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HEALTH DISPARITIES IN A DIVERSE COUNTY: INVESTIGATING INTERACTIONS BETWEEN RESIDENTS AND NEIGHBORHOODS

by

JOHN P. BARILE

Under the Direction of Gabriel P. Kuperminc

ABSTRACT

This study evaluated the associations of individual and neighborhood level risk factors with physical health, mental health, and stress in a diverse urban county. Relatively little research has attempted to disentangle the interactive individual characteristics and neighborhood conditions underlying health outcomes and disparities. To address this, survey data were collected and analyzed from 1,107 residents living in one of the 114 census tracts in DeKalb County, GA. Using multilevel structural equation modeling techniques, this study found that neighborhood level measures of the social and built environment were not associated with the health outcomes under study after controlling for neighborhood level income and education. Alternatively, individual level perceptions of the social and built environment and measures of access to health care were significantly associated with physical health, mental health, and perceived stress. This study also found that the association between low individual income and poor physical health

was more pronounced for participants who lived in low-income neighborhoods than participants who lived in high-income neighborhoods. Additionally, this study found that Black residents reported significantly better mental health compared to White residents when they lived in high-income neighborhoods, and Black participants reported significantly more stress compared to White participants when they lived in low-income neighborhoods. Results of this study further scientific understanding of the role of neighborhood processes in health disparities and potentially help inform the development of programs and policies related to neighborhood conditions and health disparities.

INDEX WORDS: Health disparities, Health inequality, Neighborhood environment, Neighborhood perceptions, Access to health care, Stress, Health-related quality of life

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JOHN P. BARILE

A Dissertation in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

in the College of Arts and Sciences

Georgia State University

2010

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John Paul Barile

2010

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by

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DEDICATION

This dissertation is dedicated to my sister, Dr. Bobbie Legg, for her continuous support through my seemingly endless graduate school experience. Her unconditional support and encouragement made the completion of my graduate studies possible.

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1 INTRODUCTION

The Institute of Medicine states that health disparities exist when the health of racial and ethnic minorities, poor people, and other disadvantaged groups is worse than the health of the overall population (Thomson, Mitchell, & Williams, 2006). Despite literature dating back well over a century (Gamble & Stone, 2006), much of the research on health disparities has focused on the *who*, *what* and *where o*f health disparities, with less focus on the *how* or *why*. Historically, health disparities research consisted of little more than reviewing large health databases and probing for differences in health outcomes as a function of sex, race or ethnicity, sexual orientation, and other factors (Lee, Mountain, & Koenig, 2001). While such comparative research has been instrumental in raising awareness of extant disparities, it has offered little insight into their causes or maintenance and has provided little guidance for the design of appropriate interventions to reduce these disparities. Furthermore, a historical focus on "group differences" has the potential for allotting blame or credit for individual health status as a function of personal genetics, knowledge, or behavior without taking into account larger systematic influences that may affect individual level outcomes (Ossorio & Duster, 2005; Sankar et al. 2004).

More recently, researchers have begun to reevaluate the ethical implications that are associated with persistent differences in health found between minority and majority populations (Braveman & Gruskin, 2003). This attention has spurred a growth in research focused on the potential causes of health disparities. In particular, the role of social and built environments in the formation and maintenance of health disparities has gained increased attention (Ramirez, Baker, & Metzler, 2008). This shift in attention was produced in part because of research findings that residents from low socioeconomic neighborhoods had higher prevalence rates of

coronary heart disease and mortality (Diez Roux, Nieto, & Muntaner et al., 1997) and obesity (Ellaway, Anderson, & Macintyre, 1997), even when controlling for personal levels of income, education, and occupation. Such findings indicate that neighborhoods themselves may contribute to the health of their residents above and beyond differences in the residents' backgrounds. Additionally, lower socioeconomic neighborhoods have also been found to be more likely to be minority-majority populations, particularly in urban settings (Sampson & Morenoff, 2006), and recent research found that the greater the percentage of members of ethnic minority groups in a neighborhood, the higher the perceived social and physical environmental stress (Schulz, Zenk, Israel, Mentz, Stokes & Galea, 2008). Together, these findings suggest that many of the health disparities found in the U.S. may be associated with differences in the neighborhood conditions experienced by racial and ethnic minorities compared to those experienced by White Americans.

The following sections will briefly outline recent literature that has examined aspects of the social environment, built environment, and access to health care that may be associated with differences in individuals' health outcomes. This will be followed by a review of literature that explores how residents from similar neighborhoods may be differentially affected by neighborhood conditions and why attention to both individual and neighborhood differences is critical to designing effective prevention and intervention strategies.

1.1 Social Environment

The social environment of neighborhoods has been found to be associated with neighborhood residents' health (Browning & Cagney, 2003; Mair, 2009; McNeill, Kreuter, & Subramanian, 2006; Sampson, 2003; Sampson, Morenoff, & Gannon-Rowley, 2002; Wen, Browning, & Cagney, 2003). Previous literature suggests that indicators of the social environment such as neighborhood social cohesion (Browning & Cagney, 2003; Mair et al.,

2009; Wen, Browning, & Cagney, 2003), social control (Browning & Cagney, 2003, Wen, Browning, & Cagney, 2003), safety (Parkes & Kearns, 2006), and violence (Mair et al.,, 2009) are all related to residents' health status, even when controlling for residents' individual backgrounds. Thus, individuals may be directly affected by living in stressful neighborhoods, most likely due to an increased likelihood of exposure to chronic stressors. In particular, neighborhood social conditions such as a fear of crime and low social cohesion have been found to be associated higher rates of cardiovascular disease (Krantz & McCeney, 2002) and residents with compromised immune systems (Hill, Ross, & Angel, 2005).

A central focus of research on the social environment has been on neighborhoods' collective efficacy, which has been defined as "*the capacity of residents to achieve social control over the environment and to engage in collective action for the common good"* (Sampson, 2003, p. 58). Residents in communities who report high levels of collective efficacy have been found to report fewer fears of being a victim of crime (Ross & Mirowsky, 2001), report less racial discrimination (Williams & Mohammed, 2009), and have better health outcomes compared to residents living in communities that do not share these characteristics. Furthermore, collective efficacy has also been found to be directly related to individual health (Browning & Cagney, 2003), potentially because neighborhoods with strong ties between their residents may be more likely to notice and attend to ailing community members, have lower overall stress, and have higher communal perception of social support. Other researchers have also found that weaker neighborhood cohesion was associated with increased depression among mothers, higher family dysfunction, poorer child outcomes (Kohen, Leventhal, Dahinten, & McIntosh, 2008), and increased drug use (Duncan, Duncan, & Strycker, 2002). For these reasons, it is important for

researchers to take into account the role of neighborhood level social environments when assessing health disparities or any individual level outcomes.

1.2 Built Environment

The built environment of neighborhoods can also have a direct influence on residents' health. The absence of lead paint, asbestos, and mold all improve the health and well-being of children and adults (Shaw, 2004). However, researchers have also found that the design of buildings and neighborhoods themselves can greatly influence the health of those that inhabit them. The amount of walking trails in a community (Wilson, Kirtland, Ainsworth, & Addy, 2004), a home's proximity to grocery stores that sell fresh foods (Inagami, Cohen, Finch, & Asch, 2006) and the availability of nearby parks (Taylor, Floyd, Whitt-Glover, & Brooks, 2007) are all associated with residents' health. Additionally, high concentrations of fast food restaurants (Alter & Eny, 2005), liquor stores (LaVeist & Wallace, 2000), the percentage of boarded up homes (Cohen et al., 2003), and/or convenience stores in one's community (Chuang, Cubbin, Ahn, & Winkleby, 2005) have been found to be negatively related to residents' health, potentially by limiting their access to healthy dietary options and contributing to increased fear of crime.

Wilson, Kirtland, Ainsworth, and Addy (2004) investigated whether residents of low SES neighborhoods (defined by census tract boundaries) had different perceptions of access and safety for engaging in physical activity compared to residents living in high SES neighborhoods. Their study found that residents from low SES neighborhoods reported greater unpleasantness of their neighborhoods and less access to public recreation facilities. Furthermore, differences in the number of walking trails in neighborhoods were significantly related to the amount of physical exercise that residents engaged in. Moreover, a review of eighteen studies on environmental

influences on walking behavior (Owen, Humpel, Leslie, Bauman, & Sallis, 2004) found that aesthetic attributes, convenience of facilities for walking, and accessibility of stores were associated with the extent to which residents walked in their neighborhood for exercise, recreation, and their total walking. Owen et al.'s review stressed the need for future studies to include multi-level designs that investigate individual and social-level influences on physical activity.

1.3 Individual Perception of Neighborhood

Even residents of the same neighborhood can differ in their perception of shared neighborhood conditions. Research that measures residents' perceptions of their neighborhood has the added benefit of being able to ask a broad array of research questions, including how individual residents differentially respond to the same neighborhood environment and experiences (Roosa, Jones, Tein, Cree, 2003). Additionally, individual differences in residents' perception of their neighborhood may contribute to the presence of health disparities within neighborhoods (Boslaugh, Luke, Brownson, Naleid, & Kreuter, 2004; Schulz, Zenk, Israel, Mentz, Stokes, & Galea, 2008).

Perceptions of the neighborhood environment have been found to vary depending on the ethnic or racial background of the independent observer. Some researchers (e.g., Boslaugh, Luke, Brownson, Naleid, & Kreuter, 2004) have found that Black residents perceived their neighborhoods as less safe and less pleasant for physical activity than did White residents, while others (Sampson & Raudenbush, 2004; Schulz, Zenk, Israel, Stokes & Galea, 2008) have found the opposite when controlling for SES. Schulz et al. (2008) found that White residents perceived higher levels of both social and physical environmental stress compared to African American residents of the same neighborhood. These findings suggest that after accounting for individual

income and education, residents of different ethnic backgrounds continue to differ in their independent perceptions of the same neighborhood.

Despite differences in individual perception, researchers have also found that many neighborhood level constructs, such as physical and social disorder (Perkins & Taylor, 1996), proximity to supermarkets, parks, and trails (Boehmer, Hoehner, Wyrwich, Ramirez, & Brownson, 2006) measured though the use of aggregated resident surveys, often yield results similar to those using other observation methods (e.g. trained assessors, crime reports, GIS mapping). These findings point to the likelihood that neighborhood surveys, on average, often closely reflect the same construct when measured through alternative means. Furthermore, data representing residents' individual perceptions allows the researcher the additional opportunity to easily compare and contrast aggregates of residents' perceptions to their individual level counterparts to investigate contextual effects.

1.4 Access to Health Care

Some have argued that allowing for greater access to health care for all individuals is the key to eliminating of health disparities (Andrulis, 1998). An individual’s access to health care is determined by a number of factors, such as residents' own monetary assets (often reflected by possessing medical insurance), transportation needs, cultural background, and other social demands. To date, much of the research on access to care has focused on the presence/absence of discrimination (Dailey, Kasl, & Jones, 2008; Smedley, Stith, & Nelson, 2003), availability of medical coverage (Cohen, 2003; Gold, 1998), and less commonly, the physical proximity of health care facilities (Brustrom & Hunter, 2001). Less research has questioned the level of care, such as the existence of a primary health care provider (versus frequenting volunteer clinics with

rotating staff) or considered the unique social demands that are commonly present in low SES neighborhoods, such as limited transportation, monetary costs, and other inhibitory demands.

Having or not having access to health care has been shown to directly affect the health of individuals (Andrulis, 1998). Research has also found that even after controlling for factors such as health insurance status, income, age, and severity of conditions, ethnic and racial minorities continue to have worse health outcomes (Nelson, 2002). This may be because a disproportionate number of minorities are in "lower-end" health care plans, thus resulting in unequal care (Nelson, 2002). Furthermore, comprehensive reviews suggest that access to health care, along with social and built environments, all need to be considered when investigating differences in health outcomes (Gee, Payne-Sturges, 2004).

