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Physical activity and health-related quality of life: US adults with and without limitations

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Abstract

Purpose—The purpose of this study was to examine the dose–response relationship between physical activity (PA) and health-related quality of life (HRQOL) among adults with and without limitations.

Methods—We dichotomized HRQOL as ≥14 unhealthy (physical or mental) days (past 30 days), or<14 unhealthy days. By using a moderate-intensity minute equivalent, PA categories were as follows: inactive, 10–60, 61–149, 150–300, and >300 min/week. Persons with limitations reported having problems that limited their activities or required use of special equipment. Age-adjusted prevalence estimates and logistic regression analyses were performed with 2009 Behavioral Risk Factor Surveillance System data (n = 357,665), controlling for demographics, BMI, smoking, and heavy alcohol use.

Results—For adults without limitations, the odds of ≥14 unhealthy days were lower among adults obtaining any PA (10–60 min/week, AOR = 0.79, 95 % CI 0.70, 0.88), compared with those inactive. A quadratic trend (P < 0.001) indicated enhanced HRQOL with each PA level, but improvements were less marked between lower and upper sufficient PA categories (150–300 and >300 min/week). Because of a significant age interaction, persons with limitations were stratified by age (18–34, 35–64, and 65+ years). Findings for persons aged 35 years or older with limitations were similar to those without limitations. Lower odds of poor HRQOL for persons aged 18–34

years with limitations were associated with recommended levels of PA (150–300 min/week; AOR = 0.61, 95 % CI 0.43, 0.88 and >300 min/week; AOR = 0.58, 95 % CI 0.43, 0.80).

Conclusions—PA is positively associated with HRQOL among persons with and without limitations.

Keywords

Exercise; Well-being; Unhealthy days; Disability status

Introduction

Health-related quality of life (HRQOL) is a multidimensional construct, and measures of HRQOL typically assess aspects of physical and mental health, social functioning, and self-perceptions of health [1]. HRQOL has been found to be related to chronic diseases and related risk factors [2] and is considered to be a valid indicator of a need for services, or as an intervention outcome [1]. Persons with chronic diseases or disabilities tend to report more unhealthy, physical or mental, days (in the past 30 days) than persons without chronic diseases or disabilities (http://www.cdc.gov/hrqol/key_findings.htm).

Research shows a positive relationship between physical activity and HRQOL [3]. Both cross-sectional [4–10] and prospective [9–11] studies have found that persons who report obtaining recommended amounts of physical activity have better HRQOL compared with those not active at recommended levels [4–9, 11]. However, few studies examine this relationship by whether persons had physical and mental limitations.

One cross-sectional study reported findings for adults by limitations and found that those who were physically active at recommended levels had 0.47 lower odds of poor HRQOL [defined as 14 or more unhealthy days (physical or mental) during the past 30 days] than persons with limitations who were inactive [4]. The finding was reported as part of a secondary analysis of the study with few additional details provided. An evaluation of HRQOL among adults aged 50 years or older with and without limitations found an association between HRQOL and a single-item measure of physical activity for both groups. The item asked, during the past month, other than your regular job, did you participate in any physical activities or exercises, such as running, calisthenics, golf, gardening, or walking for exercise? [12]. The definition of physical activity did not take into account public health recommended amounts of physical activity or dose–response relationships. Other studies evaluating physical activity and HRQOL did not stratify by, or control for, persons with limitations, but most adjusted for chronic diseases, such as cardiovascular disease, diabetes, cancers, or arthritis, [6, 7, 9, 11] or excluded persons with select chronic diseases [8, 10] or who reported difficulty walking 100 m [9].

Cross-sectional dose–response studies also confirm a positive association between physical activity and HRQOL; although in prospective analyses, these relationships were attenuated in one study [9] and manifested differently in a second study (i.e., “cross-sectional associations were mainly found for physical components of HRQOL….longitudinal associations were predominantly observed for mental components of HRQOL”) [10]. The

dose–response relationship between aerobic physical activity and HRQOL among persons with activity limitations has not been a primary focus of studies. The primary purpose of this research was to examine the dose–response relationship between aerobic physical activity and perceived HRQOL by limitation status using a large national population survey.

