Socioeconomic Differences in Household Automobile Ownership Rates: Implications for Evacuation Policy

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Abstract

The devastation wrought by hurricane Katrina laid bare many of the disparities that continue to separate Americans by race and class. One disparity that was immediately apparent in Katrina's aftermath concerned the size and composition of the area's populations that lacked access to an automobile. These households, largely dependent on the limited emergency public transportation available to evacuate the city in advance of the storm, were the most likely to be left behind. In New Orleans, this population seemed quite large in size – and overwhelmingly black. In this paper, we document differences in car-ownership rates between racial and socioeconomic groups. We present patterns for the nation as a whole as well as for the pre-Katrina New Orleans metropolitan area using data from the 2000 5% Public Use Microdata Sample (PUMS) of the U.S. Census of Population and Housing. We also present estimates of the number of people for all U.S. metropolitan areas that reside in a household without access to an automobile. Finally, we explore the relationship between residential housing segregation and spatial proximity to other households without access to automobiles among African-Americans.

1. Introduction

The devastation wrought by hurricane Katrina has laid bare many of the disparities that continue to separate Americans by race and class. One disparity that was immediately apparent in Katrina's aftermath concerned the size and composition of the area's population that lacked access to an automobile. These households, largely dependent on the limited emergency public transportation available to evacuate the city in advance of the storm, were those most likely to be left behind. In New Orleans, this population seemed quite large in size – and overwhelmingly black and poor.

In retrospect, the size and demography of the population stranded by Katrina is not particularly surprising. Nationwide household access to automobiles is quite low for African-Americans (especially poor African-Americans), with a disparity relative to white households that is somewhat smaller than, yet comparable in magnitude to, the racial disparity in home ownership rates. Moreover, New Orleans was a predominantly black city, with an overall poverty rate that exceeded by far that for the nation. The evacuation failure in New Orleans was compounded by the racial segregation of the New Orleans metropolitan area. Given that most black households resided in predominantly black areas, black households without cars were physically surrounded by neighbors without cars, rendering an evacuation strategy based on private transportation particularly ineffective.

This is not to suggest, however, that the outcome we observed in New Orleans is one that would not be reproduced elsewhere should such a catastrophe hit another major American metropolitan area. New Orleans is a mid-size American city with a population that happens to be disproportionately African-American. In many larger U.S. cities, the black population is

comparable in magnitude, highly residentially segregated, disproportionately poor, and has low car-ownership rates (the precise traits that rendered New Orleans blacks particularly vulnerable).

In this paper, we document differences in car-ownership rates between racial and socioeconomic groups. We present patterns for the nation as a whole as well as for the pre-Katrina New Orleans metropolitan area using data from the 2000 5% Public Use Microdata Sample (PUMS) of the U.S. Census of Population and Housing. We also present estimates of the number of people for all U.S. metropolitan areas that reside in a household without access to an automobile. Finally, we explore the relationship between residential housing segregation and spatial proximity to other households without access to automobiles among African-Americans.

The results of the analysis suggest that there are sizable populations without access to household automobiles in most U.S. metropolitan areas. Similar to New Orleans, the members of these households are disproportionately poor and minority. Moreover, we show that the combination of low car-ownership rates among black households coupled with racial housing segregation renders evacuation plans based on private transportation most ineffective for predominantly minority communities. The results suggest that cities facing risks requiring evacuation cannot completely depend on decentralized private evacuation strategies.

2. Was New Orleans Unique? Basic Cross-City Differences in Households Access to Automobiles

Nationwide, roughly 8 percent of the U.S. population resides in a household with no access to an automobile. As we will soon see, there are great disparities across racial and ethnic group, income class, and other demographic characteristics such as age. Before turning to these comparisons, however, here we present some basic estimates of the population with no access to

a car for specific metropolitan areas and cities. We seek to assess whether access to private transportation in New Orleans prior to Katrina was particularly weak. In addition, we seek to provide estimates for policy makers and planners of the size of their region's population that does not have access to a car.

Table 1 presents estimates of the percent of people in a household with no car as well as the overall population estimate for each metropolitan area in the United States. At the top of the table, the ten metropolitan areas with the largest percentage figures are isolated. Not surprisingly, the New York Consolidated Metropolitan Statistical Area has the largest population of individuals in households without access to a single automobile (42 percent of the population accounting for almost 4 million people). Moreover, among the nation's top ten are some of the largest metropolitan areas in the country, such as Los Angeles-Long Beach, the San Francisco Bay Area, and Chicago.

The New Orleans metropolitan area ranks at the top of this distribution, with Table 1 indicating that New Orleans has the fourth highest rate of individuals with no access to a household auto among the nearly 300 metropolitan areas in the country. As we will soon see, this fact is driven largely by the internal demographic composition of the metropolitan area. Figure 1 summarizes the relative position of the New Orleans metropolitan area. In the lion's share of metropolitan areas, the percent of individuals in households with no cars lies below eight percent, with a large share of metropolitan areas below four percent.

Table 2 reproduces these tabulations for all U.S. central cities identified in the 5 percent 2000 PUMS. Again, the table presents the percent of the population with no auto access as well as the corresponding estimate of the absolute population with access to a car. The top ten cities are isolated at the top of the table. The percentages without access to a car are clearly higher for the

nation's central cities relative to the comparable figures for entire metropolitan area. This fact reflects the relative poverty of central city populations, the higher costs associated with owning and maintaining a car in more urban settings, and the wider availability of public transit in and around major American cities.

The percent of residents without access to a car in the city of New Orleans is again high enough to place the city among the top ten. The remaining nine cities are all on the east coast, with Washington, D.C., Boston, and Baltimore being added to the list. Note, in nearly all of these top ten cities, the absolute size of the population with no access to a car is either comparable in magnitude or exceeds the estimate for New Orleans. Figure 2 summarizes the distribution of the percentage figures across central cities. Again, New Orleans is in the tail with a percentage with no car far above the average for other central cities

As a final set of tabulations, Table 3 presents comparable city-specific estimates of the percent with no car access specifically for the non-elderly and elderly poor. In the aftermath of hurricane Katrina, it become evident that most of those stranded by the hurricane were poor, and many were elderly. Here we present figures for central cities only. The percentages in households with no cars are discretely higher for those residing in poverty. Averaging across all central cities, nearly 47 percent of the central city poor reside in households without a single automobile (with little difference between the elderly and non-elderly). This figure exceeds by far the percent without a car among the poor nationwide. Again, New Orleans is near the top of the pile along this dimension as are the same set of east coast central cities that appear in each of the two prior tables.

3. The demographic correlates of car-ownership

That African-Americans have low car-ownership rates follows directly from sharp racial differences in household income and poverty. Low income households are often unable to generate the resources needed for down payments on expensive consumer durables that cannot be fully financed. Moreover, the cost of capital faced by poor households is likely to be higher on average due to such factors as poor credit histories and perhaps even discriminatory treatment in capital markets. In 2004, roughly 24.7 percent of African-Americans lived below the federal poverty line, compared with 8.6 percent of non-Hispanic whites. Median household income in 2004 for black households stood at $30,134 per year, only 62 percent of the median household income for whites.

The racial disparity in durable asset ownership that has perhaps received the most attention is housing. As of the fourth quarter of 2005, 48 percent of households headed by an African-American owned their residence, compared with 76 percent of non-Hispanic white residents and 50 percent of Hispanic residents. This racial disparity in home-ownership rates has received much attention, as home ownership is one of main avenues of wealth accumulation for U.S. residents. A house, in contrast to an automobile, generally appreciates in value over time. Moreover, borrowing against home equity is often considerably cheaper relative to the cost of capital for unsecured debt.

Racial disparities in car ownership rates have received far less attention. Nonetheless, substantial disparities exist that may be linked to racial disparities in labor market outcomes (see for example, Raphael and Stoll (2001) and Raphael and Rice (2002)), time endowments, and, as has become evident post-Katrina, other important outcomes that affect the welfare of poor

households. In this section, we document racial and ethnic differences in car ownership rates along with how car access differs by household income relative to the poverty lane.

Table 4 presents tabulations from the 2000 five percent PUMS of the percent of people who reside in households without access to a single automobile. For all U.S. residents, residents of the New Orleans metropolitan statistical area, and residents of the city of New Orleans, the table presents estimates of the percent without cars by race/ethnicity (non-Hispanic white, non-Hispanic black, other non-Hispanic, and Hispanic) and income (those with incomes below 100 percent of the poverty line (the poor), those with incomes between 100 and 200 percent of the poverty line (the near poor), and everyone else). Beginning with the results for all U.S. residents, African-Americans have the lowest car-ownership rates of all racial/ethnic groups. In particular, 19 percent of blacks reside in households without a single car, compared to 4.6 percent of whites, 13.7 percent of Hispanics, and 9.6 percent of those falling into the other category. These racial disparities are particularly large among the poor, suggesting an interaction effect between race and poverty on the likelihood of owning a car. For example, the black-white difference in car-ownership rates among the poor is over 22 percentage points (33 percent of poor blacks compared with 12 percent of poor whites), compared with an overall racial disparity of roughly 14 percentage points. This disparity narrows somewhat among the near poor but is still quite large (on the order of 12 percentage points).

Within the New Orleans metropolitan area, and in particular within the city of New Orleans, car ownership rates were very low. For example, the overall percentage of residents with no access to a car was 14 percent in the metropolitan area and approximately 26 percent for the city, compared with 8 percent for the nation as a whole. Among the poor, 36 percent of the poor in the metropolitan area and nearly 47 percent of poor residents of the city did not have access to a

single automobile, compared with 20 percent of the poor nationwide. Interestingly, most of the differences between New Orleans and the nation are driven by particularly high figures for African-Americans and, more specifically, the African-American poor. Roughly half of African-Americans residing in poverty in New Orleans (using either the city or metropolitan area definition) had no access to a car, compared with 33 percent of poor blacks nationwide.

In addition to these high percentages with no access to a car for specific racial and income groups, the racial composition of New Orleans coupled with an unusually high poverty rate further contributed to the overall size of the population at risk of being stranded. Table 5 presents tabulations from the 2000 PUMS of average socioeconomic and demographic characteristics for all residents of the U.S., residents of the New Orleans metropolitan area as well as residents of the city of New Orleans. The Table presents tabulations for all residents as well as the residents in a household with access to at least one car and residents in households with no cars.

A simple comparison of the figures in the first column reveals much about why those stranded by Katrina were disproportionately poor and black. While African-Americans comprise 12.5 percent of the U.S. population in 2000, blacks accounted for 40 percent of the population of the New Orleans metropolitan area, and 67 percent of the city population. Moreover, while the national poverty rate stood at 14.6 percent in 2000, the poverty rate for the New Orleans metropolitan area was six percentage points greater (20.8 percent), while the poverty rate for the city of New Orleans (30.5 percent) was more than double the national rate.