1.5 Importance of Considering Persons and Environments Simultaneously

Previous research suggests that risk factors associated with poor health can operate at both individual and the neighborhood levels (Elias, 1987). Elias (1987) stressed that the success of preventive efforts depends upon changes occurring in persons and in their settings. Elias reasoned that stressors and supports do not only exist on an individual level but also on a population level, resulting in population level outcomes, such as the existence of health disparities. Building on previous theory derived by Albee (1982), Elias (1987) illustrated that risk factors such as dilapidated physical environments and protective factors, such as social support, operate at both the individual and neighborhood level. Moreover, Elias suggested that the balance of both environmental risk factors and protective factors predict whether a population exhibits any particular rate of disorder. Elias's theoretical equation is illustrated below:

$$\text{Likelihood of disorder in a population} = \frac{\text{stress + factors in the environment}}{\text{socialization practices} + \text{social support resources} + \text{opportunities for connectedness}}$$

Similar to Albee's (1982) individual based model, Elias's population based model suggests that if stress and factors in the environment outweigh protective supports, such as neighborhood connectedness and social support, a population is more likely to have poor health outcomes. This model helps explain why individuals residing in neighborhoods with poor social and built environments often experience worse health outcomes than neighborhoods with greater resources.

In a similar vein, Seidman (1987) stressed the importance for researchers and interventionists to understand the impact that any single prevention strategy may have at both individual and neighborhood levels. Seidman (1987) argued that prevention research must be reviewed using a dynamic, ecological-transactional framework that pays particularly close attention to the potential impact of any program on individuals, populations, and setting; stressing the need for research to incorporate complex levels of social organization as well as individual level health outcomes. Taken together, Elias and Seidman's conclusions suggest that a rich understanding of the interactions between individuals and their settings, along with an awareness of the potential implications that may result from any particular prevention program/policy is necessary to both induce positive influences and also avoid adverse affects (as stressed in Bloom, 1993 and O'Neill, 1989).

1.6 Interactions of Individual and Neighborhood Level Research

Due to greater awareness of the potential for interactions between individuals and their neighborhoods, researchers have begun to study why some residents have better health outcomes than others despite living in similar conditions. Previous research has clearly outlined many of the known associations between individual level SES and health (Chen, 2004; Chen, Martin, & Matthews, 2006; Chen & Paterson, 2006; Robert, 1998, 1999), with the preponderance of these findings concluding that individuals of lower SES have higher prevalence rates of illness, greater severity of illness, and greater rates of mortality for most illnesses. Moreover, the relationship between individual level SES and health outcomes has been found to exist on a gradient, such that, for every step increase in SES, individuals may reap better health outcomes (Chen et al., 2006) and the amount of time one spends in a low SES demographic as a child, the higher his/her mortality rate as an adult (McDonough, Duncan, Williams, & House, 1997). While these findings have assisted in understanding general associations between SES and health, few studies have examined the potential for interactions between individual and neighborhood characteristics on health (Adler & Stewart, 2010).

Despite the consistently positive associations between having greater individual wealth and better health outcomes overall, findings on the impact of living in a low vs. high income neighborhood have been mixed. Some research suggests that simply living in a higher SES neighborhood is associated with better health outcomes (Katz, Kling & Liebman, 2001; Kling, Liebman, Katz, & Sanbonmatsu, 2004; Leventhal & Brooks-Gunn, 2003, Kobetz, Daniel, & Earp, 2003); however, other research has found the opposite (Roos, Magoon, Hupta, Chateau, & Veugelers, 2004; Veugelers, Yip, & Kephart, 2001; Winkleby, Cubbin & Ahn, 2006). For example, Winkleby (2006) and colleagues found that death rates of low SES men and women

were highest when they lived in high SES neighborhoods and lowest when they lived in low SES neighborhoods. Some researchers have suggested that these differing effects may occur when individuals live in environments that do not match their resources (Caplan, 1987). It may be that when an appropriate fit between a person and environment is lacking, individuals will be less likely to thrive. Because of this, researchers have begun investigating whether the influence of neighborhoods on individual health outcomes is conditional upon the background of the individual -- meaning that some low SES individuals may reap benefits from living in high SES neighborhoods, whereas others may be negatively influenced by living in high SES neighborhoods.

Contrary to Winkleby and colleagues (2006), Kobetz, Daniel and Earp (2003) found that low-income individuals who lived in low-income neighborhoods experienced a 40% greater likelihood of reporting poor health than non-poverty stricken individuals living in the same low-income neighborhood. Compared to Winkleby et al's sample, Kobetz and colleague's sample was all female, more rural, lower income and more ethnically diverse. These differences along with a Kobetz and colleagues' focus on general health and not mortality may explain the inconsistent findings. Kobetz and colleagues' findings are also generally supported by findings from the Moving to Opportunity (MTO) experiment (Fauth, Leventhal, & Brooks-Gunn, 2008; Katz, Kling & Liebman, 2001; Kling, Liebman, Katz, & Sanbonmatsu, 2004; Leventhal & Brooks-Gunn, 2003).

The Moving to Opportunity experiment used a randomized control design in which families with at least one child who resided in public housing were randomly selected into an intervention that provided housing vouchers enabling them to move to a higher income neighborhood (the neighborhoods they moved to were required to have poverty rates of <10%;

Leventhal Brooks-Gunn, 2003). Results of these studies found that adults who moved to low-poverty neighborhoods reported significantly lower distress/anxiety than individuals who stayed in high poverty areas (Kling, Liebman, Katz, & Sanbonmatsu, 2004; Kling, Liebman & Katz, 2007; Leventhal & Brooks-Gunn, 2003). There was less evidence for improvements in physical health, although there were decreases in obesity (Kling, Liebman, Katz, & Sanbonmatsu, 2004; Kling, Liebman & Katz, 2007) and a mobility program similar to MTO found modest improvements in general physical health (Fauth, Leventhal, & Brooks-Gunn, 2008). It should also be mentioned that while the Moving to Opportunity studies employed an experimental design, over half of the participants eligible to move to a lower poverty neighborhood declined to do so. However, regardless of whether families complied with the assigned treatment, all randomized families were included in the analyses (intention-to-treat analyses)(Leventhal & Brooks-Gunn, 2003). While it may seem surprising that such a large proportion of families declined to participate, research suggests forcing families to move out of poverty stricken neighborhoods can negatively affect their well-being due to established social networks, employment and transportation (Manzo, Kleit, & Couch, 2008; Ruel, Oakley, Wilson, & Maddox, 2010).

Studies have also found that individuals of different race, ethnicity and culture may also be differentially affected by the neighborhoods in which they live. A study by Subramanian and colleagues found that mortality rates were more strongly associated with neighborhood poverty for Black as compared to White residents (Subramanian, Chen, Rehkopf, Waterman, & Krieger, 2005). Moreover, they found that Black residents had significantly higher rates of mortality in low-income neighborhoods compared to Black residents in higher income neighborhoods. This suggests that Black residents may be more susceptible to the detrimental influences associated

with living in low-income neighborhoods, whereas White residents appear less affected. Researchers have speculated that Black residents may report worse health outcomes compared to White residents living in comparable neighborhoods due to Black residents' greater exposure to discrimination and other social disadvantages (Mays & Cochran, & Barnes, 2007). Further, in agreement of Elias's model, the preponderance of research suggests that the more stressors one accumulates, such as experiencing social injustices and living in poor housing conditions, the worse his/her mental and physical health, particularly when one has limited protective resources, such as social support (Thoits, 2010).

Research on immigrant populations has also highlighted the need for researchers to consider interactions between residents and their neighborhoods (Georgiades, Boyle, and Duku, 2007; Roosa et al., 2009). Georgiades et al. (2007) found that low SES neighborhoods had higher rates of children with emotional-behavioral problems and poorer school performance. However, this study also found that immigrant families reported fewer emotional-behavioral problems if they lived in neighborhoods with high concentrations of other immigrant families, regardless of the overall level of neighborhood SES. In contrast, non-immigrants fared worse when they lived in neighborhoods with high levels of immigrants than if they lived with fewer immigrants. This finding suggests that neighborhoods in which high proportions of residents share similar cultural backgrounds may heighten neighborhood cohesiveness, a quality that may be of particular importance for immigrant families.

Neighborhood interactions were also studied by Roosa, Weaver, White, Tein, Knight, Gonzales and Saenz (2009). Those researchers investigated Mexican Americans immigrants' well-being as a function of their familial background and characteristics of the neighborhoods in which they resided. Using latent class analysis, they found that struggling later generation

families reported worse mental health outcomes when they lived in low SES neighborhoods compared to struggling later generation families living in middle SES neighborhoods, while economically distressed families reported better mental health outcomes if they lived in a low SES neighborhood compared to economically distressed families living in middle SES neighborhood. The researchers believed that struggling-later generation families may have fared better in middle SES neighborhoods than economically distressed families because they were more likely to be English speakers and therefore able to garner greater social support from their non-immigrant neighbors. Alternatively, economically distressed families may have fared better in low SES neighborhoods than struggling later generation families because the economically distressed families were more likely to speak Spanish exclusively and more closely adhered to the traditional Mexican culture. Because less Mexican culture was available in middle SES neighborhoods compared to low SES neighborhoods, economically distressed residents may have felt less connected to their neighbors in middle SES neighborhoods.

Collectively, these studies stress the need for researchers to consider that neighborhoods may affect residents differently depending upon their individual backgrounds. Moreover, these studies find that while some neighborhood conditions may positively affect some residents, they may not affect, or even negatively affect others. More research is needed to clarify these complex mechanisms.

1.7 Consideration of Income, Education, and Appropriate Controls

Due to the dynamic and extensive number of determinants of health, it is important for studies investigating differences in health status to incorporate appropriate predictors at the individual and neighborhood levels. For example, studies have found that neighborhood level education is associated with health when tested by itself (Sundquist, Winkleby, Ahlen, &

Johansson, 2004) and when controlling for neighborhood level income (Callahan et al., 2009), yet the majority of studies investigating neighborhood level influences in health have utilized composite socioeconomic status variables (e.g., Roos, Magoon, Hupta, Chateau, & Veugelers, 2004; Veugelers, Yip, & Kephart, 2001; Winkleby, Cubbin & Ahn, 2006). Recent findings have stressed the need to measure income and education independently, despite the fact that they are often highly correlated (Schnittker, 2004; Braveman et al., 2005). Braveman and colleagues (2005) demonstrated that education and income are not interchangeable, particularly among minority populations, and each variable has unique meanings and associations at both the individual and neighborhood levels. Further, research that utilizes composite indicators of socioeconomic status are often difficult to interpret, making them more challenging to determine potential routes of intervention and/or policy reform.

Researchers who have investigated associations between neighborhood level conditions and health have often neglected to control for neighborhood level income or education altogether (e.g., Moore, Diez Roux, Nettleton, & Jacobs, 2008; Mujahid, Diez Roux & Morenoff, 2008; Mujahid, Diez Roux, & Shen, 2008; Auchincloss, Diez Roux, Brown, Erdamann, & Bertoni, 2008). Recent recommendations by Chaix, Leal, and Evens (2010) propose that researchers include neighborhood level measures of socioeconomic status when investigating associations between the neighborhood environment and health. They stressed that there is little chance that controlling for these variables would lead to an over adjustment of neighborhood environment variance due to collinearity. Furthermore, the researchers find that adjusting for neighborhood level income or education would rarely introduce a risk for collider bias, or M Bias, which occurs if two or more neighborhood characteristics cause the neighborhoods' socioeconomic status and neighborhood SES is not related to the outcome. This type of bias can induce a

correlation between the neighborhood characteristics that would not have been present if neighborhood SES were not included in the model. Consequently, Chaix and colleagues suggest that in the instances in which these biases may occur, the researcher should test the model with and without them included in the model.

