The Epidemiology of HIV/AIDS in Texas in Ages 25-49 (1999-2010)

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Bio:

Jonathan Rodriguez is currently a junior at the University of North Texas and will complete his bachelor's degree in spring 2012. He is double majoring in history and geography with a minor in Spanish. In addition, he is also seeking a Geographic Information Systems (GIS) certificate. He presented his research at University Scholars Day on April 14, 2011. Jonathan is an Emerald Eagle Scholar and a McNair Scholar. Through the McNair Scholars, he is currently researching HIV/AIDS, and he has a specific interest in medical geography. After graduation, he plans to further his education and eventually obtain a Ph.D.

Abstract:

According to the CDC, 63% of all new HIV diagnoses and 69% of all new AIDS diagnoses in 2009 were among the 25-49 year age group. While previous studies have examined the relationship between HIV/AIDS and a variety of socio-economic variables, no work has been done looking at this specific age group that constitutes a majority of new HIV/AIDS diagnoses in the recent past. Specifically, I examine relationships between HIV/AIDS outcomes in Texas and unemployment, education, income, and race/ethnic groups using data aggregated at the county level. Significant correlations where found between HIV/AIDS and unemployment, education, and race/ethnic groups. No significant association was found between HIV/AIDS and income. For future public intervention efforts targeting ages 25-49, a combination of variables, including unemployment, education, and race/ethnicity should be taken into consideration, rather than using only information on income.

Introduction

According to the U.S. Centers for Disease Control and Prevention (CDC), more than one million people were living with HIV in the USA at the end of 2009, including those not yet diagnosed (CDC, 2011). Although Blacks comprise about 12% of the US population, they accounted for 46% of people living with HIV in the U.S. (Figure 1), and for 45% of new infections each year. Texas had the fourth highest number of people living with HIV infection, after New York State, California, and Florida. With a total of 61,595 people living with HIV infection, and 35,628 with AIDS at the end of 2009, Texas faces one of the most severe HIV challenges among the states (CDC, 2010).

In the 25 to 49 age group in Texas, 46.7% of the total population is White, Blacks account for 12% of the total population, and Hispanics account for 36.9%. However, when looking at the infected population in this age group in Texas, the distributions are relatively similar to that of the U.S., with Whites making up 38.4% of the infected population; Blacks, 36.1%; and Hispanics, 24.3% (Figure 2). About 85% of HIV infected people live in more urban areas in the United States. This trend applies to Texas, with the more urban areas, such as Dallas, El Paso, and Houston having much higher rates. Nevertheless, prevalence appears to vary between places depending on access to health care, which in fact is driven by several socio-demographic factors, including unemployment, income, education, and race/ethnicity. The goal of this research is to examine the spatial distribution of HIV infection in the 25 to 49 age group in Texas.

Research indicates that HIV/AIDS transmission occurs more frequently in low socio-economic status areas that typically have access to fewer resources and are, therefore, at a social disadvantage (Galambos 84). Though there are measures, such as antiretroviral therapy, that can improve the quality of life and survival of people living with HIV, poverty is a primary obstacle

in gaining access to such prevention efforts. Early treatment can prolong life and help people

with HIV remain active and productive for longer periods of time (Galambos 84). While HIV

cannot be cured, antiretroviral treatment can be used to prevent or delay progression to AIDS.

Unfortunately, over 90% of HIV-infected persons live in impoverished areas where most cannot

afford the high price of antiretroviral drugs or do not have access to them (HIV/AIDS Research

and Prevention). This research will examine the relationship between income, unemployment

and HIV rates among adults aged 25-49 in Texas to see if this holds true for this particular group.

Typically, those living with HIV/AIDS are young adults that were infected during

adolescence and childhood (Sileo 177). Therefore, targeting youths and educating them on the

material is critical in developing HIV prevention programs. Considering the benefits of

education in preventing HIV, individuals who have a higher education tend to be at a much

lower risk to infection than those who have little to no education ("HIV/AIDS Research and

Prevention"). Education encourages the use of safer sex practices, such as condom usage. In fact,

consistent condom use is approximately 87% effective at preventing HIV infection (95%

confidence interval = 60-96%). This research will examine the effects of education levels below

ninth grade in Texas counties on HIV infection rates in the 25 to 49 age group.

