

RACIAL/ETHNIC DISPARITY AND PREDICTORS OF LEISURE-TIME PHYSICAL ACTIVITY AMONG US MEN

Objectives: To examine racial/ethnic disparity in and predictors of leisure-time physical activity (LTPA) among men.

Methods: We used the National Health Interview Surveys (NHIS) 1999–2000 data, a multistage probability sampling design producing a US representative sample of 23,459 adult males. Data were analyzed using multinomial logistic regression.

Results: The likelihood of engaging in irregular or regular LTPA was associated with younger age, being unmarried, lower household sizes, higher levels of education and income, home ownership, US citizenship, perceived better health status, contact with a health professional within a year, being a non-smoker, living in the West, and residing in a midsize metropolitan statistical area. Hispanics were significantly less likely to engage in regular LTPA than Whites and higher percentages of Hispanics were physically inactive in almost all age and education groups when compared to other races. Disparity between Whites and Blacks was less pronounced. Non-citizen Hispanics were twice as likely to be inactive than citizens and White non-citizens were 40% more likely to be inactive than citizens. Conversely, Black citizens were 20% more likely to be inactive than non-citizens.

Conclusions: Racial/ethnic disparities exist after accounting for socio-demographic characteristics. Not being a citizen exacerbates the disparity between Hispanic and White men. While disparity did exist between Black and White men, this gap was not as large as between Hispanic and White men. Health-seeking behaviors, such as contact with a health professional and non-smoking status are modifiable and influence men of all racial and ethnic backgrounds to engage in LTPA. (*Ethn Dis*. 2005;15:40–52)

Key Words: Health Disparity, Leisure-Time Physical Activity, Race Ethnicity, Socioeconomics

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INTRODUCTION

Regular leisure-time physical activity (LTPA) is recommended for children and adults alike. The health benefits derived from exercise are well documented. Furthermore, morbidity and mortality are inversely associated with LTPA. A large body of literature documented that regular physical activity extends longevity,^{1–9} improves quality of life by reducing disease burden,^{10–16} and promotes psychological health.^{9,17–23} Moreover, a great number of lives and substantial sums of money could be saved with increased physical activity.^{24,25}

Despite all these benefits, 35.4% of US men remain inactive and only 24.1% are involved in regular physical activity.²⁶ Regular exercise is so important that *Healthy People 2010*²⁷ includes regular physical activity as a leading national health indicator. *Healthy People 2010* aims to increase overall participation in physical activity and reduce health disparities across socio-demographic groups. Its goal is to reduce the proportion of adults who engage in no LTPA to 20%, from a baseline rate of 40% in 1997, and it recommends adults to engage in moderate-intensity physical activities for at least 30 minutes, five or more days of the week.^{27,28}

In order to achieve this goal, we need to better understand the predictors and correlates of regular physical activity.

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More often than not, studies of LTPA use a small number of factors for predictive modeling. This may be due to insufficient sample size resulting in limited statistical power. Also, when data are gathered using non-probabilistic sampling and when samples are drawn from small geographic areas, generalizing findings to a larger population is difficult. To fill this gap, we used the latest NHIS data (1999–2000) from a nationally representative sample. The analysis used in our study is comprehensive because in addition to commonly used variables, we examined the association of LTPA with race and ethnicity, US citizenship, geographic residence, place of residence, and home ownership in a multinomial logistic regression while accounting for standard variables in the model. This allowed us to estimate the net contributions of these independent variables predicting LTPA.

The purpose of this paper is to describe the relatively large number of predictors of LTPA and to examine racial/ethnic disparities. We have tested these associations in US men using national level, population-based surveys. We believe that the findings of this study will be useful to the design and implementation of programs aimed at improving LTPA with special attention given to racial and ethnic disparities.

METHODS

Data Source

We used pooled data from the National Health Interview Surveys (NHIS) 1999 and 2000. The study design and questions were identical for both years. The NHIS is a nationally representative

*35.4% of US men remain inactive and only 24.1% are involved in regular physical activity.*²⁶

household survey using a complex, multistage probability sampling design to choose respondents from the civilian, non-institutionalized population of the United States. Basic health and demographic information was collected on all household members. Data were gathered from one randomly selected adult per household through a personal interview by a trained census interviewer. The NHIS method and design have been described in detail elsewhere.²⁶ To adjust and account for the complex survey design effect, the Taylor Series Linearization technique was applied using STATA.²⁹ The final sample with complete data for statistical modeling is 23,459 US men.

Measurement of Leisure-Time Physical Activity (LTPA)

Our measure of LTPA was derived from several questions regarding the type and frequency-duration of the participation in light-moderate and/or vigorous activities. The respondents were asked how often they did a particular type of activity in terms of frequency and units of time per day or week or year. The subjects were also asked about the duration of the activity, each time specifying the previous two weeks. Types of LTPA include light-moderate activity that causes light sweating or a light-to-moderate increase in breathing or heart rate and vigorous activity that causes heavy sweating or large increase in breathing or heart rate. Respondents could have reported engaging in only light-moderate activity, only vigorous activity, both types of activity, or neither type. These categories were adopted from the NCHS national report.²⁶

Frequency-duration of LTPA status is divided into three categories: 1) inactive, 2) active-irregular (active but not regular) and 3) active-regular. Individuals were classified as inactive if they did not engage in any light-moderate or vigorous LTPA for as long as ten minutes at a time. Individuals were classified as active if they engaged in any light-moderate or vigorous LTPA for at least 10 minutes per session. Individuals classified as active were categorized further as active-irregular and active-regular. Regular LTPA combines frequency and duration for light-moderate and vigorous activity. Regular light-moderate activity was defined as engaging in light-moderate activity five times or more per week for at least 30 minutes at a time. Regular vigorous activity was defined as engaging in vigorous activity for three times or more per week for at least 20 minutes each time. Active-regular was defined as meeting either or both activity levels. Individuals identified as active but not meeting either criterion for regular activity were considered active-irregular. In this study, those identified as active-regular engaged in vigorous activities an average 4.5 times per week, while those considered active-irregular did so only 1.2 times per week. Active-regular men engaged in light-to-moderate activity 4.7 times per week, while active-irregular men did so 3.1 times per week.

Individuals reporting a physical inability to participate in vigorous or light-moderate activities were excluded except as follows: a respondent who reported that he was unable to participate in vigorous activity but did not report being unable to participate in light-moderate activity was included, whereas six respondents reported being unable to participate in light-moderate activity but also provided contradictory information regarding vigorous activity and were excluded. Also excluded were those who provided answers of "refused," "unascertained," "don't know," or "unknown."

Independent Variables

We examined standard factors associated with adopting and maintaining a physically active lifestyle, including socioeconomic status, demographic factors, health status and behavioral factors such as smoking and contact with the medical profession. Factors capturing the demographic and socioeconomic status of a respondent include age, race/ethnicity, marital status, level of education, family income, and family size. We also included citizenship, home ownership, and region and size of the metropolitan statistical area in which the individual resides for exploratory purposes.

Race/ethnicity was divided into four groups: Hispanic, non-Hispanic White (White), non-Hispanic Black (Black), and other. Data for persons of other races are not described separately because of less stable estimates generated from small sample sizes. Citizenship was used as a proxy for acculturation to discern differences between recent immigrants and those who were either born in the United States or became naturalized citizens, which requires US residence for at least five years.

Marital status is dichotomized (1=married; 0=other). This procedure is in accordance with previous literature that discern differences between married and non-married groups in terms of physical activity^{30,31} and mortality.³² Further, since this is a population-based study, we are also reflecting the overall profile of the US population. According to the 2000 US Census, 54.4% of the US population was married, with the remainder in a variety of categories such as single, widowed, separated, divorced, partnered, or co-habiting. These categories are more diffuse and increasingly more difficult to measure. One study suggests that living with another person is more important than marital status to explain the variation in mortality.³²

Most of the variable categorizations were done in accordance with the NCHS report on LTPA²⁶ or based on

rates which were similar among adjacent categories. Education was categorized into five groups: less than high school graduate, high school graduate, some college/associate's degree, college graduate, and post-graduate education. Detailed groupings for household income were mostly missing; however, when the question was posed by the reviewer as a dichotomous variable ($\leq \$20,000$ or $> \$20,000$), the response rate was 100% in our sample, therefore we used the dichotomous variable. Home ownership was also a dichotomous variable and was chosen as a proxy for wealth.