1.8 The Current Investigation

Research on health disparities has long focused on the extent and nature of the disparities between ethnic groups and social classes. Relatively little research has attempted to disentangle the interactive individual characteristics and neighborhood conditions underlying health outcomes and disparities (Messer, 2008; Mujahid, Diez Roux, Morenoff, & Raghunathan, 2007). The current study seeks to better explain these associations by examining individual and contextual effects using a comprehensive model that draws upon classical prevention theory (Elias, 1987; Seidman, 1987; Shinn & Toohey, 2003), modern health disparity philosophies (Braveman & Gruskin, 2003; Frohlich & Potvin, 2008; Sampson, 2003), and advanced multi-level statistical methods (Bauer & Curran, 2005; Enders & Tofighi, 2007; Ludtke et al., 2008; Preacher, Curran, & Bauer, 2006).

1.9 Hypotheses and Conceptual Model

A multilevel observational design was used to investigate main effects and interactions between individual and neighborhood level risk factors in relation to individual level health status (Figure 1). This style of ecological neighborhood assessment has been identified as one of the best means of understanding the influence of neighborhoods on individual health because it allows for the assessment of naturally occurring relationships between individual and neighborhood level effects (Owen et al., 2004; Sampson, 2008).

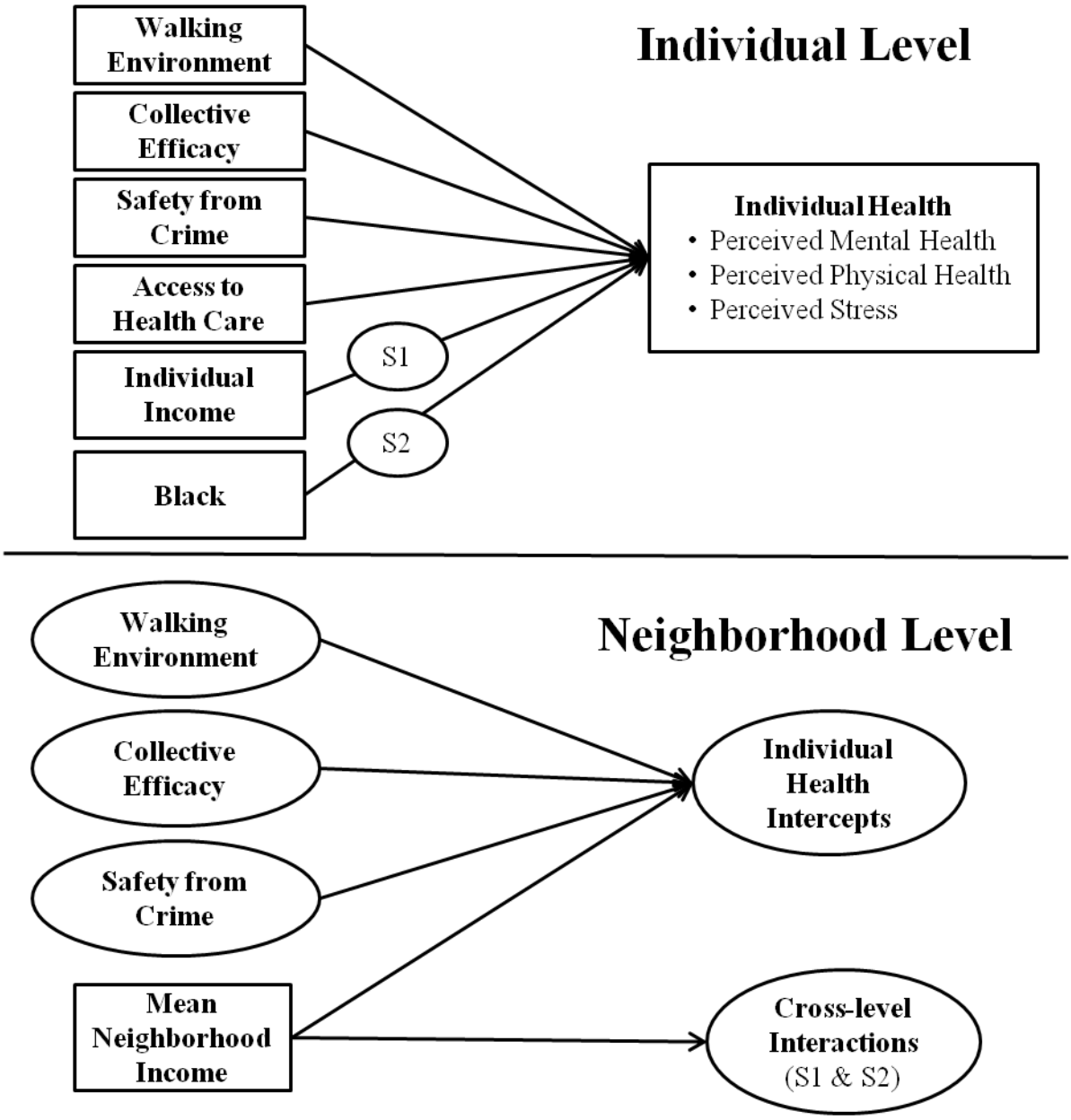

Figure 1. The general hypothesized model. Note that the dependent variables of perceived mental health, perceived physical health, and perceived stress are estimated independently and only appear in a single box for graphical simplicity.

Based on prior research, the researcher has proposed the following hypothesis:

1. Differences in resident perceptions of their neighborhood environment and access to health care will be associated with differences in their health outcomes.

   This hypothesis specifically addresses:

   - Whether neighborhood residents who share the same neighborhood but perceive their neighborhood differently have different health outcomes
   - Whether differences in neighborhood residents' access to health care are associated with differences health outcomes

2. The greater the walking environment, collective efficacy, and safety at the neighborhood level, the better individual health outcomes.

   This hypothesis specifically addresses:

   - The potential that investing in the built and social environment may have in promoting the health of residents above and beyond individual demographic differences

3. The strength of the associations between individual income and racial background, and individual health outcomes (e.g., physical health, mental health, and perceived stress) will vary as a function of the neighborhood level income.

   This hypothesis specifically addresses:

   - Whether individuals with lower personal income have better health outcomes when living in a higher income neighborhood compared to a lower income neighborhood, and whether

individuals with higher personal income have worse outcomes if they live in a low income neighborhood compared to a higher income neighborhood

- Whether Black residents have better or worse health outcomes compared to White residents when living in higher income neighborhoods, holding income and education constant

2 METHOD

2.1 Participants

One thousand, five-hundred and sixty-six adult DeKalb County residents representing 114 census tracts completed the study survey using a combination of snowball and quota sampling. Of these 1,566 participants, 1,389 (89%) provided enough information to have their home address geocoded into a census tract. All participants were DeKalb County residents over 17 years of age and only one resident was sampled from each participating household. The survey, all announcements, and the informed consent materials were available in English and Spanish. There were no other exclusion criteria.

Participant demographic and DeKalb County population demographics appear in Table 1. Overall, respondents' demographics resembled those found in DeKalb County as a whole with the exception of an oversampling of females (76%) and those with graduate level education (27%) and the under sampling of Latinos (3%). This is likely because females and those in a higher social class are more likely to respond to health related surveys (Martikainen, Laaksonen, Piha, & Lallukka, 2007). It is likely that the under-representation of Latinos was due to a greater hesitancy to respond surveys that include questions about their background (Bates & Pan, 2010; US Census Bureau, 2008). Each census tract within DeKalb County had an average of 12.18

responses per tract but there was a considerable amount of between-tract variability in the number of respondents (range1-43, median = 11, mode = 16).

Table 1
Frequency of Participants Identifying with Various Demographics

	Frequency	Percentage	DeKalb Population %
Race or Ethnicity			
White	554	38%	35%
Black	774	53%	54%
Latino	46	3%	10%
Asian	31	2%	4%
Other race or ethnicity	50	3%	
US Born			
Yes	1042	89%	83%
No	118	11%	17%
Education			
Completed 8th Grade or less	9	1%	6%
Completed 9-11th grade	41	3%	7%
Graduated High School or GED	176	12%	24%
Some College	353	24%	19%
College Graduate	476	33%	30%
Completed Graduate School	393	27%	15%
Income			
$0-$9,999	163	12%	7%
$10,000 -$19,999	122	9%	9%
$20,000- $29,999	147	11%	10%
$30,000- $39,999	134	10%	10%
$40,000- $49,999	105	8%	10%
$50,000- $59,999	110	8%	9%
$60,000-$74,999	136	10%	11%
$75,000 or more	427	32%	34%
Gender			
Male	298	23%	49%
Female	947	77%	51%
Age			
18-24	85	6%	12%
25-34	289	20%	19%
35-44	310	21%	23%
45-54	322	22%	20%
55-64	301	21%	14%
Over 65	149	10%	11%

Note. The DeKalb County estimates are based results from the 3-year American Community Survey averages from 2006-2008, found at http://www.census.gov/acs/www/.

2.2 Procedure

Sampling of residents living in DeKalb County, GA was conducted through the use of online surveys, distributed through listservs and other electronic media, and paper surveys at community events and establishments. These methods of data collection were chosen over phone surveys because of recent evidence of increasing declines in the use of home phones (62% used a home phone in 2008; Blumberg & Luke, 2009) the availability to reach residents that work off-hours, the ability to have the survey presented in Spanish, and the ability to easily forward an online survey link to other county residents. Postal mail surveys were not used due high cost and low response rates (Kaplowitz, Hadlock, & Levine, 2004).

Initial sampling of residents was conducted by using a network of neighborhood email lists that originated from the Neighborhood Empowerment Initiative, Office of the CEO, also known as the OneDeKalb Office. The OneDeKalb Office organizes a network of over three hundred neighborhood leaders and organizations with a mission to *preserve and enhance neighborhoods, empower people to make positive contributions, and bring government closer to citizens* (Simama, 2010). Between May and August of 2010, the OneDeKalb Office sent four electronic notices to a network of community leaders asking them to complete and forward an online survey to members of their neighborhood community, who in turn, were encouraged to pass along information about the survey to other DeKalb County residents (Snowball sampling). Many leaders then placed advertisements in their neighborhood newsletters, initiated automated calling, and/or placed links to the survey on their websites. Additionally, in coordination with the DeKalb County Board of Health, an advertisement and link to the survey was placed on the DeKalb County Library homepage and the DeKalb County Government homepage. Lastly, the researcher and assistants from the DeKalb County Board of Health directly contacted local

spiritual groups, community coalitions, and other regional groups and encouraged them to complete the online survey and post notices in newsletters, on websites, and through email listservs.

The online sampling of residents was also paired with paper-based sampling that focused on targeting groups that had been underrepresented using electronic methods (e.g., older adults, minorities, low-income residents).This method has previously been found to be an effective means of improving overall response rates (Dillman et al., 2009). This was done by setting up tables at numerous community events and meeting with members of senior centers, and residents of low-income neighborhoods to administer paper versions of the survey. Of the final participant sample, 607 (44%) were obtained through paper surveys and 782 (56%) were obtained through online methods. Participants who completed the survey on paper versus online were more likely to report being African American/Black (b = -2.12, p < .01, OR = .12), Latino/Hispanic (b = -1.51, p < .01, OR = .22) or Asian (b = -1.20, p <.01, OR = .29), compared to White, less likely to have completed graduate school compared to only graduating high school (b = .57. p <.01, OR = 1.74), and report lower household earnings (b = .26, p < .01, OR = 1.30). The source of measurement (coded 0 for online, 1 for paper) was not predictive of individuals' stress (b = -.02, p =.76) or physical health, (b = .11, p = .36) but did predict respondents mental health (b = .33, p = .03). Although, when source of measurement (paper/online) was included in the final model, the significance of all other coefficients were identical with or without its inclusion. All paper surveys were entered by research assistants at the DeKalb County Board of Health. The paper version of the survey may be found in Appendix 1.

