

Geography, Race/Ethnicity, and Physical Activity Among Men in the United States

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Abstract

Engaging in regular physical activity reduces one's risk of chronic disease, stroke, cardiovascular disease, and some forms of cancer. These preventive benefits associated with physical activity are of particular importance for men, who have shorter life expectancy and experience higher rates of chronic diseases as compared to women. Studies at the community and national levels have found that social and environmental factors are important determinants of men's physical activity, but little is known about how regional influences affect physical activity behaviors among men. The objective of this study is to examine the association between geographic region and physical activity among men in the United States, and to determine if there are racial/ethnic differences in physical activity within these geographic regions. Cross-sectional data from men who participated the 2000 to 2010 National Health Interview Survey ($N = 327,556$) was used. The primary outcome in this study was whether or not men had engaged in sufficient physical activity to receive health benefits, defined as meeting the 2008 Physical Activity Guidelines for Americans. Race/ethnicity and geographic region were the primary independent variables. Within every region, Hispanic and Asian men had lower odds of engaging in sufficient physical activity compared to white men. Within the Northeast, South, and West, black men had lower odds of engaging in sufficient physical activity compared to white men. The key findings indicate that the odds of engaging in sufficient physical activity among men differ significantly between geographic regions and within regions by race/ethnicity.

Keywords

physical activity, men of color, geography, health inequality/disparity

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Introduction

Engaging in sufficient physical activity is associated with multiple benefits to health and quality of life (Alves et al., 2016; Lee et al., 2012; U.S. Department of Health and Human Services, 1996; Wen et al., 2011). More specifically, regular physical activity is associated with multiple preventive benefits, such as lowering one's risk of developing chronic diseases, stroke, cardiovascular disease, some forms of cancer, and can delay all-cause mortality (Garber et al., 2011; A. C. King et al., 1995). The 2008 Physical Activity Guidelines issued by the U.S. Department of Health and Human Services recommend that adults engage in at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination (Physical Activity Guidelines Advisory Committee,

2008). The 2008 Physical Activity Guidelines note that most health benefits occur with at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity physical activity, such as brisk walking, and additional benefits may occur with more physical activity (Physical Activity Guidelines Advisory Committee, 2008). Currently, only one in five adults in the United States engages in sufficient physical activity to meet these

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guidelines (Carlson, Fulton, Schoenborn, & Loustalot, 2010; Centers for Disease Control and Prevention [CDC], 2013).

Physical activity behaviors differ by gender and are shaped according to socialization, norms, and expectations associated with gender; this underscores the importance of gender as a determinant of physical activity as a health behavior (Courtenay, 2000; Griffith, Gunter, & Allen, 2011; Kelley, Kandula, Kanaya, & Yen, 2016; Millen et al., 2005). The links between physical activity and chronic disease are of particular concern for men, who have shorter life expectancy and experience higher rates of chronic diseases such as coronary heart disease and type 2 diabetes as compared to women (Caperchione et al., 2012; Griffith et al., 2011; Thorpe, Wilson-Frederick, et al., 2013). Furthermore, physical inactivity has been identified as one of the main modifiable risk factors that contribute to poor health and noncommunicable disease among men (Bull & Bauman, 2011; Malcher, 2011; Newton, Griffith, Kearney, & Bennett, 2014). However, few studies have focused on examining the determinants of physical activity specifically among men.

While men are more likely than women to engage in sufficient physical activity to meet the recommendations specified in the 2008 Physical Activity Guidelines, disparities exist in physical activity behaviors between men of different racial/ethnic groups (Blackwell, Lucas, & Clarke, 2014). Compared to white men, men of minority racial/ethnic groups are less likely to report engaging in sufficient physical activity to meet the 2008 Physical Activity Guidelines (Blackwell et al., 2014; CDC, 1999; Crespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000; U.S. Department of Health and Human Services, 1996). The factors responsible for these racial/ethnic disparities in physical activity among men are poorly understood (Abercrombie et al., 2008; Porch et al., 2015; Thorpe, Kelley, et al., 2015). Even after accounting for individual-level characteristics, race disparities in physical activity among men persist, despite national public health initiatives geared toward promoting physical activity (Crespo et al., 2000; Kruger, Kohl, & Miles, 2007; Marshall et al., 2007).

