Racial/Ethnic Disparities and Determinants of Sufficient Physical Activity Levels

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ABSTRACT

Introduction. Adequate physical activity is an integral requirement for achieving cardiovascular health. Physical inactivity is the fourth leading cause of death worldwide. Hence, it is important to identify racial/ethnic groups that are less likely to achieve sufficient physical activity levels, and to address barriers to meeting physical activity requirements.

Methods. Cross-sectional data from the 2006-2015 National Health Interview Survey (NHIS) were used to compare self-reported sufficient physical activity among different racial/ethnic groups: non-Hispanic (NH) Whites, NH Blacks, NH Asians, and Hispanics in the United States. Sufficient physical activity was defined as ≥ 150 minutes per week of moderate-intensity physical activity, ≥ 75 minutes per week of vigorous-intensity physical activity, or ≥ 150 minutes per week of moderate and vigorous physical activity.

Results. The study sample consisted of 296,802 individuals, mean age ± standard error age 46.4 ± 0.10 years, 52% women, 70% NH White, 12% NH Black, 5% NH Asian, and 14% Hispanic. The prevalence of sufficient physical activity in the overall population was 46%, while it was 48% among NH Whites, 39% among NH Blacks, 45% among NH Asians, and 40% among Hispanics. In multivariable-adjusted models (odds ratio; 95% confidence interval), NH Blacks (0.79; 0.64,0.97), NH Asians (0.72; 0.62,0.85) and Hispanics (0.71; 0.61,0.82) were significantly less likely to engage in sufficient physical activity compared with NH Whites. Older age, women, and low income were inversely associated with sufficient physical activity, while a college education or higher was associated directly with it.

Conclusions. NH Black and Asian Americans and Hispanic adults were less likely to engage in sufficient physical activity levels compared with Whites. It is important to address barriers to meeting physical activity thresholds to help achieve optimal cardiovascular health.
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INTRODUCTION

There are well known racial/ethnic disparities in cardiovascular disease and cardiovascular risk factors.[1] Adequate physical activity is an integral requirement for achieving cardiovascular health[2,3] and physical inactivity is the fourth leading cause of death worldwide.[4] Hence, it is important to identify racial/ethnic groups that are less likely to achieve sufficient physical activity levels, and to address barriers to meeting physical activity requirements, especially among those with atherosclerotic cardiovascular disease (ASCVD).

A prior study showed that Blacks had a higher odds of physical inactivity compared with Whites even after adjusting for socioeconomic status.[5] However, these results were derived from a relatively small sample size in Baltimore. A study from the 2003-2005 National Health Interview Survey (NHIS) found that Asian Indians were less likely to be physically active compared with Whites, though this did not adjust for acculturation.[6] Another study from the 1998-2008 NHIS using age-adjusted prevalence estimates found that Hispanics were less likely to meet physical activity recommendations compared with Whites, though they did not account for other potential confounders in the association with physical activity.[7]

Herein, racial/ethnic differences in physical activity levels were examined in a more contemporary cohort, attempting to identify sociodemographic and cardiovascular risk factors that were associated with sufficient physical activity.

METHODS

Data were obtained from the 2006-2015 NHIS, a nationally representative health survey that has been conducted continuously since 1957 by the National Center for Health Statistics of the Centers for Disease Control and Prevention.[8] Detailed information on the survey design and methods can be found online: http://www.cdc.gov/nchs/nhis.html. The study was exempt from Institutional Review Board approval since it utilized deidentified data from a publicly available dataset.

All variables were self-reported. Sufficient physical activity was defined according to the 2019 American College of Cardiology/American Heart Association primary prevention of cardiovascular disease guideline as ≥ 150 minutes per week of moderate-intensity physical activity, or ≥ 75 minutes per week of vigorous-intensity physical activity, or ≥ 150 minutes per week of moderate and vigorous physical activity.[2] Race was reported as either White, Black, Asian, or Other, while ethnicity was classified as Hispanic versus non-Hispanic (NH). Race/ethnicity, therefore, was categorized as NH Whites, NH Blacks, NH

Asians, Hispanics, and Other. Asian race was classified further in NHIS as Chinese, Filipinos, and Asian Indians. Participants who identified as Japanese, Vietnamese, Korean, or other Asian subgroups were classified as "Other Asians".

