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Racial and Ethnic Disparities in Leisure-time Physical Activity in California: Patterns and Mechanisms

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Abstract

Evidence has shown that racial-ethnic minorities in the U.S. are less likely than whites to engage in leisure-time physical activity (LTPA); yet few studies to date have included Asian subgroups in the analyses and mechanisms underlying these disparities are not well-known. This study uses data from the 2007 California Health Interview Survey (N=37,164) to examine racial-ethnic disparities in self-reported adherence to LTPA recommendations and explore the mediating roles of socioeconomic status (SES), acculturation, and neighborhood perceptions. Nine racial-ethnic groups were included: non-Hispanic whites, non-Hispanic blacks, Mexicans, and six largest Asian subgroups. Results confirm that racial-ethnic minorities are, in general, less likely than whites to meet LTPA recommendations, whereas heterogeneity is also evident across Asian subgroups. No significant disparity is revealed for the Japanese and Filipinos but whites are advantaged compared to all other Asian groups. Educational attainment, percent of lifetime spent in the U.S., and access to park, playground, or open space are significantly associated with meeting the LTPA recommendations. SES and acculturation play differential roles in explaining group disparities for blacks, Mexicans, and some Asian subgroups. Perceived neighborhood environment does not mediate LTPA disparities by race-ethnicity. Net of these mediators, the advantages of whites in meeting LTPA recommendations persist for blacks, Mexicans, the Chinese, and Koreans. Future research should theorize and operationalize additional multilevel pathways linking race-ethnicity and LTPA while assessing measurement errors in the existing constructs.

Keywords

physical activity; race and ethnicity; socioeconomic status; acculturation; perceived neighborhood environment

Benefits of physical activity on a wide range of health outcomes are well recognized (U.S. Department of Health and Human Services 1996). Leisure-time physical activity (LTPA) is particularly seen as an important lifestyle measure distinct from and more amenable than other types of physical activity, such as occupational and household activities. Promoting LTPA is increasingly considered a national health priority for many developed countries (Trost et al. 2002). While recent years have witnessed increasing levels of LTPA in the U.S. (Brownson et al. 2005), racial-ethnic minorities have been persistently less engaged in LTPA than non-Hispanic whites (referred to 'whites' hereafter); these groups are largely uncommitted to meeting the recommended levels of light to moderate LTPA for at least 30 minutes five or more times per week, or vigorous LTPA for at least 20 minutes three or

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more times per week (Center for Disease Control and Prevention 2007). Variations within ethnic subgroups, particularly among Asians, are often not addressed, and mechanisms underlying these racial-ethnic disparities are not well understood (LaVeist 2005).

Filling this void in the literature, this study examines self-reported adherence to LTPA recommendations across whites, non-Hispanic blacks (referred to 'blacks' hereafter), Mexicans, and major Asian subgroups, and explores whether the observed disparities are partly attributable to groups differences in socioeconomic status (SES), acculturation experience, and neighborhood physical and social contexts. Presumably, a better understanding of nuanced LTPA disparities by race-ethnicity and sources of these disparities would provide evidence for policy interventions aimed to reduce lifestyle disparities and improve the health of the population as a whole.

Racial-Ethnic Disparities in LTPA

Prevalence rates of LTPA participation across major racial-ethnic groups in the US have been well documented. According to Center for Disease Control and Prevention (2007), about 52% of whites meet the LTPA recommendations, compared to 40% of blacks and 42% of Hispanics, whereas the percentages of persons who are physically inactive are nearly twice among Hispanics (21%) and blacks (20%) than whites (11%). However, fewer studies have addressed LTPA patterns among Asian Americans, and Asians are typically grouped together (sometimes with Pacific Islanders) and analyzed as a whole with detailed within-group variations lost in the aggregation. Limited evidence shows Asian Americans are much less likely to engage in LTPA than non-Asians, while subgroup variations are existent but less known (Kandula and Lauderdale 2005; Mampilly et al. 2005; Maxwell et al. 2012). Also less known is the sources of these group disparities. In theory, racial-ethnic disparities in LTPA participation lie within group differences in socioeconomic, cultural, and spatial-environmental factors.