The economic and social standing of communities and families can determine access to important resources that influence physical activity behaviors. As such, the social and environmental conditions in which men live must be considered in explaining these important differences in physical activity behaviors (Wilson-Frederick et al., 2014). A growing body of literature has identified associations between the social, environmental, and geographic conditions in which people live and health disparities (Bleich, Thorpe, Sharif-Harris, Fesahazion, & LaVeist, 2010; Fang, Madhavan, Bosworth, & Alderman, 1998; Gaskin, Price, Brandon, & LaVeist, 2009; Kelley, Bowie, et al., 2016; LaVeist et al.,

2008; LaVeist, Thorpe, Galarraga, Bower, & Gary-Webb, 2009; Robert, 1998; Roux et al., 2001; Thorpe, Bell, et al., 2015; Thorpe, Bowie, Wilson-Frederick, Coa, & LaVeist, 2013; Thorpe, Kelley, et al., 2015; Thorpe, Kennedy-Hendricks, et al., 2015). Geographic characteristics are particularly important to examine when interpreting disparities in physical activity, as substantial residential segregation by race/ethnicity exists in the United States, which contributes to variation in access to health-promoting resources such as places to participate in physical activity (Headen, 2005; LaVeist, 2005; LaVeist, Gaskin, & Trujillo, 2011; Williams & Collins, 2001). Multiple studies have suggested that at the community level, minority men are more likely to live in neighborhoods with more limited access to resources that promote physical activity (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Taylor, Poston, Jones, & Kraft, 2006; Wilson, Kirtland, Ainsworth, & Addy, 2004).

Beyond the community level, there are likely to be regional variations in the social, political, and environmental forces that can influence physical activity, which has important implications for policy and programmatic interventions (Singh, Kogan, & van Dyck, 2008). Yet, research exploring the degree to which physical activity among men can vary by race and region is scarce. One study identified disparities in prevalence of leisure time physical activity by geographic region, but did not examine differences by race/ethnicity or gender (Reis et al., 2004). Another study also identified regional variation in physical activity and other healthy lifestyle behaviors, including nonsmoking, maintaining a healthy weight, and fruit/vegetable consumption but did not examine differences by race/ethnicity or gender (Troost, Rafferty, Luo, & Reeves, 2012). Another study identified regional differences in built environment and neighborhood walkability (K. E. King & Clarke, 2015), which are important determinants of physical activity but did not examine differences by race/ethnicity or gender. These regional differences in the built environment may contribute to regional variation in racial/ethnic disparities among men. Identifying subpopulations to target for preventive intervention must rely on a more nuanced understanding of the areas where disparities are most pronounced. Thus, the objective of this study was to examine whether the odds of engaging in sufficient physical activity to meet the 2008 Physical Activity Guidelines vary by geographic region and by race/ethnicity through an analysis of data drawn from a nationally representative sample of men in the United States.

Method

Data Description

This study utilized cross-sectional data from the National Health Interview Survey (NHIS), conducted annually by

Table 1. Regional Categorization of United States in the National Health Interview Survey, 2000 to 2010.

Region	States included
Northeast	Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont
Midwest	Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin
South	Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia
West	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming

the National Center for Health Statistics. The NHIS is a nationally representative sample of the United States noninstitutionalized population from all 50 states and the District of Columbia and oversamples blacks, Hispanics, and Asians. The survey covers demographic characteristics, health behaviors and conditions, functional limitations, cancer screening, and health care access and utilization. The use of sampling weights yielded representative population estimates and adjusts for nonresponse. Detailed information regarding NHIS is reported elsewhere (J. Pleis & Lucas, 2009; J. R. Pleis, Schiller, & Benson, 2003).

