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Physical Activity and Sedentary Behavior Among Adults 60 Years and Older: New York City Residents Compared to a National Sample

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Abstract

This study describes moderate to vigorous physical activity (MVPA) and sedentary behavior among New York City (NYC) residents 60 years and older and compare to national United States' estimates. Adults aged 60 or older living in NYC (n=760) were compared to similar aged adults from the National Health and Nutrition Examination Survey (NHANES) (n=2451 adults). Both groups wore an ActiGraph accelerometer for one week. The NYC sample recorded 13.2, 23.8, and 37.8 mean minutes/day of MVPA and the NHANES sample recorded 10.6, 21.1, and 39.3, depending on the definition. Sedentary behavior averaged 9.6 hours/day for the NYC sample and 9.3 hours/day for the NHANES sample. The NYC sample spent a longer proportion of time in sedentary behavior and light activities, but more time in MVPA than the NHANES sample. Urbanicity may explain some of the differences between the two samples.

Keywords

exercise; leisure activity; older adults; recommendations; recreational activity; self-report; surveillance

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Introduction

In 2010, the World Health Organization issued global physical activity guidelines for adults 65 years and older in order to improve cardiorespiratory fitness, strength, bone, and functional health, and to reduce the risk of noncommunicable diseases, depression, and cognitive decline (World Health Organization, 2010a). These guidelines recommended at least 150 minutes/week of aerobic activity and acknowledged the benefit of higher amounts. The recommendation also includes muscle strengthening activities at least 2 days/week and, among those with poor mobility, activities to enhance balance and prevent falls on 3 or more days/week. For older adults unable to engage in these recommended amounts, then being as physically active as their abilities and conditions allow was recommended, as benefits still accrue. Similar physical activity recommendations exist from the United States (US) government (US Department of Health and Human Services, 2008) and jointly from the American Heart Association and the American College of Sports Medicine (Nelson et al., 2007).

US surveillance of physical activity provides metrics over time to assess whether national goals are being met (such as Healthy People 2020) and identifies groups at more risk. The assessment of physical activity on US surveillance systems has traditionally utilized self-report. Self-reported surveillance data indicate that disparities exist in the patterns of physical activity among adults (Adabonyan, Loustalot, Kruger, Carlson, & Fulton, 2010; Carlson, Fulton, Schoenborn, & Loustalot, 2010; US Department of Health and Human Services, 1996, 2008). For example, 2007 national data indicate that meeting the current recommendations for physical activity (US Department of Health and Human Services, 2008) was lower among adults 65 years and older compared to all other age groups and higher among men, those with successively more years of education, and Non-Hispanic Whites compared to other race/ethnic groups (Adabonyan et al., 2010).

To complement self-reported surveillance information, in 2003 the US National Health and Nutrition Examination Survey (NHANES) incorporated objective measures of physical activity using accelerometry. This enhancement was especially advantageous for measuring physical activity in older adults because it overcame notable limitations with self-reported questionnaires related to difficulty with recall and literacy or cultural differences that may bias questionnaires (Copeland & Esliger, 2009).

Using accelerometry, population-based studies of adults indicate that overall physical activity (assessed as average counts/minute) is lower in the US (Troiano et al., 2008) as compared to Sweden (Hagstromer, Troiano, Sjostrom, & Berrigan, 2010) and selected areas in Norway (Hansen, Kolle, Dyrstad, Holme, & Anderssen, 2012), and China (Peters et al., 2010). However, physical activity patterns using accelerometry within older age groups are typically not fully explored. Instead studies group the large age range (for example 60 years to >100 years) of older adults together, often due to sample size constraints.

Moreover, others have noted the importance of studying urban populations, where unique environments shape health behaviors differently than suburban or rural areas (Lopez & Hynes, 2006). According to the World Health Organization, in 2007 for the first time the

majority of humans were living in urban areas and this proportion is expected to grow (World Health Organization, 2010b). A number of reviews of the environment find that those who live in more densely populated areas, with better street connectivity, access to transit, and a mix of land uses (residential and commercial) obtain higher amounts of physical activity, particularly through walking (McCormack & Shiell, 2011; Saelens, Sallis, & Frank, 2003; Sallis, Floyd, Rodriguez, & Saelens, 2012). These environmental qualities characterize a more urban environment.