Mechanisms: SES, Acculturation and Neighborhood

The fundamental cause theory posits that SES affects health because it is positively associated with health-promoting resources and negatively with health-detrimental hazards, where healthy lifestyle is an emerging pathway (Link and Phelan 1995; Phelan et al. 2010). Like for many other health behaviors, there is a strong SES gradient associated with LTPA with higher SES linked to greater participation in LTPA (Pampel et al. 2010). Theoretical mechanisms explaining the link between SES and LTPA are primarily drawn from four perspectives. First, active participation in LTPA entails both self-efficacy and sufficient knowledge (Kaiser and Baumann 2010; Moore et al. 2010; Sharpe et al. 2008), and well-educated people are better equipped with human capital that helps them maintain strong personal control and maintain healthful lifestyle (Ross and Mirowsky 2010). Second, higher SES individuals have more economic and occupational resources that can be used individually or collectively on exercise. Third, the stress paradigm posits that stress exposures are often socially originated and tightly linked to social positions (Pearlin 1989; Wilkinson 1999); the disadvantaged may avoid the challenges of regular exercise and take the form of inactivity as functions of pleasure, relaxation, or self-medication (Pampel et al. 2010). Fourth, LTPA reflects a unique personal taste as well as class distinction that are in line with privileged social status. The sociological tradition that lifestyles function as reproduction of social class or status quo traces back to Weber's observation that social strata are social carriers of particular ways of living and to Bourdieu's notion of "distance from necessity" (Cockerham 2007). Privileged individuals may thus engage in activities setting themselves apart from low status groups.

Evidence to date has consistently shown that SES measured by education and income is positively correlated with LTPA participation among adults (Ahmed et al. 2005; Cutler and Lleras-Muney 2010; Droomers et al. 1998; Sternfeld et al. 1999). Research further examining potential correlates of LTPA, such as knowledge of guidelines and perceived barriers, also reveals the significance of SES (Masse and Anderson 2003; Moore et al. 2010). However, whether SES is a major mediator of the link between race-ethnicity and LTPA has not been well examined.

In the U.S., substantial SES differentials exist between disadvantaged groups like blacks and Hispanics and advantaged groups like whites and Asians (Kao and Thompson 2003). Meanwhile, SES also varies within Hispanic and Asian subgroups at the individual-level (Ramirez and de la Cruz 2002; Sakamoto et al. 2009) as well as the neighborhood level (Wen et al. 2009). It is thus plausible that individual and neighborhood SES are part of the mechanisms underlying the observed racial-ethnic disparities in LTPA.

Socioeconomic differences aside, culture may play an important and distinct role in explaining LTPA disparities. Recent immigrants from Latin America and Asia make up an increasing proportion of racial-ethnic minorities in the U.S. Most foreign-born immigrants inevitably go through a process of acculturation defined as “the process by which an individual raised in one culture enters the social structure and institutions of another, and internalize the prevailing attitudes and beliefs of the new culture” (Franzini et al. 2001: 513). Acculturation has been linked to higher levels of LTPA among Hispanics and Asian Americans (Abraido-Lanza et al. 2005; Bungum et al. 2011; Crespo et al. 2001; Evenson et al. 2004; Kandula and Lauderdale 2005), as opposed to other lifestyle factors such as smoking and alcohol intake (Abraido-Lanza et al. 2005).

In the process of acculturation in the U. S., self-perceptions of body image may change (Olvera et al. 2005), motivating individuals to engage more in LTPA. Acculturation has also been linked to “postmodernization” in advanced societies where there is a tendency for immigrants from less-developed countries to reverse some of the perceived maladaptive features of classic modernization and to adopt the values, attitudes, and behaviors of “postmodernized” American society such as adopting healthy lifestyles and enhancing health (Abraido-Lanza et al. 2005).