To be sure, it is unlikely that those left behind in the New Orleans Superdome or Convention Center were a random sample of New Orleans residents. While such a random sample would surely select a population that was disproportionately black and poor, the figures in the second

two columns of Table 5 suggest that differential access to autos within New Orleans between racial and income groups was an important contributor. For example, within the New Orleans metropolitan area, African-Americans constituted 34 percent of residents residing in a household with access to at least one car, while at the same time accounting for 77 percent of residents in households without access to a single automobile. Within the city of New Orleans, blacks constituted 61 percent of residents in households with cars and 86 percent of residents of households without cars.

Similar patterns are observed in the proportional representation of the poor. Those residing in poverty accounted for 16 percent of those in households with access to at least one automobile, but 53 percent of those in households with no cars. For the city of New Orleans, the comparable figures are 21 percent and 56 percent respectively.

Thus, both nationwide and in the New Orleans metropolitan area, there are large racial and income disparities in car ownership rates, with unusually low car ownership rates within defined groups for New Orleans. The relative poverty and racial composition of those who did not evacuate certainly reflects in part the racial and income composition of the city of New Orleans, pre-Katrina. However, these sharp differences in auto-access rates likely diminished the probability of evacuating before the flooding for the city's poor and African-American residents.

4. Racial Housing Segregation and Neighborhood Access to Private Automobiles

Thus far we have demonstrated two general facts: (1) in nearly all metropolitan areas there are numerically large populations of individuals residing in households with no auto access, and (2) these populations are disproportionately poor and minority. We have also shown that in

post-Katrina New Orleans auto-access among poor and minority communities was particularly low.

Clearly, one would expect a relationship between the ease of evacuation in response to a crisis and access to a private household auto, and the lower household auto ownership rates of African-Americans would clearly put them at a disadvantage. This disadvantage may be offset, however, if African-American households have neighbors with cars who could help in the event of a disaster. Interestingly, the stock of privately-owned automobiles in the New Orleans metropolitan area was more than sufficient to evacuate the entire population had neighbors with cars extended help to neighbors without. Tabulations from the 2000 census indicate that there were 2.3 persons for each automobile in New Orleans, only slightly lower than the 2.2 persons per car figure for the nation as a whole. Assuming an average carrying capacity of three persons per auto, there should have been sufficient private capacity to evacuate all residents of the metropolitan area.

In practice, however, the racial housing segregation that is common in most U.S. metropolitan areas is likely to have compounded the African Americans' lower access to autos in New Orleans. Simply put, given that African-Americans have low car-access rates and African-Americans are quite likely to live in disproportionately African-American neighborhoods, black households with no access to a car are likely to be physically surrounded by other households without access to a car. Thus, racial segregation mechanically limits the potential for neighborly behavior to offset the consequences of racial disparities in car ownership.

In this section, we explore the relationship between racial segregation in housing and various measures of the degree of auto access among one's neighbors. To do so, we analyze census tract level data from the 2000 Census Summary Tape Files 3 for the entire nation and use

these data to characterize the auto access rates of the neighborhoods of the average white and black residents of all metropolitan areas in the U.S. We use census tracts[1] as our measure of neighborhood.

Characterizing the degree of modern-day segregation and its effect on neighborhood auto access

Before discussing specific racial differences in auto access, we first depict the degree of racial housing segregation characteristic of U.S. metropolitan areas as of the last census. While there are many ways to numerically characterize racial housing segregation, a standard and easily interpretable segregation measure is the dissimilarity index. The dissimilarity index provides a single number that depicts the degree of racial housing segregation in a given metropolitan area. The index describes the degree of dissimilarity between the spatial distribution of two population groups (for example whites and blacks) across the neighborhoods of a given metropolitan area. The index varies from 0 to 1, with a value corresponding to the proportion of either of the metropolitan area's sub-populations that would have to be relocated to achieve perfect balance.[2] For example, our tabulations from the 2000 STF3 files yield a black-white dissimilarity score for New Orleans of 0.687, indicating that 68 percent of New Orleans blacks (or whites) would have had to move in 2000 to achieve perfect integration.

Figure 3 summarizes the degree of racial housing segregation between blacks and whites as of the 2000 census. We construct the figure as follows. First, we tabulated the dissimilarity score between blacks and whites for each metropolitan area in the country. Next, we placed

[1] Census tracts are small sub-county geographic units that are meant to capture relatively homogenous areas within cities that may be thought to approximate neighborhoods. In the 200 census, the average population of a census tract is approximately 4,000 persons.

[2] The dissimilarity index is fairly simple to calculate. Define the variable *Black* as the total black population in a given metropolitan area, *White* as the total white population in a given metropolitan area, $Black_i$ as the black population of neighborhood *i*, and $white_i$ as the white population of neighborhood *i*. The dissimilarity index for the metropolitan area is calculated by the expression $D = \frac{1}{2}\sum_{i=1}^{I}\left|\frac{Black_i}{Black} - \frac{White_i}{White}\right|$.

metropolitan areas into segregation groups based on 5 percentage point intervals. Finally, we allot African-Americans across these groups according to the size of the black population in each metropolitan area. Thus, the figure presents the distribution of segregation scores across metropolitan areas after weighting by the relative size of the black population in each region.

The degree of black-white segregation varies considerably from a low of roughly 0.25 to a high of 0.83. However, most African-Americans live in fairly segregated metropolitan areas. The median black resident in U.S. metropolitan areas resides in an area with a segregation score of 0.645 (that is to say, 65 percent of blacks in the median African-American's metropolitan area would have to relocate to desegregate the city). While this represents a substantial improvement relative to the degree of segregation in 1990, the median level of segregation experienced by blacks remained high at the close of the 20th century.[3] The degree of segregation experienced by black residents of New Orleans (a dissimilarity score of 0.687) is slightly above the national median.

To assess the extent to which racial housing segregation translates into lower neighborhood car access rates in the respective neighborhoods of blacks and whites, we performed a series of simple tabulations using the STF3 data. First, for each census tract in the country, we calculate the proportion of households without access to a car as well as the number of persons per car in the census tract. Next, we tabulate the average values for these two neighborhood level auto access measures using various alternative populations as weights. First we tabulate averages using the total census tract population as weights. These averages are indicative of the car access measures in the neighborhood of the average American. Next, we tabulate averages using census tract white population as weights, giving means that can be

[3] See Raphael and Stoll (2002) for a discussion of how racial segregation and racial disparities in geographic job access changed between 1990 and 2000.

interpreted as the access rates for the average white American. Finally, we tabulate averages using the census tract's black population as weights, providing access rates for the average black American. To the extent that racial segregation concentrates black households in neighborhoods with low car ownership rates, the fraction without a car and the number of persons per car should be higher in the typical black neighborhood relative to the typical white neighborhood.

Figures 4 and 5 graphically depict these tabulations for the nation as a whole and for the New Orleans metropolitan area. Starting with Figure 4, the average U.S. resident resides in a census tract where roughly 10 percent of households have no access to a car. The comparable figure for New Orleans is substantially higher (15.4 percent), likely reflecting the higher poverty rates and higher fraction black in New Orleans. For the average white U.S. resident, 8 percent of the households in one's neighborhood do not have single automobile, compared with approximately 20 percent for the neighborhood of the average African-American. In New Orleans, both figures are higher (9 percent for white and 26 percent for blacks), especially for African-Americans.

Figure 5 presents the comparable tabulations for the ratio of neighborhood residents to cars. Nationwide as in New Orleans, there are slightly more than two persons per car in the neighborhood of the average U.S. resident. However, there are notable racial disparities. For the nation and New Orleans, the ratio of people to cars in the typical white neighborhood is under two. In black neighborhoods, the ration of people to cars ranges from 3.3 (New Orleans) to 3.5 (nationwide).

Racial segregation and neighborhood auto access in New Orleans

The tabulations in Figures 4 and 5 provide a nice summary of the typical neighborhood access to autos and how such access varies by race. A simpler way to reinforce this point is to

analyze maps of specific regions in order to assess the visual correlation between racial housing segregation on the one hand and the spatial concentration of households with no autos on the other.

Figures 6 and 7 present such an analysis for the city of New Orleans. Figure 6 presents the fraction of each census tract's residents that are African-American. As is readily apparent, the black community is visibly concentrated in a handful of neighborhoods, including New Orleans East, the lower ninth ward, and the seventh ward. Figure 7 graphically depicts two variables: the proportion of households without access to an automobile (reflected in the different shadings of the geographic sub-units of the city) and the number of households without an auto (each dot representing 20 households). A comparison of Figures 6 and 7 reveals that household without access to automobiles are not randomly distributed. There is a notable visual correlation between the proportion of households that are black and the proportion of households without cars. In particular, predominantly African American neighborhoods such as the Lower Ninth Ward and Holy Cross, the Seventh Ward, and Tremé, all inundated with flood waters, show large concentrations of car-less households, in comparison to the mostly white, also-inundated Lakeview district.

Is the proportion carless in black neighborhoods higher in more segregated cities?

Thus far, we have shown that neighborhood access to autos is lower for African-Americans (nationwide as well as in New Orleans) and, within New Orleans, is negatively correlated with the proportion of neighborhood residents that are black. An interesting implication of these patterns concerns whether blacks in less segregated cities have better access to neighbors with cars than blacks in more segregated cities. Figure 3 reveals considerable variation in racial segregation across metropolitan areas, although most blacks reside in fairly

segregated conditions. Here, we briefly explore how segregation and neighborhood auto access vary across metropolitan areas.

Figure 8 presents a scatter plot of the proportion of households with no access to a car in the neighborhood of the average black resident against the black-white dissimilarity index. Each data point represents one of the approximately 280 metropolitan areas in the country. There is notable positive relationship between the proportion of neighbors without a car in black neighborhoods and the degree of segregation between blacks and whites. This is precisely what one would expect given the relatively low car ownership rates of black households.

To ascertain whether the correlation depicted in Figure 8 is driven by some underlying characteristic that varies across metropolitan areas and that affects car-ownership rates for both blacks and whites, Figure 9 presents a comparable scatter plot where the variable on the vertical axis is now the difference in the proportion of households without a car between the typical black and white neighborhoods of the city. By calculating the difference relative to white neighborhoods, the figure nets out any unobserved metropolitan area characteristic that may influence overall car access rates. Again, there is a strong positive correlation between the relative proportion of households without cars in black neighborhoods and the degree to which blacks are segregated from whites.