In this study, we describe physical activity and sedentary behavior among urban adults 60 years and older using accelerometry and self-reported physical activity. We present comparison accelerometer data from NHANES, analyzed using the same methods and with a similar accelerometer. This comparison allowed exploration into how physical activity might differ among a sample of urban adults compared to national estimates. Based on the environmental literature, we hypothesized that urban adults 60 years and older would obtain higher amounts of physical activity than the general US population. We also utilized several definitions of moderate to vigorous physical activity (MVPA), since a single accepted definition for older adults does not presently exist.

Methods

Recruitment of Source Population

Adults age 60 years or older were enrolled from January 2009 and June 2011 into the Cardiovascular Health of Seniors and the Built Environment Study, a longitudinal observational study designed to examine the inter-relationships among neighborhood environments, diet, physical activity, and the risk of cardiovascular disease. Participants were recruited from New York City (NYC) community centers serving seniors located in all areas of Brooklyn and selected neighborhoods in Queens (along the Brooklyn/Queens border). In 2010, Brooklyn had a population of ~2.5 million in 71 miles^2 and Queens had a population of ~2.2 million in 109 miles^2 (2010 US Census Bureau). Participants were eligible for the study if they reported a race/ethnicity of Black, White, or Hispanic, spoke English or Spanish, lived in their current residence for at least one year, and during the consenting process were deemed to understand the purpose and burden of the study. All study procedures were approved by the Mount Sinai School of Medicine Institutional Review Board and all participants provided written informed consent.

Objectively-Measured Physical Activity

The ActiGraph model #GT1M and GT3X were used to measure physical activity; it did so by converting acceleration sampled multiple times to a digital signal that was stored as a count. The accelerometer was strapped to an elastic belt and worn over the right hip. Participants were asked to wear it for one week, removing the monitor when showering and engaging in water activities such as swimming. They were also told to remove it at bedtime. The monitor recorded 1-minute epochs starting at midnight after the cohort examination.

To interpret accelerometer counts, researchers use count cutpoints or thresholds to characterize activities by intensity (Pruitt et al., 2008), which includes sedentary, light,

moderate, or vigorous activity. Calibration studies are conducted to determine cutpoints that generally correspond to these intensity levels. However, calibration studies report a wide range of cutpoints to define MVPA using the ActiGraph. Therefore, to define MVPA we utilized criteria from three studies:

(1) >=1041 counts/minute (Copeland & Esliger, 2009),

(2) >=1456 counts/minute (weighted mean from individualized equations) (Pruitt et al., 2008), and

(3) >=2020 counts/minute (Troiano et al., 2008), calculated by taking the weighted average of cutpoints from several other studies.

Each of the three MVPA definitions were denoted using the first author's last name (Copeland, Pruitt, Troiano). From Troiano et al. (2008), we also defined moderate activity between 2020-5998 counts/minute and vigorous activity as >=5999 counts/minute. For each of these MVPA cutpoints, we calculated the number of minutes spent in MVPA bouts, defined as at least 10 minutes at or above the threshold, with allowance for interruptions of 1-2 minutes below the threshold. Light intensity physical activity was defined between 101-1040 counts/minute (using the lowest bound from the Copeland moderate cutpoint) and sedentary behavior was defined as <=100 counts/minute (Matthews et al., 2008).

Other Measurements

Self-reported physical activity was assessed using an interviewer-administered questionnaire (Community Healthy Activities Model Program for Seniors or CHAMPS). The CHAMPS questionnaire assessed frequency and duration of multiple types of physical activities for a usual week in the past four weeks and has evidence for both validity and reliability among this age group (Cyarto, Marshall, Dickinson, & Brown, 2006; Moore et al., 2008; Stewart et al., 2001).

Age, race/ethnicity, education, household income, general health, and marital status were self-reported. Weight was recorded using the Tanita Body Composition Analyzer (TBF-300A) and standing height was measured using a stadiometer with participants in bare feet. Body mass index (BMI) was calculated by dividing weight measured in kilograms (kg) by the square of height measured in meters. Participants were grouped into four categories: underweight (<18.5 kg/m^2), normal weight (18.5-<25.0 kg/m^2), overweight (25.0-<30.0 kg/m^2), and obese (>=30.0 kg/m^2).