Beyond SES and acculturation at the individual level, larger socio-ecological factors such as neighborhood contexts also play salient roles in shaping health practices and outcomes and potentially mediate health disparities by race-ethnicity (Kawachi and Berkman 2003). Neighborhood streets are the most frequently used physical activity space (Giles-Corti and Donovan 2002), and neighborhood social and physical environments have been linked to individuals’ LTPA participation net of individual factors (for reviews, see Humpel et al. 2002; McNeill et al. 2006). For example, neighborhood safety and accessibility to exercise facilities have been linked to higher levels of LTPA (Li et al. 2012; Tucker-Seeley et al. 2009; Velasquez et al. 2009).

Neighborhood environments may systematically vary across racial-ethnic groups given the persistent residential segregation by race-ethnicity in America, and may thus contribute to racial-ethnic disparities in LTPA (McNeill et al. 2006). Black- and Hispanic-concentrated neighborhoods are typically more deprived and less safe (Massey 1996; Peterson 2009). However, whether deprived neighborhoods also have less favorable built environment is debatable. Several recent studies seem to suggest that deprived neighborhoods are in fact better off in activity-promoting built environmental features in terms of walkability and accessibility to destinations such as parks (Cutts et al. 2009; Franzini et al. 2010; Wen et al.

2013). Therefore, it remains an empirical question whether neighborhood built environments help explain racial-ethnic disparities in LTPA.

Hypotheses

Based on the literature reviewed, we hypothesize that, (1) compared to whites, minority groups are less likely to report meeting LTPA recommendations but considerable amounts of variations within racial-ethnicity subgroups exist; (2) higher SES individuals are more likely to meet LTPA recommendations, and SES is a mediator for white-black and white-Mexican differences, but not for the white-Asian contrast; (3) acculturation, measured by length of residence and English proficiency, is a positive covariate and a mediator for white-Mexican and white-Asian differences; and (4) perceived neighborhood safety and accessibility to exercise facilities or open space are associated with higher likelihood of meeting LTPA recommendations, net of individual characteristics.

Data and Methods

Data used in this study are from the 2007 California Health Interview Survey (CHIS) adult public files. As the nation's largest state health survey, CHIS is a population-based survey that applied a multistage sample design with the consideration of high ethnic concentration to estimate the overall state population, as well as major racial and ethnic groups and subgroups. To improve the estimate of ethnic residence, geographically targeted oversamples have been conducted, particularly for Koreans and the Vietnamese due to their high concentration of residence. Thus the CHIS data are uniquely suited to comparing racial-ethnic subgroups with relatively large sample size. We focus our sample on non-Hispanic white, non-Hispanic black, Mexican, and six largest Asian ethnicities and have excluded persons with disability. Since CHIS uses a complex sample design, we conduct weighted analyses to ensure that estimates from the CHIS sample are representative of the California adult population.

Dependent Variable

LTPA is categorized into two types by intensity: moderate LTPA refers to activities like walking, bicycling, swimming, dancing, or gardening, and vigorous LTPA refers to activities like aerobics, running, soccer, fast bicycling, or fast swimming. The 2007 CHIS data provides a variable that combines both moderate and vigorous LTPA and contains three levels: no LTPA, some LTPA but not meeting the recommendations, and regular LTPA meeting the recommendations. Our measure of LTPA is a binary variable that distinguishes respondents who have met LTPA recommendations of either moderate or vigorous activities from those who have not.¹

Independent variables

Racial-ethnic groups and subgroups include white, black, Mexican, Chinese, Japanese, Korean, Filipino, South Asian, Vietnamese, and other Asian. The other Asian group (including other Asian subgroups or two or more Asian types) is not discussed hereafter due to its conceptual ambiguity. SES is captured by household income and education. *Poverty income ratio* is the ratio of the estimated household's total annual income (in dollars) from

¹We conducted sensitivity analyses to examine whether our results would be robust to different measurement of LTPA. We replaced the dichotomous measure of meeting LTPA recommendations with a continuous measure of total minutes of LTPA per week and reran all the analyses. The results remained largely unchanged. Considering meeting LTPA recommendations is a qualitatively important outcome given evidence-based public health significance of meeting a certain threshold of LTPA amount on a regular basis (U.S. Department of Health and Human Services 2008), we chose to use the binary measure of LTPA as the outcome variable in our analyses.

all sources before taxes in the year 2006 relative to the federal poverty level. *Educational attainment* is measured as a three-level ordinal variable (high school or less, some college, and college degree or above). Demographic control variables are age (ranges 18-85 years old), gender (female and male), and marital status (not married versus married).

