PHYSICAL ACTIVITY AND OBESITY IN AFRICAN AMERICANS: THE JACKSON HEART STUDY

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Objectives: To better understand how obesity and low levels of physical activity (PA) contribute to racial health disparities, we examined the association of PA domains (work, home life, and leisure) with indicators of socioeconomic status and markers of obesity in African Americans.

Methods: These cross sectional analyses of interview and clinical measures from the baseline visit of the Jackson Heart Study of cardiovascular disease (CVD) in African Americans of the Jackson, Mississippi metropolitan statistical area included 3,174 women and 1,830 men aged 21–95 years. The main measures were active living, sport, work, home life, and total PA scores; participation in regular moderate or vigorous intensity leisure physical activity (MVLPA); demographics, body mass index (BMI), waist circumference (WC) and CVD risk factors.

Results: The sample was 63% female, 81% high school or college graduates, with 51% aged 45–64 years, and mostly overweight (32%) or obese (53%). Women were less active than men in all domains except home life. Total PA was inversely associated with WC in women and men. The overweight (BMI 25–29.9) group was most active in all domains except work; active living and sport PA and prevalence of MVLPA then declined in a dose response association with increasing BMI. Work PA was associated with the lowest BMI but otherwise with indicators of less favorable socioeconomic status and health.

Conclusions: Observed differences in PA in African Americans by domain and association with obesity biomarkers suggest areas for future study and intervention to reduce health disparities. (*Ethn Dis.* 2010;20:383–389)

Key Words: Physical Activity, African American, Obesity, Cardiovascular Disease

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INTRODUCTION

Despite decades of research and intervention programs designed to decrease or eliminate disparities in health by race, ethnicity, economics, and geography, health disparities persist in cardiovascular disease (CVD), stroke, certain cancers, and other chronic diseases. Better treatments and lifestyle changes have contributed to dramatic declines in heart disease deaths, but there is now increasing concern about rising rates of obesity and diabetes, which may reverse the progress made toward reaching national health objectives and eliminating disparities.[1,2] National surveys have consistently identified racial and geographic differences in prevalence of obesity and physical activity (PA) or physical fitness that may contribute to health disparities.[3,4] In recent studies, the state of Mississippi had the highest age-adjusted rate for death due to heart disease in the nation,[5] led the nation in obesity with over 67% prevalence of overweight or obesity, and was exceeded by only two other states in prevalence of no leisure-time PA.[6] These findings highlight a need to increase understanding of modifiable risk factors, such as PA and obesity, especially in African Americans of this geographic region, who have a higher burden of many diseases.

Both lifestyle and excess weight play important roles in understanding and eliminating health disparities in CVD.[7] Most studies describing PA in African Americans have described only leisure time PA, and few studies have used instruments that have been validated in African Americans.[8–10] The Jackson Heart Study (JHS), the largest study with an all African American cohort ever conducted, offers a unique opportunity for evaluating PA, obesity, and other factors that may be contributing to high CVD within a demographically diverse African American cohort. The JHS is a community-based observational study of cardiovascular disease (CVD) in more than 5,000 African Americans living in the Jackson, Mississippi metropolitan statistical area.[11] The purpose of this study was to describe the prevalence of PA and its relationship to weight status in the JHS cohort at the baseline examination as likely important contributors to CVD and health dis-

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parities. We examined PA in the domains of active living, sport, work, home life, and total PA, using an instrument validated with African Americans, in relation to demographic, socioeconomic and health status characteristics, including body mass index (BMI) and waist circumference (WC) as markers of obesity.

METHODS

The JHS included 3 subsamples: random, former Atherosclerosis Risk In Communities (ARIC) participants, and a volunteer sample.[12] Participants were aged 34 to 85 years and resided in the city of Jackson and its surrounding suburbs, semi-rural, and rural areas. A fourth subsample enrolled for the family study consisted of about 250 family members who were aged <35 or >84 years. Among 5,301 total participants, the 5,003 (94%) with complete responses to the PA survey were included in the analyses for this study. The research was approved by the Institutional Review Board of the University of Mississippi Medical Center, with ratification by the boards of the Jackson State University and Tougaloo College study partners, and written informed consent was obtained from all participants.