Methods

Data source

The Behavioral Risk Factor Surveillance System (BRFSS) is an annual, state-based, random-digit-dialed telephone survey of noninstitutionalized US civilian adults aged 18 years or older. The BRFSS is administered throughout the year by trained interviewers in all 50 states, the District of Columbia, Puerto Rico, the US Virgin Islands, and Guam using methodology specified by the Centers for Disease Control and Prevention. The median state–response rate in 2009 was 52.5 %, based on Council of American Survey and Research Organizations (CASRO) guidelines. Further information about survey methods, including design and sampling, is available on the BRFSS Web site (http://www.cdc.gov/BRFSS). This study is a secondary analysis of the BRFSS public use dataset and has been determined to be exempt research. Verbal consent from respondents was documented before conducting the telephone-administered BRFSS survey, and respondents are not identifiable.

Analytic sample

In 2009, 432,607 adults participated in the BRFSS survey. Of those, 74,942 respondents were excluded for missing data pertaining to physical activity (n = 37,657), HRQOL (n = 10,758), limitation status (n = 1,259), or other covariates (n = 25,268). Our analytic sample included data from 357,665 participants who had complete information on all variables of interest.

Measures

Aerobic physical activity—Six BRFSS questions assessed respondent participation in moderate- and vigorous-intensity, nonoccupational, aerobic physical activity in a usual week. To assess moderate-intensity physical activity participation, respondents were asked, “Now, thinking about the moderate activities you do when you are not working, in a usual week, do you do moderate activities for at least 10 min at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?” Respondents answering *yes* to this question were then asked about their frequency of participation and duration of time spent engaged in moderate-intensity physical activity. Similar questions were asked for vigorous-intensity physical activity, with the participation question being, “Now, thinking about the vigorous activities you do when you are not working, in a usual week, do you do vigorous activities for at least 10 min at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?” Frequency and duration of vigorous-intensity physical activity were assessed. The reliability and validity of the BRFSS physical activity questions have been previously reported, and findings suggest that this instrument can classify adults into the recommended levels of physical activity as defined by the *Healthy People 2010* standards [13].

To determine each respondent's physical activity level, we followed the recommendation in the *2008 Physical Activity Guidelines for Americans (*shortened hereafter to *2008 Guidelines)* [14]. The *2008 Guidelines* [14] recommend that adults obtain ≥150 min a week of moderate-intensity aerobic physical activity, ≥75 min a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity activity to gain substantial health benefits. Moreover, the *2008 Guidelines* report that greater health benefits can be gained for some health outcomes by obtaining more than 300 min (5 h) a week of moderate-intensity, or 150 min a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity activity [14]. At the other end of the continuum, the *2008 Guidelines* emphasize that everyone should avoid inactivity and that some health benefits may be achieved with as little as 60 min (1 h) of moderate-intensity physical activity a week [14]. The *2008 Guidelines* also indicate that aerobic activity should be done in sessions 10 min or longer.

We calculated each respondent's weekly minutes of moderate- and vigorous-intensity physical activity by using the frequency and duration questions asked of those who reported participating in aerobic physical activity that was at least 10 min in duration at a time. Then, we derived moderate-intensity equivalent minutes by multiplying weekly minutes of vigorous-intensity aerobic physical activity by two and then adding the weekly moderate-intensity physical activity minutes. This method has been used in other recent publications that report physical activity prevalence among the US adult population [15–17]. Respondents were then divided into five physical activity categories based on their minutes of moderate-intensity equivalent aerobic activity: inactive, defined as doing no weekly physical activity bout of at least 10 min in duration, two categories of insufficient activity (10–60 and 61–149 min/week), and two categories of sufficient activity (150–300 and >300 min/week). These categories were used to evaluate the dose–response relationship between physical activity and HRQOL based on cut points generated from the *2008 Guidelines* (e.g., as noted above, some health benefits may be achieved with as little as 60 min of moderate-intensity physical activity a week).

Health-related quality of life—Two questions from the BRFSS were used to assess our outcome variable HRQOL: (1) "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" and (2) "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" The construct and criterion validity of these questions are described elsewhere [2].