Differences in geographic region and place of residence were also considered. Region of residence was divided into four areas: Northeast, Midwest, South, and West. The size of the respondent's place of residence was also divided into three categories: 1) metropolitan statistical area (MSA) ≥ 5 million; 2) MSA 2.5–4.99 million; and 3) MSA < 2.5 million (including non-MSA).

Since we were analyzing participation in LTPA, we controlled for variables that can confound LTPA. These were perceived health status, body mass index (BMI), and availability of leisure time. Perceived health status was measured as excellent, very good, good, fair, or poor. Body mass index (BMI, measured as weight [kg]/height [m²]) was divided into four groups: 1) underweight, BMI < 19 ; 2) normal weight, BMI 19–24; 3) overweight, BMI 25–30; and 4) obese, BMI > 30 . A normal BMI served as the reference category for comparison.

The type and requirements of an occupational activity may influence one's LTPA. Due to a lack of detailed information about occupational type and requirements, we controlled for the number of working hours per week to address this issue. Generally, individuals who work 70 hours per week have less leisure time than someone who works 34 hours per week. Hours worked per week were divided into five categories: 1) 0 hours; 2) < 35 hours; 3) 35–40

hours; 4) 41–50 hours; and 5) > 51 hours. The reference category is 35–40 hours worked per week.

Contact with a medical professional was measured by whether an individual has seen or talked about their health with a medical professional within the past year. Finally, the respondent was asked if he is currently a smoker.

Statistical Analysis

The pooled analytical sample consisted of 23,459 adult males with complete data for all variables in the model. Population estimates (percentages) of inactive, active-irregular, and active-regular by selected characteristic were provided. All estimates and the associated standard errors were generated by using statistical software STATA7,²⁹ a software package designed to handle complex sample designs like the NHIS for 1999–2000. A multinomial logistic regression model was used to estimate the relative contributions of the independent variables. In the multinomial logit model, the estimated equations provide a set of probabilities for j categories r with characteristics x_r . In this case there were three ($j=3$) possible categories for an individual to be in: 1) inactive; 2) active-irregular; and 3) active-regular. To remove the indeterminacy in the model we normalized on the probability of being inactive (referent group). Thus, each odds ratio (OR) implies P_j/P_k where P_k was the probability of being inactive as reference and P_j was the probability of being active-irregular or active-regular. The multinomial logit model assumes that P_j/P_k is independent of the remaining probabilities. To test for the correctness of our formulation, Hausman's test for independence of irrelevant alternatives was conducted.³³ In all cases, the test indicated the alternatives were independent and the formulation of the models was correct. A variable reflecting the sample year was included to control for differences in the sample across time. We used the interaction terms to test for significance and dropped them when not statistically significant.

RESULTS

Table 1 shows percent distribution of LTPA by population characteristics that were used in the multivariate model. Over 35% of adult men were physically inactive, not engaging in any light, moderate, or vigorous leisure-time activity. Approximately half of the men who engaged in some leisure-time activity did so regularly.

Demographic Characteristics

Age

Among adult US males, the rate of being active declined in a linear fashion with increasing age. Seventy-five percent of adult men 18–24 years old engaged in some leisure-time activity. In this same age category, 43% were regularly active. Compare those percentages to these in the oldest age category; 49% of men aged 75 years or more were engaged in some leisure time activity with 22% regularly active (Table 1). In agreement, the ORs reflect this decreasing likelihood of activity with aging (Table 2).

Marital Status

Sixty-three percent of men who are currently married or cohabitating were considered active, although less than half of these men were regularly active. Fifty-one percent of widowed men were inactive, while only 29% of single men were so (Table 1). Controlling for other variables, married men were less likely (OR=0.89, $P=.04$) to be regularly active than unmarried men (Table 2).

Household Size

Participation rates in LTPA generally decline with increasing family size. This finding is clearly pronounced when examining the regression results where the likelihood significantly declines monotonically (Table 2). The decline was even steeper with respect to regular activity; families with six or more members were 44% less likely to engage in

LTPA when compared to single member households.

Socioeconomic Characteristics

Education

The rate of LTPA increased with increasing levels of education. The likelihood of being active-regular among men with post-graduate education was nearly five times as high as men with less than a high school education (Table 2).

Citizenship

Sixty-six percent of US citizens and 50% of non-citizens engaged in some LTPA (Table 1). Regression results show that non-citizens were nearly half as likely to be regularly active than citizens. They were 23% less likely to be active-irregular as well (Table 2).

Annual Household Income

Forty-seven percent of men from households with incomes up to \$20,000 were inactive, while 33% of men with larger incomes were not engaged in LTPA. Logistic regression results indicate that households with incomes greater than \$20,000 were 14% and 27% more likely to be active-irregular and active-regular, respectively, as compared with the lower income group (Table 2).

Homeownership

Sixty-six percent of homeowner men were active, with half of these men being regularly active. Homeowners were 17% and 19% more likely to be active irregular and active regular, respectively, as compared to non-homeowner men (Table 2).

Work Status

Forty-two percent of unemployed, 27% of part-timers, and 37% of those who worked 35–40 hours per week were inactive. Interestingly, the inactivity rate fell to 27% for those who worked 41–50 hours and increased to 33% for those who worked more than 50 hours

per week (Table 1). Regression results indicate that men who were currently unemployed, part-timers, or worked 40–50 hours per week were more likely to be regularly active than those who worked 35–40 hours per week (Table 2).

Geographic Region and Place of Residence

Southern men were most inactive (41%), and men from the Northeast and West were most active (69%). Southern men were 31% less likely to be irregularly active and 25% less likely to be regularly active than men from the Northeast. Men from the western states were most likely to be regularly active. Respondents from medium-size residence areas (2.5–4.99 million) were more likely to be active than those from other areas.

Health Status and Health Behaviors

Health Status

The percent of respondents involved in LTPA decreased with self-reported declining health status. Seventy-five percent of men who reported their health status as poor were inactive compared to only 26% of respondents reporting excellent health. The multinomial logit results indicate that men reporting poor health status were 62% and 89% less likely to be irregularly and regularly active compared to men who reported excellent health.

Body Mass Index

Underweight and obese men were apparently similar in terms of participation in LTPA, with 40% of obese men and 44% of underweight men considered inactive. The underweight men were 30% less likely to be regularly active than normal weight men, while obese men were 16% less likely. Overweight men were 10% more likely.

Smoking Behavior

Forty-two percent of current smokers and 33% of nonsmokers were inactive,

while 27% of smokers versus 34% of nonsmokers were regularly active. Current smokers were 25% less likely to engage in regular LTPA than nonsmokers.

Discussion with Health Professional

Thirty-four percent of the individuals that had seen or talked to a medical professional about their health in the past 12 months were inactive. Of those who had no contact, 39% were physically inactive (Table 1). Table 2 shows that those who had discussed their health with a medical professional were 26% more likely to be regularly active than men who had not.

Race/Ethnicity

Sixty-eight percent of White, 58% of Black, and 51% of Hispanic men were engaged in LTPA. Thirty-four percent of White, 30% of Black, and 26% of Hispanic men were regularly active (Table 1). Figure 1 indicates a linear trend in age-specific inactive rates within races. However, rates were significantly higher for Hispanic men when compared with those for Whites as well as Blacks (with the exception of the oldest age group, which was highest for Blacks). The proportion of the inactive group among Hispanic men was generally highest for both education and perceived health status specific rates (Figure 2 and 3).

After controlling for all the above variables, Hispanics were 32% and 20% less likely to be active than Whites. The difference is statistically significant in both active-irregular and active-regular cases. Black men were 18% less likely than White men to be active irregular as compared to being inactive.

Further analyses within racial groups (race-citizenship interaction) revealed that non-citizen Hispanic males were twice as likely (OR=2.02; CI 1.8, 2.3) to be inactive than citizens (not shown in table). White male non-citizens were 40% more likely (OR=1.4; CI 1.9, 1.5) than White male citizens to be inactive.

