)	1.3 (0.7 to 2.4)
Annual household income $				
<25,000	Reference	Reference	Reference	Reference
25,000-<75,000	1.4 (1.1 to 1.7)	1.4 (1.1 to 1.8)	1.2 (1.0 to 1.5)	1.3 (1.0 to 1.7)
≥75,000	1.2 (0.9 to 1.6)	1.2 (0.8 to 1.7)	1.3 (0.9 to 1.8)	1.2 (0.8 to 1.7)
Health insurance status				
Non-medicare beneficiary	Reference	Reference	Reference	Reference
Medicare beneficiary	0.9 (0.7 to 1.2)	0.8 (0.6 to 1.0)	1.0 (0.7 to 1.4)	0.9 (0.7 to 0.9
Leisure-time physical activity				
Inactive	Reference	Reference	Reference	Reference
Active	0.8 (0.6 to 1.0)	1.1 (0.9 to 1.3)	1.3 (1.1 to 1.7)	1.1 (0.9 to 0.8
Education				
<High school	Reference	Reference	Reference	Reference
High school	1.3 (1.0 to 1.6)	0.7 (0.6 to 1.0)	0.9 (0.7 to 1.1)	0.9 (0.7 to 1.3
>High school	1.2 (0.9 to 1.5)	0.8 (0.7 to 1.0)	0.8 (0.6 to 1.1)	0.9 (0.7 to 1.2
Smoking status				
Never	Reference	Reference	Reference	Reference
Former	1.1 (0.9 to 1.3)	1.1 (0.8 to 1.4)	1.1 (0.8 to 1.4)	1.2 (0.9 to 1.5)

Current	0.7	(0.5 to 1.0)	0.8	(0.5 to 1.3)	0.6	(0.4 to 1.0)	0.6	(0.3 to 1.1)
Physical function limitation								
No	Reference		Reference		Reference		Reference	
Yes	1.2	(0.9 to 1.5)	0.9	(0.7 to 1.1)	0.9	(0.7 to 1.1)	0.9	(0.7 to 1.2)
Study cycle								
2007-2008	Reference		Reference		Reference		Reference	
2011-2012	1.0	(0.8 to 1.3)	0.8	(0.6 to 1.0)	0.9	(0.7 to 1.2)	0.9	(0.7 to 1.3)
2013-2014	1.3	(1.0 to 1.6)	0.8	(0.6 to 1.1)	1.0	(0.7 to 1.3)	1.1	(0.8 to 1.4)
2015-2016	1.5	(1.1 to 1.9)	0.8	(0.6 to 1.1)	1.0	(0.7 to 1.4)	1.1	(0.8 to 1.5)

[a] All odds ratio estimates were weighted to be nationally representative.

[b] Free of high blood pressure, high blood cholesterol, arthritis, type 2 diabetes, coronary heart disease

[c] two chronic conditions

[d] ≥three chronic conditions