Acculturation is categorized by two variables. *Percent of lifetime in the U.S.* is a relative measure of length of residence based on respondents' age, number of years they have lived in the U.S., and the year they first come to live in this country. *English proficiency* is a dichotomous measure: does not speak good English (not well/not at all) and speaks good English (well, very well, or only speak English). Respondents who reported not speaking English at home were asked to rate their English proficiency.

Perceived neighborhood environment is tapped by two variables: neighborhood safety and access to park, playground, or open space. *Neighborhood safety* is measured by a question asking how safe respondents feel in their neighborhood, with responses dichotomized into 'safe' (feeling safe all of the time or most of the time) or 'unsafe' (feeling safe some of the time or none of the time). *Access to park, playground, or open space* is captured by a question asking respondents whether or not there is a park, playground, or open space within walking distance of their home.

Analytical Approach

A series of weighted logistic regression models are fit to test our hypotheses. The baseline model only includes racial-ethnic groups to examine crude group differences in LTPA prevalence rates while adjusting for demographic control variables. We then successively add the sets of SES, acculturation, and neighborhood environment covariates to assess their mediating effects on the link between race-ethnicity and LTPA. The final model keeps all the racial-ethnic groups and includes covariates statistically significant in previous models. Analyses are weighted to reflect the complex sampling design of CHIS using the SVY commands in STATA 11.2.

To specify the mediating effects of the race-ethnicity and LTPA link, we calculate predicted probabilities of meeting LTPA recommendations for racial-ethnic groups that are statistically significant in the final multivariate model. An increase in probability differentials with whites means the effect of race-ethnicity gets stronger after a specific set of covariates are added to the model. If the differentials decrease, then it can be argued that the racial-ethnic effects are partly attributable to the covariates. The magnitude of the mediating effects is estimated by reporting the percentage changes in predicted probability differentials.

Results

Group-specific descriptive statistics are presented in Table 1. Whites have the highest prevalence of meeting LTPA recommendations among all groups. Blacks, Mexicans, and the Vietnamese have relatively lower SES profiles. The Japanese and Filipinos have better English proficiency and longer length of residence than most other Asian subgroups, whereas South Asians have the shortest length of residence but best English proficiency among all Asians. In addition, more blacks and Mexicans report that their neighborhoods are not safe, and more Koreans report they do not have convenient access to open space.

Table 2 presents the results of a series of logistic regression analyses of the odds of meeting LTPA recommendations. Model 1 shows racial-ethnic disparities controlling for age, gender and marital status. As hypothesized, odds ratios of all the minority groups are less than 1 and most are statistically significant at the 95% confidence level—except for the Japanese and

Filipinos. Compared to whites, Chinese are the least likely (about 118% less likely) to meet LTPA recommendations; the corresponding figures for other subgroups are 82% for Koreans, 58% for the Vietnamese, 55% for Mexicans, 42% for blacks, and 40% for South Asians.

Model 2 adds two SES factors to Model 1. College education and poverty income ratio are both positively and significantly associated with LTPA. They also seem to help explain some of the white advantages compared to blacks, Mexicans and the Vietnamese but not to the other groups.

Model 3 adds acculturation factors to Model 2. The results show that percent of lifetime in the U.S. is a significant and positive factor but English proficiency is not. The higher proportion of lifetime a person has spent in the U.S., the more likely he or she is to meet LTPA recommendations. Lower percentages of lifetime spent in the U.S. help explain lower levels of LTPA participation for Mexicans, the Chinese, and Koreans, and are particularly crucial for South Asians and the Vietnamese as adding acculturation covariates has rendered their odds ratios versus whites insignificant.