MEASUREMENT PROCEDURES

The study assessment methods have been reported previously.[10,13] Briefly, the demographic and health information were obtained by trained staff during a home interview and clinical examination. Anthropometric measurements included height to the nearest centimeter and weight to the nearest .1 kilogram in light clothing and in stocking feet; waist circumference was measured to the nearest centimeter at the umbilicus. Body mass index was calculated in kilograms per meters squared. A status of neither overweight nor obese was defined by BMI of <25, overweight as BMI of 25 to 29.9, mild obesity as BMI 30–34.9, moderate obesity as BMI 35–39.9, and severe obesity as BMI ≥ 40. Presence of CVD and stroke was ascertained from participant self-report of being told by a physician they had a heart attack or stroke, history of angioplasty or coronary bypass surgery, or from electrocardiogram consistent with past myocardial infarction. Presence of type 2 diabetes mellitus was determined by measured fasting glucose of ≥126 mg/dL, use of insulin and/or oral hypoglycemic agents, or self-reported use of medications for diabetes. Hypertension was defined as a measured blood pressure ≥140 mm Hg systolic or ≥90 mm Hg diastolic, or taking antihypertensive medications regardless of blood pressure measurements. Income was categorized into three groups: low (<$20,000 for an individual or <$35,000 for a family of 4), middle (≥$20,000 and <$35,000 for an individual or ≥$35,000 and <$75,000 for family of 4), and affluent (≥$35,000 for an individual or ≥$75,000 for family of 4). Education was described as: <high school, GED, some high school, some college but no degree, or a college degree or higher. Employment status was defined as currently working or volunteering or not. Functional status (ability to do heavy work around the house, climb stairs, and walk one-half mile without assistance answered as yes or no) was determined from phone follow-up of 3,634 participants one year after the clinic examination.

Assessment of Physical Activity

The JHS Physical Activity Cohort survey (JPAC)[10,13] was administered by trained interviewers at the home visit preceding the clinical examination. The JPAC was derived from modifications to the Baecke/ARIC physical activity survey.[14,15] Although the JPAC does not allow direct assessment of adherence to the current public health guidelines for PA, continuity with the ARIC measure was important to facilitate longitudinal analyses for the JHS participants who are also part of the Jackson, Mississippi ARIC sample. Scores for four different domains of PA (active living, work, home life, and sport) were computed; index scores could range from 1 to 5 and were set to missing if any item was missing. Active living items assessed time spent walking and biking for leisure and transportation and watching television. Work items assessed frequency of sitting, standing, walking, lifting heavy loads, and sweating from exertion at work; work index scores were analyzed only for participants who reported either working or doing volunteer work in the past year. Home life items assessed time and/or frequency of care giving, preparing and cleaning up from meals, routine and major house cleaning, gardening/yard work, and heavy outdoor and household labor. Sport items assessed participation in up to 3 recreational activities, and scores take into account the frequency, duration, and intensity (effort) of each of the activities reported. A total score was computed as the sum of the index scores, with work scores set to 0 for participants who reported no paid or volunteer work during the past year. The JPAC instrument can be accessed at the JHS web site http://jhs.jsums.edu.

The psychometric properties of the JPAC were previously reported.[10] Briefly, total scores were significantly correlated with 24-hour accelerometer counts (rho = 0.24), and with three days of pedometer counts obtained about four months following the survey (rho = 0.32). For the current analyses, participation in moderate or vigorous intensity leisure physical activity (MVLPA) was estimated from items including leisure-time walking or biking or sport activities of ≥4 metabolic equivalent value.[16] Regular participation in MVLPA was defined as participation in these activities more than once a week

for more than 9 months of the year and for at least one hour per week.

Statistical Analyses

Descriptive statistics (mean and standard deviation or percentages) were computed for demographic characteristics and PA scores were evaluated separately for men and women. Analyses of variance (ANOVAs) were performed to assess for differences in mean physical activity scores among demographic subgroups. Differences in proportions were assessed using the chi-square test. Multivariable logistic regression was used to calculate odds ratios (OR) and 95% confidence intervals (CI) adjusted for age and sex. A $P \leq .01$ was considered significant. All analyses were performed using SAS version 9.3 (SAS Institute Inc., Cary, NC).

