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SAN DIEGO STATE UNIVERSITY

Residential segregation and health behavior among Black adults

A dissertation submitted in partial satisfaction of the
requirements for the degree of Doctor of Philosophy

in

Clinical Psychology

by

Irma Corral

Committee in charge:

University of California, San Diego

Professor Thomas Patterson
Professor Thomas Rutledge
Professor Georgia Sadler

San Diego State University

Professor Scott Roesch, Chair
Professor Hope Landrine, Co-Chair
Professor Vanessa Malcarne

2009

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Co-Chair

_____

Chair

UNIVERSITY OF CALIFORNIA, SAN DIEGO

SAN DIEGO STATE UNIVERSITY

2009

DEDICATION

This dissertation is dedicated in thanks to my family. To my parents, Juan Manuel and Eva Corral, for their unwavering love and support; to my brothers Joel, Juan and Armando Corral for their moral support; and especially to my sister Celia and the entire Martell family, for their constant encouragement and for being my home-away-from-home during my years in San Diego.

EPIGRAPH

The oppressed must never allow the conscience of the oppressor to slumber... To accept injustice or segregation passively is to say to the oppressor that his actions are morally right.

Martin Luther King, Jr., 1958

TABLE OF CONTENTS

SIGNATURE PAGE…….. iii

DEDICATION.……..…..... iv

EPIGRAPH..……..……..... v

TABLE OF CONTENTS...……...……..… vi

ACKOWLEDGEMENTS……..……..... ix

VITA……..... xi

ABSTRACT……..... xvii

INTRODUCTION……..…..... 1

BACKGROUND AND SIGNIFICANCE…….…. 3

Residential Segregation in the US…….. 3
Racism and Segregation……..……...……... 8
Segregation, Economic Mobility and Poverty……..……. 9

Pathways Between Segregation and Health……..…… 11
Black vs. White Neighborhoods…….. 11

Segregation and Health Outcomes……...……. 13

Black Health Behavior…….……. 16

Summary of Existing Segregation and Health Behavior Studies..… 16

The Present Study……... 17

METHODS…….…… 19

Description of the Parent (SDSU-CBHN) Study……... 19
The Community Organization……..…… 20
Participants/ Sample……...…… 20
Sampling Procedure……..……. 20
Survey Procedure…….…... 22

Description of the Present Study……...……..... 24
Independent Variables…….……..…… 24
Measuring Demographic Variables……..... 24

Measuring Neighborhood Segregation……..... 25
Measuring Neighborhood SES…… 25
Dependent Variables……..... 26
Measuring Fruit and Vegetable Consumption……..... 26
Measuring Current Smoking……..…… 26
Measuring Physical Activity…….…….. 27
Data Analytic Strategy……... 27

RESULTS……... 29

Community Reception of the Survey and Response Rates……. 29

Demographic Characteristic of the Sample……. 29
Individual Demographic Characteristics by Segregation and Poverty…… 30

Prevalence of Health Behaviors in the Sample……..……. 30
Current Smoking…… 30
5+FVC…….. 31
Physical Activity…… 32

The Segregation and Health Behavior Relationship……... 33

Removing the Influence of Individual-level Covariates……. 33
Current Smoking…… 34
5+FVC and VPA…… 34

Removing the Influence of Neighborhood Poverty…… 34

DISCUSSION……. 36

Key Findings and Implications……... 36
Socially Desirable Responding…….. 37
Segregation Levels……. 39
Rural-Suburban/Urban Differences……... 40
CA Neighborhoods…… 40

Limitations…….. 41

APPENDICES…… 45

California Black Health Network Health Survey…… 46
Reduced Set of Census Tracts Sampled..…….. 52

FIGURES……..…….. 54

Figure 1. Geographic Designations Used in the US……... 55

Figure 2. Formula Used to Calculate the Segregation (Dissimilarity) Index in a City…… 56

TABLES…….. 57

Table 1. Segregation Index for 28 Major US cities, 2000……..….... 58
Table 2. Exposure Indices for 3 Major US cities, 2000…….. 59
Table 3. Sampling Proportionate to Representation……... 60
Table 4. Final CTS Sampled……...……. 61
Table 5.Demographic Characteristics of the Sample by Segregation and Poverty…… 62
Table 6. Prevalence of Health Behaviors of the Sample by Individual- and Area-level Variables……..... 63
Table 7. Chi Square Tests of the Relationship Between Health Behavior and Segregation……... 64
Table 8. Hierarchical Logistic Regression Predicting Current Smoking from Individual Demographic Variables and Area Level Segregation Among Men……..…….. 65
Table 9. Hierarchical Logistic Regression Predicting Current Smoking from Individual Demographic Variables and Area Level Segregation among Women …….. 66
Table 10. Hierarchical Logistic Regression Predicting 5+FVC from Individual Demographic Variables and Area Level Segregation Among the Whole Sample……..…… 67
Table 11 Hierarchical Logistic Regression Predicting Physical Activity from Individual Demographic Variables and Area Level Segregation among the Whole Sample…….…….. 68
Table 12. Multi-level Logistic Regression Predicting Current Smoking from Individual- and Area-level Predictors of Smoking for Men…… 69

REFERENCES…… 70

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VITA

2002 Bachelor of Arts in Psychology, University of Nevada, Las Vegas

2006 Master of Science in Psychology, San Diego State University

2007 Master of Public Health, San Diego State University

2009 Doctor of Philosophy in Psychology, San Diego State University/University of California, San Diego

PUBLICATIONS

Landrine, H., and Corral, I. (In press). Separate and unequal: Residential segregation and Black health disparities. *Ethnicity & Disease*.

Landrine, H., and Corral, I. (In press). Methodological and statistical issues and strategies in research with diverse samples: The problem of measurement equivalence. In H. Landrine & N. F. Russo (Eds.), *Handbook of diversity in feminist psychology.* New York: Springer.

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Pichon, L.C., Corral, I., Landrine, H., Mayer, J.A., and Norman, G.J. (Under review). Prevalence and Correlates of Sun Protection Behaviors among African Americans.

Pichon, L.C., Landrine, H., Corral, I., Hao, Y., Hoerster, K.D., and Mayer, J.A. (Under review). Measuring Skin Cancer Risk in African Americans: Is the Fitzpatrick Skin Type Classification Valid?

Mellerson, J., Landrine, H., Hao, Y., Zhao, L , Corral, I., and Cooper, D. (Under review). Residential segregation and exercise among a national sample of Hispanic adults.

Cooper, D., Hao, Y., Landrine, H., Mellerson, J., Zhao, L., and Corral, I. (Under review). Individual- and area-level predictors of cancer screening in a national sample of Hispanic women.

Zhao, L., Hao, Y., Landrine, H., Cooper, D., Mellerson, J., and Corral, I. (Under review). Residential segregation, health behavior and obesity among Blacks: A multi-level analysis.

FIELDS OF STUDY

Major Field: Health Psychology/Behavioral Medicine

ABSTRACT OF THE DISSERTATION

Residential segregation and health behavior among Black adults

by

Irma Corral

Doctor of Philosophy in Clinical Psychology

University of California, San Diego, 2009

San Diego State University, 2009

Professor Scott Roesch, Chair
Professor Hope Landrine, Co-Chair

Data indicate that the health of Blacks who reside in segregated Black neighborhoods is significantly poorer than that of their more integrated cohorts. Compared to integrated Blacks, segregated Blacks have significantly higher rates of chronic conditions such as cardiovascular disease and obesity. Many have argued that such differences may reflect differences in the built-environments of segregated Black vs. integrated neighborhoods, and specifically reflect the low access to grocery stores and recreational outlets, and the high access to fast food and to tobacco in segregated areas. Such data imply that segregated Blacks differ from their integrated counterparts in the health behaviors that contribute to chronic conditions (i.e., diet, smoking, and physical activity) but this has not been empirically examined. Thus, this dissertation explored the

relationship between residential segregation and diet (fruit and vegetable consumption), smoking, and physical activity among Blacks.

A random, statewide, community sample of N = 2,190 California Black adults (>18 years) was collected over the course of 2 years using community-based participatory research methods in collaboration with the California Black Health Network (CBHN). Participants residing in randomly-selected block groups within selected high- and low-segregated census tracts were sampled door-to-door and received an anonymous written health survey; the response rate was 99%. Participants were 54% women, 43% single, and most had at least some college or higher education. Age ranged from 18 to 95 years (mean age 43.6). Multivariate and multi-level logistic models revealed that residential segregation was not a significant predictor of fruit and vegetable consumption or of physical activity, but was a significant predictor of smoking among men. These findings are inconsistent with the existing literature. This may reflect segregation differences between this California sample and the Midwestern and Northeastern samples in prior studies, as well as possible high socially-desirable responding to CBHN surveyors.

INTRODUCTION

Ecological research in behavioral medicine and public health continues to demonstrate that the neighborhood context is often a stronger predictor of health status and outcomes than individual-level variables such as health knowledge and attitudes, psychosocial factors, and even individual-level SES (Cubbin, Hadden, & Winkleby, 2001; Glass, Rasmussen, & Schwartz, 2006; Schootman, et al., 2007). Accordingly, poor health status is increasingly being understood as primarily a function of problematic features of the neighborhoods in which people reside (Lochner, Kawachi, Brennan, & Buka, 2003). Unfortunately, neighborhood-context models of health status or health behavior rarely focus on ethnic minorities and their neighborhoods of residence (Powell, Slater, Chaloupka, & Harper, 2006).

A recent report by the U.S. Census Bureau concluded that the U.S. continues to be characterized by high Black-White residential segregation, i.e., most Blacks reside in mostly Black neighborhoods and most Whites reside in mostly White neighborhoods irrespective of neighborhood- and of individual-level SES (Iceland, Weinberg, & Steinmetz, 2002). Although residential segregation characterizes the lives of most Blacks, the majority of large population and small intervention health studies do not assess segregation (Acevedo-Garcia, & Lochner, 2003; Acevedo-Garcia, Lochner, Osypuk, & Subramanian, 2003). Thus, relatively little attention has been devoted to the possibility that ethnic differences in health status and outcomes may be primarily a function of the problematic features of segregated minority neighborhoods; the

segregated neighborhood context remains a neglected potential explanation of ethnic health disparities.

The purpose of this study was to provide the first examination of the role of residential segregation in three health behaviors (smoking, physical activity, and fruit and vegetable consumption) among a statewide, random, community sample of Black adults in California. The Specific Aims were to:

1) Examine whether Blacks residing in low vs. high segregated neighborhoods differ in health behavior.

2) Examine if residential segregation accounts for a significant amount of variance in health behavior after other individual variables known to be predictive of health behavior (age, gender, marital status, education, income) are accounted for in multivariate models.

3) Examine if residential segregation accounts for a significant amount of variance in health behavior after neighborhood SES is added to these models in multilevel analyses.

BACKGROUND AND SIGNIFICANCE

Residential Segregation in the U.S.

Segregation refers to the spatial separation of population groups along racial/ethnic lines (Johnston, Poulsen & Forrest, 2007; Massey & Denton, 1988). More specifically, residential segregation refers to racial/ethnic composition and racial/ethnic spatial distribution of populations across the neighborhoods of a metropolitan statistical area (MSA), city, or smaller geographical area (Acevedo-Garcia, Lochner, Osypuk, & Subramanian, 2003). Residential segregation is a multilevel construct theorized to consist of five dimensions: Evenness (dissimilarity), centralization, clustering, concentration, and isolation (Massey & Denton, 1988; Massey, White, & Phua, 1996). Each dimension is calculated by using data from the total population of a geographical area and data on the distribution of black residents within that area (Massey, White, & Phua, 1996). Figure 1 details common geographic levels at which population data are analyzed, and highlights that MSAs are large whereas census tracts (CTS) are small.

INSERT FIGURE 1 HERE

The first index of segregation is Evenness (also known as Dissimilarity, or the Segregation Index [SI]), which refers to the differential distribution of Whites and Blacks across neighborhoods in a given area. (Johnston, Poulsen & Forrest, 2007; Massey & Denton, 1988). This is the single most-commonly used measure of segregation and hence Figure 2 shows the formula used to calculate the SI for a city. The Segregation Index (SI) ranges from 0 (fully integrated city) to 100 (fully segregated city), and is interpreted as the percentage of Blacks (or Whites) who would have to move to achieve city-wide integration. Hence, high dissimilarity (SI) means that most Blacks and Whites

reside in separate neighborhoods (i.e., Black neighborhoods vs. White neighborhoods) whereas low dissimilarity means that Blacks and Whites share most residential areas.

INSERT FIGURE 2 HERE

As noted above, SI data indicate that the U.S. continues to be characterized by high Black-White segregation (high SI). Specifically, the Census Bureau has concluded that 60-80% of the Black (or White) population would need to move to integrate most U.S. cities (Iceland, et al., 2002). Table 1 shows the SI for 28 major cities in the U.S. As shown, 86.7% of the Blacks in Detroit, 83.6% of the Blacks in Chicago, and 68.8% of the Blacks in Atlanta – for example – would have to move to integrate those cities.

INSERT TABLE 1 HERE

Centralization is another index of segregation, and this refers to the degree to which minority neighborhoods are located near the metropolitan area's central city as opposed to its suburbs. Centralization becomes a concern when discriminatory practices relegate minorities to declining city centers (i.e., "inner-city" neighborhoods), which are characterized by substandard housing and poor neighborhood conditions (Johnston, Poulsen & Forrest, 2007; Massey & Denton, 1988). Clustering, another index of segregation, refers to the degree to which Black neighborhoods are adjacent and contiguous to each other as opposed to dispersed across a metropolitan area. Said differently, clustering concerns the distribution of Black areas with respect to each other. A high degree of clustering means that there is a tightly packed ethnic/racial enclave or ghetto (Masey, White, & Phua, 1996). Another index of segregation is Concentration, which refers to the population density of the segregated group relative to the density of other groups. Black areas in a city are often a small number of neighborhoods that

together make up a very small part of a geographic area. Hence, when Black neighborhoods are densely populated in comparison to other neighborhoods, this is known as concentration (Massey & Denton, 1988; Masey, White, & Phua, 1996).