5. Conclusion

The patterns documented in this paper are several. First, we show that in most metropolitan areas there are sizable populations of households without access to automobiles. Individuals in these households are more likely to be poor and minority and are perhaps the most likely to be left behind in the event of an emergency evacuation. Second, there are quite large

disparities in car-ownership rates between black and white households. These disparities certainly reflect average differences in income as well as differential costs of owning a car. Nonetheless, even among the poor, black households are considerably less likely than white households to have access to an auto. Finally there is a compounding effect of racial segregation on access to automobiles via the fact that low black car ownership rates coupled with racial housing segregation concentrates poor minorities in neighborhoods where many households lack automobile access.

These findings raise several questions regarding how federal, state, and local policy makers should plan for the evacuation of a region's most vulnerable residents. Given low car-ownership rates among certain sub-groups, one might ask whether a city's existing public transit infrastructure can be adequately mobilized to fill the gaps left by a private transport evacuation. Moreover, given many of the difficulties experienced in the evacuation of Houston soon after the Katrina disaster, one might further inquire whether higher car ownership rates would appreciably help.

In the case of Katrina, the pre-existing public transit evacuation plan failed miserably. New Orleans had an emergency plan to evacuate one to two hundred thousand people by bus in the event of an emergency, and as the hurricane approached the City established ten pickup points to take people to emergency shelters. Drivers were to take their own families to safety on the first loaded bus run and then continue to evacuate others. However, the plan failed completely when only a few drivers reported to work during the evacuation period. Residents then were directed to the Superdome and the Convention Center despite the lack of adequate water, food, or security there.

Even had the bus drivers done their jobs, the plan was not likely to succeed. A few simple calculations demonstrate the enormity of the task of evacuating those without private transportation and the likely limited ability of transit to rise to the occasion. Optimistically, 500 buses[4] could have evacuated perhaps forty persons per vehicle or 20,000 persons per set of outbound trips. A fifty-mile trip to shelters outside the likely high damage areas (Baton Rouge is 80 miles away, so 50 miles is conservative) would at minimum take one hour assuming orderly loading and unloading, minimal time for driver relief, and little or no traffic congestion. Another hour would be consumed as the bus unloaded and then returned for the next run. If drivers had been willing to work 16 hour days, 160,000 persons could have been evacuated in a day under ideal circumstances – i.e., drivers could be found for all runs, fuel was available for rapid refueling, no breakdowns occurred, and no traffic backups or other incidents slowed the trips.

A more realistic plan would assume that speeds on freeways would be no more than twenty miles per hour during an evacuation, and perhaps as low as ten miles per hour. At these speeds a one hundred mile round trip would take five to six hours (assuming the inbound trip would be at posted speeds) and no more than two runs a day could be accomplished. This would have cut the New Orleans bus evacuation rate to only 40,000 per sixteen-hour workday.

Thus, with the benefit of hindsight, it is not too surprising that the transit evacuation strategy in place failed. The system capacity was small relative to the population without automobiles and serious unanticipated implementation problems (for example, the failure of drivers to show up) hampered the effectiveness of the effort.

To be sure, the results from this one disaster does not indicate that public transit cannot partially or even completely fill the gap left by less than universal access to private

[4] In the New Orleans Regional Transit Authority's 2/19/2004 report to the National Transit Database, the agency reports 364 buses and 40 demand-response vehicles available for maximum service (no spares, no vehicles down for repair). Elsewhere, the school bus fleet has been estimated to be about 100 vehicles (Litman, 2005.)

transportation. In other disasters, transit has played a significant role in both evacuations and in post-disaster recovery. For example, transit was the principal means of evacuating hundreds of thousands of people from lower Manhattan after the attack on the World Trade Center. Transit also was used in New York to bring emergency aid into the area and in providing emergency assistance. Likewise in Washington, DC, Metro evacuated several hundred thousand people after the attack on the Pentagon.

Nonetheless, the difficulties encountered in the wake of Katrina suggest that more comprehensive (and perhaps creative) planning is needed to avoid such catastrophes in the future. For example, while the initial plan was to evacuate New Orleans residents from the city, an alternative was to move those without cars and those with nowhere to go only as far as the nearest "safe" location within the storm zone – the Superdome and Convention Center were intended to be such sights. While the Superdome proved to be a severely flawed destination, identifying a more suitable location within say ten to twelve miles would have greatly reduced bus travel distance and perhaps have permitted moving everyone to shelter in a day.

Alternatively, reports indicate that Amtrak had equipment available for evacuation and this could have greatly increased New Orleans' overall evacuation capacity. A single train car could carry two buses worth of evacuees. Moreover, the exclusive right-of-way for rail means much less serious congestion problems. However, communications broke down and this option was not used. Similarly, buses were not brought in from other jurisdictions to help with the evacuation. Perhaps tapping such alternative sources would provide a substantial boost to the transit evacuation capacity.

The limitations to transit based evacuation strategies raises the question of whether higher car-ownership rates would increase the swiftness and coverage of a general evacuation. Clearly,

low car ownership rates among poor and vulnerable populations will continue in nearly all American cities. Even the smallest metropolitan areas have literally thousands of residents who do not have a car. Moreover, a significant proportion of households without a car also have mobility limitations or other physical or mental disabilities that would prevent them from driving.

Access to a car, however, does not guarantee an easy evacuation. In New Orleans when Katrina hit, some poor families with cars chose to remain in their homes because they did not know anyone outside the city that could provide shelter and did not have the money to stay in a hotel; others stayed because they did not want to leave pets, for whom evacuation plans had made no provisions (personal interviews, Jan. 2006). Lack of information regarding the availability of shelters further discouraged departure. Further, a study done two years before Katrina showed that there would not be enough roadway capacity to evacuate everyone by car in any case; with only 60% evacuating by car, roads were predicted to be jammed with speeds lowered to five to ten miles per hour. (Wolshon, 2002).

Other cities' experiences also underscore the limitations of auto-based evacuations. Following 9/11, many Washington D.C. workers left their cars in the city and evacuated by transit due to standstill traffic. Average speeds on both local streets and freeways dropped to less than ten miles an hour and some travel lanes were blocked by cars abandoned after crashes, breakdown, or running out of gas.

The Houston experience, a few weeks after Katrina, shows that even a reasonably well-orchestrated car-focused evacuation strategy can fail. As Hurricane Rita bore down on the Houston-Galveston area, officials called for early evacuation and planned to reverse freeway direction to increase capacity northbound, away from the coast. Plans assumed that as many as

1.2 million people would flee for points north. However, early notices recommended that everyone leave the metropolitan area, and some 2.5 million, about half the region's population, apparently attempted to do so. This led to massive traffic jams on all the freeways, with average speeds under five miles an hour on many routes. [5]

Given the limitations of both transit as well as private transportation evacuation strategies, what then should localities do in planning for future catastrophes? We have shown that thousands of people in every metropolitan area of the US don't have cars to help them evacuate in the case of disaster. Many of them live in areas where transit could serve as a good alternative, but New Orleans shows that transit can fail badly and that even a sizeable transit capacity won't be enough in a major disaster. Moreover, many of the nation's metropolitan areas do not really have extensive transit systems, so there is no realistic possibility of relying on transit alone in those areas.

Cars can evacuate thousands or even millions, but in a mass evacuation, cars can be caught in multi-hour traffic jams, with vehicle breakdowns, fuel shortages, and in the worst cases, road blockages that constrict movement in or out of the disaster area, exacerbating the disaster. Cars won't work if the roads out have collapsed or are blocked, if fuel can't be found, or if the car itself is damaged in the disaster; cars may not be fast enough if everyone is evacuating at the same time.

Tapping alternative sources of transit capacity is clearly an avenue worth exploring. Areas that face comparable yet imperfectly correlated risks (such as cities on the gulf coast) may

[5] Cars overheated and broke down or ran out of fuel, blocking roads and cutting capacity further. Gas stations ran dry and others were closed for lack of staff as their operators joined the evacuation. Plans to reverse freeway lanes to increase outbound capacity were abandoned; officials stated publicly that the lanes were needed to get emergency vehicles and supplies into the danger zone, but privately they admit that a bigger reason was that the equipment and staff were not available to reverse direction of the lanes, a process that requires intervention at every on-ramp. In addition, they discovered that many motorists needed to head South to pick up family members before evacuating, and closures caused considerable motorist confusion and consternation. (personal interviews, November 2005.)

benefit from pre-arranged sharing agreements whereby inter-locality cooperation can expand the capacity of a city's transit system when needed.

Sharing rides may also provide an alternative way to get more people out. To be sure, many drivers fill their cars with family members, pets and valuables; empty seats may be scarce. However, hardly any area has organized to provide ridesharing in a disaster and we don't know what it would take to make it work. Future thinking and research in this area is needed.

Other options need to be coordinated better than they were in New Orleans. Trains could have evacuated thousands but were left idle. In the Bay Area, ferries helped evacuate people in 1906; the Bay Area Regional Transit System kept going after the Loma Prieta earthquake. But the next quake could block or damage ferry access or damage the BART tube or tracks. It's hard to know in advance what will be accessible and usable and what will not, so scenarios should be played out.

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Table 1
Percent and Number of Residents in Households with no Access to an Automobile, 2000

Top ten metropolitan areas	Percent with no auto access	Population with no auto access
New York-Northeastern NJ	42%	3,949,939
Jersey City, NJ	30%	182,252
Waterbury, CT	16%	17,731
New Orleans, LA	**14%**	**175,289**
Philadelphia, PA	13%	646,269
Baltimore, MD	12%	290,809
Newark, NJ	12%	243,673
San Francisco-Oakland-Vallejo, CA	12%	201,303
Chicago-Gary-Lake, IL	11%	877,429
Los Angeles-Long Beach, CA	11%	1,036,738
All metropolitan areas		
Abilene, TX	5%	6,476
Akron, OH	5%	35,049
Albany, GA	9%	10,975
Albany-Schenectady-Troy, NY	8%	62,644
Albuquerque, NM	5%	32,386
Alexandria, LA	9%	11,541
Allentown-Bethlehem-Easton, PA/NJ	7%	41,857
Altoona, PA	8%	10,082
Amarillo, TX	4%	7,863
Anchorage, AK	4%	11,125
Ann Arbor, MI	3%	15,610
Anniston, AL	6%	6,331
Appleton-Oshkosh-Neenah, WI	3%	9,606
Asheville, NC	5%	11,461
Athens, GA	5%	8,386
Atlanta, GA	6%	255,959
Atlantic City, NJ	11%	38,481
Auburn-Opelika, AL	4%	4,871
Augusta-Aiken, GA-SC	7%	30,915
Austin, TX	5%	52,757
Bakersfield, CA	8%	53,768
Baltimore, MD	12%	290,809
Barnstable-Yarmouth, MA	3%	4,326
Baton Rouge, LA	6%	39,183

