Social Determinants of Health and Crime in Post-Katrina Orleans Parish

TECHNICAL REPORT
Center on Human Needs
Virginia Commonwealth University
Richmond, Virginia

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VCU Center on Human Needs
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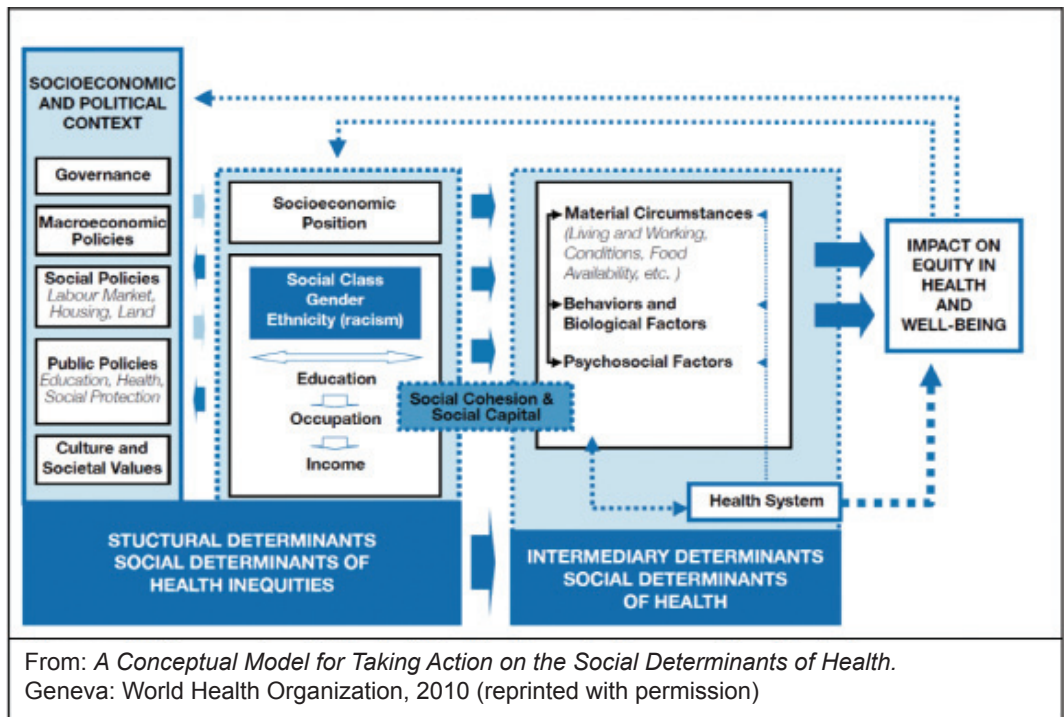Benjamin F. Evans, M.H.S.A.
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Preface

Health is influenced by more than health care, and the same is true for health disparities.[1] Inequities in health exist for reasons that transcend access to health care or adequate health insurance coverage. Health is also heavily influenced by health behaviors (e.g., tobacco use), modifiable risk factors (e.g., obesity), and environmental conditions. These conditions are only partly a matter of personal choice. Adopting a healthier diet requires access to supermarkets or farmers' markets that sell fresh produce. Regular physical activity requires a conducive built environment and access to safe parks, pedestrian routes, and green space for residents to walk, bicycle, or play. Tobacco and alcohol use is influenced by enticing advertising and marketing practices. Exposure to environmental pollutants from unhealthy housing or from nearby factories and smokestacks are not choices made by residents but by society.

Figure 1:
World Health Organization Conceptual Model for Social Determinants of Health

From: *A Conceptual Model for Taking Action on the Social Determinants of Health.* Geneva: World Health Organization, 2010 (reprinted with permission)

In the language of social epidemiology, "downstream" determinants of health—ranging from unhealthy behaviors to living and working conditions—are the byproduct of "upstream" structural determinants (see Figure 1) such as socioeconomic position, race-ethnicity, occupation, and social cohesion. These socioeconomic circumstances are themselves the result of upstream policies that create opportunities for education and employment, income and savings, social equality, and environmental stewardship. Macroeconomic policies create commercial incentives for industries to either promote unhealthy products or more healthful alternatives.[2]

Health also varies sharply by geography—across communities and neighborhoods—because unhealthful downstream conditions are often concentrated in disadvantaged areas. Areas populated by the poor or communities of color typically experience greater exposure to unhealthy conditions and material deprivation, a vicious cycle that is itself shaped by upstream factors. These upstream influences include historical antecedents, such as racial or ethnic discrimination and recurring cycles of poverty that inhibit economic growth and social mobility over generations, but also modern-day decisions about where to position highways and supermarkets and how much resource to invest in public transportation, housing, local development, crime prevention, public schools, job training, and social services. The recognition that "place matters" to health and the need to understand how unwise social policies foment health inequity comes at the recommendation of prestigious commissions sponsored by the World Health Organization,[3] MacArthur Foundation,[4] and Robert Wood Johnson Foundation.[5]

About the Place Matters Project

The Place Matters technical reports were produced by the Virginia Commonwealth University (VCU) Center on Human Needs (CHN) in collaboration with the Joint Center for Political and Economic Studies/Health Policy Institute (HPI) and the Virginia Network for Geospatial Health Research (VANGHR). All maps and geospatial analyses were produced by VANGHR.

The production of the Place Matters technical reports was funded by HPI under a subaward from a parent grant from the National Institutes of Health (grant 5RC2MD004795-02). The goal of the project was to prepare and disseminate a series of locally tailored Community Health Equity reports (CHERs) to assess population health inequities and related social and economic conditions for the following eight communities:

- Alameda County, California
- Baltimore, Maryland
- Bernalillo County, New Mexico
- Orleans Parish, Louisiana
- Cook County, Illinois
- San Joaquin Valley, California
- Boston, Massachusetts
- South Delta, Mississippi

The VCU Center on Human Needs and VANGHR were contracted by HPI to develop technical reports on which the eight CHERs were based. What follows is the technical report for Orleans Parish, Louisiana. The focus of the report and the research questions it addresses were guided by extensive input from the Place Matters team in Orleans Parish. See the Methods Appendix on the CHN website for more details on analytic methods.

The project was approved by the VCU Institutional Review Board.

For more information about the Place Matters technical reports or collaborating organizations visit the websites listed below:

Center on Human Needs: www.humanneeds.vcu.edu
Health Policy Institute: www.jointcenter.org/institutes/health-policy
Place Matters Initiative: www.jointcenter.org/hpi/pages/place-matters
Virginia Network for Geospatial Health Research: vnghr.org/

Introduction

The health of Orleans Parish residents is related to many factors.[6] Across the country, disease rates vary dramatically by age, gender, race, and ethnicity as well as with the prevalence of behaviors that increase the risk for diseases.[7–15] Place matters in health because characteristics of the areas in which people live affect health choices, behaviors, environmental exposures, and access to medical care.[16–21] Local conditions that may affect health include levels of stress and environmental toxins, the social and economic characteristics of individuals and families (such as education and income), and the characteristics of the communities in which people live. This report will focus on the characteristics of Orleans Parish and its communities that may affect health outcomes for residents, including crime, education, and risk behaviors. Health outcomes that will be explored include life expectancy, deaths from heart disease and stroke, and sexually transmitted diseases.

Countywide statistics oversimplify important geographic differences that exist between different neighborhoods and communities within Orleans Parish and that contribute to large differences in the health of residents. Geographic disparities in health status within Orleans Parish reflect, in part, geographic patterns in the population and living conditions. The health challenges faced by individuals and households are influenced by the neighborhood.[22,23] Regardless of one's education, income, or motivation to make healthy choices, risks may be introduced by increased crime, air pollution, the absence of places to exercise or nutritious food, poor schools, a scarcity of good jobs, and stress related to these community challenges.[20,21,24–32] Historical patterns contribute to long-term trends of placing vulnerable populations in stressed areas. This in turn reinforces cycles of hardship that entrench patterns of socioeconomic disadvantage.[33–37]

Of particular interest to Orleans is the geographic distribution of crime and the social factors that may leave communities most vulnerable to it. Orleans has a violent crime rate that is 80.9% greater than that of the rest of the nation (777.0 vs. 429.4 crimes per 100,000 population, respectively) and a property crime rate that is 26.7% greater (3,846.3 vs. 3,036.1 crimes per 100,000 population, respectively).[38] This report examines communities with elevated crime rates along with the social and economic factors that may contribute to the problem.
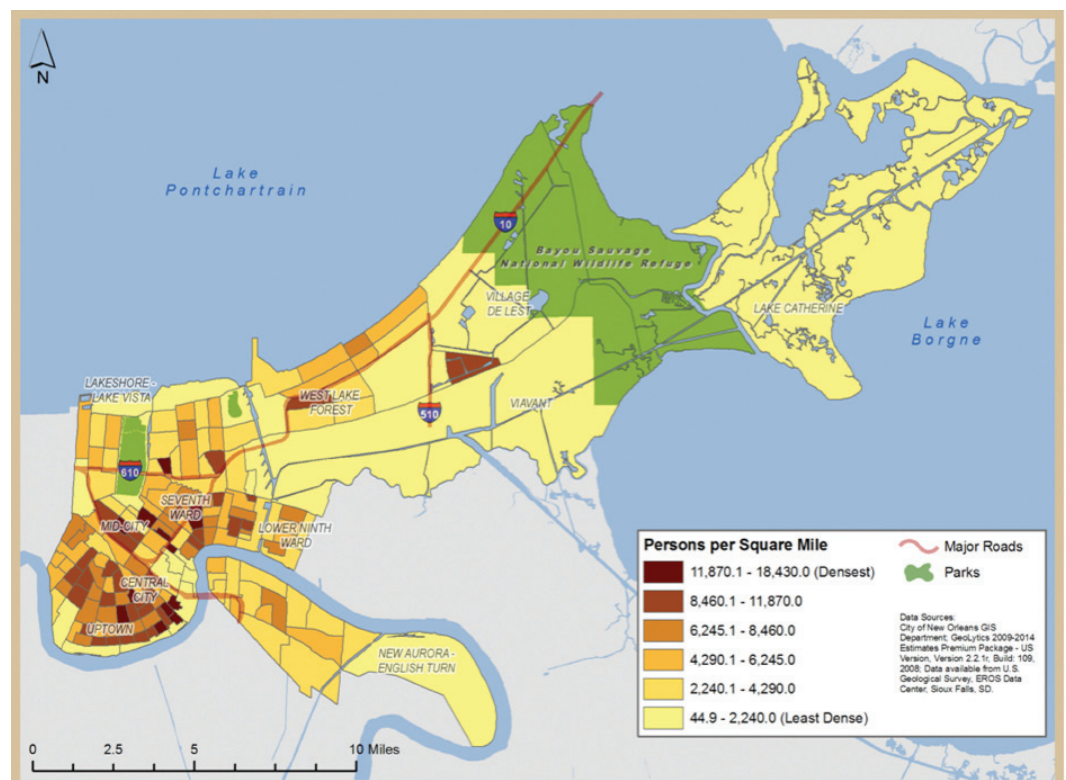
Part I of this report provides background information about New Orleans, including population data, socioeconomic conditions, community characteristics, a community risk index, and health outcomes. Part II examines the relationship between socioeconomic status, educational attainment, and health outcomes. Part III investigates the relationships between demographic, social, and economic characteristics and crime, including the rate of risk behaviors after Hurricane Katrina and its resultant displacement. Part IV presents conclusions from the analyses. Appendix A (available on the CHN website) details the data and methods used in preparing this report.

I. Background: Population, Community Characteristics, and Health in New Orleans

Population

Orleans Parish, located in southeastern Louisiana, is home to the city of New Orleans and a population of 354,850 as of 2009.[34] The overall population density in Orleans is 1,761.2 people per square mile but ranges by census tract from 44.92 in the Lake Catherine area to more than 18,000 in the Central City. Orleans is characterized by a dense urban environment in its central, downtown area and a more sparsely populated area to the east (Map 1).

Map 1:
Population Density
by Census Tract

Orleans Parish has a much larger concentration of non-Hispanic Blacks than has the rest of the nation (61.2% of the population, compared with 12.4%, nationally), making the White population the minority in the Parish[38,39] (Table 1). According to 2009 American Community Survey data, an estimated 5.8% of the population is foreign-born, which is slightly higher than the percentage in Louisiana but much lower than the national percentage (3.1% and 12.5%, respectively).
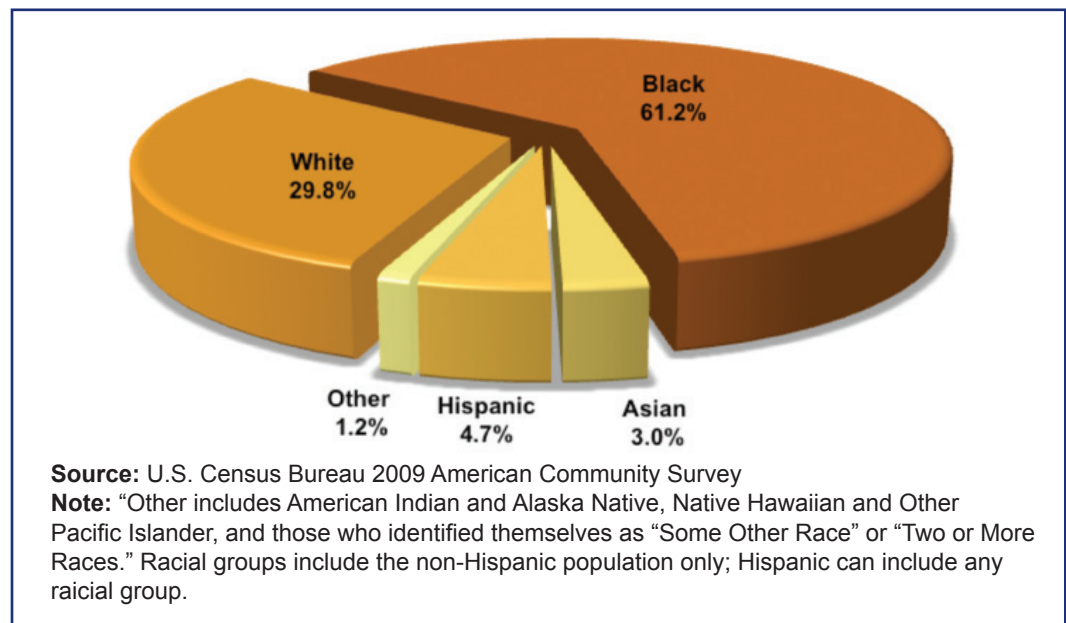
	Orleans Parish	Louisiana	United States
Population (2009)(a)	354,850	4,492,076	307,006,556
Population Density (2000)(b)	1,761.2	98.2	86.7
Race/Ethnicity (2009)(a)			
White	29.8%	61.3%	64.9%
Black	61.2%	31.8%	12.4%
Asian	3.0%	1.5%	4.5%
Hispanic	4.7%	3.6%	15.8%
Other	1.2%	1.8%	2.4%
Foreign Born (2009)(a)	5.8%	3.1%	12.5%

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

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-Hispanic population only; Hispanic can include any raicial group.

