JOINT CENTER FOR POLITICAL AND ECONOMIC STUDIES

NOVEMBER 2012

PLACE MATTERS FOR HEALTH IN BOSTON:

Ensuring Opportunities for Good Health for All

A Report on Health Inequities in Boston, Massachusetts

BOSTON PLACEMATTERS

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Ensuring Opportunities for Good Health for All

A Report on Health Inequities in Boston, Massachusetts

Prepared by
The Joint Center for Political and Economic Studies

In Conjunction With
The Center on Human Needs, Virginia Commonwealth University,
The Virginia Network for Geospatial Health Research, and
The Boston Place Matters Team

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This research was supported by Award Number 1RC2MD004795-01 from the National Institute on Minority Health And Health Disparities. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Center on Minority Health And Health Disparities or the National Institutes of Health.

The Joint Center for Political and Economic Studies and the Place Matters initiative are supported by a generous grant from the W.K. Kellogg Foundation.

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Printed in the United States.

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FOREWORD

Place matters for health in important ways, according to a growing body of research. Differences in neighborhood conditions powerfully predict who is healthy, who is sick, and who lives longer. And because of patterns of residential segregation, these differences are the fundamental causes of health inequities among different racial, ethnic, and socioeconomic groups.

The Joint Center for Political and Economic Studies and the Boston Place Matters Team are pleased to add to the existing knowledge base with this report, *Place Matters for Health in Boston: Ensuring Opportunities for Good Health for All, A Report on Health Inequities in Boston, MA.* The report, supported by a grant from the National Institute on Minority Health and Health Disparities (NIMHD) of the National Institutes of Health, provides a comprehensive analysis of the range of social, economic, and environmental conditions in Boston and documents their relationship to the health status of the county's residents.

The study finds that social, economic, and environmental conditions in low-income and non-white neighborhoods make it more difficult for people in these neighborhoods to live healthy lives.

The overall pattern in this report – and those of others that the Joint Center has conducted with other Place Matters communities – suggests that we need to tackle the structures and systems that create and perpetuate inequality to fully close racial and ethnic health gaps. Accordingly, because the Joint Center seeks not only to document these inequities, we are committed to helping remedy them.

Through our Place Matters initiative, which is generously supported by the W.K. Kellogg Foundation, we are working with leaders in 24 communities around the country to identify and address social, economic, and environmental conditions that shape health. We look forward to continuing to work with leaders in Boston and other communities to ensure that every child, regardless of their race, ethnicity, or place of residence, can enjoy the opportunity to live a healthy, safe, and productive life.

Ralph B. Everett
President and CEO
Joint Center for Political and Economic Studies

EXECUTIVE SUMMARY

[I]nequities in health [and] avoidable health inequalities arise because of the circumstances in which people grow, live, work, and age, and the systems put in place to deal with illness. The conditions in which people live and die are, in turn, shaped by political, social, and economic forces.

World Health Organization Commission on the Social Determinants of Health (2008)

Place matters for health in important ways. Neighborhood conditions—such as the quality of public schools; the age, density, and size of housing; the availability of medical care and healthy foods; the availability of good jobs; levels of exposure to environmental degradation and violence; the availability of exercise options—powerfully predict who is healthy, who is sick, and who lives longer. This study examined the relationships between place, race/ethnicity, and health in Boston, MA, and attempted to address specific questions raised by the Boston Place Matters Team:

- Which communities in Boston enjoy the best health? Which have the poorest health? And what are the demographic characteristics of these communities?
- What is the relationship between residential segregation, poverty concentration, and health inequities in Boston?
- What is the relationship between community-level measures of socioeconomic status—that is, wealth, income, and education—and social capital?
- What is the relationship between social capital and health?
- What is the relationship between social capital and community violence?

The study found that:

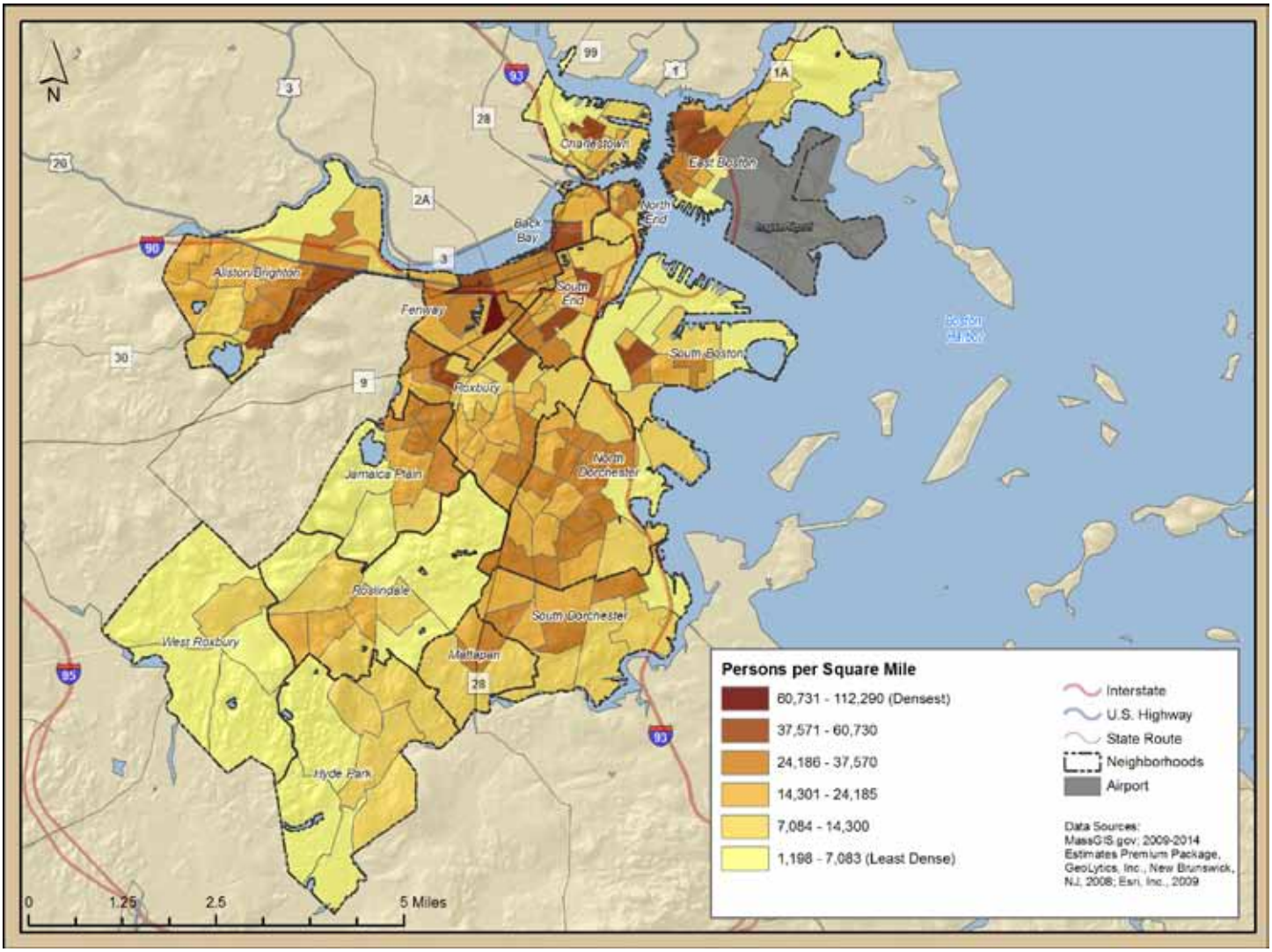
- Census tracts in Boston with the highest concentrations of people of color and families with incomes below the Federal Poverty Level have the poorest health.
- According to the Social Capital Benchmark Survey (SCBS) conducted in 2000, Boston had the lowest score for social trust of the 40 communities analyzed in the United States.
- In Boston neighborhoods where social trust scores and other indicators of social capital are lowest, the percentage of the nonwhite population is higher; voter participation, and educational attainment are lower; and poverty and levels of violent crime are higher.
- According to the 2009 American Community Survey, black adults were four times more likely, Asians six times more likely, and Latinos eight times more likely than non-Latino whites to lack a high school education.

To be sure, these findings indicate only a correlation between neighborhood conditions and health; researchers cannot say with certainty that these neighborhood conditions caused poor health. But the overall pattern suggests that the clustering of social, economic, and environmental health risks in low-income and nonwhite neighborhoods constrains opportunities for people in these communities to live healthy lives.

Because African Americans and Latinos are far more likely than whites to be consigned to neighborhoods of concentrated poverty, the significance of place in health outcomes is inextricably tied to patterns of racial segregation and to racial inequities in health outcomes. Although the scope of this report does not permit us to examine in detail the reasons for and consequences of residential racial segregation, it must be noted that such segregation is largely a product of our history of racial discrimination and of intentional and targeted government policies that have institutionalized and perpetuated residential segregation. The triple burden of the stress of racism, low income, and segregation into neighborhoods of concentrated poverty takes a huge toll on the health of individuals.

Clearly, there is a strong moral imperative to enact policies to redress the inequalities of the past, as well as current inequities, in ways that will improve health for all. It should be unacceptable in the world's wealthiest society that a person's life can be cut short by nearly 20 years simply because of where one lives. But there also is a powerful economic incentive. A study released by the Joint Center for Political and Economic Studies in 2009 (*The Economic Burden of Health Inequalities in the United States,* by T.A. LaVeist, D.J. Gaskin, and P. Richard) found that direct medical costs associated with health inequities among African Americans, Hispanics, and Asian Americans approached $230 billion between 2003 and 2006. When indirect costs, such as lowered productivity and lost tax revenue resulting from illness and premature death, were included, the total cost of health inequities exceeded $1.24 trillion. Thus, for both moral and economic reasons, we must address health inequities and their root causes now.

Map 1: Population Density by Census Tract, Boston, 2009



INTRODUCTION

Disease rates for Boston residents, like those for the rest of the country, vary dramatically by age, socioeconomic status, race, and ethnicity, as well as with the prevalence of risky health-related behaviors.[1-7] And, as with the rest of the country, place matters in the health of Boston residents because characteristics of the areas in which people live, such as the levels of environmental toxins and the social and economic characteristics of individuals and families (e.g., education and income), affect health choices, behaviors, levels of stress, environmental risks, and access to medical care.[8-13] Regardless of one's education, income, or motivation to make healthy choices, risks may be introduced by crime, air pollution, poor schools, the absence of places to exercise, lack of access to nutritious food, a scarcity of good jobs, and stress related to these community challenges.[16-24] In addition, historic oppression contributes to long-term trends of placing vulnerable populations in more highly stressed areas, thus creating structural barriers that limit one's ability to make healthy choices.

This report specifically focuses on the geographic distribution of social capital in Boston and the relationship of this distribution to health outcomes. In his 1993 book *Making Democracy Work,* Robert Putnam described social capital as the "features of social organizations such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions."[30] Studies have shown consistent relationships between social capital and self-reported health status, as well as some measures of mortality.[31-35]

Table 1. Demographic Characteristics of Boston, the State of Massachusetts, and the United States

	Boston	Massachusetts	United States
Population (2009)[(a)]	645,187	6,593,587	307,006,556
Population Density (2009)[(b)]	12,765.5	824.0	86.7
Race/Ethnicity (2009)[(a)]			
Non-Latino White	51.2%	78.2%	64.9%
Black	21.7%	5.8%	12.1%
Latino	16.3%	8.8%	15.8%
Asian	7.5%	4.9%	4.5%
Two or More Races	1.7%	1.5%	1.8%
American Indian/Alaska Native	0.2%	0.1%	0.6%
Native Hawaiian/Other Pacific Islander	0.03%	0.02%	0.1%
Some Other Race	1.5%	0.6%	0.2%
Foreign Born (2009)[(a)]	25.0%	14.3%	12.5%

(a) U.S. Census Bureau, 2009 American Community Survey
(b) 2009 Geolytics Projection

Citywide statistics oversimplify important geographic differences that exist between neighborhoods within Boston and that contribute to large differences in the health of residents.[14, 15]

Part I of this report provides background information about Boston, including population data, socioeconomic conditions, community characteristics, and health outcomes. Part II examines the relationship between the social capital of neighborhood residents and health outcomes. Part III presents conclusions about community-level factors related to social capital and health outcomes in Boston. Appendix A presents detail about the data and methods used in preparing this report.