ASCVD was defined as coronary artery disease (history of coronary heart disease, heart attack, or angina pectoris) or stroke (NHIS questionnaire did not have information on type of stroke). Cardiovascular risk factor burden in each participant was calculated as a cumulative cardiovascular risk factor score (0 to 4) based on the presence of hypertension, diabetes mellitus, current cigarette smoking, or hyperlipidemia. U.S. birth was classified as U.S. born versus foreign born. Time spent in the U.S. was categorized as < 10 versus ≥ 10 years.[9]

Study sample characteristics were summarized using mean (standard error) and numbers (weighted percentages) and compared by whether study participants engaged in sufficient physical activity. Study characteristics were stratified further by race/ethnicity.

Logistic regression models were used to study the association of race/ethnicity (NH White as reference group consistent with prior reports from NHIS[6,7]) and sufficient physical activity both in the overall study sample and restricting to individuals with prior ASCVD. Models were adjusted for age, gender, income, education, duration of time spent in the U.S., and cardiovascular risk factor score. To evaluate the determinants of sufficient physical activity in each racial/ethnic group, multivariable adjusted models were used to evaluate the association between each of age, gender, income, education, duration of time spent in the U.S., and cardiovascular risk factor score and sufficient physical activity stratifying by race/ethnicity.

To ascertain differences among NH Asians subgroups, multivariable-adjusted logistic regression models as above were used to study the association of Asian ethnic groups and sufficient physical activity (Chinese as reference given that they have a lower cardiovascular risk factor profile compared with other Asian groups[10]).

All analyses were conducted using Stata version 16.1 (StataCorp, College Station, Texas). A p value < 0.05 was considered statistically significant.

RESULTS

The study sample consisted of 296,802 individuals, mean age ± standard error 46.4 ± 0.10 years, 52% women, 70% NH White, 12% NH Black, 5% NH Asian, 14% Hispanic, and 1% Other. The prevalence of sufficient physical activity in the overall population was 46%, while it was 48% among NH Whites, 39% among NH Blacks, 45% among NH Asians, 40% among Hispanics, and 46% in other racial/ethnic groups (Table 1).

Compared with participants who did not engage in sufficient physical activity, those who did were younger (43 vs. 49 years), more likely to be men (58% vs. 42%), more likely to have college education or higher (54% vs. 46%), and have an annual income > $25,000 (65% vs. 35%). They were less likely to have spent greater than 10 years in the U.S. (40% vs. 60%), or have cardiovascular risk factors including current smoking (39% vs. 61%) diabetes (30% vs. 70%), hypertension (36% vs. 64%), hyperlipidemia (41% vs. 59%), and ASCVD (28% vs. 72%); all p < 0.001 (Table 2). Study characteristics stratified by race/ethnicity are displayed in the Table 1. The prevalence of current smoking was highest among NH Whites and Blacks, and diabetes was most prevalent among NH Asians. Hypertension was most prevalent among NH Blacks, and hyperlipidemia, coronary artery disease, and stroke were most prevalent among NH Whites; all p < 0.001.

Table 1. Baseline characteristics of the study sample stratified by race/ethnicity.*

	NH White (n = 179,239)	NH Black (n = 45,061)	NH Asian (n = 17,318)	Hispanic (n = 51,732)	Other (n = 3,452)	p Value
Age, years	48.4 ± 0.1	43.6 ± 0.2	44.0 ± 0.2	40.3 ± 0.1	42.3 ± 0.4	< 0.001
Women	97,738 (52%)	27,356 (55%)	9,269 (53%)	28,655 (49%)	1,940 (53%)	< 0.001
College education or higher	113,090 (63%)	22,713 (52%)	12,569 (74%)	18,353 (37%)	1,874 (53%)	< 0.001
Annual income > $75,0000	15,199 (16%)	1,550 (7%)	1,906 (23%)	1,487 (6%)	151 (9%)	< 0.001
Greater than 10 years in U.S.	6,755 (81%)	3,237 (72%)	8,835 (72%)	21,784 (76%)	186 (74%)	< 0.001
Sufficient physical activity	85,005 (48%)	16,446 (39%)	7,997 (45%)	19,777 (40%)	1,589 (40%)	< 0.001
Current smoking	36,130 (20%)	9,209 (20%)	1,813 (10%)	6,908 (13%)	976 (27%)	< 0.001
Diabetes	16,141 (8%)	6,242 (12%)	1,358 (8%)	5,221 (9%)	464 (14%)	< 0.001
Hypertension	59,572 (31%)	19,070 (37%)	4,029 (22%)	11,875 (21%)	1,159 (32%)	< 0.001
Hyperlipidemia	24,402 (29%)	4,793 (22%)	1,819 (24%)	4,600 (20%)	394 (23%)	< 0.001
Coronary artery disease	14,724 (7%)	3,104 (6%)	659 (3%)	2,344 (4%)	257 (7%)	< 0.001
Stroke	5,846 (3%)	2,020 (4%)	291 (2%)	1,052 (2%)	126 (3%)	< 0.001
ASCVD	18,081 (9%)	4,349 (8%)	821 (4%)	2,956 (5%)	337 (9%)	< 0.001