Lastly, the index of exposure (also known as Social Isolation Index, ISO) refers to the average probability of contact between Whites and Blacks at the neighborhood level. This index captures the experience of segregation, as felt by an average member of a minority or majority group, and is an indicator of Black connectedness to mainstream culture and resources (Johnston, Poulsen & Forrest, 2007; Massey & Denton, 1988). That is, the exposure/isolation index measures the extent to which (likelihood that) minority and majority members physically interact with one another by virtue of sharing a common residential area. Table 2 shows the Exposure Index for 3 major U.S. cities, and the SI as well. As shown, in a highly segregated city such as Detroit (SI=86.7), Blacks make up 22.8% of the city's population yet reside in neighborhoods (census tracts) that are 80% Black. Blacks in Detroit interact with other Blacks (outside of work) 80% of the time, and interact with Whites only 15% of the time. Similarly, Detroit Whites (who make up 69.7% of the city's population) live in neighborhoods that are 87.9% White and interact that often with Whites outside of work – and rarely (4.9% of the time) interact with Blacks.

INSERT TABLE 2 HERE

Each of the segregation indexes summarized above measures a distinct and unique aspect of segregation. Ethnic groups can be segregated along one or more of the above dimensions; when a minority group is segregated on all of these dimensions, that group is referred to as hypersegregated (Massey & Denton, 1989). Although a variety of

U.S. minority groups are segregated along one or more of the above dimensions, Blacks are more likely than others to be hypersegregated (Johnston, et al., 2007). For example, in a study of segregation among U.S. minority groups in a national sample, Wilks and Iceland (2004) found that Blacks were hypersegregated in 29 metropolitan areas (MSAs). In contrast, Latinos were hypersegregated in two MSAs, and Asians and Native Americans were not hypersegregated in any metropolitan areas.

At the CT level, segregation is often measured by the percent of Black residents living in the tract, where CTs with ≥ 61% Black residents are considered high-segregated, and neighborhoods having ≤ 50% Black residents considered to be low-segregated or integrated (Fang, Madhvan, Bosworth, & Alderman, 1998; Inagami, et al., 2005). Recently, there has been a movement towards measuring neighborhood variables at the CT level. Indeed, there is reason to suspect that measuring segregation and health effects at the CT level may be superior to measuring these at larger geographical areas such as zip codes or MSAs. For example, studies on the effects of neighborhood-SES have demonstrated that measuring SES at the CT level is superior to measuring it at the zip code, county, and MSA levels (Krieger, Chen, Waterman, Rehkopf, & Subramanian, 2003); such data support the hypothesis that segregation likewise might be best measured at the CT level.

Specifically, studies have revealed that census-tract (CT) level measures are more sensitive to neighborhood-level effects than measures at zip code and larger levels (See Figure 1). This is because, unlike zip codes (Mean N = 30, 000), CTs are relatively small (Mean N = 4,000) geographic areas that are by and large homogenous in population density, living conditions (e.g., area resources, hazards, exposures), living circumstances

(e.g., owning vs. renting) and hence lifestyle (Krieger, Chen, Waterman, Rehkopf, et al., 2003; Krieger, Chen, Waterman, Rehkopf, et al., 2005; Krieger, Zierler, Hogan, Waterman, et al., 2003; Krieger, Williams, & Moss, 1997). A typical zip code, on the other hand, contains CTs that differ significantly by ethnicity, density, and SES, and typically contains the highest and lowest SES CTs within it. Hence, measures at the zip code level – and by extension, at the larger city/MSA level – obscure both SES and ethnic disparities within these areas (Krieger, Williams, & Moss, 1997).

In addition, CTs are non-overlapping, relatively permanent subdivisions of a county based on population and ecological-niche characteristics, and are, in this sense, "neighborhoods" in a way that larger geographical areas are not. For example, MSAs typically encompass more than one city (e.g., Los Angeles-Long Beach, Chicago IL-Gary IN) and so represent socially-, economically- and ecologically-different areas. Similarly, zip codes (which are created by the U.S. Postal Service for mail delivery) are not permanent; usually overlap; range in size from one building to a huge area that cuts across state lines; and are constantly added, deleted, and their boundaries changed in response to letter-carrier needs (Krieger, Chen, Waterman, Rehkopf, et al., 2003). Furthermore, resources and hazards tend to hold across the block groups within a CT, but do not hold across the numerous CTs in a zip code, or across the numerous zip codes in an MSA. CT-level (SES) measures not only adequately represent living conditions across the block groups within the CT but also hold across ethnic groups within a CT, which is not the case for zip codes and MSAs (Krieger, Chen, Waterman, Rehkopf, & Subramanian, 2003). Hence, analyses of segregation at the CT level may be as beneficial and preferable as analyses of SES at the CT level. This is why, in community-based SES

research, CTs (which are ecologically meaningful geographical units where individuals within it share living conditions and neighborhood resources that may impact health) are operationally defined as neighborhoods (Krieger, Chen, Waterman, Rehkopf, & Subramanian 2003). People, likewise, think of their "neighborhood" as their CT or specific block-groups within their CT (Krieger, Chen, Waterman, Rehkopf, & Subramanian 2003).

Racism & Segregation. Residential segregation in the United States is a function of racism (Cell, 1982; Collins & Williams, 1999; Massey & Denton, 1993). A key characteristic of racism is the ideology that minorities are inferior, and the associated desire to maintain social distance from minority groups. Hence, in the United States, residential segregation originated in deliberate discriminatory housing practices that relegated minorities, Blacks in particular, to neighborhoods separate from Whites (Collins & Williams, 1999; Logan & Alba, 1995; Massey & Denton, 1993; Williams & Collins, 2001; Yinger, 1995). Thus, sociologists regard residential segregation as the structural manifestation of racism (Collins & Williams, 1999; Jaynes & Williams, 1989; Massey & Denton, 1993; Williams & Collins, 2001).

Studies indicate that housing discrimination against Blacks, Latinos and other minority groups persists in both subtle and blatant ways (Yinger, 1995). For example, several studies have demonstrated that real estate agents discourage Blacks (or steer Blacks away) from living in White neighborhoods (Ross & Turner, 2005). Similarly, studies indicate that banks and lending institutions are less likely to offer financial backing to Latinos (vs. Whites) attempting to buy homes in White neighborhoods, when all financial markers are equal (Ross & Turner, 2005). Rental discrimination often is

more blatant, as exemplified by a recent experimental study by Carpusor & Loges (2006) in which rental applications with stereotypically Black names (e.g., Tyrell Jackson) received fewer positive responses from potential landlords than the same applications with stereotypically White names (e.g., Patrick McDougall).

These subtle and blatant discriminatory forces directly impede the spatial integration of minorities and Whites. Thus, Black residential segregation is not the result of Black housing preferences. That is, Black neighborhoods are not segregated because Blacks desire and choose to live near members of their own ethnic group. On the contrary, national and metropolitan studies consistently demonstrate that Blacks and other minority groups would prefer to live in integrated neighborhoods but Whites do not want to live near them, and indeed say they would move if Blacks and other minorities moved into their neighborhood (Charles, 2001; Dawkins, 2004; Krysan, 2002; Krysan & Farley, 2002).

White intolerance of integration with various minority groups contributes to the severity of ethnic segregation. For example, Black segregation is most prevalent, with segregation of Latinos somewhat less prevalent, and segregation of Asians least prevalent. This pattern represents a racial/ethnic gradient in White's self-reported acceptance of residential integration with these groups. That is, Whites report higher tolerance for residing in neighborhoods with Asians, moderate tolerance for having Latino neighbors, and least tolerance of integration with Blacks (Charles, 2001; Farley, 2002).

Segregation, Economic Mobility & Poverty. Ethnic/racial segregation does not mirror income segregation, and thus is not an artifact of socioeconomic (SES) differences

between minorities and Whites (Charles, 2001; Dawkins, 2004; Farley, 2005). Census data indicate that SES segregation is only mildly to moderately prevalent in U.S. cities, while racial segregation is highly prevalent (Jargowsky, 1997). This means that if people were forced to live in neighborhoods with people of similar SES, the ensuing neighborhoods would be racially integrated (Charles, 2001; Dawkins, 2004; Farley, 2005). Indeed, evidence indicates that the discriminatory housing practices that relegate Blacks to Black neighborhoods hold across Black social-class levels. Upwardly-mobile, affluent, educated Blacks who want to live in mostly White suburban neighborhoods face housing discrimination that keeps them out of those neighborhoods (Adelman, 2004; Alba, Logan, & Stults, 2000; Logan & Alba, 2002). This means that affluent Blacks are also segregated into their own neighborhoods.

Although segregation impacts all ethnic minorities irrespective of SES, poor Blacks are disproportionately affected. Place of residence determines local educational opportunities, and for segregated Blacks, this means limited educational options (and subsequently limited employment opportunities) as a function of attending the substandard schools that characterize segregated neighborhoods (Collins & Williams, 1999; Schulz, Williams, Israel, & Lempert, 2002). These educational inequalities, coupled with the relative absence of non-skilled jobs (and preponderance of white-collar jobs) in central cities means that segregation is causally related to high levels of unemployment among segregated Blacks, and to low economic mobility (Massey & Denton, 1993; Schulz, Williams, Israel, & Lempert, 2002).

Pathways between Segregation & Health.

According to ecological models of health and health behavior, health is embedded in the social and environmental context in which groups of people live and work (Hovell, Wahlgren, & Gehrman, 2002). Hence, irrespective of how segregation is measured, theoretically, segregation contributes to health via its constituents – i.e., the characteristics of separate and unequal Black vs. White neighborhoods (Landrine & Corral, in press). A few of these neighborhood inequalities are summarized below to highlight theorized pathways between neighborhood disparities and health disparities.

Black vs. White Neighborhoods. Irrespective of neighborhood SES, Black neighborhoods (compared to White ones) have poorer housing quality and poorer neighborhood conditions (Massey, 2001). In particular, Black and other minority neighborhoods are characterized by significantly higher exposure to environmental hazards than White neighborhoods (Gee & Paine-Sturges, 2004; Morello-Frosh & Jesdale, 2006; Morello-Frosh & Lopez, 2006; Morello-Frosh, Pastor, & Sadd, 2001; Morello-Frosh & Shenassa 2006; Ponce, Hoggatt, Wilhelm, & Ritz, 2005). For example, a recent study found that residence in a segregated Black neighborhood entailed a three-fold increase in cancer risks associated with exposure to ambient air toxics (Morello-Frosh & Jesdale, 2006). These higher environmental exposures contribute to Black poor health, and are particularly deleterious during critical pre- and post-natal developmental periods (Block, Scribner, & DeSalvo, 2004; Hyland, Travers, Cummings, et al., 2003; Kwate, 2007; Lewis, Sloane, Nascimento, Diamant, Guinyard, Yancey, et al., 2005; Moore & Diez Rouz, 2006; Peterson, Lowe, & Reid, 2005). The increased disease

vulnerabilities associated with environmental hazards are then exacerbated by inequality in neighborhood resources.

Specifically, Black neighborhoods also have fewer health-enhancing resources than White neighborhoods, irrespective of neighborhood SES. For example, there are fewer cancer screening facilities in general, and inexpensive cancer screening facilities in particular, in Black neighborhoods compared to White neighborhoods (Zenk, Tarlov, & Sun, 2006). Moreover, the distance from and travel time (via public transit) to low- or no-fee mammography facilities is significantly longer from poor Black than from poor White neighborhoods (Zenk, Tarlov, & Sun, 2006). Unfortunately, studies of segregation and access to cancer screening facilities have never examined cancer screening rates among both groups.

In addition, access to vegetable markets and chain supermarkets selling inexpensive fresh fruits and vegetables is lower in Black neighborhoods than in comparable White neighborhoods. Chain supermarkets offer a wider variety of fresh fruits and vegetables, and offer these at significantly lower prices than do small grocery and convenience stores (Moore & Diez-Roux, 2006; Moorland, Wing, Diez-Roux, & Poole, 2002). White (vs. Black) neighborhoods have been demonstrated to contain more of these markets. Specifically, several large studies – e.g., entailing 500 census tracts (Moore & Diez-Roux, 2006; Moorland, Wing, Diez-Roux, & Poole, 2002) or 28,000 zip-codes representing 281 million people (Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2006) have found that White neighborhoods have 2-4 times more chain supermarkets than Black neighborhoods, even after controlling for community SES (assessed as median home value or median household income). Similarly, the distance to a chain

supermarket is significantly further (1.1 miles further) from (the center of) Black vs. White neighborhoods (Zenk, Schulz, Israel, James, Shuming, and Wilson, 2005). Such studies of segregation and supermarket-access unfortunately have never examined any health outcome or health behavior (i.e., diet).

Minority neighborhoods are replete with health-damaging neighborhood features. For example, Black and Latino neighborhoods have significantly more fast-food restaurants (Block, Scribner, & DeSalvo, 2004; Kwate, 2007; Lewis et al., 2005), more tobacco outlets, more alcohol outlets, and more prevalent and dense tobacco and alcohol advertising than White neighborhoods (Barbeau, Woln, Naumova, E., & Balbach, 2005; Chuang, Cubbin, Ahn, & Winkleby, 2005; Hyland, Travers, Cummings et al, 2003; La Veist & Wallace, 2000; Peterson, Lowe, & Reid, 2005). Finally, Black neighborhoods are characterized by lower availability of sidewalks, parks, gyms, biking paths, recreation centers, public pools, and other activity-encouraging features of the built environment (Powell, Slater, & Chaloupka, 2004; Powell, Slater, Chaloupka, & Harper, 2006). Thus, theoretically, segregation might contribute to Black health disparities directly via environmental exposures, and indirectly via altering health behaviors such as consumption of fruits/vegetables, smoking, and cancer-screening (Gee & Payne-Sturges, 2006; Landrine & Corral, in press; Williams & Collins, 2001).