NHANES Measurements

We used data from NHANES during 2003-2006, the most recently available accelerometer data, to compare to the NYC sample. The NHANES is a program of studies designed to assess the nutritional and health status of adults and children in the US since the early 1960's. In 1999, NHANES became a continuous program, and the sample is selected to represent the US population for all ages through a complex, multistage probability sample of the civilian non-institutionalized population. The NHANES sampling procedure consists of 4 stages from largest to smallest size: primary sampling units (PSU; counties or groups of contiguous counties), segments within PSU (a block or group of blocks), households, and

finally individuals within households. To produce reliable estimates, over sampling occurs for several population groups, including adults 60 years and older. The PSU for NHANES 2003-2006 were selected from a frame of all US counties, using the 2000 census data and associated estimates/projections.

NHANES includes both in-home interviews, in English or Spanish, using a computer-assisted personal interview system and physical examinations at a mobile examination center. The data used in this study were obtained between 2003 and 2006, the most recently available national data for accelerometer assessed physical activity. Among participants 60 years and older, unweighted response rates for the interview ranged from 63% to 72% and for the examination ranged from 57% to 68%. Generally response rates declined with higher age groupings, comparing 60-69 years to 70-79 years and 80+ years.

For accelerometry, the ActiGraph model #AM7164 was used. The monitor recorded 1-minute epochs starting at midnight after the examination and it was worn similarly to the NYC study, with more information elsewhere (Evenson, Buchner, & Morland, 2012; Troiano et al., 2008). The NHANES questionnaires, protocols, and coding for the self-reported data are described elsewhere (http://www.cdc.gov/nchs/nhanes.htm). Self-reported age above 85 years was top-coded before the data were released to protect confidentiality of the respondents. Other self-reported measures used to describe the participants included age, race/ethnicity, education, household income, general health, and marital status. BMI was assessed using measured height and weight.

Statistical Analysis

Cleaning and reduction of accelerometer data was conducted similarly for both NYC and NHANES. Non-wear was defined by an interval of at least 60 consecutive minutes of zero counts/minute, with allowance of 1 or 2 minutes of nonzero counts if no counts were detected during both the 30 minutes of upstream and downstream from that interval; any nonzero counts except the allowed short intervals were considered as wear time (Choi, Liu, Matthews, & Buchowski, 2011). Counts in the non-wear period were set to missing. Spurious counts (counts >= 30,000 counts/minute and >10 minutes of repeated non-zero counts) were also set to missing. To be included in the analysis, the participant had to wear the accelerometer for four or more compliant days, with a compliant day defined as having at least 10 hours/day of wear, similar to what others recommend (Trost, McIver, & Pate, 2005).

The NYC study included 1455 adults, among whom 24 enrolled that were less than the entry age of 60 years and were excluded. We also excluded 475 without accelerometer data. Another 196 wore the accelerometer, but not for at least 10 hours per day for at least 4 days. This left a final sample size of 760 (n=397 using GT1M and n=363 using GT3X).

NHANES included 3471 participants who were >=60 years of age during 2003-2006. Among them, n=561 did not wear the accelerometer, n=140 returned accelerometers that were out of calibration, and n=319 did not provide at least 4 compliant days, leaving 2451 adults for the analysis (n=1319 in 2003-2004 and n=1132 in 2005-2006).

For the NHANES analyses, all percentages and means were weighted using sample weights to account for the differential probability of selection. We calculated 4-year sample weights from the base probabilities of selection, adjusted for non-response to participation in the NHANES physical activity monitor component (by modifying this SAS program: http://riskfactor.cancer.gov/tools/nhanes_pam/reweight.html), and post-stratified to match population total controls (National Center for Health Statistics, 2004, 2006). The data were nested (i.e., screener, household interview, examination), such that non-response and post-stratification adjustments were applied. For both cohorts, we calculated results overall and stratified by age group (60-69, 70-79, >=80 years), gender, and race/ethnicity (Nonhispanic White, Nonhispanic Black, Hispanic, Other). Differences between the NYC and NHANES samples were evaluated using Pearson chi-squared tests for categorical variables and t-tests using Scatterwaite's method for continuous variables (2-samples with unequal variances). Significance was highlighted at $p<0.05$ when comparing the two samples. Analyses were conducted using SAS 9.3 (Cary, NC).