2.3 Measures

The survey included seven neighborhood built and social environment measures. They included, perceived aesthetic quality (5 items; α = .78; ICC = .15), walking environment (7 items, α = .85; ICC = .21), availability of healthy foods (3 items; α = .93; ICC = .09), safety (3 items; α = .84; ICC = .15), violence (4 items, α = .85; ICC = .11), social cohesion (4 items; α = .86; ICC = .15), and informal social control (5 items; α = .89; ICC = .08). All measures have been previously found to have strong psychometric and ecometric properties (Mujahid et al., 2007; Raudenbush & Sampson, 1999). Due to high collinearity between measures at the neighborhood level, the measures of safety and violence (r = .97) were combined to form a composite neighborhood safety measure (α = .88; ICC = .16), and following previous literature (Sampson, Raudenbush, Earls, 1997; Raudenbush & Sampson, 1999), the measures of informal social control and social cohesion (r = .90) were combined to form a nine item measure of collective efficacy (α = .81; ICC = .15). The measures of aesthetic quality and availability of healthy foods were dropped from further analyses due to low between-neighborhood level variance (ICC < .10) and high collinearity with other measures of the neighborhood environment. All measures were scored by taken an average of the scale items (range, 1-5).

Four items from the Behavioral Risk Factor Surveillance System (BRFSS; Centers for Disease Control and Prevention, 2008) representing access to health care were included in the questionnaire (Health Care Access items 1-4). Two additional items, *how long do you have to travel to get to your health care provider*, and, *if I need to see a specialist, it is easy for me to find one near my home*, were included at the individual level to assess other domains of individual differences in residents' access to health care.

The primary dependent variables were overall perceived physical and mental health, measured by the 9-item CDC Health-Related Quality-of-Life measure (HRQOL; Centers for Disease Control and Prevention, 2009), and perceived stress, measured by the Perceived Stress Scale-4 (Cohen, Kamarck, & Mermelstein, 1983; Cohen & Williamson, 1988). The HRQOL is an empirically validated scale (Horner-Johnson, Krahn, Andresen, Hall & RRTC Expert Panel on Health Status Measurement, 2009; Horner-Johnson et al., 2010) that consists of a 4-item physical health scale and a 4-item mental health scale. Previous research using items from the HRQOL measure have demonstrated content, construct, and criterion validity with the Short-Form 36 (CDC 2000; Moriarty et al 2003; Moriarty et al 2005). Consistent with findings from Horner-Johnson et al. (2010), one physical health item, *would you say that in general your health is…* was omitted in the current study due to a low factor loading. The Perceived Stress Scale was found to have acceptable internal consistence in the current investigation ($\alpha = .72$). Previous literature has also found the measure to have a two-month test-retest reliability of .55 (Cohen, Kamarck, & Mermelstein, 1983) and to have construct and discriminant validity, (Cohen & Williamson, 1988; Cohen, Tyrrell, & Smith, 1993).

The survey also included numerous demographic questions: participant's age, income, education, gender, if they were born in the United States, their home address, and the name of their neighborhood. Information regarding participants' home address was gathered in order to place participants' residence within one of 115 census tracts in DeKalb County, GA. In circumstances in which the participant only provided partial address information, such as reporting only their neighborhood name or only their street name, the researcher utilized the information available to approximate the census tract in which the participant resided. In cases in which the participant only provided very general resident information (e.g. only reported they

live in “Atlanta” or provided a street name that spans multiple census tracts), the participant was removed from further analysis. Participants who provided enough home address information to be geocoded compared to those that did not provide enough information were less likely to identify as an unclassified race/ethnicity (b = -1.16, p = .04, OR = .31), or have been born outside the United States (b = -.71, p = .03, OR = .49); residents’ perceptions of their neighborhood nor any other demographic variables significantly predicted group membership. All complete addresses were geocoded using a batch geocoding service run by the University of Southern California’s GIS Research Laboratory (https://webgis.usc.edu/Services/Geocode/). While census tracts may not be congruent with all respondents’ idea of their "neighborhood," the use of census tracts as a proxy for neighborhoods has been found to closely correspond in size to neighborhoods described by neighborhood residents (Coulton, Korbin, Chan, & Su, 2001), and also found to consistently account for gradients in neighborhood SES and mortality rates (Krieger et al., 2002).

3 RESULTS

All data were screened to ensure that no recipient completed the survey more than once and for multiple respondents within households by included only the first response per home address. Data were then cleaned and all descriptive statistics were assessed to determine whether a representative sample was obtained. The final sample of size 1,107 participants with 114 tracts was used to test all hypotheses. The final sample used in all analyses was reduced from 1,389 geocoded addresses to 1,107 due to missing data on one or more independent variables. The reduction in sample size was largely due to missing data on income (n = 137), race/ethnicity (n = 53) and whether a participant was born in the US (n = 50). Despite the reduction in sample size, the final sample size closely coincided with suggested guidelines for investigating multilevel

models with random components, which recommends 100 clusters with 10 participants per cluster to achieve adequate power (Hox, 1998).

Missing data on all endogenous variables was addressed using full-information maximum likelihood under the assumption that missingness is at random conditional on the covariates. (for more information on the appropriateness of the method, please see: Schafer & Graham, 2002). All analyses were conducted using the maximum likelihood estimator with robust standard errors to account for non-normality of the measures. A multilevel structural equation modeling approach, using Mplus 6.0 software (Muthen & Muthen, 1998-2010), was then employed to test all research questions.

3.1 Independent Variables

A number of predictors and covariates were included in all analyses. Ethnicity/race was measured using a series of dummy variables, with White, non-Hispanic serving as the reference group. Individuals identifying as Hispanic or Latino/a were coded as such, regardless of their identified race. Table 2 presents the outcome variables, broken down by race, and significant difference tests between groups with White serving as the reference group and no inclusion of covariates.

Per recommendations by Braveman et al. (2005), SES composite variables were not created, instead the researcher included income and education variables at the individual and neighborhood level. At the individual level, participants' highest level of education was dummy coded into those receiving less than a high school diploma or GED (0 for no, 1 for yes), those receiving a college degree (0/1), and those who had received a graduate degree (0/1). Individuals whose highest level of education was receiving a high school diploma or GED served as the reference group. At the neighborhood level, education was coded as a percentage of the

number of college graduates within each census tract that responded to the survey. Participant income was an ordinal variable that ranged from 1-9. An increase in one integer corresponded with a ten-thousand dollar increase in income. For example, those who reported making between $0-$9,999 were coded as a one and those making between $10,000 and $19,999 were coded as a 2. This pattern continued for all income groups except for those that reported making between $60,000-$74,999 dollars, which were coded as 7.5 and those that reported making over $75,000 dollars were coded as a 9. Other dummy coded predictors included whether participants were born in the United States or not (US Born, reference) and gender (male, reference).

Analyses included individual and neighborhood level covariates and predictors. All participant responses regarding their neighborhood environment were modeled at both the individual and neighborhood levels, grand mean centered. Estimating residents' perceptions of their neighborhood at both levels allowed the researcher to decompose variance into individual and neighborhood level components, often referred to as a contextual analysis (Diez Roux, 2002). The neighborhood level predictors of walking environment, collective efficacy, and safety from crime were derived by creating a latent aggregate of the individual residents' responses. The latent covariate approach to creating higher-level predictors has been found to be a more accurate, less biased method than simple mean aggregation of reflective individual level responses, particularly when intraclass correlations and sampling ratios are small (Ludtke et al., 2008). Simple mean aggregations of individual level responses to income and age were computed and modeled on the neighborhood level. As recommended by Ludtke and colleagues, the simple mean aggregation approach was taken for these variables because they are formative in nature (versus reflective). Individual level resident income variable was group mean centered to allow for unbiased cross-level interactions between the individual characteristics and age was

grand mean centered to allow for the estimation of contextual effects (Enders & Tofighi, 2007). The six access to health care items were group mean centered to appropriately assess only individual level variation and exclude neighborhood level variance.

Table 2

Mean of Dependent Variables by Race/ethnicity without Adjustment for Covariates

	White *n* = 464	Black *n* =558	Latino *n* = 34	Asian *n* = 20	Other Race *n* = 32
Physical Health					
Days Physically Unhealthy	2.24	4.18	3.84	2.37	3.74
Days Limited Activities	1.80	2.78	2.55	2.50	3.13
Days in Pain	1.87	3.00	.52	1.30	2.58
Mental Health					
Days Mentally Unhealthy	3.38	5.38	3.56	4.70	4.81
Days Depressed	3.31	4.41	3.58	4.05	5.42
Days Anxious	5.68	5.59	5.19	6.45	7.00
Days without sleep	8.97	8.37	7.97	6.90	11.23
Factor Scores					
Physically Unhealthy	-.210	.071**	-.118	.216	.508*
Mentally Unhealthy	.002	.004	-.068	.062	.603
Stress Score	2.177	2.398***	2.302	2.437	2.450*

Note. Statistical tests were only conducted for the continuous variables, e.g. the factor scores and stress scores, White residents served as the reference group. Participants represented in the table correspond to those include in the final analyses.

*$p < .05$, **$p < .01$, ***$p < .001$.

3.2 Dependent Variables

Prior to hypothesis testing, factor scores were estimated for two of the three dependent variables, physical health and mental health. This was necessary to account for the count distribution of the factor indicators. The physical health factor was composed of three items and the mental health factor was composed of four items, all required a response from 0 to 30 days. All factor indicators were estimated using negative binomial regression to appropriately model the unique distribution of count indicators and account for the presence of overdispersion in each of the indicators (Atkins & Gallop, 2007). Each of the factor indicators was significantly associated with their corresponding latent factors (p <.001), although since all factor indicators were estimated using negative binomial regression techniques, no residual variance parameters were estimated and therefore standardized factor loadings are not available. Factor scores were saved for each participant using the expected a posteriori method (Bock, 1997). Using factor scores instead of including latent factors in the model allowed the researcher to appropriately utilize the latent covariate approach previously outlined, a feature not available in mplus when numerical integration is needed. This analysis resulted in slightly higher bivariate correlations between the factors when estimated as factor scores (r = .79) compared to latent factors (r = .69). The factor scores were also moderately correlated with the perceived stress scale score (Physical r = .42; Mental r = .54). Correlations between the continuous individual and neighborhood level variables under investigation and the three dependent variables are presented in Table 3.

Table 3

Correlations between Continuous Individual and Neighborhood Level Predictors

Individual Level	Income	Walking Environment	Collective Efficacy	Safety	Stress	Physically Unhealthy
1. Income	--					
2. Walking Environment	.09	--				
3. Collective Efficacy	.21	.23	--			
4. Safety	.07	.45	.13	--		
5. Stress	-.23	-.17	-.11	-.15	--	
6. Physically Unhealthy	-.24	-.17	-.01	-.17	.42	--
7. Mentally Unhealthy	-.16	-.18	-.03	-.18	.54	.80
Neighborhood Level						
1. Income	--					
2. Walking Environment	.73	--				
3. Collective Efficacy	.79	.85	--			
4. Safety	.32	.52	.38	--		
5. Stress	-.88	-.61	-.60	-.27	--	
6. Physically Unhealthy	-.65	-.48	-.49	-.34	.76	--
7. Mentally Unhealthy	-.64	-.25	-.39	-.34	.80	.73

Note. Intraclass correlations for physical health = .04, mental health = .02, and stress = .04.