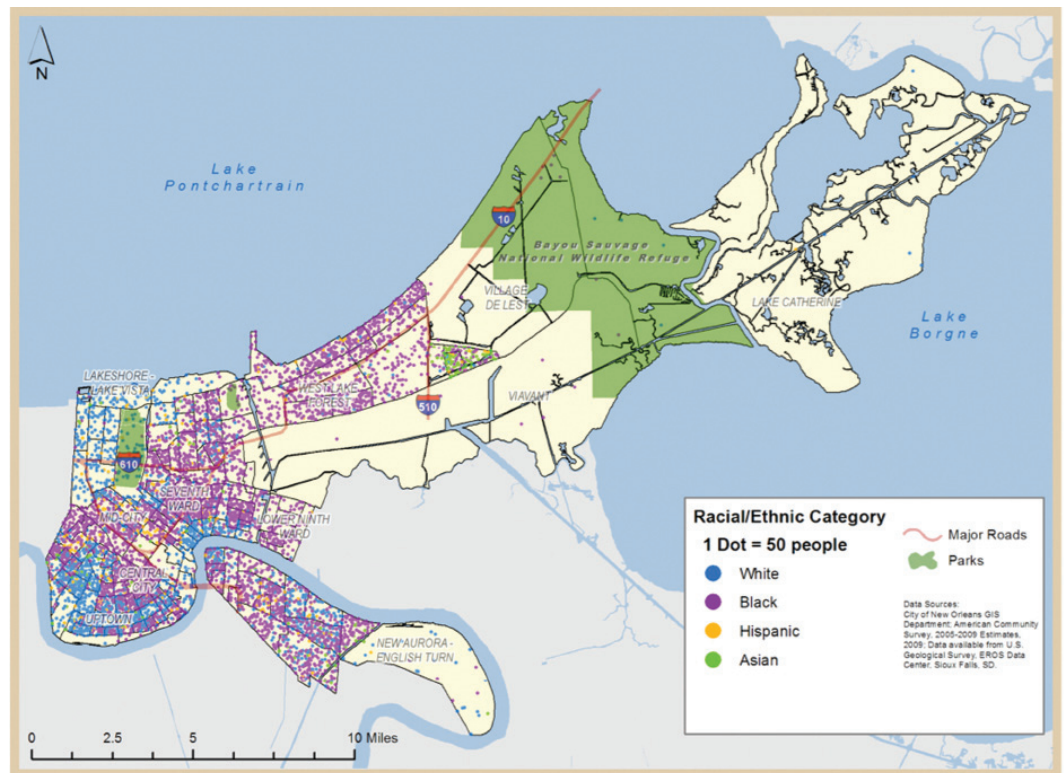**Source:** U.S. Census Bureau 2009 American Community Survey
Note: "Other includes American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, and those who identified themselves as "Some Other Race" or "Two or More Races." Racial groups include the non-Hispanic population only; Hispanic can include any raicial group.

In many instances, people of color and disadvantaged populations have historically been relegated to isolated and segregated communities that perpetuate cycles of hardship through avenues such as limited housing and employment opportunities and lack of access to capital. One characteristic of segregated communities is high population density, which is closely related not only to racial segregation but also to the unemployment rate, resource deprivation, and violent crime.[40]

In part because of racial segregation, racial and ethnic groups are concentrated differently across the Parish.[21,41,42] The Index of Dissimilarity[43] is a measure of residential segregation that quantifies the percentage of the population that would have to relocate to achieve perfect racial integration of the community: The higher the value is, the more segregated is the area. In 2009, the Index of Dissimilarity between the White and Black population of Orleans was 65.5%, as compared with 56.2% for the state of Louisiana.[44] New Orleans ranked 34th in Black-White segregation among the top 100 largest metropolitan areas, according to the 2005–2009 American Community Survey. Milwaukee, Detroit, the New York City metropolitan area, Chicago, and Cleveland took the top five spots.[45]

The Index of Dissimilarity is less useful than the diversity index in comparing smaller geographic units such as census tracts. The diversity index is 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. Although the diversity index for Orleans as a whole is 53.2%, the value across census tracts ranges from zero (no diversity) to 70.1% (high diversity). According to the U.S. Census Bureau, there are 14 tracts in
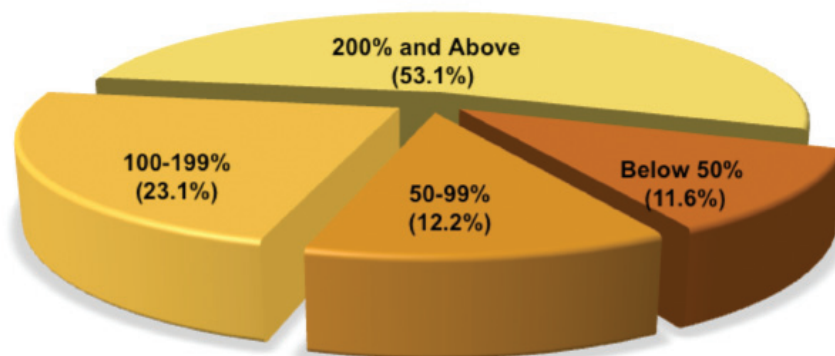
Orleans where non-Hispanic Blacks constitute the entire population.[46] These tracts are located in the following neighborhoods: Fischer Development, the Lower Ninth Ward, the Florida Area, the Florida Development, Pontchartrain Park, Lake Catherine, the Seventh Ward, Saint Bernard Area, Tremé/Lafitte, the B.W. Cooper, Dixon, and the northern portion of Central City. The most diverse tract in Orleans is a three-block group area within Mid-City that is contained between South Carrollton Avenue, City Park Avenue, and Interstate 10 and Canal Street.

Map 2 illustrates the spatial distributions of different racial groups throughout the parish. The greatest racial diversity exists in Lake Terrace and Oaks, Saint Anthony, Milneburg, Old Aurora, Tall Timbers/Brechtel, West and East Riverside, the Lower Garden District, the Central Business District, Mid-City, and Marlyville/Fontainebleau. By comparison, the Lower Ninth Ward, Seventh Ward, St. Roch, and Central City areas comprise highly segregated Black communities in Orleans, whereas Whites predominate in the Lakeview area between Orleans and Pontchartrain Avenue and in Audubon between Robertson Street and Prytania Street.

Socioeconomic Characteristics

As is true of other communities, socioeconomic conditions in Orleans Parish exert an important, and often unrecognized, influence on health status. Nationally, families living below the federal poverty level (FPL) are 3.6 times more likely to report fair or poor health than are those with incomes of at least twice the poverty level.[47]

Figure 3:
Income to Poverty Ratio for
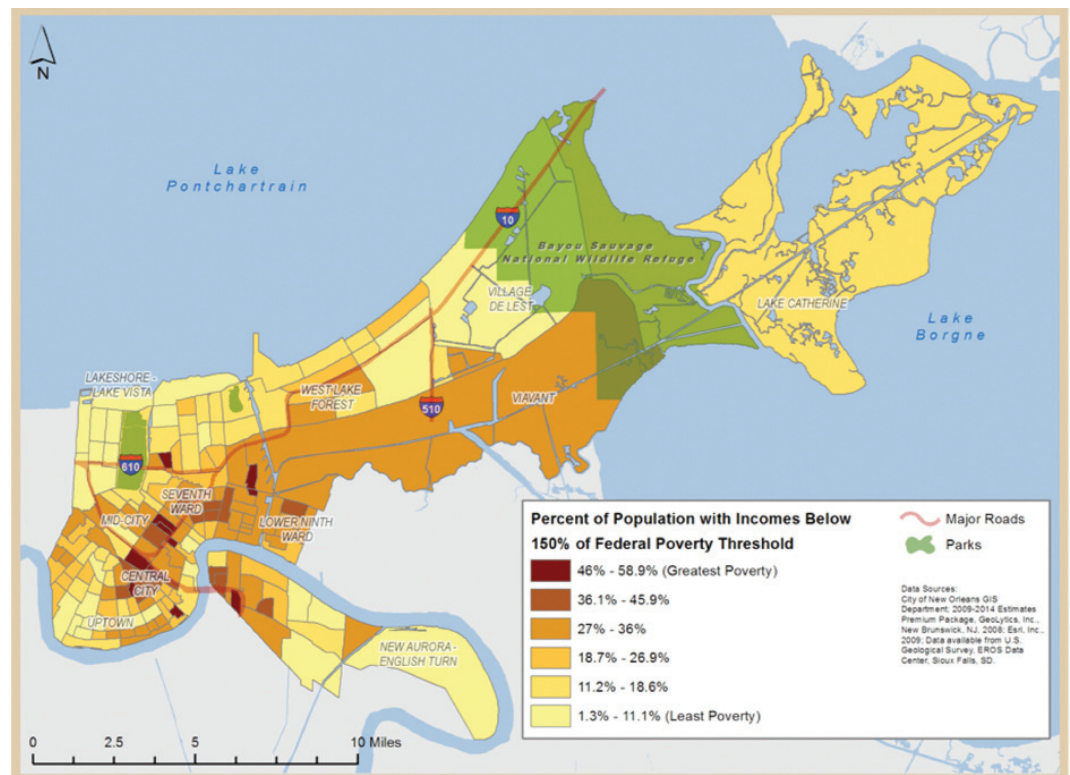Orleans Parish County

Source: U.S Census Bureau 2009 American Community Survey

Poverty is a pervasive issue in Orleans. In 2009, almost one fourth (23.8%) of the population in Orleans Parish had incomes below the FPL, as compared with 17.3% in Louisiana and 14.4% nationwide. The income-to-poverty ratio expresses household income as a percentage of the FPL. Figure 3 shows that more than one of every nine persons (11.6%) in New Orleans lived in severe poverty, with incomes less than half the FPL (below an income-to-poverty ratio of 0.5), and almost half (46.9%) were either poor or near poor, with incomes less than twice the FPL. For a family of four in 2009, this would be an annual income below $44,100.
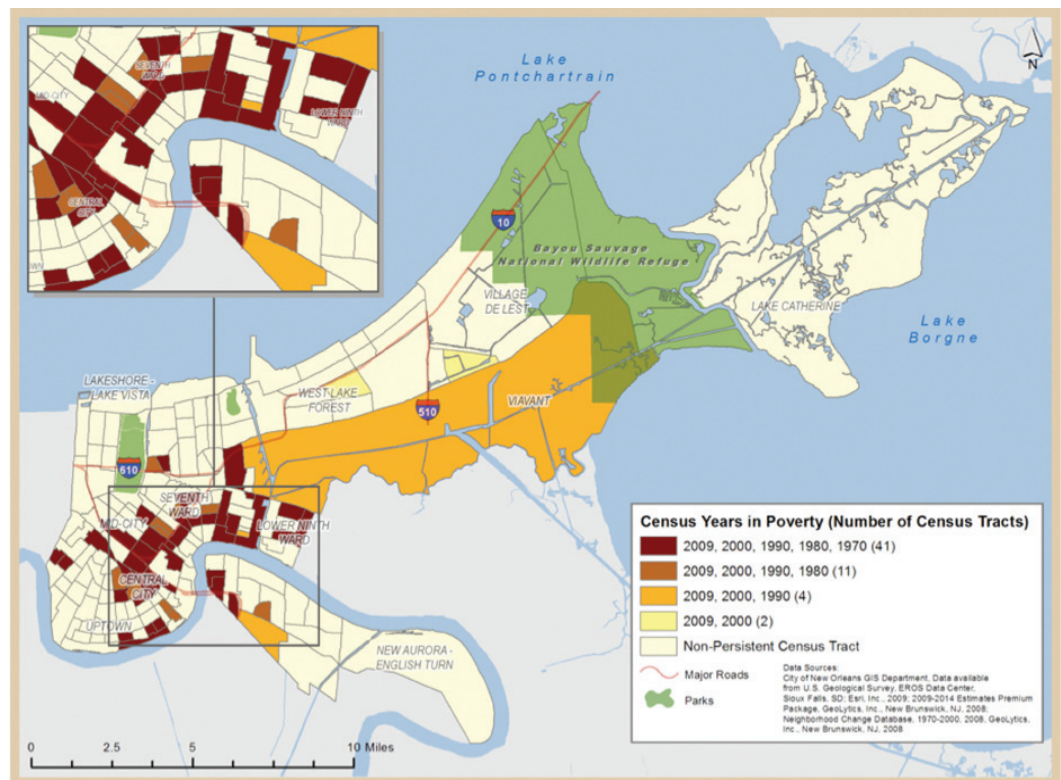
Nationwide in 2009, 23.6% of households had incomes below 150% of the FPL.[34] The same year in Orleans Parish, 54.1% of the census tracts—fully 98 tracts—met or exceeded this level of poverty. Areas of concentrated poverty, where at least half of the population has an income below 150% of the FPL, include the Fischer Development, the Florida Development, the Desire Development, Tremé/Lafitte, Iberville, the B.W. Cooper, Saint Bernard area, the St. Thomas Development, and the western portion of Central City between the Pontchartrain Expressway and Martin Luther King Blvd (Map 3). The seven tracts that make up the Lower Ninth Ward have a rate of poverty below 150% of the federal poverty level, ranging from 27% to 39% of the population.[44] After hurricane Katrina, this percentage varied widely over time, likely because of the slow repopulation of the area after the flooding.[48]

Map 3:
Poverty by Census Tract

The persistence of concentrated poverty over several decades may carry additional health and societal implications, particularly for children living in affected areas. A persistent lack of economic resources during childhood has consequences on cognitive, emotional, behavioral, and physical development.[49,50] It may also diminish the likelihood of high school completion, thus perpetuating disadvantage and the multigenerational cycle of living in conditions that adversely affect health. *Persistent poverty* is defined as poverty occurring in areas in which at least 20% of the population was poor (incomes less than 100% of the FPL) for at least two decennial census periods. The following neighborhoods of Orleans Parish contain census tracts that meet these criteria for persistent poverty over five decades: Central City, the Seventh Ward, the Lower Ninth Ward, B.W. Cooper, Bayou Saint John, Bywater, the Central Business District, the Desire Area, East Riverside, the Fischer Development, the Florida Development, Gert Town, Iberville, and Irish Channel (Map 4).