Results

The descriptive information on the two samples can be found in Table 1. The NYC sample tended to be older, include more women, and include more Non-Hispanic Blacks and Hispanics than the NHANES sample. The NYC sample generally had lower education, household income, and general health, and was much less likely to be married or have normal weight as compared to the NHANES sample. All differences between these descriptive characteristics were significant at $p<=0.001$.

The NYC sample wore the accelerometer on average 13.6 hours/day (median 13.3, interquartile range (IQR) 12.0-14.7) and the NHANES sample wore it 14.1 hours/day (median 13.9, IQR 12.4-15.2). The average total counts/minute for the NYC sample was significantly higher ($p=0.004$) for the NYC sample (186; standard error 3.8; median 169; IQR 112-236) compared to the NHANES sample (203; standard error 2.7; median 181; IQR 116-262). Total counts/minute was also significantly ($p<0.05$) higher among the following NYC groups compared to the same NHANES groups: 70-79 years, women, Nonhispanic Black, Hispanic, and Other race ethnic groups.

On average, the NYC sample recorded 13.2 (Troiano), 23.8 (Pruitt), and 37.8 (Copeland) minutes/day of MVPA depending on the definition used (Table 2). In contrast, the NHANES sample recorded a lower amount of MVPA: 10.6 (Troiano), 21.1 (Pruitt), and 39.3 (Copeland) minutes/day. For both samples, the prevalence of MVPA was lower with each successive age group (60-69, 70-79, >=80), higher among men than women, and higher among Hispanics compared to Non-Hispanic Black or White participants, regardless of MVPA definitions. Mean vigorous activity was very low for both samples overall (mean minutes/day: 0.1 NYC and 0.3 NHANES) and across age, gender, and race/ethnicity (data not shown).

The prevalence of MVPA bouts was also higher among the NYC compared to the NHANES participants (Table 3). For both samples, MVPA bouts were lower with each successive age group (60-69, 70-79, >=80) and higher among men than women, regardless of MVPA bout

definitions. For the NYC sample, MVPA bouts were lowest among Non-Hispanic Blacks across the three definitions. MVPA bouts were highest among Hispanics, using the higher cutpoint definitions (Troiano and Pruitt), and similar to Non-Hispanic Whites using the lower Copeland definition. For the NHANES sample, MVPA bouts were similar between Non-Hispanic Whites and Hispanics, and lower for Non-Hispanic Blacks, consistent across the three definitions.

For the NYC sample, less time was spent in light activities compared to the NHANES sample, overall and across all strata (Table 2). However, for the NYC sample, on average more time was spent in sedentary behavior compared to the NHANES sample (9.6 hours/day vs. 9.3 hours/day). For both samples, the prevalence of sedentary behavior was higher with each successive age group (60-69, 70-79, >=80), higher among men compared to women, and lowest among Hispanic participants for both samples.

For NYC participants, the most commonly reported activities from the CHAMPS questionnaire included walking to do errands, light work around the house, walking leisurely for exercise or pleasure, and stretching or flexibility exercises (Table 4). This same questionnaire was not administered to NHANES participants to make comparisons.

Discussion

This study of adults 60 years and older indicate that levels of physical activity were low and sedentary behavior was high, both for those from NYC and representing the US. The NYC sample, recruited from urban areas of Brooklyn or Queens, spent a longer proportion of time in sedentary behavior and less in light activities, but more time in MVPA than the NHANES sample. In part, the differences in MVPA may be due to urban differences, with a number of reviews indicating that characteristics of urban environments (more densely populated areas, better street connectivity, access to transit, and land use mix) may obtain higher amounts of physical activity, particularly through walking, than those living in less urban environments (McCormack & Shiell, 2011; Saelens et al., 2003; Sallis et al., 2012). Walking is most frequently reported activity among adults who meet recommendations for physical activity and 2010 national data indicate that the prevalence of walking for leisure or transport was lowest among men and women age 65 and older compared to other adult age groups (Berrigan et al., 2012). In support of this, using the self-reported questionnaire, the NYC sample reported walking more frequently than any other leisure activity.