Segregation and Health outcomes

The majority of large population and small intervention health studies do not assess segregation (Acevedo-Garcia, & Lochner, 2003; Acevedo-Garcia, Lochner, Osypuk, & Subramanian, 2003). The studies that do assess segregation have found strong relationships between segregation and Black (but not White) health. In the vast majority

of these studies, adult mortality rates from all causes and infant mortality rates were the health outcome examined (Acevedo-Garcia and Lochner, 2003; Acevedo-Garcia, Lochner, Osypuk, and Subramanian, 2003; Deaton and Lubotsky, 2003; Jackson, Anderson, Johnson, and Sorlie, 2000; Polednak, 1997). With very few exceptions (Mellor and Milyo, 2004), these studies indicate that Black infant and adult mortality are higher in states, counties, metropolitan statistical areas (MSA), and zip codes where Blacks represent a higher proportion of the population (Deaton & Lubotsky, 2003; Jackson, Anderson, Johnson, & Sorlie, 2000; McLaughlin & Stokes, 2002; Mellor & Milyo, 2001; Subramanian, Acevedo-Garcia, & Osypuk, 2005). Specifically, results from mortality studies reveal that adult and infant mortality rates among segregated Blacks are 2 to 5 times higher than those of Whites even after controlling for socioeconomic status (SES). For example, there are no Black-White differences in adult mortality rates for low-segregated Blacks (SI < 50), but Black adult mortality for high segregated Blacks (SI >65 or 70) is 3X that of Whites (Acevedo-Garcia & Lochner, 2003; Deaton & Lubotsky, 2003; Jackson, Anderson, Johnson, & Sorlie, 2000; Polednak, 1997), mortality from cardiovascular disease in particular (Cooper, 2001). The effect of segregation on mortality rates holds for Blacks but not Whites: Living in a segregated Black neighborhood predicts increased mortality for Blacks, but living in a segregated White neighborhood is not associated with mortality for Whites.

Only a handful of studies have examined outcomes other than mortality rates. For example, a few studies examined the role of segregation in the prevalence of low birthweight infants among Blacks vs. Whites and likewise found strong segregation effects: 30% of Black-White birthweight difference is accounted for by segregation alone

(Bell, Zimmerman, Almgren, Mayer, & Huebner, 2006; Gennaro, 2005; Grady, 2006; Sastry, & Hussey, 2003). In addition, one recent study revealed a strong relationship between segregation and body mass index (BMI) for Blacks but not for Whites in which every 1 standard deviation increase in Black segregation was associated with a 14% increase in the odds of Blacks being overweight and a 0.423 increase in Black BMI (Chang, 2006). There also have been a few recent studies of segregation and self-reported health status in which every 10-percentage point increase in Blacks in a neighborhood (CT) was associated with a 5% increase in poor health (after controlling for individual-income and education, geographical region, and degree of urbanization (Mellor & Milyo, 2004; Subramanian, Acevedo-Garcia, & Osypuk, 2005). Finally, there are a few recent studies linking high Black segregation to high rates of infectious diseases (such as tuberculosis) among Blacks (Acevedo-Garcia, 2001; Acevedo-Garcia, 2000).

Despite strong evidence that segregation is related to mortality and other health indicators, there is a general absence of studies examining segregation and *chronic disease morbidity,* and *prevalence of health behaviors*, both of which logically precede mortality and could be possible mechanisms through which segregation impacts mortality. Specifically, segregation has never been investigated in studies of Black chronic disease morbidity (i.e., Black excess rates of diabetes, hypertension, asthma, or cancer). Similarly - with the exception of two recent studies described below, segregation has not been examined in studies of Black health behavior. Hence, the purpose of the present study is to investigate the relationship of residential segregation to three problematic Black health behaviors in a random, stratified, community sample of 2,500 Black adults. Below, data on the problematic nature of these behaviors are briefly

summarized, and then followed by a summary of the sole two studies of segregation of Black health behavior (i.e., Bell, Zimmerman, Mayer, Almgren, & Huebner, 2007; Lopez, 2006).

Black Health Behavior.

Numerous studies have revealed that Blacks have significantly poorer health behaviors than Whites. Specifically, fruit and vegetable consumption (FVC) among Blacks is significantly lower than that of Whites (Casagrande, Wang, Anderson, and Gary, 2007; Gans, Burkholder, Risica, and Lasater, 2003; Patterson, Block, Rosenberger, Pee, and Kahle,1990; Subar, Heimendinger, Patterson, Krebs-Smith, Pivonka, and Kessler, 1995). Similarly, Blacks have higher rates of smoking than Whites (Centers for Disease Control, 2004; U.S. Dept. of Health and Human Services, 1998). Moreover, in contrast to the recent decline in prevalence and incidence of cigarette use among younger populations, cigarette use among low-income African Americans has remained high and unchanged (American Cancer Society, 2000; CDC, 2004; Northridge, Morabia, Ganze. Bassett, Gemson, Andrews, & McCord,1998). Furthermore, Blacks are more likely to be physically inactive than Whites and are hence are less likely to meet standard physical activity recommendations (Centers for Disease Control, 2004; Centers for Disease Control, 2003). With the exception of the studies noted below, the role of segregation in the above problematic health behaviors has not been examined.

Summary of Segregation and Health Behavior Studies.

Bell and colleagues (2007) examined the relationship of residential segregation to smoking during pregnancy for a sample of Black women. They found that residence in a high segregated (vs. low-segregated/integrated) neighborhood was associated with a 29%

increase in smoking during pregnancy. Unfortunately, Black pregnant women smokers are a select group from whom conclusions about the impact of segregation on smoking cannot be drawn. In another study, Lopez (2006) examined the impact of residential segregation on physical inactivity and found that increased segregation was associated with an increased risk of being physically inactive, even when controlling for individual SES. Unfortunately, this study assessed segregation at the MSA level, which, as detailed previously, may not be the best level at which to analyse segregation. More importantly, this study used data from the CDC's Behavioral Risk Factor Surveillance System (BRFSS), which utilizes random-digit-dial telephone survey (RDDTS) methodology to collect health information. Studies examining the validity of RDDTS methodology for collecting data among Black participants suggest that telephone-survey samples are biased toward the higher SES members of the Black population who have better health behavior (Massey, O'Connor, & Krotki, 1997; Thornberry, & Massey, 1988; U.S. Bureau of the Census, 1994; Frankel, Srinath, Hoaglin, Battaglia, Smith, Wright, & Khare, 2003; Ford, 1998). Hence, this preliminary investigation of segregation and physical inactivity has several significant methodological limitations. However, these two studies represent a promising start, and underscore the need for research on the possible role of segregation in problematic smoking, diet, and physical inactivity among Blacks.

The Present Study.

Hence, in the present study, Blacks were randomly sampled from CTs that varied from 20% to 92% Black, and the role of segregation in smoking, physical activity, and fruit and vegetable consumption was investigated as a contextual variable *for the first time*. The purpose of this study was provide the first examination of the role of

residential segregation in three health behaviors (smoking, physical activity, and fruit and vegetable consumption) among a statewide, random, community (rather than telephone) sample of Black adults in California. The Specific Aims were to: 1) Examine whether Blacks residing in low vs. high segregated neighborhoods differ in health behavior; 2) Examine the extent to which residential segregation accounts for a significant amount of variance in health behavior after other individual-level variables known to be predictive of health behavior (age, gender, education, income) are accounted for in multivariate models; and 3) Examine the extent to which residential segregation accounts for a significant amount of variance in health behavior after neighborhood SES is added to these models in multilevel analyses. Achieving these aims is novel and timely, and constitute a substantial contribution to the literature. Specifically, providing a clearer understanding of the link between segregation and Black health has major implications for whether interventions should focus primarily on changing people or on changing places.

METHODS

To achieve the aims posed above, data from the TRDRP 2006-2009 study, "Prevalence & Correlates of African-American Tobacco Use," were used. This study (TRDRP Grant 15 AT-1300) is a community-based participatory research (CBPR) project entailing a collaboration between San Diego State University (SDSU PIs: Drs. Hope Landrine and Scott Roesch; SDSU Project Director: Irma Corral) and the California Black Health Network (CBHN PI: Ms. Denise Adams-Simms). The purposes of the community organization-academic researcher partnership (or CARA grant) were 1) to facilitate research on the Black community by decreasing Black distrust of researchers and to 2) assure dissemination of results to Blacks in a manner that advances Black community health. The Project Director of this study participated in the experimental design and design of the survey used; contributed the health-behavior survey items analyzed here; trained and supervised research assistants in community data collection; and coordinated all day-to-day aspects of the project including data collection, cleaning and scanning, and participant-reimbursement incentives and record-keeping. The study methodology of the parent study is detailed below, followed by a description of the present study.

Description of the parent (SDSU-CBHN) Study

The aims of the San Diego State University (SDSU) - California Black Health Network (CBHN) study were to acquire basic data on the role of residential segregation and of sociocultural variables in tobacco use among CA Blacks from a random, statewide, sample of 2500 Black adults surveyed in-person, in their communities, by Blacks. In addition to a plethora of tobacco-use items relevant to the funder (TRDRP),

the Project Director and SDSU PIs added measures of a variety of other health behaviors including physical activity and fruit and vegetable consumption. The survey is given in its entirety in the Appendix.

The Community Organization. As noted, this study was a collaborative partnership between Dr. Hope Landrine and Dr. Scott Roesch of San Diego State University (SDSU) and the California Black Health Network (CBHN). The CBHN is a consortium of community health agencies, and is the oldest and largest organization of Black public health professionals in CA. Created in 1978, the CBHN is a 501(c) not-for-profit organization devoted to improving the health of the CA Black population through programs and research. The main office of the CBHN is in San Diego, with chapters in Sacramento, Los Angeles, Oakland-San Francisco, and the Inland Empire (San Bernardino-Riverside). Hence, CBHN programs and surveys are conducted statewide in all major metropolitan statistical areas were the CA Black population resides. Not surprisingly, the CA Black community respects and trusts CBHN, and has long been accustomed to completing health surveys for CBHN.

Participants/Sample. A statewide, random, community sample of N = 2500 CA Black adults (≥18 years), collected over the course of 2 years. Participants resided in neighborhoods in San Diego, Los Angeles, Sacramento, San Francisco, Oakland, and San Bernardino.

Sampling Procedure. The community-based sampling procedure used in the Harlem (Northridge, Morabia, Ganze, Bassett, Gemson, Andrews, & McCord, 1998; Fullilove, Fullilove, Northridge, et al., 1999), Chicago (Dell, Whitman, Shah, Silva, & Ansell, 2005), and other recent studies of minorities (e.g., Eschback, Ostir, Patel,

Markides, & Goodwin, 2004) was adapted. This procedure entails (Stage 1) selecting counties where Blacks reside with probability proportional to their representation, then (Stage 2) selecting census tracts (CTS) within those that are stratified by neighborhood SES and segregation, and finally (Stage 3), randomly-sampling block-groups within the CTS and conducting door-to-door surveys of one randomly-selected adult from each household. This procedure assures a sample from whom generalizations to CA Blacks can be made, as detailed below.

In Stage 1, data from the 2000 Census were used to ascertain where CA Blacks live. This revealed that 85% of the CA Black population (*N*= 2,263,882) resides in cities in these 7 counties: San Francisco, San Diego, San Bernardino, Sacramento, Riverside, Los Angeles, and Alameda. Hence, these 7 counties were selected for sampling. Treating these as the universe (as 100% of CA Blacks) revealed that the Black population is roughly distributed across the counties as follows: San Francisco = 5%, San Diego = 8%, San Bernardino = 10%, Sacramento = 10%, Riverside = 10%, Los Angeles = 42%, Alameda = 15%. Hence, the plan was to sample the N= 2500 Black adults from the counties as follows: San Francisco = 125, San Diego = 200, San Bernardino= 250, Sacramento= 250, Riverside = 250, Los Angeles = 1050, Alameda = 375. Because sampling was proportional to representation of CA Blacks and only one adult per household was surveyed, weighting of cases was not necessary during data analysis (e.g., Dell, Whitman, Shah, Silva, & Ansell, 2005; Eschback, Ostir, Patel, Markides, & Goodwin, 2004; Fullilove et al., 1999; Northridge et al., 1998).

In Stage 2, demographic data on the 4194 CTs that comprise the 7 counties were examined, and the 513 CTs with >20% Black residents selected; 20% Blacks (non-

segregated) was selected as the minimum CT% Blacks for efficient, door-to-door sampling. The percent Blacks in the 513 CTs ranged from 20% to 92%, and the percent Black residents Below the Poverty Line (Black % BPL) ranged from 0 to 100%. Next, CT level data on the Black %BPL (area SES) were added to the census data to create a table of 513 CTS that varied in %Black, Black %BPL (the major contextual variables). These Black % BPL data were obtained from public use datasets that are available at US Census Bureau. Sampling continued (using any combination of CTS as needed) until each stratification cell was filled and each county N was acquired.

Finally, the 513 CTS were reduced to 85 (see Appendix) that vary simultaneously in % Black and Black % BPL (i.e., CTs were selected because they met the stratification criteria, not because of their locations). As shown in page 52-53 the appendix, the Overall % BPL often (Rows 1, 20, 85) but does not always (Rows 3, 26, 81, and 83) match the Black %BPL. Table 3 shows the actual sample acquired, and demonstrates that the sample acquired matches the distribution of Blacks across CA. CTs in Riverside were omitted from the study due to safety concerns, and San Diego was slightly oversampled as a result.

INSERT TABLE 3 HERE

Survey Procedure. Participants completed the *California Black Health Network Health Survey*, a brief, anonymous survey created by CBHN and SDSU. The survey's simple questions can be understood by those with a 7th grade reading level, and it generally takes 10-15 minutes to complete.

Black/minority undergraduate students from SDSU and from colleges in each community (San Francisco, San Diego, San Bernardino, Riverside, Sacramento, Los

Angeles, Oakland) were hired by CBHN or SDSU (depending on location) to collect the data. CBHN staff in each community (i.e., at the local CBHN office), and often the Project Director as well, accompanied 2-10 students during the door-to-door sampling in each CT. The local CBHN staff and local students from each community were trained in the sampling and survey procedures, and then conducted the sampling in their own communities. After CTS were selected, random block-groups were sampled within them.

Only households with self-identified Black adults were allowed to participate. At each household, the local survey team stated that they represented the (local) CBHN (and SDSU) and were conducting an anonymous survey of the health of Blacks in that neighborhood. When a person answered the door, they were asked how many adults live in the household and how many are currently at home. If the person who answers the door was the only one at home, that person was surveyed. If other adults were at home, one was randomly-selected using a modification of the Kish procedure (Kish, 1949). In this modification, instead of using a random-number generator to select a person in the household, the adult whose birthday is closest to the day of sampling is selected; this simple procedure assures similar randomness as indicated in recent multi-level modeling studies entailing random samples of Blacks and Latinos (Stuber, Galea, Ahern, Blaney, & Fuller, 2003). Each participant had the option of completing the survey while the local team waited outside, taking the survey to complete and turning it in to the local team a half hour later, or having the local team read the survey aloud and fill-in the person's answers. These options were included to increase participation by those with low literacy levels. Participants were reimbursed $10 cash upon turning-in the survey and the local team then moved to the next household. Sampling occurred on weekends (Saturday and

Sunday) during the daylight hours and occasionally on weekday evenings from 4-6 PM in order to increase participation by adults and men.

