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Neighborhood ethnic density and self-rated health: Investigating the mechanisms through social capital and health behaviors

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Abstract

While living with co-ethnics benefits minorities' health, the so-called ethnic density effect, little is known about the mechanisms through which neighborhood ethnic density influences self-rated health. We examine two pathways, namely neighborhood social capital and health behaviors, with a 2010 survey collected in Philadelphia (2,297 blacks and 492 Hispanics). The mediation analysis indicates that (1) living with co-ethnics is beneficial to both blacks' and Hispanics' self-rated health, (2) neighborhood social capital and health behaviors mediate almost 15 percent of the ethnic density effect for blacks, and (3) the two mechanisms do not explain why living with co-ethnics improves Hispanics' health.

Keywords

Ethnic density; self-rated health; social capital; health behaviors; Philadelphia

INTRODUCTION

It is suggested that residents living in neighborhoods with a high concentration of minorities have poorer economic outcomes and more limited access to opportunities than those living in racial/ethnically diverse communities (Albrecht et al., 2005; Downey and Hawkins, 2008; Schulz et al., 2002; Williams and Collins, 2001). However, despite the substandard socioeconomic conditions, minority residents who are exposed to high levels of co-ethnics tend to report better health outcomes than their counterparts in neighborhoods with low levels of co-ethnics, which is known as the ethnic density hypothesis (Halpern, 1993; Pickett and Wilkinson, 2008; Stafford et al., 2009). While this paradox has been documented, little

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research has investigated the underlying mechanisms for the relationship between neighborhood ethnic density (i.e., co-ethnic composition) and health outcomes.

This study aims to propose and examine two plausible mechanisms (i.e., social capital and health behaviors) through which ethnic density may affect health for the two largest minority groups, namely non-Hispanic blacks and Hispanics. It should be emphasized that the ethnic density hypothesis is not a new concept as it could be traced back to the work by Faris and Dunham (1939). Measuring mental health using facility admission rates, they found that when living in an area with higher concentrations of blacks, black individuals had a lower admission rate than did their white counterparts (Faris and Dunham, 1939), implying a positive ethnic density effect for blacks. The discussion initiated by Faris and Dunham (1939) was replicated later in later decades by studies on Italian immigrants in Boston (Mintz and Schwartz, 1964) and residents of different origins in New York (e.g., Puerto Rico, Ireland, and Russia) (Muhlin, 1979; Rabkin, 1979). That is, it has been largely supported that minorities who live in areas with a higher concentration of their co-ethnics tend to have better health.

Over the years, the ethnic density argument has been investigated widely in the United States (U.S.) (Bécares et al., 2012b). However, there are two knowledge gaps in the literature. First, despite the well-documented relationship between exposure to co-ethnics and health, the question of how ethnic density gets under the skin remains underexplored. Explicitly, little is known about the mechanisms through which ethnic density affects health. It is worth noting that several potential pathways have been proposed to answer this question but few studies have empirically tested the mechanisms (Bécares et al., 2012b). The second gap is that previous research mainly focuses on the ethnic density effect on mental health while little attention has been paid to self-rated health (SRH), which is a powerful predictor for mortality and other diseases later in life (Idler and Benyamini, 1997; Mossey and Shapiro, 1982). Even among the studies on SRH in the U.S., the findings are inconsistent and more effort is warranted to better understand whether the ethnic density effect could be applied to SRH (Bécares et al., 2012b; Shaw and Pickett, 2011; White and Borrell, 2005).

This study argues that it is critical to understand the mechanisms between neighborhood co-ethnic composition and individual SRH. By examining the potential mediating roles of social capital and health behaviors, this study goes beyond the literature by providing a more thorough picture of *how* neighborhood co-ethnic composition gets under the skin and *whether* the mechanisms vary by minority group.

LITERATURE REVIEW

Ethnic Density Effect: Beneficial or Detrimental?

From a theoretical perspective, living in neighborhoods with high concentrations of co-ethnics could have either a beneficial or a detrimental effect on minorities' health. For the former, being exposed to a high co-ethnic density could bring social and institutional support that facilitate the transmission of health information, minimize risk behaviors, and promote advantageous health outcomes. A racially/ethnically concentrated neighborhood establishes a platform for co-ethnic members to easily share sociocultural norms, linguistic qualities,

and religious beliefs. As a result, such a neighborhood should feature strong social integration and cohesion (Pickett and Wilkinson, 2008), which provides both tangible or emotional support to residents, particularly co-ethnic members. It is also more likely to develop positive role models for minority members in neighborhoods dominated by the same ethnicity (Smaje, 1995). For example, Reyes-Ortiz and colleagues (2009) find that Hispanic Americans have a higher intake of fruits and vegetables (e.g., tomatoes and beans) when they reside in communities with more co-ethnics than do their counterparts in racially/ethnically diverse neighborhoods. Similarly, Hispanics who are exposed to more co-ethnics report less daily stress and have improved immunity function, both of which are associated with a range of other positive health outcomes (Ford and Browning, 2015).

By contrast, there are several studies pointing to a potential detrimental effect of co-ethnic density on health. First, when the co-ethnics themselves are inclined to engage in poor health behaviors (e.g., smoking or binge drinking), heightened exposure to them through social networks or neighborhood-based personal ties may negatively affect individuals' health (Christakis and Fowler, 2007). Second, attitudes toward certain health outcomes or behaviors (e.g., obesity and dietary patterns) may be more relaxed among minorities than among non-Hispanic whites (Baturka et al., 2000). Exposure to co-ethnic neighbors may hence alter one's attitude and ultimately undermine his/her health (Robert and Reither, 2004). Third, neighborhoods with high concentrations of minorities tend to have high crime rates and poverty, which are sources of stress. Living in such neighborhoods may lead to mental health problems and other undesirable health outcomes. Mason and colleagues (2010), for example, find that living in neighborhoods with a high concentration of non-Hispanic blacks increases the risk of preterm delivery. A similar negative association is reported between predominantly black neighborhoods and the risk of having a low birth weight baby (Nkansah-Amankra, 2010).