RESULTS

The demographics of the sample are shown in Table 1. The sample was predominantly female (63%), high school graduates or with at least some college (82%), with 51% aged 45 to 64 years. More men than women were currently married, and the majority of all participants were currently employed. There were few current smokers. More men than women reported using alcohol, and most of the participants had a BMI in the overweight or obese range (BMI ≥25). Functional status ascertained one year after the JPAC interview indicated that most participants were capable of PA; only 4.9% were unable to walk up and down stairs, 8.0% were unable to walk one-half mile, and 14.5% were unable to do heavy work around the house without assistance. The 298 Jackson Heart Study participants excluded from the current analyses because of missing JPAC scores were older and more likely to be unmarried, but were not significantly different from those included in this study in education, employment status, income, smoking history, or BMI.

Table 1. Characteristics of Jackson Heart Study participants at the baseline examination*

Characteristics	Females, *n*=3173	Males, *n*=1830
Age		
21–34	141 (4.4)	98 (5.4)
35–44	592 (18.7)	381 (20.8)
45–54	768 (24.2)	462 (25.3)
55–64	873 (27.5)	473 (25.9)
65–74	608 (9.2)	319 (17.4)
75–84	183 (5.8)	92 (5.0)
≥ 85	8 (.3)	5 (.3)
Education		
< High school	567 (17.9)	347 (19.0)
GED	63 (2.0)	37 (2.0)
High school graduate	586 (18.5)	315 (17.2)
Some college no degree	670 (21.1)	431 (23.6)
College degree or higher	1280 (40.3)	695 (38.0)
Currently employed	2080 (65.5)	1346 (73.5)
Currently married	1440 (45.4)	1297 (70.9)
Income†		
Low	1221 (38.5)	500 (27.3)
Middle	786 (24.8)	466 (25.5)
Affluent	672 (21.2)	583 (31.9)
Smoking status		
Never smoked	2354 (74.2)	1032 (56.4)
Former smoker	477 (15.0)	463 (25.3)
Current smoker	325 (10.2)	323 (17.7)
Alcohol use status		
Never	1057 (33.3)	256 (14.0)
Stopped drinking > 1 year ago	889 (28.0)	490 (26.8)
Current user	1206 (38.0)	1077 (58.9)
Body mass index		
< 25.0	383 (12.1)	337 (18.4)
25–29.9	879 (27.7)	735 (40.2)
30–34.9	863 (27.2)	467 (25.5)
35–39.9	555 (17.5)	185 (10.1)
≥40.0	488 (15.4)	102 (5.6)

* Data are presented as *n* (% within sex).
† Low = <$20,000 individual or <$35,000 family of 4; middle= <$35,000 individual or <$75,000 family of 4.

Prevalence of Specific Physical Activities

Although 41.2% of participants reported walking for leisure at least 15 minutes more than once a week and 41.4% reported participating in sport or exercise, only 5% reported sweating from leisure-time exertion at least once a week. Women were more likely than men to report ≥1.5 hours/day in meal preparation/cleanup (46.0% vs 20.9%), but men were more likely to report gardening/yard work (44.5% vs 17.6%) and major cleaning activity (28.9% vs 17.0%). Women (42.8% vs 29.7% for men) and those with a BMI≥30 (41.5%) were more likely than the non-obese (34.1%) to report spending at least 20 hours per week at home in non-paid care giving. The most frequently reported sport/exercise activities (in rank order) for women were brisk walking, treadmill, aerobic dance, stationary bike, stretching/yoga, running/

Table 2. Physical activity scores in relation to demographic characteristics, Jackson Heart Study