Model 4 further adds the perceived neighborhood environment variables to Model 3. While neighborhood safety is not a significant covariate, having convenient access to facilities is a positive and significant factor associated with odds of meeting LTPA recommendations. Individuals who report having walkable access to park, playground, or open space are about 20% more likely to meet LTPA recommendations. However, there is almost no change in the odds ratios of racial-ethnic groups from Model 3 to Model 4, except for Koreans, suggesting that for the most part these two neighborhood factors do not explain why ethnic minorities are less likely than whites to engage in LTPA.

Model 5 is the final predictive model that includes all the racial-ethnic groups as well as covariates that were significant in previous models and remained significant in the final multivariate modeling. As we can see, the racial-ethnic effects for four minority groups, blacks, Mexicans, the Chinese, and Koreans, remain statistically significant, suggesting that gaps in LTPA prevalence between these groups and whites cannot be fully explained by SES, acculturation, and perceived neighborhood environment variables included in the analyses. Moreover, the three key independent variables, education, percent of lifetime in U.S., and access to park, playground, or open space, remain statistically significant in our final multivariate model. In other words, class, culture, and neighborhood all matter to LTPA as predictors or covariates, although they may not help explain LTPA disparities by race-ethnicity.

To better illustrate mediating roles of the hypothesized mediators, Figure 1 presents predicted probabilities of meeting LTPA recommendations for white and the four racial-ethnic groups that remain statistically significant in Model 5, holding all the other variables at their means. To estimate the amount of mediating effects of SES, acculturation, and neighborhood environment, we look at changes in probabilities from Model 1 through Model 4. The black-white difference decreases from 0.083 (.431-.348) to 0.071 (0.421-0.350) after adjusting for SES covariates, indicating that SES can explain about 14% of the difference. The Mexican-white gap drops from 0.103 to 0.076, indicating SES can explain more than 26% of the difference. However, the mediating effects of SES are minimal for the Chinese and Koreans. Similarly, based on changes of group differences from Model 2 to Model 3, we can see that acculturation covariates explain more than 18% of LTPA disparity between Mexicans and whites, 16% for the Chinese, and 21% for Koreans, but little for blacks. Furthermore, adding neighborhood variables has hardly any impact on the racial-ethnic effects, as their probabilities hold constant from Model 3 to Model 4,

except for the white-Korean difference that has a 5% decrease. Such results echo those from the logistic regression analyses, and are consistent with our hypotheses that for Asians acculturation rather than SES helps explain their lower levels of participation in LTPA than whites while for blacks and Mexicans it is the other way around.

Discussion

Using data from multiethnic California, we have examined racial-ethnic disparities in meeting LTPA recommendations between whites and a number of minority groups, and tested whether SES, acculturation, and perceived neighborhood environment play a mediating role in contributing to these disparities. Results are largely consistent with our hypotheses that racial-ethnic disparities in LTPA are remarkable and within-Asian subgroup variations are visible. Blacks, Mexicans, the Chinese, Koreans, South Asians, and the Vietnamese are significantly less likely than whites to meet LTPA recommendations. At the same time, there are no significant differences between whites and two Asian groups, the Japanese and Filipinos.

The Japanese and Filipinos are the most acculturated compared to other Asian subgroups. There have been few Japanese immigrants to the U.S. in recent decades, and Filipinos come from a former U.S. colony. Besides, the Japanese and Filipinos are less residentially segregated from whites compared to other Asians (Xie and Goyette 2004). Thus our findings underscore the importance of taking into account the heterogeneity across ethnic subgroups in the U.S. as well as country of origin in studying immigrant health.