Among the diverse adults 60 years and older living in NYC that we studied, they averaged 186 counts/minute from the accelerometer, a general marker of overall physical activity. This was lower than the NHANES national sample of the same age (mean 203 counts/minute) and lower than similar data from national samples in Sweden (Hagstromer et al., 2010), 10 regional centers in Norway (Hansen et al., 2012), and Shanghai, China (Peters et al., 2010). For the Swedish adults 60 to 75 years of age in 2001-2002, men averaged 321 counts/minute and women averaged 304 counts/minute in 2001-2002 (Hagstromer et al., 2010). For the Norwegian adults 65 to 85 years of age in 2008-2009, men averaged 305 counts/minute and women averaged 287 counts/minute (Hansen et al., 2012). For Chinese adults 60 to 75 years of age in 1997-2006, the sample averaged 221 counts/minute (Peters et

al., 2010). The values are also substantially lower than findings among a convenience US sample of 64 to 77 year olds (Copeland & Esliger, 2009) and among a sample of volunteers in a study from the United Kingdom, France, and Italy (Davis & Fox, 2007). Reasons for these differences among older ages should be further explored.

Sedentary behavior is a distinct class of behaviors that involves sitting and low levels of energy expenditure (<=1.5 metabolic equivalent or METS), although much less studied than physical activity behavior (Marshall & Ramirez, 2011; Owen, Healy, Matthews, & Dunstan, 2010). Those with high amounts of sedentary behavior are at increased risk of diabetes, other chronic conditions, and mortality regardless of their levels of MVPA (Rhodes, Mark, & Temmel, 2012). While the US does not have national recommendations for sedentary time among adults, the absolute time spent in sedentary behavior was quite high in both groups. For the NYC sample, sedentary behavior averaged 71% of their monitored day. This was higher than the national NHANES sample (66% of their monitored day) and the Swedish national sample (Hagstromer et al., 2010). For Swedish adults 60 to 75 years of age, men averaged 8.4 hours/day and women averaged 8.1 hours/day of sedentary behavior. Norwegian women averaged 9.1 hours/day and men averaged 9.5 hours/day of sedentary behavior (Hansen et al., 2012). However, it was lower than the 9.9 hours/day assessed using an Actical accelerometer among a Canadian sample of adults 60-79 years (Colley et al., 2011). Combined, these results are concerning for the large proportion of time the NYC and US adults spend in sedentary behaviors and lack MVPA, particularly when compared to other countries (Colley et al., 2011; Hagstromer et al., 2010; Hansen et al., 2012; Peters et al., 2010).

Gender, Age, and Race/Ethnicity Differences

This study explored differences in physical activity and sedentary behavior by age, gender, and race/ethnicity. Few studies include enough adults to contrast prevalence at these age groups. We were able to do this with both samples, and confirmed that MVPA and MVPA bouts assessed by accelerometry declined with higher age categories (60-69, 70-79, >=80) in both the NYC and NHANES cohorts. For both cohorts, women consistently engaged in less MVPA and MVPA bouts than men regardless of the definition used, which supports self-reported US findings summarized elsewhere (US Department of Health and Human Services, 1996, 2008). The gender differences were particularly pronounced at the higher physical activity intensities. The gender differences were similarly found among other studies that included or separately reported on older adults (Colley et al., 2011; Davis & Fox, 2007; Hagstromer et al., 2010; Hansen et al., 2012).

In both the NYC and NHANES cohorts, Hispanics had higher MVPA than Non-Hispanic Blacks and Non-Hispanic Whites. This is in contrast to national surveillance studies where Non-Hispanic Whites self-report the highest levels of physical activity (Adabonyan et al., 2010; Carlson et al., 2010). We also cannot yet distinguish the different types of activities with accelerometer data, such as active travel or occupation, which may vary and thus contribute to the differences across race/ethnic groups (Davis et al., 2011).

Choice of MVPA Cutpoint

The 2008 US Guidelines for Americans indicates the use of either absolute or relative (i.e., perceived) intensity to monitor recommended levels physical activity: (i) at least 150 minutes/week of moderate intensity aerobic activity, (ii) at least 75 minutes/week of vigorous intensity aerobic activity, or (iii) a combination of the two (US Department of Health and Human Services, 2008). However, for older adults the guidelines recommend relative intensity, not absolute intensity, be used to determine effort. Relative intensity can account for cardiorespiratory fitness to assess effort, whereas absolute intensity is based on the rate of energy expended and does not account for cardiorespiratory fitness. In populations of older adults, the range of cardiorespiratory fitness is large and can result in inappropriate absolute intensity physical activity recommendations. In particular, those with low levels of cardiorespiratory fitness physiologically could be unable to meet the absolute intensity guidelines.