Description of the Present Study

In the present study, the role of neighborhood (CT level) residential segregation in three health behaviors (smoking, physical activity, and fruit and vegetable consumption) among Black adults was investigated for the first time. Specifically, the Specific Aims were to: 1) Examine whether Blacks residing in low vs. high segregated neighborhoods differ in health behavior; 2) Examine the extent to which residential segregation accounts for a significant amount of variance in health behavior after other variables known to be predictive of health behavior (age, gender, marital status, education, income) are accounted for in multivariate models; and 3) Examine the extent to which residential segregation accounts for a significant amount of variance in health behavior after neighborhood SES is added to these models in multilevel analyses. Measurement and psychometric properties of the variables of interest are detailed below.

Independent Variables (IVs).

The 6 IVs are 1) Age; 2) Gender; 3) Marital Status; 4) Education; 5) Household Income; 6) Neighborhood (CT) Segregation Level; and 7) Neighborhood (area /CT) SES.

Measuring demographic variables. The questions used to assess the demographic IVs (age, gender, marital status, education, household income) have been used in prior population-based studies (i.e., National Health Interview Survey [NHIS], Behavioral Risk Factor Surveillance System [BRFSS], California Health Interview Survey [CHIS]), and have been demonstrated to have moderate to high reliability and validity (http://www.chis.ucla.edu/methods.html).

Measuring Neighborhood Segregation. Segregation can be measured in a variety of ways including the % Blacks in a geographic area, the Dissimilarity Index (SI), and the Isolation Index (ISO). Recent studies indicate that ISO, a measure of the probability that Blacks will encounter Blacks (and no Whites) in their CT, has better construct validity and is more sensitive to disparities than the more commonly-used Dissimilarity Index (SI) a measure of the uneven distribution of Blacks vs. Whites across a CT (Acevedo-Garcia & Lochner, 2003; Cooper, Friedman, Tempalski & Friedman, 2007; Subramanian, Acevedo-Garcia & Osypuk, 2005). Thus, by using ISO to measure segregation, the measure of segregation used here is superior to that in most studies *(*Subramanian, Acevedo-Garcia, & Osypuk, 2005; Acevedo-Garcia, & Lochner, 2003). In studies using ISO, high segregation is defined as ≥ .70 *(*Subramanian, Acevedo-Garcia, & Osypuk, 2005; Acevedo-Garcia, & Lochner, 2003). The Isolation Index for the CTs sampled is this study is shown in Table 4.

INSERT TABLE 4 HERE

Measuring Neighborhood SES. Neighborhoods were operationally defined as census tracts (CTs) (Krieger, Williams, & Moss, 1997). Because neighborhood poverty is often associated with segregation (Collins & Williams, 1999; Schulz, Williams, Israel, & Lempert, 2002), neighborhood-level poverty was included in analyses. Neighborhood-SES was measured as the percent of Black CT residents below the poverty line. Several well-known geocoding studies all consistently reveal this measure to be superior (i.e., one that better highlights SES disparities) than other CT-level SES measures such as CT-Median Household Income, Median Home Value etc. (Krieger, Williams, & Moss, 1997; Krieger, Zierler, Hogan, Waterman, Chen, Lemieux, and Gjelsvik, 2003). Neighborhoods

are defined as a poverty-area if $\geq 20\%$ residents in that neighborhood live below the federal poverty line. This cutoff was used in this study in order to be consistent with the literature.

Dependent Variables (DVs).

The 3 health behaviors investigated were Fruit and Vegetable Consumption, Physical Activity, and Current Smoking. These were measured by the following 3 DVs; 1) Consuming 5+ servings of fruits and vegetables a day (yes, no); 2) Vigorous physical activity in past 30 days (yes/no); and 3) Current smoker (yes/no). These variables are further detailed below.

Measuring Fruit and Vegetable Consumption (FVC). The FVC module used in all major national and state public health studies (such as the NHIS, BRFSS, CHIS) was used to measure FVC. This brief module consists of 6 items (Questions 42 – 47 in the Appendix) assessing consumption of fruit, fruit juice, and various vegetables. These questions have been demonstrated to have moderate to high reliability and validity (Jackson, Jatulis, & Fortmann, 1992; Liao, Tucker, Okoro, Giles, Mokdad, & Harros, 2004; U.S. Department of Health and Human Services, 2000; Nelson, Powell-Griner, Town, & Kovar, 2003; Warneke, Davis, De Moor, and Brandonowski, 2001). Items for this module were summed to obtain a daily FVC summary score (i.e., number of servings of fruits and vegetables a day). A binary outcome of meeting the National Institutes of Health recommended 5+ servings of fruits and vegetables per day (yes/no) was then calculated.

Measuring Current Smoking. Participants were asked "Do you smoke cigarettes now – even once in awhile?" (question 25 in the appendix) to assess Current Smoking.

The stem of this item is used in all major national and state public health studies (such as the NHIS, BRFSS, CHIS). In general, studies indicate that this self-reported current smoking variable is reliable and valid in that, by and large, it correctly classifies smokers vs. nonsmokers when these self reports are compared to objective biological measures of tobacco use (e.g., blood cotinine levels) (Caraballo, Giovino, Pechacek, & Mowery, 2001; Martínez, Reid, Jiang, Einspahr, Alberts, 2004; Patrick, Cheadle, Thompson, Diehr, Koepsell, & Kinne, 1994; Vartiainen, Seppälä, Lillsunde, & Puska, 2002).

Measuring Physical Activity. Participants were asked "over the past 30 days, did you do any hard or vigorous physical activity (such as exercise, sports or dancing) for at least ten minutes that caused heavy sweating or large changes in your breathing or heart rate?" (yes/no; item 51 in the appendix) to assess Vigorous Physical Activity (VPA). As the other variables above, this item is used in major national and state public health studies and has been shown to have moderate-high validity and reliability (Ainsworth, Bassett, Strath, et al., 2000; Brown, Trost, Bauman, Mummery, & Owen, 2004; Evenson, Eyler, Wilcox, Thompson, & Burke, 2003; Evenson, & McGinn, 2005; Strath, Bassett, Ham, & Swartz, 2003).

Data Analytic Strategy

A stepped analytical approach was taken to analyze the data to achieve the 3 specific aims. First, descriptive statistics were used to detail the relationships between the variables of interest. Next, Chi-Square (univariate) analyses were used to explore the relationships between segregation and health behaviors (Specific Aim 1). Next hierarchical logistic regression (multivariate) analyses were used to examine the variance in health behavior accounted for by residential segregation after other known individual-

level covariates (age, gender, marital status, education, and income) are controlled (Specific Aim 2). If segregation contributed to any outcome in the above analyses, then multi-level logistic regression analyses were conducted to examine the extent to which segregation accounted for a significant amount of variance in the outcome after neighborhood SES and individual-level variables were controlled (Specific Aim 3).

RESULTS

Community Reception of the Survey and Response Rates

Twenty census tracts in six CA cities were visited approximately 160 times over the course of 2 years. For every household approached where a person was home and answered the door, approximately 4-6 other households were approached where no one was home (total households approached range: 8,760 to 13,140). Approximately 10 households, and one entire block in two high poverty neighborhoods were skipped by the surveyors due to potential danger (i.e., loose dogs, suspicious activity). Of the households where someone was home and there was an adult who met the eligibility criteria, the participation rate was 99%.

Demographic Characteristics of the Sample

A total of 2,190 self-identified African Americans completed the California Black Health Network Health Survey. Of the 2,190 survey respondents, 47% (n = 1024) resided in Los Angeles, 18% (n = 403) in San Diego, 16% (N=345) in Oakland, 8% (n = 181) in Sacramento, 6% (n = 124) in San Francisco, and 5% (n = 113) in San Bernardino. Of the six demographic variables measured, Education and Income were reduced for ease of interpretation. Specifically, the six education categories were reduced to the following: 1) less than high school degree, 2) high school graduate or GED, and 3) some college or higher. Income was also reduced as follows 1) $0-10,999, 2) $11,000-$25,999, 3)$26,000-49,999, and 4) ≥$50,000. The sample's overall demographic characteristics are summarized in Table 5. As shown, the sample contained slightly more women (54%) than men, was mostly single (43%), had at least some college education or higher

(64.3%), and had household incomes of $50,000 or more (36%). Age ranged from 18 to 95 years, with a mean of 43.6 (SD=16.3).

Individual Demographic Characteristics by Segregation and Poverty. The distribution of demographic characteristics by segregation and poverty levels is shown in Table 5. As shown, the sample was diverse in age, gender, marital status, education, and income, in both high and low poverty and high and low segregated neighborhoods.

INSERT TABLE 5 HERE

Prevalence of Health Behaviors

Prevalence rates of smoking, FCV, and physical activity are summarized in Table 6. As shown, overall, 32.6% of the sample reported that they were current smokers, 25.2% reported consuming 5 or more servings of fruits/vegetables a day, and 57.3% reported engaging in vigorous physical activity in the past month.

INSERT TABLE 6 HERE

Current Smoking. As shown in Table 6, 37.6 % of men reported that they were current smokers vs. 29.5% of women. For age, 42% of participants between the ages of 45-54 reported that they were current smokers, while 36.2% of those between ages 35-44, 34.2% of those between ages 18-34, and 21.9% of those 55 and older reported that they were current smokers. For marital status, 37.7% of single participants reported that they were current smokers, while 32% of those divorced/widowed, and 26.9% of those who were married reported that they were current smokers. For education, 49.6% of participants who had less than a high school education reported that they were current smokers, while 42.4% of those with a high school education, and 25.9% of those with some college education or higher reported that they were current smokers. For household

income, 47.5 % of participants with the lowest income (≤$10,999) and 46.7% ($11,000 to 25,999) reported that they were current smokers, while 25.4% of those with a household income of $26,000 to 49,999, and 21.1% of those with a household income of ≥$50,000 reported that they were current smokers. For neighborhood poverty, 40% of residents of high poverty neighborhoods vs. 25.3% of residents of low poverty neighborhoods reported that they were current smokers. For neighborhood segregation, 37.4 % of residents of low-segregated neighborhoods vs. 27.5% of residents of high-segregated neighborhoods reported that they were current smokers.

5+FCV. As shown in Table 6, 25.7 % of men reported that they consumed 5 or more servings of fruits/vegetables a day vs. 24.4% of women. For age, 28.6% of participants between the ages of 18-34 reported that they consumed 5 or more servings of fruits/vegetables a day, while 27.3% of those between ages 35-44, 24.5% of those between ages 45-54, and 21.3% of those 55 and older reported that they consumed 5 or more servings of fruits/vegetables a day. For marital status, 29.8% of single participants reported that they consumed 5 or more servings of fruits/vegetables a day, while 24% of those who were married and 19.9% of those who were divorced/widowed reported that they consumed 5 or more servings of fruits/vegetables a day. For education, 25.5% of participants who had some college education or higher reported that they consumed 5 or more servings of fruits/vegetables a day, while 24.6% of those with a high school education, and 24.2% of those with less than a high school education reported that they consumed 5 or more servings of fruits/vegetables a day. For household income, 28.1% of participants with the lowest income (≤$10,999) reported that they consumed 5 or more servings of fruits/vegetables a day, while 24.5% of those with a household income of

$11,000 to 25,999, 27.1% of those with a household income of $26,000 to 49,999, and 23.6% of those with a household income of ≥$50,000 reported that they consumed 5 or more servings of fruits/vegetables a day. For neighborhood poverty, 25.7% of residents of low poverty neighborhoods vs. 24.7% of residents of high poverty neighborhoods reported that they consumed 5+ fruits/vegetables daily (5+ Daily FVC). For neighborhood segregation, 25.8 % of residents of high-segregated neighborhoods vs. 24.6% of residents of low-segregated neighborhoods reported 5+ Daily FVC.

Physical Activity. As shown in table 6, 61.4 % of men reported that they engaged in vigorous physical activity (VPA) in the past month vs. 54.8% of women. For age, 62.7% of participants between the ages of 18-34 reported VPA, while 62.1% of those between ages 35-44, 57.7% of those between ages 45-54, and 60.2% of those 55 and older reported that they engaged in VPA. For marital status, 60% of married participants reported that they engaged in VPA, while 57.1% of those who were single, and 53.3% of those who were widowed/divorced reported that they engaged in VPA. For education, 62.8% of participants with some college education or higher reported that they engaged in VPA, while 47.8% of those with a high school education, and 47.5% of those with who had less than a high school education reported that they engaged in VPA. For household income, 66% of participants with a household income of ≥$50,000 reported that they engaged in VPA, while 59.2% of those with a household income of $11,000 to 25,999, 57.7% of those with a household income of $26,000 to 49,999, and 47.3% of those with a household income of ≤$10,999 reported that they engaged in VPA. For neighborhood poverty, 58.5% of residents of low poverty neighborhoods vs. 56.1% of residents of high poverty neighborhoods reported that they engaged in VPA. For

neighborhood segregation, 59.2 % of residents of high-segregated neighborhoods vs. 55.5% of residents of low-segregated neighborhoods reported that they engaged in VPA.

The Segregation and Health Behavior Relationship

Aim 1 was to examine whether Blacks residing in low vs. high segregated neighborhoods differ in health behavior. To achieve aim 1, differences in health behavior among Low vs. High segregated Blacks were examined using the chi-square statistic. These results are summarized in Table 7 and are described below.

INSERT TABLE 7 HERE

As shown, there were no segregation differences in 5+FVC or in VPA. Because smoking rates are known to vary significantly by gender, segregation effects on smoking were analyzed separately for men and women. For women, those residing in low vs. high segregated neighborhoods did not differ significantly in smoking rates. However, among the men in the sample, those residing in low segregated neighborhoods reported significantly higher rates of smoking (44.2%) than those residing in high segregated neighborhoods (30.5%).

Removing the influence of individual-level covariates

Aim 2 was to examine the extent to which residential segregation accounts for a significant amount of variance in health behavior after other variables known to be predictive of health behavior (age, gender, marital status, education, and income) are accounted for in multivariate models. To achieve Aim 2, a series of hierarchical logistic regressions were conducted with each dichotomous health behavior as the criterion. Results are summarized in Tables 8 through 11 and are described below.