I. Background: Population, Community Characteristics, and Health in Boston

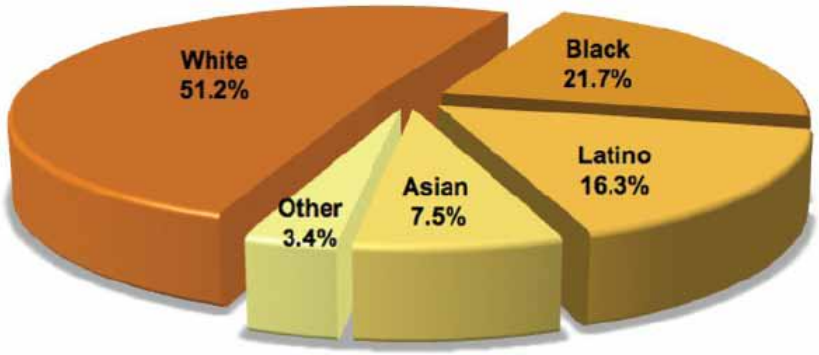
Population

The city of Boston, located on the eastern coast of Massachusetts, had a population of 645,187 in 2009.[36] It is one of the densest cities in the U.S., with an overall population density of 12,765.5 people per square mile. Population density ranges from a low of 1,197.8 people per square mile in coastal East Boston to a high of 112,290 people per square mile in eastern Fenway (see Map 1).[37] Boston is characterized by a dense urban environment in the central and downtown areas of the city, which becomes progressively sparser toward the southwest areas of the city, in neighborhoods such as Roslindale, West Roxbury, and Hyde Park. Compared to the nation as a whole (see Table 1 and Figure 1), Boston has a higher percentage of non-Latino African Americans (21.7% to 12.1%) and a lower percentage of non-Latino whites (51.2% to 64.9%).[36] There is also a larger Asian population (7.5% to 4.5%). Latinos represent 16.3% of Boston residents while representing 15.8% of the U.S. population.[36] According to the Census Bureau, a quarter of Bostonians were born outside of the United States (25.0%), twice the percentage of the U.S. as a whole (12.5%).[32, 36]

In many cities and towns, people of color and disadvantaged populations have historically been relegated to isolated and segregated communities, and this segregation perpetuates cycles of hardship because of limited housing and employment opportunities and lack of access to financial capital. One characteristic of segregated communities is a high percentage of low-income residents, which is highly related to the unemployment rate, resource deprivation, and the average homicide rate.[38]

Racial and ethnic groups are concentrated differently across Boston.[13, 39, 40] The Index of Dissimilarity[41] is a measure of residential segregation that identifies the percentage of the population that would have to relocate to completely integrate the community. Between 2005 and 2009, the Index of

Figure 1: Race and Ethnicity in Boston



Source: U.S. Census Bureau, 2009 American Community Survey.
Note: "Other" includes American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, and those who identified themselves as some other race or two or more races. Racial groups include the non-Latino population only; Latino can include any racial group.

Dissimilarity for Boston between white and black populations was 66.7%, compared to 63.9% in Massachusetts.[42] Boston ranked 19th in black-white segregation among the 100 largest metropolitan areas based on 2005–2009 American Community Survey data. Milwaukee, Detroit, the New York metropolitan area, Chicago, and Cleveland held the top five spots.[42]

For comparisons at smaller geographic levels, a more useful tool than the Index of Dissimilarity is the Diversity Index, a measure of the likelihood that two people randomly chosen from an area will be of a different race or ethnicity. The higher the value, the less segregated the area. While the Diversity Index for Boston as a whole is 65.2%, the value ranges from 1.7% in the Pleasure Bay area of South Boston (east of O and N Streets) to 84.8% in East Boston (west of Border, Meridian, and Havre Streets).

Map 2 illustrates the spatial distribution of racial groups throughout the city. The least diverse section of Boston, according to the Diversity Index, is in South Boston (east of K, H, and E Streets). This area is majority white. The area where the population is least diverse and majority black is in Mattapan (between Norfolk and Harvard Streets). Hyde Park and North Dorchester (east of Boston Street) display the most diversity

Socioeconomic Characteristics

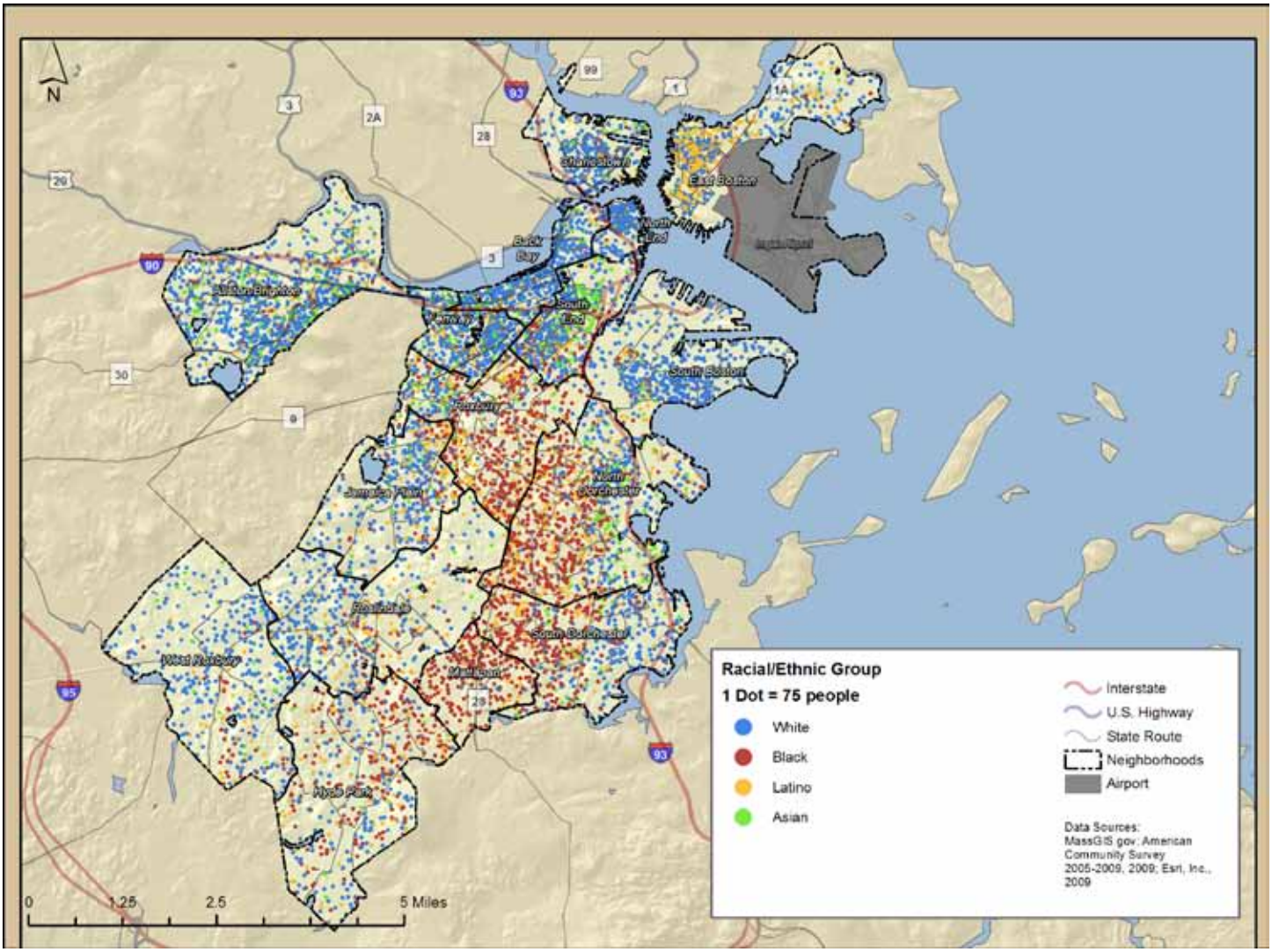
As is true of other communities, socioeconomic conditions in Boston exert an important and often unrecognized influence on health status. Nationally, families living below the federal poverty threshold are 3.6 times more likely to report fair or poor health than those with incomes of at least twice the poverty level, which for a family of four in 2009 was $44,100 a year.[43]

In 2009, about one-sixth (16.9%) of households in Boston had incomes below the federal poverty threshold, compared to 10.3% of Massachusetts households and 14.3% nationally.[36] The income-to-poverty ratio expresses household income as a percentage of the federal poverty threshold. Figure 2 shows that 8.5% of households in Boston had incomes below half the federal poverty threshold (an income-to-poverty ratio of less than 50%), and more than one-third of households (33.5%) had incomes less than twice the poverty threshold.[36]

The U.S. Census Bureau estimates that 23.6% of U.S. households had incomes below 150% of the federal poverty level in 2009.[36] In Boston, 25.4% of the population had incomes less than 150% of the federal poverty level, yet 52.9% of Boston census tracts—representing 83 tracts—met or exceeded this level of poverty.[37] As shown in Map 3, the percentage of the population below 150% of the federal poverty level was highest in parts of:

- South Boston (near Old Colony Avenue, B Street, and Columbia Road, and Old Colony Avenue and Dorchester Street)

Map 2: Racial and Ethnic Distribution, Boston, 2005–2009

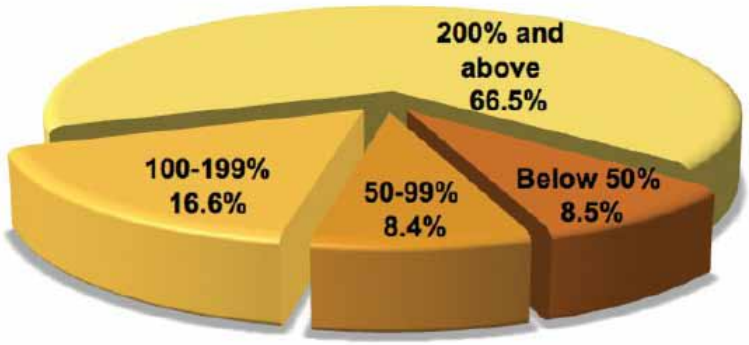


- East Boston (near Meridian Street and Decatur Street)
- South End (near Berkeley Street and Albany Street)
- Jamaica Plain (near Centre Street and Walden Street)
- Roxbury (near Tremont, Whittier, and Saint Alphonsus Streets, near Washington and Lenox Streets, near Harrison Avenue and Warren Street, and near Blue Hill Avenue and Route 28)
- North Dorchester (near Tremont Street and Talbot Avenue and near Columbia Road, Washington Street, and Dudley Street)
- Allston/Brighton (near Cambridge and Washington Streets).

In 2009, white residents of Boston had significantly higher median income ($67,956) than black ($37,242) and Latino ($32,265) residents.[36] Even at similar income levels, populations of color in Boston have a more difficult time accumulating wealth compared to white residents, largely because of the legacy of our history of racial discrimination and issues of structural racism that persist today. For example, Figure 3 shows that, in 2009, blacks and Latinos in Boston experienced more difficulty securing home loans than whites at every comparable income level.