HRQOL cut points can be defined by researchers on the basis of their data distribution or other scientific rationale (see http://www.cdc.gov/hrqol/faqs.htm#11). We dichotomized HRQOL as ≥14 unhealthy days or <14 unhealthy days (based on unhealthy physical or mental days combined) reported during the past 30 days. Fourteen or more unhealthy days represent a standard summary measure used by previous researchers and allow for comparing findings from different studies [4–6]. Fourteen unhealthy days have been found to be a meaningful cut point for those reporting substantially impaired or poor HRQOL and

correspond to the upper 10–15 % of the distribution for each of the quality of life questions [4].

Limitation status—Two BRFSS questions assessed limitation status: (1) “Are you limited in any way in any activities because of physical, mental, or emotional problems?” and (2) “Do you now have any health problem that requires you to use special equipment, such as a cane, a wheelchair, a special bed, or a special telephone?” A *yes* response to either of these questions classified the respondent as having limitations. Respondents answering *no* to both questions were classified as having no limitations. Although we refer to these items as measures of limitation status, they are also referred to as measures of activity limitations, [4] functional limitations, [12], and disability [18] in the literature. It can be argued that the terms “disability status” best characterize what these items measure, because some respondents may identify that they use special equipment in question 2, but do not identify being limited in anyway in responding to question 1.

Covariates

We included the following covariates: sex, age, race/ethnicity (white, non-Hispanic; black, non-Hispanic; Hispanic; and other, non-Hispanic), education level (less than high school, high school graduate, some college, and college graduate), marital status (single/never married, married/member of unmarried couple, and separated/divorced/widowed), smoking status (current smoker, former smoker, and never smoked), heavy drinking (yes or no, defined as having more than two drinks per day for men and more than one drink per day for women), and body mass index (BMI) category. We calculated body mass index (BMI = kg/m^2) from self-reported height and weight. By using the classification categories recommended by the National Institutes of Health [19], respondents with a BMI <25.0 kg/m^2 were classified as underweight/normal weight, a BMI between 25.0 and 29.9 kg/m^2 as overweight, and those with a BMI ≥30 kg/m^2 were considered obese.

Analysis

By using an adjusted Wald *F* test, we first assessed potential interaction effects between our main exposure variable—aerobic physical activity—and several variables related to HRQOL (i.e., sex, limitation status, and age group, in that order). Weighted prevalence estimates were calculated. To assess the association between aerobic physical activity and HRQOL, we used logistic regression analyses to determine multivariable-adjusted odds ratios (AORs) and 95 % confidence intervals (CIs), controlling for covariates. Linear and quadratic trends were tested by using polynomial contrasts. We used SUDAAN 10.0 [20] to account for the complex survey design of BRFSS. Statistical inferences were based on a significance level of P (two-sided) ≤ 0.05.

Results

The sample population was predominately white, non-Hispanic, had at least some college education, and was married (Table 1). Approximately 20.2 % (95 % CI 20.0, 20.5) of US adults report limitations in their functioning (data not shown in tables). Among adults with limitations, nearly one-quarter reported that they do not engage in aerobic physical activity

during a usual week, and among adults without limitations, about 9 % reported being inactive. The prevalence of 14 or more unhealthy days (poor HRQOL) during the past month among adults with and without limitations was 48 and 11 %, respectively.

The association between physical activity and HRQOL was not significantly modified by sex ($P = 0.20$); however, we did detect a significant interaction between physical activity and limitation status ($P < 0.001$). In addition, among adults without limitations, age group did not significantly modify the association between physical activity and HRQOL ($P = 0.52$); however, among adults with limitations, the interaction was significant ($P < 0.001$). On the basis of these results, we stratified our analysis by limitation status, and for adults with limitations, we further stratified by age group (18–34, 35–64, ≥65) and adjusted for continuous age.