We also find that education, percent of lifetime in the U.S., and access to park, playground, or open space are positively associated with LTPA participation. This finding highlights the salience of these factors to LTPA and resonates with the growing literature examining correlates of LTPA (Cradock et al. 2009; Trost et al. 2002; Wen et al. 2007). That education is a stronger predictor of LTPA than income has been previously reported (Cutler and Lleras-Muney 2010; Droomers et al. 1998). It is also in line with the notion that education is a central aspect of SES that matters for health behaviors, possibly due to its strong influences promoting psychosocial strengths, such as social support and self-efficacy, that are presumably contributory to desirable lifestyle modifications (Ross and Mirowsky 2010). The finding on the positive association between lifetime spent in the U.S. and LTPA is consistent with previous work on acculturation and health (Abraido-Lanza et al. 2005; Berrigan et al. 2006; Kandula and Lauderdale 2005). In addition, that neighborhood accessibility to LTPA facilities is positively linked to LTPA is in line with the rapidly growing literature pointing to the significance of the built environment on physical activity and obesity (Papas et al. 2007; Sallis and Glanz 2006).

Contrary to several previous studies (Abraido-Lanza et al. 2005; Bungum et al. 2011; Crespo et al. 2001; Evenson et al. 2004; Kandula and Lauderdale 2005), this study shows that English proficiency, used as a proxy factor of language acculturation, is not independently associated with meeting LTPA recommendations, after adjusting for SES and percent of lifetime residing in the U.S. This may be because supportive evidence mainly comes from studies that focus on Hispanics while the current study includes a diverse sample of Asian subgroups. It is also possible that we include lifetime spent in the U.S. in the analyses which can be a better indicator of acculturation for Asians than language proficiency because individuals fluent in English may have acquired the language skill in their home country and is not necessarily a direct marker of acculturation. The effect of language proficiency may have been overshadowed by the effect of percent of lifetime in the U.S.

Another noteworthy finding is that perceived neighborhood safety is not associated with LTPA. Previous literature has not reached consistency regarding the role of neighborhood safety in LTPA; there are two ways to conceptualize it. One is some general sense of safety, or general fear of crime; the other is incident-based fear of being a victim of a particular crime, such as assault, robbery, or rape (Rountree and Land 1996). Offense-specific fear of crime is arguably more emotive, producing strong endocrine response thus more damaging to health than general fear of crime; thus, our measure of neighborhood safety may not be thorough enough to capture perceptions of safety and crime. Moreover, the mixed findings may also reflect interaction effects of demographic characteristics and neighborhood contexts. Previous studies have documented variations of neighborhood safety effects by gender (Velasquez et al. 2009) and race-ethnicity (Center for Disease Control and Prevention 1996; Williams and Collins 2001). To keep our analyses focused, these interaction effects are not examined in our study.

Our second aim is to explore whether the observed LTPA disparities by race-ethnicity can be partly attributed to SES, acculturation and neighborhood factors. As hypothesized, SES appears to explain some portion of the LTPA gap for blacks and Mexicans versus whites. This is consistent with other evidence showing the importance of SES in mediating racial-ethnic disparities in physical activity (He and Baker 2005) and physical inactivity (Marshall et al. 2007). Our results also show that acculturation partly explains disparities between Mexicans and whites as well as those between Asians and whites. A prior study suggests that immigrant status plays a role in the disparity between Hispanic and white men in LTPA (Ahmed et al. 2005). We extend this literature to Asian subgroups, and find similar patterns that acculturation is a prominent mediator for many Asians. Among all the groups examined in this study, the Chinese and Koreans exhibit the most remarkable and resilient disparities from whites. After controlling for demographic, SES, acculturation, and neighborhood factors, odds ratios of the Chinese and Koreans remain strong. These patterns suggest that either there is a need to better measure the SES, acculturation, and neighborhood concepts, or additional pathways exist underlying some minority groups' persistent under-engagement in LTPA. It is possible that self-reported LTPA data, albeit well-validated in Western settings, are less able to characterize moderate to vigorous LTPA forms (e.g., Tai Chi) that are more prevalent among ethnic groups (Afable-Munsuz et al. 2010). In addition, Asians have the lowest obesity prevalence across major racial-ethnic groups in the U.S. (Wang and Beydoun 2007) and thus may not realize the urgent need to exercise compared to other groups.