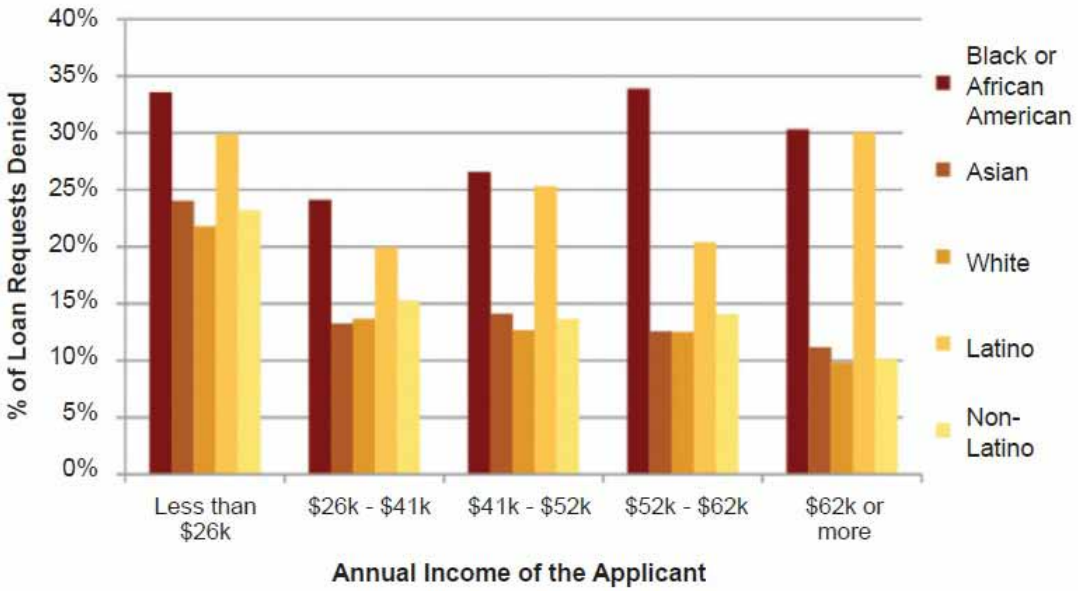
Persistence of concentrated poverty across several decades may have additional health and social consequences, particularly for the children living in those areas. A persistent lack of economic resources during childhood has consequences for cognitive, emotional, behavioral, and physical development.[44, 45] It also may diminish the likelihood of high school completion, thus perpetuating disadvantage and the multigenerational

Figure 2: Income-to-Poverty Ratio in Boston, 2009



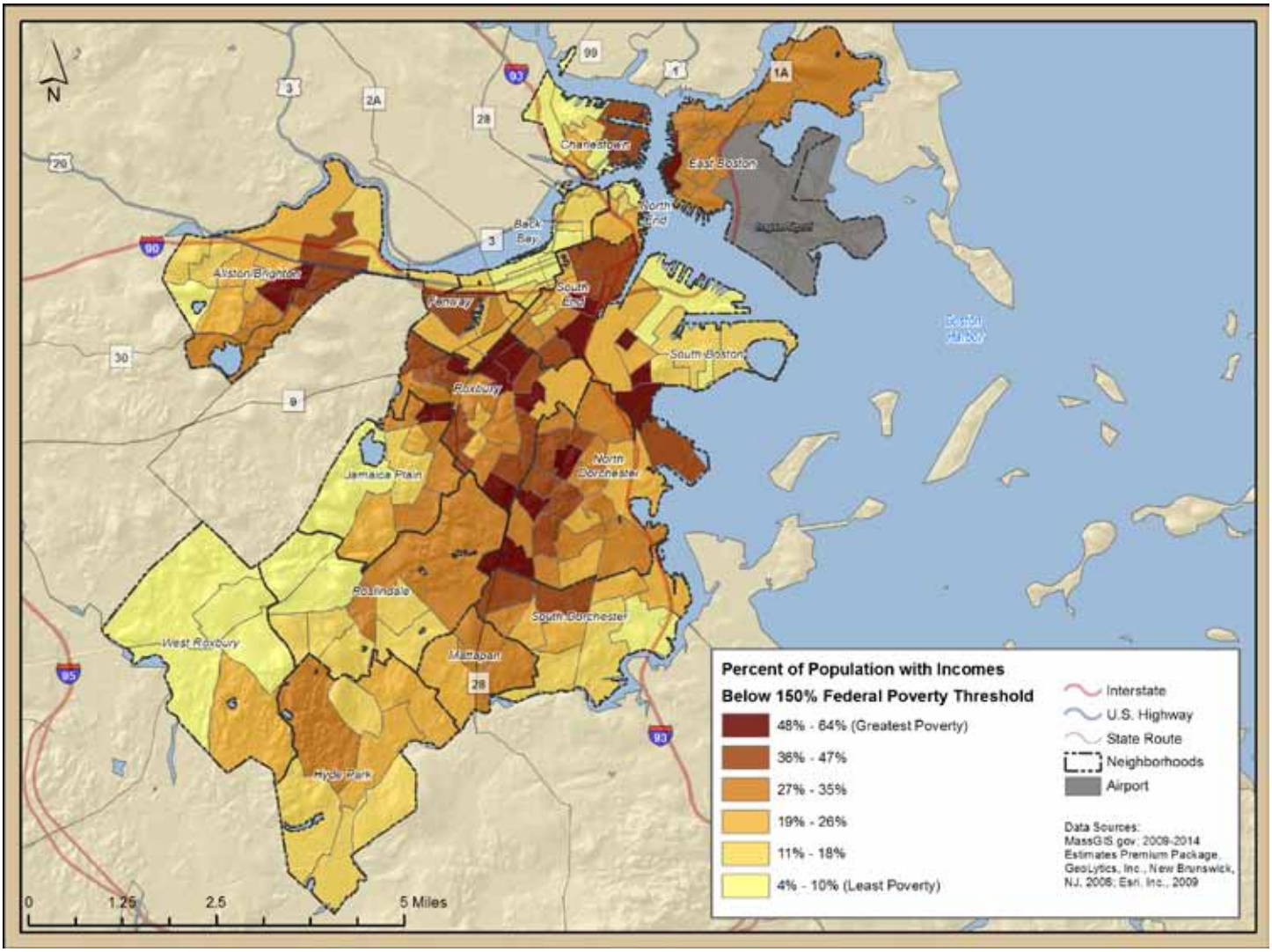
Source: U.S. Census Bureau, 2009 American Community Survey.
Note: Income-to-poverty ratio (IPR) refers to a family's, or unrelated individual's, income divided by their federal poverty threshold. For example, a family with an IPR of 50% has income that is half the poverty threshold.

Figure 3: Loan Denials by Race and Income, Boston, 2009



Source: Federal Financial Institutions Examination Council, Home Mortgage Disclosure Act 2009.

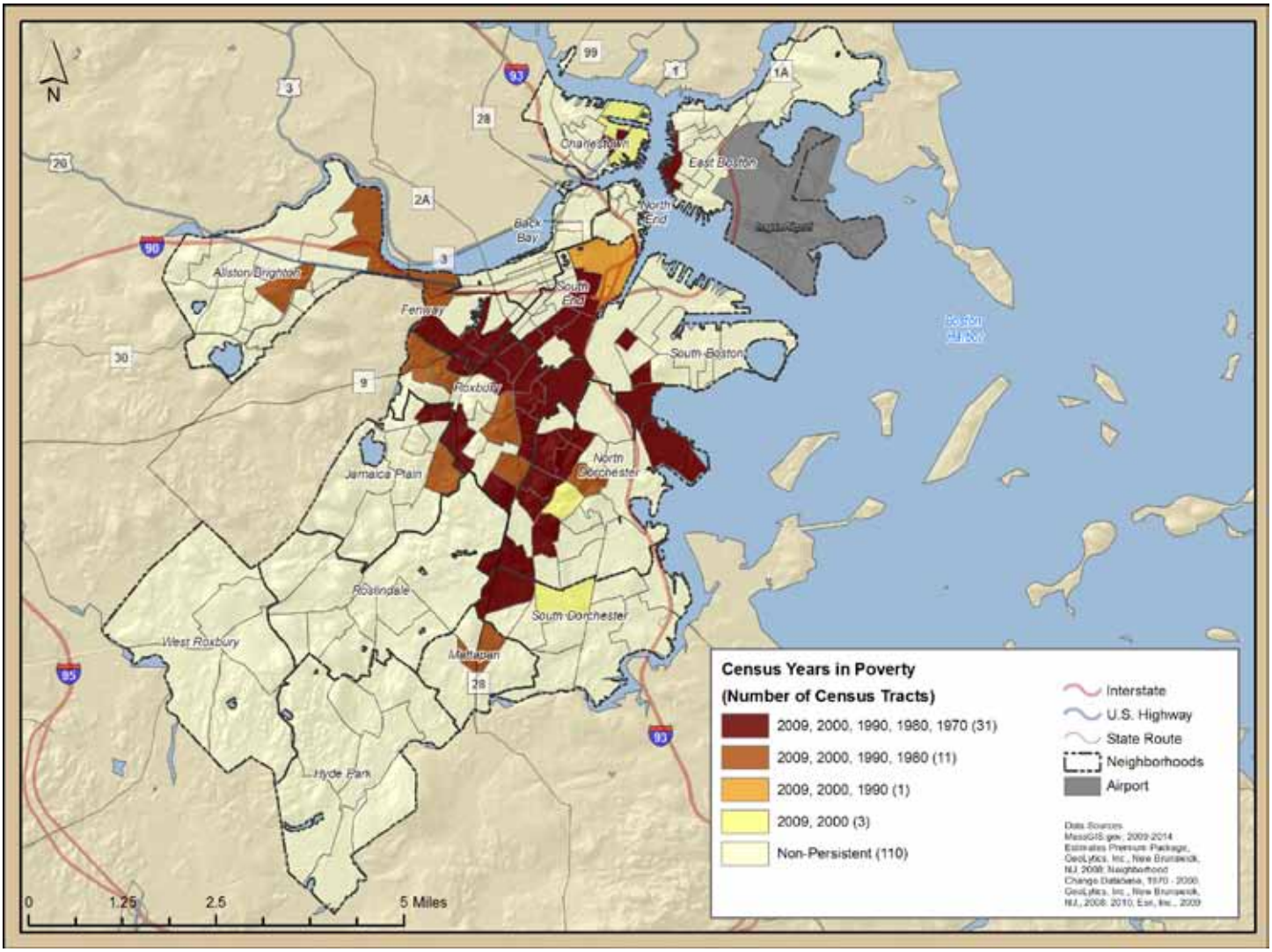
Map 3: Households Below 150% of the Federal Poverty Threshold, by Census Tract, Boston, 2009



cycle of living in conditions that adversely affect health.[44, 45] Neighborhoods of persistent poverty, defined as having at least 20% of the population with incomes less than 100% of the federal poverty level for at least two consecutive census periods (or decades), exist in several areas of Boston:

- Charlestown (near Route 1 and Vine Street)
- East Boston (near Meridan and Decatur Streets)
- South Boston (near Old Colony Avenue, Columbia Road, and B and Dorchester Streets)
- South End (near Washington, Berkeley, and Waltham Streets, near Marginal Road and Tremont Street, near Massachusetts Avenue and Tremont Street, and near Albany and Union Park Street)
- Roxbury (near Massachusetts Avenue and Tremont Street, near Dudley and Hampden Streets, near Melnea Cass Boulevard, Harrison Avenue, and Tremont Street, near Tremont, Ruggles, and Saint Alphonsus Streets, near Warrant and Quincy Streets, and near Route 28 and Blue Hill Avenue)
- Jamaica Plain (near Centre and Bickford Streets)
- North Dorchester (near Columbia Road, Geneva Avenue, and Quincy Street, near Magnolia and Quincy Streets, near William J. Day Boulevard and Mount Vernon Street, near Columbia and Stoughton Street, near Ceylon and Quincy Streets, near Washington and Harvard Streets, and near Route 28 and Harvard Street)
- South Dorchester (near Route 28 and Woodrow Avenue).