While the literature provides mixed findings, among the studies that test the ethnic density hypothesis, the evidence for a beneficial health effect is stronger than that for a detrimental effect. Specifically, after systematically reviewing 57 published articles, Bécaries and colleagues (2012b) conclude that "protective ethnic density effects are more common than adverse associations" (p.e33). Following their conclusion, this study expects to find a beneficial relationship between neighborhood ethnic density and minority health. The discussion and proposed mechanisms below are also drawn from this perspective.

Current Gaps in the Literature

Extending from the discussion above, even though the evidence for a protective effect of neighborhood ethnic density on health is strong, little research has endeavored to understand why and how this association exists. From a theoretical perspective, Pickett and Wilkinson (2008) offered several interrelated explanations for the ethnic density effect. First, they suggested that the link between ethnic density and health could be sustained by social integration. As it has been shown in the literature, social integration, having friends, being married or belonging to a social group all improve health (Berkman et al., 2000). Being exposed to co-ethnics makes it easier to share sentiments and establish social relationships that promote good health. The second mechanism, stigmatization, is closely related to their

third explanation, which is discrimination. They noted that discrimination is a source of stress for minority populations (Whitley et al., 2006). It has been found that people who experienced discrimination feel uncomfortable and stigmatized, particularly when they are out of their comfort zone, namely the social space where they feel accepted (Bourdieu, 1986). Thus, people who live among their co-ethnics should feel the adverse effects of discrimination to a lesser degree than their counterparts who live outside of their ethnic community (and therefore encounter more discrimination while gaining less support).

Beyond social integration and discrimination, the health impact of living with co-ethnics can be transmitted through strong social support or capital. It is expected that the increase in neighborhood ethnic density is associated with an increase in strong interpersonal relationships as individuals tend to build stronger social bonds with those of the same background (e.g., race/ethnicity) (Lin, 2002). These social relationships enable individuals to access information, resources, and opportunities, which have been shown to improve health (Das-Munshi et al., 2010; Whitley et al., 2006). Similarly, Bhugra and Becker (2005) argue that high ethnic density strengthens the sense of community and belongingness. In this sense, in contrast to racially diverse neighborhoods, those with higher levels of co-ethnics are more likely to show a strong sense of familiarity and belongingness among residents, which ultimately benefits their health by reducing the stress originating from alienation and rejection.

The plausible mechanisms above are closely related to individuals' mental health, which explains why the literature pays little attention to other health outcomes. Among the largely ignored health outcomes, SRH has been arguably one of the most important health indicators as it has been found to predict mortality and other physical ailments (Idler and Benyamini, 1997; Mossey and Shapiro, 1982). More specifically, after reviewing numerous published studies, Idler and Benyamini (1997) conclude that SRH is a critical health indicator for several reasons. First, it captures a wide range of illnesses (e.g., chronic diseases). Additionally, SRH is able to precisely demonstrate the severity of these illnesses as it reflects respondents' self-assessments. Finally, SRH integrates and reflects the respondent's family history of disease. Given these strengths, SRH is an inclusive measure that provides a complete assessment of social, psychological and biological factors.

Nonetheless, relatively few studies have incorporated SRH into the ethnic density effect literature in the U.S. and the empirical findings are far from conclusive. Indeed, several scholars found a null association between neighborhood ethnic density and the racial/ethnic disparities in SRH (Gibbons and Yang, 2014; Mellor and Milyo, 2004; Usher, 2007; White and Borrell, 2005). Others reported a positive association (Bécares et al., 2012a; Patel et al., 2003; Robert and Ruel, 2006), but these findings are mainly drawn from the black population. Furthermore, while it is rare in the literature (Shaw and Pickett, 2011), a negative relationship between neighborhood ethnic density and SRH has been presented (both among blacks and Hispanics). These mixed findings suggest a need to clarify whether the ethnic density effect can be applied to SRH in the context of the U.S.

Mechanisms to Be Examined in This Study

This study proposes two mechanisms linking neighborhood ethnic density and SRH. One is the social capital mechanism and the other is the health behaviors mechanism. The former is mainly drawn from the discussion above and the other has not been commonly tested in the literature. We elaborate on these mechanisms below.

Social capital mechanism.—The concept of social capital dates back to the works by Bourdieu (1986), Coleman (1988), and Lin (1981). Bourdieu (1986) suggests that social capital is a form of capital that can be converted from other sources of capital such as human and cultural capital. He emphasizes that social capital is related to the social relationships an individual maintains and the resources that are inherently embedded in these relationships. Social capital can be accumulated by investing in interpersonal bonds, which can ultimately be translated into resources when one is in need. By contrast, Coleman (1988) defines social capital by its function. Social capital is more about obligations, expectations, networks, norms, and sanctions that facilitate an individual's social actions. Lin and colleagues (1981) stress that the resources generated from the social relationships among individuals can be used to reach personal goals. These definitions are rooted in the micro-perspective until Putnam (1996) defines social capital as “features of social life-networks, norms, and trust—that enable participants to act together more effectively to pursue shared objectives” (p.56), which expands social capital to the macro-level (i.e., ecological).

Specific to this study and drawing from these concepts, we define social capital as an individual's social relationships and the mutual trust, reciprocal assistance and engagement embedded in those relationships. This definition is appropriate for two reasons. One is that it corresponds to the core concept of social capital in the literature (i.e., social relationships, actions, and resources). The other is that it can be extended to account for how ethnic density is associated with social capital. To be specific, individuals tend to establish social relationships with those of a similar background, such as socioeconomic status and race/ethnicity, which is known as homophily (Lin, 2002). When living in neighborhoods with high concentrations of co-ethnics, individuals are more likely to interact with other residents, build social bonds, and provide support (both emotional and tangible). Consequently, high levels of ethnic density facilitate one's social capital (Mollica et al., 2003).