INSERT TABLES 8 and 9 HERE

Current Smoking. As in previous analyses, men and women were analyzed separately. Current smoking was the criterion, and age (entered at step 1), marital status (step 2), socioeconomic status (SES, education and household income, entered at step 3), and segregation (entered at the last step) were the predictors. Results for men (at the last step) are summarized in Table 8. Results revealed that education and income were significant predictors, and that segregation also contributed after controlling for demographics and SES; men in low segregated neighborhoods were 2.07 times more likely to be smokers than men in high segregated neighborhoods. For women (Table 9), income was a significant predictor of smoking. Segregation was not a significant predictor of smoking among women after controlling for the covariates.

INSERT TABLES 10 and 11 HERE

5+FVC and VPA. For these logistic regressions, gender (entered on step 2) was added to the models. As shown, and consistent with the chi-square results, segregation was not associated with FVC (Table 10), or with VPA (Table 11).

Removing the influence of Neighborhood Poverty

Aim 3 was to examine the extent to which residential segregation accounts for a significant amount of variance in health behavior after neighborhood SES is added to these models in multilevel analyses. To achieve Aim 3, a multilevel logistic regression analyses was conducted. Current smoking among men was the only outcome analyzed in this manner because it was the only outcome to which segregation contributed. In this analysis, age, marital status, education, and income were the individual-level predictors, and neighborhood poverty and segregation were the area-level predictors. The results from this analysis are shown in Table 12. Four models are shown. Model 0 (the empty

or non-conditional model) shows neighborhood level variation in the outcome; Model 1 included only individual level predictors; Model 2 included only neighborhood level predictors; and Model 3 included both individual and neighborhood level predictors.

INSERT TABLE 12 HERE

As shown in Model 0, there was significant census tract (neighborhood) variation in smoking among men. As shown in Model 1, individual-level income and education contributed significantly to smoking among men. As shown in Model 2, both neighborhood (CT) poverty and segregation contributed significantly to smoking among men. As shown in Model 3, after controlling for the individual level variables, the effect for neighborhood poverty was no longer significant, but the effect for neighborhood segregation remained significant; men in low-segregated CTS were half as likely (OR= 0.50) to smoke as those in high segregated CTS.

DISCUSSION

Prior studies indicate that the health of Blacks who reside in segregated Black neighborhoods is significantly poorer than that of their more integrated cohorts. Compared to integrated Blacks, segregated Blacks have significantly higher rates of chronic conditions such as cardiovascular disease and obesity, and self-report significantly poorer health as well. Many have argued that such differences may reflect differences in the built-environments of segregated Black vs. integrated neighborhoods, and specifically reflect the low access to grocery stores and recreational outlets, and the high access to fast food and to tobacco in segregated areas. Such data imply that segregated Blacks differ from their integrated counterparts in the health behaviors that contribute to chronic conditions (i.e., in diet, smoking, and physical activity) but this has not been empirically examined. Thus, this study explored the relationship between residential segregation and diet (fruit and vegetable consumption), smoking, and physical activity among Blacks.

Key Findings and Implications.

Results revealed that residential segregation was not a significant predictor of fruit and vegetable consumption or of physical activity. These results are inconsistent with those of prior studies in which segregation predicted obesity (Chang, 2006) and physical inactivity (Lopez, 2006). Segregation was a significant predictor of smoking, but only among men. This result is inconsistent with prior studies in which segregation predicted smoking among women (Bell et al., 2007). Below, four possible explanations for these inconsistent findings are discussed.

Socially-desirable Responding. The first possible explanation is that the segregation effect found in prior studies exists in CA, but was not found in this study due to socially-desirable responding (SDR), especially among segregated Blacks, in response to being surveyed by the CBHN. SDR is the tendency to provide answers desired by society irrespective of their veracity (Johnson & van de Vijver, 2003; Dillman, 2000; Dillman, Sangster, Tarnai, & Rockwood, 1996). SDR increases as anonymity decreases, and so is more common in RDDTS and household surveys (in particular) than in mail surveys; hence reports of socially-desirable behaviors such as cancer screening are significantly higher, and reports of undesirable behaviors such as smoking and drug use are significantly lower in household and random-digit-dial telephone surveys (RDDTS) than in anonymous mail surveys (Johnson & van de Vijver, 2003; Dillman, 2000; Dillman, Sangster, Tarnai, & Rockwood, 1996; Dudley, McFarland, Goodman, Hunt, and Sydell, 2005; Beebe, Jenkins, Anderson, Davern, and Rockwood, 2008; Partin, Grill, Noorbaloochi, Powell, Burgess, Vernon, et al. 2008; Beebe, McRae, Harrison, Davern, and Quinlan, 2005; Johnson, O'Rourke, Burris, and Warnecke, 2005; Johnson and Bowman, 2003).

SDR also is significantly more prevalent among Blacks than Whites (Johnson & van de Vijver, 2003; Dudley, McFarland, Goodman, Hunt, and Sydell, 2005; Davis, 1997a; Davis, 1997b; Davis, & Silver, 2003; Krysan, & Couper, 2003). For example, the discrepancy between self-reported (socially-desirable) cancer screening vs. medical records is significantly larger for Blacks than for Whites (Partin, Grill, Noorbaloochi, Powell, Burgess, Vernon, et al. 2008; Rauscher, Johnson, Cho, & Walk, 2008; McPhee, Nguyen, Shema, Nguyen, Somkin, Vo, et al. 2002). Black self-reported screening in

RDDTS and household surveys is 25% and 33% higher (respectively) than actual screening (Rauscher, Johnson, Cho, and Walk, 2008; McPhee, Nguyen, Shema, Nguyen, Somkin, Vo, et al. 2002). Likewise, denial of (socially-undesirable) smoking (i.e., self-reported non-smoking by cotinine-determined smokers) is more common among Blacks (Fisher, Taylor, Shelton, and Debanne, 2008); Black smokers in the NHANES III were 3.5 to 8.9 times (depending on age) more likely than age/gender matched Whites to deny smoking (Fisher, Taylor, Shelton, and Debanne, 2008) – with 70% of older, Black women-smokers doing so. Black SDR decreases with Black interviewers, and increases when actual (in-person) or presumed (i.e., RDDTS, computer) Whites ask the questions (Davis, 1997a; Davis, 1997b; Davis, & Silver, 2003; Krysan & Couper, 2003). Thus, Black SDR is understood as an effort to protect Blacks from negative White evaluations and stereotyping (Johnson &van de Vijver, 2003; Dudley, McFarland, Goodman, Hunt, & Sydell, 2005; Davis, 1997a; Davis, 1997b; Davis, & Silver, 2003; Krysan, & Couper, 2003) – i.e., it represents both stereotype threat (Davis and Silver, 2003) and distrust of White researchers (Corbie-Smith, Thomas, & St. George, 2002; Shavers, Lynch, & Burmeister, 2000; Shavers, Lynch, and Burmeister, 2002). Moreover, those most aware of and sensitive to (on the lookout for) stereotypes, prejudice and discrimination – e.g., Blacks who in reside in segregated Black communities, and Blacks who have experienced frequent discrimination – are more sensitive and vulnerable to stereotype threat (Brown & Lee, 2005; Brown & Pinel, 2003; Mendoza-Denton, Purdie, Downey, & Davis, 2002). Similarly, the greater the identification with one's group, the greater the threat and stress produced by stereotypes about the group – the higher the stereotype threat (Cole, Matheson, & Anisman, 2007; Ployhart, Ziegert, & McFarland, 2003).

Hence, those who reside in segregated Black neighborhoods might experience greater stereotype-threat and so exhibit higher SDR responding.

Blacks also exhibit SDR to actual or presumed Blacks (Davis, 1997a; Davis, 1997b; Davis, & Silver, 2003; Krysan, & Couper, 2003), usually in a manner that conforms to Black norms. Because the CBHN serves and represents the Black (i.e., segregated) communities sampled here, it is possible that participants felt pressure to present themselves in a positive light (under reporting of negative health behaviors, over reporting of positive health behaviors) in order to please and support the CBHN. This might explain the extremely high response rate (99%) to CBHN surveyors, the lack of a segregation effect for smoking among Black women (70% of whom deny smoking), as well as the lack of findings for the FVC and VPA. In addition, if high segregated (Black community) Blacks felt more pressure to engage in SDR with CBHN, then this may explain the lower prevalence of reported smoking in among high-segregated vs. low-segregated men.

Segregation Levels. The second possible explanation is that the segregation effect in prior studies exists in CA but is minimal here because the segregation levels of CA cities are lower than those in the prior studies. Specifically, most of the literature on segregation and health outcomes is based on data collected in highly segregated Midwestern (e.g., Chicago, Detroit) and Northeastern (e.g., New York, Newark) cities. Cities in CA do not exhibit these very high levels of segregation or hypersegregation. As was shown in Table 1, none of the cities with SI > 80 are in CA, and SI > 80 cities were the setting for prior studies. Hence it is possible that the segregation effect found in prior studies was attenuated in the CA sample due to the lower levels of segregation of CA

cities. This might explain why segregation was only a significant predictor of one of three possible health behaviors.

Rural-Suburban/Urban Differences. A third, related possible explanation is that the segregation effect found in prior studies exists in CA but was further attenuated by the rural and suburban communities included in this study versus the 100% highly-urban communities that were sampled in prior studies. A handful of studies suggest that segregation in rural and suburban areas is structurally different from segregation in urban areas (Lichter, Parisis, Grice, & Taquino, 2007; Wilks & Iceland, 2004); the effect of this difference on the health of residents in those areas remains largely unknown because the relationship between segregation and health status remains largely unstudied in rural and suburban geographical areas. Hence, inclusion of some rural and of numerous suburban neighborhoods in San Diego, San Bernardino, and Sacramento may have further blunted the effect of segregation on health behavior.

CA Neighborhoods. A fourth and final possible explanation is that the segregation effect found in prior studies does not exist in CA because neighborhood built-environments in CA might not differ by segregation the way they do elsewhere. Although there is strong evidence indicating that Black and White neighborhoods differ significantly in health promoting and health damaging features (e.g., grocery stores, tobacco outlets, recreational facilities, fast food outlets), most of the studies reporting such findings were conducted in Midwestern and Northeastern cities – and none of the studies were conducted in CA. Hence, it is possible that the neighborhoods in low versus high segregated communities in CA do not significantly differ in the built-environment features that are known or suspected to impact health behavior.

Limitations.

Several limitations are highlighted by the explanations above. Specifically, the study did not consider that strong SDR might be elicited by the CBHN surveyors, did not consider the comparatively low segregation levels of high-segregated CA neighborhoods, did not measure rural-urban-suburban differences in the communities sampled, and did not measure the aspects of the built-environment that may be the mediators between segregation and health behavior. These limitations could be remedied in future studies in the manner described below.

Because having a Black community partner (CBHN) probably increased response rates, it remains important for future studies to include such an organization and hence critical to control the possible SDR effect of having a well-known, trusted Black organization involved in sampling Blacks. Two recent studies suggest a simple strategy for reducing SDR (Beebe, Jenkins, Anderson, Davern, and Rockwood, 2008; Johnson, O'Rourke, Burris, and Warnecke, 2005): People's self-reports of cancer screening are inflated relative to their medical records, and such reports by and large reflect SDR (Beebe et al., 2008). Thus, providing people with the opportunity to engage in screening-related SDR *before* asking them about their screening-history should decrease inflated reports of prior screening. Hence, Beebe et al. (2008) asked (N = 752) people (> age 50) about their future colorectal cancer (CRC) screening-intentions (gave them the opportunity to engage in SDR) *before* asking them CRC screening-history questions, by mail vs. by telephone. As hypothesized, 58% vs. 71% reported prior screening in the intentions-1st vs. intentions-2nd conditions, respectively. This effect was stronger in the mail survey where 49% asked intentions-1st vs. 72% asked intentions-2nd reported prior

screening – a 23% difference; those asked intentions-1st were (OR) 2.7 times less likely to report prior screening. Johnson et al (2005) found similar (but considerably weaker) effects in a study of reports of breast and cervical cancer screening among women who were asked screening-barriers or future-intentions before vs. after screening history. Both studies suggest that the validity of self-reported cancer-screening might be increased (and inflated, socially-desirable reports decreased) by asking about screening-intentions before asking about screening history.

These studies imply that the validity of other self-reported health behaviors might be increased (and inflated, socially-desirable reports of healthy behaviors decreased) by asking about intentions to engage in healthy behaviors before asking about current health behaviors. Asking people about intentions to increase physical activity (PA), increase consumption of fruit/vegetables (FVC), and intentions to quit smoking before asking them about their current levels of these behaviors might decrease reports of PA and FVC and increase reports of smoking. Given that SDR is particularly high among Blacks, this SDR-intentions manipulation might have a significant effect on Blacks' self-reports.

Another issue that will be important for future studies to remedy is that CA may not be the best place to examine the role of segregation in health behavior. That is, given that there is a lower prevalence of high segregated communities in CA, and given that the majority of the evidence for segregation differences in health outcomes is from Midwestern and Northeastern cities (areas that have very high segregated communities), it may be that those are the best places to begin to assess the impact of segregation on health behavior. If CA or other states with lower segregation levels are examined, then rural-urban-suburban differences (degree of urbanicity) in the communities sampled must

be controlled for in the segregation analyses in future studies. This can be easily accomplished by using census datasets because these include rural-urban (RUC) codes for counties, and rural-urban commuting-area (RUCA) codes for cities, towns, and census tracts nationwide. The federal government (i.e., US Dept of Agriculture) has generated RUC and RUCA codes and made these available in all state and nationwide census datasets; future studies can add RUCA codes (1= urban to 10= rural farm) and include them in models to control for CT urbanicity.

Finally, future studies of segregation and health behavior should assess the built environment (health-enhancing and health damaging aspects) of the communities sampled to determine whether these features differ across high vs. low segregated neighborhoods, and determine their impact on health behavior. This could most easily be accomplished by combining the individual-level data collected by methods such as those in this study with objective data on the neighborhoods in which the participants reside. GIS (Geographical Information Systems), a computer-based system for analyzing health in its geographic context, is one such method of acquiring objective data on the features of neighborhoods. GIS integrates health data with mapping functions to facilitate spatial-analyses of health behavior via computer-assisted cartography of racial X geographical disparities (Cromley and McLafferty, 2002; Cromley, 2003; Gatrell, 2002; Graves, 2008). Utilizing this technology in combination with individual-level health behavior data could better clarify the nature of the segregation-health behavior relationship, and could determine whether features of the built environment play a role in mediating the health behavior of Blacks in segregated vs. integrated communities.