Map 4: Persistent Poverty by Census Tract, Boston, 1970–2009



Within these tracts at least 20% of the population has experienced poverty for the past five census periods (1970–2009) (see Map 4).[37, 46]

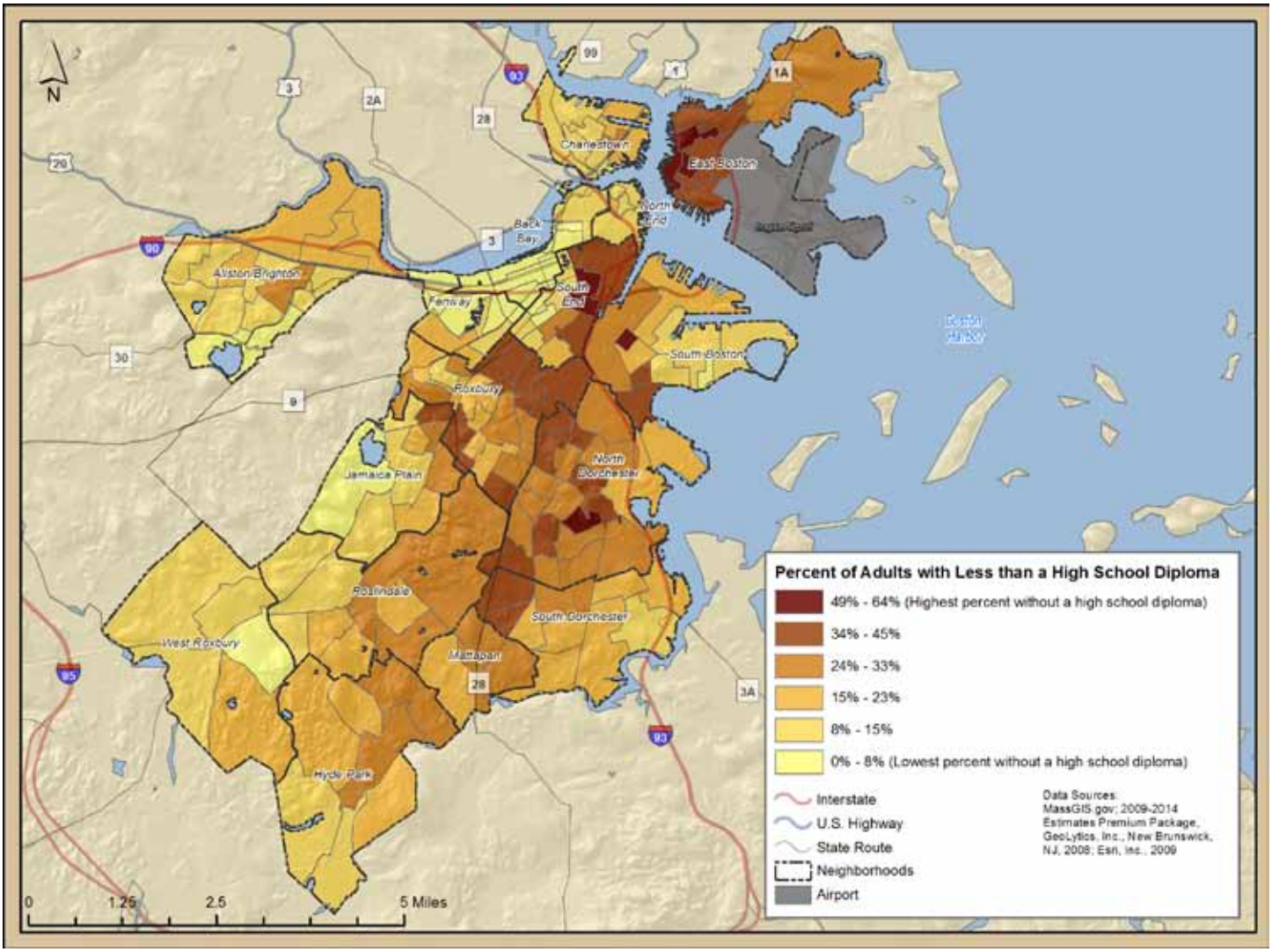
Furthermore, lower percentages of community-level owner-occupied housing are associated with higher crime rates and lower educational attainment.[47-50] Because of a lack of access to financial capital, impoverished families are more likely to rent rather than own property and to live in less-desirable areas. In 2009 only 30.6% of housing units in Boston were owner occupied, compared to 57.7% in Massachusetts and 60.7% nationally.[37]

Education is a pathway to higher income and net worth, and also has strong influences on health status and access to health care. In 2009, American adults with less than a high school diploma as their highest educational attainment had less than half the earnings ($18,432 versus $47,510)[36] and were three times more likely to die prior to age 65 than adults with at least a bachelor's degree.[51]

The percentage of the population with less than a high school education is higher in Boston than statewide (14.5% vs. 11.0%, respectively) but is comparable to the rate for the nation as a whole (14.7%) (see Table 2).[36] High school completion rates, however, vary greatly by neighborhood (see Map 5).[37] The tracts exhibiting the highest level of educational distress—with more than half of adults lacking a completed high school education—are in South Boston (near Broadway and B Street), the South End (near Route 28 and Marginal Road, Berkeley Street and Harrison Avenue), East Boston (near Meridian, Decatur, Gove, and Princeton Streets), and North Dorchester (near Geneva Avenue and Bowdoin Street).

Besides educational attainment, measures of educational proficiency also vary by place. The National Assessment of

Map 5: Adults With Less Than a High School Education, Boston, 2009



Educational Progress (NAEP) evaluates samples of students in the 4th, 8th, and 12th grades to gauge their proficiency in various subjects. While Massachusetts students scored better than average in most subjects in 2009, Boston 4th and 8th graders scored lower in reading and mathematics than did students in Massachusetts or the nation.[53] Boston students in these grades were more likely to score below basic proficiency in these subjects than were students nationwide.[53]

Compared to non-Latino whites in the same time period, black adults in Boston were more than four times as likely to lack a high school education (see Figure 4).[36] Latino residents fare even worse, with almost two of every five adults lacking a high school education. The Asian population of Boston is nearly six times as likely as non-Latino whites to lack a high school education and nearly twice as likely to lack a high school education as the Asian population of the U.S. (29.1% and 14.7%, respectively).[36] Gross comparisons such as these, however, overlook differences within groups. Boston's Asian population is made up of 15 different ethnic subgroups.[54] Approximately two-thirds of metropolitan Boston's Asian population are of Chinese, Indian, or Vietnamese descent, but there are also significant populations of Cambodians, Koreans, Japanese, Filipinos, Laotians, Thais, Pakistanis, and Hmong, among others.[54] Those of Chinese and Indian ancestry in Boston are much more likely to have completed high school than those of Vietnamese or Cambodian ancestry.[54]

Environmental Hazards

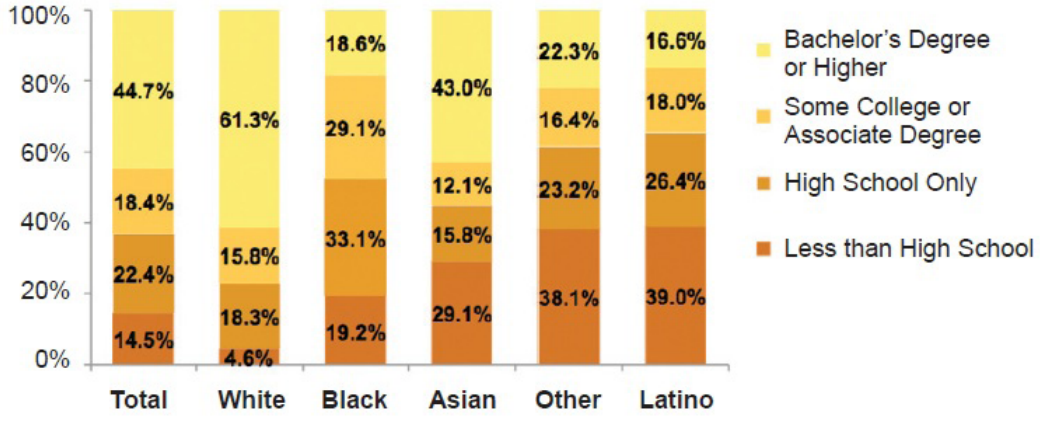
Environmental hazards are another potential community-level stressor for some areas in Boston. Exposure to environmental toxins may cause disease and injuries via contaminated air, water, and food or via hazards associated with workplace

Table 2. Socioeconomic Characteristics of Boston, the State of Massachusetts, and the United States

	Boston	Massachusetts	United States
Educational Attainment			
Less than High School	14.5%	11.0%	14.7%
High School Only	22.4%	26.3%	28.5%
Some College	18.4%	24.4%	28.9%
Bachelor's Degree or Higher	44.7%	38.2%	27.9%
Poverty Rate			
Below 50% of Poverty Rate	8.5%	4.5%	6.3%
50-99% of Poverty Rate	8.4%	5.8%	8.1%
100-199% of Poverty Rate	16.6%	12.7%	18.4%
200% and Above of Poverty Rate	66.5%	77.0%	67.3%

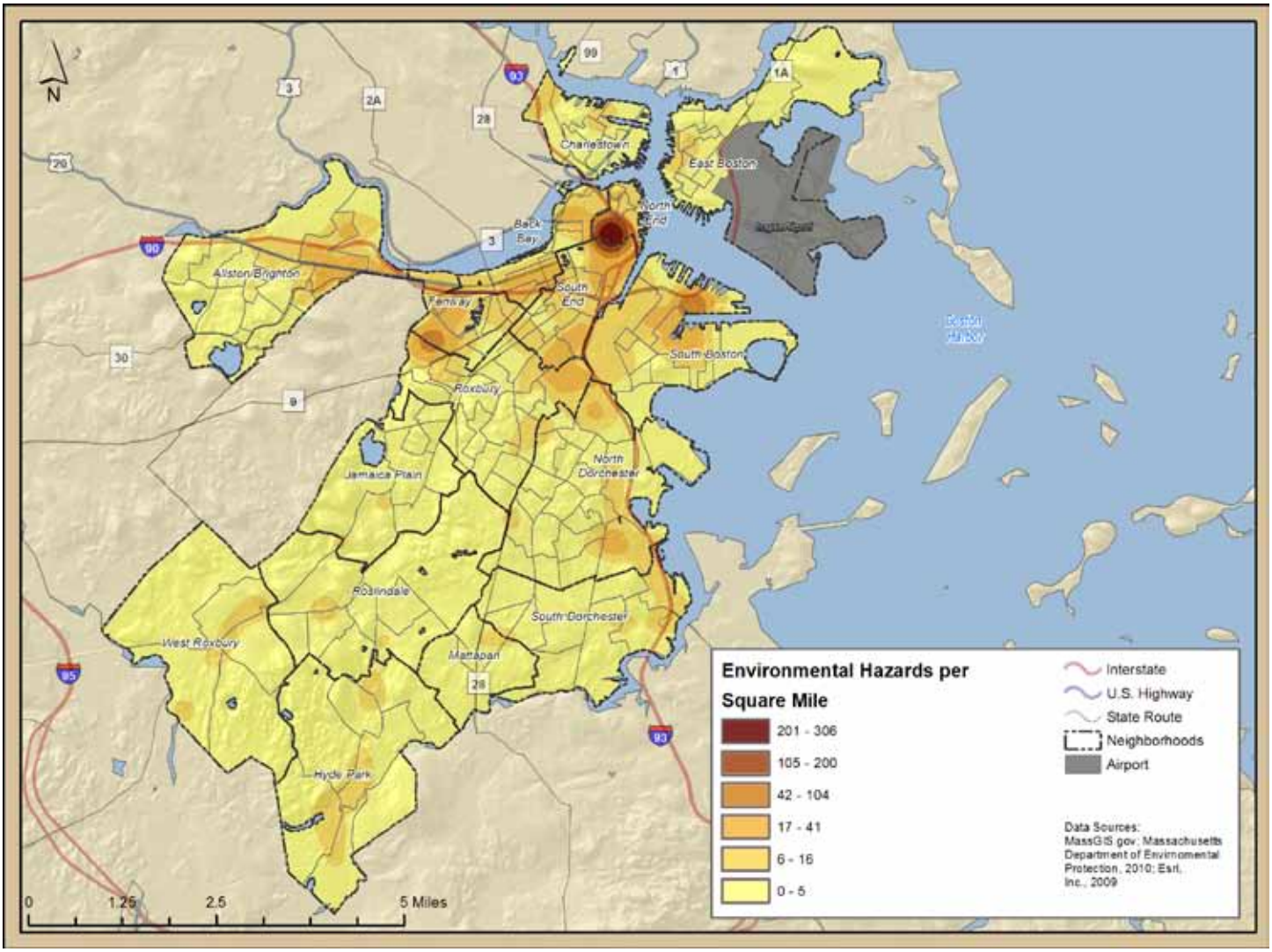
Source: U.S. Census Bureau, 2009 American Community Survey