3.3 Hypothesis 1: Main Effects of Individual Perceptions and Characteristics

Hypothesis 1 investigated whether differences in residents' perceptions of their neighborhood were associated with differences in individual health outcomes, after controlling for other individual level variables. The findings suggest the more positively residents perceived the walking environment of their neighborhood, the better their physical and mental health, Table 4. The results also suggest that the safer residents perceived their neighborhood to be, the better their physical and mental health. Unexpectedly, the more highly residents perceived their neighborhoods' collective efficacy, the lower their physical health.

The model also assessed six variables assessing access to health care at the individual level. These findings suggest that residents who reported they had not seen a doctor because the costs were too high also reported significantly lower physical and mental health and higher stress. Results also suggest that the longer it had been since an individual had visited a doctor for a routine checkup, the higher their perceived stress.

Table 4

Associations Between Individual and Neighborhood Level Variables and Health Outcomes

	Physically Unhealthy			Mentally Unhealthy			Perceived Stress		
Individual Level Associations	*b*	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*p*
Demographics									
Age	.00	.00	.53	**-.02**	**.01**	**.00**	**.00**	**.00**	**.01**
Female	.15	.11	.20	**.36**	**.16**	**.02**	.01	.06	.90
Black	-.01	.14	.93	-.28	.20	.16	.04	.08	.58
Latino	-.28	.32	.39	-.23	.42	.59	-.03	.13	.81
Asian	.00	.37	.99	-.09	.58	.88	.15	.22	.50
Other race/ethnicity	.44	.27	.10	.58	.31	.06	.25	.15	.09
Income	**-.09**	**.02**	**.00**	-.04	.03	.15	**-.03**	**.01**	**.02**
Less than HS diploma or GED	.41	.30	.17	.04	.36	.91	.06	.13	.64
College Graduate	-.02	.12	.90	.07	.13	.62	-.04	.05	.50
Completed Graduate School	.22	.15	.16	.14	.18	.43	-.06	.07	.40
US Born	.29	.16	.06	.74	.22	.00	.12	.07	.11
Individual Perceptions									
Walking Environment	-.11	.08	.16	-.26	.09	.00	**-.09**	**.04**	**.02**
Collective Efficacy	**.18**	**.07**	**.01**	.13	.09	.13	-.02	.04	.50
Safety from crime	**-.21**	**.08**	**.01**	**-.22**	**.09**	**.02**	-.07	.04	.07
Access to Health Care									
Health care coverage (0/1)	-.23	.15	.11	-.17	.19	.35	.10	.07	.15
Personal doctor (0/1)	-.05	.13	.68	-.07	.17	.70	-.09	.06	.16
Costs too high (0/1)	**-1.00**	**.12**	**.00**	**-1.20**	**.15**	**.00**	**-.29**	**.06**	**.00**
Time since last visit	-.01	.05	.76	.11	.06	.05	**.08**	**.02**	**.00**
Travel time to get to provider	.09	.07	.19	.07	.07	.34	.00	.03	.87
Accessibility to a specialist	-.07	.05	.15	-.09	.07	.19	-.02	.03	.36
Neighborhood Level Associations									
Mean Neigh. Income	-.14	.07	.05	-.14	.09	.12	**-.08**	**.03**	**.01**
% of College Graduates	**-.78**	**.31**	**.01**	-.47	.42	.27	-.25	.14	.06
Mean Age of residents	.02	.01	.07	.01	.01	.50	.00	.00	.42
Walking Environment	.20	.32	.54	.56	.41	.17	-.01	.13	.94
Collective Efficacy	.20	.58	.73	-.09	.72	.90	.20	.23	.37
Safety from Crime	-.23	.25	.36	-.34	.31	.28	.00	.08	.97
Cross-level Interactions									
Ind. Income X Neigh. Income	**.04**	**.02**	**.03**	.01	.02	.54	.01	.01	.23
Black X Neigh. Income	-.11	.12	.34	**-.37**	**.16**	**.02**	**-.14**	**.05**	**.01**

Note. 0=Yes, 1=No

3.4 Hypothesis 2: Main Effects of the Neighborhood Environment

Hypothesis 2 investigated whether neighborhood level conditions were associated with individual health outcomes after adjusting for the variance associated with differences in neighborhood perceptions at the individual level. After adjusting for differences associated with individual perceptions of their neighborhood, mean neighborhood income, the average age of neighborhood residents, and the proportion of residents with a college degree, the neighborhood walking environment, collective efficacy, and safety from crime were not associated with individual health outcomes, Table 4.

To verify that the neighborhood level null finding was not the result of collinearity between the three neighborhood condition variables, the model was also estimated with only one neighborhood condition variable included at a time. Despite the moderate bivariate correlations between the neighborhood level condition variables and the dependent variables (Table 3), none of the neighborhood condition variables were significantly related to health after controlling for neighborhood level income and education. The neighborhood condition variables were only found to be significantly associated with the dependent variables after removing both the neighborhood income and education variables, and the other neighborhood condition variables (greater collective efficacy was associated with lower stress [p = .001], and better physical health [p = .006], and better walking environment was associated with lower stress [p = .004]). No combination of removing the neighborhood condition variables influenced the associations between neighborhood level education, income, or the interaction of individual and neighborhood level income.

3.5 Hypothesis 3: Neighborhood Income as a Moderator

Hypothesis three investigated whether the association between individual income and individual health outcomes were dependent upon neighborhood level income, and whether the association between identifying as an African American/Black and individual health outcomes were dependent upon neighborhood level income. This was done by examining the estimated paths from the neighborhood level variables to the within level slopes (labeled S1, S2) in the model (the cross-level interactions) for each of the three dependent variables, all included in a single model, Table 4. Results from the multilevel model found the following: 1) the association between individual income and physical health was moderated by mean neighborhood income, 2) the association between identifying as Black, compared to White, and mental health was moderated by neighborhood income, and 3) the association between identifying as Black, compared to White, and perceived stress was moderated by mean neighborhood income. There were no other statistically significant interaction terms.

Following recent quantitative recommendations (Bauer & Curran, 2005; Preacher, Curran & Bauer, 2006), all significant cross-level interactions identified in hypothesis 1 were also probed to better understand and graphically represent the associations between resident characteristics and their neighborhoods. The association between individual income and poor physical health was more pronounced for participants that lived in low-income neighborhoods (b = -.16, p < .001) than participants that lived in higher income neighborhoods (b = -.10, p = .40). This finding is graphically represented in Figure 2. Black participants reported similar mental health compared to White participants when they lived in low-income neighborhoods (b = .35, p = .28) but Black participants reported significantly better mental health when they lived in high-income neighborhoods (b = -.89, p = .01; Figure 2). Additionally, Black participants reported

significantly more stress when they lived in low-income neighborhoods (b = .29, p = .01) but no significant differences were found between Black and White participants when they lived in high-income neighborhoods (b = -.19, p = .14; Figure 3).

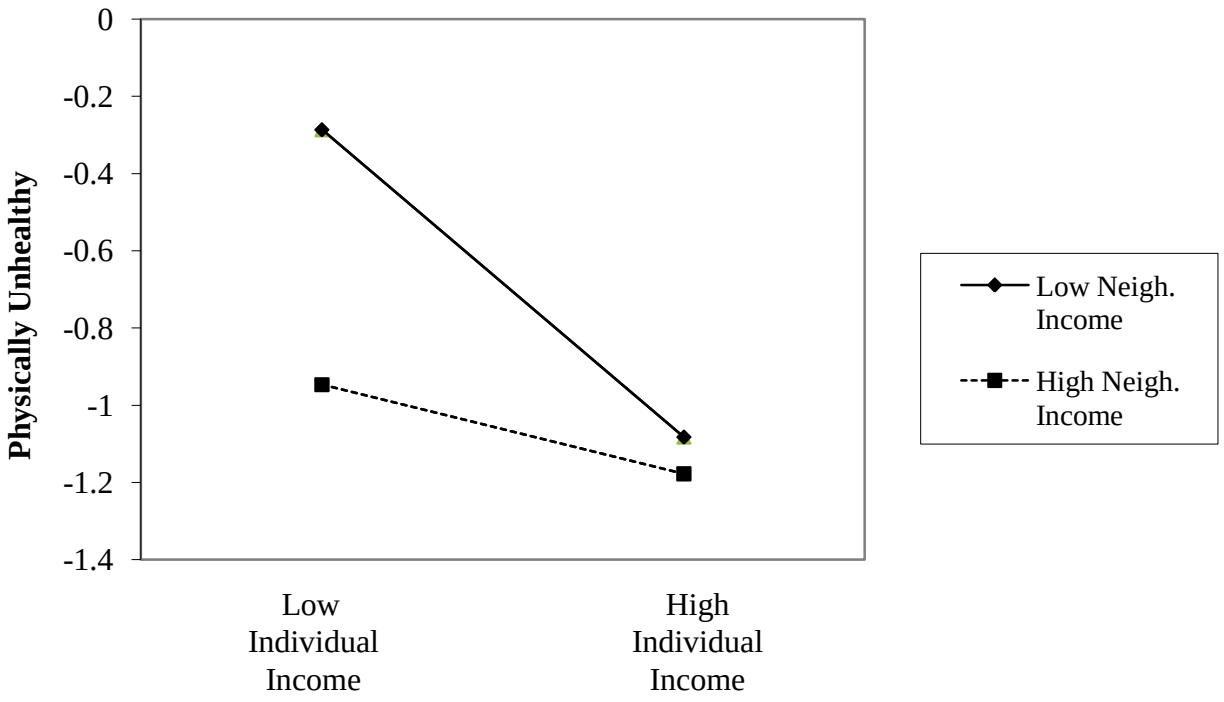

Figure 2. The association between individual income and being physically unhealthy, moderated by mean neighborhood income. Levels of low and high individual and neighborhood incomes represent one standard deviation below and one standard deviation above the mean (Individual income, *M* = 5.69, *SD* = 2.33; Neighborhood income, *M* = 5.53, *SD* = 1.73).

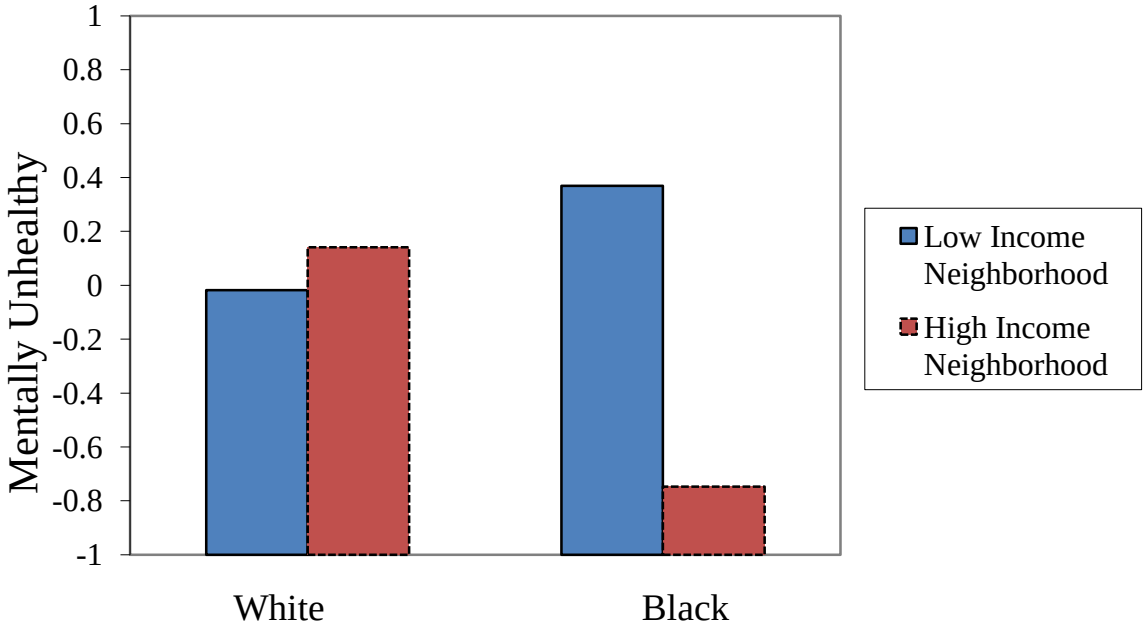

Figure 3. The association between racial identity and being mentally unhealthy in low and high-income neighborhoods. Levels of low and high-income neighborhoods represent one standard deviation below and one standard deviation above the mean (Neighborhood income, *M* = 5.53, *SD* = 1.73).