This study combines data from the 2000 to 2010 NHIS and no major changes to the questions used in this analysis were made during that time frame. Based on the information in the survey description documentation, this analysis accounted for the changes that occurred in questions related to smoking and drinking behaviors in 2004, changes to NHIS survey weights in 2006, and changes to income questions in 2007.

This study combines data from the 2000 to 2010 NHIS. Men who responded to questions regarding their race/ethnicity, geographic region in which they lived, height and weight, and physical activity behaviors and who were aged 18 and older were included in these analyses. The resulting analytic sample consisted of 327,556 male adults.

Measures

The primary outcome in this study was whether or not men had engaged in sufficient physical activity for health benefits through any means, including leisure time physical activity, walking for transportation, and occupational physical activity, as self-reported in the NHIS questionnaire. The 2008 Physical Activity Guidelines suggest that most health benefits occur with at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity physical activity; therefore, engaging in sufficient physical activity was defined as completing at least 150 minutes/week of moderate-intensity aerobic activity or its equivalent to meet the 2008 Physical Activity Guidelines

(Physical Activity Guidelines Advisory Committee, 2008).

Race/ethnicity and geographic region were the primary independent variables. The states in which men reported they lived were categorized into the regions Northeast, Midwest, South, and West. Table 1 displays this classification. Race/ethnicity was reported by men as either white, black/African American, Asian, and their ethnicity as Hispanic or not Hispanic. Race/ethnicity was then recoded as non-Hispanic white, non-Hispanic black, Hispanic, or Asian.

Covariates included age (years), married (1 = yes; 0 = no), body mass index (kg/m^2), smoking status (0 = never, 1 = any level of former smoking, 2 = any level of current smoking), drinking status (0 = never, 1 = any level of former drinking, 2 = any level of current drinking), income level (0 = <\$35,000, 1 = \$35,000-75,000, 2 = >\$75,000), and education level (0 = less than high school graduate; 1 = high school graduate/GED; 2 = more than high school graduate), and number of chronic conditions (0, 1, 2, 3+).

Statistical Analysis

Mean and proportional differences were calculated using analysis of variance and chi-square tests to examine demographic and health-related factors between men living in different regions of the United States. Logistic regressions were specified for the total sample and by geographic region to determine the age-adjusted proportions of health-related characteristics. Health-related characteristics were modeled as a function of geographic region after adjusting for age and survey year. Logistic regression models were used for multivariate analysis to examine the association among race/ethnicity, region, and physical activity, after adjusting for covariates described above and survey year. In the overall model comparing regions, an interaction term between race/ethnicity and region was included and identified as significant ($p < .001$). Analysis was therefore stratified by region and racial/ethnic differences in physical activity within each geographic region were examined. To account for the complex survey sampling design of

Table 2. Distribution of Select Demographic Characteristics of Men Aged 18 and Older by Geographic Region, National Health Interview Survey, 2000 to 2010.

	Geographic region					<i>p</i> Value
	Overall sample (<i>N</i> = 327,556)	Northeast (<i>N</i> = 56,092)	Midwest (<i>N</i> = 69,925)	South (<i>N</i> = 118,186)	West (<i>N</i> = 83,353)	
Age, mean ± SE	44.8 ± 0.1	46.1 ± 0.2	44.6 ± 0.2	44.6 ± 0.2	44.2 ± 0.2	<.001
Race (%)						
White	71.8	76.8	84.4	67.2	61.1	<.001
Black	10.6	8.8	8.0	17.1	4.1	.402
Hispanic	13.5	10.0	5.3	13.3	26.2	<.001
Asian	4.1	4.4	2.3	2.4	8.7	<.001
Married (%)	65.7	65.2	65.9	66.1	65.2	.844
Income (%)						
<\$35,000	27.3	23.5	26.3	30.6	26.0	<.001
\$35,000-\$75,000	29.5	27.1	31.4	29.7	29.2	.057
>\$75,000	20.0	22.7	20.2	17.8	21.0	<.001
Did not respond	23.2	26.7	22.2	21.9	23.8	<.001
Education level						
Less than high school graduate	16.7	14.0	13.0	19.3	18.9	<.001
High school graduate/GED	28.8	30.2	32.2	29.1	23.4	<.001
More than high school graduate	54.5	55.6	54.7	51.6	57.8	.542

Note. Mean and proportional differences were calculated using analysis of variance and chi-square tests.