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Table 1. Estimated percent (SE) of US adult males engaged in physical activity by socio-demographic and other characteristics, 1999–2002

| Selected Characteristic | Physically | Active Irregular | Active Regular | Population |
|--|---------------|------------------|----------------|------------|
| <i>Age in years</i> | | | | |
| 18–24 | 24.9 ± (1.10) | 32.2 ± (1.16) | 42.9 ± (1.15) | 13.5 |
| 25–44 | 31.9 ± (0.58) | 35.0 ± (0.58) | 33.1 ± (0.54) | 42.6 |
| 45–74 | 40.2 ± (0.60) | 30.5 ± (0.56) | 29.3 ± (0.54) | 38.3 |
| 75 and over | 50.5 ± (1.48) | 27.2 ± (1.30) | 22.3 ± (1.17) | 5.7 |
| <i>Marital status</i> | | | | |
| Never married, living w/partner | 29.0 ± (0.73) | 31.9 ± (0.72) | 39.1 ± (0.72) | 27.3 |
| Married | 36.8 ± (0.53) | 33.6 ± (0.49) | 29.7 ± (0.48) | 61.2 |
| Divorced/separated | 38.8 ± (1.05) | 29.0 ± (0.96) | 32.3 ± (0.96) | 9.0 |
| Widowed | 50.9 ± (1.75) | 24.0 ± (1.46) | 25.1 ± (1.68) | 2.5 |
| <i>Household size</i> | | | | |
| 1 | 31.6 ± (0.73) | 30.9 ± (0.61) | 37.5 ± (0.63) | 18.4 |
| 2 | 36.2 ± (0.67) | 32.5 ± (0.65) | 31.3 ± (0.61) | 32.7 |
| 3–5 | 34.9 ± (0.64) | 33.5 ± (0.64) | 31.7 ± (0.58) | 43.6 |
| 6 and more | 43.6 ± (1.98) | 29.0 ± (1.69) | 27.4 ± (1.80) | 5.3 |
| <i>Level of education</i> | | | | |
| Less than high school | 56.1 ± (1.01) | 23.1 ± (0.83) | 20.9 ± (0.77) | 17.5 |
| High school | 41.5 ± (0.76) | 29.9 ± (0.67) | 28.5 ± (0.65) | 29.5 |
| Some college, AA degree | 29.4 ± (0.76) | 35.6 ± (0.73) | 35.0 ± (0.70) | 28.0 |
| College graduate | 20.7 ± (0.75) | 39.1 ± (0.94) | 40.3 ± (0.98) | 16.3 |
| Post graduate | 17.7 ± (0.91) | 37.2 ± (1.19) | 45.1 ± (1.31) | 8.8 |
| <i>Citizenship</i> | | | | |
| US citizen | 34.1 ± (0.45) | 32.8 ± (0.43) | 33.1 ± (0.40) | 92.9 |
| Not a US citizen | 49.3 ± (1.45) | 28.3 ± (1.39) | 22.3 ± (1.16) | 7.1 |
| <i>Household income (>\$20,000)</i> | | | | |
| Yes | 32.9 ± (0.46) | 33.6 ± (0.45) | 33.6 ± (0.42) | 83.1 |
| No | 46.5 ± (0.98) | 27.0 ± (0.83) | 26.5 ± (0.71) | 16.9 |
| <i>Race—Ethnicity</i> | | | | |
| White | 32.5 ± (0.52) | 33.9 ± (0.49) | 33.6 ± (0.45) | 75.3 |
| Black | 41.9 ± (1.19) | 27.7 ± (1.07) | 30.4 ± (0.97) | 10.2 |
| Hispanic | 49.3 ± (1.12) | 25.0 ± (0.87) | 25.7 ± (0.91) | 10.5 |
| Other | 31.3 ± (2.10) | 37.5 ± (1.95) | 31.2 ± (1.72) | 4.1 |
| <i>Homeownership</i> | | | | |
| Yes | 34.1 ± (0.52) | 33.3 ± (0.51) | 32.6 ± (0.47) | 70.1 |
| No | 37.7 ± (0.78) | 30.5 ± (0.62) | 31.8 ± (0.64) | 29.9 |
| <i>Work hours per week</i> | | | | |
| Doesn't work | 41.7 ± (0.80) | 27.8 ± (0.69) | 30.5 ± (0.72) | 28.2 |
| Part-time (<35 hrs/wk) | 27.4 ± (1.23) | 37.1 ± (1.23) | 35.5 ± (1.25) | 8.9 |
| Full-time (35–40 hrs/wk) | 36.8 ± (0.72) | 31.8 ± (0.66) | 31.5 ± (0.61) | 32.3 |
| Full-time (41–50 hrs/wk) | 27.1 ± (0.88) | 37.4 ± (0.98) | 37.4 ± (0.98) | 16.8 |
| Full-time (51+ hours/wk) | 33.0 ± (0.99) | 34.6 ± (0.90) | 32.4 ± (0.94) | 14.0 |
| <i>Region</i> | | | | |
| Northeast | 31.4 ± (0.88) | 34.7 ± (0.97) | 33.9 ± (0.86) | 18.9 |
| Midwest | 33.5 ± (0.87) | 34.7 ± (0.79) | 31.9 ± (0.74) | 25.6 |
| South | 40.8 ± (0.76) | 28.9 ± (0.73) | 30.3 ± (0.66) | 36.2 |
| West | 30.6 ± (0.91) | 34.0 ± (0.80) | 35.4 ± (0.84) | 19.4 |
| <i>Health status (self-reported)</i> | | | | |
| Excellent | 26.3 ± (0.62) | 32.1 ± (0.61) | 41.6 ± (0.67) | 35.2 |
| Very good | 32.7 ± (0.65) | 35.0 ± (0.67) | 32.3 ± (0.63) | 32.3 |
| Good | 42.0 ± (0.79) | 32.6 ± (0.80) | 25.4 ± (0.74) | 22.7 |
| Fair | 54.7 ± (1.36) | 26.9 ± (1.11) | 18.4 ± (1.07) | 7.6 |
| Poor | 75.2 ± (2.12) | 17.6 ± (1.84) | 7.3 ± (1.12) | 2.3 |

Table 1. Continued

| Selected Characteristic | Physically | Active Irregular | Active Regular | Population |
|--|---------------|------------------|----------------|------------|
| <i>Body mass index</i> | | | | |
| Underweight | 43.9 ± (3.14) | 29.3 ± (3.04) | 26.8 ± (3.01) | 1.3 |
| Normalweight | 34.1 ± (0.67) | 31.6 ± (0.69) | 34.3 ± (0.64) | 33.8 |
| Over weight | 33.3 ± (0.60) | 32.9 ± (0.59) | 33.8 ± (0.56) | 43.8 |
| Obese | 40.3 ± (0.79) | 33.0 ± (0.78) | 26.8 ± (0.74) | 21.2 |
| <i>Current smoker</i> | | | | |
| Yes | 42.4 ± (0.83) | 30.4 ± (0.80) | 27.3 ± (0.72) | 26.0 |
| No | 32.7 ± (0.46) | 33.2 ± (0.47) | 34.2 ± (0.46) | 74.0 |
| <i>Contact with med. prof. in past 12 mo</i> | | | | |
| Yes | 34.1 ± (0.50) | 33.0 ± (0.48) | 32.9 ± (0.45) | 74.5 |
| No | 38.5 ± (0.83) | 30.7 ± (0.77) | 30.8 ± (0.71) | 25.5 |
| <i>Place of residence</i> | | | | |
| MSA 5 million and more | 35.2 ± (1.27) | 33.4 ± (1.34) | 31.4 ± (0.98) | 9.0 |
| MSA 2.5–4.99 million | 28.7 ± (1.08) | 36.3 ± (1.17) | 35.0 ± (0.99) | 12.2 |
| MSA less than 2.5 million | 36.2 ± (0.51) | 31.7 ± (0.46) | 32.1 ± (0.45) | 78.8 |
| Total | 35.2 ± (0.44) | 32.5 ± (0.41) | 32.4 ± (0.38) | 100.0 |

Reversing the trend, Black male non-citizens were 20% less likely (OR=0.8; CI 0.7, 0.9) to be inactive than their citizen counterparts.

DISCUSSION

Evident were race-ethnic disparities in LTPA, but the majority of men engaged in some form of physical activity. Disparities arose when we broke down physical activity by category of activity. Thus, Hispanic men were less likely to be active compared to White men, and Black men were more likely to be active-irregular than White men. Hispanic non-citizens were most likely to be inactive when compared to citizens but Black non-citizens were the most likely to be active.