We find little evidence that perceived neighborhood contexts help explain racial-ethnic disparities in LTPA. Neighborhood contexts have been found to mediate black-white gaps in other health domains such as self-rated health (Cagney et al. 2005; Do et al. 2008), prenatal conditions (Grady 2006; Schempf et al. 2011), and fruit and vegetable intake (Dubowitz et al. 2010). The results are mixed on obesity risks, with a national study finding community socioeconomic disadvantage mediating black-white differences in obesity risks (Robert and Reither 2004) while a Utah study reporting residential segregation along with other neighborhood factors not explaining the observed Hispanic-white obesity disparities (Wen and Maloney 2011). Few studies have specifically examined whether neighborhood contexts mediate LTPA disparities by race-ethnicity, especially regarding Asian subgroups. Our study is among the first to address this issue. It is possible that the two neighborhood variables we have examined, safety and accessibility, are not systematically varying across racial-ethnic groups in California. It is also possible there are many other aspects of neighborhood contexts potentially relevant to LTPA but not examined in this study, such as subcultural orientation toward LTPA in the neighborhood. More research is warranted to further evaluate the role of neighborhood contexts in contributing to racial-ethnic disparities in LTPA.

Study limitations should be acknowledged. First, the analyses are based on self-rated measures; therefore, group-specific response bias and recall bias are likely existent. Objective data such as accelerometer counts provide an alternative and innovative way to measure physical activity (Troiano et al. 2008). Second, our mediating variables are limited to SES, acculturation, and perceived neighborhood environment, so we are not able to develop a formal or full test of mediation. Third, since this study is based on a sample collected in California, findings reported here are not automatically applicable elsewhere.

Despite the limitations, this study contributes to the current literature by scrutinizing detailed patterns of and mechanisms underlying LTPA disparities across major racial-ethnic groups and the largest Asian subgroups in the United States. To reiterate, the take-home message from this study is that ethnic minorities are generally less likely to engage in LTPA than whites in the U.S., and SES and acculturation play differential roles in mediating these disparities for blacks, Mexican, and some Asian subgroups. The heterogeneity found in this study in both the patterns and the mechanisms of LTPA disparities by race-ethnicity may have implications for policy makers, educators, and primary care physicians when designing and implementing targeted and culturally sensitive health promotion intervention programs tailored to specific groups. Moreover, as the underlying mechanisms are not fully revealed, future research may inquire into the moderating roles of age, gender, and region, and theorize and operationalize additional multilevel pathways linking race-ethnicity and LTPA while assessing measurement errors in the existing constructs.

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Note: Probabilities are calculated using the *margins, at means* commands following the logistic regression models in Table 2 in STATA 11.2.

Figure 1. Predicted Probabilities of Leisure-time Physical Activity by Race/Ethnicity

Note: Probabilities are calculated using the *margins, at means* commands following the logistic regression models in Table 2 in STATA 11.2.

Table 1

Descriptive Statistics

	White	Black	Mexican	Chinese	Japanese	Korean	Filipino	South Asian	Vietnamese	Other Asian
Regular LTPA	0.428	0.357	0.333	0.261	0.388	0.291	0.386	0.352	0.325	0.287
Age	46.56	42.03	37.60	43.30	49.08	42.36	40.61	37.11	39.52	36.33
Male	0.505	0.474	0.515	0.475	0.447	0.462	0.444	0.588	0.465	0.566
Married	0.604	0.315	0.532	0.613	0.580	0.626	0.585	0.711	0.570	0.446
Poverty Income Ratio ^a	3.59	3.00	2.48	3.15	3.66	3.21	3.34	3.50	2.67	3.23
Education ^b	2.16	1.85	1.41	2.22	2.19	2.23	2.31	2.67	1.80	2.00
Percent Life in US ^c	4.81	4.80	3.74	3.04	4.45	3.04	3.65	2.65	3.12	3.82
English Good	0.995	0.999	0.611	0.711	0.954	0.621	0.962	0.975	0.639	0.816
Neighborhood Safe	0.968	0.869	0.879	0.932	0.958	0.936	0.913	0.906	0.948	0.897
Access to Park/playground/open space (Yes)	0.839	0.824	0.821	0.829	0.807	0.691	0.860	0.843	0.808	0.705
Sample size	25561	1806	5661	1299	490	587	665	440	406	249

Note: data shown are proportions or means.