Beaumont-Port Arthur-Orange, TX	7%	26,692
Bellingham, WA	4%	7,390
Benton Harbor, MI	6%	9,366
Bergen-Passaic, NJ	9%	122,761
Billings, MT	4%	5,779
Biloxi-Gulfport, MS	**5%**	**14,449**
Binghamton, NY	8%	19,137
Birmingham, AL	7%	52,528
Bloomington, IN	4%	5,341
Bloomington-Normal, IL	4%	5,483
Boise City, ID	3%	13,922
Boston, MA	10%	334,172
Boulder-Longmont, CO	4%	8,061
Brazoria, TX	3%	7,725
Bremerton, WA	4%	10,105
Bridgeport, CT	9%	31,838
Brockton, MA	6%	14,643
Brownsville-Harlingen-San Benito, TX	9%	29,783
Bryan-College Station, TX	5%	8,051
Buffalo-Niagara Falls, NY	10%	122,645
Canton, OH	4%	17,479
Cedar Rapids, IA	4%	8,160
Champaign-Urbana-Rantoul, IL	6%	11,418
Charleston-N. Charleston, SC	9%	39,429
Charlotte-Gastonia-Rock Hill, SC	5%	72,754
Charlottesville, VA	5%	7,676
Chattanooga, TN/GA	5%	22,215
Chicago-Gary-Lake, IL	11%	877,429
Chico, CA	5%	11,088
Cincinnati OH/KY/IN	8%	115,193
Clarksville-Hopkinsville, TN/KY	4%	5,560
Cleveland, OH	8%	184,821
Colorado Springs, CO	4%	18,777
Columbia, MO	5%	6,595
Columbia, SC	6%	31,832
Columbus, GA/AL	9%	17,118
Columbus, OH	5%	79,196
Corpus Christi, TX	5%	12,422
Dallas-Fort Worth, TX	5%	177,464
Danbury, CT	3%	5,288
Danville, VA	10%	11,156

Davenport, IA Rock Island-Moline, IL	6%	15,215
Daytona Beach, FL	5%	20,458
Dayton-Springfield, OH	6%	59,374
Decatur, AL	4%	5,927
Decatur, IL	6%	6,955
Denver-Boulder-Longmont, CO	6%	111,526
Des Moines, IA	4%	16,708
Detroit, MI	7%	312,133
Dothan, AL	6%	7,819
Dover, DE	6%	7,105
Duluth-Superior, MN/WI	7%	13,568
Dutchess Co., NY	5%	14,377
Eau Claire, WI	4%	5,815
El Paso, TX	7%	49,802
Elkhart-Goshen, IN	7%	12,767
Erie, PA	7%	19,267
Eugene-Springfield, OR	5%	16,588
Evansville, IN/KY	5%	13,710
Fargo-Morehead, ND/MN	4%	5,386
Fayetteville, NC	5%	14,736
Fayetteville-Springdale, AR	3%	10,714
Fitchburg-Leominster, MA	7%	9,583
Flagstaff, AZ-UT	5%	5,947
Flint, MI	9%	22,122
Florence, AL	4%	5,712
Fort Collins-Loveland, CO	3%	5,949
Fort Lauderdale-Hollywood-Pompano Beach, FL	6%	105,401
Fort Myers-Cape Coral, FL	5%	20,280
Fort Pierce, FL	4%	14,406
Fort Smith, AR/OK	5%	8,874
Fort Walton Beach, FL	2%	4,165
Fort Wayne, IN	6%	25,801
Fort Worth-Arlington, TX	4%	69,076
Fresno, CA	10%	88,046
Gadsden, AL	6%	6,620
Gainesville, FL	5%	11,773
Galveston-Texas City, TX	6%	16,002
Gary-Hammond-East Chicago, IN	7%	41,805
Glens Falls, NY	5%	6,470
Goldsboro, NC	7%	7,462
Grand Junction, CO	4%	4,003

Grand Rapids, MI	4%	41,595
Greeley, CO	3%	6,227
Green Bay, WI	4%	8,340
Greensboro-Winston Salem-High Point, NC	6%	69,650
Greenville, NC	7%	9,507
Greenville-Spartanburg-Anderson SC	6%	44,295
Hagerstown, MD	6%	7,477
Hamilton-Middleton, OH	4%	14,568
Harrisburg-Lebanon-Carlisle, PA	6%	38,170
Hartford-Bristol-Middleton-New Britain, CT	10%	71,732
Hattiesburg, MS	5%	5,163
Hickory-Morgantown, NC	4%	13,658
Honolulu, HI	8%	71,373
Houma-Thibodoux, LA	7%	7,677
Houston-Brazoria, TX	6%	271,082
Huntsville, AL	4%	12,276
Indianapolis, IN	5%	80,229
Iowa City, IA	4%	4,313
Jackson, MI	5%	7,684
Jackson, MS	6%	28,334
Jackson, TN	8%	8,276
Jacksonville, FL	6%	63,967
Jacksonville, NC	4%	5,496
Jamestown-Dunkirk, NY	8%	11,210
Janesville-Beloit, WI	3%	5,059
Jersey City, NJ	30%	182,252
Johnson City-Kingsport-Bristol, TN/VA	4%	14,139
Johnstown, PA	6%	14,667
Joplin, MO	4%	6,336
Kalamazoo-Portage, MI	5%	21,581
Kankakee, IL	5%	5,168
Kansas City, MO-KS	5%	84,916
Kenosha, WI	4%	6,127
Kileen-Temple, TX	4%	11,367
Knoxville, TN	5%	26,109
Kokomo, IN	5%	4,574
LaCrosse, WI	4%	4,347
Lafayette, LA	7%	17,887
Lafayette-W. Lafayette, IN	4%	7,361
Lake Charles, LA	6%	10,688
Lakeland-Winterhaven, FL	5%	24,498

Lancaster, PA	9%	41,469
Lansing-E. Lansing, MI	4%	18,255
Laredo, TX	8%	15,983
Las Cruces, NM	4%	6,652
Las Vegas, NV	7%	101,104
Lawrence-Haverhill, MA/NH	10%	25,762
Lexington-Fayette, KY	6%	15,256
Lima, OH	4%	6,729
Lincoln, NE	4%	9,180
Little Rock-North Little Rock, AR	6%	33,504
Longview-Marshall, TX	6%	10,067
Los Angeles-Long Beach, CA	11%	1,036,738
Louisville, KY/IN	7%	68,185
Lowell, MA/NH	5%	16,011
Lubbock, TX	5%	12,403
Lynchburg, VA	7%	14,208
Macon-Warner Robins, GA	7%	23,754
Madison, WI	5%	23,613
Manchester, NH	6%	6,839
Mansfield, OH	5%	6,900
McAllen-Edinburg-Pharr-Mission, TX	7%	42,237
Medford, OR	3%	6,220
Melbourne-Titusville-Cocoa-Palm Bay, FL	4%	17,223
Memphis, TN/AR/MS	9%	85,869
Merced, CA	9%	18,490
Miami-Hialeah, FL	10%	228,192
Middlesex-Somerset-Hunterdon, NJ	5%	61,028
Milwaukee, WI	9%	140,448
Minneapolis-St. Paul, MN	5%	154,771
Mobile, AL	6%	34,471
Modesto, CA	7%	29,312
Monmouth-Ocean, NJ	5%	60,251
Monroe, LA	11%	16,034
Montgomery, AL	6%	21,664
Muncie, IN	5%	5,503
Myrtle Beach, SC	5%	9,179
Naples, FL	4%	9,289
Nashua, NH	5%	5,999
Nashville, TN	5%	56,176
Nassau Co, NY	4%	120,914
New Bedford, MA	10%	17,524

New Haven-Meriden, CT	11%	39,930
New Orleans, LA	**14%**	**175,289**
New York-Northeastern NJ	42%	3,949,939
Newark, NJ	12%	243,673
Newburgh-Middletown, NY	9%	30,939
Norfolk-VA Beach-Newport News, VA	7%	103,646
Oakland, CA	7%	169,166
Ocala, FL	4%	10,544
Odessa, TX	5%	12,022
Oklahoma City, OK	5%	44,908
Olympia, WA	5%	9,856
Omaha, NE/IA	5%	29,776
Orange County, CA	5%	152,799
Orlando, FL	5%	75,368
Panama City, FL	5%	6,935
Pensacola, FL	5%	21,380
Peoria, IL	5%	17,920
Philadelphia, PA/NJ	13%	646,269
Phoenix, AZ	5%	166,950
Pittsburgh-Beaver Valley, PA	9%	198,462
Portland, ME	5%	13,000
Portland-Vancouver, OR	5%	97,319
Providence-Fall River-Pawtucket, MA/RI	9%	87,841
Provo-Orem, UT	3%	9,183
Pueblo, CO	7%	9,620
Punta Gorda, FL	4%	5,160
Racine, WI	5%	9,833
Raleigh-Durham, NC	5%	56,984
Reading, PA	8%	27,727
Redding, CA	5%	8,130
Reno, NV	7%	23,300
Richland-Kennewick-Pasco, WA	4%	8,165
Richmond-Petersburg, VA	7%	67,107
Riverside-San Bernardino, CA	6%	203,710
Roanoke, VA	6%	13,864
Rochester, MN	4%	5,421
Rochester, NY	7%	72,861
Rockford, IL	5%	16,827
Rocky Mount, NC	9%	12,550
Sacramento, CA	6%	96,444
Saginaw-Bay City-Midland, MI	5%	19,880

Salem, OR	5%	14,585
Salinas-Sea Side-Monterey, CA	6%	17,461
Salt Lake City-Ogden, UT	3%	45,122
San Antonio, TX	7%	106,999
San Diego, CA	6%	179,556
San Francisco-Oakland-Vallejo, CA	12%	201,303
San Jose, CA	4%	75,538
San Luis Obispo-Atascadero-P Robles, CA	4%	8,650
Santa Barbara-Santa Maria-Lompoc, CA	6%	23,078
Santa Cruz, CA	5%	11,994
Santa Fe, NM	3%	4,913
Santa Rosa-Petaluma, CA	4%	17,087
Sarasota, FL	4%	25,992
Savannah, GA	9%	21,350
Scranton-Wilkes-Barre, PA	7%	45,835
Seattle-Everett, WA	5%	123,523
Sharon, PA	7%	7,983
Sheboygan, WI	4%	4,098
Shreveport, LA	9%	36,052
Sioux City, IA/NE	6%	5,702
Sioux Falls, SD	4%	5,287
South Bend-Mishawaka, IN	6%	14,854
Spokane, WA	5%	21,624
Springfield, IL	8%	8,942
Springfield, MO	4%	14,322
Springfield-Holyoke-Chicopee, MA	9%	55,486
St. Cloud, MN	3%	4,840
St. Joseph, MO	6%	5,652
St. Louis, MO-IL	7%	173,574
Stamford, CT	5%	18,998
State College, PA	6%	8,084
Stockton, CA	7%	41,948
Sumter, SC	8%	8,554
Syracuse, NY	8%	58,100
Tacoma, WA	5%	32,222
Tallahassee, FL	6%	16,044
Tampa-St. Petersburg-Clearwater, FL	6%	135,858
Terre Haute, IN	5%	7,040
Toledo, OH/MI	6%	36,775
Topeka, KS	4%	7,534
Trenton, NJ	9%	31,239