In our findings, married men were less likely to be regularly active than unmarried men, and this pattern continued among those with increasingly larger family sizes. The differences in marital status may be attributable to two factors; married men may systematically have less leisure time to devote to physical activity than non-married men, or while the amount of leisure time may be roughly the same for both married

and non-married men, the partitioning of that time takes on new priorities with marriage. Associated with marital status is family size. Generally, as family size increases so do the demands on the use of leisure time, and children necessarily consume time that may have otherwise been spent on other leisure time activities. The age and spacing of children may also place different yet equally important competing demands on leisure time, which further reduces the leftover amount of time devoted to physical activity.³⁴ Family responsibility may affect LTPA³⁵ but, on the other hand, a narrow economic view of LTPA would suggest that parents might be more at risk if they were not to engage in healthy behaviors such as LTPA. Persons with serious health challenges (eg, cancer) often cite their children as the most important reason to recover and make appropriate changes so that they may see their children grow into adulthood.³⁶ However, this finding might not be consistent with the attitudes of those without serious health problems.

We measured socioeconomic status with education, home ownership, work status, and annual household income. Consistent with other studies^{26,37–39} our study found that as the level of educa-

tion increased so did the likelihood of engaging in regular LTPA. The more educated have more access to literature and resources that enable healthy behaviors and lifestyles.^{40,41} In general, LTPA is one way to ensure the longevity of an investment in education and to continually reap and extend returns, such as improved physical and mental health, for which regular physical activity may be a mediator.^{9,17–23}

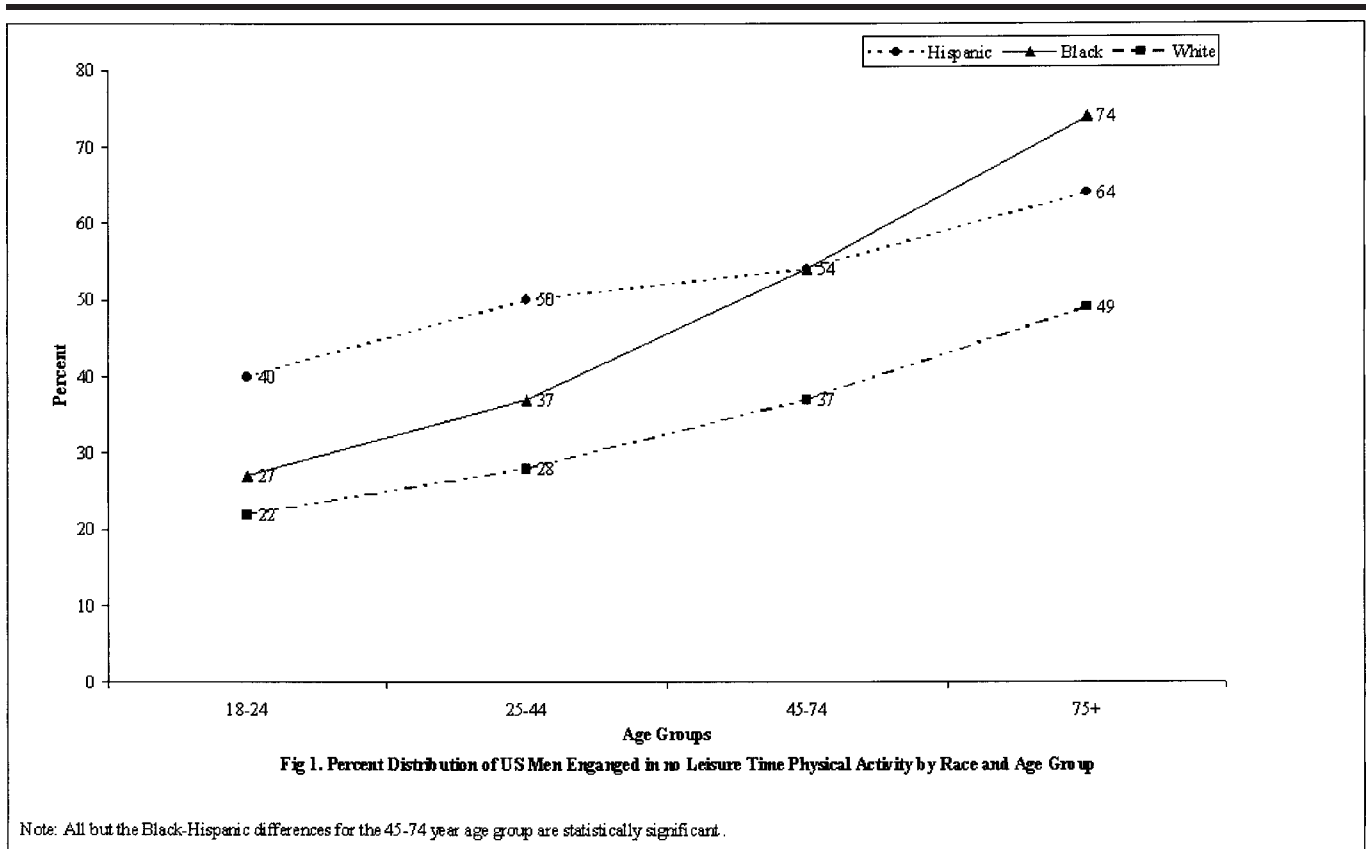
As for the effect of work status, men who are unemployed, work part-time, or work >50 hours per week were more likely to be physically active during leisure time than those who worked 35–40 hours/week. A U-shaped relationship was found for employment status, with the unemployed and those working >50 hours per week more likely to be engaged in physical activity. In cases of those with a few, if any, work hours, they may simply have more leisure time to fill with regular physical activity. However, the reasons why persons who work long hours and accommodate LTPA are more complex and require further study. Persons who work these long hours may have a support network in place that enables them to exercise on a regular basis.

Annual household income also rep-

Table 2. Adjusted odds ratios of being active-irregular and active-regular as compared to being inactive in leisure-time physical activity among US men, 1999–2000