Among adults without limitations, prevalence of poor HRQOL (≥14 unhealthy days) was highest among inactive persons and lowest among those sufficiently active (150–300 or 301+ min/week of moderate-intensity equivalent physical activity) (Table 2). Adults with any activity, including those who met the aerobic physical activity guideline (150–300 and 301+ min/week), had significantly decreased odds of poor HRQOL than inactive adults. A significant linear and quadratic trend ($P < 0.001$) was found for the dose–response relationship among the different categories of physical activity. This demonstrates nonlinear variation and an overall decrease in AORs of poor HRQOL with increasing physical activity. Findings were similar for models with and without an adjustment for a five-level age group variable.

For adults with limitations, all age groups showed decreased prevalence of poor HRQOL as physical activity level increases (Table 3). Overall, among adults with limitations, the prevalence of poor HRQOL was higher than that observed among adults without limitations. However, a similar pattern that was observed in adults without limitations emerges in the relationship between aerobic physical activity and poor HRQOL, although the association of physical activity and poor HRQOL was modified by age group. Among the youngest group, only those who engaged in at least 150 min/week were significantly less likely to report poor HRQOL compared with inactive adults. Among those aged 35–64 and 65 years or older, any amount of physical activity versus inactivity resulted in significantly lowered odds of poor HRQOL. For all age groups, as physical activity level increased from a minimal dose of activity (10–60 min/week), the magnitude of the association increased. However, the overall difference is less pronounced among those aged 65 years or older. Significant linear and quadratic trends for the relationship between physical activity level and HRQOL were noted among the 35–64 and 65 years or older age groups ($P < 0.001$ for both age groups), whereas only the linear trend was significant among the 18–34 years age group. Although direct comparisons cannot be made between persons with and without limitations, the magnitude of the associations between physical activity and HRQOL seems greater for adults with disabilities, especially those aged 35–64 and 65 years and older.

Discussion

This study builds and expands on existing knowledge about the relationship between physical activity and HRQOL. Overall, physical activity is associated with better HRQOL (defined as a lower odds of ≥14 unhealthy days during the previous 30 days) among persons with and without limitations. With the exception of younger persons with limitations, our findings support the statement that some physical activity is better than none for HRQOL benefits.

For persons reporting limitations, this association was modified by age group. We found that among all age groups, there is a positive dose–response relationship between physical activity and prevalence of ≥14 unhealthy days, but for persons aged 18–34 years, only those who obtained recommended amounts of physical activity had significantly lower odds of having 14 or more unhealthy days. Although findings for the younger age group were in the positive direction, findings were not significant for those obtaining 10–60 or 61–149 min. This finding could simply be caused by the smaller sample sizes in this age group, or there may be another reason.

It is possible that the types or causes of limitations among younger persons (perhaps congenital or developmental) are different from those of older persons (perhaps more chronic disease-related, or a combination of developmental and chronic disease-related limitations). Thus, limitations may manifest differently for physical activity or HRQOL in younger and older adults with limitations, and a higher amount of physical activity may be needed to enhance HRQOL in young adults. We are unable to evaluate this possibility because we do not know the type or cause of reported limitations.

We recognize that chronic conditions may be a confounder to the association between physical activity and HRQOL, if adults are less active because of a condition and also have lower HRQOL due to the condition, or physical activity's influence on chronic conditions can represent one pathway by which physical activity is associated with HRQOL. To address one chronic condition, we controlled all our models for BMI category, which is probably overly conservative, if BMI category is part of the causal pathway (i.e., physical activity is related to HRQOL through its influence on overweight and obesity). We also conducted sensitivity analyses to see whether adding indicators for three major health conditions, (ever told by a doctor, nurse or health professional you had a…) heart attack, stroke, and diabetes, would significantly influence our findings. We added indicators for persons reporting the presence of these conditions separately to each of our models and findings did not change. Our study did stratify by limitation status, which may differentiate those with and without chronic conditions, although as previously stated, we are unable to know whether limitations are a result of chronic disease conditions or other reasons. Researchers may wish to further examine the interplay between the presence of chronic conditions, physical activity level, and HRQOL in future research.

We also conducted a post hoc inspection of our data and found that the mean number of physical and mental unhealthy days among persons with limitations aged 18–34 years who reported poor HRQOL was near evenly split (mean 14.7 and 17.0, respectively), compared

with persons aged 35–64 years (mean 20.4 and 14.9, respectively) and 65+ years of age (mean 23.3 and 8.1, respectively). The relationship between physical activity and HRQOL may be more sensitive to a higher prevalence of unhealthy physical days and a lower prevalence of unhealthy mental days with aging.