*Continuous variables are presented as mean ± standard error and categorical variables are presented as count (weighted row percentages). Abbreviations: NH (non-Hispanic), ASCVD (atherosclerotic cardiovascular disease).

Table 2. Baseline characteristics of the study sample stratified by sufficient physical activity.*

	Insufficient Physical Activity (n = 165,988; 54%)	Sufficient Physical Activity (n = 130,814; 46%)	Overall (n = 296,802)	p Value
Age	49.0 ± 0.1	43.3 ± 0.1	46.4 ± 0.1	< 0.001
Women	98,273 (58%)	66,685 (42%)	164,958	< 0.001
Race				< 0.001
NH White	94,234 (52%)	85,005 (48%)	179,239	
NH Black	28,615 (61%)	16,446 (39%)	45,061	
NH Asian	9,321 (55%)	7,997 (45%)	17,318	
Hispanics	31,955 (60%)	19,777 (40%)	51,732	
Other	1,863 (54%)	1,589 (46%)	3,452	
College education or higher	78,462 (46%)	90,137 (54%)	168,599	< 0.001
Annual income > $75,0000	6,984 (35%)	13,309 (65%)	20,293	< 0.001
Greater than 10 years in U.S.	24,896 (60%)	15,901 (40%)	40,797	0.03
Current smoking	33,911 (61%)	21,125 (39%)	55,036	< 0.001
Diabetes	21,139 (70%)	8,287 (30%)	29,426	< 0.001
Hypertension	62,772 (64%)	32,933 (36%)	95,705	< 0.001
Hyperlipidemia	21,991 (59%)	14,017 (41%)	36,008	< 0.001
Coronary artery disease	15,422 (71%)	5,666 (29%)	21,088	< 0.001
Stroke	7,277 (77%)	2,058 (23%)	9,335	< 0.001
ASCVD	19,523 (72%)	7,021 (28%)	26,544	< 0.001

*Continuous variables are presented as mean ± standard error and categorical variables are presented as count (weighted row percentages) Abbreviations: NH (non-Hispanic), ASCVD (atherosclerotic cardiovascular disease).

Table 3. Multivariable-adjusted[ǀ] odds ratio (95% confidence interval) for the association of risk factors and sufficient physical activity by race/ethnicity.*

	NH White (n = 179,239)	NH Black (n = 45,061)	NH Asian (n = 17,318)	Hispanic (n = 51,732)	Other (n = 3,452)
Age, years	**0.984 (0.975,0.995)**	**0.980 (0.966,0.994)**	0.991 (0.981,1.001)	**0.982 (0.976,0.988)**	0.932 (0.857,1.012)
Women	0.88 (0.68,1.14)	**0.51 (0.35,0.73)**	**0.77 (0.64,0.92)**	0.87 (0.75,1.00)	0.75 (0.17,3.35)
College education or higher	**2.04 (1.48,2.82)**	**2.00 (1.40,2.85)**	**2.20 (1.69,2.87)**	**1.93 (1.65,2.26)**	2.37 (0.37,15.25)
Annual Income					
< $25,000	**0.63 (0.44,0.89)**	0.91 (0.47,1.73)	**0.69 (0.52,0.92)**	**0.44 (0.29,0.65)**	0.22 (0.01,5.89)
$25,000-$45,000	**0.48 (0.34,0.67)**	0.89 (0.47,1.68)	0.82 (0.63,1.08)	**0.50 (0.34,0.75)**	1.11 (0.01,147.0)
$45,000-$75,000	**0.71 (0.53,0.95)**	1.10 (0.54,2,23)	0.82 (0.61,1.10)	0.80 (0.52,1.22)	0.34 (0.01,12.19)
> $75,000	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Greater than 10 years in the U.S.	1.14 (0.80,1.63)	1.04 (0.71,1.55)	**1.42 (1.08,1.87)**	1.16 (0.97,1.38)	3.63 (0.41,32.50)
Cardiovascular risk factor score**	1.09 (0.97,3.01)	1.01 (0.60,5.09)	1.04 (0.93,1.17)	0.96 (0.89,1.03)	1.09 (0.37,3.22)