With respect to the association between social capital and health, it has been well-documented that individuals with abundant social capital report better health than those with poor social capital (Rose, 2000; Song et al., 2010; Veenstra, 2000). There are differing explanations for why social capital is beneficial. On one hand, social capital facilitates the diffusion of health information (e.g., preventive health services and new treatments) and reduces the barriers to health services (e.g. neighbors offering transportation to health facilities) (Kawachi et al., 1999). On the other hand, social capital creates trustful interpersonal relationships. Having such relationships leads to a better quality of life, mitigates many of the daily stressors that can compromise individuals' immune systems, and thus makes individuals more capable of fighting off disease when necessary (Ross and Mirowsky, 2001).

The discussion above forms the mechanisms linking neighborhood ethnic density to individual health. To our knowledge, this social capital mechanism has been tested only in two studies: one in the United Kingdom (Bécares and Nazroo, 2013) and the other in Philadelphia (Hutchinson et al., 2009).¹ Using the mixed method approach, the former investigates the intertwined relationships among ethnic density, social capital and mental health with an emphasis on social capital at the ecological level (Bécares and Nazroo, 2013). They find that the association between ethnic density and social capital changes by ethnic group, and social capital does not mediate the relationship between ethnic density and health. Hutchinson and colleagues (2009) also adopt an ecological perspective to explore how social capital contributes to the relationship between ethnic density and all-cause mortality rates among blacks. They report that social capital only moderates, rather than mediates, the association between ethnic density and mortality. In other words, the protective effect of ethnic density on mortality is more profound in the areas with strong social capital than in those with weak social capital. Given the scant attention to the mediation mechanisms for the relationship between ethnic density and health, more research is needed in this particular area.

Health behaviors mechanism.—Beyond the social capital mechanism, we argue that living with co-ethnics affects an individual's health behaviors and those behaviors are known to affect an individual's health in any manifestation. There are several ways that exposure to co-ethnics alters one's health behaviors. First, high levels of co-ethnic density are related to strong social cohesion that creates connectedness, solidarity, and social control among people in the same racial/ethnic group (Sampson et al., 1997). These factors form strong social norms that inevitably affect individual behaviors. People who are well connected to others are expected to follow social norms since failing to do so would lead to collective sanctions (Portes, 1997). In other words, high ethnic densities come with high social control, which encourages people to engage in specific health behaviors, such as diet and exercise.

Second, as discussed previously, living with co-ethnics reduces daily stress. Moreover, low stress makes minorities less susceptible to high-risk health behaviors that are often used to cope with stress, such as smoking and drug abuse (Bécares et al., 2011). With an emphasis on discrimination, Bécares and colleagues (2011) suggest that minorities, regardless of nativity status, are exposed to discrimination, and with that comes elevated stress and damaged self-esteem, both of which are associated with high-risk behaviors (Baumeister et al., 2007; Cooper et al., 2003). They indicate that living with co-ethnics attenuates these potential negative effects of discrimination on individual behaviors as minorities feel more welcome and valued. Consequently, residents in neighborhoods with high concentrations of co-ethnics report fewer high-risk health behaviors.

The empirical evidence for the protective association of ethnic density with health behaviors is strong (Bécares et al., 2012b). For example, it has been found that blacks and Indians who live among co-ethnics consume significantly less alcohol in contrast to their counterparts who do not live in such ethnically dense neighborhoods (Bécares et al., 2012a; Bécares et

¹Previous research on neighborhood effects has extensively investigated why neighborhood characteristics matter but here we focus on the pathways linking the ethnic density (rather than racial/ethnic composition) of a neighborhood to an individual's health.

al., 2011). Similarly, Xue and colleagues (2007) report that black adolescents who live in neighborhoods with high concentrations of blacks smoke less than those living in communities with low concentrations of blacks. Importantly, they find that pro-social activities, such as attending community and church activities, reduce smoking, which bolsters the importance of living with co-ethnics. Several recent studies also support the protective association between ethnic density and health behaviors (Kandula et al., 2009; Wheaton et al., 2015).

Some suggest that strong social cohesion may also generate peer pressure that forces individuals to engage in high-risk behaviors (Woolcock and Narayan, 2000). However, this adverse relationship has received little support. Baker and Hellerstedt (2006) suggest that foreign-born black women who live in neighborhoods with higher concentrations of blacks are more likely to partake in substance abuse during pregnancy than their counterparts in neighborhoods with low concentrations of blacks. While theoretically it is possible that ethnic density is related to such high-risk behaviors, the empirical evidence is thin.

Compared to the association between ethnic density and behavior, the relationship between specific behaviors and health has been more thoroughly studied. For example, excessive alcohol consumption, smoking, and diet have been found to explain the variation in health outcomes (Curry et al., 2003; Cutler and Lleras-Muney, 2010; Samitz et al., 2011). Mokdad and colleagues (2004) further connect these behaviors to mortality and estimate that smoking accounts for 18.1 percent of total deaths in the U.S., poor diet and/or insufficient physical activity contributes to 16.6 percent, and alcohol consumption is responsible for 3.5 percent of total deaths. They conclude that lifestyle related behaviors are the leading causes of death in the U.S. As they are modifiable risk factors for health, their roles in determining individual health warrant further investigation.

Following the literature, we propose the following hypotheses:

(H1) After controlling for individual differences, living in neighborhoods with high levels of ethnic density improves self-rated health for blacks and Hispanics.

(H2) Living in neighborhoods with high levels of ethnic density is beneficial to one's health in part because it creates strong social capital and helps to regulate health behaviors among minority members.

(H3) The two mechanisms—strong social capital and regulated health behaviors—are applicable to both black and Hispanic populations.

DATA AND METHODS

Data Sources

The data for this research come from the 2010 Southeastern Pennsylvania Household Health Survey (SPHHS), which was conducted through telephone interviews with a representative sample of 10,006 adults 18 years of age and older living in Bucks, Chester, Delaware, Montgomery and Philadelphia Counties. People aged 64 or older were over sampled. The survey collected key information about health status, personal health behaviors, and access

to, utilization of and quality of area health services. Questions about neighborhood social capital were also asked in the survey. Because we aimed to examine how exposure to co-ethnics in neighborhoods influences health, we restricted our sample to minority respondents. The analytical sample consisted of 2,297 black adults living in 497 neighborhoods and 492 Hispanic adults living in 273 neighborhoods. While the data structure is suitable for multilevel modeling, the average number of respondents in a neighborhood is small for both groups. In light of this issue, we opted to use logistic regression with cluster-adjusted standard errors as our main analytic approach.