Our findings showing that physical activity and HRQOL are related in a dose–response manner are also consistent with the research in this field, but the shape of the relationship differs among studies, as noted by Heesch and colleagues [9]. In our study, we found a significant quadratic trend for physical activity and HRQOL among all groups regardless of limitation status and age, with the exception of persons with limitations, aged 18–34 years. Compared with inactive persons, a lower prevalence and odds of reporting ≥14 unhealthy days were related to physical activity in a dose–response manner across physical activity categories, with a leveling off of the association occurring once sufficient or greater amounts of activity were attained (150–300 and 301+ min/week). Our findings are consistent with those of Heesch and colleagues [9] who evaluated the physical activity and HRQOL association among two age cohorts of midlife and older women. The researchers reported that both total physical activity and walking behavior only were related in a curvilinear dose–response manner across physical activity levels that included none, very low, low, intermediate, sufficient, high, and very high amounts of activity. Similar to our findings, Heesch et al. [9] indicate that persons who were physically active below recommended amounts had better HRQOL compared with persons doing no activity, but the gains in HRQOL tended to level off for sufficient and higher amounts of activity.

Research also shows that physical activity is related to HRQOL regardless of how physical activity (or recommended amounts of physical activity) is defined, even though prevalence estimates generated by different definitions are not comparable [7]. In a prior study [3] that evaluated the relationship between physical activity and HRQOL among persons with limitations as a secondary analysis, three levels of physical activity were defined by using the Centers for Disease Control and Prevention and American College of Sports Medicine (CDC/ACSM) public health recommendations [21, 22], which take into account intensity, frequency, and duration of activity. This differs from our study, which defined five levels of physical activity using the *2008 Guidelines* that recommend a total amount of physical activity by minutes per week. Our finding indicating that persons with limitations who are physically active have better HRQOL than those who are inactive [4] is consistent with preliminary findings that defined physical activity categories based on the CDC/ACSM public health recommendation. Together, the findings are important and show that physical activity and HRQOL are positively related among persons with (and without) limitations by using different definitions of physical activity.

Our study has several limitations. The findings are positive, but it may be that persons with higher HRQOL are predisposed and better able to be more physically active than persons with poor HRQOL, rather than physical activity being causally related to HRQOL. If so, maintaining good HRQOL is important to facilitate physically active lifestyles that can, in turn, lead to benefits derived from physical activity, such as enhanced cardiorespiratory functioning, muscle and bone strength, mental health, and the ability to control body weight that can, in turn, maintain or enhance HRQOL. There is a need for additional well-designed

and conducted exercise training studies to better understand the mechanism(s) linking physical activity with HRQOL, and variation in response to physical activity with respect to HRQOL. Other limitations are related to the BRFSS design and sampling. BRFSS is a telephone-based survey and, in 2009, the survey excluded persons in households without telephone access or persons who use only cellular telephones. The CASRO response rate was 52.5 %, and low response rates can result in response bias; however, BRFSS estimates generally are comparable with estimates from surveys based on face-to-face interviews [23, 24]. Weighting adjustments that account for sex, age group, and race/ethnicity attempt to minimize nonresponse, noncoverage, and under coverage. In addition, BRFSS excludes institutionalized persons by design, and our findings may not generalize to this segment of the population. Many institutionalized persons have limitations; thus, our prevalence estimates for limitations may be underestimated. Moreover, the BRFSS measures of limitations do not account for severity or type of limitation. Therefore, we were unable to control for type and severity of limitation that may affect both amount of physical activity that can be done and quality of life of the respondents. In addition, our outcome measures, including physical activity, are self-reported and are subject to recall and social desirability biases. However, the amount of physical activity recommended in the *2008 Guidelines* was based on epidemiologic studies of the association between self-reported physical activity and health benefits [2].