Map 4:
Persistent Poverty
by Census Tract

Insufficient income to meet basic needs intensifies material hardship for both the poor and the middle class. In 2009, the housing cost burden in Orleans was moderate to severe (consuming between 30% and 49.9% of income) for 19.6% of households, and another 19.3% of households experienced severe housing cost burdens (consuming more than 50% of income).[39] Both values exceed the rate for Louisiana (12.5% and 8.2%, respectively) and the United States (18.4% and 12.0%, respectively).[39] The same year, the percentage of households lacking plumbing in Orleans was more than double that of Louisiana and triple that of the nation.[44] Nearly one third of Orleans households (30.4%) did not have a vehicle as compared with less than one tenth for the state and the nation (9.2% and 8.5%, respectively).[44] Insufficient income can also cause instability in securing even basic needs, such
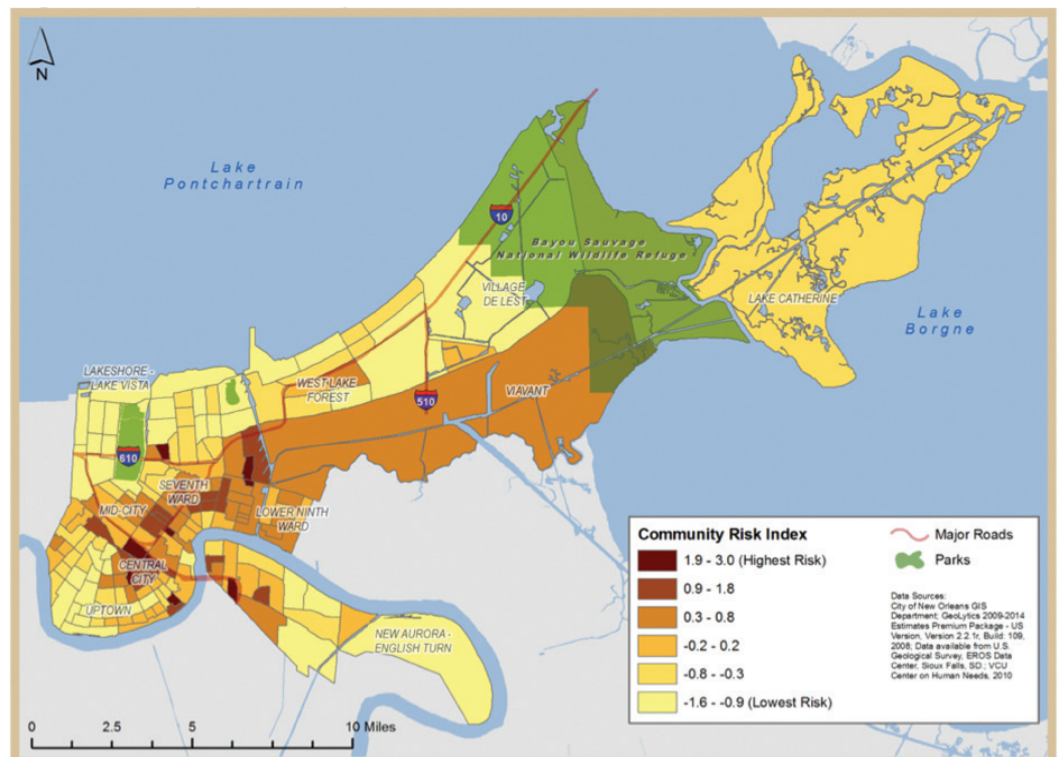
as food. The U.S. Department of Agriculture reports that one of every 10 households in Louisiana experienced some form of food insecurity between 2007 and 2009.[51]

A lack of financial resources exposes individuals to further risks from the environment in which they live. An unkempt physical environment, lacking in proper maintenance, serves as a signal to others that otherwise unacceptable behaviors may be tolerated.[29] Orleans housing units that are not occupied by owners are at risk of deterioration, which in turn leads to neighborhood blight. In 2009, nearly a quarter (23.5%) of Orleans housing units was vacant, compared with 14.0% in Louisiana and 12.6% nationally.[39] In 2004, the last full year before Katrina, only 15.2% of Orleans households were vacant.[52] In addition, only 40.5% of housing units in Orleans were occupied by those who owned and held financial stake in the property, compared with 61.3% in Louisiana and 60.7% nationally.[29,44]

Community Risk Index

To sum up socioeconomic and neighborhood risks, we developed an index for comparing Orleans Parish neighborhoods. Using a data reduction technique known as factor analysis, we statistically combined a set of measures into a single community risk index (CRI) for each census tract (see Appendix A on website for details). This risk index was calculated on the basis of measurements of the following indicators for each community: population below 150% of the FPL, severely overcrowded households (more than 1.5 person per room), households without a vehicle, and vacant housing.
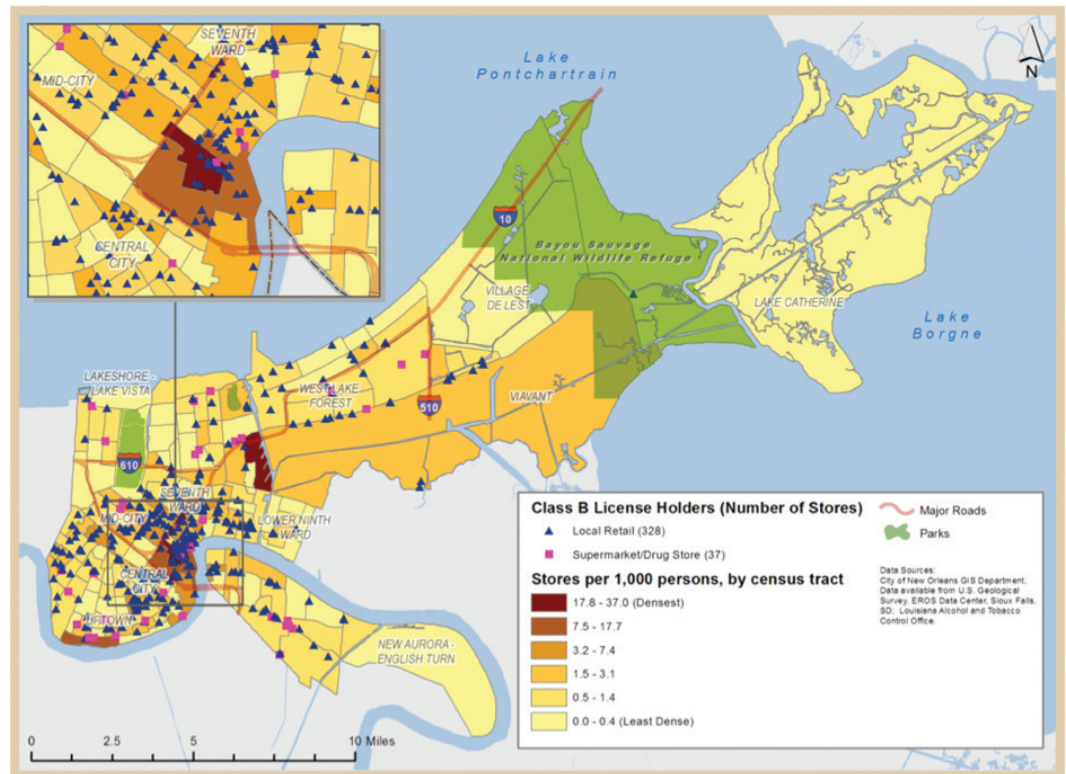
Map 5:
Community Risk Index
by Census Tract

Higher scores on the CRI indicate a community in which poverty, material deprivation, and poor housing conditions combine and may create an environment of community distress. Such neighborhoods may experience higher rates of crime and environmental hazards, restricted access to healthy foods and job opportunities, and poor health outcomes.[24–33] Map 5 shows the CRI for individual census tracts in Orleans, with the darkest colors indicating areas facing the greatest community risk (high CRI) from the measured variables. The CRI is a negative value (–1.57) in favored areas such as the Lake Terrace and Oaks region north of Leon C. Simon Drive and is as high as 3.00 in the Lower Garden District between Felicity Street and Josephine Street. Fully 84 tracts (46.4%) have a CRI value greater than zero, indicating a higher than average level of risk. Areas in Orleans with the highest CRI include the Desire Development, Saint Bernard, Central City, the Saint Thomas Development, the Florida Development, Iberville, B.W. Cooper and the Fischer Development. Areas with the lowest risk include Old Aurora, Lake Terrace and Lake Oaks, Lakeview, West End, Lakewood, Fillmore, Little Woods, and Read Boulevard East.

Socioeconomically disadvantaged communities often lack nutritious food options and have a surfeit of unhealthy options, including fast food outlets and liquor stores. The density of off-premise liquor establishments is correlated with more frequent and more severe violence, independent of other socioeconomic characteristics associated with crime.[53] This effect is heightened in areas where liquor stores are clustered.[53] The type of retail provider is also important. Blumenthal et al. found that retail providers in areas of socioeconomic distress tended to be smaller liquor stores rather than supermarkets.[54] In addition, the characteristics of the neighborhood population seemed to affect the type of alcohol consumed. In the same study, areas with a higher percentage of White and median income had greater availability of beer beverages, whereas areas with higher concentrations of Blacks and poverty had greater availability of malt liquor products.[54] Malt liquor availability is associated with increased drinking and intoxication levels as well as homicide.[55,56]
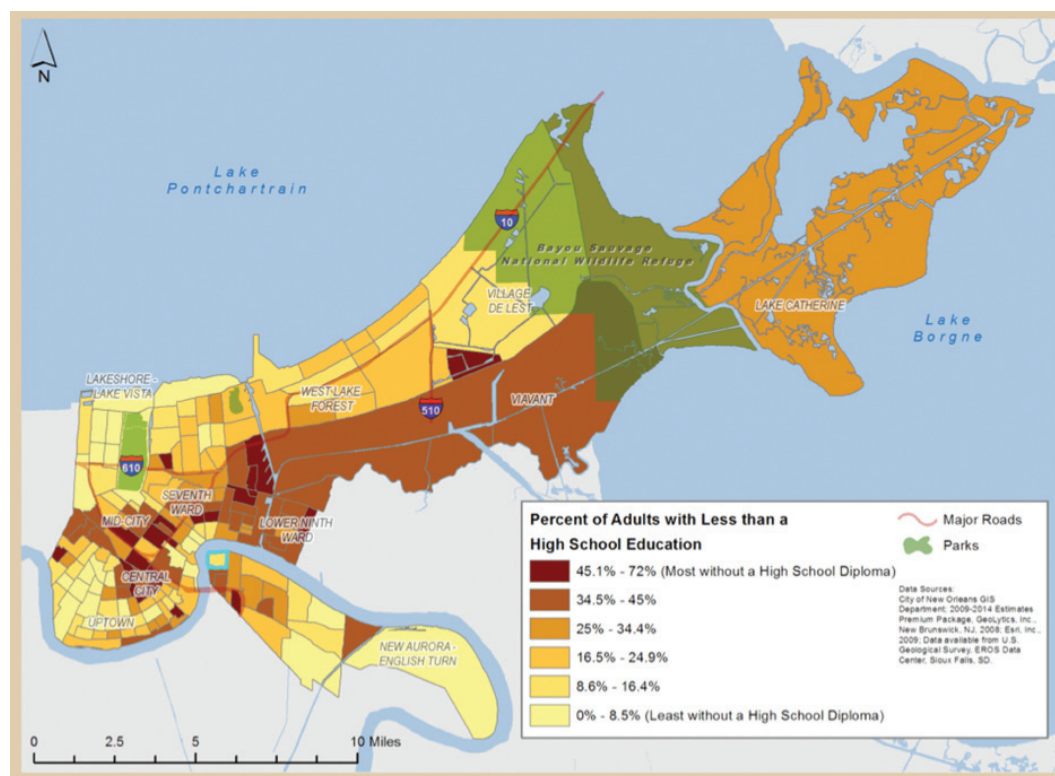
Map 6 highlights the geographic disparity in the location and density of alcohol retail establishments in Orleans. The highest density of liquor stores exists in the Central Business District (surrounded by Magazine Street and Derbginy Street on the east and west and Iberville Street and Lafayette Street to the north and south) and the Desire Area. Almost one third of the population in this area (30.8%) is below 150% of the FPL.[44]

Education

Education is a pathway to higher income and net worth, which also have 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 made less than half of the earnings of their counterparts with a Bachelor's degree ($18,432 versus $47,510, respectively).[39] Even those adults who had attended some college enjoyed greater average earnings than those who only graduated from high school ($31,906 versus $26,140, respectively).[39]

Among those over the age of 25, Orleans Parish has a slightly lower percentage of the population with less than a high school education than does the state of Louisiana (16.1% and 17.8%, respectively), but its percentage exceeds the national average (14.7%) (Table 2). [33,34] The percentage of adults in Orleans who lack a high school education varies greatly by location (from 0% to 72%). In 120 census tracts (66.3%), the rate falls below that of Louisiana, and in 127 (70.2%) tracts it falls below the national average. The following areas of Orleans have the lowest percentage of adults with a high school education: B.W. Cooper, Central City, the Desire Area, the Desire Development, the Fischer Development, the Florida Area, and the Florida Development (Map 7). The highest proportion of adults with a high school education exists in the Lakeshore–Lake Vista, Lakeview, Audubon, Black Pearl, East Carrollton, and New Aurora/Englishtown areas.

Besides educational attainment, measures of educational proficiency (how well students perform on tests) also vary by place. The National Assessment of Educational Progress (NAEP) draws samples of students in the 4th, 8th, and 12th grades to gauge the level of proficiency in various subjects. In 2009, estimates of proficiency scores for 4th- and 8th-grade students in Louisiana were below the average score for public students in the nation for reading and math.[57–60] In all four categories, Louisiana scored no higher than the 41st-ranked state for these scores.

Race and ethnicity are strong predictors of educational attainment. Compared with Whites in the same time period, Black Orleans residents of age 25 and older were more than three times as likely to lack a high school education, and Asian residents were five and half times as likely[22,39] (Figure 4). The Asian population of Orleans is more than twice as likely to lack a high school education (35.1%) as the Asian population of the United States (14.7%).[39]

	Orleans Parish	Louisiana	United States
Educational Attainment (a)			
Less than High School	16.1%	17.8%	14.7%
High School Only	26.8%	34.3%	28.5%
Some College	25.9%	26.4%	28.9%
Bachelor's Degree or Higher	31.1%	21.4%	27.9%
Poverty Rate (a)			
Below 50%	11.6%	7.2%	6.3%
50–99%	12.2%	10.1%	8.1%
100–199%	23.1%	20.0%	18.4%
200% and Above	53.1%	62.7%	67.3%

(a) Source: U.S. Census Bureau 2009 American Community Survey

Source: U.S. Census Bureau, 2009 American Community Survey
Note: White includes non-Hispanic population only; all other racial categories include Hispanic and non-Hispanic population, Racial groups include non-Hispanic population only; Hispanic can include any racial group.

Educational attainment is a strong predictor of health risks. Low educational attainment is associated with being uninsured, lacking a usual source of health care, and foregoing or delaying medical care based on cost.[61,62] National statistics indicate that adults (age 25 and older) who lack a high school education or equivalent are more likely to engage in unhealthy behaviors such as cigarette smoking[63] and are three times more likely to die before age 65 as those with a college education.[62] Geographic disparities in the level of risk a community faces are related to health choices, behaviors, environmental risks, and access to medical care.[16–18,20,21,64]

Health Outcomes

According to the County Health Rankings released in 2011 by the Robert Wood Johnson Foundation, Orleans Parish ranked 60th in health status among the 64 counties in Louisiana.[65] In 2004, there were 500.4 deaths before the age of 65 for every 100,000 residents in Orleans, compared with 388.6 in St. Tammany Parish, which ranked first in health status in Louisiana.[66]

In 2007, Louisiana had the third lowest life expectancy of any state including the District of Columbia.[67] The same year, Louisiana had the second highest rate for diabetes mortality and low birth weight and the fifth highest cardiovascular mortality rate.[68,69]
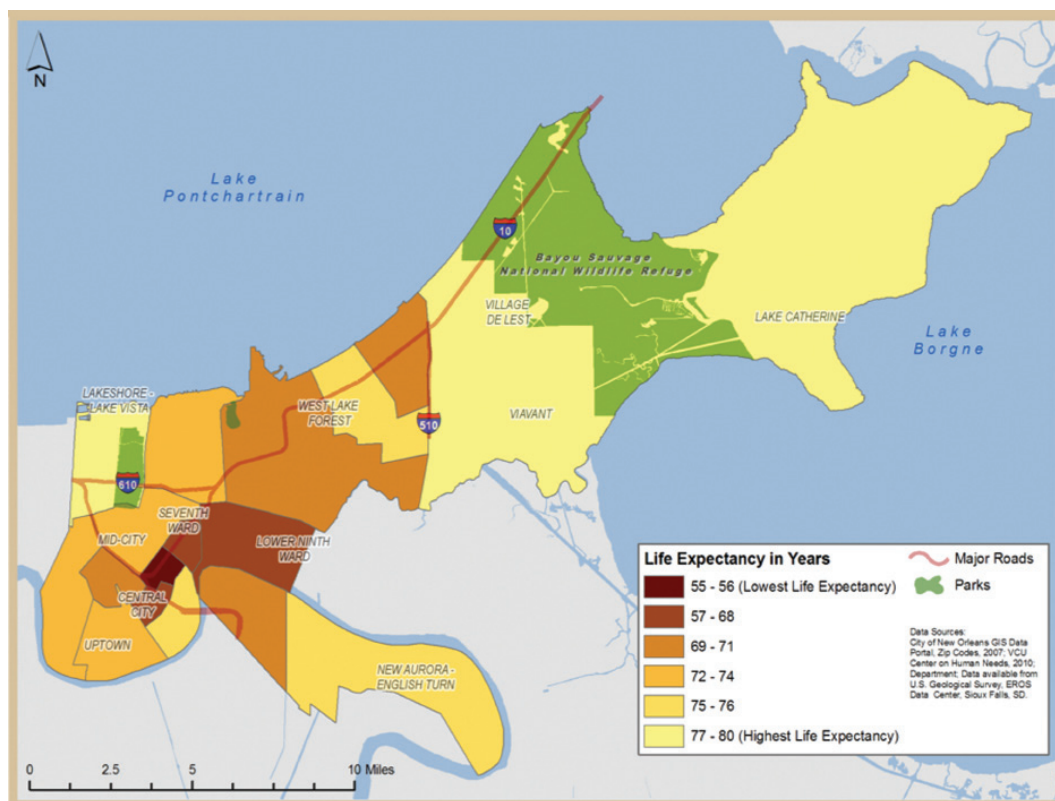
Orleans Parish has poorer health outcomes on many important measures (Table 3). The age-adjusted rate for all-cause mortality and low birth rate is higher in Orleans than in either Louisiana or the United States as a whole. According to vital statistics records from 1995 to 2007, the estimated life expectancy at birth in New Orleans is 72.5 years, which is 2.8 years less than the state average (75.3 years) and fully 5.4 years less than the national average (77.9 years).