Figure 4: Education Attainment in Boston



Source: U.S Census Bureau, 2009 American Community Survey.
Note: "Other" includes American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, and those who identified themselves as some other race or two or more races. White includes the non-Latino population only; all other racial categories include both Latino and non-Latino; Latino can include any racial group.

Map 6: Environmental Hazards per Square Mile, Boston, 2010



conditions, transportation, pests, vectors, noise, toxic spills, and climate change. Map 6 illustrates the spatial distribution of environmental hazards in Boston based on entities registered as hazardous waste generators with the Massachusetts Department of Environmental Protection. These data do not take into account air pollutants or how they are geographically distributed, a shortcoming that limits our ability to attribute risk of mortality and/or morbidity to environmental hazard exposure. The highest density area for hazardous waste generators is found in Back Bay (near Blockstone and Commercial Street east of North Washington Street). Neighborhoods of southern Boston, along with Allston/Brighton, tend to have a much lower density of these environmental hazards.

Health Outcomes

Disparities in health outcomes based on demographic factors are well established. In 2007, life expectancy at birth for the U.S. was 77.9 years: it was 73.6 years for blacks compared to 78.4 years for whites.[55] In 2007, black Boston residents had 127.0 more premature deaths (prior to the age of 65) per 100,000 persons than white residents, compared to 109.6 more in Massachusetts and 163.2 more nationally[56] (see Table 3).

Nationally, blacks had the highest age-adjusted mortality rate in 2007 among racial or ethnic groups, a rate 215.3 deaths per 100,000 persons higher than the white population.[56] In Boston, black residents have an all-cause mortality rate that is 282.4 deaths per 100,000 higher than white residents (Table 4), a disparity higher than that of the U.S. and of Massachusetts (110.2 more deaths). Nationally, blacks also had the highest age-adjusted mortality rate from circulatory diseases, which

Table 3. Health Characteristics of Boston, the State of Massachusetts, and the United States

	Boston	Massachusetts	United States
Life Expectancy at Birth	79.9[a]	79.3[b]	78.4[c]
Premature Mortality (per 100,000)	213.3[d]	181.4[e]	238.4[e]
White	159.7[d]	179.4[e]	221.5[e]
Black	286.7[d]	289.0[e]	384.7[e]

(a) Calculations performed by the VCU Center on Human Needs from 2003-2007 mortality data provided by Boston Resident Deaths, Massachusetts Department of Public Health, available from Boston Public Health Commission Research and Evaluation Office.
(b) Calculations performed by VCU Center on Human Needs from NVSS death tables by state and Geolytics population estimates
(c) Health, United States 2010: With Special Features on Death and Dying; the Centers for Disease Control and Prevention, 2007.
(d) Calculations performed by the VCU Center on Human Needs from 2007 mortality data provided by Boston Resident Deaths, Massachusetts Department of Public Health, available from Boston Public Health Commission Research and Evaluation Office; Centers for Disease Control and Prevention CDC Wonder Tool 2007.
(e) Centers for Disease Control and Prevention and CDC Wonder Tool 2007.

Note: All racial categories are non-Latino only.

Table 4. All-Cause and Disease-Specific Mortality Rates in Boston, the State of Massachusetts, and the United States

	Boston	Massachusetts	United States
All-Cause Mortality (per 100,000)[c]	762.5[a]	709.1[c]	776.3[c]
White	727.9[b]	712.5[c]	763.3[c]
Black or African American	1010.3[b]	822.7[c]	978.6[c]
Circulatory Diseases (per 100,000)[c]	211.3[a]	219.8[c]	256.0[c]
White	207.8[b]	220.7[c]	249.4[c]
Black or African American	272.3[b]	243.3[c]	343.6[c]

(a) Calculations performed by Boston Public Health Commission Research and Evaluation Office from 2007 death data provided by Boston Resident Deaths, Massachusetts Department of Public Health.
(b) Calculations performed by the VCU Center on Human Needs from 2003-2007 mortality data provided by Boston Resident Deaths, Massachusetts Department of Public Health, and the 2001-2008 Geolytics Premium Estimates.
(c) 2007 Centers for Disease Control and Prevention CDC Wonder Tool indirectly standardized to the 2000 U.S. Census Population.

Note: All racial categories are non-Latino only.

include conditions such as ischemic heart disease and stroke.[56] The racial disparity in circulatory disease mortality in Boston is lower than the rest of the U.S. (64.5 vs, 94.2 more deaths for blacks per 100,000 , respectively) but it is higher than the disparity seen at the state level (22.6 more deaths).[56]

The infant mortality rate in the U.S. for 2006 was 6.7 deaths per 1,000 live births, but outcomes differed significantly by race:[55] the infant mortality rate was 5.6 per 1,000 for white mothers and 12.9 per 1,000 for black mothers. Infant mortality is more than 24 times greater for infants with a birth weight of less than 2,500 grams than it is for infants at or above this weight.[55] In the U.S., black mothers are nearly twice as likely as

Table 5. Low-Birth-Weight Rates in Boston, the State of Massachusetts, and the United States

	Boston	Massachusetts	United States
Low-Birth-Weight Rate[(d)]	9.6[(a)]	7.7%[(b)]	8.2%[(b)]
White	8.4%[(a)]	7.3%[(b)]	7.1%[(b)]
Black	12.7%[(a)]	10.1%[(b)]	13.4%[(b)]

(a) Calculations performed by Boston Public Health Commission Research and Evaluation Office from 2007 data provided by Boston Resident Births, Massachusetts Department of Public Health.
(b) Centers for Disease Control and Prevention National Vital Statistics System 2007.

Note: All racial categories are non-Latino only.

white mothers to deliver a child with a low birth weight (13.4% to 7.1%, respectively). The gaps are narrower in Boston and Massachusetts (4.3% and 2.8%, respectively), but they are still significant (Table 5).

Socioeconomic Factors and Health

Socioeconomic factors, largely the result of issues of structural racism, affect the way people live and may impact the risk of illness and premature death.[68] In 2007, members of families living in poverty nationwide were nearly twice as likely to have diabetes, 5.3 times more likely to report serious psychological distress, and 1.6 times more likely to have been hospitalized during the previous year compared to families with incomes of at least twice the federal poverty threshold.[59] In addition, access to health care services is much more limited for those with low incomes. That same year, impoverished families were two to four times more likely to lack health insurance or a usual source of care, or to delay health care or not obtain care due to cost, compared with families that had incomes of at least twice the federal poverty threshold.[59]

Figure 5 illustrates the relationship between the poverty rate and premature deaths at the census-tract level in Boston. To conduct this analysis, the VCU Center on Human Needs split tracts into quintiles (five equally sized groups) based on the percentage of the population under 150% of the federal poverty level. The percentage of the population in poverty for each quintile is described below:

- Quintile 1 – Less than 14%
- Quintile 2 – Between 14% and 22.2%
- Quintile 3 – Between 22.2% and 29.7%
- Quintile 4 – Between 29.7% and 40%
- Quintile 5 – Greater than 40%

Census tracts in the first quintile had the lowest rate of premature deaths. The premature death rate goes up in the next two quintiles, has a slight drop between quintile 3 and 4 and then a large increase between quintiles 4 and 5. The highest rate of premature death is in quintile 5, where the prevalence of poverty is the highest.

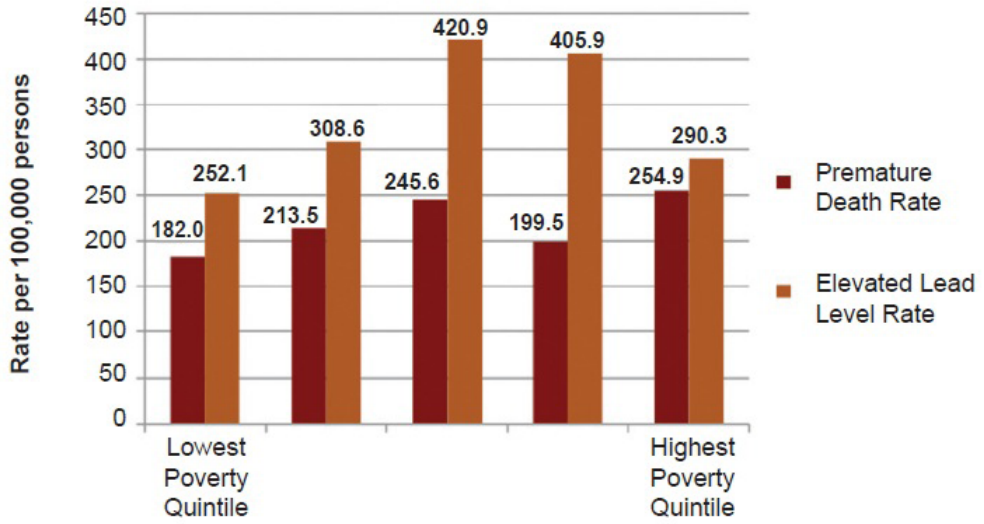
Education is a strong predictor of health outcomes. For example, in a 37-state reporting area in 2005, the Centers for Disease Control and Prevention found that the infant mortality rate among babies born to mothers with less than 12 years of education was more than twice the rate for mothers with 16 or more years of education.[60] In 2007, among adults age 25 and older, those with less than a high school diploma were 4.5 times more likely to report fair or poor health status, had more than twice the prevalence of diabetes, and were more than five times as likely to report serious psychological problems.[59]

In Boston, the percent of the population with less than a high school education is significantly correlated with the census tracts' premature death rate. Figure 6 illustrates the relationship between educational attainment and premature death and lead toxicity. The Center on Human Needs split the tracts into quintiles based on the percentage of the population over the age of 25 that had not graduated high school. The quintiles split up by the following criteria:

- Quintile 1 – Less than 10.3% not graduated from high school
- Quintile 2 – Between 10.3% and 16.3%
- Quintile 3 – Between 16.3% and 24.7%
- Quintile 4 – Between 24.7% and 35.7%
- Quintile 5 – Greater than 35.7%