| Selected Characteristic | Active-Irregular vs Inactive | | Active-Regular vs Inactive | |
|---|------------------------------|--------------|----------------------------|--------------|
| | Odds Ratio | 95% CI | Odds Ratio | 95% CI |
| <i>Age in years</i> | | | | |
| 18–24 | 3.12* | (2.43, 3.76) | 4.81* | (3.85, 6.00) |
| 25–44 | 2.09* | (1.73, 2.51) | 2.61* | (2.19, 3.12) |
| 45–74 | 1.30‡ | (1.11, 1.53) | 1.68* | (1.43, 1.99) |
| 75 and over | 1.00 | Referent | 1.00 | Referent |
| <i>Marital status</i> | | | | |
| Married vs other | 1.09 | (0.97, 1.22) | 0.89‡ | (0.79, 0.99) |
| <i>Household size</i> | | | | |
| 1 | 1.00 | Referent | 1.00 | Referent |
| 2 | 0.88 | (0.77, 1.01) | 0.78* | (0.69, 0.88) |
| 3–5 | 0.78† | (0.68, 0.90) | 0.66* | (0.58, 0.75) |
| 6 or more | 0.67* | (0.54, 0.83) | 0.56* | (0.44, 0.70) |
| <i>Level of education</i> | | | | |
| Less than high school | 1.00 | Referent | 1.0 | Referent |
| High school | 1.33* | (1.17, 1.51) | 1.37* | (1.21, 1.56) |
| Some college | 2.06* | (1.80, 2.35) | 2.07* | (1.79, 2.39) |
| College graduate | 3.06* | (2.63, 3.57) | 3.28* | (2.80, 3.86) |
| Post graduate | 3.51* | (2.94, 4.20) | 4.51* | (3.73, 5.46) |
| <i>Citizenship</i> | | | | |
| Not US citizen vs citizen | 0.77† | (0.64, 0.91) | 0.56* | (0.47, 0.66) |
| <i>Household income >\$20,000</i> | | | | |
| Yes vs no | 1.15‡ | (1.02, 1.28) | 1.27* | (1.14, 1.42) |
| <i>Race/ethnicity</i> | | | | |
| White, non-Hispanic | 1.00 | Referent | 1.00 | Referent |
| Black, non-Hispanic | 0.82† | (0.72, 0.94) | 0.91 | (0.80, 1.03) |
| Hispanic | 0.68* | (0.59, 0.78) | 0.80† | (0.70, 0.92) |
| Other | 1.04 | (0.82, 1.32) | 0.89 | (0.69, 1.15) |
| <i>Homeownership</i> | | | | |
| Yes vs no | 1.17† | (1.06, 1.29) | 1.19† | (1.07, 1.32) |
| <i>Work hours per week</i> | | | | |
| Doesn't work | 1.11 | (0.98, 1.25) | 1.38* | (1.22, 1.57) |
| Part-time, <35 hrs/wk | 1.59* | (1.37, 1.84) | 1.48* | (1.26, 1.74) |
| Full-time, 35–40 hrs/wk | 1.00 | Referent | 1.00 | Referent |
| Full-time, 40–50 hrs/wk | 1.42* | (1.26, 1.61) | 1.36* | (1.21, 1.52) |
| Full-time, 51+ hrs/wk | 1.07 | (0.95, 1.20) | 1.01 | (0.90, 1.15) |
| <i>Region</i> | | | | |
| Northeast | 1.00 | Referent | 100 | Referent |
| Midwest | 0.89 | (0.78, 1.32) | 0.86‡ | (0.76, 0.97) |
| South | 0.69* | (0.60, 0.79) | 0.75* | (0.67, 0.85) |
| West | 1.14 | (0.99, 1.03) | 1.23† | (1.07, 1.42) |
| <i>Health status (self-reported)</i> | | | | |
| Excellent | 1.00 | Referent | 1.00 | Referent |
| Very good | 1.00 | (0.92, 1.09) | 0.72* | (0.65, 0.80) |
| Good | 0.89‡ | (0.80, 0.99) | 0.55* | (0.48, 0.62) |
| Fair | 0.71* | (0.60, 0.82) | 0.37* | (0.30, 0.44) |
| Poor | 0.38* | (0.26, 0.50) | 0.11* | (0.08, 0.16) |
| <i>BMI</i> | | | | |
| Underweight | 0.85 | (0.61, 1.19) | 0.70‡ | (0.49, 0.99) |
| Normal weight | 1.00 | Referent | 1.00 | Referent |
| Overweight | 1.09 | (1.00, 1.19) | 1.11‡ | (1.01, 1.21) |
| Obese | 0.98 | (0.88, 1.09) | 0.84† | (0.75, 0.95) |
| <i>Contact with med. prof. in past 12 mo.</i> | | | | |
| Yes vs no | 1.20* | (1.09, 1.33) | 1.26* | (1.14, 1.39) |
| <i>Current smoker</i> | | | | |
| Yes vs no | 0.82* | (0.74, 0.90) | 0.75* | (0.68, 0.82) |
| <i>Place of residence</i> | | | | |
| MSA. 2.5–4.99 million vs other | 1.39* | (1.22, 1.56) | 1.30* | (1.15, 1.46) |
| <i>Year</i> | | | | |
| 2000 vs 1999 | 1.04 | (0.97, 1.13) | 1.16† | (1.06, 1.25) |

* $P < .001$; † $P < .01$; ‡ $P < .05$.



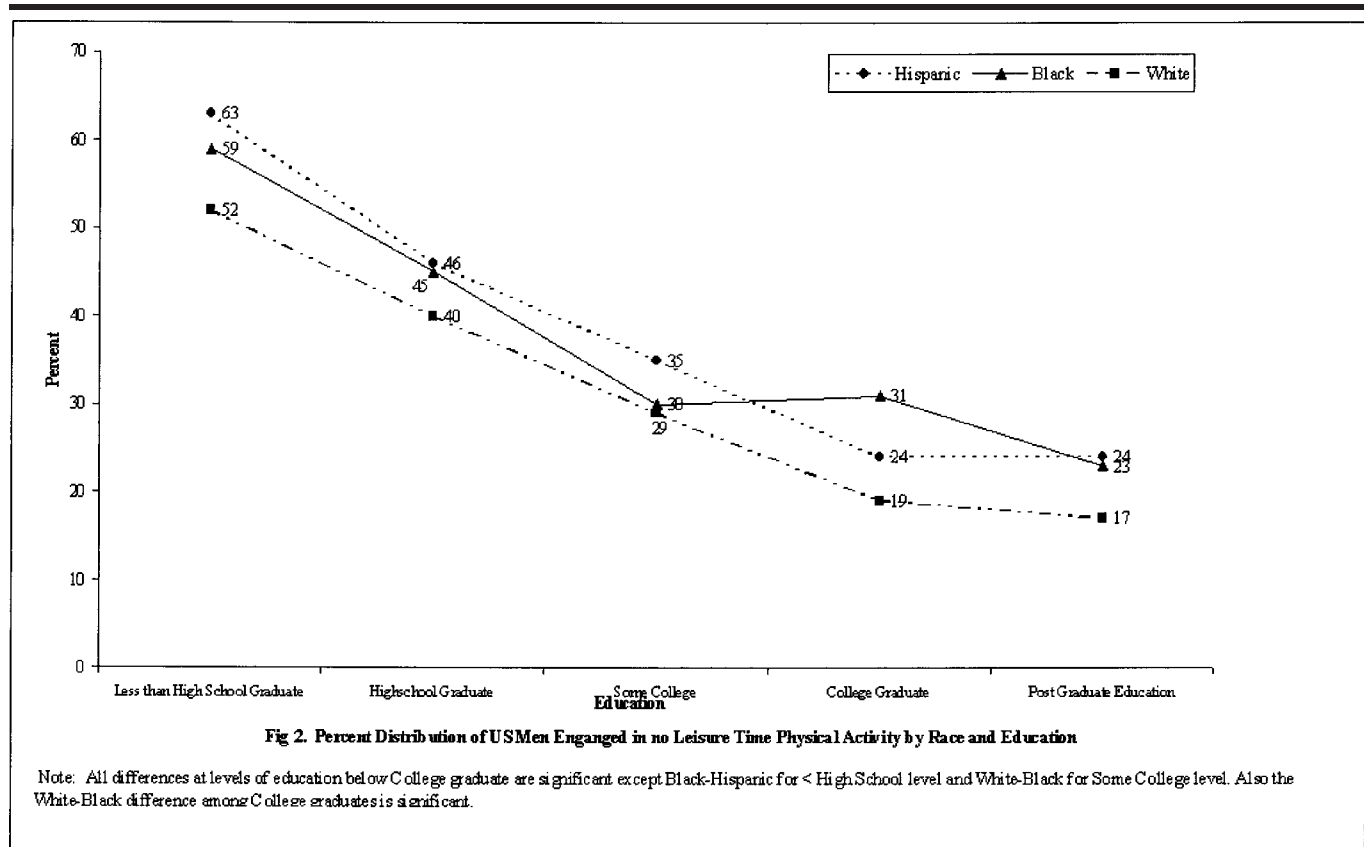
resents the ability to have more disposable income to spend on amenities that facilitate LTPA, such as athletic club memberships, sports equipment, or personal trainers to design personal exercise programs. Similar to our results for income, we found that homeowners also were more likely to be physically active, after controlling for income, during leisure time than non-homeowners. Home ownership is a proxy for wealth and represents an investment that one maintains in order to gain future returns.