Hypotheses

Based on the literature reviewed, I will test the hypotheses below for the Texas population in

the 25 to 49 age group.

1. Blacks will have a higher rate of infection than Whites and Hispanics.

2. Counties with higher unemployment rates will have higher rates of HIV/AIDS than

   counties with lower unemployment rates.

3. Counties with lower levels of income will have higher rates of HIV/AIDS than counties with higher levels of income.

4. Counties with lower levels of education will have higher rates of HIV/AIDS than counties with higher levels of education.

Data

HIV data was provided by the Texas Department of State Health Services. Race/ethnicity, education, income, and unemployment data were obtained from the Texas Department of Health Services, 2000 U.S. Census, the Health and Human Services Commission, and the Texas Workforce Commission, respectively. Race/ethnicity categories used in this research for the counties are percentage White, percentage Black, and percentage Hispanic. Unemployment was calculated in terms of percentage of the total population unemployed (Figure 3). Income was calculated by finding each county's income over the course of 12 years and averaging the results over that time period (Figure 4). Finally, education was measured as the percentage of the county population aged 25 to 49 that had completed less than the ninth grade (Figure 5). Maps showing HIV infection rates for each county (i) was computed as follows (Figure 6):

$$R_i = \frac{Cases_i}{Population_i} \times 100,000$$

Since the Texas State Department of Health case data was from 1999 to 2010, we multiplied the denominator by 12 to use person-years instead of population counts. However, it should be noted that data for the 2010 year was not complete. Choropleth maps (Figures 3-9) were created using ArcMap. Data were classified using the natural breaks classification method. Finally, Spearman's rho correlation coefficients with two-tailed tests of significance were used in order to compute correlations between HIV infection and the examined predictor variables of unemployment, education, income, and race/ethnicity.

Results

A Spearman rho correlation coefficient was calculated for the relationship between HIV infection rates and the percentage of the county population that is White (Figure 7). A low, negative correlation was found (rho = -.226, sig. = $p < .001$), indicating a significant relationship between the two variables.

A Spearman rho correlation coefficient was calculated for the relationship between HIV infection rates and the percent of the county population that was Black (Figure 8). A moderate, positive correlation was found (rho = .480, sig. = $p < .001$), indicating a significant relationship between the two variables. Thus, Hypothesis 1 was supported by the data.

A Spearman rho correlation coefficient was calculated for the relationship between HIV infection rates and the percent of the county population that was Hispanic (Figure 9). The relationship was negligible and was not significant (rho = .004, sig. = $p > .951$) indicating no relationship between the two variables.

A Spearman rho correlation coefficient was calculated for the relationship between HIV infection rates and unemployment rates in Texas counties. A moderate, positive correlation was found (rho = .362, sig. = $p < .001$), indicating a significant relationship between the two variables. As can be seen in Figures 3 and 6, the patterns between the examined variables show some similarities, indicating that higher HIV infection is associated with higher unemployment rates. Thus, the data support Hypothesis 2.

The relationship between HIV infection rates and income rates in Texas counties was captured by a negligible correlation that was not significant (rho = .060, sig. = $p > .338$). Thus, there is no support for Hypothesis 3.As a result, the hypothesis that counties with a lower income will display a higher rate of HIV/AIDS than higher income counties is not supported by the data.

As can be seen in Figures 4 and 6, the patterns between the examined variables show no similarities, indicating that high HIV infection rates are not closely related to lower income rates.

A Spearman rho correlation coefficient was calculated for the relationship between HIV infection rates and percent of the 25-49 age group population of Texas counties with less than ninth grade education. An extremely weak positive correlation was found (rho = .148, sig. = $p <$ .018). As can be seen in Figures 5 and 6, the patterns between the examined variables show some similar patterns, indicating that high HIV infection rates are related to counties with less than ninth grade education. Hypothesis 4 is supported by the data.

Discussion

When examining the prevalence of HIV infection rates in Texas counties, east Texas seems to have higher concentrations of the disease. This could be attributed to the fact that east Texas is much more heavily populated than west Texas. This concept of urban east and rural west could be a factor leading to these results. Furthermore, as seen in Figure 3, east Texas has a larger Black population when compared to west Texas. This could account for the higher HIV infections, as previous research has suggested.