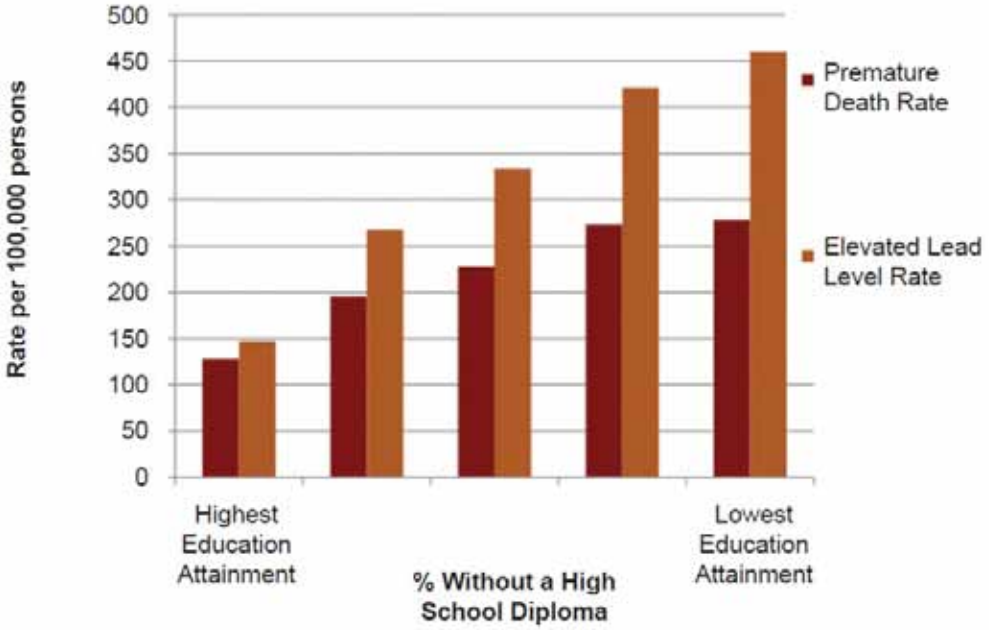
On average, census tracts with the lowest percentage of high school graduates (the lowest 20% for educational attainment) had twice the premature mortality rate as tracts with the highest educational attainment (top 20%).

Figure 5: Health Outcomes by Poverty Quintile in Boston



Source: Calculations performed by VCU Center on Human Needs; Geolytics 2009 Premium Estimates: Boston Resident Deaths, Massachusetts Department of Public Health, Available from Boston Public Health Commission Research and Evaluation Office; Boston Public Health Commission Office of Environmental Health.

Figure 6: Health Outcomes by Educational Attainment Quintile in Boston



Source: Calcuations performed by the VCU Center on Human Needs2009 Geolytics Premium Estimates, 2003–2007 Boston Resident Death, Massachusetts Departmetn of Public Health; 2004–2008 Boston Public Health Commission Office of Environmental Health.

Summary

Part I of this report presented data on various community characteristics that may be related to health outcomes, such as segregation, poverty, and educational attainment. We have also examined racial and geographic disparities in the distribution of health outcomes in Boston. There is strong evidence for the relationship between poverty, income, and educational attainment at the census-tract level in Boston as well as a relationship between all three variables and health outcomes. Areas in Boston in which poverty, low educational attainment, and high premature mortality co-occur include the neighborhoods of East and South Boston, the South End, Roxbury, and North Dorchester. In the next section, we will examine the social and environmental factors associated with poor health outcomes.

II. Social Capital, Health Outcomes, and Community Violence

Social Capital

A central idea behind Putnam's definition of social capital is the notion that community problems like crime, poor schools, and blighted properties are more easily overcome by collective rather than individual action.[30] Interventions such as neighborhood watch programs, which show strong evidence of causing a decrease in criminal activity,[61] require collaboration among a network of people. Areas where strong social networks and social capital exist have an advantage in facilitating action.[30] The potential mechanisms through which social capital is associated with health are unclear, but such mechanisms could include an increase in knowledge about health promotion and available health care services, peer pressure toward maintaining healthy behaviors such as dietary habits or eliminating smoking, and/or improved psychological outlook and reduced stress.[62]

Social capital is an abstract concept that cannot be measured directly. It is generally thought to exist when residents have multiple, strong contacts within the community and participate in events and programs that foster knowledge and cooperation. Putnam suggests that social capital in a community can be assessed by measuring levels of participation in community activities, interpersonal trust between residents, and perceptions of mutual aid among community members.[63, 64] *It should be noted that, while it is beyond the scope of this report, levels of social capital can be significantly affected by issues of structural racism that can limit cooperative community activities, interpersonal trust, and mutual aid.*

Social Capital Nationwide

The Social Capital Benchmark Survey (SCBS), conducted in 2000, was a national survey that gathered baseline measurements on social capital utilizing various observed indicators. Based upon the survey responses, 11 elements of social capital were identified: social trust, interracial trust, conventional politics, protest politics, civic leadership, associational involvement, informal socializing, diversity of friendships, giving and volunteering, faith-based engagement, and social capital equity.[65]

SCBS findings revealed differences in social capital by race, age, and socioeconomic status. In response to the question, "How much can you trust people in your neighborhood?" people who responded "a lot" were significantly more likely to be older, white, and more highly educated. Similarly, respondents who were more highly educated and white were more likely to rate their communities as "excellent" places to live.[66] A similar pattern was observed for other indicators of social capital, including voting in the 1996 presidential election, attending political rallies, and signing petitions.

One indicator of social capital that did not follow these trends was participation in religious events, which was less common for whites. Religious participation was associated with education and age, and black respondents were slightly more likely than whites to report being church/synagogue members (64% to 59%, respectively), attend religious services every week (42% and 40%, respectively), and participate in church activities other than attending services (52% and 46%, respectively).[66]

Like the SCBS, the General Social Survey (GSS) and the World Values Survey (an international version of the GSS) found educational attainment to be one of the strongest predictors of social capital.[67] The number of years of education has been found to be correlated with membership in organizations, church attendance, working to solve local problems, and social trust.[67] Furthermore, this relationship appears to be consistent in most countries.[67]

Social Capital in Boston

SCBS findings were used to calculate social trust quotients for 40 different communities in the United States (ranging from cities to entire states).* A quotient was defined as a community's performance on a particular dimension of social capital, relative to what was predicted given its urbanicity, ethnicity, levels of education, and age distribution.[65] A score below 100 indicates that a community shows less of this type of social capital.[65] Boston had a score of 81 for social trust.[68] Boston also scored below 100 in civic leadership, associational involvement, informal socializing, giving and volunteering, and faith-based engagement.[68] Scores for political participation, however, were above average.[68]

The information from national surveys like the SCBS and the GSS indicate that patterns of social, economic, and demographic factors are strong predictors of access to and stocks of social capital. In the next section, we focus on the relationship between these factors in Boston and its neighborhoods. One unique characteristic of the City of Boston is the high concentration of colleges/universities and college students. In 2008, 15.8% of the Boston population above age 3 was a registered college student: this ranged from a low of 2.7% in North Dorchester between Dudley Street and Quincy Street west of Columbia Road to 94.1% in Back Bay between Deerfield and University Road, where the Boston University campus is located and where students of other universities also live.[69] The large student population has an effect on findings related to socioeconomic status and social capital. Census tracts with a high concentration of college students tend to have high average education levels (usually associated with greater social capital), but a young adult demographic (otherwise associated with lower social capital). Furthermore, college students are largely a transient population, which may limit attachment to the community.

Measuring Social Capital at the Neighborhood Level

We utilized three sources of data to measure social capital at the neighborhood and census-tract level in Boston: the Boston Neighborhood Survey (BNS) conducted in 2008 by the Harvard Youth Violence Prevention Center; voter participation data from the Boston Elections Department; and the number of houses of worship and community centers located in each census tract.

The BNS provided neighborhood-level data on social trust indicators. We used responses to nine questions from the BNS as indicators of the levels of social trust in each neighborhood (the social trust index). The index score represents the average number of affirmative responses residents provided to the following nine questions:

- Have you attended any neighborhood social activities?
- Do you own or rent your home?
- Do you like the neighborhood you live in?
- Can the people in your neighborhood be trusted?
- Do you have friends that live in your neighborhood?
- Are the people in your neighborhood willing to help their neighbors?
- Are there adults in your neighborhood whom children can look up to?
- Can adults in your neighborhood be counted on to watch out that children and teens are safe?
- Are your neighbors likely to do something about a fight?

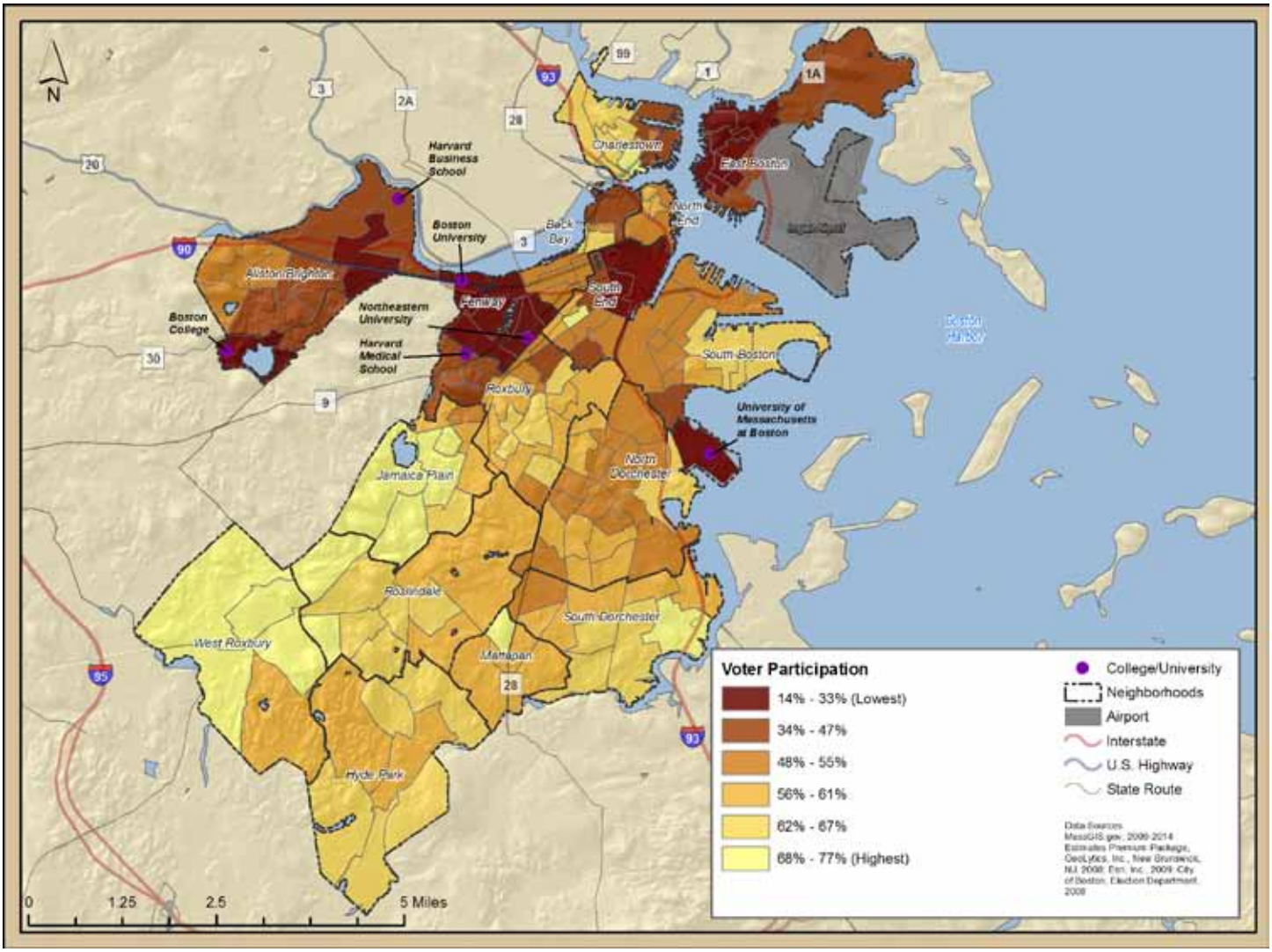
Responses were weighted by gender, race, age, income, and education. A more detailed description of the methodology and the questions used can be found in Appendix B.