Our findings for health status and health-related behaviors support existing literature. We found that those who reported poor health status were more likely to be physically inactive. Perceived health status and participating in LTPA are synergistic; those who believe their health to be good are likely to behave in a way reflecting that belief. Leisure-time physical activity (LTPA) has an im-

port on psychosocial well being^{9,17-21} which in turn promotes people to engage in LTPA. The same could be said for the effect of BMI on the likelihood of LTPA. Further, we found that discussion with a health professional is also an important and pivotal factor in improving the likelihood of participating in LTPA.⁴²⁻⁴⁴ Trained health professionals are credible sources of knowledge, which may positively influence the health behavior of their clients.⁴⁵

Considering geographic region and place of residence, we found that southern men were the least likely to engage in any physical activity when compared to their counterparts from the Northeast and West. In 2001, a large proportion of the US poor lived in the South.⁴⁶ Nevertheless, even with the effects of household income controlled, southern men continued to remain physically inactive at a higher proportion than men

from other regions. Levin et al⁴⁷ show that the effect of urban versus rural geographic location may be better explained by level of education. We also found lower educational attainment is associated with lower rates of LTPA, and the level of education was lowest in the South. Cubbin, Hadden, and Winkleby⁴⁸ explain that even after controlling the effects of socioeconomic status, residence in deprived neighborhoods increased the risk of diabetes, smoking, high BMI, and blood pressure for Black women. While we did not measure neighborhood deprivation per se, other studies^{40,49} have indicated that lower societal positions and deprivation might affect health. Regional deprivation, such as poor school districts, high levels of unemployment, low aggregate levels of educational achievement, deteriorating infrastructure, and other ecologic factors may help explain the disparity in men's



LTPA between the South and other regions of the United States.^{26,34,46-48,50}

In terms of place of residence, it may be that, when compared to urban and rural counterparts, “suburban” men may have a more integrated infrastructure enabling physical activity. For example, these areas are more likely to have non-congested sidewalks and streets more conducive to walking and running activities.⁵⁰ More recreational parks may exist in which to play team sports such as soccer or basketball. Streetlights may be available, and gymnasiums and other community resources may be more readily available and easily accessible than in very large MSAs or rural areas.³⁴ Medium-sized MSAs may have more homogenous incomes than their rural and densely populated urban counterparts.²⁶ Other influences may also include weather or climate-related factors as suggested by Trost et al,⁵¹ Burton et

al,⁵² and Salmon et al.⁵³ Barriers of any form can have compounding effects when coupled with socioeconomic barriers as in the case of persons in welfare transfer payment programs as in the Women, Infant, Children program as described by Fahrenwald and Walker.⁵⁴ These findings suggest that future research may be needed to explore interactions between SES and place of residence in terms of LTPA.

A large disparity exists in LTPA when considering citizenship. US citizens are nearly twice as likely as non-US citizens to engage in regular physical activity. US citizens, beyond the effects of the other SES variables, may still have access to more resources enabling regular schedules of physical activity during leisure time. Many non-citizens encounter language barriers and are subsequently disadvantaged in terms of receiving information regarding health

and physical activity.^{55,56} Moreover, non-citizens may experience physically laborious occupations, loaded work schedules, income insecurity, and other stressors⁵⁷ that may play a role in their inability to engage in or need LTPA. Crespo et al⁵⁸ suggest that most immigrants to the United States are in better physical shape than US citizens and that this may be a reason for fewer health problems among Mexican Americans who are not yet acculturated to the United States. Acculturated immigrants, including Hispanics, are reported to have adopted unhealthy behaviors such as cigarette smoking, drug usage and other dietary health-related behaviors that are characteristic of persons born in the United States⁵⁹—a sort of “McDonaldization”⁶⁰ of health behavior. Nonetheless, consistent with others,^{38,61} we found Hispanic men were least likely to engage in LTPA.

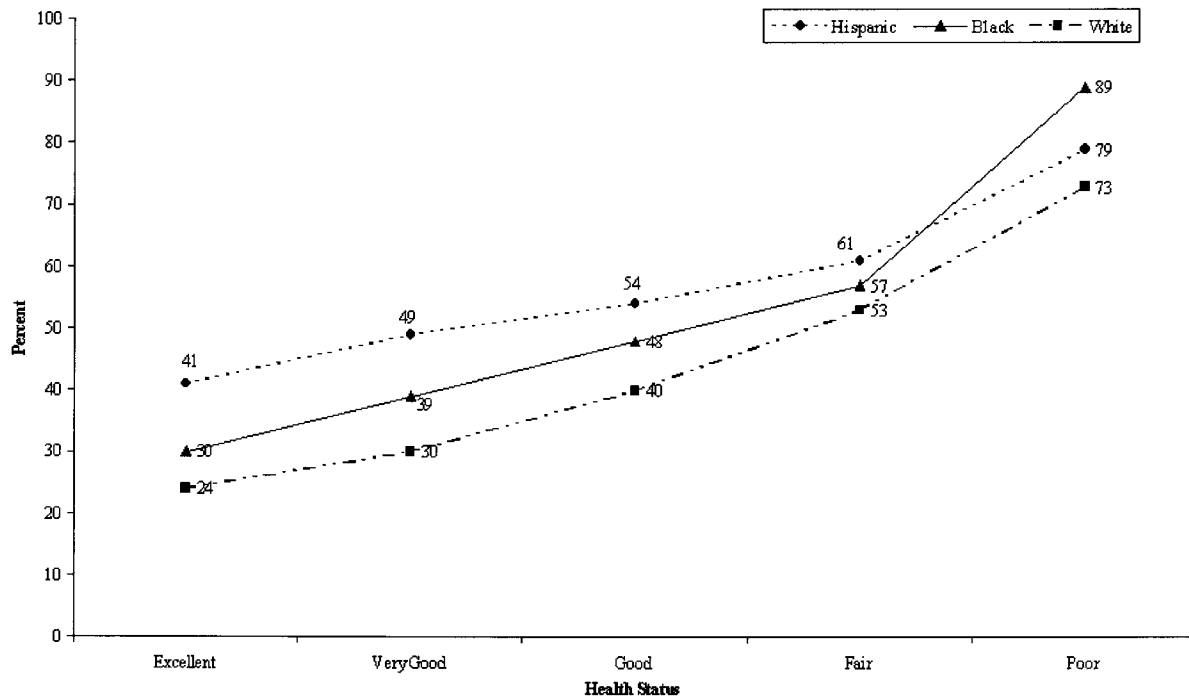


Fig3. Percent Distribution of US Men Engaged in no Leisure Time Physical Activity by Race and Health Status

Note: All differences for levels of Health Status above Fair are statistically significant. Also White-Hispanic Difference for Fair Health Status and White-Black Difference for poor Health Status are statistically significant.

Our findings for citizenship under-score disparities which clearly exist in terms of race and ethnicity.^{37,38,62,63} A majority of men from all ethnic and racial backgrounds participated in some form of physical activity, but when we controlled for the socio-demographic characteristics mentioned above, Latinos had the lowest proportion of participation in LTPA. Though Hispanics are at a comparatively greater risk for inactivity, this factor seems to depend more so on citizenship status than other factors; non-citizens are more likely to be inactive than citizens. Contrast that to the opposing trend among Black men where citizens are more likely to be inactive than non-citizens. Differences between Hispanic and White men were not completely attributable to other factors such as education and income, as has been found in previous literature examining Black/White health disparities. This

may suggest that the nature of the disparity is different from those of Black/White health disparity dynamics.

As mentioned, Hispanics were disproportionately more likely to be non-citizens than Whites and Blacks. Thirty-nine percent of Hispanics were not US citizens, and only 1.6% of Whites and 5.6% of Blacks were not citizens. Fifty-two percent of the US foreign population is from Latin America, with 36.4% from Central America and 6.2% from South America. The US Census Bureau Report on Foreign Born Population states that “The foreign born live in family households that are larger than those of natives. In 2002, 25.5% of the family households with a foreign-born householder included five or more people. In contrast, only 12.5% of the family households with a native householder were this large (p.4).”⁶⁴ While the foreign born have a better health profile,⁵⁸

they may also have a larger stress burden in terms of family obligations and occupational status. However, these interactions were not statistically significant. In a variety of Latino cultures these factors may not be perceived as stressors but they do take up time.

Among Hispanics, non-citizens were twice as likely to be inactive as citizens. These results—that Hispanics (citizens and non-citizens alike) were less likely to engage in regular activity—also may be affected by the amount of physical activity performed on the job,⁵⁸ which was not measured by the NHIS. In the context of differing physical activity requirements of job categories, differences in LTPA may be less pronounced. Forty-four percent of Hispanic men did not have a high school degree, compared to 13% and 24% of Whites and Blacks. Lower levels of education are highly correlated with occupations that require

vigorous activity such as intensive manual labor. To address this problem, we have controlled for number of hours worked per week and education level. Moreover, our goal is not to predict overall level of physical activity but to specifically focus on LTPA.

Racial/ethnic disparities exist in LTPA. For Hispanic men this disparity is largely attributable to citizenship. Hispanic non-citizens are the most likely to be inactive. Conversely, Black US citizens are more likely to be physically inactive when compared to their non-citizen counterparts. Black and Hispanic immigrants may be largely different in terms of immigration characteristics.⁶⁵ We speculate that the education and affluence of Black immigrants may influence their participation in LTPA. To explain the difference between Black citizen and non-citizen LTPA requires further study.