In this study, we used the census tract to approximate neighborhood boundaries, because each census tract is designed to be relatively homogeneous with respect to population characteristics, economic status, and living conditions and is commonly used in neighborhood effect research (Sampson, 2002). To obtain information about the resident composition and neighborhood socioeconomic characteristics, we extracted tract-level data from the 2008 to 2012 five-year estimate of the American Community Survey (ACS) and then linked these data to individual records in the SPHHS.

Measures

The dependent variable of this study was a binary indicator of *self-rated health*. The survey asked, “Would you say your health, in general, is excellent, very good, good, fair, or poor?” The dependent variable was coded 1 if a respondent rated his/her health as good, very good, or excellent. Otherwise, the variable was coded 0. Dichotomizing SRH is a commonly used approach in the literature (Idler and Benyamini, 1997; Yang et al., 2017).

The focal independent variable was *neighborhood ethnic density*, which was defined as the proportion of the population in the residential census tract belonging to the same racial/ethnic group as the respondent. In the regression models for black respondents and models for Hispanic respondents, we included the proportion of non-Hispanic blacks and the proportion of Hispanics in a census tract, respectively.

We controlled for various individual and neighborhood characteristics in the analysis. At the individual level, we included respondents’ *age*, *gender*, *marital status*, *nativity*, *education*, *employment status*, *poverty*, and *access to health insurance*. Gender was a simple binary variable coded 1 for females, and age was measured in years. Marital status was a categorical variable that distinguishes divorced/widowed/separated, single and married respondents. Nativity status reflected whether a respondent is foreign-born or native-born. To measure education, we constructed dummy variables for high school graduate, some college, college degree, and post college education, with less than high school being the reference category. Respondents’ employment status consisted of three categories, employed (reference group), unemployed, and other situations (e.g., retired and student). *Poverty status* was a binary indicator of whether a respondent’s household income is below 100% of the federal poverty line. We also included an indicator of whether a respondent has health insurance.

Drawing from the ACS tract data, we were able to control for multiple aspects of neighborhood characteristics. *Neighborhood poverty rate* was measured by the proportion of

individuals in a census tract whose income is below the poverty line. We also controlled for the *proportion of individuals who have a bachelor's degree*, the *proportion of female-headed households*, and the *proportion of renter-occupied households* in a neighborhood.

Following the proposed mediating mechanisms, we gauged *neighborhood social capital* and *health behaviors* as follows. With white respondents being excluded in the analysis, neighborhood social capital was a factor score based on five items:² 1) The number of local groups or organizations in which a respondent participates; 2) A respondent's rating of the likelihood that people in the neighborhood are willing to help their neighbors, on a scale from 1 "never" to 5 "always"; 3) Whether people in the neighborhood have ever worked together to improve the neighborhood; 4) The extent to which a respondent agrees that he/she belongs and is part of the neighborhood, rated on a scale from 1 "strongly disagree" to 4 "strongly agree"; 5) The extent to which a respondent agrees that most people in the neighborhood can be trusted, rated on a scale from 1 "strongly disagree" to 4 "strongly agree." The principle component factor analysis with varimax rotation suggested that one factor was sufficient to capture the concept of social capital. A higher factor score value indicated stronger social capital embedded in a respondent's neighborhood networks.

Respondents' health behaviors were assessed with four variables, *fruit and vegetable consumption*, *fast food consumption*, *smoking*, and *exercise*. Respondents were asked about the number of servings of fruits and vegetables they eat on a typical day. Fast food consumption was measured by the number of times that a respondent eats food from a fast food restaurant in the past seven days, possible answers including "never", "once", "2 times", and "3 or more times," and coded from 0 to 3. The frequency of smoking was an ordinal variable ranging from 1 "never" to 4 "every day." Exercise was measured by the frequency at which a respondent participates in any physical activities for exercise that lasted for at least one-half hour during the past month, which was rated on a scale from 0 "none" to 4 "more than three times a week."

Analytic Strategy

As discussed previously, we estimated a series of logistic regression models³ for blacks and Hispanics in order to assess the association of local neighborhood ethnic density with minorities' health status, while controlling for individual characteristics and neighborhood conditions. We used robust standard errors, adjusting for the cluster at the neighborhood level in all regressions. Doing so allows us to account for the potential intragroup correlation of errors. To examine the mediating mechanisms, we then added neighborhood social capital and health behaviors to the baseline model, and assessed the change in the coefficients of the density of blacks or Hispanics in local neighborhoods.

To formally test the two mediating mechanisms, we employed the method developed by Karlson, Breen, and Holm (Breen et al., 2013; Karlson and Holm, 2011) (KHB method

²The multivariate results and conclusions are not altered even when the analysis is conducted for blacks and Hispanics, respectively. These results are available upon request.

³In addition to the small average number of respondents in a neighborhood, the variance components analysis indicated that the between-neighborhood variation accounts for less than 5% of the total variation in health status for both blacks and Hispanics. This further justified why multilevel modeling is not necessary.

hereafter) for three reasons. One is that the KHB method goes beyond the conventional mediation analysis by allowing users to decompose the total effect into the direct and indirect effect in logistic models as well as other nonlinear probability models (Karlson and Holm, 2011). Second, the KHB method is able to investigate multiple mediators simultaneously. It has been shown that the KHB decomposition approach maintains all of the features of decomposing a linear model (Karlson et al., 2012) and including a vector of mediators (i.e., multiple mediators) will not cause any problem (Breen et al., 2013).

The third reason we find KHB useful is that this recently developed method can be applied to multiple imputation datasets. Roughly 1.8% of our data were missing values. We conducted multiple imputations using chained equations to generate five completed datasets which can then be analyzed using the KHB method. The technical details and proofs of the KHB method are available elsewhere (Breen et al., 2013; Karlson and Holm, 2011; Karlson et al., 2012). We used Stata 13 to implement the analysis.