In addition, when examining the data, Hispanics seem to be most vulnerable to HIV infection based on the variables examined. Hispanics are predominantly located along the border of Texas and Mexico (Figure 9). When looking at this area in the examined variables, this area accounts for a large part of the highest unemployment rates, the lowest incomes, and the lowest levels of education. One might expect that because of these results, Hispanics would experience much higher rates, if not the highest rates, of HIV infection. However, this is not the case. This phenomenon could be attributed to the Hispanic paradox, in which Hispanics, while having the most negative of situations, tend to paradoxically match, or even surpass, health outcomes when compared to Whites and Blacks in the U.S. (Franzini 2001).

Finally, income and unemployment, while closely associated with each other, both had very different relationships to HIV infection. While unemployment showed significant positive results (rho = .362, sig. = p < .001), the same cannot be said for income (rho = .060, sig. = p > .338). Given the expectation of larger unemployment rates in rural areas and that urban areas have higher HIV infection rates, this relationship might be better captured through analysis that show urban populations only.

Conclusions

HIV/AIDS among adults aged 25 to 49 appears to be influenced by unemployment rates, education, and race/ethnicity composition of the counties, but analyses by income did not reveal any statistical significance. It also appears that counties with a relatively high percentage Black population are more likely to have a relatively high rate of HIV/AIDS, which is consistent with previous research findings that Blacks have higher rates of HIV/AIDS than Whites or Hispanics. On the other hand, counties with larger Hispanics populations, while having the highest social risk indicators (i.e. unemployment, income, education), have the least infection rates. This is consistent with previous research on the Hispanic paradox which finds that while Hispanics are vulnerable because of their socioeconomic status, they are, nevertheless, relatively healthy (Franzini 2001). This research suggests that counties with relatively high Black populations, high unemployment rates, and low levels of education should be targeted for HIV/AIDS awareness and prevention programs.

For further research, relationships between the variables tested in this study will be re-examined using the 2010 census data and the latest HIV outcome data from the Texas Department of State Health Services, as this data could show demographic changes that have occurred since the 2000 census. In particular, the DFW Metroplex area in Texas has seen drastic demographic changes in this ten year period (Young 2011). Additionally, due to regional

differences in population structure, such as race/ethnicity, observing areas, such as the Texas-

Mexico border region could lead to more interesting results, therefore requiring analysis at finer

geographic scales.

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     show." *Dallas Morning News.* 17 Feb. 2011, Print.