^aPoverty Income Ratio is treated as a continuous variable in the models. It has four levels: "0-99% FPL," "100-199% FPL," "200-299% FPL," "300% FPL and above."

^bEducation is treated as a continuous variable in the models. It has three levels: "High school or less," "Some college," "College and above."

^cPercent Life in US is treated as a continuous variable in the models. It has five levels: "0-20%," "21-40%," "41-60%," "61-80%," "81%+."

Table 2

Logistic Regression Odds Ratio for Leisure-time Physical Activity

	Model 1	Model 2	Model 3	Model 4	Model 5
White (Ref)	1.000	1.000	1.000	1.000	1.000
Black	0.705*** (0.601-0.827)	0.738*** (0.631-0.864)	0.735*** (0.628-0.860)	0.737*** (0.629-0.863)	0.727*** (0.621-0.851)
Mexican	0.646*** (0.581-0.719)	0.724*** (0.647-0.810)	0.769*** (0.684-0.864)	0.771*** (0.685-0.867)	0.763*** (0.683-0.853)
Chinese	0.472*** (0.403-0.554)	0.482*** (0.412-0.565)	0.547*** (0.461-0.649)	0.548*** (0.462-0.649)	0.551*** (0.466-0.652)
Japanese	0.855 (0.637-1.147)	0.848 (0.632-1.137)	0.8794 (0.652-1.173)	0.878 (0.653-1.180)	0.880 (0.655-1.182)
Korean	0.548*** (0.398-0.755)	0.558** (0.403-0.772)	0.634** (0.453-0.888)	0.652* (0.468-0.910)	0.659* (0.471-0.920)
Filipino	0.835 (0.662-1.054)	0.839 (0.666-1.058)	0.914 (0.719-1.161)	0.913 (0.718-1.160)	0.921 (0.724-1.173)
South Asian	0.716* (0.543-0.943)	0.700* (0.533-0.919)	0.824 (0.621-1.093)	0.830 (0.625-1.101)	0.851 (0.643-1.127)
Vietnamese	0.634** (0.465-0.864)	0.684* (0.500-0.937)	0.764 (0.548-1.063)	0.765 (0.548-1.070)	0.766 (0.549-1.068)
Other Asian	0.510** (0.321-0.808)	0.523** (0.329-0.832)	0.563* (0.353-0.896)	0.578* (0.365-0.915)	0.585* (0.373-0.919)
Poverty Income Ratio ^a		1.064** (1.017-1.113)	1.037 (0.988-1.088)	1.035 (0.985-1.087)	
Education ^b		1.066** (1.016-1.119)	1.068** (1.019-1.121)	1.062* (1.011-1.115)	1.075** (1.025-1.127)
Percent Life in US ^c			1.082** (1.019-1.121)	1.081** (1.011-1.115)	1.093** (1.025-1.127)

	Model 1	Model 2	Model 3	Model 4	Model 5
			(1.035-1.133)	(1.034-1.131)	(1.050-1.138)
English Good			1.004	1.009	
			(0.841-1.200)	(0.843-1.208)	
Neighborhood safe				1.041	
				(0.863-1.256)	
Neighborhood access to park/playground/open space (Yes)				1.205**	1.214***
				(1.083-1.340)	(1.090-1.352)

Note: N=37164. 95% Confidence Intervals are in parentheses. Models 1 to 4 all adjusted for age, gender, and marital status. Model 5 adjusted for gender and marital status.

^aPoverty Income Ratio is treated as a continuous variable in the models. It has four levels: "0-99% FPL," "100-199% FPL," "200-299% FPL," "300% FPL and above."

^bEducation is treated as a continuous variable in the models. It has three levels: "High school or less," "Some college," "College and above."

^cPercent Life in US is treated as a continuous variable in the models. It has five levels: "0-20%," "21-40%," "41-60%," "61-80%," "81%+."

*
p<0.05

**
p<0.01

p<0.001.