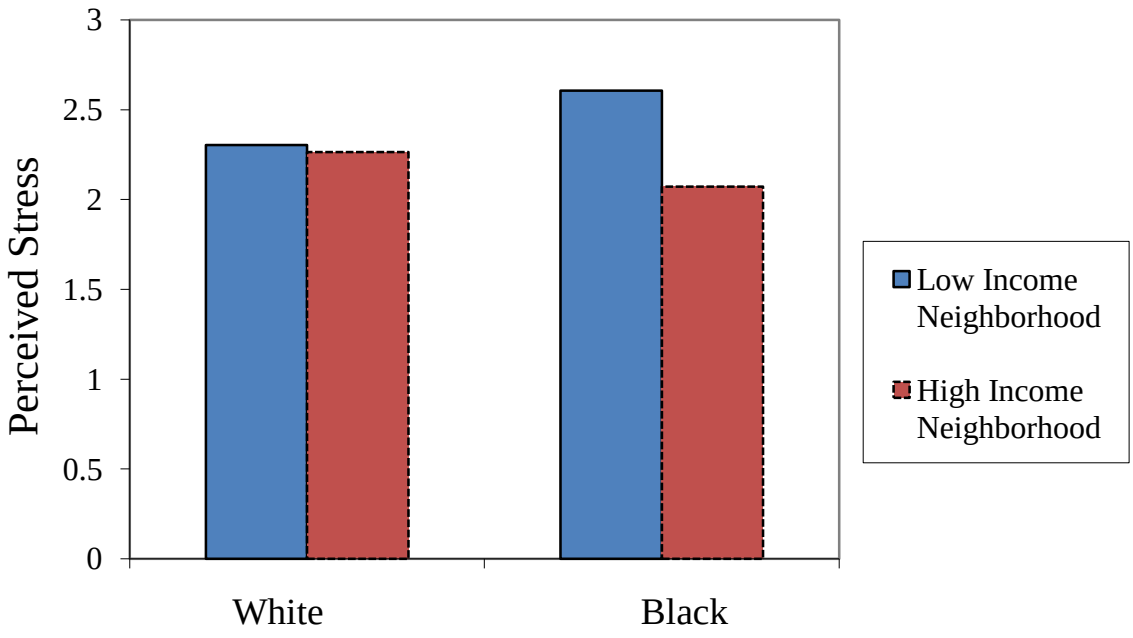

Figure 4. The association between racial identity and perceived stress in low and high-income neighborhoods. Levels of low and high-income neighborhoods represent one standard deviation below and one standard deviation above the mean (Neighborhood income, *M* = 5.53, *SD* = 1.73).

3.6 Covariates

The model also included a number of covariates at the individual and neighborhood level. At the individual level, younger adults, females and US born residents reported significantly worse mental health after taking into account other demographic factors and access to health care. All three findings are consistent with previous literature. Multiple studies have found that females report worse mental health than males and younger adults report worse mental health than older adults (Jia, Moriarty, & Kanarek, 2009; Zahran, Kobau, Moriarty, Zach, Holt & Donehoo, 2005). Previous research has also consistently found that US residents born outside of the US report better mental health than their US born counterparts (Lucas, Daheia, Barr-Anderson & Kington, 2003; Wei, Valdez, Mitchell, Haffner, Stern & Hazuda, 1996). No other individual level covariates were statistically significant. At the neighborhood level, higher mean neighborhood education was significant associated with better physical health, a finding also previously noted (Callahan et al., 2009; Sunquist, Winkleby, Ahlen, & Johansson, 2004). No other neighborhood level covariates were statistically significant.

4 DISCUSSION

This study investigated individual and neighborhood level predictors of perceived stress, mental health and physical health. Findings are consistent with the overall premise of the study, that neighborhood characteristics play a role in health, over and above the role of individual characteristics. Because members of ethnic minority groups and people in lower socioeconomic strata typically live in lower quality neighborhoods (as indexed by neighborhood income, lower levels of collective efficacy, lower safety, etc.) and experience poorer health, the study highlights the importance of neighborhood environments in furthering understanding of health disparities.

4.1 Individual Differences in Access to Health care

Individuals who reported they had limited access to health care because the costs were too high reported worse physical health, mental health, and stress. This study also found that the longer individuals had gone without a routine health checkup, the higher their perceived stress. Both of these findings have a direct relevance to health care policy. Interestingly, the cost of health care was associated with all of the health domains, even after controlling for the presence of health insurance, personal income, and education. This suggests that despite residents' personal resources, individuals who reported they did not receive needed medical care due to the monetary costs, were more likely to report worse health. For individuals with health insurance, these costs may have been associated with high deductibles and/or co-pays, and for those without health insurance, they could have been due to a lack of low-cost or free health care options for the unemployed and those ineligible for employer sponsored policies (e.g., self-employed or part-time employees). Adrulis (1998) argued that access to care should be the centerpiece in the elimination of socioeconomic disparities in health. While the current study cannot conclude that access to health care is the *centerpiece* of health outcomes, this study did find that the perceived cost of health care, regardless of whether one is insured or not, may be a barrier to eliminating health disparities. Further investigation is needed to determine if these associations are maintained across all populations, regardless of their medical need. Nevertheless, these findings reinforce the potential that monetary barriers to receiving health care may be positively associated with human costs due to a lack of affordable health care options for all individuals.

4.2 Associations between Neighborhood Perceptions and Health Outcomes

After controlling for neighborhood and individual level confounds, there were no significant main effects of neighborhood level safety from crime, collective efficacy, or the

walking environment. However, differences in residents' perception of their neighborhood were significantly associated with mental health, physical health, and stress. Specifically, the more positively residents perceived their neighborhoods' walking environment, the better their mental health and the lower their stress, and the more residents felt safe from crime, the better they reported their physical and mental health. These findings confirm previous research that suggests individuals perceptions of their environment are associated with health outcomes above and beyond neighborhood level factors (Roosa, White, Zeliders, & Tein, 2009; Wen, Hawkley, & Cacioppa, 2006).

Post-hoc analyses to verify that the neighborhood level null finding was not the result of collinearity between the three neighborhood condition variables found that they were significantly associated with the health outcomes but only after the removal of neighborhood level education, income, and including only one neighborhood environment variable at a time. It is possible that the null neighborhood level findings were because the neighborhood characteristics under study were more closely associated with more proximate measures, such as walking behavior, than they were with distal outcomes, such as physical and mental health. This may be a particularly promising line of research since previous studies have found these associations consistently, despite the limited amount of studies devoted to the topic (Owen, Humpel, Leslie, Bauman, & Sallis, 2004).

The differences found in the current study compared to other studies that have investigated neighborhood level conditions may also be due to the inclusion of neighborhood education and income as predictors in the model. Previous research investigating the neighborhood environment has often neglected to control for neighborhood level socioeconomic factors, such as income and education (e.g., Moore, Diez Roux, Nettleton, & Jacobs, 2008;

Mujahid, Diez Roux & Morenoff, 2008; Mujahid, Diez Roux, & Sheen, 2008; Auchincloss, Diez Roux, Brown, Erdamann, & Bertoni, 2008). Chaix, Leal, and Evans (2010) argue that controlling for neighborhood level income when investigating neighborhood conditions is as necessary as controlling for individual level income when investigating individual level perceptions. Moreover, Chaix and colleagues recommend that researchers include measures of neighborhood level socioeconomic position when assessing neighborhood environments unless the researcher has a clearly articulated argument of why it may not be appropriate (e.g., the rare introduction of collider bias).

It is possible that the associations between neighborhood perceptions and health are largely an individual level phenomenon, despite 15%-21% of the neighborhood perception variance being found at the neighborhood level. Previous research has found that negative perceptions of the neighborhood environment are associated with worse physical health, worse mental health and higher stress (Ellaway, Macintyre, & Kearns, 2001; Wen, Hawkley, & Cacioppo, 2006; Ross, 2000; Wilson, Law, Jerrett, Keller-Olaman, 2004). Wen and colleagues found that residents with negative perceptions of their neighborhood had worse health, but unlike the current study, their study also included objective census measures of the environment. Despite the inclusion of these more objective neighborhood measures and a number of demographic predictors, Wen and colleagues still found strong associations between residents' perceptions of their neighborhood and general health. This suggests that individuals' unique perception of their environment explains additional variance above and beyond what may be traditionally viewed as more objective measures of neighborhood conditions. It is likely that individuals continue to differ in their experiences and interpretation of events and conditions in their neighborhood, differences that could be due to dispositional characteristics of individuals,

such as unique personality traits, or systematic differences in their exposure to discrimination or other unmeasured phenomenon.

The hypothesized associations between collective efficacy and health were not supported. Instead, participants reporting higher levels of neighborhood collective efficacy tended to report poorer physical health (the same pattern was found for mental health but did not reach statistical significance). Because of the cross-sectional nature of this study, it is impossible to determine the direction of causation implied by this association. It is possible that individuals who are in poor physical health rely more on their neighbors for assistance. Because of this, they may perceive greater levels of collective efficacy than individuals who have less need to rely on neighbors. Further, unlike individual perceptions of the physical environment and classical measures of self-efficacy, few studies have empirically tested associations between collective efficacy and health on an individual level. It is also possible that this finding is a result of net suppression. This is evidenced by the strengthening and changing of the direction of association between individual collective-efficacy and physical health when compared to the simple bivariate correlation. This could have occurred because of a high level of collinearity between collective-efficacy and a combination of other independent variables. This can then result in a regression coefficient that is of the opposite sign of the simple bivariate correlation between the independent variable and the dependent variable (Messick & van de Geer, 1981).

4.3 Interaction between Individual and Neighborhood Income Levels

Prior research investigating interactions between individual and neighborhood income has been limited and have often produced contradictory results (Diez Roux & Mair, 2010). For example, studies with US samples by Winkleby, Cubbin and Ahn (2006), and Yen and Kaplan (1999) found that low-income residents living in higher SES neighborhoods had higher mortality

rates than low-income residents who lived in low SES neighborhoods, and Taylor, Ahn, & Winkleby (2006) found that low-income individuals living in high SES neighborhoods had higher rates of hospitalizations. These findings seemingly contradict findings from the current investigation, experimental studies (e.g., Katz, Kling & Liebman, 2001; Kling, Liebman, Katz, & Sanbonmatsu, 2004; Leventhal & Brooks-Gunn, 2003), studies using more racially diverse samples (e.g., Kobetz, Daniel, & Earp, 2003), and those specifically using the same outcome measures (e.g., Jia, Moriarty, & Kanarek, 2009).