NHIS and ensure correct standard errors, survey procedures were used in the statistical models. All *p* values <.05 were considered statistically significant and all tests were two-sided. All analyses were conducted using STATA 13 (StataCorp LP, 2013).

Results

The distribution of characteristics of men who participated in the 2000 to 2010 NHIS by region is provided in Table 2. Of the 327,556 male adults in the sample, 56,092 lived in the Northeast (17%), 69,925 lived in the Midwest (21%), 118,186 lived in the South (36%), and 83,353 lived in the West (25%). Additionally, of the men in the sample, 200,163 were non-Hispanic white (72%), 40,211 were non-Hispanic black (11%), 71,416 were Hispanic (14%), and 15,766 were non-Hispanic Asian (4%). The mean age for the sample was 44.8 years. In the sample, 66% of men were married, 27% had income below \$35,000, and 17% had less than a high school graduate degree. With respect to demographic variables, there were also differences by region. Men in the Northeast were older than men living in other regions. The largest proportion of white men lived in the Midwest, while the largest proportions of Hispanic and Asian men lived in the West. The largest proportion of men reporting incomes greater than \$75,000 was in the Northeast, while the largest proportion of men reporting incomes less than \$35,000 was in the South. The largest proportion of men reporting

that they had obtained less than their high school graduate degree/GED was in the South, while the largest proportion of men reporting that they had obtained their high school graduate degree/GED was in the Midwest. Across regions, there were similar proportions of men who reported being married, having annual household incomes ranging between \$35,000 and \$75,000, and having obtained more than a high school degree.

Table 3 provides the distribution of age-adjusted proportions for health-related characteristics overall and by region. In the total sample, 48% of men reported engaging in sufficient physical activity, 27% of men were obese, 51% had never smoked, and 16% had never drank alcohol. Overall, 71% of men reported that they had no chronic conditions. Across regions, there were similar proportions of men who reported engaging in sufficient physical activity, being overweight, and having chronic conditions. The largest proportion of obese men lived in the Northeast while the proportion of men of healthy weight status was largest among men in the West. The proportions of men who never smoked or formerly smoked were largest in the West, while the proportion of current smokers was largest in the Northeast. The proportion of current drinkers was largest among men in the Northeast, while the proportions of former drinkers and never drinkers were largest in the West.

When examining the relationship between region and engaging in sufficient physical activity, differences were observed. Compared to men living in the Northeast, men

Table 3. Age-Adjusted Distribution of Health Related Characteristics of Men Aged 18 and Older by Geographic Region, National Health Interview Survey, 2000 to 2010.

	Geographic region					<i>p</i> Value
	Overall sample (<i>N</i> = 327,556)	Northeast (<i>N</i> = 56,092)	Midwest (<i>N</i> = 69,925)	South (<i>N</i> = 118,186)	West (<i>N</i> = 83,353)	
Sufficient physical activity (%)	47.7	48.2	47.9	47.6	47.4	.287
Weight status (%)						
Underweight (BMI < 18.5)	9.1	9.1	9.1	9.1	9.1	.965
Normal (18.5 ≤ BMI < 25)	30.4	29.7	30.1	30.6	31.0	.011
Overweight (25 ≤ BMI < 30)	41.8	41.3	41.6	41.9	42.1	.081
Obese (BMI ≥ 30)	26.5	27.7	27.0	26.3	25.6	<.001
Smoking status (%)						
Never	51.0	48.8	50.1	51.4	52.7	<.001
Former	22.2	23.1	22.6	22.1	21.6	<.001
Current	23.3	24.6	23.8	23.1	22.4	<.001
Drinking status (%)						
Never	16.1	13.0	14.7	16.7	18.8	<.001
Former	12.8	11.8	12.4	13.0	13.6	<.001
Current	69.3	73.6	71.1	68.5	65.8	<.001
Number of chronic conditions						
None (%)	70.5	70.3	70.4	70.6	70.7	.481
One (%)	19.6	19.9	19.7	19.5	19.3	.185
Two (%)	5.0	5.0	5.0	5.0	5.1	.531
Three or More (%)	2.4	2.3	2.4	2.4	2.4	.705