ǀThe above covariates were all present in the adjusted model.
*Abbreviations: NH (non-Hispanic). Bold items have significant p value.
**Cardiovascular risk factor burden score was based on the presence of hypertension, diabetes mellitus, current cigarette smoking, and hyperlipidemia and ranged from 0 to 4

In multivariable-adjusted models (odds ratio; 95% confidence interval), NH Blacks (0.79; 0.64,0.97), NH Asians (0.72; 0.62,0.85) and Hispanics (0.71; 0.61,0.82) were significantly less likely to engage in sufficient physical activity compared with NH Whites (Table 3). There were no significant racial/ethnic differences among those with ASCVD (results not shown).

Older age was inversely associated with sufficient physical activity among NH Whites and Blacks and Hispanic adults. NH Black and NH Asian women were less likely to engage in sufficient physical activity compared with men. A college education or higher was associated with higher likelihood of sufficient physical activity in all racial/ethnic group except in the "Other" group. Low annual income was associated inversely with sufficient physical activity except among NH Blacks and "Other" groups. There was a statistically significant association between living longer than 10 years in the U.S. and sufficient physical activity only among NH Asians (1.42; 1.08,1.87; Table 3).

Among NH Asians, 21% were Asian Indians, 20% were Chinese, 23% were Filipinos, and 36% were of another Asian ethnicity. In multivariable-adjusted models restricting to NH Asian individuals, there were no significant differences in odds of sufficient physical activity in Asian ethnic groups compared with Chinese (results not shown).

DISCUSSION

In a contemporary and representative sample of U.S. individuals (the majority of whom were NH White), less than half of U.S. adults engaged in sufficient physical activity. NH Black, NH Asian, and Hispanic adults were less likely to engage in sufficient physical activity compared with NH Whites. These differences persisted after adjusting for sociodemographic factors and cardiovascular risk factor burden. Older individuals, women, and those with low income were less likely to engage in sufficient physical activity levels, while educated individuals were more likely to be physically active.

The present study found that less than half of U.S. adults engage in sufficient physical activity. This was more pronounced among racial/ethnic minority groups including NH Blacks, Asians, and Hispanics who have a high burden of cardiovascular risk factors and ASCVD.[1] There were no significant differences in physical activity levels among those with ASCVD, though this analysis was likely underpowered. In addition to establishing clear guidance on physical activity thresholds that are necessary to achieve optimal cardiovascular health, it also was important to account for racial disparities and other barriers to achieving sufficient physical activity. Physical activity guidelines should acknowledge these cultural and socioeconomic factors in making their physical activity recommendations.

Physical activity should be addressed at each outpatient visit and adherence to activity recommendations should be reinforced for prevention of ASCVD. Clinicians and other healthcare providers also should consider tailoring their health recommendations to each patient's unique culture and their prevailing socioeconomic conditions. This will require training in culture-specific care where healthcare rec-

ommendations are delivered in a manner that is congruent with the values and lifestyles of a patient's specific culture. Prior research has shown the utility of a patient-centered culturally sensitive health care model for improving health care among ethnically diverse patients.[11] This may be especially important for recommendations pertaining to lifestyle habits such as diet, exercise, physical activity, tobacco, and alcohol intake.