	n	Active living	Work†	Home life	Sport	Total
Range of Scores		1.00, 4.75	1.00, 4.88	1.00, 5.00	1.00, 5.00	3.00, 16.88
Sex						
Male	1830	2.11 (.81)	2.71 (.72)	2.28 (.69)	2.23 (1.20)	8.61 (2.64)
Female	3173	2.05 (.80)	2.61 (.66)	2.28 (.58)	2.10 (1.22)	8.15 (2.58)
*P**		0.01	0.01	0.8	0.0005	<.0001
Age						
21–44	1212	2.23 (.78)	2.69 (.73)	2.42 (.63)	2.40 (1.24)	9.49 (2.28)
45–64	2576	2.09 (.80)	2.62 (.68)	2.83 (.62)	2.14 (1.24)	8.46 (2.49)
64–84	1215	1.89 (.81)	2.69 (.59)	2.13 (.59)	1.91 (1.20)	6.85 (2.48)
*P**		<.0001	0.03	<.0001	<.0001	<.0001
Education						
Less than high school	914	1.83 (.80)	2.99 (.66)	2.16 (.59)	1.69 (1.10)	6.81 (2.45)
GED	100	1.99 (.76)	2.97 (.66)	2.19 (.55)	1.93 (1.15)	7.86 (2.60)
High school	901	2.05 (.78)	2.78 (.73)	2.33 (.65)	2.09 (1.21)	8.41 (2.64)
Some college no degree	1101	2.15 (.79)	2.70 (.72)	2.38 (.66)	2.29 (1.24)	8.92 (2.58)
College degree or higher	1975	2.22 (.80)	2.47 (.60)	2.28 (.60)	2.42 (1.26)	8.93 (2.36)
*P**		<.0001	<.0001	<.0001	<.0001	<.0001
Employment status						
Working/volunteering	3426	2.16 (.78)	2.65 (.69)	2.32 (.62)	2.27 (1.24)	9.41 (2.09)
Not working/volunteering	1577	1.88 (.82)		2.19 (.62)	1.89 (1.19)	5.95 (2.00)
*P**		<.0001		<.0001	<.0001	<.0001
Income level‡						
Low	1721	1.96 (.79)	2.87 (.71)	2.26 (.62)	1.96 (1.18)	7.73 (2.70)
Middle	1252	2.08 (.82)	2.61 (.66)	2.33 (.64)	2.21 (1.23)	8.67 (2.53)
Affluent	1255	2.24 (.81)	2.46 (.64)	2.22 (.59)	2.48 (1.21)	9.01 (2.35)
*P**		<.0001	<.0001	<.0001	<.0001	<.0001

* *P* for differences between sex and employment status groups or trend for increasing or decreasing age, education, and income.
† Work scores were computed only for participants reporting they worked for pay or did volunteer work during the past year.
‡ Low = <$20,000 individual or <$35,000 family of 4; middle= <$35,000 individual or <$75,000 family of 4.

jogging, weight lifting, other dance, calisthenics, and stair climbing. For men, the most frequently reported were brisk walking, basketball, weight lifting, running/jogging, treadmill, golf, bicycling, stationary bike, calisthenics, and swimming.

Association of PA Scores with Demographic Characteristics

Except for work, lower PA domain and total scores were generally associated with being female, increasing age, lower education, and lower income (Table 2).

Association of PA Scores with Obesity Markers and CVD Risk Status

Waist circumference decreased for both men and women with increasing quartiles of PA domain scores (Figure 1). As shown in Figure 2, with the exception of work, overweight (BMI 25–29.9) participants were more active than other BMI groups in all PA domains ($P \leq .01$), and PA then tended to decline as BMI increased (Figure 2). This pattern of results was not different when adjusted for age. In other analyses, age-adjusted sport and total PA scores were lower for current smokers, participants with hypertension, diabetes, or CVD, and nondrinkers ($P < .01$; data not shown), but work scores were not different between participants with and without hypertension, diabetes, CVD or previous stroke ($P > .10$).

Participation in Moderate and/or Vigorous Leisure-time Physical Activity

About one-third of women and men participated in no MVLPA during the past year, and about two-thirds had no regular MVLPA. After adjustment for age and/or sex (as appropriate), the odds of no regular MVLPA were greater in older, less educated, and lower income participants (Table 3). Compared to those with BMI <25, participants with severe obesity were less likely to report regular MVLPA.

DISCUSSION

This study begins to fill the gap in knowledge about the prevalence of PA in different domains and the association between PA, weight status, and demographic factors that are likely contributors to the high burden of CVD and health disparities in African Americans. Consistent with the findings of multiethnic national studies,[3] female sex,