RESULTS

Table 1 presents the descriptive statistics of all variables in this study. About 73% of blacks and 70% of Hispanics reported good health. The average ages for black and Hispanic respondents were 51 and 42 years old, respectively. Around 70% of the respondents were female for both blacks and Hispanics. For blacks, only 34% were married, 28% were divorced, widowed, or separated, and 38% were single. Nearly half of the Hispanic adults were married. A small proportion (6%) of the black adults were foreign-born and almost half of the Hispanic adults had a foreign origin. For blacks, the most common level of education was high school graduate (39%), followed by some college (24%), whereas 60% of Hispanics received only a high-school or lower level of education. About half of the black respondents and 54% of the Hispanic respondents were employed full-time or part-time, and 12% were unemployed for both racial groups, with the remaining proportion being out of the labor force. About one fifth of blacks and one fourth of Hispanics had a household income below the federal poverty line. Ten percent of the black respondents and 21% of the Hispanic respondents did not have health insurance.

In terms of neighborhood characteristics, on average, blacks and Hispanics lived in neighborhoods with high poverty rates (over 27%). Both groups lived in neighborhoods with around one fifth of residents possessing a bachelor's degree. In a typical neighborhood for blacks, about 53% of the households were female-headed with that number being 43% in a typical neighborhood for the Hispanic respondents. In an average neighborhood where blacks and Hispanics live, over 40% of the non-vacant households were renter occupied. Specific to local neighborhood ethnic density, blacks resided in a neighborhood where 66% of the residents were also black. For Hispanic respondents, on average 26% of the residents in their neighborhoods were Hispanic.

For the mediators, neighborhood social capital had a mean of 0.04 for blacks and -0.19 for Hispanics. On average, both black and Hispanic respondents ate more than 2 servings of fruit and vegetables each day and consumed fast food less than once in the past week. The majority of the black and Hispanic respondents did not smoke at the time of the survey. Only

25% of blacks and 20% of Hispanics were smokers (not shown in the table). On average, the respondents exercised 2 to 3 days each week.

The results of logistic regression with cluster-adjusted standard errors among black adults are shown in Table 2. We first included all individual and neighborhood level control variables, as well as the focal independent variable-neighborhood ethnic density. The findings at the individual level largely echoed the existent literature. For example, age was negatively related to the odds of reporting good health, and marriage was protective with respect to SRH. One's socioeconomic status also followed our expectation in that education, employment, and income were associated with good/very good/excellent SRH. As these findings were fairly stable across the models in Table 2, our discussion below is mainly focused on neighborhood features.

Without considering any mediator (Model 1), neighborhood ethnic density (i.e., proportion of non-Hispanic blacks) was found to have a positive and significant association with good health, which supported the ethnic density argument that living with co-ethnics leads to better health among blacks. Explicitly, for every 10 percentage point increase in neighborhood ethnic density, the odds of reporting good health increased by 7% ($e^{0.673*0.1}=1.07$). Somewhat surprisingly, the neighborhood poverty rate did not have a significant effect on our dependent variable but the proportion of female-headed households in one's neighborhood is associated with lower odds of reporting good/very good/excellent SRH. While these neighborhood level covariates are likely to be highly correlated, the variance inflation factor (VIF) scores among all independent variables are well below 4, which is a strict criterion for multicollinearity. All the VIFs are shown in the appendix and in light of this finding, multicollinearity should not bias the significance tests in our regression analysis.

Social capital was considered in Model 2 and including this mediator explained the association between neighborhood ethnic density and SRH by roughly 5 percent ($(0.673-0.640)/0.673=0.05$). The relationships of other covariates with SRH in Model 2 were comparable with those in Model 1. Moreover, social capital itself was found to improve one's SRH. Increasing an individual's social capital by 0.5 units is associated with an 8 percent ($e^{0.152*0.5}=1.08$) increase in the odds of reporting good/very good/excellent SRH.

We tested the health behavior mechanism by including the four health behavior variables in Model 3. While the amount of fruit and vegetable consumption did not have a significant relationship with SRH, eating fast food and smoking had a negative relationship with health and the frequency of doing exercise was positively related to health. Overall, these health behaviors explained more than 11 percent of the ethnic density effect among blacks. When both mediators were included in the analysis (Model 4), the ethnic density effect for black respondents decreased by 15 percent but its statistical significance remained.

The same model specifications were implemented for Hispanics and the results were summarized into Table 3. While the findings at the individual level for Hispanics were in general comparable to those for blacks, there were several discrepancies. For example, employment status and poverty were not significant determinants of SRH among Hispanics,

but these variables were important among blacks. Educational attainment and marriage were positively related to SRH for both racial/ethnic groups.

Despite the differences in the individual level covariates, the ethnic density effect was significant for Hispanics. Take Model 5 for example, for every 10 percentage point increase in neighborhood ethnic density, the odds of reporting good/very good/excellent SRH increased by 13 percent ($e^{1.253*0.1}=1.13$). In addition to neighborhood ethnic density (i.e., proportion of Hispanics), higher neighborhood poverty rates were negatively associated with the odds of reporting good/very good/excellent SRH.

Unlike the findings drawn from black respondents, including social capital and health behaviors in the analysis did not explain the ethnic density effect for Hispanics. Indeed, the results indicated that these two mechanisms may, to some extent, suppress the ethnic density effect on SRH for Hispanics as the magnitude of the ethnic density effect increased when mediators were considered. For example, in contrast to Model 5, the ethnic density effect slightly rose from 1.253 to 1.259 in Model 6 where social capital was included. This pattern was applicable to health behaviors, which seem to suppress the ethnic density effect for Hispanics more than social capital does.

To formally test the proposed mediating mechanisms, we applied the KHB method to the imputed datasets and presented the results in Table 4. The KHB analysis largely echoed the findings in Tables 2 and 3.⁴ We obtained statistical evidence to support the notion that social capital and health behaviors mediated the ethnic density effect among blacks, particularly when both mediators were considered simultaneously. Based on Table 4, social capital alone accounted for 5 percent of the total effect ($0.034/0.674=0.05$), whereas health behaviors explained 11 percent ($0.073/0.670=0.11$).