Figure 1. Percentage of U.S. Population by Race/Ethnicity and the Percentage of the U.S. Population with HIV Infection by Race Ethnicity, 2009
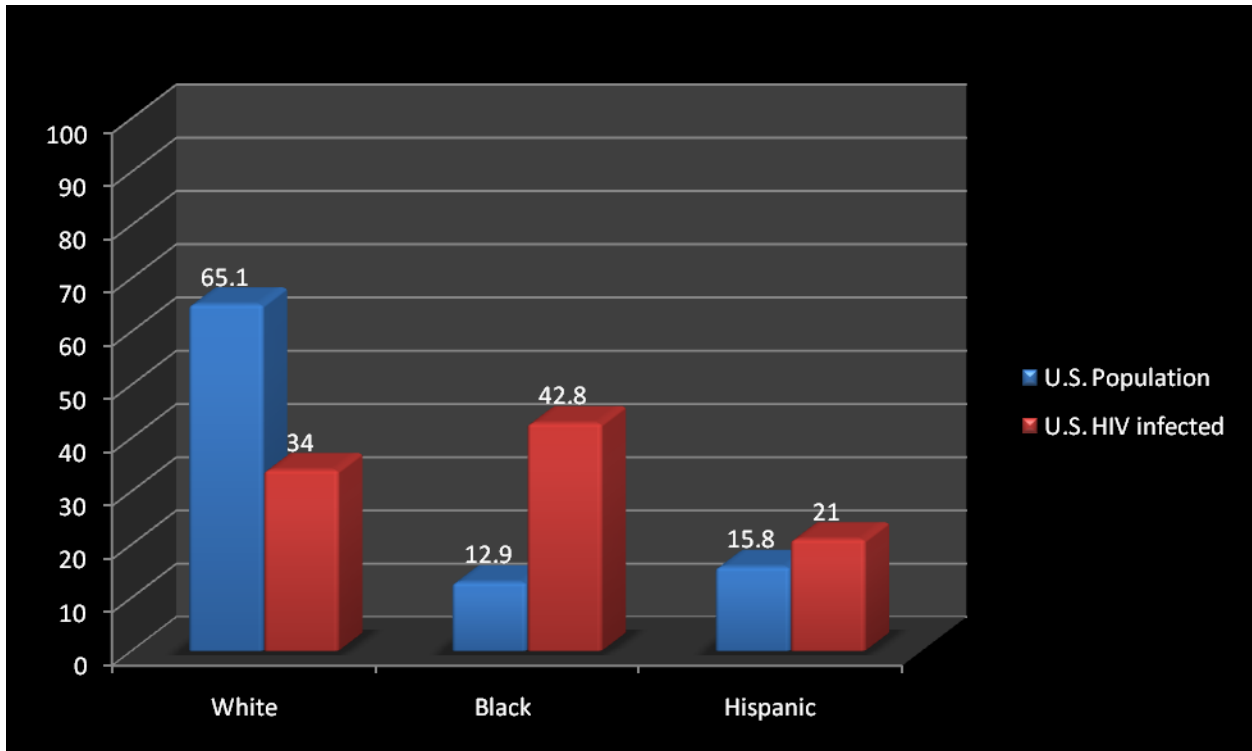
Figure 2. Percentage of the Population of the State of Texas Aged 