Although this study has limitations, it also has several strengths. One of these is that it provides strong evidence that Black community participants, traditionally a "hard to reach" population, can be effectively sampled when sensitive methods such as CBPR are used to reduce distrust. Specifically, partnering with a community organization (the CBHN) was greatly successful in reducing distrust of researchers and increasing Black participation. The unprecedented 99% response rate is a marker of the effectiveness of the methodology and represents a vast improvement over other methods such as telephone and mail surveys, which obtain very low response rates from Blacks – and especially from segregated Blacks (Blumberg & Luke, 2007; Blumberg & Luke, 2008; Blumberg, Luke & Cynamon, 2006; Keeter, Kennedy, Clark, Tompson & Mokrzycki, 2007; Kempf & Remington, 2007; Link & Mokdad, 2005; Link, Mokdad, Stackhouse, & Flowers, 2006) Although the relationship between segregation and health behavior remains unclear due to the limitations described above, several promising avenues for future research are highlighted by the findings of this study, as discussed above. Given significant, well-known Black-White health and health-behavior disparities, it remains critical to examine the possible contribution of their separate neighborhoods to those disparities.

APPENDICES

California Black Health Network Survey

Draft

CALIFORNIA BLACK HEALTH NETWORK HEALTH SURVEY

For Office Use Only
SC: CT

The first questions are about your health

1. Has a doctor ever told you that you have hypertension (high blood, high blood pressure)? ☐ yes ☐ no

2. Has a doctor ever told you you have diabetes (high sugar)? ☐ yes ☐ no

3a. Has a doctor ever told you that you have cancer of any kind? ☐ yes ☐ no

3b. If yes, what kind of cancer?

☐ Breast ☐ Prostate ☐ Lung ☐ Cervical ☐ Other type

4. On a scale of 0 to 100, what do you think your chances of getting skin cancer are, where 0 is no chance of getting skin cancer, and 100 means you will definitely get it?

Write the number in the boxes to the right and fill in the circles beneath.

5. Has a doctor ever told you that you have heart disease? ☐ yes ☐ no

6. Has a doctor ever told you that you have asthma? ☐ yes ☐ no

7. In general, your health is: ☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

8. Do you have health/medical insurance? ☐ yes ☐ no

9. Do you have a regular doctor? ☐ yes ☐ no

10. About how long has it been since you last saw a doctor about your own mental or physical health?
☐ Less than one year ago ☐ 1 to 2 years ago ☐ More than 2 years ago

11. In the past year, did you seek help at a hospital or clinic for your PHYSICAL health? ☐ yes ☐ no

12. In the past year, did you visit an emergency room for your PHYSICAL health? ☐ yes ☐ no

13. In the past year, did you seek help from a friend or family member about your PHYSICAL health? ☐ yes ☐ no

14. In the past year, did you seek help from a minister or folk healer about your PHYSICAL health? ☐ yes ☐ no

15. In the past year, did you EVER feel that you would have gotten better medical care/treatment for your PHYSICAL health if you had been a member of a DIFFERENT race or ethnic group?

☐ yes ☐ no ☐ I didn't seek physical health care in past year

16. In the past year, did you seek help from a psychologist or counselor about your MENTAL health? ☐ yes ☐ no

17. In the past year, did you visit an emergency room for your MENTAL health? ☐ yes ☐ no

18. In the past year, did you seek help from a friend or family member for your MENTAL health? ☐ yes ☐ no

19. In the past year, did you seek help from a minister or folk healer for your MENTAL health? ☐ yes ☐ no

20. In the past year, did you EVER feel that you would have gotten better medical care/treatment for your MENTAL health if you had been a member of a DIFFERENT race or ethnic group?

☐ yes ☐ no ☐ I didn't seek mental health care in past year

The next two questions are about women's health and are for WOMEN ONLY

21a. A mammogram is an x-ray taken only of the breast by a machine that presses against the breast. Have you EVER HAD a mammogram?

☐ yes ☐ no ☐ I don't know

21b. How many mammograms have you had in the last 6 years?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ more than 10

22a. A Pap smear is a routine test for women in which the doctor examines the cervix, takes a cell sample from the cervix with a small stick or brush and sends it to the lab. Have you EVER HAD a Pap smear test?

☐ yes ☐ no ☐ I don't know

22b. How many Pap smear tests have you had in the last 6 years?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ more than 10 ☐ I don't know

The next question is about men's health and is for MEN ONLY

23a. A PSA test is a blood test to detect prostate cancer. It is also called a prostate-specific antigen test. Have you EVER HAD a PSA test?

☐ yes ☐ no ☐ I don't know

23b. How many PSA tests have you had in the last 5 years?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ more than 10 ☐ I don't know

The next questions are about smoking and are for everyone whether you smoke or not

24. Have you smoked at least 100 cigarettes in your lifetime? ☐ yes ☐ no

25. Do you smoke cigarettes now - even once in a while? ☐ yes ☐ no (if no, GO TO question #35)

26. When you smoke cigarettes (even a puff) do you smoke ☐ Menthol ☐ Non-Menthol ☐ Both

27. How many cigarettes do you smoke each day?

Write the number in the boxes to the right and fill in the circles beneath.

1	○	○
2	○	○
3	○	○
4	○	○
5	○	○
6	○	○
7	○	○
8	○	○
9	○	○
0	○	○

28. Do you intend to quit smoking in the next 30 days?
☐ yes ☐ no ☐ maybe

29. Do you intend to quit smoking in the next 6 months?
☐ yes ☐ no ☐ maybe

30. Has a doctor or nurse ever advised you to quit smoking? ☐ yes ☐ no

31. Have you made an attempt to quit smoking in the past that led to your not smoking for 24 hours or longer?
☐ yes ☐ no

32. If a free, quit-smoking program were nearby in this neighborhood, would you use it?
☐ yes ☐ no ☐ maybe ☐ I don't know

33. How old were you in years when you started smoking?

Write the number in the boxes to the right and fill in the circles beneath.

1	○	○
2	○	○
3	○	○
4	○	○
5	○	○
6	○	○
7	○	○
8	○	○
9	○	○
0	○	○

34. Do you believe that nicotine gum or patches could help you quit smoking?

☐ yes ☐ no ☐ maybe ☐ I don't know

35. Has your minister/pastor/priest EVER advised your church congregation to quit smoking?

☐ yes ☐ no ☐ I don't know ☐ I don't go to church

36. Are people EVER allowed to smoke (cigarettes, cigars, pipes, weed) INSIDE this house/apartment (indoors)?

☐ yes ☐ no

37. In a typical week, how many days per week do people smoke (cigarettes, cigars, pipes, weed) INSIDE this home? ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

Have you EVER in your entire life smoked any of these...

38a. Bidis..... ☐ yes ☐ no 38b. Blunts..... ☐ yes ☐ no 38c. Black & Mild or Philly.. ☐ yes ☐ no

38d. Kreteks (cloves).. ☐ yes ☐ no 38e. Other Cigars.. ☐ yes ☐ no 38f. Marijuana (weed)..... ☐ yes ☐ no

Have you smoked any of these in the past 30 days - even a puff?

39a. Bidis..... ☐ yes ☐ no 39b. Blunts..... ☐ yes ☐ no 39c. Black & Mild or Philly.. ☐ yes ☐ no

39d. Kreteks (cloves).. ☐ yes ☐ no 39e. Other Cigars.. ☐ yes ☐ no 39f. Marijuana (weed)..... ☐ yes ☐ no

How old were you when you tried these for the FIRST time?

40a. Bidis..... ☐ Never tried ☐ 5-10 ☐ 11-14 ☐ 15-17 ☐ 18-20 ☐ 21-30 ☐ 31 or up

40b. Blunts..... ☐ Never tried ☐ 5-10 ☐ 11-14 ☐ 15-17 ☐ 18-20 ☐ 21-30 ☐ 31 or up

40c. Cigarettes..... ☐ Never tried ☐ 5-10 ☐ 11-14 ☐ 15-17 ☐ 18-20 ☐ 21-30 ☐ 31 or up

40d. Kreteks (cloves)..... ☐ Never tried ☐ 5-10 ☐ 11-14 ☐ 15-17 ☐ 18-20 ☐ 21-30 ☐ 31 or up

40e. Marijuana (weed)..... ☐ Never tried ☐ 5-10 ☐ 11-14 ☐ 15-17 ☐ 18-20 ☐ 21-30 ☐ 31 or up

40f. Black&Mild or other cigars... ☐ Never tried ☐ 5-10 ☐ 11-14 ☐ 15-17 ☐ 18-20 ☐ 21-30 ☐ 31 or up

41. Do any of the people you live with EVER smoke cigarettes - even a puff? ☐ yes ☐ no ☐ no, I live alone

The next questions ask about the things you eat and drink

42. During the past 7 days, how many times did you drink fruit JUICE?

Write the number in the boxes to the right and fill in the circles beneath.

☐☐
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

43. During the past 7 days, how many times did you eat FRUIT (including fresh, frozen, and canned fruit and applesauce)?

Write the number in the boxes to the right and fill in the circles beneath.

☐☐
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

44. During the past 7 days, how many times did you eat SALAD made with lettuce or spinach?

Write the number in the boxes to the right and fill in the circles beneath.

☐☐
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

45. During the past 7 days, how many times did you eat POTATOES (baked, boiled, mashed, potato salad, sweet potatoes or yams, red potatoes, french fries, hash browns, and home fries)?

Write the number in the boxes to the right and fill in the circles beneath.

☐☐
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

46. During the past 7 days, how many times did you eat BEANS (cooked, dried, refried or baked beans, bean soup, pork and beans, and bean salad)?

Write the number in the boxes to the right and fill in the circles beneath.

☐☐
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

47. During the past 7 days, how many times did you eat OTHER VEGETABLES such as tomatoes, carrots, collard greens, corn, spinach, broccoli, other greens, and okra?

Write the number in the boxes to the right and fill in the circles beneath.

☐☐
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

48. In a typical week, how many days do you drink alcohol (beer, wine, wine coolers, hard liquor)?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ I don't drink alcohol

49. On days when you drink alcohol, how many days do you typically drink? Put 00 if you don't drink alcohol (one drink is the same as one 12oz. bottle of beer, one 5oz. glass of wine, or one shot of liquor)

Write the number in the boxes to the right and fill in the circles beneath.

☐☐
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

50. How many days in the last month have you had 5 or more drinks of alcohol in one sitting? (Put 00 if you don't drink alcohol.)

Write the number in the boxes to the right and fill in the circles beneath.

☐☐
1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

The next questions are about the things you usually do

51. Over the past 30 days, did you do any HARD or VIGOROUS physical activities (such as exercise, sports or dancing) for at least 10 minutes that caused heavy sweating or large increases in your breathing or heart rate?

☐ yes ☐ no

52. Over the past 30 days, did you do any MODERATE physical activities (such as exercise, sports, or dancing) for at least 10 minutes that caused light sweating or slight increases in your breathing or heart rate?

☐ yes ☐ no

During the summer months, how often do you do the following when you are out in the sun for more than 15 minutes?

53a. Wear sunscreen with SPF of 15 or higher..... ☐ Never ☐ Sometimes ☐ About half the time ☐ Often ☐ Always

53b. Wear sunglasses..... ☐ Never ☐ Sometimes ☐ About half the time ☐ Often ☐ Always

53c. Wear a hat with a surrounding brim of at least 2 1/2 inches..... ☐ Never ☐ Sometimes ☐ About half the time ☐ Often ☐ Always

54. Which of the following best describes your skin's usual reaction to your first exposure to summer sun, without sunscreen, for one-half hour at midday?

☐ Always burn, unable to tan
☐ Usually burn, then can tan if I work at it
☐ Sometimes mild burn, then tan easily
☐ Rarely burn, tan easily
☐ None of the above describes me

Because neighborhoods affect health, the next questions ask about this neighborhood

55. About how many churches are there in this neighborhood?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ More than 10

56. About how many of the stores in this neighborhood sell cigarettes?

☐ None of them ☐ A few ☐ Some ☐ Most ☐ All

57. About how many of the stores in this neighborhood sell fresh fruit and vegetables?

☐ None of them ☐ A few ☐ Some ☐ Most ☐ All

58. About how many of the stores in this neighborhood sell alcohol (beer, wine, or hard liquor)?

☐ None of them ☐ A few ☐ Some ☐ Most ☐ All

59. About how many stores in this neighborhood sell single (individual) cigarettes (loosies)?

☐ None of them ☐ A few ☐ Some ☐ Most ☐ All ☐ I don't know

60. How long have you lived in this neighborhood? ☐ Less than 1 year ☐ 1-2 years ☐ More than 2 years

61. Is there a park close-by in this neighborhood? ☐ Yes ☐ No ☐ Don't know

62. About how many hospitals/medical centers are in this neighborhood?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ More than 8

63. How dangerous is this neighborhood? ☐ Not at all ☐ A little ☐ Somewhat ☐ Very

64. How much do you fear going outside at night in this neighborhood?

☐ Not at all ☐ A little ☐ Somewhat ☐ A lot

65. How much crime is there in this neighborhood? ☐ Not at all ☐ A little ☐ Some ☐ A lot ☐ Don't know

66. How much traffic is there in this neighborhood? ☐ Not at all ☐ A little ☐ Some ☐ A lot ☐ Don't know

67. How noisy is this neighborhood? ☐ Not at all noisy ☐ A little noisy ☐ Somewhat noisy ☐ Very nois

These last questions are about you and your life

68. How old are you? ☐☐

Write the number in the boxes to the right and fill in the circles beneath.