Tucson, AZ	7%	58,110
Tulsa, OK	5%	37,376
Tuscaloosa, AL	6%	9,925
Tyler, TX	4%	7,665
Utica-Rome, NY	8%	22,703
Vallejo-Fairfield-Napa, CA	4%	23,372
Ventura-Oxnard-Simi Valley, CA	4%	29,415
Vineland-Milville-Bridgetown, NJ	10%	14,495
Visalia-Tulare-Porterville, CA	9%	31,867
Waco, TX	5%	11,194
Washington, DC/MD/VA	8%	396,047
Waterbury, CT	16%	17,731
Waterloo-Cedar Falls, IA	5%	6,025
Wausau, WI	3%	3,926
West Palm Beach-Boca Raton-Delray Beach, FL	6%	67,890
Wichita Falls, TX	5%	6,548
Wichita, KS	4%	21,568
Williamsport, PA	6%	7,484
Wilmington, DE/NJ/MD	6%	31,000
Wilmington, NC	5%	12,447
Worcester, MA	9%	26,112
Yakima, WA	6%	12,514
Yolo, CA	6%	10,916
York, PA	5%	18,595
Youngstown-Warren, OH-PA	5%	32,070
Yuba City, CA	6%	8,869
Yuma, AZ	6%	9,649

Tabulations from the 5 Percent Public Use Microdata Sample of the U.S. Census of Population and Housing.

Table 2
Percent and Number of Residents in Households with no Access to an Automobile
U.S. Central Cities, 2000

Top ten cities	Percent with no auto access	Population with no auto access
New York, NY	48%	3,815,980
Newark, NJ	38%	101,835
Jersey City, NJ	34%	83,610
Baltimore, MD	32%	205,544
Hartford, CT	32%	38,975
Washington, DC	32%	182,927
Philadelphia, PA	30%	460,331
Boston, MA	28%	163,340
New Orleans, LA	**26%**	**123,084**
Buffalo, NY	26%	75,563
All cities		
Akron, OH	9%	20,635
Alexandria, VA	10%	12,697
Allentown, PA	15%	16,619
Anaheim, CA	8%	25,870
Anchorage, AK	4%	11,125
Ann Arbor, MI	5%	6,075
Bakersfield, CA	7%	18,287
Baltimore, MD	32%	205,544
Baton Rouge, LA	10%	23,830
Beaumont, TX	10%	11,534
Bellevue, WA	3%	3,791
Boise, ID	3%	6,329
Boston, MA	28%	163,340
Bridgeport, CT	19%	26,317
Brownsville, TX	10%	14,592
Buffalo, NY	26%	75,563
Burbank, CA	8%	7,769
Cambridge, MA	19%	19,719
Cape Coral, FL	2%	2,269
Charlotte, NC	7%	36,177
Chattanooga, TN	10%	14,744
Chesapeake, VA	4%	8,292

Chicago, IL	23%	668,489
Cincinnati, OH	20%	67,740
Cleveland, OH	21%	98,461
Columbia, SC	12%	13,584
Columbus, GA	9%	17,118
Corona, CA	5%	5,898
Corpus Christi, TX	7%	19,815
Costa Mesa, CA	5%	5,952
Dayton, OH	16%	27,580
Des Moines, IA	6%	12,778
Detroit, MI	18%	171,495
Downey, CA	7%	7,913
El Monte, CA	15%	17,000
Elizabeth, NJ	21%	25,106
Erie, PA	13%	13,573
Evansville, IN	8%	10,434
Fayetteville, NC	8%	8,928
Flint, MI	13%	16,680
Fontana, CA	6%	7,206
Fort Collins, CO	3%	3,596
Fort Wayne, IN	7%	13,376
Fresno, CA	13%	53,958
Fullerton, CA	6%	7,754
Garden Grove, CA	6%	9,763
Gary, IN	15%	15,395
Glendale, CA	11%	20,611
Grand Rapids, MI	8%	16,699
Green Bay, WI	5%	5,605
Greensboro, NC	7%	16,373
Hampton, VA	7%	9,602
Hartford, CT	32%	38,975
Huntington Beach, CA	4%	7,006
Huntsville, AL	5%	7,653
Independence, MO	4%	4,595
Inglewood, CA	12%	13,405
Irvine, CA	3%	3,850
Irving, TX	5%	9,184
Jackson, MS	10%	17,982
Jersey City, NJ	34%	83,610
Kansas City, MO	10%	41,870
Knoxville, TN	8%	14,410

Lafayette, LA	8%	8,824
Lancaster, CA	8%	9,809
Lansing, MI	8%	8,902
Lexington-Fayette, KY	6%	15,256
Little Rock, AR	8%	14,313
Livonia, MI	2%	2,298
Long Beach, CA	15%	68,720
Los Angeles, CA	15%	553,423
Lowell, MA	11%	12,239
Madison, WI	9%	18,731
Manchester, NH	6%	6,839
McAllen, TX	6%	6,662
Memphis, TN	12%	79,027
Milwaukee, WI	18%	109,656
Minneapolis, MN	15%	58,005
Mobile, AL	10%	19,307
Modesto, CA	7%	12,982
Montgomery, AL	8%	16,613
Moreno Valley, CA	5%	7,402
New Haven, CT	23%	28,996
New Orleans, LA	**26%**	**123,084**
New York, NY	48%	3,815,980
Newark, NJ	38%	101,835
Newport News, VA	9%	15,379
Norfolk, VA	14%	32,485
North Las Vegas, NV	8%	9,391
Norwalk, CA	6%	6,744
Oklahoma City, OK	6%	31,123
Ontario, CA	8%	12,314
Orange, CA	5%	6,449
Oxnard, CA	7%	11,517
Palmdale, CA	7%	7,882
Pasadena, CA	10%	14,277
Pasadena, TX	7%	9,523
Paterson, NJ	24%	36,268
Peoria, IL	10%	11,110
Philadelphia, PA	30%	460,331
Pittsburgh, PA	22%	71,588
Plano, TX	2%	3,530
Pomona, CA	9%	13,345
Providence, RI	17%	29,911

Provo, UT	3%	3,609
Raleigh, NC	5%	14,698
Rancho Cucamonga, CA	3%	3,805
Reno, NV	10%	17,394
Richmond, VA	19%	36,909
Riverside, CA	7%	17,946
Rochester, NY	21%	44,507
Rockford, IL	8%	12,086
Sacramento, CA	10%	41,076
Saint Louis, MO	22%	74,966
Saint Paul, MN	12%	33,949
Salinas, CA	6%	9,529
Salt Lake City, UT	8%	13,518
San Bernardino, CA	12%	23,137
San Buenaventura (Ventura), CA	4%	4,449
San Francisco, CA	21%	160,445
Santa Ana, CA	10%	33,992
Santa Clarita, CA	4%	5,452
Savannah, GA	15%	18,985
Seattle, WA	11%	62,269
Simi Valley, CA	2%	2,165
Sioux Falls, SD	4%	5,287
South Bend, IN	9%	9,786
Spokane, WA	8%	16,080
Springfield, IL	8%	8,942
Springfield, MA	19%	28,664
Springfield, MO	6%	8,982
Stamford, CT	8%	9,728
Sterling Heights, MI	3%	3,877
Stockton, CA	11%	25,747
Syracuse, NY	21%	30,807
Tacoma, WA	8%	14,894
Thousand Oaks, CA	3%	2,984
Toledo, OH	10%	30,329
Torrance, CA	4%	5,387
Tulsa, OK	7%	26,649
Vancouver, WA	6%	8,378
Virginia Beach, VA	3%	14,698
Warren, MI	4%	5,579
Washington, DC	32%	182,927
Waterbury, CT	16%	17,731

West Covina, CA	5%	5,117
Wichita, KS	5%	17,093
Winston-Salem, NC	9%	17,394
Worcester, MA	14%	23,152
Yonkers, NY	23%	46,171

Tabulations from the 5 Percent Public Use Microdata Sample of the U.S. Census of Population and Housing.

Table 3
Percent of Non-elderly and Elderly Poor In Households without Access to a Car by City

	Percent of non-elderly poor residing in a household with no car	Percent of elderly poor in a household with no car
Top Ten Cities		
New York, NY	68%	64%
Jersey City, NJ	58%	52%
Newark, NJ	54%	52%
Baltimore, MD	53%	53%
Yonkers, NY	53%	42%
Philadelphia, PA	50%	49%
Washington, DC	48%	47%
Buffalo, NY	47%	36%
New Orleans, LA	**47%**	**44%**
Hartford, CT	44%	50%
All Cities		
Akron, OH	26%	33%
Alexandria, VA	23%	18%
Allentown, PA	32%	30%
Anaheim, CA	19%	17%
Anchorage, AK	10%	25%
Ann Arbor, MI	7%	29%
Bakersfield, CA	19%	18%
Baltimore, MD	53%	53%
Baton Rouge, LA	21%	31%
Beaumont, TX	27%	29%
Bellevue, WA	13%	18%
Boise, ID	9%	8%
Boston, MA	38%	48%
Bridgeport, CT	39%	41%
Brownsville, TX	20%	36%
Buffalo, NY	47%	36%
Burbank, CA	22%	38%
Cambridge, MA	14%	66%
Cape Coral, FL	5%	8%
Charlotte, NC	20%	26%
Chattanooga, TN	23%	32%
Chesapeake, VA	16%	21%
Chicago, IL	43%	48%