DISCUSSION AND CONCLUSION

We revisited our research hypotheses with the analytic results above. The first hypothesis stated that after controlling for individual differences, living in neighborhoods with high levels of ethnic density improves self-rated health. This hypothesis was supported by the results based on both black and Hispanic samples. Specifically, all models in Tables 2 and 3 indicated that the odds of reporting good/very good/excellent SRH increased with neighborhood density for both blacks and Hispanics, net of other individual characteristics and neighborhood features. We concluded that the first hypothesis holds in the study area.

Our first conclusion challenged recent findings that high levels of ethnic density undermine SRH (Shaw and Pickett, 2011; White and Borrell, 2005). There are several plausible explanations for this discrepancy. One is that the definition of neighborhood differs among these studies. We used the most commonly used unit (i.e., census tract) in this study, but previous research adopted ZIP code or metropolitan statistical areas to measure “neighborhood” ethnic density. The second explanation is that our analysis was specific to one single race/ethnicity group but earlier studies pooled all racial/ethnic groups, which

⁴Due to the difference in estimation approach, the coefficient estimates between the KHB method (Table 4) and logistic regression with cluster-adjusted standard errors (Tables 2 and 3) are slightly different.

cannot clearly identify the effect that living with co-ethnics has on health. The third explanation concerns the different operationalization of “ethnic density.” We only focused on the density of residents whose racial/ethnic identity is the same as a respondent’s identity, but earlier studies included other minority populations.

Two issues related to the first hypothesis should be discussed. First, though the ethnic density effect seems to be stronger for Hispanics than for blacks when comparing the coefficients of ethnic density in Table 2 and Table 3, a formal test indicates that the difference in the ethnic density effect between blacks and Hispanics is not statistically significant. Second, while some Hispanics may identify themselves as blacks, in our data, only 78 respondents are Hispanic blacks, which is a small number for multivariate analysis. As a sensitivity analysis, we included the 78 respondents in the black samples (and removed them from the Hispanic samples) and the results are not altered.

Our second hypothesis asserted that the two mechanisms partially account for the association between neighborhood ethnic density and SRH. The strongest support for this hypothesis was from Models 2, 3, and 4 in Table 2 (as well as the KHB findings in Table 4). As reported in the previous section, among blacks, the neighborhood social capital mechanism alone explained approximately 5 percent of the neighborhood ethnic density effect, and roughly 11 percent of the effect can be attributed to one’s health behaviors. Combining both mechanisms can explain almost 15% of the overall ethnic density effect. More importantly, the associations of mediating variables with SRH followed the theoretical expectations (Curry et al., 2003; Cutler and Lleras-Muney, 2010; Samitz et al., 2011). When one’s social capital increased by 0.5 units, the odds of reporting good/very good/excellent SRH increased by 8 percent ($e^{0.152*0.5}=1.08$; Model 2 in Table 2), assuming other variables are constant. Similarly, an increase in fast food consumption by one time per week was related to a 16 percent decrease in the odds of reporting good/very good/excellent SRH ($1-e^{-0.171}=0.16$). Our findings advance the literature by answering the question of how living with co-ethnics may be beneficial to minorities’ health.

We finally hypothesized that the two mechanisms are applicable to both blacks and Hispanics. The findings did not support our hypothesis. Specifically, while the two mechanisms partially accounted for the ethnic density effect among blacks, they did not explain why living with co-ethnics was beneficial to Hispanics’ SRH. Instead, the analytic results indicated that social capital and health behaviors suppressed the ethnic density effect on SRH among Hispanics. This finding suggests that there is a racial/ethnic difference in how ethnic density gets under the skin. We concluded that our final hypothesis is not supported and the two mechanisms are only applicable to blacks.

Why do the social capital and health behaviors mechanisms better explain the effect that ethnic density has on health for blacks than for Hispanics? We propose several reasons for this discrepancy. First, there is a wide diversity in country of origin among Hispanics, which may undermine the development of social capital in a community and explain why the social capital mechanism works for blacks but not for Hispanics. Second, blacks and Hispanics may have different norms and expectations toward health behaviors. Following others’ health behaviors may not be a common practice in Hispanic culture; however, for blacks, a

high ethnic density forms an environment where engaging in health-promoting behaviors is encouraged. Finally, the data do not provide information on how long a respondent has lived in his/her neighborhood. As it takes time for both mechanisms to prevail, the racial/ethnic discrepancy in the mechanisms may be a result of the difference in neighborhood residential history.

Beyond the plausible explanations above, future research on the ethnic density effect should explore the roles of several additional factors. Individual discrimination experience is an important variable that is directly associated with neighborhood ethnic density and health (Bécares et al., 2012b). Specifically, living in racially/ethnically concentrated neighborhoods should reduce the exposure to discrimination, which ultimately contributes to health. In addition, the psychosocial and social cognitive pathways, such as self-esteem and social appraisal schemes, should be considered. As a high ethnic density increases interaction among co-ethnics, it may alter how individuals' appraisal of their daily interaction contributes to good health. Finally, should the data allow, it is desirable to test whether the ethnic density of one's social network affects his/her health. Living in racially/ethnically concentrated neighborhoods does not necessarily translate into a social network with a high concentrations of co-ethnics, because individuals are exposed to other environments, e.g. working and leisure.

We implemented several sensitivity analyses to further validate our conclusions. One was to include the language used in the interview in the analysis to understand if the findings for Hispanics were biased due to language issues (Bzostek et al., 2007). The results suggest that language is not an important determinant of SRH and the findings are not altered. In addition, we created and included the so-called extralocal neighborhood variables in our models (Crowder and South, 2011; South and Crowder, 2010) and found these variables irrelevant to our dependent variable.

This study has several limitations. First, there is no consensus on how to measure social capital. Using a different indicator may result in different conclusions. Second, the analysis was cross-sectional and the relationships among variables cannot be interpreted as causal associations. It should also be noted that the SPHHS data did not provide information on how long a respondent has lived in their neighborhood so we were unable to control for this factor. Third, more than half of the Hispanic population in the Philadelphia metropolitan area are from Puerto Rico and as such, their socioeconomic profiles are poorer compared to the continental U.S. Hispanic population (Yang et al., 2017). Therefore, the findings of this study may not be generalized to other areas or populations.