Cutpoints assume that at a given count/minute the value represents the same level of physical activity intensity regardless of age (Davis & Fox, 2007). However, it is likely that the cutpoint is heterogeneous. Factors that influence the correct cutpoint include gait patterns, metabolic cost of walking, cardiorespiratory fitness, and age. Thus, we used several definitions of MVPA in our analyses (Copeland & Esliger, 2009; Pruitt et al., 2008; Troiano et al., 2008). Findings for age, gender, and race/ethnicity were generally consistent across definitions of MVPA and MVPA bouts, but the absolute amount of activity differed. For example, mean MVPA ranged from 13.2 (Troiano) to 37.8 (Copeland) minutes/day for the NYC sample and 10.6 (Troiano) to 39.3 (Copeland) minutes/day for the NHANES sample.

Limitations

Although these findings contribute to a growing area of science, the results need to be taken in context of several limitations. First, the NYC sample was recruited from community centers across Brooklyn and selected neighborhoods of Queens. While the urban sample was diverse in terms of race/ethnicity and socioeconomic status, it sampled adults who utilized community center services. Therefore, these findings may not be generalizable to all older adults and particularly did not include the frailest or those who do not seek social services. Second, while the same accelerometer (ActiGraph) was used in the study, different models were employed. However, several studies indicate that the models used in this study produce similar results while others note differences (John, Tyo, & Bassett, 2010; Kozey, Staudenmayer, Troiano, & Freedson, 2010; Ried-Larsen et al., 2012; Rothney, Apker, Song, & Chen, 2008; Sasaki, John, & Freedson, 2011). Third, the participants in both the NYC and NHANES studies were asked to remove the accelerometer when engaging in water activities, such as swimming, so these activities were under represented. Fourth, the accelerometer was analyzed with the vertical plane and thus can underestimate activities such as bicycling, carrying loads, or climbing stairs. Finally, while NHANES provided a US population based sample to compare to the NYC sample, we did identify sociodemographic differences between the two samples.

Conclusion

This study provides estimates of physical activity and sedentary behavior among adults 60 years and older living in NYC using objective assessment with comparisons to national data. MVPA was higher among the NYC sample compared to the national sample, attributable to higher moderate activity, but absolute amounts were below recommendations for most participants in either cohort. Urbanicity may explain the differences between the two groups, with walking the most commonly reported activity among the NYC participants. Sedentary behavior was high for both groups. As our understanding of the intrapersonal, interpersonal, environmental, cultural, and policy factors that influence physical activity and sedentary behavior of older adults expands, these findings can be applied to develop tailored public health interventions to impact this growing population.

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Table 1

Descriptive information on adults 60 years and older included in the analyses

	NYC (n=760)		NHANES 2003-2006 (n=2451)		
	n	Percent	n	Weighted Percent	Standard Error
Age					
60~69	281	37.0	1087	47.3	1.5
70~79	324	42.6	809	33.9	1.2
80 and older	155	20.4	555	18.8	1.0
Gender					
Women	585	77.0	1211	56.1	1.0
Race/Ethnicity					
Non-Hispanic White	219	28.8	1491	82.6	2.1
Non-Hispanic Black	344	45.3	397	8.6	1.3
Hispanic	174	22.9	492	5.2	1.1
Other	23	3.0	71	3.6	0.5
Education					
Less than high school	166	22.7	911	25.7	2.0
High school	322	44.0	618	29.2	1.3
Greater than high school	244	33.3	917	45.1	2.2
Household Income					
<$15,000	351	63.6	464	14.4	1.2
>=$15,000	201	36.4	1822	85.6	1.2
Marital status					
Married	173	23.2	1444	61.1	1.6
Body mass index					
Underweight	4	0.6	25	1.1	0.2
Normal weight	133	18.5	686	28.8	1.3
Overweight	264	36.7	946	39.3	1.3
Obese	319	44.3	767	30.8	1.0
General health					
Excellent	37	5.4	308	15.4	1.0
Very good	140	20.4	579	28.0	1.4
Good	283	41.3	824	32.6	1.2
Fair/Poor	226	32.9	739	23.9	1.5

NHANES = National Health and Nutrition Examination Survey; NYC = New York City

Table 2

Mean minutes/day of physical activity and sedentary behavior, overall and by age, gender, and race/ethnicity