Ethnic-specific research on values and preferences regarding lifestyle can inform culturally-sensitive recommendations. For example, a prior study of physical activity among South Asians in Scotland found that men were more likely to go to the gym and play football while women were more likely to walk and swim.[12] Both groups reported external motivators for taking part in physical activity such as social activity, enjoyment, weight reduction, and improving physical and mental health. Few respondents reported undertaking in physical activity for its own sake. Understanding which forms of physical activity are popular in a patient's culture and what are the barriers and motivators for physical activity will help patients be more engaged and adhere to lifestyle recommendations.

The South Asian heart lifestyle intervention (SAHELI) pilot study[13] and South Asians Active Together (SAATH; NCT04400253) trial were designed as culturally-targeted, community-based lifestyle intervention to improve physical activity and other lifestyle habits among South Asians. For example, South Asian women previously cited concerns about modesty gender norms, and lack of role models as reasons for not exercising. Therefore, men and women in SAHELI will exercise separately and participate in culturally-tailored exercise activities. Similarly, a randomized trial showed the effectiveness of pharmacist-led interventions among barbershop Black male patrons for reducing blood pressures in those with uncontrolled hypertension.[14]

The present analysis found that NH Black adults were less likely to engage in sufficient physical activity compared with NH Whites even after adjusting for income. A prior study found that Black individuals tended to be more physically inactive than Whites, but when adjusted for socioeconomic status, this difference was small.[5] However, that study was done in one low-income suburb in southwest Baltimore and cannot be extrapolated to a national level, as other studies have shown that physical activity varies significantly by geographical location.[15] In a prior study from NHIS, Black women were less likely to report physical activity compared with White women.[16] Black individuals may be more likely to work during non-conventional work hours and have less time to exercise or engage in physical activity.[17] Access to neighborhood greenspace and walkability, and crime also were potential contributors.[18]

Ye et al.[6] found that among Asian ethnic groups, only Asian Indians were more likely to report physical inactivity compared with Whites. In our study, all Asian American individuals were less likely to report sufficient physical activity compared to White Americans. There were no significant differences in physical activity comparing Asian ethnic groups to Chinese in the present study. Differences in physical activity among Asian Americans may be driven in part by acculturation, social and cultural norms, rigid gender roles, and difficulty defining mainstream approaches to physical activity.[19] In the present study, Asian Americans who lived in the U.S. longer than 10 years were more

likely to engage in sufficient physical activity. A previous study found similar results showing increased physical activity levels amongst third-generation Asian immigrants compared with their first-generation counterparts.[20] This could be due to an increased percentage of English speakers with each generation resulting in greater exposure to information and American social norms that promote physical activity.

In the current study, Hispanic adults were less likely to engage in sufficient physical activity compared with Whites. In a prior study from NHIS, Hispanic women were less active compared with White women.[16] In another study of Hispanic adults from South Texas, both Hispanic men and women were less likely to engage in physical activity compared with their NH White counterparts.[21] The most frequently reported barriers included "lack of time", feeling "very tired", and "lack of self-discipline" to exercise. Latino communities tended to live in areas with fewer parks, less access to recreational facilities, unsafe infrastructure, and higher crime rates.[22] Physical activity levels among Hispanic adults also were heterogenous depending on country of origin.[23]

By examining potential barriers and facilitators of physical activity, data from this study can inform large scale public, economic, and healthcare policy and guidelines to increase physical activity levels. Improving pedestrian infrastructure can be achieved by creating bicycle lanes, landscaping, pedestrian overpass or underpass, sidewalks, trails, or shared-use paths, and importantly signage to improve pedestrian safety. Subsidizing gym memberships may incentivize people to join the gym. Workplace wellness initiatives through tax credits and grants also can encourage physical activity to, from, and at the workplace.[24,25] Health insurance plans and employers may offer cash incentives to individuals who are physically active. Offering wearable fitness trackers also may help individuals meet their physical activity targets.[26]

The present results should be interpreted in the context of important limitations. All our variables were self-reported and may be prone to measurement error and recall bias. However, previous studies have shown that there was a high concordance between self-reported and objectively measured physical fitness.[27] There was no information on risk factors control. Small sample size likely underpowered our analysis to detect significant differences among those with prior ASCVD. As in any observational study, residual confounding may exist despite multivariable adjustment.

In conclusion, NH Black and Asian Americans and Hispanic adults were less likely to engage in sufficient physical activity levels compared with Whites. It is important to address barriers to meeting physical activity thresholds to help achieve optimal cardiovascular health.

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