The clearest differences between these two sets of findings are the outcomes of interest. In accord with the current study, it is possible that individuals of low personal income who lived in higher income neighborhoods reported better physical health because they had better access to neighborhood resources, healthier social norms, and higher self-efficacy (Joseph, Chaskin, & Webber, 2007, Boardman & Robert, 2000). And in accord with the mortality and hospitalization studies, low income individuals that lived in high income neighborhoods may have experienced weaker social networks due to a greater likelihood for individual differences with their neighbors (Manzo, Kleit, & Couch, 2008) and consequently, lower social support; an established predictor of mortality (Blazer, 1982; Berkman & Syme, 1979). In addition, the mortality and hospitalization studies also controlled for numerous individual risk factors closely associated with mortality, such as obesity, smoking, hypertension, physical inactivity and health status (illness and hospitalized days), variables that are likely mediators rather than confounders of the association between neighborhood conditions and mortality (Diez Roux, 2003; Diez Roux, 2004; Sampson, 2008; Diez Roux & Mair, 2010). Therefore, it is possible that low-income individuals experience better physical health when living in higher income neighborhoods (compared to

lower income neighborhoods) but after controlling for risk factors associated with physical health, they may be at a higher risk for hospitalization and mortality.

Compared to the previously mentioned mortality and hospitalization studies, the current investigation included a more diverse sample. The current investigation sampled residents from DeKalb County, GA, which is uniquely diverse by income and race. In fact, DeKalb County is the second-most affluent county with an African-American majority in the United States, yet 10% of the population also lives below the poverty line (US Census, 2008). The current investigation included a Black majority (53%), of which, 22% reported a household annual income of $75,000 dollars or more and 27% reported making less than $20,000 dollars a year. Further, Black residents were represented in 90 of the 114 census tracts under study.

Unlike the current investigation, the mortality (Winkleby, Cubbin & Ahn, 2006; Yen & Kaplan, 1999) and hospitalization studies (Taylor, Ahn, & Winkleby, 2006), included only a small percentage of Black residents (all less than 12%). And due to the lower propensity for Black individuals to live in high income neighborhoods (Massey, 2004; Sampson & Wilson, 1995; Williams & Collins 2001), it likely that the poorest neighborhoods in their studies were predominately Black and the higher SES neighborhoods were almost, if not entirely, composed of White residents. This problem was potentially amplified in these studies because the researchers split the neighborhood SES variable, and the individual level SES variables into three or four subgroups (e.g., low, moderate and high individual SES, and low, moderate and high neighborhood SES) and compared the highest income group to the lowest income group. This method of investigation potentially exploits large contrasts between individual income and neighborhood income and minimizes the opportunity assess variance associated with small incremental differences between residents up and down the income spectrum (Royston, Altman,

& Sauerbrei 2006; van Walraven & Hart, 2008). Regardless of the analytical method, further research is needed to determine whether the associations found in the current study are generalizable to less diverse areas and whether the mortality and hospitalization findings are generalizable to settings that are more diverse.

4.4 Interactions between Race and Neighborhood Income Levels

This study also found that Black participants who lived in high-income neighborhoods reported better mental health than Black participants who lived in low-income neighborhoods. Additionally, Black participants who lived in low-income neighborhoods reported significantly more stress than Black participants who lived in high income neighborhoods. In one of the few studies on the topic, Subramanian et al. (2005) found similar results. Their study found that Black residents who lived in a low-income neighborhood were at a higher risk for mortality than White residents who lived in a low-income neighborhood. This finding also concurs with those found by Jones-Webb, Snowden, Herd, Short, and Hannan (1997) who found that Black men reported greater numbers of alcohol-related problems compared to white men when they lived in high poverty neighborhoods but no differences were found when living in high-income neighborhoods. These findings suggest that after controlling for individual income and other social factors, neighborhood level income potentially amplifies disparities in mental health and stress between White and Black residents living in low-income neighborhoods.

Taken together, these findings suggest that the associations between individual income and neighborhood level income, and the individual race and neighborhood income are not associated with residents' health equally. In line with findings from Boardman and Robert (2000), it is possible that low-income residents and black residents that live in low-income neighborhoods are particularly vulnerable to experiencing low self-efficacy due to their greater

exposure to more similar peers. For example, individuals of higher personal income or non-minority status are more likely to have more interactions with family and friends of higher social status who live outside their neighborhood simply by the stratification of low-income neighborhoods. Additionally, it is also possible that individuals of low personal income and minorities that live in low-income neighborhoods suffer from a greater accumulation of stressors, such as racism, discrimination, or other detrimental influences, such as toxic environments. Subsequently, and consistent with Elias's model (1987), the greater accumulation of stressors may outweigh the potential positives that residents may gain by living with more similar peers, such as stronger ties with neighbors, the availability of culturally relevant spiritual centers, or resources designed to cater to low-income residents.

4.5 Strengths

This study utilized a large diverse sample to investigate the potential for individual and neighborhood determinants of health using advanced statistical techniques that appropriately controlled for numerous confounds at both the individual and neighborhood levels. Unlike many previous studies, this study also included a diverse sample of residents who lived in racially integrated neighborhoods. This difference enabled the researcher to examine the influence of neighborhood environments when investigating neighborhoods with Black representation in low and high-income environments.

Additionally, this investigation utilized a set of previously validated measures to test perceived neighborhood conditions, stress, and health-related quality of life. Furthermore, while perceived stress is frequently measured in psychological literature, it is rarely measured in neighborhood investigations, despite often being cited as a likely precursor to illness (Diez Roux & Mair, 2010).

This study also included a comprehensive set of individual and neighborhood level predictors. By modeling indicators such as perceptions of the neighborhood environment on both the individual and neighborhood level, the potential for ecological bias (the absence of accounting for individual variance) and individualistic bias (the absence of accounting for neighborhood variance) was reduced. This method also allowed for a better understanding of the unique associations between each of the predictors and outcomes of interest at each level simultaneously.

4.6 Limitations

This study has a number of limitations. Participants in this study were not randomly selected. Instead, a convenience sample of residents was obtained through sending notifications about the study to county email lists, placed on public websites, and in person recruitment at community events. Despite the use of this method, the final study sample included a diverse sample that reflected the demographic diversity of the county as a whole, with the exception of the under recruitment of Latinos, and the oversampling of females and those with higher education.

This study relied on individual and neighborhood data from the same source, sometimes refered to as same-source bias (Duncan, Raudenbush, 1999; Raudenbush & Sampson, 1999; O'Campo, 2003). Permitting the same residents to report their perceptions of their neighborhood and their perceptions of their health can lead to the spurious associations between self-reported conditions and self-reported health (Mujahid, Diex Roux, Morenoff, & Raghunathan, 2007). Ideally, it has been argued, neighborhood research should involve two separate data collections efforts, one that measures perceptions of neighborhoods that can be aggregated to the neighborhood level and a second that includes individual level predictors and the outcome

measures. Unfortunately, conducting two data collection efforts requires significantly more resources than were available to the researcher.

This study was not comprehensive of all neighborhood and individual factors that affect health. In particular, this study did not address issues associated with air pollution, toxic homes (e.g., lead paint, mold) and other environmental contaminants that have been found to be more prevalent in low-income and minority neighborhoods (Downey & Hawkins, 2008). This study also did not assess all neighborhood measures of the built environment, such as the presence of liquor stores or fast food restaurants, or all measures of the social environment, such as place attachment, sense of community, participation, neighboring, or alternative measures of collective efficacy (e.g. Long & Perkins, 2003; Perkins, Hughey, & Speer, 2002; Perkins & Long, 2002). For example, unmeasured aspects of the built environment, such the presence of fast food outlets, has been found to be a significant predictor of mortality and coronary hospitalizations even after controlling for neighborhood level income. Similarly, unmeasured aspects of the social environment, such as a neighborhood's level of participation in a local community organization, have been found to be associated with better resident mental health (Dupere & Perkins, 2007). This study also did not inventory individual psychological factors such as social support or self-efficacy, which could potentially mediate or moderate both individual and neighborhood level associations with health and stress. Lastly, this study did not incorporate any neighborhood condition variables such as unemployment rates, vacant housing, or income derived from census data. While these variables may have aided the research in identifying specific neighborhood characteristics that may harm or help neighborhood residents, at the time of data analyses, available census data at the tract level were more than ten years old and therefore deemed less valid than current self-reported data used in this study.

Due to the cross-sectional and observational nature of this study limited causal inferences can be made. It is possible that associations between individual characteristics, such as income or education are actually caused by health (reverse causation; Kawachi, Adler, & Dow, 2010). For example, individuals of poor health may be less able to obtain education or earnings, but this causal dilemma cannot be solved by simply conducting longitudinal analyses since they are likely reciprocally related throughout one's life. For instance, Kawachi and colleagues (2010) produce several scenarios in which health may cause poorer health, beyond limitations in productivity, including the lower probability for children with early chronic health conditions to graduate from college (Case, Fertig, & Paxson, 2005) and overweight women's lower likelihood of marrying a spouse of high social status (Conley & Glauber, 2007).

Interpretations from this study are limited due to residents' self-selection into the neighborhood environment in which they lived. Addressing selection effects in the context of this study and others that have investigated associations between neighborhoods and residents have no clear solution (Sampson, 2008). For example, some low-income individuals may go out of their way to live in higher income neighborhoods despite the potential for higher housing costs because they are particularly concerned about their health, want their children to attend a particular school, or want to live near recreational facilities they deem safe and accessible. Conversely, others may choose to live in low-income neighborhoods due to greater accessibility to friends, family or their spiritual center. Moreover, since individuals are not randomized to a live in a neighborhood, and particularly since this study had no longitudinal components, one cannot determine whether healthier individuals simply choose to live in higher income neighborhoods or whether higher income neighborhoods contributed to the health of low-income individuals. Unfortunately, it is impractical (and probably unethical) for a researcher to

randomize participants to live in certain neighborhoods and even if one had such an opportunity, it would be inconceivable to believe that individuals' history of living in a high poverty neighborhoods would be removed once they moved to a higher income neighborhood. Nevertheless, Sampson and Sharkey (2008) found that over a seven-year period, regardless of the decisions that went into deciding where to live, residents generally remained in their original neighborhood or moved to neighborhoods of similar income and racial composition. Therefore, despite the limitations associated with neighborhood selection bias, they remain consistent over time and are not greatly influenced by resident mobility.

Lastly, the sample size of Latino participants in the current investigation was too small to estimate accurately the cross-level interaction between ethnicity and neighborhood income. This is an important line of research that has the potential to yield results different than those found for Black and White residents, particularly for Latino residents who have recently immigrated to the United States (Cagney, Browning & Wallace, 2007; Georgiades, Boyle, and Duku, 2007; Roosa et al., 2009). Future research endeavors should be aware of and test for these potential differences when available.

4.7 Conclusions

The current study finds that the average income of residents within neighborhoods interacts with individual income, in the case of physical health, and interacts with race, in the case of mental health and stress. The potential benefits offered to low-income residents living in higher income neighborhoods are likely to include healthier social norms, higher self-efficacy, and less toxic environments. This study also found that Black residents, when compared to White residents, may be more vulnerable to hazards associated with living in a low-income neighborhood. It is possible that Black residents report greater stress than White residents when

living in low-income neighborhoods due to the greater accumulation of life stressors, such as discrimination and racism (Williams, 1999). Williams suggests that Black residents endure the added burden of racism compared to white residents of the same socioeconomic status and that individual and institutional discrimination along with other stigmas of inferiority adversely affect health both directly and indirectly. Consequently, Black residents living in low-income neighborhoods may face a form of double jeopardy not faced by White residents in any neighborhood.