	Orleans	Louisiana	United States
Life Expectancy	72.5 (a)	75.3 (b)	77.9 (c)
All Cause Mortality Rate* (2007)(c)	1061.5	970.6	807.6
White	829.3	903.1	792.2
Black	1237.9	1171.0	1035.2
Cardiovascular Mortality Rate (2007)(d)	336.6	340.1	295.3
White	n/a	317.8	288.7
Black	389.9	410.8	389.9
Low Birth Weight Rate (2008)(e)	13.0%	10.8%	8.2%
White Alone	7.4%	7.9%	7.1%
Black Alone	15.1%	15.1%	13.4%
Non-Hispanic	13.3%	11.0%	8.6%
Hispanic	8.8%	7.0%	7.0%

(a) Calculations performed by VCU Center on Human Needs from data provided by Louisiana Vital Statistics Department and 2009 Geolytics Premium Estimates
(b) Calculation performed by VCU Center on Human Needs from data provided by the Centers for Disease Control and Prevention CDC Wonder Compressed Mortality Data 2007
(c) Health, United States. 2010: With Special Features on Death and Dying; The Centers for Disease Control and Prevention: 2007.
(d) Data from the Centers for Disease Control and Prevention, CDC Wonder, adjusted to the 2000 Census Population
(e) The Centers for Disease Control and Prevention National Vital Statistics System 2008
*Mortality statistics are per 100,000 population

Given the geographic variation in socioeconomic and environmental factors that affect health in Orleans Parish, it follows that health outcomes—including life expectancy, cardiovascular mortality, and low birth weight—vary sharply by neighborhood as well. As shown in Map 8, life expectancy at birth varies by 25.5 years between ZIP codes within Orleans Parish. We calculated a life expectancy of 54.5 years in ZIP code 70112 (containing portions of the neighborhoods Tulane/Gravier, Iberville, the Central Business District, and Tremé/Lafitte), which is a value lower than the life expectancy of Cambodia, Gabon, and Guinea.[70] The population in ZIP code 70112 also had the highest cardiovascular mortality, stroke mortality, and diabetes mortality in Orleans (Table 4).The highest life expectancy in Orleans is 80.0 in ZIP code 70124 (Lakeshore, Lake Vista, Lakeview, West End, Lakewood, and Navarre).

ZIP Code	Neighborhood	Life Exp[a]	STD Rate[b]	LBW Rate[b]	Heart Disease Mortality[a]	Percent Less Than HS[c]	Percent Non-White[c]	Percent Below 150% FPL[c]
70112	Tulane, Gravier, Iberville, Tremé	54.5	4658.6	34.3	1946.2	39.5%	87.2%	36.0%
70113	Central City, Central Business Dist.	66.3	1292.8	27.1	375.9	40.0%	84.2%	35.0%
70114	Algiers Point, McDonogh, Whitney, Behrman	70.5	1048.7	29.5	350.9	27.4%	78.5%	31.0%
70115	Audubon, West Riverside, Uptown, Freret, Milan, Touro, E. Riverside, Irish Channel	73.8	573.8	12.7	261.5	16.7%	44.6%	21.0%
70116	Tremé, Seventh Ward, French Quarter, Marigny	65.7	1937.0	16.3	406.8	21.8%	55.2%	28.0%
70117	St.Roch, Florida Area, St. Claude, Bywater, Lower Ninth Ward, Holy Cross	67.6	1114.6	15.1	349.9	37.5%	88.4%	34.0%
70118	Audubon, Black Pearl, E. Carroliton, Leonidas, Hollygrove	73.2	671.6	13.5	291.9	20.0%	55.0%	20.0%
70119	Mid-City, Bayou, St. John, Tremé	74.4	841.2	11.3	262.1	34.9%	75.6%	25.0%
70122	Lake Terrace & Oaks, Fillmore, St. Anthony, Milneburg, Gentilly Terrace, Dillard	73.1	568.1	8.2	252.4	20.5%	75.3%	20.0%
70124	Lakeshore, Lake Vista, Lakeview, West End, Lakewood, Navarre	80.0	75.8	0.0	190.9	7.8%	6.7%	6.0%
70125	Broadmoor, Marlyville, Fontainebleau, Gert Town, B.W. Cooper	70.6	628.8	11.4	302.8	24.6%	66.6%	26.0%
70126	Pontchartrain Park, Gentilly Woods, Desire Area, Pines Village, Little Woods, Plum Orchard	68.8	826.8	12.7	339.1	22.2%	88.4%	20.0%
70127	Little Woods, West Lake Forest, Plum Orchard, Read Blvd West	75.4	608.4	12.1	236.8	18.4%	87.2%	18.0%
70128	Little Woods, Read Blvd East	70.5	742.5	14.0	317.9	16.8%	90.0%	15.0%
70129	Little Woods, Read Blvd East, Viavant, Venetian Islands	79.1	219.6	6.8	161.5	39.6%	80.5%	24.0%
70130	St. Thomas Development, Lower Garden Dist., Central Business Dist.	75.4	705.0	15.4	241.0	20.2%	44.5%	24.0%
70131	Old Aurora, Tall Timbers, Brechtel, New Aurora, English Turn	75.6	571.9	18.7	314.4	12.6%	47.9%	13.0%

(a) Calculated from abridged death tables provided by LA Vital Records Office and population estimates from 2000–2009 Geolytics Premium Estimates.
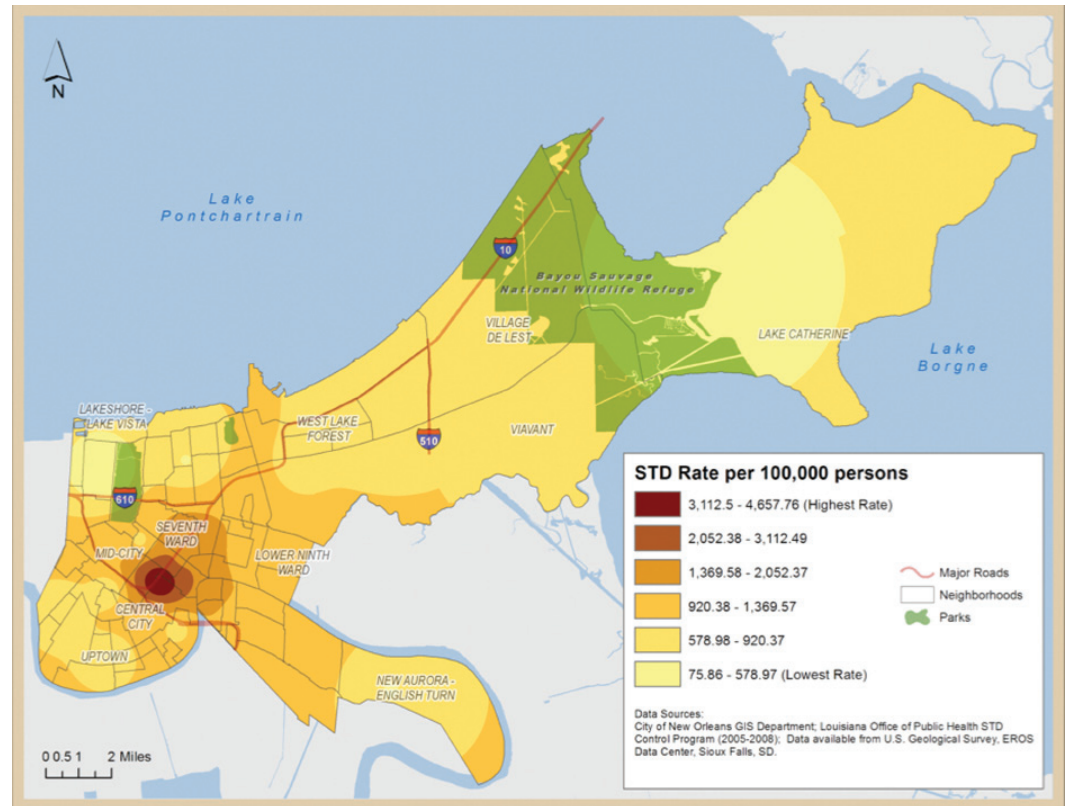(b) Louisiana Department of Health
(c) 2009 Geolytics Premium Estimates
Note: All rates are per 100,000 population. FPL = federal poverty level, HS = high school education, Life Exp = life expectancy at birth (years); LBW = low birth weight; STD = sexually transmitted disease.

Nationally, the incidence of sexually transmitted diseases (STDs) is higher in high-poverty communities.[71] Using data from the New Orleans Health Department, we calculated the incidence rate for gonorrhea, *Chlamydia*, and syphilis from 2005 to 2008, adjusting for both age and gender by ZIP code. Map 9 shows an interpolated raster surface for this rate. This mapping technique creates a continuous surface from sampled points by predicting values for all portions of Orleans based on an inverse distance weighted technique. The highest rates were in the Tulane/Gravier area.

As is true elsewhere across the United States, social and economic levels of distress are not evenly distributed geographically or across groups identified by race, ethnicity, or immigration status. Needs related to poverty, lack of education, and community risk cluster together and are associated with poor health outcomes. In Orleans, the ZIP code of 70112 is an area of approximately one square mile, encircled by Canal Street and the Pontchartrain Expressway to the north and south, respectively, and Claiborne Avenue and Magazine Street to the east and west, respectively. The Louisiana Superdome is located in the southwest corner. This ZIP code has the lowest life expectancy in Orleans as well as the highest rates for STDs, heart disease mortality, and low birth weight of any ZIP code in the city. Between 1999 and 2007, the heart disease mortality rate was almost five times higher than the next highest rate in the city. ZIP code 70112 is also the poorest ZIP code (defined as an income below 150% of the FPL), the third largest population over 25 years old with less than a high school education, and the fifth highest non-White population.

The task of isolating the individual effects that social (e.g., education, poverty) and environmental factors (e.g., crime, hazards, food access) have on the distribution of health in Orleans is complex. These factors are deeply interrelated in a complex causal web and can be misleading when their effects are examined as independent relationships. An additional methodological difficulty in examining these relationships is that the geographic unit of analysis varies by the type of data. All health outcomes reported here are only available at the ZIP code level, limiting the number of geographic units of analysis to only 17. Compared with census tracts or block groups, ZIP code areas of Orleans include

larger population sizes that make for more stable estimates of prevalence rates, but having only 17 locations to compare limits the statistical power to examine multiple relationships simultaneously.

In sum, the population of Orleans is predominantly Black (61.2%) and has an overall level of racial segregation that is 65.5%. As of 2009, almost one fourth of the population in Orleans Parish lived in poverty, and 58 census tracts had endured persistent poverty (for two or more decades). The age-adjusted rate for all-cause mortality and low birth weight is higher in Orleans than in either Louisiana or the United States, and the estimated life expectancy at birth in New Orleans is 72.5 years, which is a year and a half less than the state and 5.5 years less than the nation. Life expectancy varies by 25.5 years between ZIP codes within Orleans Parish, with a low of 54.5 in ZIP code area 70112. The correlation between health and socioeconomic factors will be examined in section II.

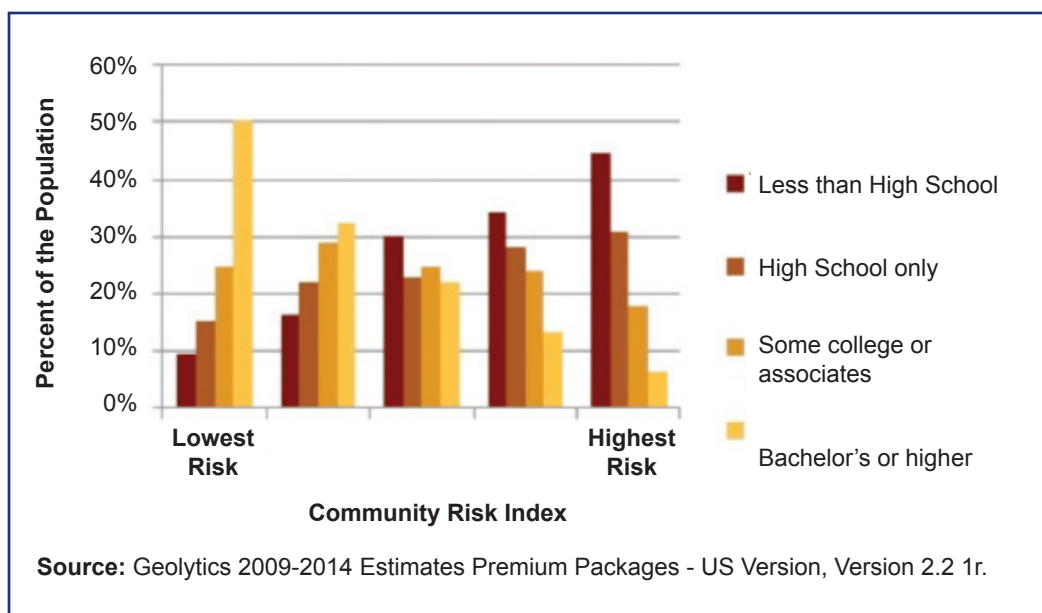# II. Socioeconomic Status, Education, and Health

As already noted, health is affected not only by the characteristics of individuals and their families but also by the neighborhoods and environment in which they live. Several important factors include the crime rate, the quality of local schools, the built environment, and neighborhood housing conditions. These factors can affect a person's health regardless of income or education. Here, we focus first on the relationship between socioeconomic status and educational attainment and then on our statistical analysis of the relationship between CRI, poverty, educational attainment, race, and life expectancy.