25-49 by Race/Ethnicity and the Percentage of the Population Aged 25-49 by Race/Ethnicity, 2009
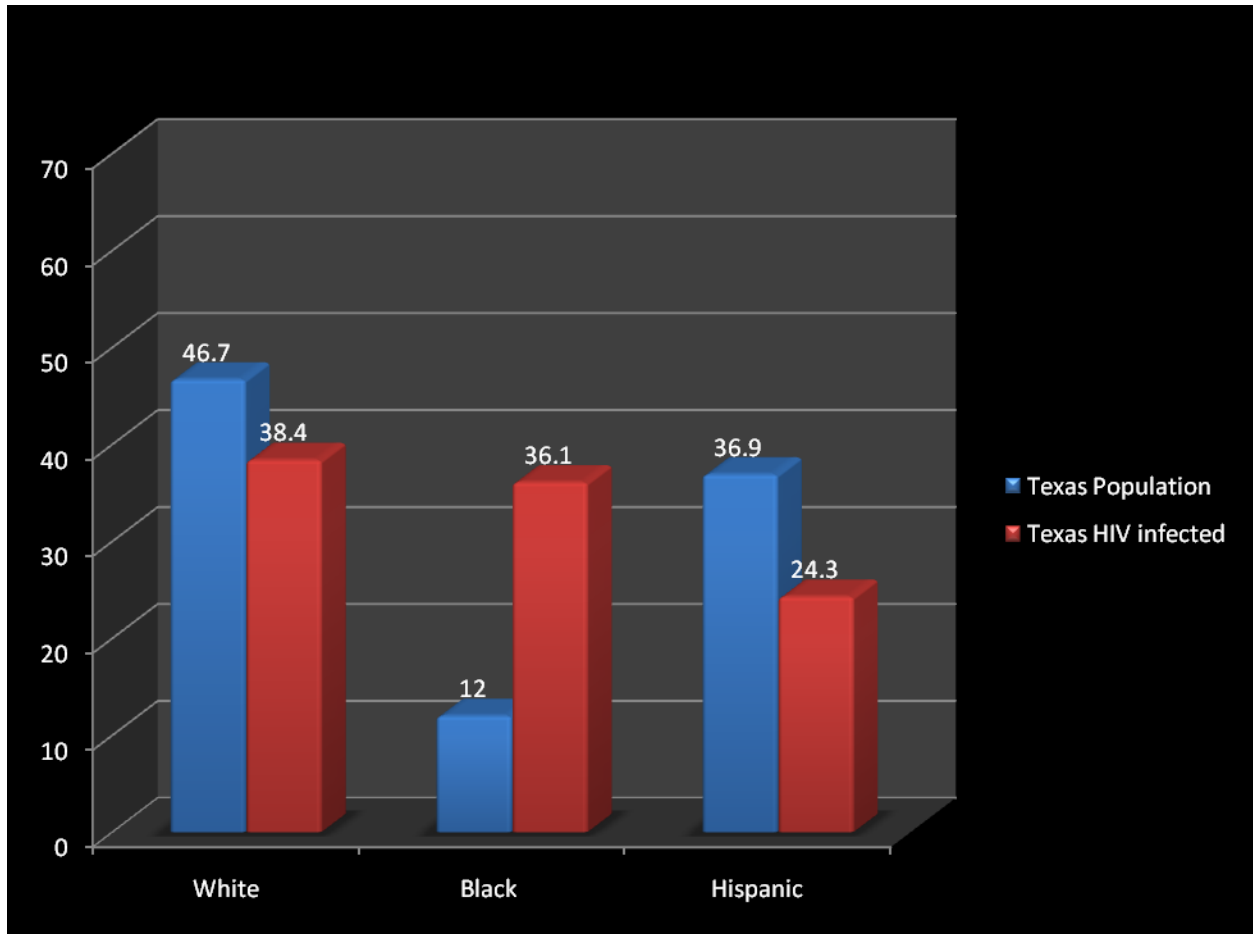
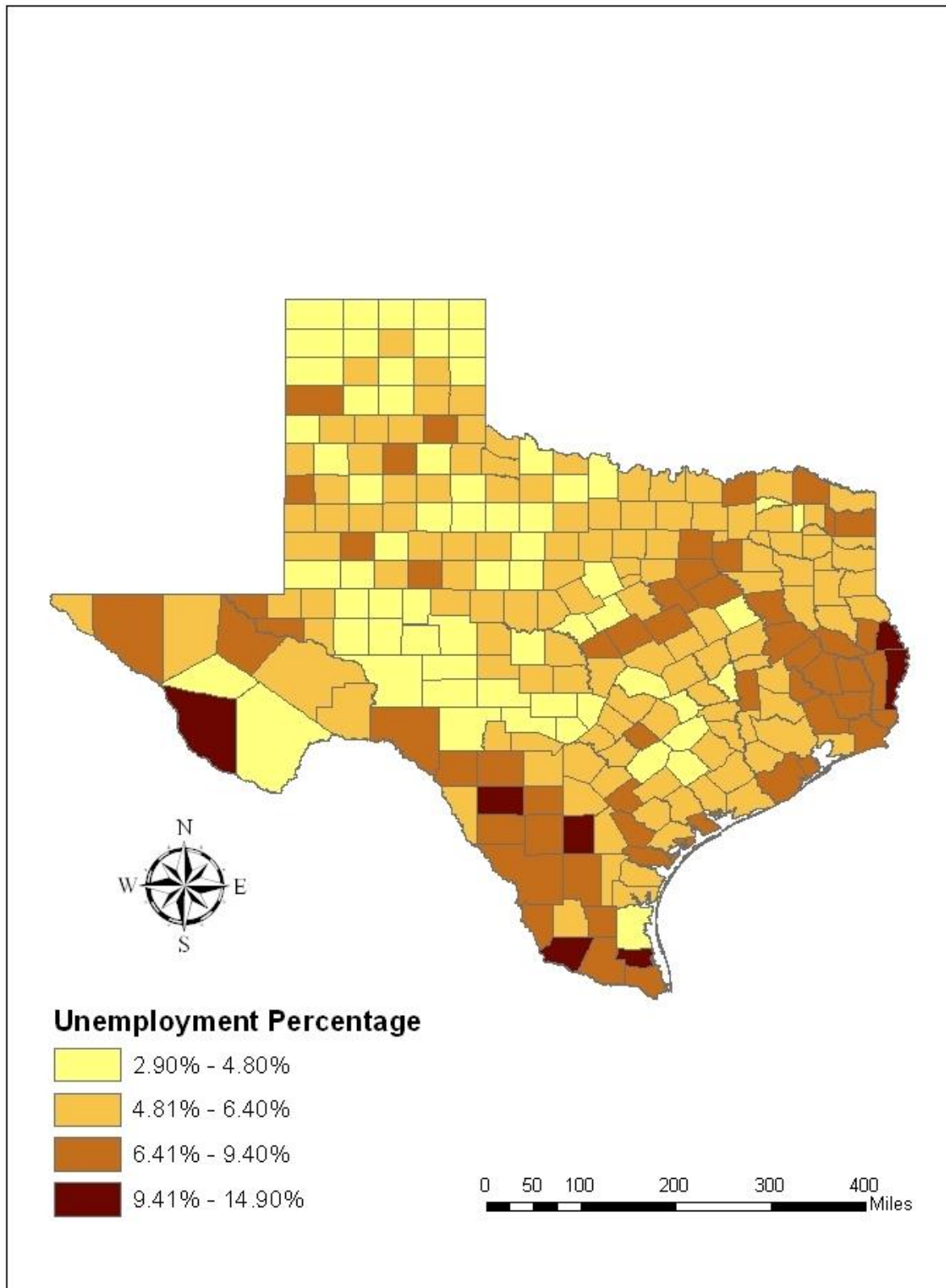Figure 3. Percentage of Total Population Unemployed in Texas Counties, 2000