In spite of these limitations, this study has several important strengths: BRFSS provides a large, population-based sample allowing us to examine the relationship between physical activity and HRQOL across limitation and age subgroups controlling for other demographic variables. Most studies have not included a primary focus on persons with limitations. In addition, BRFSS data enabled us to define physical activity based on the *2008 Guidelines*—the current physical activity public health recommendation. Another related strength is that we evaluated the dose–response relationship between physical activity and HRQOL by using cut points generated from the *2008 Guidelines*.

Conclusions

These results have important public health implications for promoting physical activity. Physical activity is associated with better HRQOL (defined as lower odds of ≥14 unhealthy days during the previous 30 days), regardless of limitation status. Furthermore, for a large majority of adults, doing some physical activity is associated with better HRQOL than doing none. Promoting physical activity may have benefits related to HRQOL for both those with and without limitations.

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Table 1

Study characteristics, stratified by limitation status, BRFSS, 2009

Variable	Without limitations			With limitations		
	n	%	95 % CI	*n*	%	95 % CI
Age group (years)						
18–34	38,005	33.8	33.3, 34.2	5,004	16.8	16.0, 17.5
35–64	156,747	53.0	52.5, 53.4	49,709	55.5	54.8, 56.1
65+	69,127	13.3	13.1, 13.5	39,073	27.8	27.3, 28.3
Gender						
Men	105,183	50.5	50.1, 50.9	34,789	46.6	45.9, 47.2
Women	158,696	49.5	49.1, 49.9	58,997	53.4	52.8, 54.1
Race/ethnicity						
White, non-Hispanic	210,974	69.4	68.9, 69.8	75,881	73.6	72.9, 74.3
Black, non-Hispanic	19,803	9.5	9.2, 9.8	7,591	10.1	9.6, 10.5
Hispanic/Latino	18,522	14.5	14.1, 14.8	5,003	10.4	9.9, 11.0
Other	14,580	6.7	6.5, 6.9	5,311	5.9	5.6, 6.3
Education						
Less than high school	17,987	8.5	8.3, 8.8	11,911	13.0	12.5, 13.5
High school graduate	74,324	26.6	26.3, 27.0	29,810	30.7	30.1, 31.3
Some college	70,259	26.5	26.2, 26.9	27,046	29.2	28.6, 29.8
College graduate	101,309	38.3	37.9, 38.7	25,019	27.1	26.5, 27.7
Marital Status						
Single/never married	30,980	20.0	19.6, 20.4	9,751	14.7	14.1, 15.3
Married/unmarried couple	168,951	66.8	66.4, 67.3	45,188	57.9	57.2, 58.5
Separated, divorced or widowed	63,948	13.2	12.9, 13.4	38,847	27.5	26.9, 28.0
PA level (min/week of moderate-intensity equivalent activity)						
Inactive	26,424	9.2	8.9, 9.4	25,936	24.2	23.7, 24.7
10–60	22,894	8.2	8.0, 8.4	11,436	11.5	11.1, 11.9
61–149	35,498	12.6	12.3, 12.9	13,841	14.4	13.9, 14.9
150–300	59,020	21.7	21.4, 22.0	16,425	17.8	17.3, 18.3
301+	120,043	48.4	48.0, 48.8	26,148	32.2	31.5, 32.8

Variable	Without limitations			With limitations		
	n	%	95 % CI	*n*	%	95 % CI
HRQOL						
< 14 unhealthy days	235,920	88.9	88.7, 89.2	49,765	52.4	51.7, 53.1
≥14 unhealthy days	27,959	11.1	10.8, 11.3	44,021	47.6	46.9, 48.3
BMI category						
Underweight/normal weight	98,424	38.2	37.8, 38.6	26,360	28.3	27.6, 28.9
Overweight	100,160	37.1	36.8, 37.5	31,001	32.7	32.1, 33.4
Obese	65,295	24.7	24.4, 25.1	36,425	39.0	38.3, 39.7
Smoker						
Never smoked	150,597	60.4	60.0, 60.8	40,765	43.9	43.2, 44.6
Current	38,427	16.3	16.0, 16.6	19,599	24.4	23.7, 25.0
Former	74,855	23.3	23.0, 23.6	33,422	31.7	31.1, 32.3
Heavy drinker						
No	250,040	94.5	94.3, 94.7	90,262	95.5	95.1, 95.8
Yes	13,839	5.5	5.3, 5.7	3,524	4.5	4.2, 4.9