It is encouraging that no statistically significant disparity between White and Black men exists beyond the effects of socioeconomic status. Unlike other health areas,^{37,38,62,63} LTPA is similar for both Black and White men for regularly active vs inactive. The race effect on Blacks is most likely mediated through social and economic conditions. An independent effect of race that has been found for other health concerns (eg, cancer) does not exist, at least in terms of LTPA, for these data analyzed. However, for Hispanics, race-ethnic disparities in LTPA exist even beyond education and socioeconomic effects.^{38,66} LTPA is a relatively less expensive and amenable way to pave the road for preventive measures for healthy behaviors.

Strengths

The strongest point of this paper is that we use the National Health Interview Survey, which uses a statistically representative sample of the US population. It is one of the best representative data sets available on health in the United States. Further, the NHIS is given in English and Spanish; a strength in this

study since we report on Hispanic men. The survey is not given only as a take-home questionnaire but also uses trained interviewers to minimize language and cultural misinterpretations. We also carefully examined the literature to use standard measures of LTPA. Perhaps the most novel contribution of this study is our focus on disparities by using socio-demographic characteristics often ignored by researchers but extremely important to daily life and health, particularly citizenship. The health status of non-citizens has been central to political debates with very little data to support legislation. This finding is complementary to studies on culture and acculturation; social constructs that affect exercise and perceptions of physical activity. Citizenship is an important part of acculturation because it entails an acceptance, at least politically, of the new country with intense and long preparation and commitment. Further, it involves a new set of privileges and responsibilities that facilitate a lifestyle amenable to the traditions and lifestyles of the new country. It is a unique experience, and one that is not taken lightly, involving issues of identity, patriotism, culture, and lifestyle.

This study is the first of a series of research that examines LTPA and associated disparities. We first studied men because of our special focus on the citizen vs non-citizen divide. Immigration patterns are such that men typically migrate first, followed by their female and younger relatives. Our next study will focus on only women, and the final study will combine the two samples to examine gender differences. We also wanted to examine one sex-group at a time to tease out any physiologic or behavioral differences, such as socio-cultural expectations, so that we may first understand the interactions at each level before combining the samples.

Limitations

As with any study that uses secondary data, we are limited by the type and

Public health efforts should continue to address the needs of all groups in culturally sensitive and appropriate fashions.

number of variables in the dataset to include in our analyses. We would have liked to include a variable that tapped the nature of activities completed at work (ie, occupational physical activity), as that might have explained the necessity of LTPA outside of work. Variables directly related to cultural behaviors would have also been desirable to include in the models.

CONCLUSIONS AND RECOMMENDATIONS

We found that racial/ethnic disparities persist between Hispanic and White men, even when controlling for socio-demographic characteristics. Lack of citizenship further exacerbates this disparity, at least for Hispanics. The gap between Black and White men is statistically insignificant beyond education and socioeconomic status, but a within-race effect exists for Black and Hispanic men which falls along a citizen/non-citizenship cleavage line. Public health efforts should continue to address the needs of all groups in culturally sensitive and appropriate fashions. Hispanics may have a deeper, unmet need for education about LTPA than previously thought and this need may be layered with citizenship status issues as well as other cultural and social factors not addressed in this paper. Given the growing portion of the US population that is represented by Hispanics, this problem will become increasingly urgent, and health disparity literature will need to address it. The disparity within groups of Black men

poses a different kind of challenge. While it seems that the gap is nearly closed between Black and White men in terms of devoting leisure time to regular physical activity, disparities remain among Black men where non-citizen Black men are at an exercise advantage. Public health efforts may need to reach within the Black community to correct these disparities and perhaps borrow from these non-citizen groups to facilitate LTPA among US Black men. Further research needs to examine whether within-group differences exist for White men as well and whether gaps exist across citizenship categories.

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 Data analysis and interpretation: Ahmed, Smith, Wood, Mason, Stain
 Manuscript draft: Ahmed, Flores, Pamies, Wood, Mason, Stain
 Statistical expertise: Ahmed, Smith
 Acquisition of funding: Ahmed, Mason
 Administrative, technical, or material assistance: Ahmed, Flores, Pamies, Stain
 Supervision: Ahmed, Flores, Wood, Pamies

REFERENCES

1. Kujala UM, Kaprio J, Sarna S, Koskenvuo M. Relationship of leisure-time physical activity and mortality: the Finnish twin cohort. *JAMA*. 1998;279:440-444.
2. Fried LP, Kronmal RA, Newman AB, et al. Risk factors for 5-year mortality in older adults: the Cardiovascular Health Study. *JAMA*. 1998;279:585-592.
3. Kaplan GA, Strawbridge WJ, Cohen RD, Hungerford LR. Natural history of leisure-time physical activity and its correlates: associations with mortality from all causes and cardiovascular disease over 28 years. *Am J Epidemiol*. 1996;144:793-797.

4. US Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, Ga: USDHHS, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; 1996.
5. Blair SN, Kohl HW III, Barlow CE, Paffenbarger RS Jr, Gibbons LW, Macera CA. Changes in physical fitness and all-cause mortality. A prospective study of healthy and unhealthy men. *JAMA*. 1995;273:1093-1098.
6. Lee IM, Hsieh CC, Paffenbarger RS Jr. Exercise intensity and longevity in men. The Harvard Alumni Health Study. *JAMA*. 1995;273:1179-1184.
7. Paffenbarger RS Jr, Hyde RT, Wing AL, Lee IM, Jung DL, Kampert JB. The association of changes in physical-activity level and other lifestyle characteristics with mortality among men. *N Engl J Med*. 1993;328:538-545.
8. Paffenbarger RS Jr, Kampert JB, Lee IM, Hyde RT, Leung RW, Wing AL. Changes in physical activity and other lifeway patterns influencing longevity. *Med Sci Sports Exerc*. 1994;26:857-865.
9. Morris JN, Clayton DG, Everitt MG, Semmence AM, Burgess EH. Exercise in leisure time: coronary attack and death rates. *Br Heart J*. 1990;63:325-334.
10. Wannamethee SG, Shaper AG. Physical activity in the prevention of cardiovascular disease: an epidemiological perspective. *Sports Med*. 2001;31:101-114.
11. Sesso HD, Paffenbarger RS Jr, Lee IM. Physical activity and coronary heart disease in men: The Harvard Alumni Health Study. *Circulation*. 2000;102:975-980.
12. Hu FB, Stampfer MJ, Colditz GA, et al. Physical activity and risk of stroke in women. *JAMA*. 2000;283:2961-2967.
13. Wannamethee SG, Shaper AG. Physical activity and the prevention of stroke. *J Cardiovasc Risk*. 1999;6:213-216.
14. Jaglal SB, Kreiger N, Darlington G. Past and recent physical activity and risk of hip fracture. *Am J Epidemiol*. 1993;138:107-118.
15. Breslow L, Breslow N. Health practices and disability: some evidence from Alameda County. *Prev Med*. 1993;22:86-95.
16. Helmrich SP, Ragland DR, Leung RW, Paffenbarger RS Jr. Physical activity and reduced occurrence of non-insulin-dependent diabetes mellitus. *N Engl J Med*. 1991;325:147-152.
17. Tkachuk G, Martin G. Exercise therapy for patients with psychiatric disorders: research and clinical implications. *Prof Psychol Res Pract*. 1999;30:275-282.
18. Fox KR. The influence of physical activity on mental well-being. *Public Health Nutr*. 1999;2:411-418.
19. Ross CE, Hayes D. Exercise and psychologic well-being in the community. *Am J Epidemiol*. 1988;127:762-771.
20. Weyerer S. Physical inactivity and depression in the community. Evidence from the Upper Bavarian Field Study. *Int J Sports Med*. 1992;13:492-496.
21. Camacho TC, Roberts RE, Lazarus NB, Kaplan GA, Cohen RD. Physical activity and depression: evidence from the Alameda County Study. *Am J Epidemiol*. 1991;134:220-231.
22. King AC, Taylor CB, Haskell WL, DeBusk RF. Influence of regular aerobic exercise on psychological health: a randomized, controlled trial of healthy middle-aged adults. *Health Psychol*. 1989;8:305-324.
23. Taylor C, Sallis J, Needle R. The relationship of physical activity and exercise to mental health. *Public Health Rep*. 1985;100:195-201.
24. Katzmarzyk PT, Gledhill N, Shephard RJ. The economic burden of physical inactivity in Canada. *CMAJ*. 2000;163:1435-1440.
25. Wang G, Helmick CG, Macera C, Zhang P, Pratt M. Inactivity-associated medical costs among US adults with arthritis. *Arthritis Rheum*. 2001;45:439-445.
26. Schoenborn CA, Barnes PM. *Leisure-Time Physical Activity Among Adults: United States, 1997-98*. Hyattsville, Md: National Center for Health Statistics; 2002. Advance Data from Vital and Health Statistics.
27. US Department of Health and Human Services. *Healthy People 2010: Understanding and Improving Health*. Washington, DC: USDHHS; 2000.
28. Pate RR, Pratt M, Blair SN, et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA*. 1995;273:402-407.
29. StataCorp. *Stata Statistical Software: Release 7.0*. College Station, Tex: Stata Corporation; 2001.
30. Kaplan MS, Newsom JT, McFarland BH, Lu L. Demographic and psychosocial correlates of physical activity in late life. *Am J Prev Med*. 2001;21:306-312.
31. King AC, Kiernan M, Ahn DK, Wilcox S. The effects of marital transitions on changes in physical activity: results from a 10-year community study. *Ann Behav Med*. 1998;20:64-69.
32. Lund R, Due P, Modvig J, Holstein BE, Damsgaard MT, Andersen PK. Cohabitation and marital status as predictors of mortality—an eight year follow-up study. *Soc Sci Med*. 2002;55:673-679.
33. Hausman J, McFadden D. A specification test for the multinomial logit model. *Econometrica*. 1984;52:1219-1240.
34. Wilcox S, Castro C, King AC, Housemann R, Brownson RC. Determinants of leisure time physical activity in rural compared with urban older and ethnically diverse women in the United States. *J Epidemiol Community Health*. 2000;54:667-672.
35. Backett KC, Davison C. Lifecourse and lifestyle: the social and cultural location of health behaviors. *Soc Sci Med*. 1995;40:629-638.