Cincinnati, OH	41%	37%
Cleveland, OH	39%	42%
Columbia, SC	15%	40%
Columbus, GA	25%	29%
Corona, CA	23%	14%
Corpus Christi, TX	21%	26%
Costa Mesa, CA	5%	26%
Dayton, OH	29%	38%
Des Moines, IA	15%	17%
Detroit, MI	33%	38%
Downey, CA	15%	8%
El Monte, CA	28%	16%
Elizabeth, NJ	37%	43%
Erie, PA	29%	30%
Evansville, IN	21%	22%
Fayetteville, NC	22%	29%
Flint, MI	29%	31%
Fontana, CA	12%	13%
Fort Collins, CO	5%	10%
Fort Wayne, IN	16%	19%
Fresno, CA	25%	30%
Fullerton, CA	12%	9%
Garden Grove, CA	17%	16%
Gary, IN	25%	25%
Glendale, CA	22%	30%
Grand Rapids, MI	19%	19%
Green Bay, WI	11%	16%
Greensboro, NC	15%	24%
Hampton, VA	12%	25%
Hartford, CT	44%	50%
Huntington Beach, CA	13%	4%
Huntsville, AL	11%	23%
Independence, MO	13%	21%
Inglewood, CA	26%	25%
Irvine, CA	6%	17%
Irving, TX	11%	22%
Jackson, MS	22%	29%
Jersey City, NJ	58%	52%
Kansas City, MO	25%	29%
Knoxville, TN	14%	24%
Lafayette, LA	20%	30%
Lancaster, CA	21%	20%
Lansing, MI	20%	34%

Lexington-Fayette, KY	13%	29%
Little Rock, AR	22%	24%
Livonia, MI	6%	7%
Long Beach, CA	33%	24%
Los Angeles, CA	30%	32%
Lowell, MA	30%	31%
Madison, WI	20%	28%
Manchester, NH	16%	23%
McAllen, TX	15%	25%
Memphis, TN	29%	35%
Milwaukee, WI	38%	34%
Minneapolis, MN	29%	25%
Mobile, AL	24%	24%
Modesto, CA	20%	19%
Montgomery, AL	23%	25%
Moreno Valley, CA	18%	17%
New Haven, CT	35%	51%
New Orleans, LA	**47%**	**44%**
New York, NY	68%	64%
Newark, NJ	54%	52%
Newport News, VA	24%	27%
Norfolk, VA	23%	39%
North Las Vegas, NV	21%	16%
Norwalk, CA	17%	14%
Oklahoma City, OK	16%	19%
Ontario, CA	15%	25%
Orange, CA	14%	3%
Oxnard, CA	14%	16%
Palmdale, CA	19%	15%
Pasadena, CA	26%	21%
Pasadena, TX	19%	21%
Paterson, NJ	42%	51%
Peoria, IL	25%	23%
Philadelphia, PA	50%	49%
Pittsburgh, PA	37%	41%
Plano, TX	6%	17%
Pomona, CA	15%	12%
Providence, RI	26%	47%
Provo, UT	4%	22%
Raleigh, NC	10%	22%
Rancho Cucamonga, CA	6%	11%
Reno, NV	22%	23%
Richmond, VA	35%	48%

Riverside, CA	17%	20%
Rochester, NY	38%	28%
Rockford, IL	21%	14%
Sacramento, CA	19%	28%
Saint Louis, MO	39%	43%
Saint Paul, MN	25%	27%
Salinas, CA	10%	18%
Salt Lake City, UT	16%	37%
San Bernardino, CA	27%	23%
San Buenaventura (Ventura), CA	12%	25%
San Francisco, CA	35%	54%
Santa Ana, CA	19%	15%
Santa Clarita, CA	9%	19%
Savannah, GA	29%	41%
Seattle, WA	20%	41%
Simi Valley, CA	8%	15%
Sioux Falls, SD	6%	17%
South Bend, IN	20%	26%
Spokane, WA	21%	28%
Springfield, IL	26%	19%
Springfield, MA	39%	35%
Springfield, MO	10%	23%
Stamford, CT	27%	29%
Sterling Heights, MI	10%	10%
Stockton, CA	23%	23%
Syracuse, NY	35%	36%
Tacoma, WA	18%	24%
Thousand Oaks, CA	6%	18%
Toledo, OH	24%	30%
Torrance, CA	10%	24%
Tulsa, OK	19%	19%
Vancouver, WA	13%	23%
Virginia Beach, VA	10%	19%
Warren, MI	6%	13%
Washington, DC	48%	47%
Waterbury, CT	39%	33%
West Covina, CA	20%	11%
Wichita, KS	13%	23%
Winston-Salem, NC	23%	25%
Worcester, MA	28%	21%
Yonkers, NY	53%	42%

Tabulated from the 5 percent Census PUMS files, 2000.

Table 4
Percentage of Residents without Household Access to Automobile by Race and Ethnicity: The Nation as a Whole, the New Orleans Metropolitan Area, and the City of New Orleans

Panel A: All U.S. Residents

	All Residents	White, non-Hispanic	Black, Non-Hispanic	Other, non-Hispanic	Hispanic
All	7.8%	4.6%	19.0%	9.6%	13.7%
Poor[a]	20.4%	12.1%	33.4%	20.9%	25.0%
Near Poor[b]	12.4%	9.0%	21.4%	14.6%	14.0%
Non Poor[c]	4.0%	2.7%	9.9%	5.5%	7.8%

Panel B: The New Orleans Metropolitan Area

	All Residents	White, non-Hispanic	Black, Non-Hispanic	Other, non-Hispanic	Hispanic
All	14.1%	4.7%	27.3%	6.8%	10.2%
Poor[a]	35.8%	13.3%	46.7%	17.8%	22.1%
Near Poor[b]	18.9%	10.5%	27.2%	7.5%	8.5%
Non Poor[c]	4.9%	2.5%	10.7%	2.7%	7.1%

Panel C: The City of New Orleans

	All Residents	White, non-Hispanic	Black, Non-Hispanic	Other, non-Hispanic	Hispanic
All	25.5%	9.7%	32.7%	9.1%	20.9%
Poor[a]	46.7%	17.4%	52.4%	22.1%	40.2%
Near Poor[b]	30.2%	22.1%	33.4%	3.5%	21.0%
Not Poor[c]	10.0%	5.9%	13.2%	4.9%	11.5%

Tabulations from the 5 % Public Use Microdata Sample of the U.S. Census of Population and Housing.

a. Individuals in households with incomes under 100 percent of the federal poverty line.
b. Individuals in households with incomes between 100 and 200 percent of the federal poverty line.
c. Individuals in households with incomes greater than 200 percent of the federal poverty line.

Table 5
Basic Demographic and Socioeconomic Characteristics of Residents in Households With and Without Access to Automobiles in 2000
The Nation as a Whole, the New Orleans Metropolitan Area, and the City of New Orleans

Panel A: All U.S. Residents

	Share of All Residents	Share of Residents in Households with a Car	Share of Residents in Households with no Car
White, non-Hisp.	69.1%	71.5%	40.6%
Black, non-Hisp.	12.5%	11.0%	30.5%
Other, non-Hisp.	4.6%	4.5%	5.7%
Hispanic	12.5%	11.7%	22.0%
17 and Under	25.6%	25.7%	24.8%
65 and Over	11.8%	11.1%	19.9%
Homeowners	67.3%	70.6%	28.2%
Poor[a]	14.6%	12.6%	38.4%
Near poor[b]	16.9%	16.0%	26.7%

Panel B: The New Orleans Metropolitan Area

	All Residents	In Household with a Car	In Household with no Car
White, non-Hisp.	52.2%	57.9%	17.8%
Black, non-Hisp.	39.6%	33.5%	76.9%
Other, non-Hisp.	2.8%	3.0%	1.3%
Hispanic	4.7%	4.9%	3.5%
17 and Under	26.6%	25.5%	33.2%
65 and Over	10.8%	10.2%	14.7%
Homeowners	63.0%	69.2%	25.0%
Poor[a]	20.8%	15.5%	53.0%
Near poor[b]	19.3%	18.2%	26.0%

Panel C: The City of New Orleans

	All Residents	In Household with a Car	In Household with no Car
White, non-Hisp.	26.9%	32.6%	10.2%
Black, non-Hisp.	67.0%	60.5%	86.1%
Other, non-Hisp.	2.4%	3.0%	0.9%
Hispanic	3.1%	3.3%	2.6%
17 and Under	26.8%	24.1%	34.5%
65 and Over	11.1%	10.6%	12.8%
Homeowners	47.6%	56.8%	20.6%
Poor[a]	30.5%	21.8%	55.9%
Near poor[b]	21.5%	20.1%	25.4%

Tabulations from the 5 % Public Use Microdata Sample of the U.S. Census of Population and Housing.

a. Individuals in households with incomes less than 100 percent of the federal poverty line.
b. Individuals in households with incomes between 100 and 200 percent of the federal poverty line.