Socioeconomic Status and Educational Attainment

The socioeconomic status of a community is strongly related to the educational attainment of its residents. Using CRI to summarize community socioeconomic status (as described in Part 1, the CRI is a composite index based on percentage of the population below 150% of the FPL, overcrowded households, households without a vehicle, and vacant housing), our analysis found that the CRI score of census tracts in Orleans is very highly correlated with the level of educational attainment [correlation coefficient (r) = 0.85, $P \leq 0.0001$).[a] This relationship is illustrated in Figure 5. With CRI scores broken out into quintiles (five equally sized groups), we found that areas with increased risk as measured with the CRI have a higher percentage of people who lack a high school education and a lower percentage of people with at least a Bachelor's degree. In communities with the lowest CRI scores, only 9.5% of adults over 25 years have less than a high school education, and one half (50.4%) have a Bachelor's degree or higher. In comparison, in communities with the highest CRI scores nearly half (44.6%) of adults lack a high school education, and only one of every 15 (6.6%) have a Bachelor's degree or higher.

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[a] Other community-level indicators vary with the CRI as well. The violent crime rate is also correlated with the CRI (r = 0.44, $P \leq 0.0001$) and, when compared with the CRI based on the quintile groups formed, increases from a low of 224.4 cases per 100,000 in the lowest CRI quintile to a high of 921.9 in the highest quintile—a fourfold increase. Total crime and property crime rate increase by CRI quintile as well.
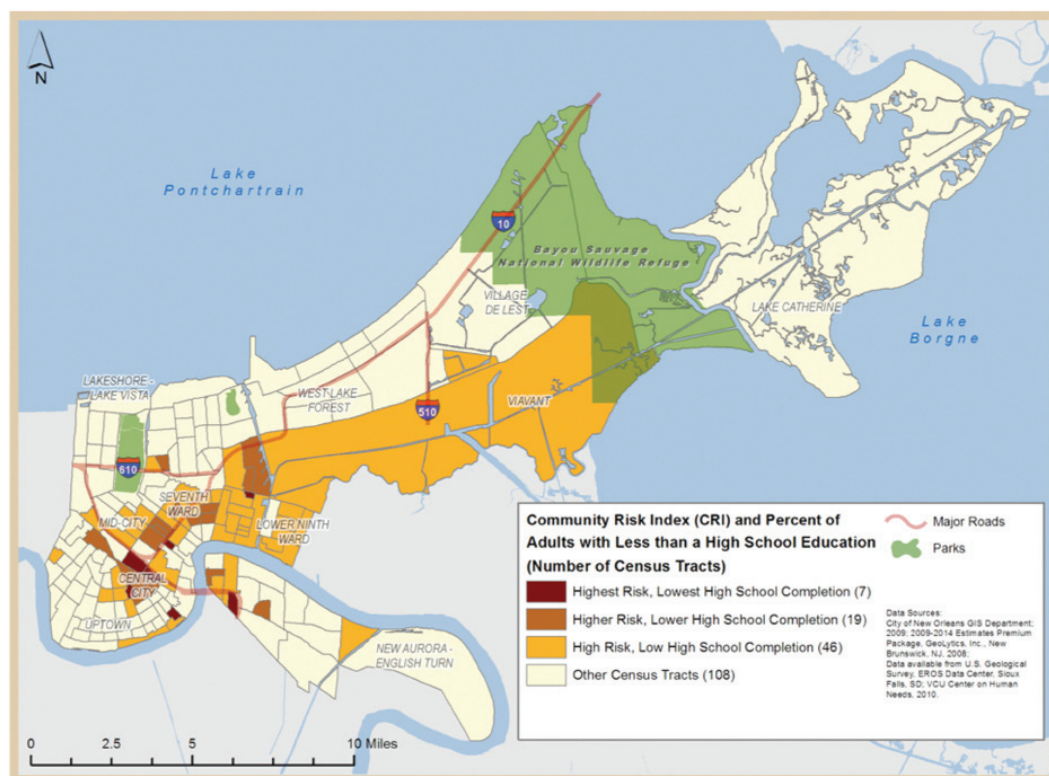
Figure 5:
Educational Attainment by Community Risk Level

Percent of the Population

60%
50%
40%
30%
20%
10%
0%

Lowest Risk — Highest Risk

Community Risk Index

- Less than High School
- High School only
- Some college or associates
- Bachelor's or higher

Source: Geolytics 2009-2014 Estimates Premium Packages - US Version, Version 2.2 1r.

In order to investigate the statistical relationship between educational attainment in Orleans and socioeconomic factors, we performed an ordinal logistic regression. For this model, we split educational attainment into four categories: less than a high school education, high school only, some college or an associate's degree, and a Bachelor's degree or higher. The results of the analysis show a statistically significant relationship between the CRI and educational attainment at all four levels (see Appendix A for an explanation of the methodology and the findings). It is important to note, however, that the observed relationship does not imply causation—that is, it does not provide evidence that higher community risk causes lower educational attainment.

Map 10 pinpoints the census tracts in Orleans that have both a high community risk, as calculated by the CRI, and low levels of educational attainment. The darkest areas (B.W. Cooper, western Central City, the Fischer Development, the Florida Development, Iberville, and the Saint Thomas Development) have the highest CRI values and the lowest percentage of the population with a high school education. The lighter areas indicate census tracts with a high CRI and a rate for high school completion that is below the Parish average, including Behrman, Central City, the Desire Area, the Desire Development, and Gert Town.

Health Outcomes

In 2007, members of families living in poverty nationwide were 3.6 times more likely to report fair or poor health status, nearly twice as likely to have diabetes, 5.3 times more likely to report serious psychological distress, and 1.6 times as likely to have been hospitalized during the previous year than were families with incomes at least 200% of the FPL.[61] In addition, access to needed health care services is much more limited for those with low income. That same year, comparing impoverished families with families having incomes of at least 200% of the FPL, those in poverty lacked health insurance three times as often, lacked a usual source of care twice as often, delayed health care because of cost 2.6 times as often, and went without care because of cost 3.6 times as often.[61]

Figure 6 displays ZIP codes by quintiles to demonstrate how CRI is related to health outcomes. In areas with the highest CRI scores (higher community risk), the risk of dying from heart disease, stroke, and diabetes was increased by 71.4%, 53.8%, and 99.2%, respectively, compared to those with the lowest CRI.
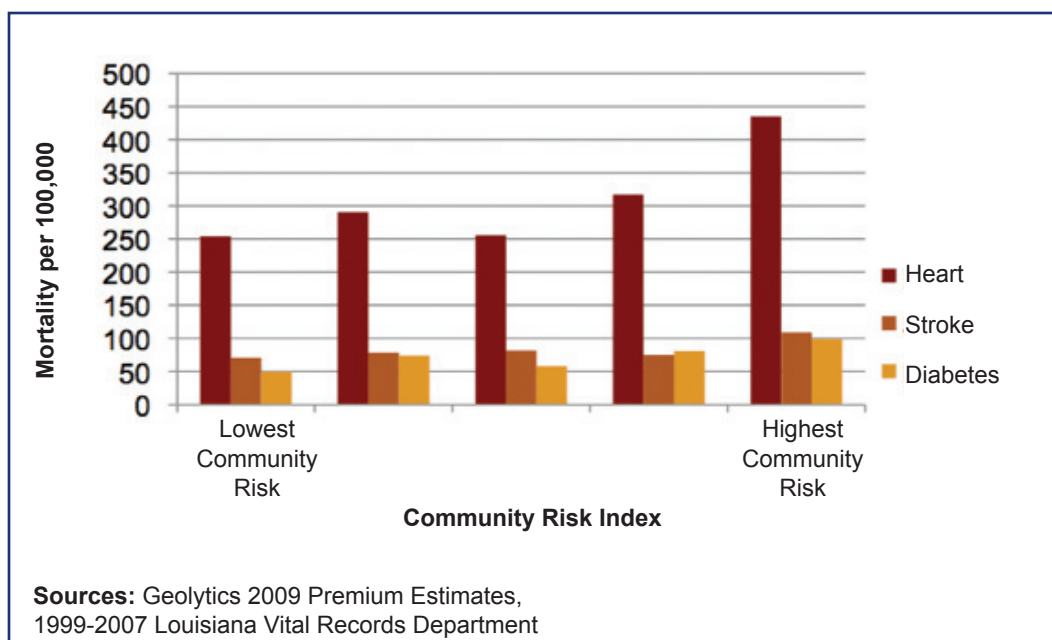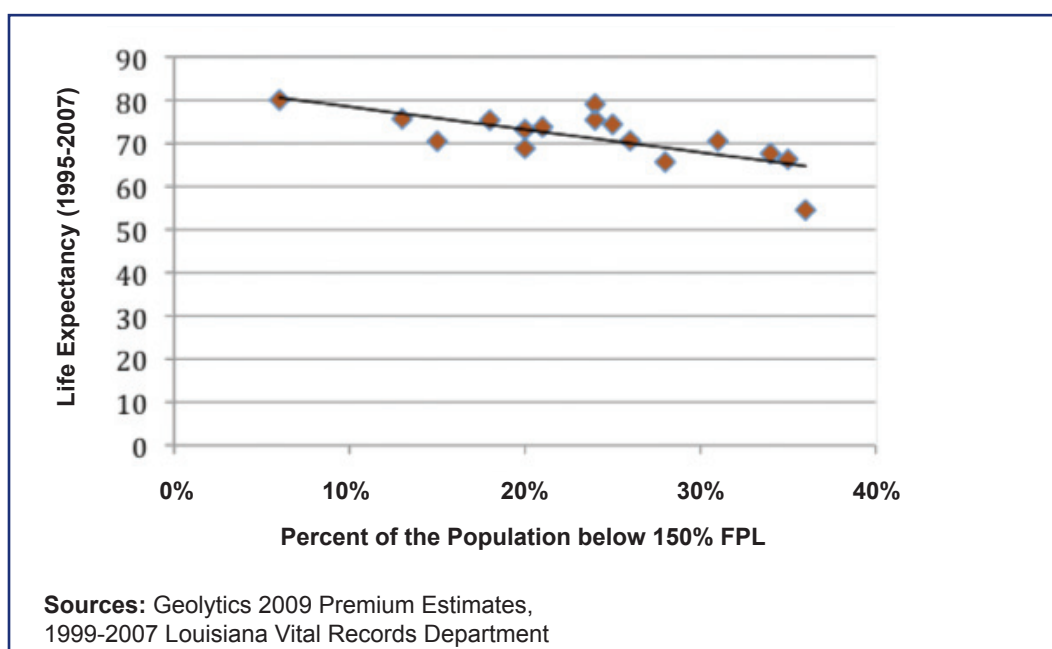
Mortality per 100,000 — Community Risk Index — Heart, Stroke, Diabetes

Sources: Geolytics 2009 Premium Estimates,
1999-2007 Louisiana Vital Records Department

Life Expectancy (1995-2007) — Percent of the Population below 150% FPL

Sources: Geolytics 2009 Premium Estimates,
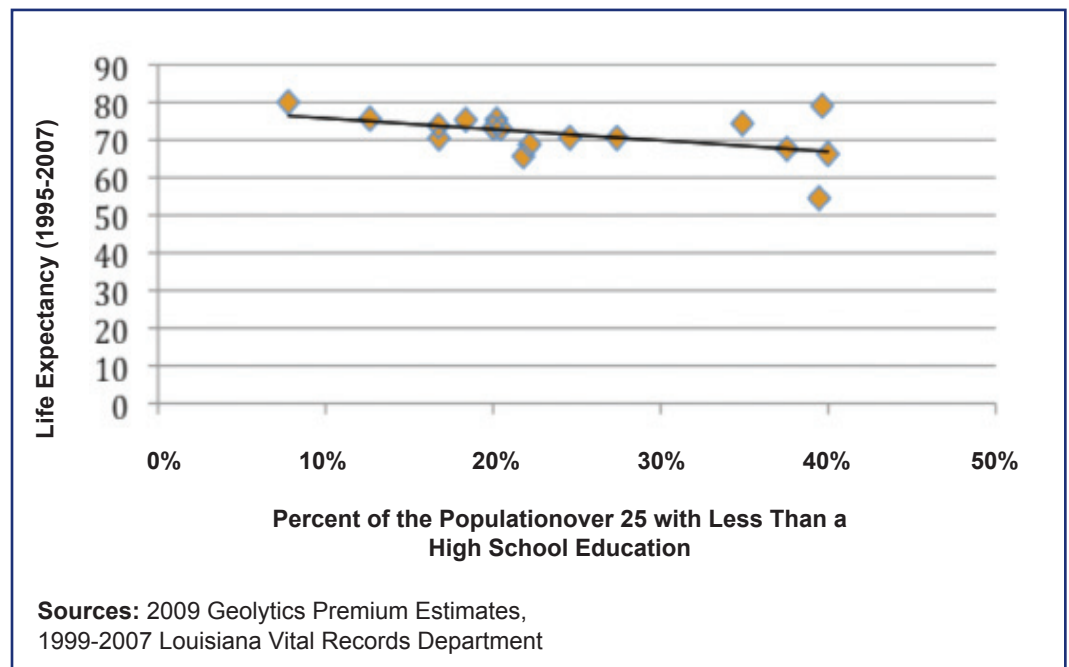1999-2007 Louisiana Vital Records Department

In Orleans, ZIP codes with the higher poverty rates also tend to suffer from worse health outcomes. ZIP code 70112 (containing portions of Tulane, Gravier, Iberville, and Tremé) had the highest percentage of the population below 150% of the FPL and had a life expectancy that was only 72% that of ZIP code 70131, which had the lowest percentage of the population below 150% FPL. Once again, implications from cross-sectional analysis are not definitive, but as Figure 7 shows, life expectancy in Orleans is inversely correlated with income. Although the number of cases is small (17 ZIP codes), the inverse correlation between life expectancy and percent of the population below 150% FPL is statistically significant ($r = –0.71$, $P \leq 0.0013$).

The literature citing the strong relationship between income and education was previously mentioned in section I. In Orleans, the percentage of the population with less than a high school education is highly correlated with the percentage of the population with incomes below 150% of the FPL (r = 0.83, P ≤ 0.0001). Education is also 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.[72] 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 5 times as likely to report serious psychological problems, as were those with a Bachelor's degree.[61]
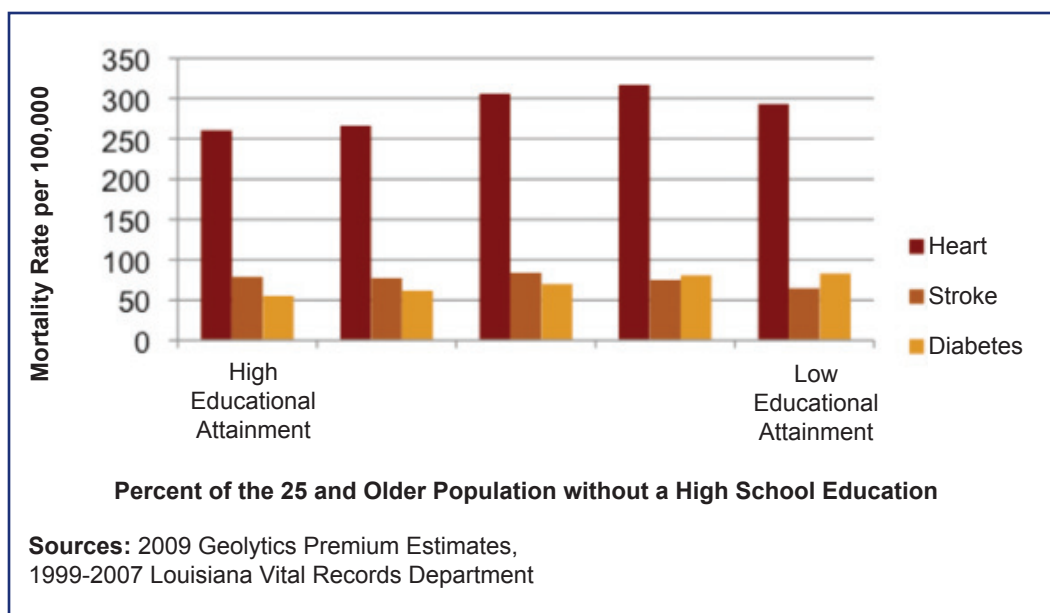
As shown in figure 8, ZIP codes in Orleans with lower rates of high school completion tend to have lower life expectancies, and the converse is true. In ZIP code 70124, where only 7.8% of adults did not complete high school, the life expectancy is as high as 80 years. Although the number of cases is small (17 ZIP codes), the correlation between life expectancy and percentage of the population with less than a high school education is statistically significant (r = –0.50, P ≤ 0.0429).