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36. Yellen SB, Cella DF. Someone to live for: social well-being, parenthood status, and decision-making in oncology. *J Clin Oncol.* 1995; 13:1255–1264.
37. Caspersen CJ, Christenson GM, Pollard RA. Status of the 1990 physical fitness and exercise objectives—evidence from NHIS 1985. *Public Health Rep.* 1986;101:587–592.
38. Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey (BRFSS) 2000: Physical Activity by Race-Ethnicity and State.* Atlanta, Ga: CDC; 2000.
39. Rhodes RE, Martin AD, Taunton JE, Rhodes EC, Donnelly M, Elliot J. Factors associated with exercise adherence among older adults. An individual perspective. *Sports Med.* 1999; 28:397–411.
40. Ross CE, Wu C-L. The links between education and health. *Am Sociol Rev.* 1995;60: 719–745.
41. Ross CE, Wu CL. Education, age, and the cumulative advantage in health. *J Health Soc Behav.* 1996;37:104–120.
42. Wee CC, McCarthy EP, Davis RB, Phillips RS. Physician counseling about exercise. *JAMA.* 1999;282:1583–1588.
43. Bull FC, Jamrozik K. Advice on exercise from a family physician can help sedentary patients to become active. *Am J Prev Med.* 1998;15: 85–94.
44. Burton LC, Paglia MJ, German PS, Shapiro S, Damiano AM. The effect among older persons of a general preventive visit on three health behaviors: smoking, excessive alcohol drinking, and sedentary lifestyle. The Medicare Preventive Services Research Team. *Prev Med.* 1995;24:492–497.
45. Lewis BS, Lynch WD. The effect of physician advice on exercise behavior. *Prev Med.* 1993; 22:110–121.
46. Proctor BD, and the US Bureau of the Census. *Poverty in the United States: 2001.* Washington, DC: US Dept of Commerce, Census Bureau; 2002:iv, 35.
47. Levin S, Mayer-Davis EJ, Ainsworth BE, Addy CL, Wheeler FC. Racial/ethnic health disparities in South Carolina and the role of rural locality and educational attainment. *South Med J.* 2001;94:711–718.
48. Cubbin C, Hadden WC, Winkleby MA. Neighborhood context and cardiovascular disease risk factors: the contribution of material deprivation. *Ethn Dis.* 2001;11:687–700.
49. Strongeffer WJ, Freidl W, Rasky E. Health behavior and risk behavior: socioeconomic differences in an Austrian rural county. *Soc Sci Med.* 1997;44:423–426.
50. Sallis JF, Hovell MF, Hofstetter CR, et al. A multivariate study of determinants of vigorous exercise in a community sample. *Prev Med.* 1989;18:20–34.
51. Trost SG, Owen N, Bauman AE, Sallis JF, Brown W. Correlates of adults' participation in physical activity: review and update. *Med Sci Sports Exerc.* 2002;34:1996–2001.
52. Burton NW, Turrell G, Oldenburg B. Participation in recreational physical activity: why do socioeconomic groups differ? *Health Educ Behav.* 2003;30:225–244.
53. Salmon J, Owen N, Crawford D, Bauman A, Sallis JF. Physical activity and sedentary behavior: a population-based study of barriers, enjoyment, and preference. *Health Psychol.* 2003;22:178–188.
54. Fahrenwald NL, Walker SN. Application of the Transtheoretical Model of behavior change to the physical activity behavior of WIC mothers. *Public Health Nurs.* 2003;20: 307–317.
55. Crespo CJ, Ainsworth BE, Keteyian SJ, Heath GW, Smit E. Prevalence of physical inactivity and its relation to social class in US adults: results from the Third National Health and Nutrition Examination Survey, 1988–1994. *Med Sci Sports Exerc.* 1999;31: 1821–1827.
56. Crespo CJ, Smit E, Andersen RE, Carter-Pokras O, Ainsworth BE. Race/ethnicity, social class and their relation to physical inactivity during leisure time: results from the Third National Health and Nutrition Examination Survey, 1988–1994. *Am J Prev Med.* 2000;18:46–53.
57. Sundquist J, Winkleby M. Country of birth, acculturation status, and abdominal obesity in a national sample of Mexican-American women and men. *Int J Epidemiol.* 2000;29: 470–477.
58. Crespo CJ, Smit E, Carter-Pokras O, Andersen R. Acculturation and leisure-time physical inactivity in Mexican-American adults: results from NHANES III, 1988–1994. *Am J Public Health.* 2001;91:1254–1257.
59. Vega W, Amaro H. Latino outlook: good health, uncertain prognosis. In: LaVeist TA, ed. *Race, Ethnicity, and Health: A Public Health Reader.* San Francisco, Calif: Jossey-Bass; 2002:xxxviii, 701.
60. Ritzer G. *The McDonaldization of Society: an Investigation into the Changing Character of Contemporary Social Life.* Thousand Oaks, Calif: Pine Forge Press; 1996:xxi, 265.
61. Crespo CJ, Keteyian SJ, Heath GW, Sempos CT. Leisure-time physical activity among US adults. Results from the Third National Health and Nutrition Examination Survey. *Arch Intern Med.* 1996;156:93–98.
62. Caspersen CJ, Merritt R. Trends in physical activity patterns among older adults: the Behavioral Risk Factor Surveillance System, 1986–1990. *Med Sci Sports Exerc.* 1992; 24(suppl).
63. DiPietro L, Caspersen CJ. National estimates of physical activities among White and Black Americans. *Med Sci Sports Exerc.* 1991;23.
64. Schmidley D. The foreign-born population in the United States. 2003: current population reports, US Census Bureau. Available at: <http://www.census.gov/prod/2003pubs/p20-539.pdf>. Accessed September 2003.
65. US Immigration and Naturalization Service. *Statistical Yearbook of the Immigration and Naturalization Service, 2000.* Washington, DC: US Government Printing Office; 2002.
66. White CC, Powell KE, Hogelin GC, Gentry EM, Forman MR. The Behavioral Risk Factor Surveys: IV. The descriptive epidemiology of exercise. *Am J Prev Med.* 1987;3:304–310.