Note. BMI = body mass index. Logistic regressions were specified for the total sample and by geographic region to ascertain differences in age-adjusted proportions of health-related characteristics.

living in the West had greater odds of engaging in sufficient physical activity (odds ratio [OR] = 1.12, 95% confidence interval [CI; 1.04, 1.20]), men living in the Midwest had lower odds of engaging in sufficient physical activity (OR = 0.86, 95% CI [0.81, 0.92]), and men living in the South also had lower odds of engaging in sufficient physical activity (OR = 0.83, 95% CI [0.78, 0.89]) after adjusting for age, marital status, income, education, smoking and drinking status, chronic conditions, and race/ethnicity (data not displayed).

Table 4 reports the association between race, region, and odds of achieving the 2008 Guidelines for Physical Activity. Within every region, Hispanic and Asian men had lower odds of meeting federal recommendations for physical activity compared to men. Within the Northeast, South, and West, black men had lower odds of meeting federal recommendations for physical activity compared to white men. Within the Midwest, black men and white men had similar odds of meeting the federal recommendations for physical activity.

Discussion

The objective of this study was to determine whether the odds of engaging in sufficient physical activity among men in the United States, as defined by meeting the 2008

Guidelines, vary by geographic region and by race/ethnicity. The key findings indicate that the odds of engaging in sufficient physical activity among men differ significantly between geographic regions and within regions by race/ethnicity. Compared to men living in the Northeast, men living in the West had greater odds of engaging in sufficient physical activity, while men living in the Midwest and South had lower odds of engaging in sufficient physical activity after adjusting for age, marital status, income, education, smoking and drinking status, chronic conditions, and race/ethnicity. In examining differences in odds of engaging in sufficient physical activity within regions between men of different races/ethnicities, black men have lower odds of engaging in sufficient physical activity than white men in the South and West, while Hispanic men have lower odds of engaging in sufficient physical activity in the South, West, and Northeast. Asian men have lower odds of engaging in sufficient physical activity than white men in all regions.

The findings presented in this study that indicate regional variation in physical activity are consistent with those presented in other studies, which have identified higher prevalence of physical activity in the West and lower prevalence in the South, but which did not present results separately by gender or race/ethnicity (Reis et al., 2004; Troost et al., 2012). To the authors' knowledge, this

Table 4. Association Between Race/Ethnicity and Odds of Achieving 2008 Guidelines for Physical Activity Guidelines Within Geographic Region Among Men Aged 18 and Older, National Health Interview Survey, 2000 to 2010.

	Odds ratio (95% confidence interval)			
	Northeast	Midwest	South	West
White	Reference	Reference	Reference	Reference
Black	0.82 [0.72, 0.92]	0.87 [0.76, 1.00]	0.92 [0.86, 0.99]	0.83 [0.72, 0.96]
Hispanic	0.58 [0.52, 0.66]	0.90 [0.78, 1.03]	0.83 [0.77, 0.90]	0.66 [0.60, 0.72]
Asian	0.44 [0.37, 0.53]	0.73 [0.58, 0.91]	0.72 [0.62, 0.84]	0.70 [0.62, 0.79]

Note. Models included race, survey year, age, marital status, insurance status, household income, education level, body mass index, smoking and drinking status, and number of chronic conditions. Within each region, white men were the reference group against which men of other races/ethnicities are compared.

is the first study that has examined differences in physical activity among men by region and by race/ethnicity. Ultimately, these results suggest that there may be significant differences in physical activity behaviors between regions within the United States, and that those differences also vary by race/ethnicity.