		Sedentary Behavior			Light			MVPA			MVPA			MVPA		
	n	<=100 cpm (Matthews)			101-1040 cpm			>=1041 cpm (Copeland)			>=1456 cpm (Pruitt)			>=2020 cpm (Troiano)		
		Mean Hours/ Day^	Standard Error of the Mean		Mean Minutes/ Day^	Standard Error of the Mean		Mean Minutes/ Day^	Standard Error of the Mean		Mean Minutes/ Day^	Standard Error of the Mean		Mean Minutes/ Day^	Standard Error of the Mean	
NYC (n=760)																
Overall	760	9.6	0.1	*	198.5	2.4	*	37.8	1.1		23.8	0.8	*	13.2	0.6	*
Age groups																
60~69	281	8.9	0.1		218.5	4.0	*	51.1	1.9		33.5	1.5	*	20.0	1.3	*
70~79	324	9.8	0.1	*	198.4	3.5	*	33.8	1.5		20.3	1.1		10.7	0.8	
80 and older	155	10.6	0.2		162.2	4.8	*	22.0	1.7		13.3	1.3	*	6.4	0.9	
Gender																
Men	175	10.0	0.2		193.1	5.1	*	50.1	2.7		35.0	2.3	*	22.4	1.9	*
Women	585	9.5	0.1	*	200.1	2.7	*	34.1	1.1		20.4	0.8	*	10.5	0.5	*
Race/Ethnicity																
Non-Hispanic White	219	9.9	0.2	*	197.4	4.3	*	39.1	2.2		25.0	1.7	*	14.5	1.3	*
Non-Hispanic Black	344	9.7	0.1		194.7	3.6	*	33.5	1.5		20.2	1.1	*	10.6	0.8	*
Hispanic	174	9.2	0.2	*	211.4	5.3	*	46.1	2.3		30.2	1.8	*	17.4	1.4	*
Other	23	10.3	0.4		166.7	11.0	*	27.3	4.5	*	17.3	3.5		9.4	2.5	
NHANES 2003-2006 (n=2451)																
Overall	2451	9.3	0.1		250.4	2.3		39.3	1.4		21.1	1.0		10.6	0.7	
Age groups																
60~69	1087	8.8	0.1		269.7	2.7		50.8	1.4		27.6	0.9		13.8	0.6	
70~79	809	9.5	0.1		243.9	3.3		34.2	2.1		18.1	1.6		8.9	1.1	
80 and older	555	10.2	0.1		213.5	4.7		19.5	2.3		10.3	1.8		5.4	1.6	
Gender																
Men	1240	9.6	0.1		238.9	2.7		46.6	1.9		26.0	1.5		13.1	1.0	
Women	1211	9.0	0.1		259.3	3.5		33.6	1.2		17.3	0.8		8.6	0.6	

		Sedentary Behavior		Light		MVPA		MVPA		MVPA	
	n	<=100 cpm (Matthews)		101-1040 cpm		>=1041 cpm (Copeland)		>=1456 cpm (Pruitt)		>=2020 cpm (Troiano)	
		Mean Hours/ Day^	Standard Error of the Mean	Mean Minutes/ Day^	Standard Error of the Mean	Mean Minutes/ Day^	Standard Error of the Mean	Mean Minutes/ Day^	Standard Error of the Mean	Mean Minutes/ Day^	Standard Error of the Mean
Race/Ethnicity											
Non-Hispanic White	1491	9.3	0.1	249.1	2.6	39.4	1.5	21.3	1.1	10.7	0.8
Non-Hispanic Black	397	9.5	0.2	244.5	6.7	31.7	2.0	15.7	1.1	6.9	0.6
Hispanic	492	8.5	0.1	269.8	5.2	46.1	2.2	24.9	1.4	11.9	0.9
Other	71	9.5	0.2	265.2	12.2	44.4	5.6	25.3	3.0	14.0	1.4

CPM = counts per minute; MVPA = moderate to vigorous physical activity; NHANES = National Health and Nutrition Examination Survey; NYC = New York City

^The means are weighted for the NHANES sample

*p<0.05 comparing the NYC to the NHANES sample strata

Table 3

Mean minutes/day of MVPA in bouts, overall and by age, gender, and race/ethnicity