Sources: 2009 Geolytics Premium Estimates,
1999-2007 Louisiana Vital Records Department

To examine the effect that education has on health outcomes, we split the ZIP codes into quintiles according to the percentage of the population with less than a high school education. Figure 9 shows that the rate of diabetes mortality increases as the population without a high school diploma increases. Among the 17 cases available for analysis, none of these relationships appeared to be statistically significant.

Percent of the 25 and Older Population without a High School Education

Sources: 2009 Geolytics Premium Estimates,
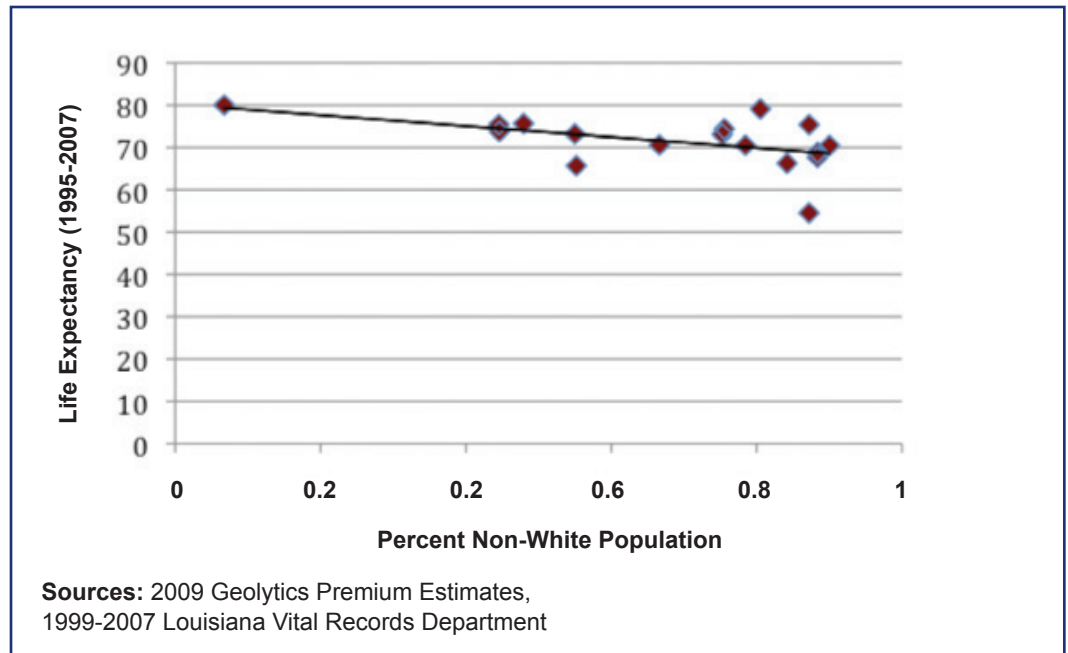1999-2007 Louisiana Vital Records Department

Race and ethnicity also play an important role in predicting health outcomes. In 2006, a Black newborn child in the United States was expected to live 73.2 years, which is five years less than a White newborn (78.2 years).[73] Black infants were also 2.4 times more likely to die before reaching their first birthday than were White infants.[68] Although the full extent of these inequalities is due to a confluence of factors, research indicates that genetic factors and other confounding socioeconomic characteristics such as income and education do not account fully for the disparity.[74–78]

For the years 2001–2007, the typical Orleans resident had a life expectancy of 72.5 years, but circumstances differed by race: Whereas Whites had a life expectancy of 76.2 years, Blacks had an expectancy of 67.4 years—a statistically significant difference of 8.8 years. In addition, the age-adjusted all-cause mortality rate for Black Orleans residents was greater than 50% higher than for White residents (1353.8 vs. 872.1 deaths per 100,000 population, respectively), and the risk of premature death (before age 65) was greater than 60% higher for Blacks than for Whites (566.8 vs. 343.9 deaths per 100,000 population, respectively).

Health outcome data for small geographic areas is limited for Orleans, making it difficult to document racial health inequalities by place. However, analysis at the ZIP code level appears to show a relationship between race and life expectancy that mirrors that seen nationally (Figure 10). In ZIP code 70124, in which only 6.7% of the population is non-White, the life expectancy is 80 years. In contrast, in ZIP codes where at least 80% of the population is non-White life expectancy ranges from 54.5 years to 79.1 years. Despite the small number of cases (17 ZIP codes), the correlation between life expectancy and percent of the population that is non-White is statistically significant (r = –0.49, P ≤ 0.0446). However, because this is a cross-sectional analysis the findings must be interpreted with caution. As discussed earlier, the same ZIP codes are areas with limited income, education, and other conditions that each has a causal relationship with health outcomes.

Sources: 2009 Geolytics Premium Estimates,
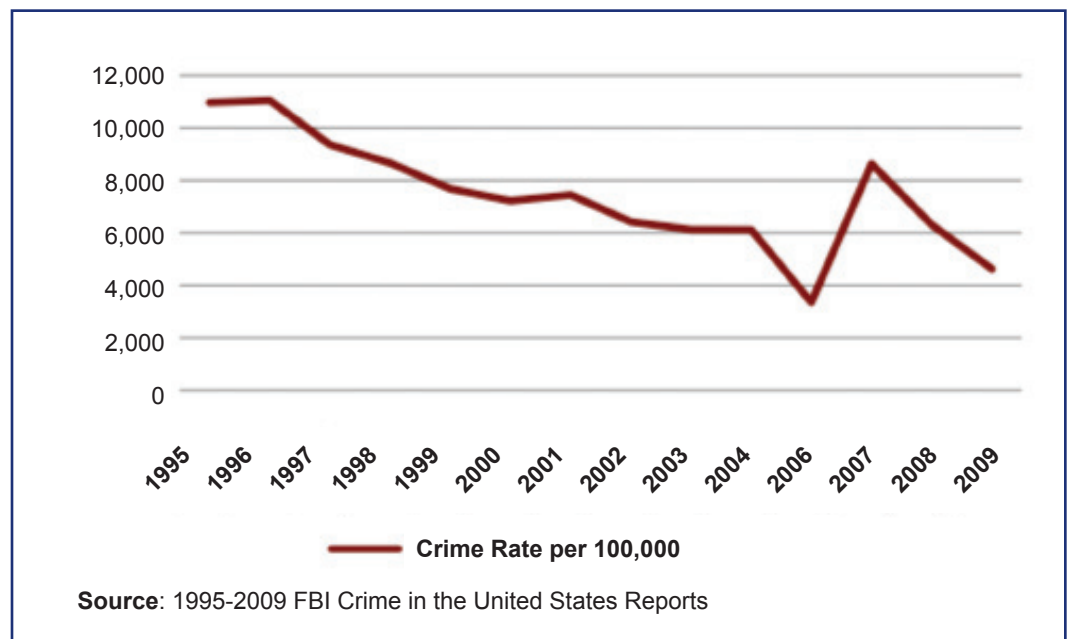1999-2007 Louisiana Vital Records Department

In sum, there is strong evidence for the relationship between socioeconomic status (measured by the CRI) and educational attainment at the census-tract level in Orleans Parish. We have documented that health outcomes are associated with socioeconomic status, poverty, educational attainment, and race. Despite the limitation of obtaining health outcome data only at the ZIP code level, which limits the number of cases for analysis to 17 large areas, we found statistically significant relationships between life expectancy and poverty, the percentage of the population with less than a high school education, and race. Areas of low CRI and low educational attainment include the B.W. Cooper area, western Central City, the Fischer Development, the Florida Development, Iberville, the Saint Thomas Development, Behrman, Central City, the Desire Area, the Desire Development, and Gert Town.

III. Crime and New Orleans Communities

Repopulation and Crime

In 2004, Orleans had higher rates of virtually every reported crime compared with Louisiana, larger crime-reporting regions in the south[b], and the United States.[79] The crime story in Orleans has changed dramatically within the past 5 years in large part because of the effects of Hurricane Katrina, which struck the area in 2005. After Katrina, crime rates in Orleans as reported by the Federal Bureau of Investigation have fluctuated during these years (Figure 11). Rates for 2005 are not available from the Federal Bureau of Investigation, but between 2004 and 2006 there was a steep decline in crime followed by a rapid spike in 2007.[33,34,54,79–81] Rates subsequently declined between 2007 and 2009. By 2009, the crime rate in Orleans had dropped appreciably in a number of categories.[38,54,82,83] Compared with crime rates for Louisiana, Orleans had a higher rate of violent and property crime, as well as murder, robbery, burglary, and motor vehicle theft, but had lower rates for forcible rape, aggravated assault, and larceny-theft (Table 5).[38]

Figure 11.
Crime Rate in New Orleans

Crime Rate per 100,000

Source: 1995-2009 FBI Crime in the United States Reports

[b] The FBI reports crime data for the City of New Orleans within several nested layers: the New Orleans–Metairie–Kenner LA Metropolitan Statistical Area, the state of Louisiana, the West South Central Region, and the Southern Region.

	Orleans	Louisiana	United States
2004[a]			
Violent Crime Rate/100,000	**948.3**	**638.7**	**465.5**
Murder/Non-Negligent Homicide	56.0	12.7	5.5
Forcible Rape	40.1	35.8	32.2
Robbery	389.8	145.4	136.7
Aggravated Assault	462.4	444.9	291.1
Property Crime Rate/100,000	**5162.0**	**4410.2**	**3517.1**
Burglary	1449.7	1004.5	729.9
Larceny-Theft	5335.7	2969.2	2365.9
Motor Vehicle Theft	875.3	436.6	421.3
2009[b]			
Violent Crime Rate/100,000	**777.0**	**620.0**	**429.4**
Murder/Non-Negligent Homicide	51.7	11.8	5.0
Forcible Rape	29.1	30.3	28.7
Robbery	277.0	135.9	133.0
Aggravated Assault	419.1	442.0	262.8
Property Crime Rate/100,000	**3846.3**	**3794.6**	**3036.1**
Burglary	1135.8	1029.5	716.3
Larceny-Theft	1934.2	2504.3	2060.9
Motor Vehicle Theft	776.4	260.8	258.8

(a) Department of Justice Federal Bureau of Investigation. Crime in the United States in 2004
(b) Department of Justice Federal Bureau of Investigation. Crime in the United States in 2009
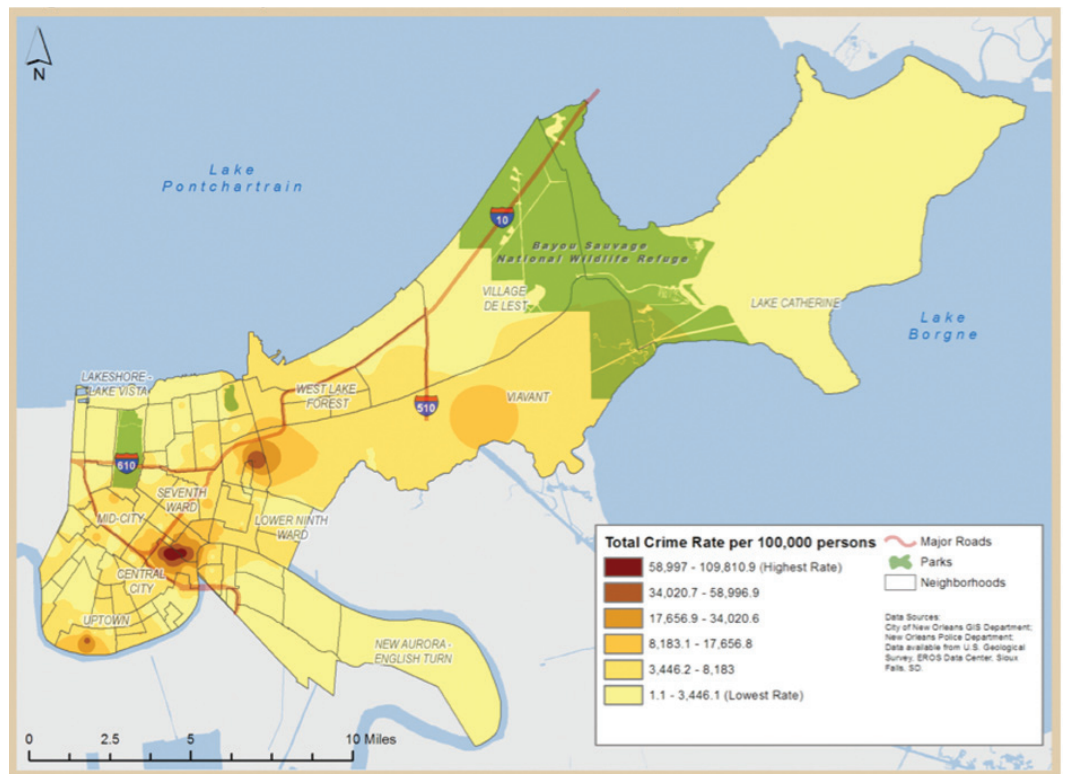
The U.S. Census Bureau has estimated that the population of Orleans in 2009 is still 20.2% less than the population before Katrina in 2004.[39,52] In light of the massive displacement caused by the flooding, there are legitimate questions surrounding the effect the storm had on criminal activity within the Parish. Crime rates are affected by characteristics of place, such as urbanization and age of the population in the area. Given that crime varies highly in both gross geographic areas such as state and county as well as census tracts and blocks within Orleans, it is important to understand not only how patterns of criminal activity have changed since Katrina but also to explore how socioeconomic factors within census tracts and blocks are associated with criminal activity.

To explore these associations, we examined several data sources in order to investigate the level of crime in smaller geographic regions within Orleans. The New Orleans Police Department (NOPD) provides data on service calls by location in the Parish that can be broken down by specific crimes.[84] In addition, they produce annual homicide reports that list the approximate location of each murder.[85,86]

According to these data, in 2009 there were 3,592.8 service calls (for criminal incidents) per 100,000 population. Calls about violent crimes averaged 510.6 per 100,000. The homicide data for 2008 and 2009 indicate a homicide rate of 56.4 per 100,000 for the two-year period. There were 88 census tracts (48.6%) with a higher total crime rate, 86 tracts (47.5%) with a higher violent crime rate, and 68 (37.6%) with a higher homicide rate than the rate for Orleans.

Map 11 is an interpolated raster surface of the total service call rate for crimes in 2009. The map indicates that the worst crime areas in Orleans were in the Tulane/Gravier area, Tremé/Lafitte, the Desire Area, and West Riverside.