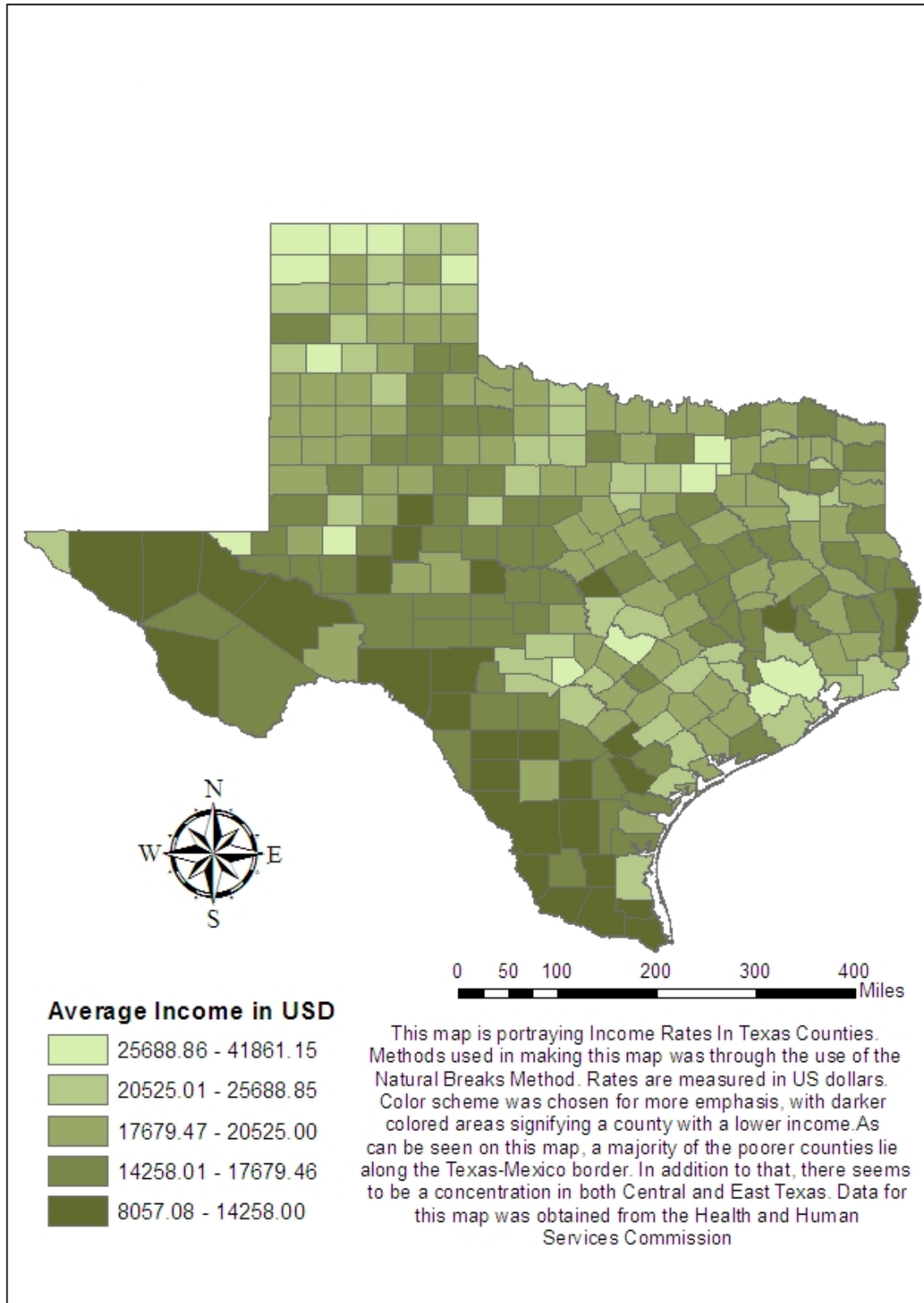Figure 4. Average Income over 12 Year Period in Texas Counties