1 ○○
2 ○○
3 ○○
4 ○○
5 ○○
6 ○○
7 ○○
8 ○○
9 ○○
0 ○○

69. What is your employment status?

☐ Working full time (40 hours or more per week)
☐ Working part time (less than 40 hours per week)
☐ Full time student, not working
☐ Student and working full time (working 40 hours or more per w
☐ Student and working part time
☐ Unemployed (not working and looking for a job)
☐ Home-maker
☐ Retired
☐ Disabled
☐ Other

70. What is your level of education (the highest degree or grade you completed)?

☐ Less than high school
☐ High school graduate or GED
☐ Some college
☐ BA or BS degree
☐ Masters degree
☐ Doctorate or other professional degree

71. What is your family (household) yearly income?

☐ Less than 5000
☐ 5,000 to 10,999
☐ 11,000 to 16,999
☐ 17,000 to 25,999
☐ 26,000 to 49,999
☐ 50,000 to 75,999
☐ 76,000 to 99,999
☐ 100,000 or higher

72. How religious or spiritual are you? ☐ Not at all ☐ A little ☐ Somewhat ☐ Very much

73. What is your religion?

☐ Methodist, Baptist, or other Protestant ☐ Catholic ☐ Muslim ☐ None ☐ Other

74. People sometimes use spiritual practices such as prayer as a way of dealing with illness or trying to stay healthy. Have you EVER prayed for your own health? ☐ yes ☐ no

75. How much racism or discrimination have YOU personally experienced in your ENTIRE LIFE?

☐ None ☐ A little ☐ Some ☐ A lot

76. How much racism or discrimination have YOU personally experienced in THE PAST YEAR?

☐ None ☐ A little ☐ Some ☐ A lot

77. How much racism or discrimination have your FAMILY and FRIENDS experienced in THE PAST YEAR?

☐ None ☐ A little ☐ Some ☐ A lot

78. How often do you read Black magazines/newspapers (for example: Ebony, Jet)?

☐ Never ☐ 1-2 times a month ☐ Once a week ☐ More than once a week

79. How often do you watch Black TV shows?

☐ Never ☐ 1-2 times a month ☐ Once a week ☐ More than once a week

80. How often do you attend Black community events such as concerts or fashion shows?

☐ Never ☐ 1-2 times a month ☐ Once a week ☐ More than once a week

Please answer questions 83-87 only if you are Latino.

81. How often do you read Latino magazines/newspapers or magazines/newspapers in Spanish?

☐ Never ☐ 1-2 times a month ☐ Once a week ☐ More than once a week

82. How often do you watch Latino TV shows or TV shows in Spanish?

☐ Never ☐ 1-2 times a month ☐ Once a week ☐ More than once a week

83. How often do you listen to music in Spanish?

☐ Never ☐ 1-2 times a month ☐ Once a week ☐ More than once a week

84. Are you male or female?

☐ male ☐ female

85. Do you have a cell phone?

☐ yes ☐ no

86. Do you have a regular (landline) telephone?

☐ no ☐ sometimes ☐ yes

87. Are you:

☐ Single/Never married
☐ Married or living as married
☐ Separated, Divorced, Widowed

88. What is your race/ethnic group?

☐ African American/Black
☐ Latino/Hispanic
☐ White/Anglo
☐ American Indian
☐ Asian American

89. What language do you speak at home? ☐ English ☐ Spanish ☐ Other Language

90. What country were you born in? ☐ United States ☐ Other country

Reduced Set of Census Tracts Sampled (N=85)

CTS FROM WHICH TO SAMPLE			CT Total N	CT Whites		CT Blacks		CT Residents Below Poverty Line		
ROW #	CT	County		N	%	N	%	% Overall	% Blacks	% Whites
01	424.11	Riverside	2847	1637	57%	580	20%	4.61%	4%	3%
02	610	San Francisco	2542	484	19%	506	20%	10%	4%	13%
03	458	Riverside	11137	3625	33%	2216	20%	21.45%	6%	10%
04	4052	Alameda	4991	1804	36%	1004	20%	7.41%	9%	5%
05	426.06	Riverside	3670	1797	49%	729	20%	12.75%	11%	8%
06	5401.02	Los Angeles	6839	2308	34%	1335	20%	14%	13%	14%
07	2911.3	Los Angeles	3369	1026	30%	688	20%	8%	14%	3%
08	1041.03	Los Angeles	3840	1261	33%	755	20%	13%	15%	6%
09	2286	Los Angeles	4667	1460	31%	929	20%	37%	22%	51%
10	5753	Los Angeles	4919	1062	22%	998	20%	31%	25%	33%
11	12	San Diego	5641	3231	57%	1107	20%	20.17%	27%	15%
12	5421.02	Los Angeles	7669	1893	25%	1504	20%	29%	28%	41%
13	4235	Alameda	2967	1569	53%	596	20%	27.32%	33%	21%
14	2285	Los Angeles	4506	1313	29%	890	20%	43%	35%	45%
15	462	Riverside	3335	1323	40%	658	20%	29.61%	37%	24%
16	27.09	San Diego	4212	1328	32%	836	20%	45.28%	37%	14%
17	74.08	San Bernardino	3785	1599	42%	762	20%	33.06%	49%	18%
18	428	Riverside	6451	2009	31%	1300	20%	35.48%	52%	20%
19	425.04	Riverside	2808	1370	49%	574	20%	41.98%	62%	26%
20	408.05	Riverside	5350	3851	72%	1280	24%	0.00%	0%	0%
21	426.05	Riverside	18387	7902	43%	4357	24%	13.53%	14%	7%
22	4055	Alameda	4147	642	15%	996	24%	18.13%	15%	9%
23	305.01	Riverside	4597	1142	25%	1090	24%	35.33%	29%	25%
24	34.02	San Bernardino	8543	3054	36%	2081	24%	27.65%	31%	20%
25	42	Sacramento	4861	954	20%	1179	24%	34%	34%	30%
26	425.19	Riverside	1652	712	43%	396	24%	37.17%	59%	11%
27	27.06	San Diego	8096	2879	36%	2410	30%	17.60%	19%	9%
28	42	Sacramento	5722	1836	32%	1724	30%	17%	22%	13%
29	158	San Francisco	6871	3284	48%	2029	30%	19%	31%	8%
30	163	San Francisco	4521	2452	54%	1355	30%	18%	41%	5%
31	2397	Los Angeles	5991	1491	25%	1820	30%	40%	46%	75%
32	31.12	San Diego	4484	823	18%	1613	36%	16.41%	19%	6%
33	4611	Los Angeles	4840	1821	38%	1739	36%	20%	20%	10%
34	34.01	San Diego	5890	1833	31%	2114	36%	12.95%	21%	9%
35	38	Sacramento	5307	1607	30%	1901	36%	21%	23%	11%
36	2221	Los Angeles	3738	644	17%	1333	36%	28%	28%	0%
37	65	Sacramento	5890	1816	31%	2143	36%	32%	30%	28%
38	33.02	San Diego	9347	1730	19%	3358	36%	32.98%	32%	19%
39	42.02	San Bernardino	4645	1166	25%	1695	36%	39.37%	38%	55%
40	2321.1	Los Angeles	2943	606	21%	1046	36%	39%	44%	0%
41	2398	Los Angeles	7563	1341	18%	2689	36%	45%	47%	0%
42	83	Sacramento	6828	2440	36%	2460	36%	53%	51%	57%

Reduced Set of Census Tracts Sampled (cont.)

CTS FROM WHICH TO SAMPLE			CT Total N	CT Whites		CT Blacks		CT Residents Below Poverty Line		
ROW #	CT	County		N	%	N	%	% Overall	% Blacks	% Whites
43	2073	Los Angeles	3804	1310	34%	1368	36%	48%	58%	42%
44	2062	Los Angeles	3467	549	16%	1238	36%	57%	68%	72%
45	53	Sacramento	1483	574	39%	531	36%	63%	69%	70%
46	2172	Los Angeles	3950	827	21%	1727	44%	13%	11%	9%
47	4005	Alameda	3415	1376	40%	1488	44%	14.12%	16%	14%
48	31.03	San Diego	6159	1063	17%	2703	44%	15.46%	17%	7%
49	4093	Alameda	5492	1129	21%	2417	44%	26.73%	32%	30%
50	605.02	San Francisco	3393	253	7%	1500	44%	37%	55%	47%
51	2411.1	Los Angeles	2653	259	10%	1173	44%	32%	56%	0%
52	2063	Los Angeles	4995	1148	23%	2183	44%	66%	71%	62%
53	5410.01	Los Angeles	1175	242	21%	593	50%	20%	4%	27%
54	5413	Los Angeles	5696	730	13%	2855	50%	18%	22%	0%
55	5410.02	Los Angeles	3320	936	28%	1705	51%	6%	3%	6%
56	4604	Los Angeles	859	139	16%	434	51%	11%	7%	0%
57	4078	Alameda	2340	701	30%	1198	51%	7.90%	11%	5%
58	161	San Francisco	5257	1577	30%	2690	51%	22%	18%	19%
59	6001	Los Angeles	6172	690	11%	3152	51%	4%	43%	74%
60	4603.02	Los Angeles	4330	1012	23%	2362	55%	8%	7%	6%
61	2349	Los Angeles	7064	1046	15%	3875	55%	44%	42%	38%
62	6002.02	Los Angeles	6312	965	15%	3457	55%	15%	48%	73%
63	232	San Francisco	4490	403	9%	2661	59%	17%	19%	0%
64	5716	Los Angeles	1980	214	11%	1161	59%	11%	66%	49%
65	31.01	San Diego	3718	643	17%	2259	61%	11.52%	11%	17%
66	4016	Alameda	1768	290	16%	1087	61%	40.88%	46%	10%
67	4077	Alameda	4599	958	21%	2877	63%	11.52%	11%	10%
68	4082	Alameda	4388	829	19%	2762	63%	20.53%	23%	9%
69	4014	Alameda	4765	439	9%	3003	63%	49.75%	51%	33%
70	6003.02	Los Angeles	3378	242	7%	2428	72%	38%	18%	0%
71	5408	Los Angeles	5583	423	8%	4008	72%	37%	29%	85%
72	4010	Alameda	5709	805	14%	4110	72%	30.72%	32%	10%
73	2362.01	Los Angeles	6289	496	8%	4518	72%	42%	41%	46%
74	231.03	San Francisco	4657	76	2%	3354	72%	52%	54%	0%
75	2379	Los Angeles	3537	66	2%	2879	81%	19%	16%	0%
76	2382	Los Angeles	5243	260	5%	4228	81%	20%	21%	0%
77	4021	Alameda	1258	13	1%	1020	81%	52.07%	58%	0%
78	7031	Los Angeles	5445	420	8%	4671	86%	18%	4%	0%
79	2380	Los Angeles	5887	154	3%	5046	86%	16%	11%	49%
80	6005.01	Los Angeles	2716	33	1%	2343	86%	46%	17%	40%
81	6007.04	Los Angeles	2996	179	6%	2585	86%	44%	19%	18%
82	5433.04	Los Angeles	6374	122	2%	5786	91%	7%	4%	32%
83	6004	Los Angeles	4151	186	4%	3762	91%	43%	22%	62%
84	6008.01	Los Angeles	3181	47	1%	2929	92%	14%	9%	0%
85	2343	Los Angeles	4262	77	2%	3940	92%	16%	17%	0%

Notes: CT=Census Tract

FIGURES

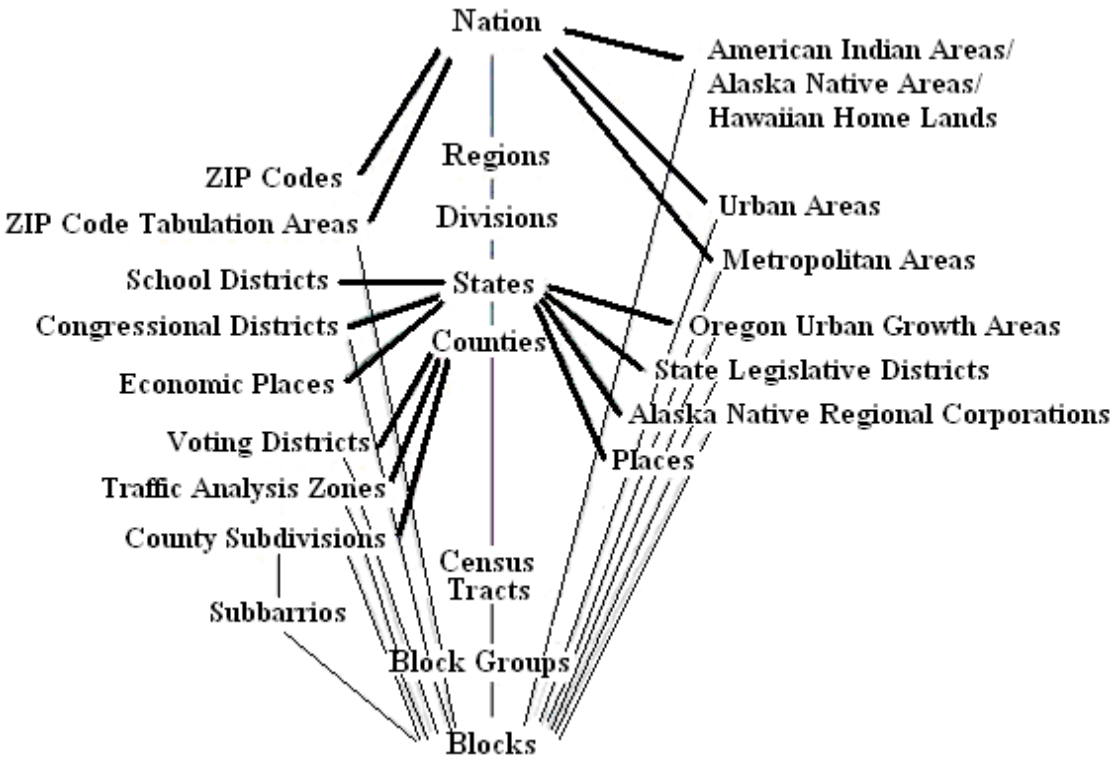


Figure 1. Geographic designations used in the U.S.

$$D = \frac{1}{2}\sum_{i=1}^{n} \left| \frac{P_{1i}}{P_1} - \frac{P_{2i}}{P_2} \right| \times 100,$$

where P_1 = citywide population of Group 1

P_2 = citywide population of Group 2

P_{1i} = neighborhood i population of Group 1

P_{2i} = neighborhood i population of Group 2

n = number of neighborhoods in city.