Map 11.
Crime Rate
by Census Tract,
Orleans Parish (2009)

Map 12.
Violent Crime Rate
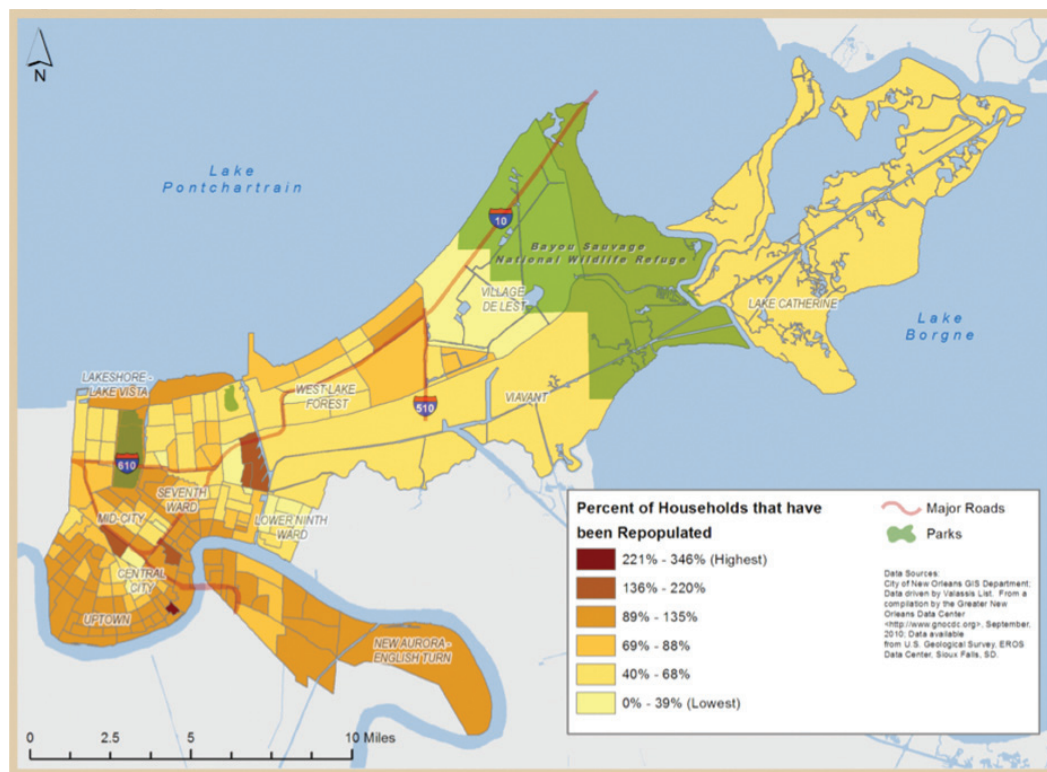by Census Tract,
Orleans Parish (2009)

Map 12 focuses only on service calls for violent crimes. Once again, Tulane/Gravier and Tremé/Lafitte have the comparatively highest rate. As with total crime, the Desire Area exhibits a disproportionately higher rate of violent crime than that of the rest of the Parish, although Map 11 shows a darker shade indicating that nonviolent crime is more of a factor than violent crime.

Large-scale migration as occurred in Orleans Parish after Katrina has an uncertain effect on crime rates. The immediate loss of 48.9% of the population from 2005 to 2006 left few residents in areas that were previously densely populated.[87,88] The density of a population has a known association with crime, particularly in urban areas where poverty is segregated from the suburbs.[89] In general, the population displaced by the flooding was economically disadvantaged.[90] Conversely, areas receiving displaced individuals from Orleans after Katrina have seen their crimes rates increase.[90]

Previous studies suggest that natural disasters tend to bring communities together in collective solidarity, which may also be a factor in the large decline in crime immediately after Katrina.[90] To account for the effect of Katrina-related displacement on the fluctuating crime rate, we examined geographical differences within Orleans in the return of the population after Katrina and the crime rate of the area in 2009.

To estimate the return of the population, we used a comparison of the households receiving mail in June 2005 (two months before Katrina) with those receiving mail in December 2009. Data on households receiving mail were obtained from the Greater New Orleans Community Data Center.[91] According to these data, 78.5% of the households that were occupied (receiving mail) before Katrina were occupied in 2009. At the census-tract level, the return rates varied from 0.4% in Gentilly Woods to a 345.6% increase in the lower Garden District between Felicity Street and Josephine. As Map 13 indicates, the neighborhoods of eastern Desire Area, the Lower Garden District, Gert Town (including Xavier University area), the Desire Development, and the Tulane/Gravier area (including the Interim Louisiana State University Public Hospital) have more than repopulated after the storm. The neighborhoods of Tremé/Lafitte, the Lower Ninth Ward, the Saint Bernard area, B.W. Cooper, Lake Catherine, and Viavant/Venetian Isles have remained below previous occupation levels.

Map 13.
Repopulation
of Households,
Orleans Parish (2009)

We developed a linear regression model to predict crime rates at the census-tract level by controlling for community risk (using CRI), the ratio of males age 15 to 29 to males age 35 to 44, racial composition, and population density. Both the percentage of households that have returned since Katrina and the CRI had statistically significant relationships with both total crime and violent crime, based on service calls. That is, the co-occurrence of high CRI scores and repopulation rates with high total and violent crime rates is unlikely to be due to random chance. The equation suggests that repopulation of census tracts was associated with higher crime rates in 2009, particularly violent crime. The model was more highly predictive of violent crime calls ($R^2 = 0.46$) than of total crime calls ($R^2 = 0.36$). See Appendix A for further description of the methodology.

Orleans neighborhoods are being repopulated by new and returning residents at different rates; a large number of residents remain displaced, and many have no plans to return.[93] Given the complexity of factors that predict crime after massive displacement and repopulation, the findings here should be considered preliminary, but they do indicate a significant relationship between both community risk and repopulation and crime.

Educational Attainment and Crime

Socioeconomic characteristics also play an important role in the geographic distribution of crime. [89,93,94] This is especially true for educational attainment, which is associated with lower crime rates. Lochner and Moretti estimated that a 1% increase in the percentage of adult men in the United States (ages 20 to 60) who had completed high school would save $1.4 billion per year in reduced crime-related costs incurred by victims and society at large.[95] Education improves the material well-being of the population and raises the opportunity costs of crime by giving potential perpetrators viable alternatives for an improved lifestyle.[33] An improvement in the educational attainment of the population could help alleviate the crime problems Orleans currently faces.
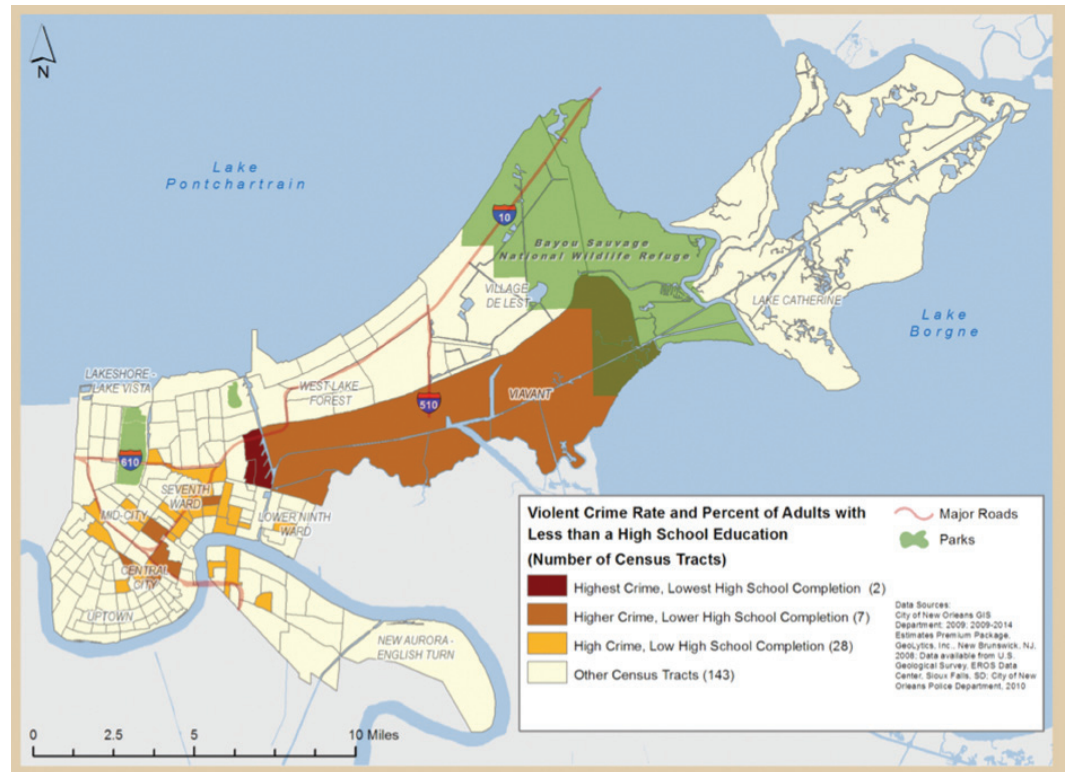
Using 2009 data obtained from the New Orleans Police Department crime maps,[84] we found that the percentage of the population over 25 years with less than a high school diploma at the census-tract level had a moderately strong correlation (r = .45, P < .0001) with the rate of calls for violent crime, as did the CRI (r = .44, P < .0001). The relationship between education and total crime was not statistically significant. Similarly, using 2008 and 2009 homicide data from the Homicide Division Annual Report[85,86] we found a moderately strong correlation between homicides and educational attainment at the census-tract level (r = .48, P < .0001) and between homicides and CRI (r = .48, P < .0001).[c]

Across 167 census tracts in Orleans, we analyzed the relationship between the percentage of the population with less than a high school education and total crime and violent crime (see Appendix A for a discussion of how the tracts were chosen). We used a forward stepwise regression model to control for population density, age, race, and poverty (see appendix A for further explanation of the methodology) (adjusted R^2 = .3501). Although this model did not show a significant correlation between education and total crime service calls, the association with violent crime was significant (P = 0.0008). The coefficient was "positive," indicating that tracts with a higher percentage of the population without a high school education in 2009 were also more likely to have a higher rate of violent crime service calls.

Map 14 illustrates where high rates of violent crime co-occur geographically with high percentages of the population that lack a high school education. The Desire Area and Desire Development had the highest crime rates and the highest percentage of the population that lacked a high school education. The Central Business District, Central City, Saint Roch, Tulane/Gravier, and Viavant/Venetian Isles also display a spatial co-occurrence of populations lacking a high school education and violent crime.

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[c] The strength of the relationship was measured with Pearson's correlation coefficient (r), and the statistical significance (P) is the probability of obtaining the observed correlation by chance alone. Because of a skewed distribution of both the violent crime service call data and the homicide data, we used a square root transformation to normalize the data and excluded outliers that fell outside the 99% confidence interval in calculating the correlation coefficient.

Map 14.
Census Tracts
with Both Low Educational
Attainment and a High Violent
Crime Service Call Rate,
Orleans Parish, 2009

In summary, high crime rates remain a concern in Orleans Parish. High crime rates before Katrina were followed by a period of volatility in crime rates as Orleans repopulated, with rates dropping somewhat between 2007 and 2009. Our analysis of the relationship between repopulation and crime rates found that repopulation rates vary dramatically by neighborhood across the city and that repopulation rates do have a significant relationship to crime. Although higher repopulation rates appear to be associated with higher crime rates, other characteristics of the neighborhood may contribute to these relationships.

For example, we found that educational attainment, community risk, and poverty are important predictors of violent crime rates, as measured by volume of service calls received by the police department. Educational attainment of adults in a neighborhood is strongly linked to other socioeconomic characteristics of the neighborhood. Further research is needed to tease out the causal contribution of the various neighborhood conditions that contribute to crime. Furthermore, the link between the educational achievement of current adults and the future educational attainment of children in those neighborhoods will also require further analysis, as well as time, to document the long-term outcomes of school-improvement efforts currently underway in Orleans.[95]

IV. Conclusions: Education as a Predictor of Community Risk, Health Status, and Crime Rates

The analyses presented here have shown that educational attainment in Orleans is strongly linked to community risk, health outcomes, and crime rates and that levels of educational attainment in a neighborhood are linked to race and location. Compared with Whites in the same time period, Black Orleans residents age 25 and over were more than three times as likely to lack a high school education, and Asian residents were five and half times as likely. The percentage of adults without a high school education in Orleans census tracts is as low as 0% and as high as 72% depending on the census tract.

Educational attainment is a strong predictor of health risks and is associated with many important indicators of access to care (such as being uninsured, lacking a usual source of health care, and forgoing or delaying care), health behaviors (such as smoking, substance use, and seatbelt usage), and health outcomes (such as premature mortality, infant mortality, fair or poor health status, diabetes, and serious psychological problems).[56,57] Although the number of cases available for this analysis was small because health outcome data were only available at the ZIP code level (17 ZIP codes), the correlation between life expectancy and percent of the population with less than a high school education shows a moderately strong, statistically significant relationship. ZIP codes in Orleans with a higher percentage of the population lacking a high school education tend to have lower life expectancies.

The level of educational attainment in a community is strongly related to socioeconomic status and community risk. We found that the CRI is very highly correlated with the level of educational attainment. In communities with the lowest CRI scores, only 9.5% adults have less than a high school education, and one half (50.4%) have a Bachelor's degree or higher. In comparison, in communities with the highest CRI scores nearly half (44.6%) of adults have less than a high school education, and only one of every 15 adults (6.6%) have a Bachelor's degree or higher. Results of a multivariate statistical analysis of the relationship between educational attainment in Orleans and socioeconomic factors found a statistically significant relationship between the CRI and educational attainment at all four levels of educational attainment (less than a high school education, high school only, some college or an associate's degree, and a Bachelor's degree or higher).

The situation in Orleans in the past five years has been unlike any other in United States history. Levee failure during a massive hurricane displaced approximately 1.5 million people of age 16 years and older and caused an estimated $96 billion worth of property damage and more than 1,800 deaths.[92–94] Each year since 2006, the U.S. Census Bureau has estimated population growth in Orleans. The analysis in this report suggests that the returning population has a significant association with violent crime and that communities with aggregated risks such as poverty, overcrowded households, or an abundance of vacant, unmaintained properties exhibit the highest violent crime rates. The analysis of the relationship between socioeconomic status and violent crime showed that the strongest contributions to violent crime rates came from a lack of educational attainment and from poverty in the census tract. The 2009 data suggest that neighborhoods with more high school graduates experience a lower violent crime rate independently of other factors, including population density, race, and age ratio. According to the 2009 service call data, these high-crime-rate areas were in the Tulane/Gravier area, Tremé/Lafitte, the Desire Area, and West Riverside.

An increasingly educated population should benefit the entire population of Orleans because stressors experienced in one neighborhood can affect the larger community or city as a whole. For example, two census tracts in the coastal section of the Central Business District exhibit the highest rate of service calls for crime in 2009, even though less than 2,000 people live there. These tracts (between Canal and Julia Street to the north and south and Loyola and Derbigny to the east) are highly commercialized and are highly populated in daytime by residents of other areas of Orleans and beyond. Thus, the education of the entire area will likely affect crime rates in these locations. Strikingly, spatial findings from this study pinpoint a number of neighborhoods that continually exhibit conditions of distress, whether it is in education, poverty, CRI, crime, or health. The neighborhoods of the Desire Development and the Desire Area, along with the B.W. Cooper, Bayou Saint John, Bywater, the Central Business District, Central City, East Riverside, the Fischer Development, the Florida Development, Gert Town, Iberville, and Irish Channel, appear to have endured conditions of distress for as long as five decades. The physical, mental, and emotional stressors these conditions create ultimately affect the potential health and well-being of its residents and their children.