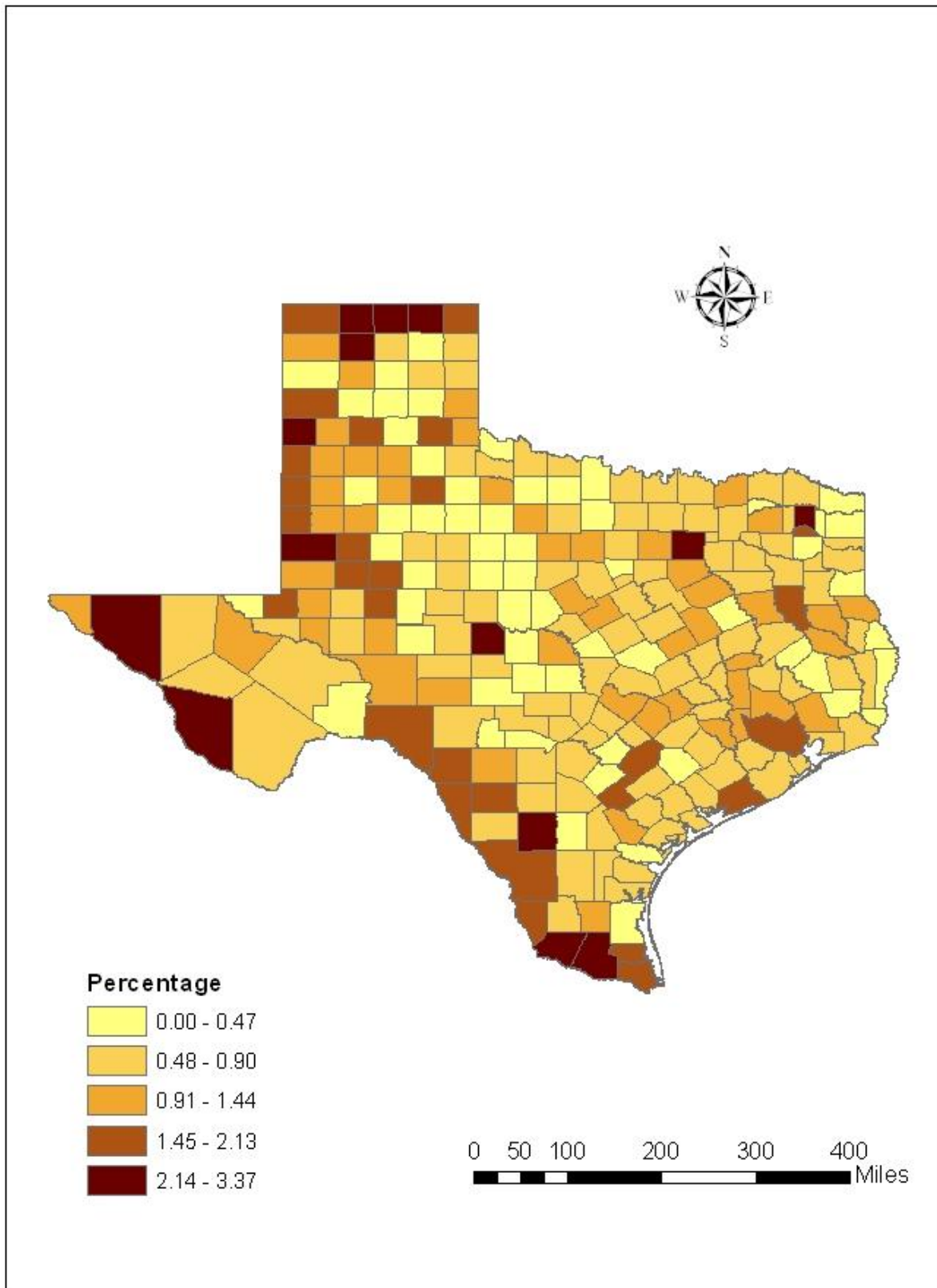Figure 5. Percentage of Population 25-49 Years of Age with Less Than 9th Grade Education in Texas Counties, 2000