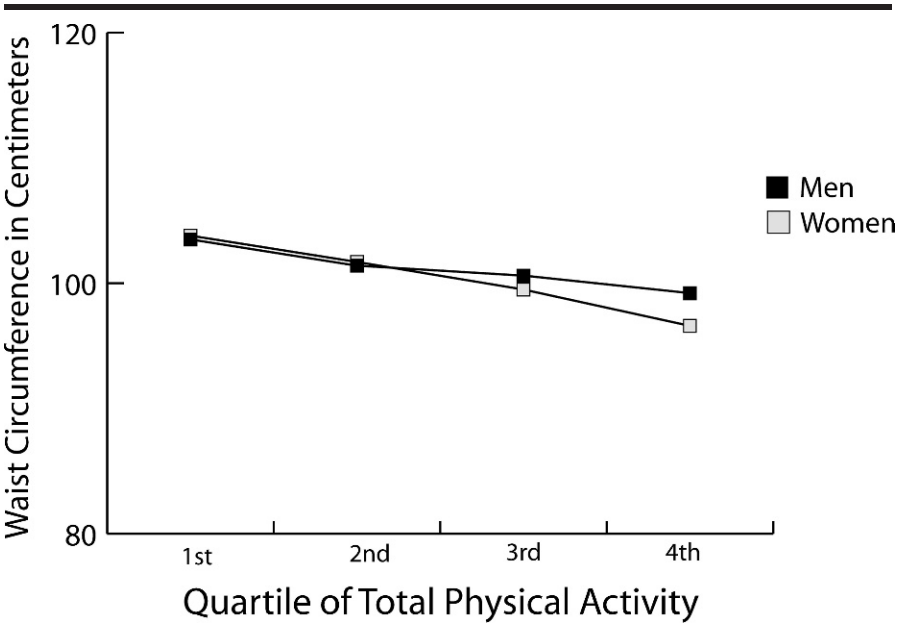

Fig 1. Waist circumference for men and women in centimeters by quartile of total physical activity score

older age, lower education and income, higher BMI levels, and other CVD risk factors were significant correlates of PA within the all-African American cohort of the JHS. However, examination of domain-specific PA scores and PA in relation to obesity markers revealed a more complex picture. Participants with a BMI of 25–29.9 attained the highest leisure PA scores and similarly had the lowest prevalence of no regular MVLPA. A dose-response relationship was then observed, with decreasing leisure PA and increasing prevalence of no MVLPA as BMI increased to 30 and higher. Work PA scores generally trended in the opposite direction to sport PA and were positively correlated with indicators of less favorable socioeconomic status and health status. Men and women reported somewhat different home life activities, but non-paid care giving for at least 20 hours per week was prevalent among men and women and participants with higher BMI. The reasons for the differences in PA of different domains and different BMI levels such as those we observed need further study so the results can be translated to improve interventions to increase healthy PA.

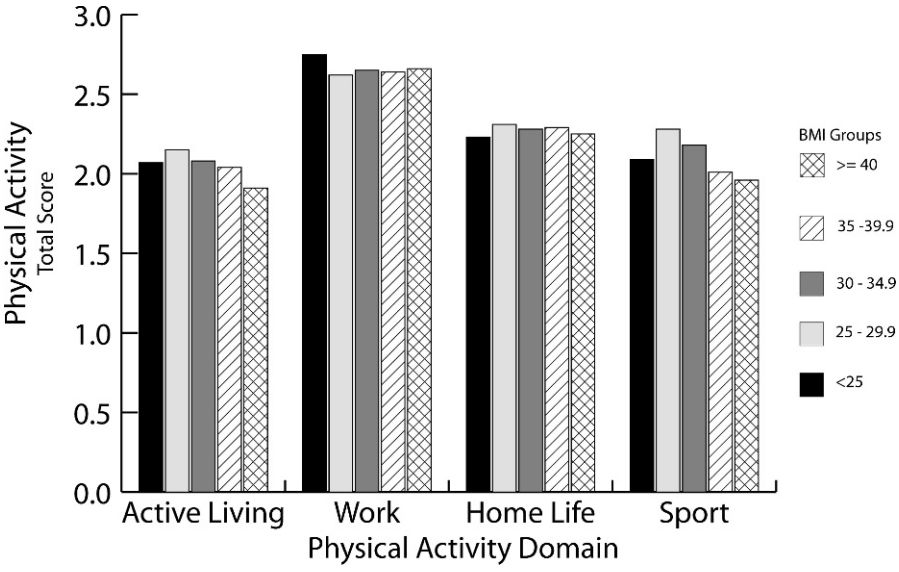

Fig 2. Physical activity domain scores by body mass index group

The findings of relatively high participation in active living and sport PA among many overweight and obese participants of the JHS are encouraging.