The finding that the mechanisms between ethnic density and health vary by race/ethnicity suggests that the one-size-fits-all approach to making policies promoting population health should be implemented with caution. Nevertheless, some important policy implications can be drawn for blacks. First, given its mediating role and the positive association with SRH, social capital should be developed via activities that facilitate interactions among residents, such as community gardens, neighborhood walks, and block parties. Second, related to the previous point, building strong social ties within a neighborhood helps residents spread health-related information, adhere to beneficial health behaviors, and minimize risk

behaviors. These ultimately improves health, especially among black residents. With respect to Hispanics, while the mediating mechanisms remain unclear, our results indicate that improving neighborhood socioeconomic profiles (e.g., reducing poverty) should directly and positively ameliorate health in a neighborhood.

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Highlights

- High levels of exposure to co-ethnics improve black and Hispanic self-rated health.
- Social capital accounts for 5 percent of the ethnic density effect for blacks.
- Health behaviors explain 11 percent of the ethnic density effect for blacks.
- The ethnic density effect cannot be explained by the two mechanisms for Hispanics.

Table 1.

Descriptive Statistics for Variables Used in Models Predicting Self-rated Health among Black and Hispanic Adults in Philadelphia

Variables	Description	Mean/Proportion	
		Blacks	Hispanics
Self-rated good health	1= Respondent reports good, very good or excellent health	0.73	0.70
<i>Individual characteristics</i>			
Age	Respondents' age in years	50.90	42.42
Female	1= Female	0.73	0.68
Marital status			
Married	1= Respondent is married or living with a partner	0.34	0.47
Divorced/ Widowed/ Separated	1= Respondent is divorced, widowed, or separated	0.28	0.19
Single or other	1= Respondent is single or of other status	0.38	0.34
Foreign-born	1= Respondent is foreign-born	0.06	0.46
Education			
Less than high school	1= Respondent has less than high school education	0.12	0.23
High school graduate	1= Respondent has graduated from high school	0.39	0.37
Some college	1= Respondent has some college education	0.24	0.22
College graduate	1= Respondent has graduated from college	0.17	0.12
Post college	1= Respondent has more than college education	0.08	0.06
Employment status			
Employed	1= Respondent is employed full-time or part-time	0.50	0.54
Unemployed	1= Respondent is unemployed	0.12	0.12
Other employment status	1= Respondent is retired, disabled, a student or a homemaker	0.39	0.35
Poverty status	1= Household income is below 100% federal poverty line	0.19	0.25
Insured	1= Respondent has health insurance	0.89	0.79
<i>Neighborhood characteristics</i>			
Neighborhood poverty rate	Proportion of individuals in the neighborhood whose income is below the poverty line	0.27	0.28
Proportion of residents with a bachelor's degree	Proportion of individuals in the neighborhood who have a bachelor's degree	0.19	0.20
Proportion of female-headed households	Proportion of female-headed households in the neighborhood	0.53	0.43
Proportion of renters	Proportion of renter occupied households among all non-vacant households	0.45	0.42
Neighborhood density of non-Hispanic Blacks	Proportion of non-Hispanic Blacks in a respondent's census tract	0.66	--
Neighborhood density of Hispanics	Proportion of Hispanics in a respondent's census tract	--	0.26
<i>Mediating variables</i>			
Neighborhood social capital	Factor score generated by factor analysis of five variables: Participation in local groups, willingness to help, neighborhood improvement, sense of belonging, and trust	0.04	-0.19
Fruit and vegetable consumption	Number of servings of fruits and vegetables the respondent eats on a typical day	2.33	2.18
Fast food consumption	Number of times that the respondent eats food from a fast food restaurant in the past seven days, coded 0 (never), 1 (once), 2 (2 times), and 3 (3 or more times)	0.78	0.81

Variables	Description	Mean/Proportion	
		Blacks	Hispanics
Smoking	Frequency at which a respondent now smokes cigarettes every day, rated on a scale of 1 (never smoked), 2 (not at all), 3 (some days), 4 (everyday)	1.88	1.74
Exercise	Frequency of participating in any physical activities for exercise that lasted for at least one-half hour during the past month, rated on a scale from 0 (none) to 4 (more than three times a week)	2.53	2.45
Number of individuals		2,297	492
Number of neighborhoods		497	273

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Table 2.

Logistic Regression Models Predicting Self-rated Good Health among Black Adults in Philadelphia with Cluster-adjusted Standard Errors