Although few studies have examined regional differences in racial/ethnic disparities in physical activity, studies assessing community-level factors that affect physical activity provide insight into why disparities in physical activity may vary by region. Multiple studies have suggested that important determinants of physical activity vary by region, such as socioeconomic factors, including median household income, education, and racial makeup of neighborhoods, as well as environmental factors, such as community walkability and access to physical-activity promoting facilities (Reis et al., 2004; Troost et al., 2012). Studies have suggested that minority men more often live in places where they have less access to physical-activity-promoting resources, as compared to white men, which may contribute to racial/ethnic disparities in physical activity among men (Estabrooks, Lee, & Gyurcsik, 2003; Powell, Slater, Chaloupka, & Harper, 2006). The findings presented in this study suggest that beyond this, there are regional differences in the extent to which racial/ethnic disparities in physical activity exist among men.

What remains most unclear is what drives these inter-region differences in disparities in physical activity among men. For example, this analysis suggests that black men in the South and West are less likely than white men in those regions to engage in sufficient physical activity. One explanation for this difference is that educational attainment and socioeconomic status, which are important correlates of physical activity behaviors, are lower in the South for black men compared to their white counterparts (Gillum & Ingram, 1996; MacDonald & Turner, 2015; Reis et al., 2004). Thus, the lower socioeconomic status of black men in the South and West regions may play a role in regional disparities in physical activity levels identified in this study. Little is known, however, about what is different

about the Midwest, where white, black, and Hispanic men all have similar odds of engaging in sufficient physical activity, or why Asian men have lower odds of engaging in physical activity relative to white men in all regions of the United States. Investigating the interplay of these factors and how they contribute to regional and racial/ethnic variation in physical activity is an important area for future research.

There are several limitations of this study that may affect interpretations. First, NHIS is a cross-sectional survey and thus, causal inferences cannot be made. Furthermore, because NHIS relies on self-reported data, the covariates in our models and levels of physical activity may include some bias, which may vary by region and/or by race/ethnicity (Le et al., 2014). In addition, the federal guidelines for physical activity include only leisure time physical activity and excludes forms of work-related physical activity; this may contribute to lower reports of physical activity for men of lower socioeconomic status who are in blue-collar occupations, which may vary by region and race/ethnicity (Marshall et al., 2007; Sallis & Saelens, 2000). Another limitation of this study is that it did not account for whether men lived in rural versus urban areas, which may vary by region and would likely affect levels of physical activity among men (Reis et al., 2004; Zhang et al., 2014).

Despite these limitations, there are several strengths associated with this study. First, this study's focus on men enabled the authors to examine the relationship of geographic region and physical activity in an understudied and important population and add to the growing body of literature. Additionally, this study accounted for a wide array of upstream social determinants of physical activity, such as income level and educational attainment in all regions in the United States across men of various races/ethnicities. Furthermore, this study used 11 years of NHIS data, which afforded a large sample size with ample statistical power.

Physical activity behaviors are influenced by a complex interaction of policy, environmental, intrapersonal,

and interpersonal factors (Reis et al., 2004). Thus, to promote increased physical activity at a population level, strategies must target improvements to the social and physical environmental contexts for physical activity (Kumanyika et al., 2008). In documenting the regional and racial/ethnic variations in physical activity among men, the findings of this study contribute to a more nuanced understanding of the inter- and intraregional forces that may contribute to disparities in physical activity. In addition, identifying the areas where degree of disparity is highest can be used to inform resource allocation for the implementation of interventions to increase physical activity among men in high-risk geographic areas and of certain racial/ethnic backgrounds. Future research should aim to provide further exploration of how historical, social, political, and environmental contribute to disparities in physical activity among men at the inter- and intraregional levels.

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