The findings of relatively high participation in active living and sport PA among many overweight and obese participants of the JHS are encouraging. However, even in the highest quartile of PA scores, mean WCs were in the range generally associated with central obesity and increased health risks.[17] The 86% of participants with a BMI ≥25 is comparable to concurrent surveillance estimates of 73.3% in this BMI range for the state of Mississippi and 69.9% at the national level for African Americans.[18] Less than half of the participants reported walking during leisure time for at least 15 minutes more than once weekly, and nearly two-thirds had no regular MVLPA in the past year. Thus, the overall low levels of participation in PA in JHS reflect the state and national epidemic of obesity and sedentary lifestyles.

Table 3. Characteristics of Jackson Heart Study participants with no regular moderate or vigorous intensity leisure-time physical activity*

	n (%) with no regular MVLPA	Odds ratio†	95% confidence interval
Age group			
21–44	679 (56.0)	1.00 (reference)	
45–64	1524 (59.2)	1.13	.99, 1.30
65 and older	768 (63.2)	1.38	1.14, 1.58
Sex			
Male	1055 (57.7)	1.00 (reference)	
Female	1915 (60.4)	1.11	.99, 1.25
Education			
College degree or higher	1018 (51.5)	1.00 (reference)	
Some college, no degree	664 (60.3)	1.44	1.24, 1.68
High school graduate	594 (65.9)	1.81	1.53, 2.13
GED	61 (61.0)	1.46	.97, 2.21
Less than high school	624 (68.3)	1.99	1.67, 2.37
Employment status			
Working/volunteering	1981 (58.0)	1.00 (reference)	
Not working/volunteering	982 (62.3)	1.10	.96, 1.26
Income status‡			
Affluent	639 (50.9)	1.00 (reference)	
Middle	731 (58.4)	1.37	1.17, 1.60
Low	1124 (65.3)	1.79	1.48, 2.08
BMI Status			
< 25	432 (60.0)	1.00 (reference)	
25–29.9	880 (54.6)	.79	.66, .95
30–34.9	786 (59.1)	.96	.80, 1.16
35–39.9	460 (62.2)	1.10	.89, 1.36
≥40	405 (68.6)	1.51	1.20, 1.91

MVLPA - moderate or vigorous intensity leisure physical activity.

* Defined as no physical activities of at least moderate intensity (no walking or bicycling for 15 min during leisure time and no sport activity of ≥ 4.0 METs more than once/week) during the past year.

† Adjusted for age and/or sex.

‡ Low = <$20,000 individual or <$35,000 family of 4; middle= <$35,000 individual or <$75,000 family of 4.

A recent national survey of energy expenditure in United States adults found household activities accounted for 30% and 20% of energy expenditure in African American women and men, respectively.[19] The impact of these routine activities on CVD and other health risks is not yet well understood, as the clearest evidence of a protective effect of PA comes from studies of easier to measure specific leisure PA such as walking and sports participation.[15,16] Current public health recommendations encourage PA of at least moderate intensity in bouts of at least 10 minutes.[20] A recent study of PA measured by accelerometer found that PA in bouts of at least 10 minutes had a much stronger inverse association with BMI and WC than the accumulation of nonbout PA.[21] Our results seem to be consistent with these findings, as sport and active living PA scores, which reflect activities typically performed in bouts of 10 minutes or more, had a clearer inverse dose-response relationship to BMI than home life or work PA.

The strengths of this study included the large number of participants, their demographic diversity, and the examination of physical activity across several domains that may be differentially associated with future health outcomes in an all-African American cohort. The JHS differs from many other studies of African Americans that compare different ethnic groups and often confound race or ethnicity with socioeconomic status. The study also has limitations. Data from this study are cross-sectional and PA was self reported and therefore subject to the possibility of recall bias and social desirability. An additional limitation is that BMI may not be a good indicator of body composition, especially in African Americans. In this study we used common BMI categories that have been used in other large studies, but also reported on WC as a measure of visceral adiposity.

The JHS will provide an important opportunity to observe the relationship of different BMI levels to health outcomes and any protective effects of total and domain-specific PA at varying levels of participation in African American adults. A recent report from the National Institutes of Health funded American Association of Retired Persons Diet and Health Study[22] indicated mortality may be reduced for physically active persons at different BMI levels, even at less than the current guideline levels. Increased PA will likely be required as part of the solution to the health disparities related to obesity and CVD currently observed by race and geographic region in the United States. Increasing understanding of the correlates of different kinds of PA and determining how to help men and women of varying BMI to increase PA remain important public health priorities.

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Data analysis and interpretation: Dubbert, Robinson, Sung, Newton, Wyatt, Ainsworth

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