Cross-sectional analyses such as those presented here cannot claim that educational interventions are the sole solution to issues of societal distress. Policies to improve other living conditions in Orleans are also important. However, given the strong correlation between education and other distress metrics such as poverty, crime, and poor health—along with a large body of literature supporting the link between improved outcomes and education—it seems reasonable to target attention to the educational needs of children and adults in areas such as the Lower Ninth Ward, St. Claude, Bywater, Marigny, French Quarter, and Tremé/Lafitte areas, where as many as 50% or more of adults lack a high school education.

1. Woolf SH BP. Where health disparities begin: The role of social and economic determinants--and why current policies could make matters worse. *Health Affairs*. 2011;30:1852-1859.

2. World Health Organization. *A conceptual model for taking action on the social determinants of health.* Geneva, Switzerland: World Health Organization; 2010.

3. WHO Commission on Social Determinants of Health, World Health Organization. *Closing the gap in a generation health equity through action on the social determinants of health : Final report of the Commission on Social Determinants of Health.* Geneva, Switzerland: World Health Organization; 2008."

4. John D. and Catherine T. MacArthur Foundation. *Reaching for a Healthier Life: Facts on Socioeconomic Status and Health in the United States*. Chicago, IL: MacArthur Foundation Research Network on Socioeconomic Status and Health; 2008.

5. Braveman P ES. *Overcoming Obstacles to Health*. Princeton, NJ: Robert Wood Johnson Foundation;2008.

6. McGinnis JM, Williams-Russo P, Knickman JR. The case for more active policy attention to health promotion. *Health Aff (Millwood)*. 2002;21:78-93.

7. Agency for Healthcare Research and Quality. *National healthcare disparities report*. Rockville, MD: U.S. Department of Health and Human Services; 2003.

8. Smedley BD, Stith AY, Nelson AR, Institute of Medicine (U.S.), Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care. *Unequal Treatment:Confronting Racial and Ethnic Disparities in Health Care.* Washington, DC: National Academy Press; 2003.

9. Marmot MG, Wilkinson RG. *Social Determinants of Health.* Oxford; Oxford Univ Press; 1999.

10. Wilkinson RG, Marmot MG, World Health Organization, et al. *Social Determinants of Health : The Solid Facts*. 2nd ed. Copenhagen: WHO Regional Office for Europe; 2003.

11. Marmot M. Social determinants of health inequalities. *Lancet*. 2005;365:1099-1104.

12. World Health Organization Commission on the Social Determinants of Health. Social injustice is killing people on a grand scale. *Scand J Public Health*. 2008;36:896–897.

13. Adler NE, Ostrove JM. Socioeconomic status and health: What we know and what we don't. *Ann N Y Acad Sci.* 1999;896:3-15.

14. 2009 National Healthcare Disparities Report. *Medical Benefits* [serial online]. July 15, 2010;27(13):6–8. Available from: Business Source Complete, Ipswich, MA. Accessed June 1, 2010.

15. Shaw M. Housing and public health. *Annu Rev Public Health*. 2004;25:397-418.

16. Leventhal T, Brooks-Gunn J. The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychol Bull.* 2000;126:309-337.

17. Lynch JW, Kaplan GA, Salonen JT. Why do poor people behave poorly? Variation in adult health behaviours and psychosocial characteristics by stages of the socioeconomic lifecourse. *Soc Sci Med*. 1997;44:809-819.

18. Smedley BD, Syme SL, Institute of Medicine (U.S.), Committee on Capitalizing on Social Science and Behavioral Research to Improve the Public's Health. *Promoting Health : Intervention Strategies from Social and Behavioral Research.* Washington, D.C: National Academy Pr; 2000.

19. Yen IH, Syme SL. The social environment and health: A discussion of the epidemiologic literature. *Annu Rev Public Health*. 1999;20:287-308.

20. McNeill LH, Kreuter MW, Subramanian SV. Social environment and physical activity: A review of concepts and evidence. *Soc Sci Med.* 2006;63:1011-1022.

21. Robert SA. Socioeconomic position and health: The independent contribution of community socioeconomic context. *Annual Review of Sociology*. 1999;25:489-516.

22. Sampson RJ, Morenoff JD, Gannon-Rowley T. Assessing "neighborhood effects": Social processes and new directions in research. *Annual Review of Sociology.* 2002;28:443-478.

23. Jencks C, Mayer SE. Segregation, job proximity, and black job opportunities: The empirical status of the spatial mismatch hypothesis. In: *Inner-City Poverty in the United States.* Lynn LE, McGeary MGH, eds Washington, D.C.: National Academy Press; 1990:187-222.

24. Mouw T. Job relocation and the racial gap in unemployment in Detroit and Chicago, 1980 to 1990. *Am Sociol Rev.* 2000;65(5):730–753.

25. Small ML, McDermott M. The presence of organizational resources in poor urban neighborhoods: An analysis of average and contextual effects. *Social Forces*. 2006;84(3):1697-1724.

26. Diez-Roux AV, Nieto FJ, Caulfield L, Tyroler HA, Watson RL, Szklo M. Neighbourhood differences in diet: The atherosclerosis risk in communities (ARIC) study. *J Epidemiol Community Health.* 1999;53:55-63.

27. Larson NI, Story MT, Nelson MC. Neighborhood environments: Disparities in access to healthy foods in the U.S. *Am J Prev Med*. 2009;36:74-81.

28. Brulle RJ, Pellow DN. Environmental justice: Human health and environmental inequalities. *Annu Rev Public Health.* 2006;27:103-124.

29. Coulton CJ, Crampton DS, Irwin M, Spilsbury JC, Korbin JE. How neighborhoods influence child maltreatment: A review of the literature and alternative pathways. *Child Abuse Negl.* 2007;31(11–12):1117–1142.

30. McEwen BS. Stress, adaptation, and disease. Allostasis and allostatic load. *Ann N Y Acad Sci.* 1998;840:33–44.

31. Steptoe A, Marmot M. The role of psychobiological pathways in socio-economic inequalities in cardiovascular disease risk. *Eur Heart J.* 2002;23(1):13–25.

32. Massey DS, Denton NA. *American Apartheid: Segregation and the Making of the Underclass.* Cambridge, Mass: Harvard Univ Press; 1993.

33. Jargowsky PA. *Poverty and Place: Ghettos, Barrios, and the American City*. New York: Russell Sage Foundation; 1997.

34. Harrington M. *The Other America: Poverty in the United States.* 1st Touchstone ed. New York: Simon & Schuster; 1997.

35. Charles CZ. The dynamics of racial residential segregation. *Ann Rev Sociol.* 2003;29:167–207.

36. Squires GD, Kubrin CE. Privileged places: Race, uneven development and the geography of opportunity in urban America. *Urban Stud.* 2005;42(1):47–68.

37. United States Department of Justice, Federal Bureau of Investigation. Crime in the United States, 2009; 2010.

38. U.S Census Bureau. U.S. Census Bureau 2009 American Community Survey; 2010.

39. Pearson-Nelson B. *Understanding Homicide Trends: The Social Context of a Homicide Epidemic.* New York: LFB Scholarly Pub; 2008.

40. Schulz AJ, Williams DR, Israel BA, Lempert LB. Racial and spatial relations as fundamental determinants of health in Detroit. *Milbank Q.* 2002;80(4):677–707, iv.

41. Richardson LD, Norris M. Access to health and health care: How race and ethnicity matter. *Mt Sinai J Med.* 2010;77(2):166–177.

42. Jahn J, Schmid CF, Schrag C. The measurement of ecological segregation. *Am Sociol Rev.* 1947;12:293–303.

43. Geolytics I. 2009 estimates premium. East Brunswick, NJ: Geolytics; 2009.

44. Frey WH. New Racial Segregation Measures for States and Large Metropolitan Areas: Analysis of the 2005-2009 American Community Survey. Available at: http://censusscope.org/ACS/Segregation.html. Accessed February 15, 2011.

45. U.S Census Bureau. U.S. Census Bureau 2005–2009 American Community Survey 5-year estimates: 2005–2009; 2009.

46. Adams PF, Barnes PM, Vickerie JL. Summary health statistics for the U.S. population: National health interview survey, 2007. *Vital Health Stat 10.* 2008;(238)(238):1–104.

47. Geolytics I. 2001 - 2008 estimates premium. East Brunswick, NJ: Geolytics; 2009.

48. Brooks-Gunn J, Duncan GJ. The effects of poverty on children. *Future Child.* 1997;7(2):55–71.

49. Duncan GJ, Brooks-Gunn J, Klebanov PK. Economic deprivation and early childhood development. *Child Dev.* 1994;65(2 Spec No):296–318.

50. U.S. Department of Agriculture. Measuring food security in the United States: Household food security in the United States, 2009; 2010.

51. U.S. Census Bureau. U.S. Census Bureau 2004 American Community Survey; 2007.

52. Gruenewald PJ, Freisthler B, Remer L, LaScala EA, Treno A. Ecological models of alcohol outlets and violent assaults: Crime potentials and geospatial analysis. *Addiction.* 2006;101:666–677.

53. Bluthenthal RN, Cohen DA, Farley TA, et al. Alcohol availability and neighborhood characteristics in Los Angeles, California and southern Louisiana. *J Urban Health.* 2008;85:191–205.

54. Jones-Webb R, McKee P, Hannan P, et al. Alcohol and malt liquor availability and promotion and homicide in inner cities. *Subst Use Misuse.* 2008;43:159–177.

55. Chen M-J, Paschall MJ. Malt liquor use, heavy/problem drinking and other problem behaviors in a sample of community college students. *J Stud Alcohol.* 2003;64:835–842.

56. Institute of Education Sciences. *The nation's report card. Mathematics 2009 snapshot state report: Louisiana grade 4 public schools.* Washington, DC: National Center for Education Statistics; 2009.

57. Institute of Education Sciences. *The nation's report card. Reading 2009 state snapshot report: Louisiana grade 4 public schools*. Washington, DC: National Center for Education Statistics; 2009.

58. Institute of Education Sciences. *The nation's report card. Mathematics 2009 snapshot state report: Louisiana grade 8 public schools.* Washington, DC: National Center for Education Statistics; 2009.

59. Institute of Education Sciences. *The nation's report card. Reading 2009 state snapshot report: Louisiana grade 8 public schools.* Washington, DC: National Center for Education Statistics; 2009.

60. Centers for Disease Control and Prevention. 2007 National Health Interview Survey; 2008.

61. Heron M, Hoyert DL, Murphy SL, Xu J, Kochanek KD, Tejada-Vera B. Deaths: Final data for 2006. *Natl Vital Stat Rep.* 2009;57:1–134.

62. Centers for Disease Control and Prevention (CDC). Cigarette smoking among adults—United States, 2002. *MMWR Morb Mortal Wkly Rep*. 2004;53:427–431.

63. Smedley BD, Syme SL, Committee on Capitalizing on Social Science and Behavioral Research to Improve the Public's Health. Promoting health: Intervention strategies from social and behavioral research. *Am J Health Promot.* 2001;15:149–166.

64. County Health Rankings. 2010 health outcomes map; 2010.

65. Louisiana Department of Health and Hospital, 2004 vital statistics data tables; 2007.

66. American Human Development Project. *The measure of America: American human development report, 2008–2009*; 2009.

67. Xu j, Kochanek KD, Murphy SL, Tejada-Vera B, Division of Vital Statistics. Deaths: Final data for 2007. *Natl Vital Stat Rep*. 2010;58(19). Hyattsville, MD: National Center for Health Statistics.

68. Martin JA, Hamilton BE, Sutton PD, *et al.* Births: Final data for 2007. *Natl Vital Stat Rep*. 2010;58(24). Hyattsville, MD: National Center for Health Statistics.

69. United Nations, Department of Economic and Social Affairs, Population Division. World population prospects: The 2006 revision. 2007;ESA/P/WP.202.

70. Dolan C, Delcher C. Monitoring health inequities and planning in Virginia: Poverty, human immunodeficiency virus, and sexually transmitted infections. *Sex Transm Dis*. 2008;35:981–984.

71. Centers for Disease Control and Prevention. Infant mortality statistics from the 2005 period linked Birth/Infant death data set. *Natl Vital Stat Rep.* 2008;57(2).

72. Centers for Disease Control and Prevention. Health, United States, 2008—Updated trend tables as of July 2009; 2009.

73. Nazroo JV. The structuring of ethnic inequalities in health: Economic position, racial discrimination, and racism. *Am J Public Health*. 2003;93:277–284.

74. Krieger N, Rowley DL, Herman AA, Avery B, Phillips MT. Racism, sexism, and social class: Implications for studies of health, disease, and well-being. *Am J Prev Med*. 1993;9:82–122.

75. Krieger N, Sidney S. Racial discrimination and blood pressure: The CARDIA study of young black and white adults. *Am J Public Health*. 1996;86:1370–1378.

76. Krieger N. Discrimination and health. In: *Social Epidemiology.* Berkman L, Kawachi I, eds. Oxford, England: Oxford Univ Press; 2000:36.

77. James SA, Strogatz DS, Wing SB, Ramsey DL. Socioeconomic status, John Henryism, and hypertension in blacks and whites. *Am J Epidemiol*. 1987;126:664–673.

78. United States Department of Justice, Federal Bureau of Investigation. *Crime in the United States,* 2004; 2005.

79. United States Department of Justice, Federal Bureau of Investigation. *Crime in the United States,* 2006; 2007. Accessed February 17, 2011.

80. United States Department of Justice, Federal Bureau of Investigation. *Crime in the United States,* 2007; 2008. Accessed February 17, 2011.

81. United States Department of Justice, Federal Bureau of Investigation. *Crime in the United States,* 2008; 2009. Accessed February 17, 2011.

82. United States Department of Justice, Federal Bureau of Investigation. *Crime in the United States,* 2009; table 4; 2010.

83. 2009 City of New Orleans Crime Maps. Available at: http://www.crimemapping.com/map/la/neworleans. Accessed June 30, 2010.

84. New Orleans Police Department. Bureau of Investigations Homicide Division: 2008 year end report; 2009.

85. New Orleans Police Department. Bureau of Investigations Homicide Division: Homicide statistics 2009 year end report; 2010.

86. U.S Census Bureau. U.S. Census Bureau 2005 American Community Survey; 2007.

87. U.S. Census Bureau. U.S. Census Bureau 2006 American Community Survey; 2007.

88. Jargowsky P A, Park Y. Cause or consequence? Suburbanization and crime in U.S. metropolitan areas. *Crime & Delinquency.* 2009;55:28-50.

89. Varano SP, Schafer JA, Cancino JM, Decker SH, Greene JR. A tale of three cities: Crime and displacement after hurricane Katrina. *Journal of Criminal Justice.* 2010;38:42-50.

90. Data driven by Valassis Lists. From a compilation by the Greater New Orleans Community Data Center; 2010.

91. Sastry N. Displaced New Orleans residents in the aftermath of hurricane Katrina: Results from a pilot survey. *Organ Environ*. 2009;22:395–409.

92. Park RE, Burgess E, McKenzie RD. *The City.* Chicago, IL: Univ Chicago Press; 1925.

93. Lochner L, Moretti E. The effect of education on crime: Evidence from prison inmates, arrests, and self-reports. *Am Econ Rev.* 2004;94:155–189.

94. Polier N. After Katrina: Tales from a chartered school classroom. *Radical Teacher*. 2006:20–23.

95. Groen JA, Polivka AE. Hurricane Katrina evacuees: Who they are, where they are, and how they are faring. *Monthly Labor Review.* 2008;131:32–51.

96. The White House. The federal response to hurricane Katrina: Lessons learned. Washington, DC; 2006.

97. Knabb RD, Rhome JR, Brown DP. Tropical cyclone report: Hurricane Katrina, August 23–30, 2005. *Fire Eng.* 2006;159:32–37.