For Boston as a whole the social trust index measured 6.5 out of 9. The social trust score at the individual level did not show statistically significant differences by respondents' race, ethnicity, education, or income. We aggregated the social trust score to the neighborhood level, resulting in 16 different levels of social trust, ranging from 4.0 in Mattapan to 8.0 in the North End. The differences were not statistically significant. It is difficult to determine whether this lack of statistical differences was a result of no relationship between social trust and the social/economic/demographic characteristics tested in Boston, or whether the limitations of the survey data made it impossible to detect relationships which do, in fact, exist.

To measure electoral participation, we utilized data on voter participation in the 2008 presidential election. In that year, 61.5% of eligible voters registered and 49.9% of all eligible voters in Boston ultimately cast a vote (see Appendix A for a description of how these findings were calculated). West Roxbury had the highest voter participation rate. Fenway had the lowest rate, with only one of four residents over 18 actually casting a vote.

* Included areas were: Atlanta Metro (GA), Baton Rouge (LA), Birmingham Metro (AL), Bismarck (ND), Boulder County (CO), Central OR, Charlotte Region/14 counties (NC), Chicago Metro (IL), Cincinnati Metro (OH), Delaware, Denver (city/county) (CO), Detroit Metro/7 city (MI), East Tennessee, Freemont/Newaygo County (MI), Grand Rapids (MI), Greensboro/Guilford County (NC), Houston/Harris City (TX), Indiana, Kalamazoo County (MI), Kanawha Valley (WV), Lewiston-Auburn (ME), Los Angeles County (CA), Minneapolis (MN), Montana, New Hampshire, North Minneapolis (MN), Peninsula/Silicon Valley (CA), Phoenix/Maricopa City (AZ), Rochester Metro (NY), San Diego County (CA), San Francisco (CA), Rural South Dakota, Seattle (WA), Saint Paul (MN), Syracuse/Onodaga County (NY), Winton-Salem/Forsyth County (NC), Yakima (WA), and York (PA).

Map 7: Percentage of Eligible Voters Who Cast a Ballot by Census Tract, Boston, 2008



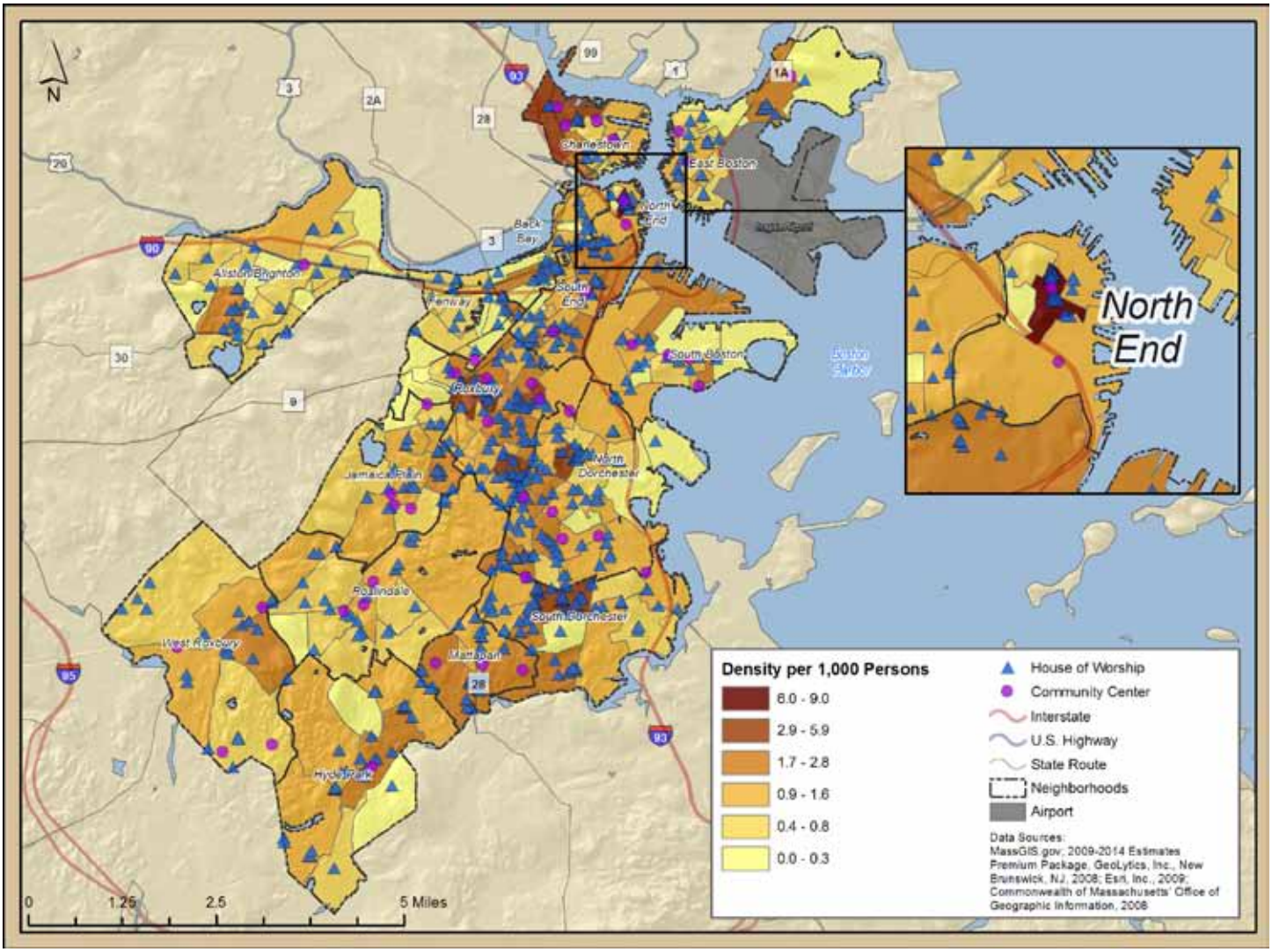
Map 7 displays the percentage of eligible voters who cast a ballot by census tract. The lowest rates were found mostly in:

- Northwestern Boston near the university campuses
- North Dorchester (near Blue Hill Avenue and Cottage Street, near Columbia Road, Dudley Street, and Stoughton Street, near Columbia Road and Quincy Street, and near Washington Street and Talbot Avenue)
- Roxbury (near Massachusetts Avenue and Melnea Cass Boulevard)
- Jamaica Plain (near Centre Street and Forbes Street)
- Allston/Brighton (near Washington Street and Chestnut Hill Avenue)
- South Boston (near Broadway and H Street).

Another aspect of social capital is group membership and participation in group activities. Going to church or participating in community activities provide opportunities for networking and may increase access to resources. Access to these opportunities may depend in part on the number of groups or institutions located within a community, which varies greatly by neighborhood. As shown in Map 8, in 2008 the North End (between Commercial and Salem Streets) had the highest concentration of houses of worship and community centers, while Fenway had the lowest.

We conducted an analysis of the correlation between voter participation and other measures of social capital. As reported in Appendix A, we found a positive correlation with both social trust and houses of worship/community centers. Next, we examine the socioeconomic and demographic predictors of social capital in Boston and its connections to health outcomes.

Map 8: Community Centers and Houses of Worship per 10,000 People, by Census Tract, Boston, 2008



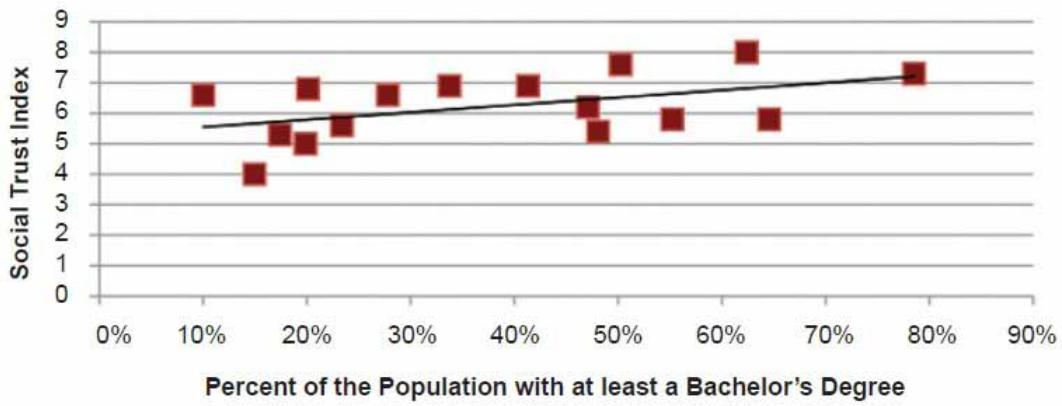
Social Capital, Neighborhood Characteristics, and Health

The relationship between community socioeconomic characteristics and health is well known, and the same relationship can be found in Boston.[3, 5, 6, 70] National analyses have also found significant relationships between the socioeconomic and demographic characteristics of individuals and social capital.[68 71, 72, 73] In addition, studies have linked multiple aspects of social capital to health outcomes such as self-reported health status and mortality.[31-35, 74] In sum, socioeconomic status, social capital, and health outcomes exhibit strong interconnections.

Neighborhood-level data for Boston underscore sociodemographic influences on social capital. BNS data for 2008 demonstrate that the social trust index was higher when educational attainment was higher (percent of adults with a bachelor's degree or higher) (see Figure 7), when the population was older (percent of population age 65 or older), and when the percent of the population who identified themselves as white was higher at the census-tract level (see Figure 8). Voter participation (percent of eligible population that voted in 2008) was significantly correlated with age, educational attainment (percent of adults with less than a high school education), and poverty (percent of households with income below 150% of the poverty threshold) (see Figure 9). Finally, the density of houses of worship/community centers was significantly correlated with representation of blacks in the census tract.

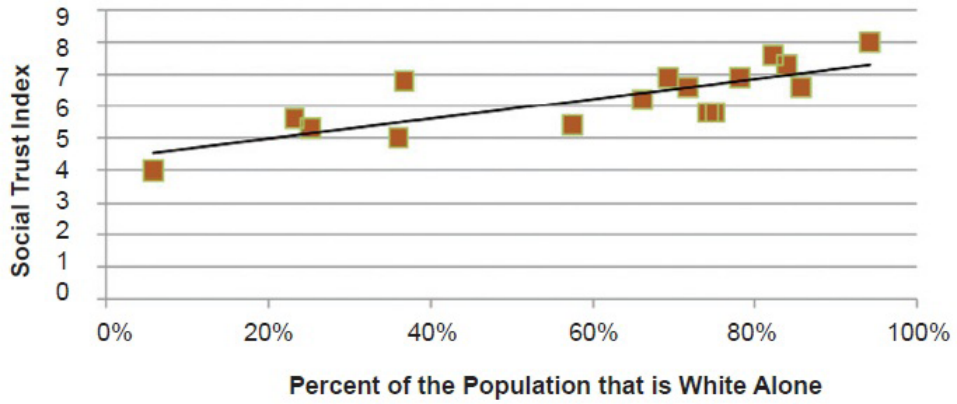
Figures 7-9 demonstrate that elements of social capital are strongly related to social, economic, and demographic characteristics at the census-tract level of Boston. These findings point to the uneven distribution of social capital based on age, race, and socioeconomic status, which is also reflected in the geographic distribution of social capital and favorable health outcomes. In order to determine whether these measures of

Figure 7: Boston Neighborhoods With More College Graduates Tend to Have Higher Social Trust



Sources: 2009 Geolytics Premium Estimates; Boston Neighborhood Survey, 2008; Harvard Youth Prevention Center through a cooperative agreement with the Centers for Disease Control and Prevention.