	Model 1	Model 2	Model 3	Model 4
Age	-0.012 ** (0.004)	-0.014 *** (0.004)	-0.014 *** (0.004)	-0.015 *** (0.004)
Female	0.132 (0.107)	0.146 (0.107)	0.093 (0.111)	0.107 (0.112)
Divorced/Widowed/Separated	-0.224 ⁺ (0.124)	-0.198 (0.125)	-0.194 (0.125)	-0.178 (0.126)
Single or other	-0.167 (0.118)	-0.145 (0.119)	-0.128 (0.120)	-0.114 (0.120)
Foreign-born	0.906 ** (0.322)	0.933 ** (0.323)	0.684 * (0.335)	0.708 * (0.336)
High school graduate	0.333 * (0.144)	0.298 * (0.145)	0.263 ⁺ (0.146)	0.237 (0.146)
Some college	0.478 ** (0.159)	0.442 ** (0.157)	0.413 * (0.163)	0.387 * (0.161)
College graduate	0.875 *** (0.219)	0.837 *** (0.219)	0.771 *** (0.227)	0.742 ** (0.227)
Post college	0.711 ** (0.254)	0.649 * (0.256)	0.573 * (0.254)	0.530 * (0.255)
Unemployed	-0.437 * (0.195)	-0.429 * (0.195)	-0.452 * (0.199)	-0.444 * (0.199)
Other employment statuses	-1.191 *** (0.139)	-1.195 *** (0.141)	-1.180 *** (0.141)	-1.182 *** (0.142)
Poverty status	-0.478 *** (0.126)	-0.469 *** (0.126)	-0.470 *** (0.133)	-0.466 *** (0.132)
Insured	0.138 (0.174)	0.116 (0.176)	0.091 (0.182)	0.077 (0.184)
<i>Neighborhood characteristics</i>				
Neighborhood poverty rate	0.161 (0.634)	0.260 (0.625)	0.231 (0.672)	0.305 (0.667)
Proportion with bachelor's degree	0.996 * (0.472)	0.964 * (0.473)	0.944 ⁺ (0.500)	0.923 ⁺ (0.500)
Proportion female-headed household	-0.731 * (0.337)	-0.739 * (0.334)	-0.704 * (0.344)	-0.714 * (0.342)
Proportion renter occupied household	-0.421 (0.396)	-0.410 (0.394)	-0.419 (0.405)	-0.410 (0.404)
Proportion of non-Hispanic blacks	0.673 *** (0.203)	0.640 ** (0.204)	0.596 ** (0.215)	0.574 ** (0.214)
<i>Mediators</i>				
Neighborhood Social capital		0.152 ** (0.053)		0.115 * (0.056)
Fruit and vegetable consumption			0.052 (0.042)	0.046 (0.043)
Fast food consumption			-0.171 *** (0.050)	-0.168 *** (0.050)
Smoking			-0.202 *** (0.048)	-0.199 *** (0.048)
Exercise			0.195 *** (0.036)	0.192 *** (0.036)
Constant	1.700 *** (0.406)	1.818 *** (0.411)	1.872 *** (0.456)	1.968 *** (0.463)
Number of individuals	2,297	2,297	2,297	2,297
Number of Neighborhoods	497	497	497	497

Note:

⁺ p<0.1

* p<0.05

** p<0.01

*** p<0.001

Table 3.

Logistic Regression Models Predicting Self-rated Good Health among Hispanic Adults in Philadelphia with Cluster-adjusted Standard Errors

	Model 5	Model 6	Model 7	Model 8
Age	-0.024 ** (0.008)	-0.023 ** (0.008)	-0.031 *** (0.009)	-0.030 *** (0.009)
Female	-0.425 + (0.258)	-0.424 (0.258)	-0.495 + (0.271)	-0.488 + (0.271)
Divorced/Widowed/Separated	-0.145 (0.306)	-0.151 (0.306)	-0.013 (0.308)	-0.019 (0.306)
Single or other	-0.516 * (0.249)	-0.525 * (0.251)	-0.526 * (0.250)	-0.542 * (0.253)
Foreign-born	-0.368 (0.232)	-0.370 (0.232)	-0.341 (0.251)	-0.338 (0.251)
High school graduate	0.389 (0.281)	0.390 (0.282)	0.251 (0.283)	0.239 (0.284)
Some college	0.471 (0.337)	0.476 (0.340)	0.360 (0.351)	0.358 (0.352)
College graduate	1.242 ** (0.465)	1.263 ** (0.477)	1.057 * (0.474)	1.101 * (0.488)
Post college	2.600 * (1.023)	2.617 * (1.032)	2.525 *** (0.941)	2.548 *** (0.953)
Unemployed	0.090 (0.365)	0.086 (0.366)	0.233 (0.397)	0.234 (0.401)
Other employment statuses	-0.335 (0.282)	-0.337 (0.282)	-0.214 (0.286)	-0.216 (0.284)
Poverty status	-0.493 + (0.269)	-0.486 + (0.272)	-0.559 + (0.287)	-0.550 + (0.288)
Insured	-0.292 (0.274)	-0.288 (0.273)	-0.230 (0.291)	-0.221 (0.290)
<i>Neighborhood characteristics</i>				
Neighborhood poverty rate	-3.654 ** (1.340)	-3.702 ** (1.339)	-4.035 ** (1.320)	-4.169 ** (1.328)
Proportion with bachelor's degree	-1.801 + (0.931)	-1.825 + (0.936)	-1.846 + (0.956)	-1.914 * (0.972)
Proportion female-headed household	-0.704 (0.724)	-0.716 (0.727)	-0.586 (0.792)	-0.600 (0.801)
Proportion renter occupied household	1.004 (0.936)	1.030 (0.932)	0.807 (0.983)	0.858 (0.979)
Proportion of Hispanics	1.253 * (0.567)	1.259 * (0.567)	1.532 * (0.598)	1.544 ** (0.598)
<i>Mediators</i>				
Neighborhood Social capital		-0.036 (0.147)		-0.094 (0.153)
Fruit and vegetable consumption			0.014 (0.100)	0.024 (0.100)
Fast food consumption			-0.162 (0.120)	-0.158 (0.120)
Smoking			-0.109 (0.107)	-0.101 (0.106)
Exercise			0.291 *** (0.076)	0.298 *** (0.076)
Constant	3.599 *** (0.704)	3.582 *** (0.708)	3.641 *** (0.796)	3.538 *** (0.806)
Number of individuals	492	492	492	492
Number of Neighborhoods	273	273	273	273

Note:

+ p<0.1

* p<0.05

** p<0.01

*** p<0.001

Table 4.

KHB Mediation Analysis Results for Black and Hispanic Adults with Imputed Data[‡]

	Blacks			Hispanics		
	Ethnic Density Effect without Mediator(s)	Ethnic Density Effect with Mediator(s)	Difference	Ethnic Density Effect without Mediator(s)	Ethnic Density Effect with Mediator(s)	Difference
Social Capital	0.674 ^{**}	0.640 ^{**}	0.034 ⁺	1.255 [*]	1.259 [*]	-0.003
Health Behaviors	0.670 ^{**}	0.596 ^{**}	0.073 ⁺	1.341 [*]	1.532 [*]	-0.192
Both	0.672 ^{**}	0.574 [*]	0.097 [*]	1.341 [*]	1.544 [*]	-0.203

Note:

⁺ p<0.1

^{*} p<0.05

^{**} p<0.01

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