Figure 1

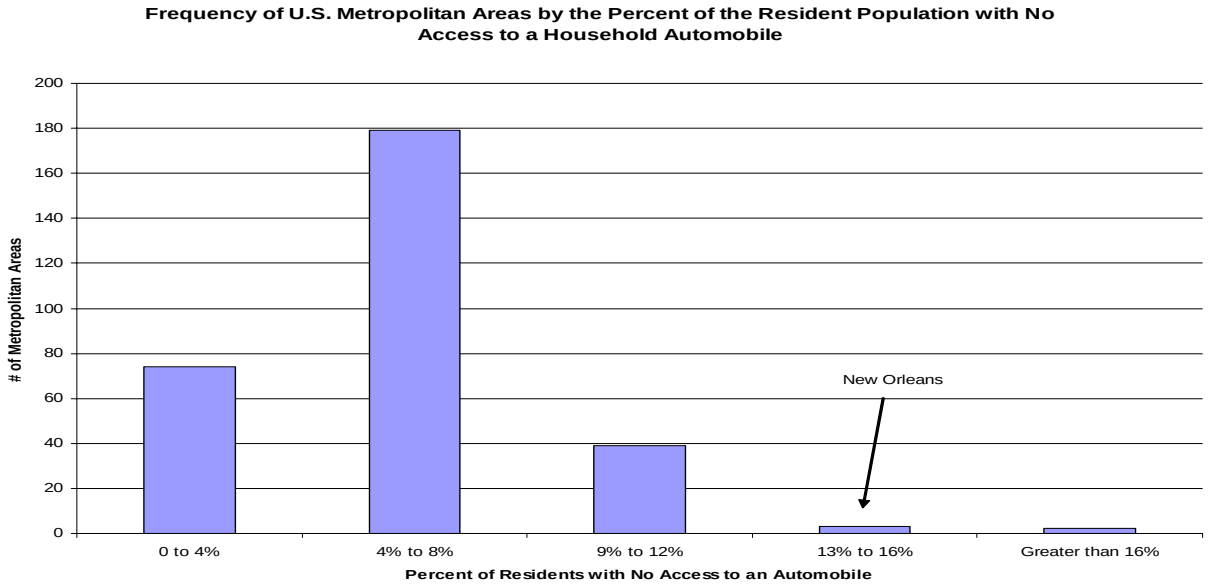


Figure 2

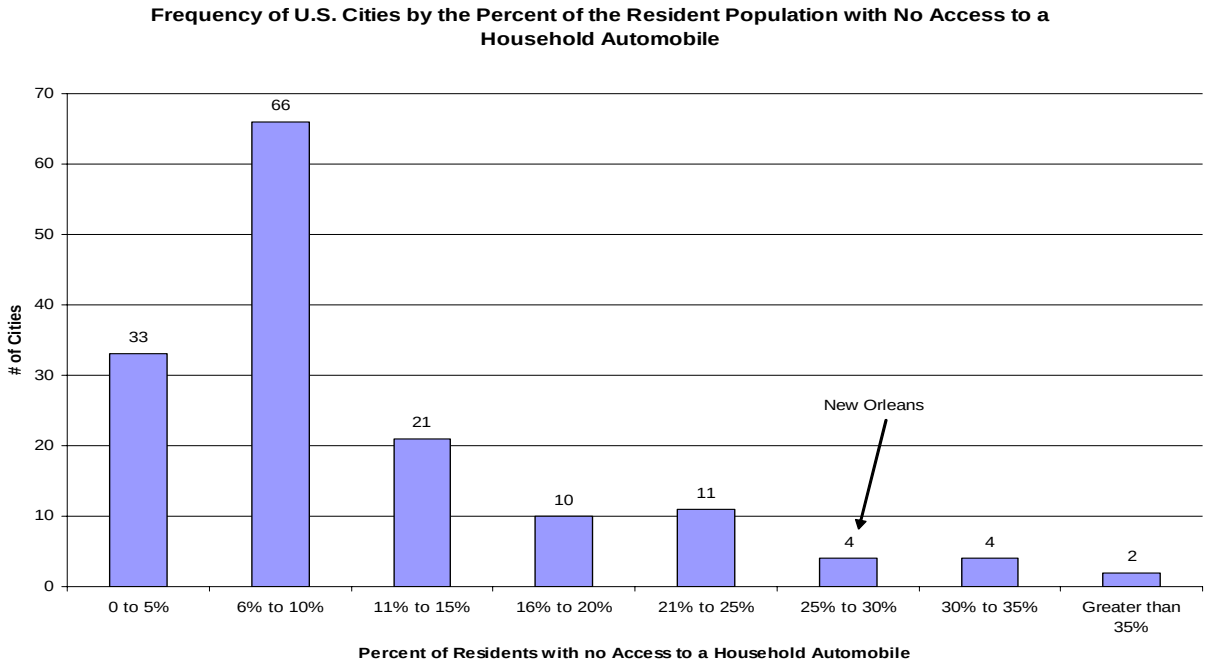


Figure 3

Distribution of U.S.Black Residents Across Metropolitan Areas by Scores of the Black-White Dissimilarity Index, 2000

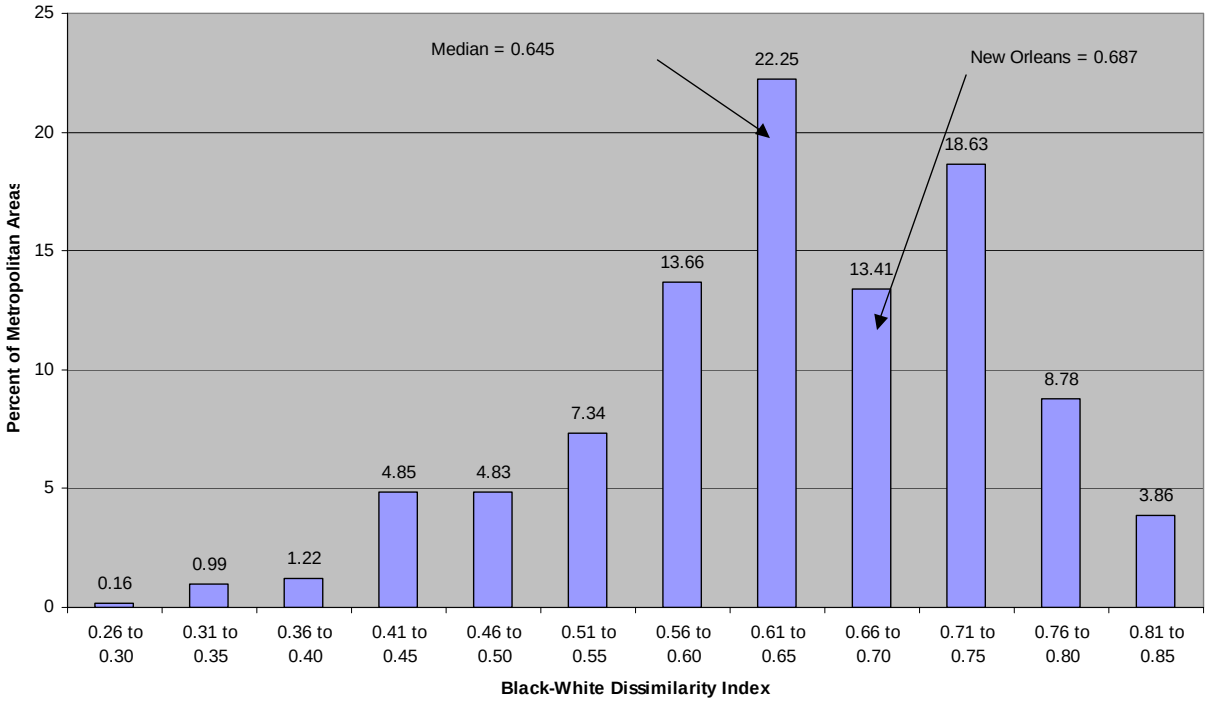


Figure 4

Proportion of Households without a Car in the Typical Neighborhood of All Residents, White Residents, and Black Residents for the Entire U.S. and for New Orleans, 2000

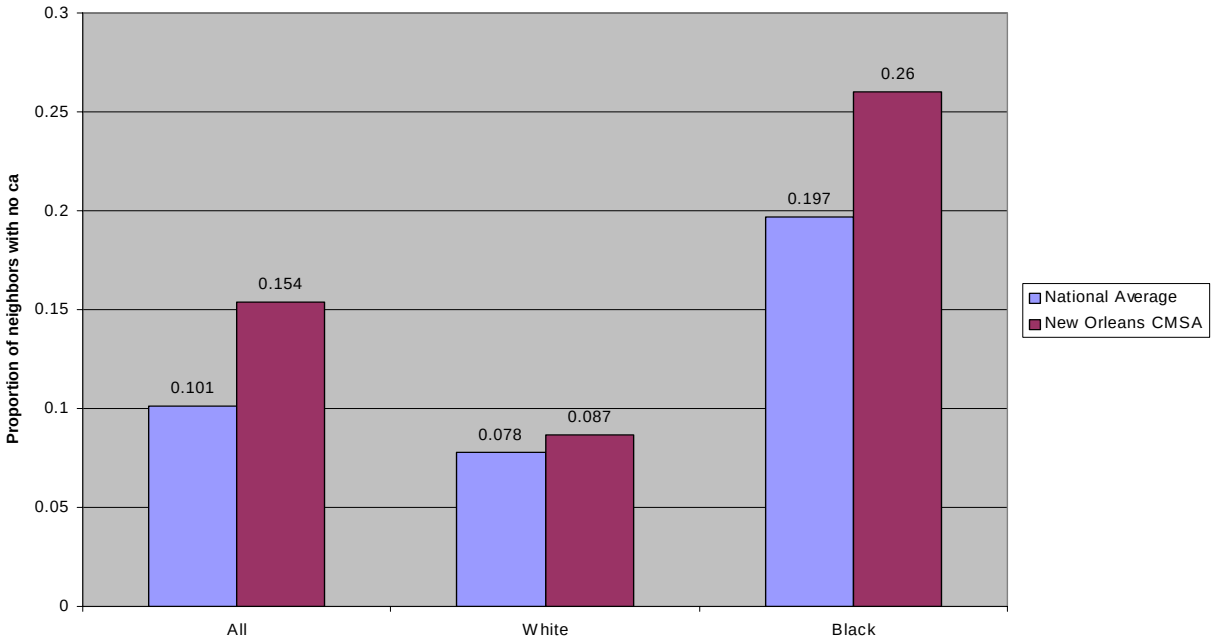


Figure 5

Average Number of Persons per Neighborhood Car for All Residents, White Residents, and Black Residents for the Entire U.S. and for New Orleans, 2000