Figure 8: White Neighborhoods Tend to Have Higher Social Trust Scores in Boston



Sources: 2009 Geolytics Premium Estimates; Boston Neighborhood Survey, 2008; Harvard Youth Prevention Center through a cooperative agreement with the Centers for Disease Control and Prevention

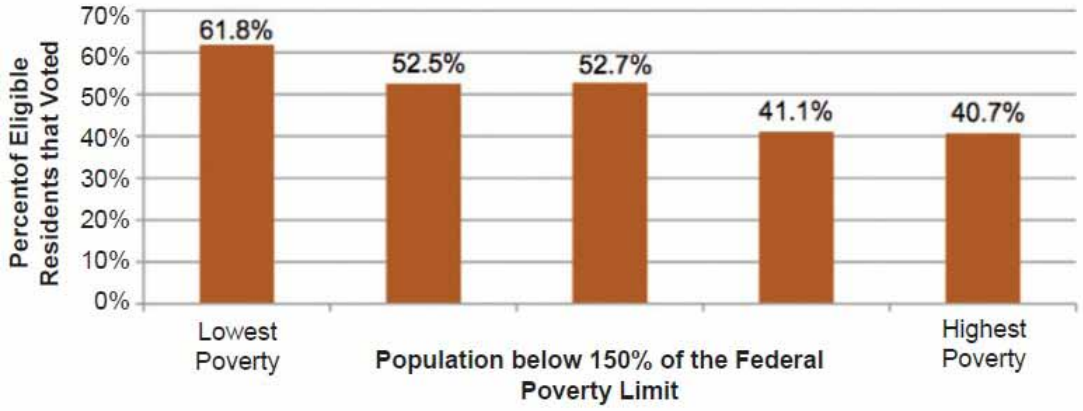
social capital have a relationship to health outcomes beyond the health effects of demographic and socioeconomic characteristics we conducted further analysis, which is summarized below.

Social Capital and Community Violence

Adherence to social norms and customs has been shown to be related to levels of community violence.[75, 75, 76] Kennedy et al. found statistically significant relationships in the U.S. between indicators of social capital (e.g., social trust and group membership) and both homicide rates and firearm violent crimes, even after controlling for poverty and firearm availability.[77]

According to the Federal Bureau of Investigation, in 2009 Boston had a violent crime rate of 992.0 per 100,000 residents, which was more than double that year's rates for Massachusetts and the U.S. (see Table 6).[78] Boston's violent crime rate reflected rates of murder, rape, robbery, and aggravated assault that exceeded national and state averages.[78] The property crime

Figure 9: Voter Participation Is Lowest in Boston's Higher-Poverty Neighborhoods



Source: 2008 Boston Electoral Department and 2009 Geolytics Premium Projections.

Table 6. Crime in Boston, the State of Massachusetts, and the United States, 2009

	Boston	Massachusetts	United States
Violent Crime Rate per 100,000	992.0	457.1	429.4
Murder and Nonnegligent Manslaughter	8.0	2.6	5.0
Forcible Rape	43.1	25.8	28.7
Robbery	364.8	112.6	133.0
Aggravated Assault	576.1	316.0	262.8
Property Crime per 100,000	3,324.0	2,304.0	3,036.1
Burglary	473.4	525.7	716.3
Larceny-Theft	2,484.2	1,600.3	2,060.9
Motor Vehicle Theft	366.4	178.0	258.8

Source: United States Justice Department, Federal Bureau of Investigation, 2009 Crime in the United States.

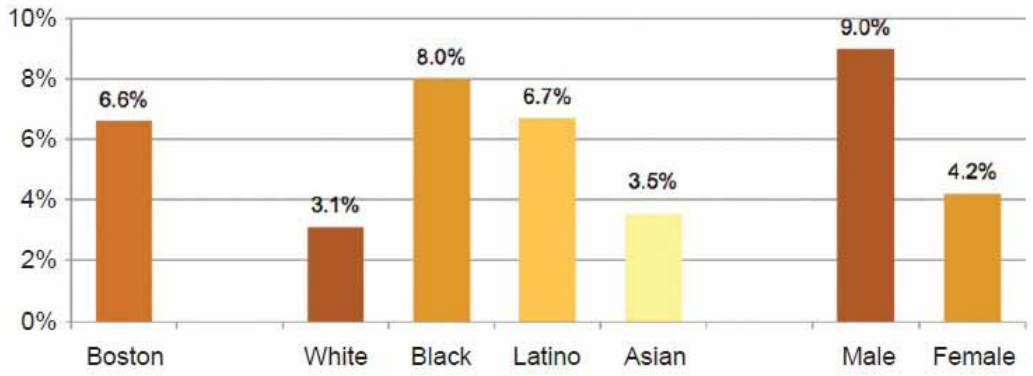
rate and all of its subcomponents, apart from burglary, were also higher in Boston than in Massachusetts or the U.S.[78] It is important to note, however, that crime rates are highly dependent on the type of setting (urban vs. rural) as well as the social and economic characteristics of the area.

In 2009, minors (under age 18) represented more than 14% of all arrests across the U.S.[79] Arrests of individuals under age 25 accounted for 43.6% of all arrests.[79] Among Boston students under age 18 surveyed that same year, 14.6% claimed to carry a weapon in the last 30 days, 5.5% reported missing days of school because they felt unsafe, 7.5% had been threatened or injured with a weapon in the past 12 months, and 5.5% were physically hurt or injured in the past 12 months.[80]

As is the case with social and economic stress, exposure to violence varies based on demographics. Figure 10 illustrates the frequency of being threatened or injured with a weapon at school by gender and race.

In national studies, a lack of voter participation, social trust, and group membership are associated with increased levels of crime

Figure 10: Percentage of Boston Students (18 and Under) Who Have Been Threatened or Injured by a Weapon in the Past Year



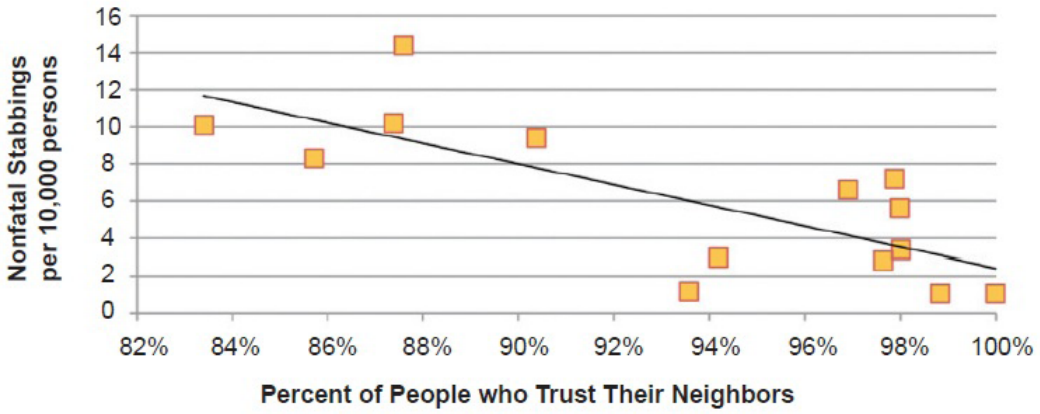
Source: Youth Risk Behavior Survey 2007 and 2009, Youth Risk Behavior Surveillance System (YRBSS), Centers for Disease Control and Prevention (CDC).

Table 7. Nonfatal Shootings and Stabbings by Neighborhood in Boston, 2008

	Stabbings per 10,000 Persons	Shootings per 10,000 Persons
BOSTON	5.8	3.4
Allston/Brighton	1.2	—
Back Bay	1.1	—
Charlestown	7.2	—
East Boston	10.2	—
Fenway	1.1	—
Hyde Park	5.6	2.8
Jamaica Plain	2.8	2.2
Mattapan	8.3	6.5
N. Dorchester	10.1	7.7
Roslindale	3.4	1.8
Roxbury	14.4	8.7
S. Boston	3.0	—
S. Dorchester	9.4	8.0
South End	6.6	3.7
West Roxbury	—	—

Note: Neighborhood data are zip code based. Data are not reported for neighborhoods with fewer than five incidents (—).
Source: Weapon Related Injury Surveillance Program, Massachusetts Department of Public Health.
Analysis: Boston Public Health Commission Research and Evaluation Office.

Figure 11: Boston's Nonfatal Stabbing Rate Is Lower in Neighborhoods in Which People Trust their Neighbors



Source: 2008 Weapon Related Injury Surveillance Program, Massachusetts Department of Public Health; Boston Neighborhood Survey, 2008; Harvard Youth Prevention Center through a cooperative agreement with the Centers for Disease Control and Prevention.

such as homicide and firearm-related violence.[75-77] Table 7 shows the rate of nonfatal shootings and stabbings by neighborhood in 2008. That year, Roxbury had the highest rate of assault-related nonfatal gunshot and stabbing wounds. Allston/Brighton, Back Bay, and Fenway had the lowest rates. Our analysis up to this point has been at the census-tract level, which provides a sufficient number of cases for more robust analysis. However, because our community violence variables are at the neighborhood level, which provides fewer cases of study, our data lack sufficient power to identify significant relationships between social trust measures and violence at the neighborhood level.

Even with the small number of cases available (n=16 neighborhoods), several statistically significant relationships are found between measures of social capital and violent crime. Nonfatal gunshot rates in 2008 were inversely correlated with the percentage of the population that owned their home and with the percentage of respondents who liked their neighborhood, trusted people in their neighborhood, described people in their neighborhood as willing to help their neighbors, and reported that neighbors would intervene if they saw a fight. Similarly, nonfatal stabbings were inversely correlated with the percentage of respondents who liked their neighborhood, trusted people in their neighborhood, and reported that neighbors were willing to help each other.

Figure 11 illustrates the association we observed between trust among neighbors and crime rates (nonfatal stabbings in 2008). In neighborhoods where fewer than 90% of respondents trust their neighbors, the nonfatal stabbing rate ranged from approximately 8.3 to 14.4 per 10,000. In neighborhoods where more than 93% trust their neighbors, the nonfatal stabbing rate ranged from 1.1 to 7.2. A similar pattern emerges with nonfatal gunshot rates. Of course, this relationship does not establish causality between these factors. Other factors may be responsible, and reverse causality is a possibility: the level of violence in the community may affect residents' level of trust in their neighbors, rather than the reverse.

III. Conclusions: Socioeconomic Status, Social Capital, and Health Outcomes in Boston

The analyses presented here have shown that elements of social capital, such as social trust and voter participation, are strongly linked to social, economic, and demographic characteristics of communities. Understanding of the causal relationship between social capital and health is still evolving. The analysis included in this report is entirely cross-sectional (a study of the relationship between two variables at one point in time rather than sequentially) and ecological (a study of the characteristics of populations rather than individuals) and does not address the literature that examines mechanisms whereby social capital, cohesion, and other factors might relate to the natural history of disease progression. Health disparities associated with income, education, race, and place are complex, multifactorial relationships that cannot be reduced to a single explanation or mitigated by a single policy solution. The literature and this analysis suggest, however, that interventions aimed at strengthening community bonds and networks may be important public health strategies in Boston, particularly in the neighborhoods of Mattapan, North and South Dorchester, and the South End.

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