	Mean MVPA Above Cutpoints in Bout Minutes/Day^								
	>=1041 cpm (Copeland)			>=1456 cpm (Pruitt)			>=2020 cpm (Troiano)		
	Mean Minutes/ Day^	Standard Error of the Mean		Mean Minutes/ Day^	Standard Error of the Mean		Mean Minutes/ Day^	Standard Error of the Mean	
NYC (n=760)									
Overall	26.0	1.5	*	17.4	0.9	*	10.7	0.5	*
Age groups									
60~69	35.1	3.4		23.5	1.3	*	16.0	1.1	*
70~79	22.3	1.2		14.5	1.0		8.8	0.7	
80 and older	17.3	2.8		12.4	2.8		5.1	0.8	
Gender									
Men	35.6	2.9	*	27.8	2.8	*	18.4	1.5	*
Women	23.1	1.7	*	14.3	0.7		8.4	0.5	
Race/Ethnicity									
Non-Hispanic White	30.4	4.6		19.0	2.2		11.4	1.1	
Non-Hispanic Black	21.7	1.3		14.5	1.0		8.5	0.8	
Hispanic	29.7	1.7		21.7	1.4	*	14.3	1.2	*
Other	19.7	4.0	*	12.8	3.1		9.7	2.6	
NHANES 2003-2006 (n=2451)									
Overall	23.4	1.5		14.9	1.2		9.4	0.9	
Age groups									
60~69	29.0	1.5		18.5	1.2		11.7	0.9	
70~79	20.8	2.1		12.9	1.8		7.9	1.3	
80 and older	14.0	4.4		9.5	3.9		6.4	3.5	
Gender									
Men	28.2	2.1		17.9	1.7		10.5	1.1	
Women	19.7	1.6		12.6	1.4		8.5	1.3	
Race/Ethnicity									
Non-Hispanic White	23.5	1.7		15.0	1.4		9.5	1.1	
Non-Hispanic Black	16.9	1.3		11.0	1.5		6.5	0.8	
Hispanic	24.3	1.5		15.8	1.1		9.3	1.1	
Other	36.1	6.0		20.9	1.8		13.4	1.1	

cpm = counts per minute; MVPA = moderate to vigorous physical activity; NHANES = National Health and Nutrition Examination Survey; NYC = New York City

^ 10-minute bouts were defined as >=10 consecutive minutes above the threshold, with allowance for interruptions of 1 or 2 minutes below the threshold.

^The means are weighted for the NHANES sample

*p<0.05 comparing the NYC to the NHANES sample strata

Table 4

Self-reported physical activity among the NYC sample

In a typical week during the past 4 weeks, did you:	n=686	Percent Reporting Any	Mean # times/week	Median # times/week (IQR)
Walk to do errands	530	77.3	3.7	3 (2-5)
Light work around the house	508	74.1	3.7	3 (2-7)
Walk leisurely for exercise or pleasure	466	67.9	4.4	4 (2-7)
Stretching or flexibility exercises	384	56.0	3.4	3 (2-5)
Dance	235	34.3	2.0	1 (1-2)
General conditioning exercises	224	32.7	2.4	2 (1-3)
Walk fast/briskly for an exercise	216	31.5	4.2	4 (2-7)
Light gardening	203	29.6	2.5	2 (1-3)
Yoga or Tai-chi	135	19.7	1.7	1 (1-2)
Walk or hike uphill	119	17.4	3.5	3 (2-5)
Light strength training	93	13.6	2.9	2 (2-3)
Heavy work around the house	85	12.4	2.2	1 (1-3)
Aerobics or aerobic dancing	83	12.1	1.9	1 (1-2)
Riding bicycle or stationary cycle	62	9.0	3.2	3 (2-4)
Jog or run	43	6.3	3.1	3 (2-4)
Moderate to heavy strength training	39	5.7	3.2	3 (1-5)
Other aerobic machines	30	4.4	2.9	3 (2-3)
Heavy gardening	29	4.2	2.1	1 (0.5-3)
Work on care/truck/lawn mower or other machinery	23	3.4	1.5	1 (1-2)

The remaining activities were reported by less than 3% of the sample including: playing golf (riding in cart, carrying/pulling equipment), tennis (singles, doubles), playing basketball / soccer / racquetball, skating, swimming (moderately or fast, gently), and water exercises.

IQR=interquartile range; NYC=New York City