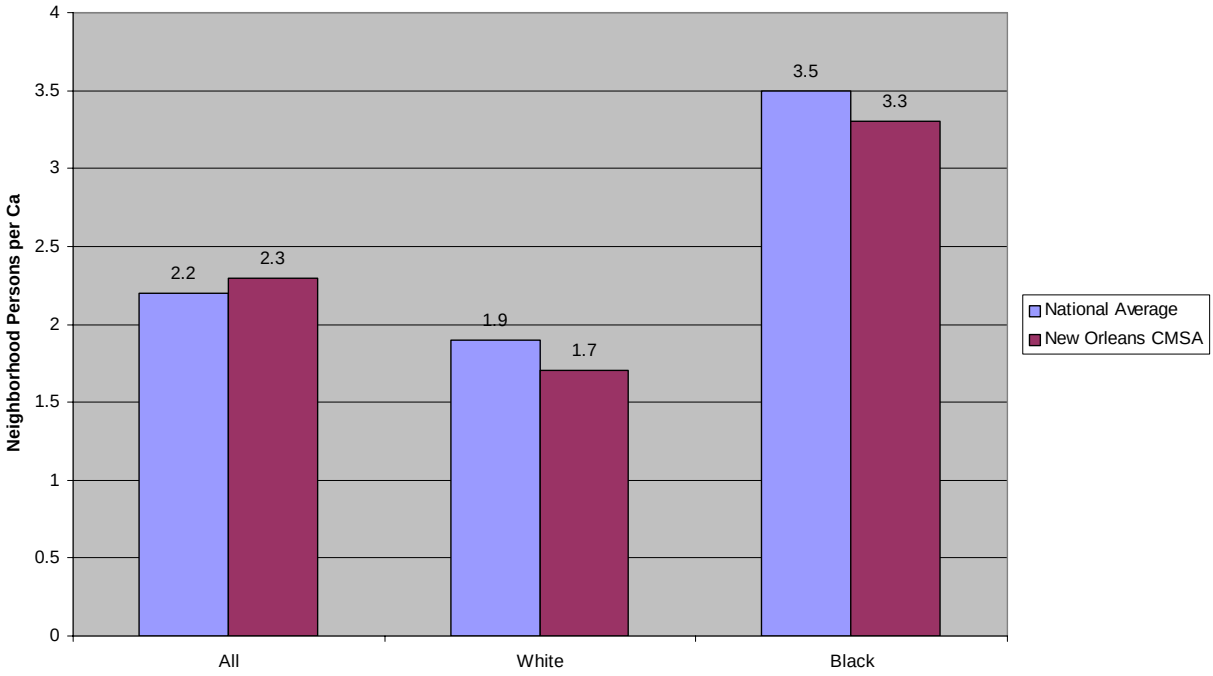


Figure 6
Percent Black by Census Tract for the City of New Orleans

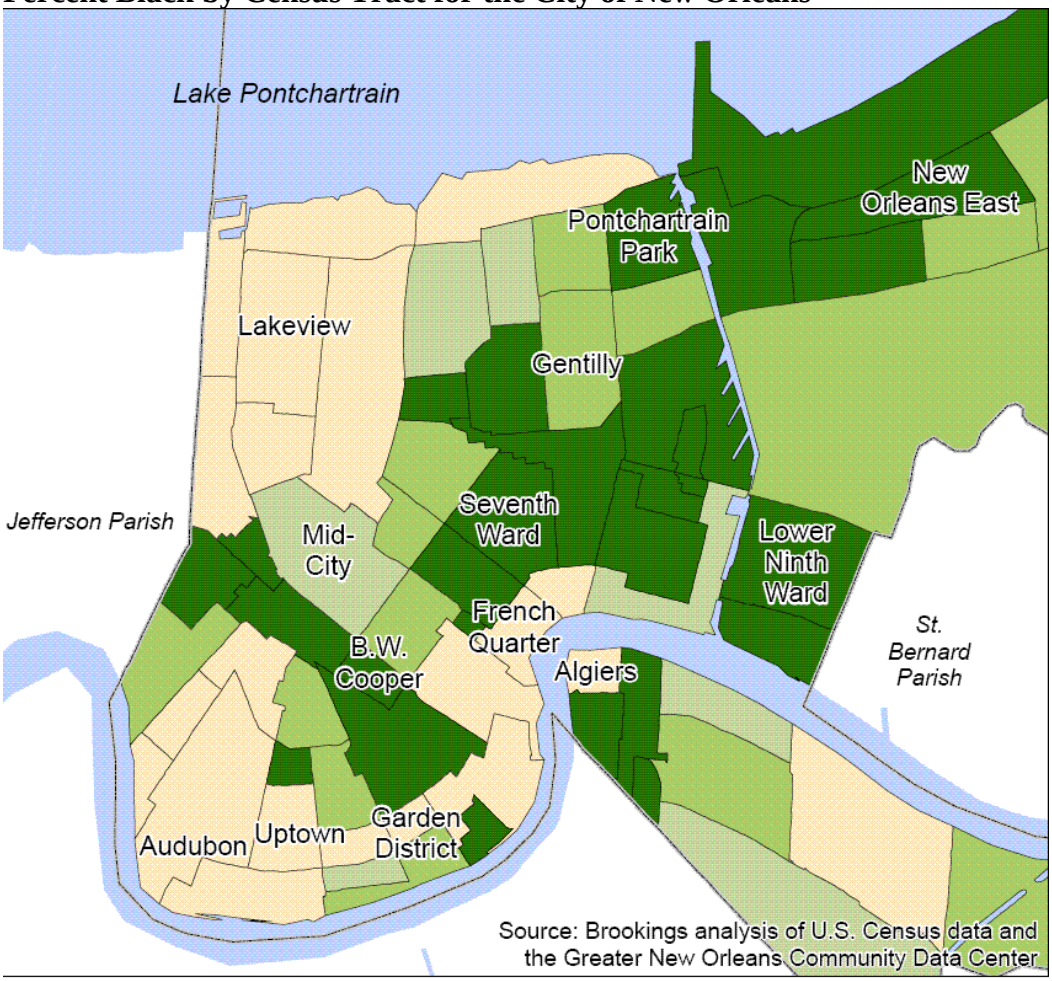
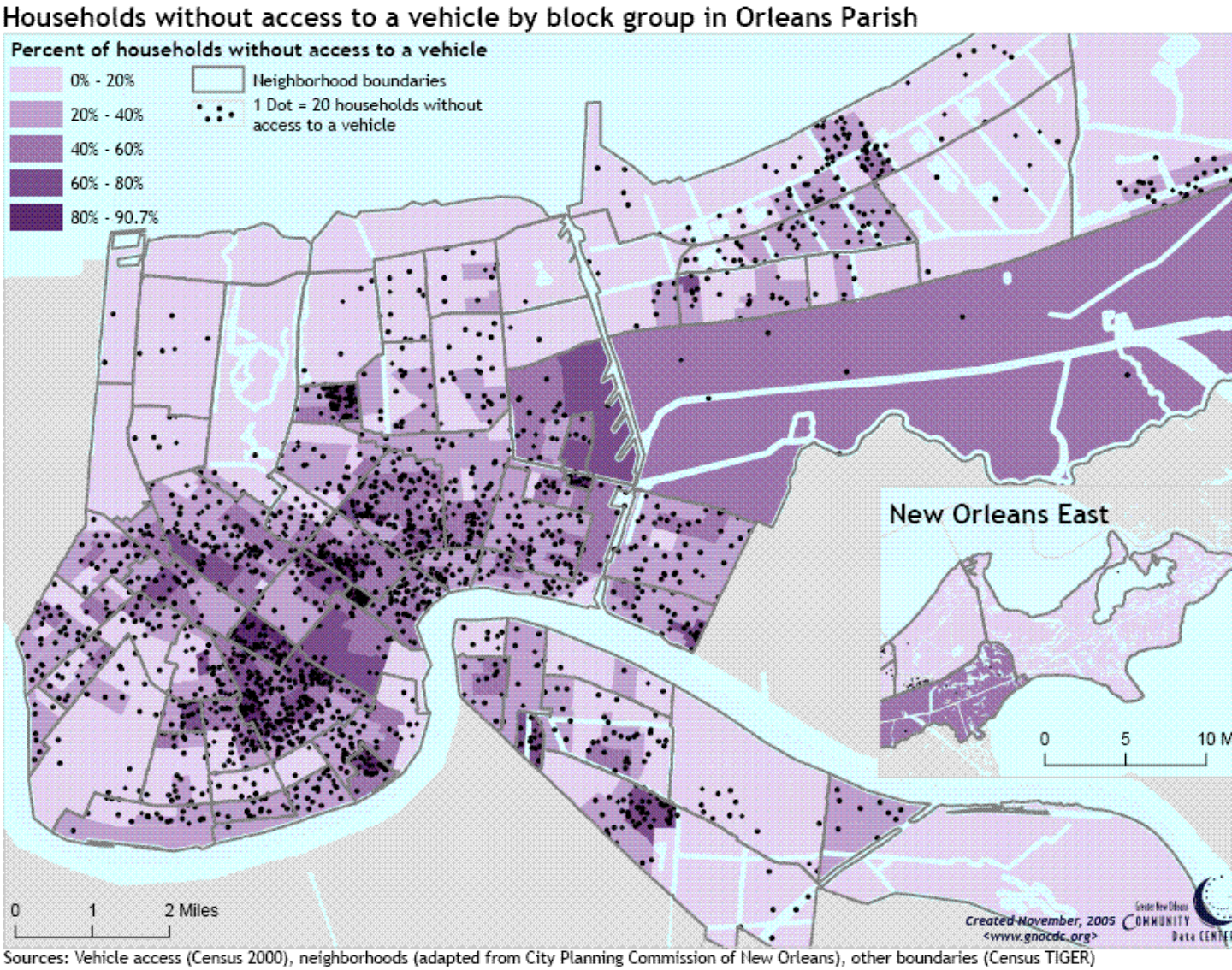


Figure 7



Sources: Vehicle access (Census 2000), neighborhoods (adapted from City Planning Commission of New Orleans), other boundaries (Census TIGER)

Figure 8

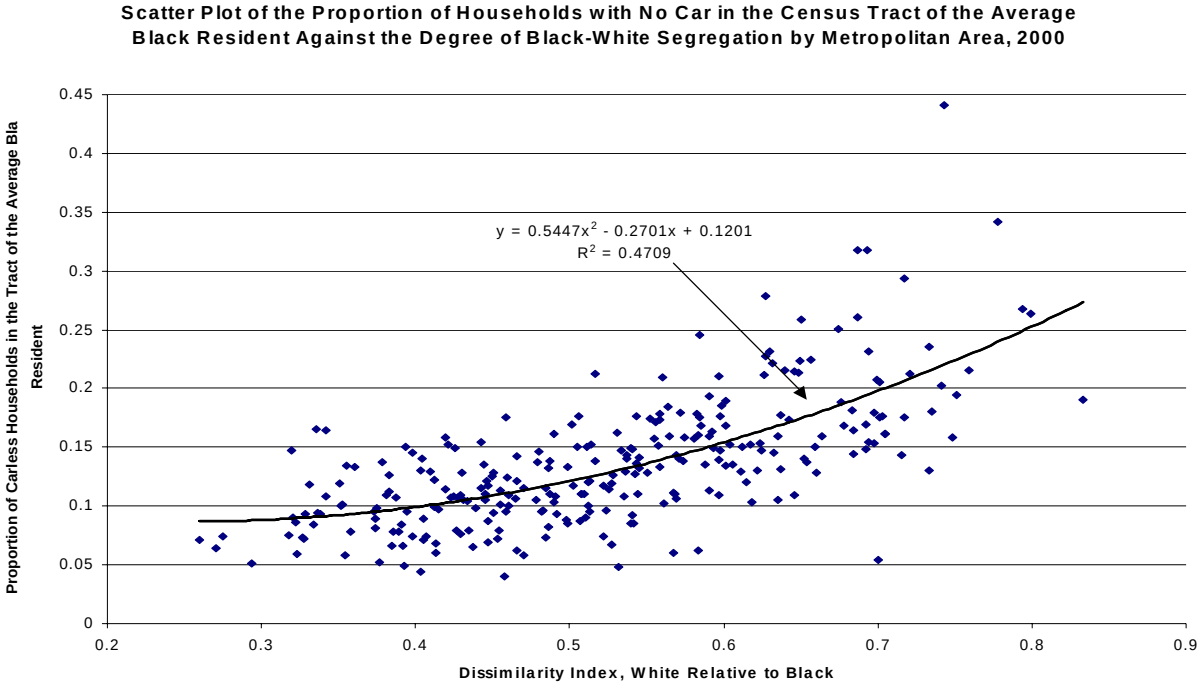


Figure 9