Without limitations and with limitations are adults answering no or yes, respectively, to a question asking whether they have problems limiting their activities or requiring their use of special equipment

BMI category = weight (kg)/height $(m)^2$ underweight/normal: <25, overweight: 25.0–29.9; obese: ≥30

BMI body mass index, *BRFSS* Behavioral Risk Factor Surveillance System, *CI* confidence interval, *PA* physical activity, *HRQOL* health-related quality of life

Table 2

Prevalence and adjusted odds ratios of 14 or more unhealthy days among adults without limitations, BRFSS, 2009

	Prevalence		Model 1		Model 2	
	%	95 % CI	AOR	95 % CI	AOR	95 % CI
Physical activity level (min/week of moderate-intensity equivalent activity)						
Inactive	16.9	15.9, 17.8	1.00	Referent	1.00	Referent
10–60	12.6	11.7, 13.7	0.79	0.71, 0.89	0.79	0.70, 0.88
61–149	11.1	10.4, 11.9	0.72	0.65, 0.80	0.72	0.65, 0.80
150–300	10.1	9.6, 10.6	0.69	0.63, 0.76	0.68	0.62, 0.75
301+	10.1	9.8, 10.5	0.71	0.65, 0.77	0.70	0.64, 0.76
P for trend	L: *P* <0.001		L: *P* < 0.001		L: *P* < 0.001	
	Q: *P* <0.001		Q: *P* < 0.001		Q: *P* < 0.001	

Model 1 adjusted for gender, race/ethnicity, education, marital status, body mass index category, smoking status, and heavy drinking status; Model 2 adjusted for all covariates in Model 1 and age group

Adults without limitations answered no to questions asking whether they have problems limiting their activities or requiring their use of special equipment

CI confidence interval, *AOR* adjusted odds ratio, *L* linear, *Q* quadratic

Table 3

Prevalence and adjusted odds ratios of 14 or more unhealthy days among adults with limitations by age group, BRFSS, 2009

Physical activity level (min/week of moderate-intensity equivalent activity)	Overall		18–34 years				35–64 years				65+ years			
	%	95 % C	%	95 % CI	AOR	95 % CI	%	95 % CI	AOR	95 % CI	%	95 % CI	AOR	95 % CI
Inactive	62.3	61.2, 63.5	59.3	52.9, 65.3	1.00	Referent	70.7	69.1, 72.2	1.00	Referent	52.5	51.0, 54.0	1.00	Referent
10–60	50.9	49.0, 52.7	54.1	45.9, 62.0	0.93	0.60, 1.43	56.4	54.2, 58.5	0.56	0.50, 0.63	38.1	35.6, 40.6	0.57	0.50, 0.64
61–149	45.1	43.4, 46.9	48.2	41.1, 55.3	0.75	0.50, 1.12	49.3	47.2, 51.5	0.45	0.40, 0.50	35.0	32.8, 37.2	0.51	0.45, 0.57
150–300	40.9	39.3, 42.5	44.1	38.2, 50.2	0.61	0.43, 0.89	43.4	41.6, 45.3	0.37	0.33, 0.41	32.8	30.7, 35.1	0.47	0.42, 0.53
301+	40.1	38.8, 41.4	43.6	39.7, 47.5	0.59	0.43, 0.80	41.9	40.4, 43.4	0.34	0.30, 0.37	30.5	28.9, 32.1	0.41	0.37, 0.46
Linear trend	$P < 0.001$		$P < 0.001$		$P < 0.001$		$P < 0.001$		$P < 0.001$		$P < 0.001$		$P < 0.001$	
Quadratic trend	$P < 0.001$		$P = 0.335$		$P = 0.874$		$P < 0.001$		$P < 0.001$		$P < 0.001$		$P < 0.001$	

Adjusted for age as a continuous variable, gender, race/ethnicity, education, marital status, body mass index category, smoking status, and heavy drinking status

Adults with limitations answered yes to a question asking whether they have problems limiting their activities or requiring their use of special equipment

CI confidence interval, *AOR* adjusted odds ratio