This study did not find that after controlling for neighborhood income, education, and resident age, that neighborhood collective efficacy, safety from crime, or the walking environment explained a significant amount of variance associated with physical health, mental health, or stress. A post-hoc investigation of these findings revealed that their association with the outcomes of interest were only present in the absence of the formerly mentioned covariates and each other. This could have occurred because they are collinear with the covariates and each other but more likely because previous investigations into their associations with the outcomes failed to adequately control for neighborhood socioeconomic position. It is possible that neighborhood socioeconomic position of neighborhoods drives many of the social and environmental factors that are often found to be associated with better health and well-being. For example, it is possible that conditions such as walkability and safety are not uniquely associated with health in low-income neighborhoods but are in high-income neighborhoods. In essence, they interact with each other and with level of neighborhood income. This could occur when low-income neighborhoods have adequate sidewalks but residents choose to not use them due to high crime rates in their neighborhood. Conversely, even if it is safe in a resident's neighborhood, one may choose to drive only a few blocks because there are no walking paths

available. Therefore, it is possible that the unique effects of either walkability or safety on health are only found in neighborhoods that have high levels of both conditions. Future research would benefit from further probing of these potential interactions and if they are consistent across all neighborhood income levels. Finally, the lack of associations between the neighborhood environment variables and the health outcomes under study could be because these factors are more strongly related to proximal outcomes, such as walking or engaging in other healthy behaviors. Future studies would benefit from utilizing a longitudinal design that incorporated such behaviors as a potential mediator of the relationship between neighborhood environments and distal health outcomes.

Lastly, this study reinforced previously found notions that individuals' perceptions of their neighborhoods matter. Specifically, individuals' own experiences and interpretations of their neighborhoods are related to their health, even after controlling for differences in neighborhood level effects, demographic differences, and differences in access to health care between individuals. Therefore, it is important for future research to include measures of individual perception even when neighborhood level proxies are available (e.g., census data).

4.8 Implications

This study has a number of implications for researchers, interventionists, and policy makers. First, this study supports the need for researchers to include measures of neighborhood level income as a predictor of health outcomes when other measures of neighborhood characteristics, such as the social and built environment, are of interest. Additionally, when measures of the social and built environment are of interest, researchers should consider how residents' experience and interpret the same neighborhood differently, which may subsequently affect their health. This study also supports the need for researchers to consider a wide range of

potential determinants of health not often found in neighborhood health research, such as measures of access to health care. In particular, this study finds that residents that did not receive health care treatment because of costs reported worse health and more stress. More research is need to determine how limiting one's access to needed treatment adversely affects one's health above and beyond the possession of health insurance and personal wealth.

Interventionists and policy makers should consider the potential for health benefits associated with allowing low-income residents to live in higher income neighborhoods through voucher programs or the creation of more low-income housing options in higher-income neighborhoods. This study found that low-income residents and Black residents reported better health when they lived in higher income neighborhoods, while the mean income of the neighborhood made no significant difference for high-income and White residents. It should also be noted that the low-income residents that lived in higher income neighborhoods in this study lived there presumably by choice and not necessarily because of the closing of public housing communities or other low-income housing. A significant amount of debate has surrounded the closing and subsequent required move of all residents out of public housing communities (Manzo, Kleit, & Couch, 2008; Ruel, Oakley, Wilson, & Maddox, 2010). These types of forced moves potentially disrupt residents' social network and the availability of established resources. The outcomes associated with these types of interventions are likely quite different from the optional moves made available through the Moving to Opportunities programs (Fauth, Leventhal, & Brooks-Gunn, 2008; Katz, Kling & Liebman, 2001; Kling, Liebman, Katz, & Sanbonmatsu, 2004; Leventhal & Brooks-Gunn, 2003) and the findings of this study.

This study finds that racial disparities in health may be due in part to interactions between individual and neighborhood income, access to affordable health care, and differences in

residents' perceptions of their neighborhood. While this investigation did not incorporate all likely predictors of health, it did include a wide spectrum of potential determinants rarely found in a single study. Future extensions of this research would benefit from a longitudinal design and greater representation of Latino and Asian residents, as it is quite possible that these findings do not generalize outside the largely Black/White dichotomy found in this study.

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Appendix

DeKalb County Neighborhood and Health Survey

We are interested in finding out about your neighborhood conditions and your health. By neighborhood we mean the area around where you live and around your home. It may include places you shop, nearby religious or public institutions, or a local business district. It is the general area around your home where you might perform routine task, such as shopping, going to the park or visiting with your neighbors. Please read each of the following questions or statements and circle the number that best corresponds with your neighborhood or information about you.

Would you say you strongly disagree, disagree, are neutral, agree or strongly agree with the following statements:	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. There is a lot of trash and litter on the street in my neighborhood.	1	2	3	4	5
2. There is a lot of noise in my neighborhood.	1	2	3	4	5
3. In my neighborhood the buildings and homes are well-maintained.	1	2	3	4	5
4. The buildings and houses in my neighborhood are interesting.	1	2	3	4	5
5. My neighborhood is attractive.	1	2	3	4	5
6. My neighborhood offers many opportunities to be	1	2	3	4	5

physically active.					
7. Local sports clubs and other facilities in my neighborhood offer many opportunities to get exercise.	1	2	3	4	5
8. It is pleasant to walk in my neighborhood.	1	2	3	4	5
Would you say you strongly disagree, disagree, are neutral, agree or strongly agree with the following statements:	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
9. The trees in my neighborhood provide enough shade.	1	2	3	4	5
10. In my neighborhood it is easy to walk places.	1	2	3	4	5
11. I often see other people walking in my neighborhood.	1	2	3	4	5
12. I often see other people exercising (for example, jogging, bicycling, playing sports) in my neighborhood.	1	2	3	4	5
13. A large selection of fresh fruits and vegetables is available in my neighborhood.	1	2	3	4	5
14. The fresh fruits and vegetables in my neighborhood are of high quality.	1	2	3	4	5
15. A large selection of low-fat products is available in my neighborhood.	1	2	3	4	5
16. People around here are willing to help their neighbors.	1	2	3	4	5

17. People in my neighborhood generally get along with each other.	1	2	3	4	5
18. People in my neighborhood can be trusted.	1	2	3	4	5
19. People in my neighborhood share the same values.	1	2	3	4	5
20. I feel safe walking in my neighborhood, day or night.	1	2	3	4	5
21. Violence is not a problem in my neighborhood.	1	2	3	4	5
22. My neighborhood is safe from crime.	1	2	3	4	5
Would you say it is very likely, likely, neither likely nor unlikely, unlikely, or very unlikely that your neighbors could be counted on to intervene in various ways if:	**Very Unlikely**	**Unlikely**	**Neither Likely or Unlikely**	**Likely**	**Very Likely**
23. Children were skipping school and hanging out on a street corner.	1	2	3	4	5
24. Children were spray-painting graffiti on a local building.	1	2	3	4	5
25. Children were showing disrespect to an adult.	1	2	3	4	5
26. A fight broke out in front of their house.	1	2	3	4	5
27. The fire station closest to their home was threatened with budget cuts.	1	2	3	4	5

During the past 6 months, how often:	**Never**	**Rarely**	**Sometimes**	**Often**	**Very often**
28. . . .was there a fight in your neighborhood in which a weapon was used?	1	2	3	4	5
29. . . .were there gang fights in your neighborhood?	1	2	3	4	5
30. . . .was there a sexual assault or rape in your neighborhood?	1	2	3	4	5
31. . . .was there a robbery or mugging in your neighborhood?	1	2	3	4	5
These statements refer to relationships you may have outside your neighborhood.	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
32. I have a close network of friends that do NOT live in my neighborhood.	1	2	3	4	5
33. If I have a problem, I can easily receive support from people that do NOT live in my neighborhood.	1	2	3	4	5
34. Friends and family who do NOT live in my neighborhood often ask me for support.	1	2	3	4	5
These questions pertain to questions about you. Please	**Never**	**Almost Never**	**Sometimes**	**Fairly Often**	**Very often**

choose the response that best corresponds to how often you have felt the following in the last month:					
35. In the last month, how often have you felt that you were unable to control the important things in your life?	1	2	3	4	5
36. In the last month, how often have you felt confident about your ability to handle your personal problems?	1	2	3	4	5
37. In the last month, how often have you felt that things were going your way?	1	2	3	4	5
38. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	1	2	3	4	5

These questions ask about your access to health care.					
39. Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?				Yes	No
40. Do you have one person you think of as your personal doctor or health care provider?				Yes	No
41. Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?				Yes	No
42. About how long has it been since you last visited a doctor	Within	1-2 years	3-4 years	5 or	Never

for a routine checkup? A routine checkup is a general physical exam, not an exam for a specific injury, illness, or condition.	Past year	ago	ago	more years ago	
43. How long do you have to travel to get to your health care provider?	Less than 5 minutes	5 to 14 minutes	15 to 29 minutes	30 to 45 minutes	More than 45 minutes
44. If you need to see a specialist, it is easy for you to find one near your home?	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

These questions ask about your general health.					
45. Would you say that in general your health is:	Excellent	Very Good	Good	Fair	Poor
46. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?				Number of Days _____	
47. Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?				Number of Days _____	
48. During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?				Number of Days _____	
49. During the past 30 days, for about how many days did PAIN make it hard for you to do your usual activities, such as self-care, work, or recreation?				Number of Days _____	
50. During the past 30 days, for about how many days have your felt SAD, BLUE, or				Number of Days _____	

DEPRESSED?	
51. During the past 30 days, for about how many days have you felt WORRIED, TENSE, or ANXIOUS?	Number of Days _____
52. During the past 30 days, for about how many days have you felt you did NOT get ENOUGH REST or SLEEP?	Number of Days _____
53. During the past 30 days, for about how many days have you felt VERY HEALTHY AND FULL OF ENERGY?	Number of Days _____

We are also interested in some background information about you.

54. What is your age in years?	Years _____					
55. What is your gender?	Male		Female		Transgender	
56. What is your sexuality?	Heterosexual	Gay	Lesbian	Bi-sexual	Queer	Questioning
57. Are you Hispanic or Latino?	Yes			No		
58. What is your race (you may choose more than one if applicable)?	White	Black	Asian	Native Hawaiian or Other Pacific Islander	American Indian or Alaskan Native	Other (specify) _____

59. What is your nationality (country of origin)? _____

60. Were you born in the United States?				Yes			No	
61. How long have you lived in the United States?			Less than one year	One to five years	Six to ten years		More than ten years	Entire life
62. Are you?		Married	Divorced	Widowed	Separated		Never Married	Unmarried Couple
63. Is your annual household income from all sources between:	$0-$9,999	$10,000 - $19,999	$20,000- $29,999	$30,000- $39,999	$40,000- $49,999	$50,000- $59,999	$60,000- $74,999	$75,000 or more
64. What is the highest grade or year of school you completed?	Completed 8th Grade or less	Completed 9-11th grade	Graduated High School or GED	Some College	College Graduate	Completed Graduate School		
65. How long have you lived in your neighborhood?	Less than 6 months	6-11 months	1 -2 years	3-4 years	5 to 9 years	10 or more years		
66. What do you feel is the biggest problem in your neighborhood?	_____							
67. What do you feel is the most appropriate solution to this problem?	_____							
68. What is your home address? (This is only used by the researcher for placing your responses in a geographic region and will not be viewed or used for any other purpose)	Street:_____ City:_____ ZIP:_____						No stable residence	

69. What is the name of the neighborhood you live in? _____

70. How did you hear about this study?	Family	Friend	Neighbor	Organization Specify:_____

Thank you very much for participating!

If you have any questions or concerns please feel free to email John Barile at jbarile1@gsu.edu or call (404) 840-3023