Figure 2. Formula used to calculate the Segregation (Dissimilarity) Index in a city

TABLES

Table 1. Segregation Index for 28 Major US Cities, 2000

Atlanta	68.8	Detroit, MI	86.7	Milwaukee	84.4	Phoenix	49.1
Birmingham	77.4	Ft. Lauderdale	64.8	Minneapolis	64.5	Portland	55.8
Boston	68.8	Houston, TX	71.8	Nashville	61.7	Richmond	62.9
Chicago	83.6	Indianapolis	75.5	New Orleans	74.7	St. Louis	78.0
Cleveland	79.7	Las Vegas	47.4	New York	84.3	San Diego	58.2
Dallas	64.4	Los Angeles	70.5	Newark	83.4	San Francisco	65.6
Denver	66.2	Miami, FL	78.8	Philadelphia	76.9	Washington	66.2

Data Source: http://www.censusscope.org

Table 2. Exposure Indices for 3 Major U.S. Cities, 2000

			Neighborhood Composition		
			White	Black	Latino
Detroit (SI 86.7)	Whites	(69.7%)	87.9%	4.9%	2.5%
	Blacks	(22.8%)	15.0%	80.0%	1.7%
	Latinos	(2.9%)	61.4%	13.6%	20.1%
Chicago (SI 83.6)	Whites	(58%)	78.6%	4.5%	10.5%
	Blacks	(18.6%)	14.0%	75.4%	7.5%
	Latinos	(17.1%)	35.6%	8.2%	50.7%
Atlanta (SI 68.8)	Whites	(59.8%)	77.9%	12.5%	4.9%
	Blacks	(28.7%)	26.0%	64.4%	5.6%
	Latinos	(6.5%)	45.2%	24.4%	23.2%

Data Source: http://www.censusscope.org

Table 3. Sampling Proportionate to Representation

County	% CA Black population	% of sample Collected	N
San Francisco	5	6	124
San Diego	8	18	403
San Bernardino	10	5	113
Sacramento	10	8	181
Riverside	10	0	0
Los Angeles	42	47	1024
Alameda	15	16	345
	100%	100%	2190

Table 4. Final CTS sampled

				CT Blacks		CT Residents Below Poverty Line		Segregation	
ROW #	CT	City	CT Total N	N	%	% Overall	% Blacks	Isolation Index (ISO)	N collected
01	38	Sacramento	5307	1901	36%	21%	23%	0.3794	87
02	65	Sacramento	5890	2143	36%	32%	30%	0.4859	60
03	33.02	San Diego	9347	3358	36%	32.98%	32%	0.4449	98
04	42.02	San Bernardino	4645	1695	36%	39.37%	38%	0.4116	113
05	53	Sacramento	1483	531	36%	63%	69%	0.3594	34
06	31.03	San Diego	6159	2703	44%	15.46%	17%	0.5449	123
07	5413	Los Angeles	5696	2855	50%	18%	22%	0.5810	86
08	5410.02	Los Angeles	3320	1705	51%	6%	3%	0.7701	108
09	4078	Alameda	2340	1198	51%	7.90%	11%	0.5381	92
10	6001	Los Angeles	6172	3152	51%	4%	43%	0.5379	119
11	31.01	San Diego	3718	2259	61%	11.52%	11%	0.6208	123
12	4082	Alameda	4388	2762	63%	20.53%	23%	0.6745	126
13	4010	Alameda	5709	4110	72%	30.72%	32%	0.7244	127
14	231.03	San Francisco	4657	3354	72%	52%	54%	0.7385	124
15	2382	Los Angeles	5243	4228	81%	20%	21%	0.8170	144
16	6005.01	Los Angeles	2716	2343	86%	46%	17%	0.8927	114
17	5433.04	Los Angeles	6374	5786	91%	7%	4%	0.8858	112
18	6004	Los Angeles	4151	3762	91%	43%	22%	0.9036	111
19	6008.01	Los Angeles	3181	2929	92%	14%	9%	0.9167	112
20	2343	Los Angeles	4262	3940	92%	16%	17%	0.9132	118
								Total N	2190

San Diego N = 403	Los Angeles N =1024	Southern CA N =1427
Oakland N = 345	San Francisco N =124	Northern CA N = 294
Sacramento N = 181	San Bernardino N = 113	Central CA N = 469

Table 5. Demographic characteristics of the sample by Segregation and Poverty

		Segregation (ISO)		POVERTY (Pov)	
	Overall Sample N=2190	Low (ISO <.70)	High (ISO≥.70)	Low (Pov<20%)	High (Pov≥20%)
Mean Age (SD)	43.58 (16.26)	43.74 (16.48)	43.41 (16.01)	46.48 (16.28)	40.72 (15.732)
Gender					
Women	57.8	51.9	48.1	50.3	49.7
Men	42.2	51.7	48.3	50.8	49.2
Marital status					
Single/never married	42.7	52.0	48.0	41.2	58.8
Married/living as married	33.3	51.4	48.6	60.8	39.2
Divorced/ widowed/ separated	24.1	54.5	45.5	52.4	47.6
Education					
<HS	6.8	56.8	43.2	39.9	60.1
HS grad or GED	28.7	52.4	47.6	37.4	62.7
≥Some college	64.3	52.1	47.9	57.6	42.4
Household income					
≤$10,999	22.6	52.5	47.5	27.1	72.9
$11,000 to 25,999	18.5	58.0	42.0	42.0	58.0
$26,000 to 49,999	22.8	55.8	44.2	50.8	49.2
≥$50,000	36.0	46.9	53.1	64.8	35.2

Table 6. Prevalence of health behaviors of the sample by individual and area-level variables

		N	Smoking	5+FVC	Physical activity
Overall % Yes			32.6	25.2	57.3
INDIVIDUAL- LEVEL VARIABLES			% Yes	% Yes	% Yes
Gender	Women	1179	29.5	24.4	54.8
	Men	860	37.6	25.7	61.4
Age	≥ 18 to ≤ 34 years	655	34.2	28.6	62.7
	≥ 35 to ≤ 44 years	415	36.2	27.3	62.1
	≥ 45 to ≤ 54 years	429	42.0	24.5	57.7
	≥ 55 years	514	21.9	21.3	50.2
Marital status	Single/Never married	877	37.7	29.8	57.1
	Married/Living as married	683	26.9	24.0	60.0
	Divorced/ Widowed/ Separated	494	32.0	19.9	53.3
Education	< High School (HS) Grad	148	49.6	24.2	47.8
	HS grad or GED	605	42.4	24.6	47.5
	≥Some college	1358	25.9	25.5	62.8
Household Income	≤$10,999	436	47.5	28.1	47.3
	$11,000 to $25,999	357	46.7	24.5	59.2
	$26,000 to $49,999	439	25.4	27.1	57.7
	≥$50,000	693	21.1	23.6	66.0
AREA-LEVEL VARIABLES			% Yes	% Yes	% Yes
CT-Poverty	Low (< 20%)	1105	25.3	25.7	58.5
	High (≥ 20%)	1085	40.0	24.7	56.1
CT-Segregation	Low (Isolation < .70)	1120	37.4	24.6	55.5
	High (Isolation ≥ .70)	1070	27.5	25.8	59.2

Table 7. Chi Square tests of the relationship between health behavior and segregation

		Segregation		
		%Low (iso <70)	%High (iso>70)	$X^2_{df=1}$
Smoking				
Women				
	Yes	31.2	27.8	1.48
	No	68.8	72.2	
Men				
	Yes	44.2	30.5	15.73*
	No	55.8	69.5	
5+FVC				
	Yes	24.7	25.8	.356
	No	75.3	74.2	
Physical Activity				
	Yes	55.8	59.0	2.00
	No	44.2	41.0	

* p<.0001

Table 8. Hierarchical logistic regression predicting current smoking from individual demographic variables and area level segregation among men

Step and variable selected		β	SE	β/SE	Wald	OR	95% CI
1. Age		-0.007	0.007	-1.000	0.974	0.993	0.980,1.007
2. Marital Status	Single/Never married					Reference	
	Married/Living as married	0.241	0.242	0.996	0.992	1.273	0.792,2.047
	Divorced/ Widowed/ Separated	0.328	0.299	1.097	1.203	1.389	0.772,2.497
3. Socioeconomic Status							
Education	<HS	1.168	0.367	3.183	10.098*	3.215	1.564,6.607
	HS grad	0.298	0.204	1.461	2.145	1.389	0.904,2.009
	≥Some college					Reference	
Household Income	≤ $10,999	0.928	0.281	3.302	10.910*	2.531	1.459,4.390
	$11,000 - $25,999	1.431	0.265	5.400	29.109*	4.182	2.487,7.034
	$26,000 - $49,999	0.288	0.257	1.121	1.109	1.334	0.806,2.208
	≥$50,000					Reference	
4. Segregation							
	Low	0.729	0.180	4.05	16.423*	2.073	1.457,2.950
	High					Reference	

* $p < 0.001$

Table 9. Hierarchical logistic regression predicting current smoking from individual demographic variables and area level segregation among women

Step and variable selected		β	SE	β/SE	Wald	OR	95% CI
1. Age		-0.009	0.006	-1.500	2.390	0.991	0.979,1.002
2. Marital Status	Single/Never married					Reference	
	Married/Living as married	-0.028	0.211	-0.133	0.017	0.973	0.643,1.472
	Divorced/ Widowed/ Separated	0.266	0.227	1.172	1.368	1.304	0.836,2.037
3. Socioeconomic Status							
Education	<HS	0.155	0.342	0.453	0.206	1.168	0.597,2.284
	HS grad	0.429	0.186	2.306	5.346	1.536	1.068,2209
	≥Some college					Reference	
Household Income	≤ $10,999	1.046	0.236	4.432	19.640*	2.847	1.792,4.521
	$11,000 - $25,999	0.748	0.239	3.130	9.779*	2.113	1.322,3.376
	$26,000 - $49,999	0.222	0.228	0.974	0.943	1.248	0.798,1.953
	≥$50,000					Reference	
4. Segregation							
	Low	0.122	0.162	0.753	0.574	1.130	0.823,1.552
	High					Reference	

* $p < 0.001$

Table 10. Hierarchical logistic regression predicting 5+FVC from individual demographic variables and area level segregation among the whole sample

Step and variable selected		β	SE	β/SE	Wald	OR	95% CI
1. Age		-0.003	0.004	-0.750	0.372	0.997	0.989,1.006
2. Gender	Women					Reference	
	Men	0.058	0.122	0.475	0.227	1.060	0.835,1.345
3. Marital Status	Single/Never married					Reference	
	Married/Living as married	-0.152	0.153	-0.993	0.981	0.859	0.637,1.160
	Divorced/ Widowed/ Separated	-0.520	0.189	-2.751	7.534**	0.594	0.410,0.862
4. Socioeconomic Status							
Education	<HS	-0.142	0.269	-0.528	0.279	0.868	0.512,1.1469
	HS grad	-0.154	0.144	-1.069	1.130	0.858	0.646,1.138
	≥Some college					Reference	
Household Income	≤ $10,999	0.304	0.184	1.652	2.733	1.355	0.945,1.943
	$11,000 - $25,999	0.053	0.184	0.288	0.084	1.055	0.736,1.511
	$26,000 - $49,999	0.202	0.163	1.239	1.548	1.224	0.80,1.684
	≥$50,000					Reference	
5. Segregation							
	Low	-0.074	0.120	0.6167	0.378	0.929	0.734,1.175
	High					Reference	

** $p < 0.05$

Table 11. Hierarchical logistic regression predicting physical activity from individual demographic variables and area level segregation among the whole sample

Step and variable selected		β	SE	β/SE	Wald	OR	95% CI
1. Age		-0.020	0.004	-5.000	23.828*	0.980	0.973,0.988
2. Gender	Women					Reference	
	Men	0.309	0.112	2.759	7.608**	1.363	1.094,1.698
3. Marital Status	Single/Never married					Reference	
	Married/Living as married	0.085	0.144	0.590	0.353	1.089	0.822,1.1443
	Divorced/ Widowed/ Separated	0.118	0.165	1.19	0.511	1.089	0.814,1.555
4. Socioeconomic Status							
Education	<HS	-0.594	0.233	-2.549	6.513**	0.552	0.350,0.871
	HS grad	-0.515	0.129	-3.06	15.891*	0.597	0.464,0.770
	≥Some college					Reference	
Household Income	≤ $10,999	-0.562	0.168	-3.345	11.212*	0.570	0.410,0.792
	$11,000 - $25,999	-0.165	0.166	-0.994	0.980	0.848	0.612,1.175
	$26,000 - $49,999	-0.248	0.148	-1.675	2.795	0.780	0.583,1.044
	≥$50,000					Reference	
5. Segregation							
	Low	-0.112	0.110	-.001	1.028	0.894	0.721,1.110
	High					Reference	

* $p < 0.001$; ** $p < 0.05$

Table 12. Multi-level logistic regression predicting current smoking from individual- and area-level predictors of smoking for men

Predictors		Model 0: Empty Model		Model 1: Individual Variables		Model 2: Area-Level Variables		Model 3: Both	
Individual- level Variables		OR	95% CI	OR	95% CI	OR	95%CI	OR	95%CI
Age				0.99	0.98,1.01			0.99	0.98,1.01
Marital Status	Single/Never married			0.75	0.46,1.24			0.77	0.47,1.27
	Divorced/ Widowed/ Separated			1.04	0.59,1.84			1.06	0.6,1.87
	Married/Living as married			Reference				Reference	
Education	< High School (HS) Graduate			3.31	1.57,6.99*			3.3	1.56,6.97*
	High School (HS) Graduate			1.38	0.90,2.09			1.33	0.87,2.03
	≥ Some College			Reference				Reference	
Income	≤ $10,999			2.59	1.44,4.66*			2.37	1.32,4.28*
	$11,000 - $25,999			4.27	2.48,7.35*			4.26	2.48,7.32
	$26,000 - $49,999			1.47	0.87,2.49			1.36	0.80,2.29
	≥$50,000			Reference				Reference	
Area-level variables									
CT Poverty	Low (< 20%)					Reference		Reference	
	High (≥ 20%)					1.78	1.04,3.06*	1.31	0.80,2.16
CT Segregation	Low (Iso < 70)					0.52	0.30,0.89*	0.50	0.31,0.80*
	High (Iso ≥ 70)					Reference		Reference	
Measures of clustering									
	CT-level Variance (SE)	0.357 (0.172)*		0.222 (0.129)		1.66 (0.112)		0.081 (0.090)	
	Median Odds Ratio (MOR)	1.76		1.57		1.47		1.13	
	ICC	0.098		0.063		0.048		0.024	

*$p < 0.05$

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