Figure 6. Prevalence of HIV/AIDS Diagnosis Rates in Texas Counties in Ages 25-49, 1999-2010
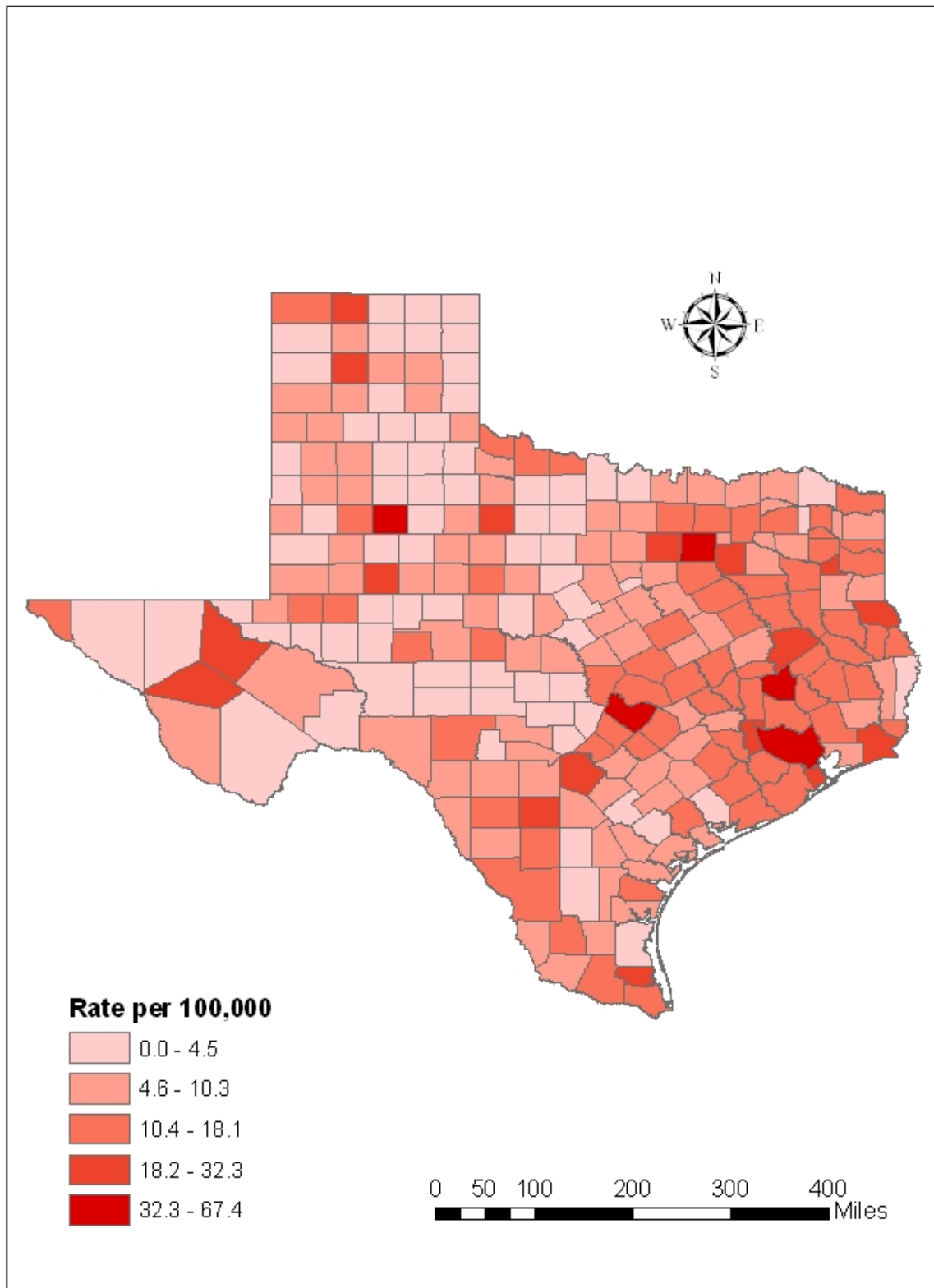
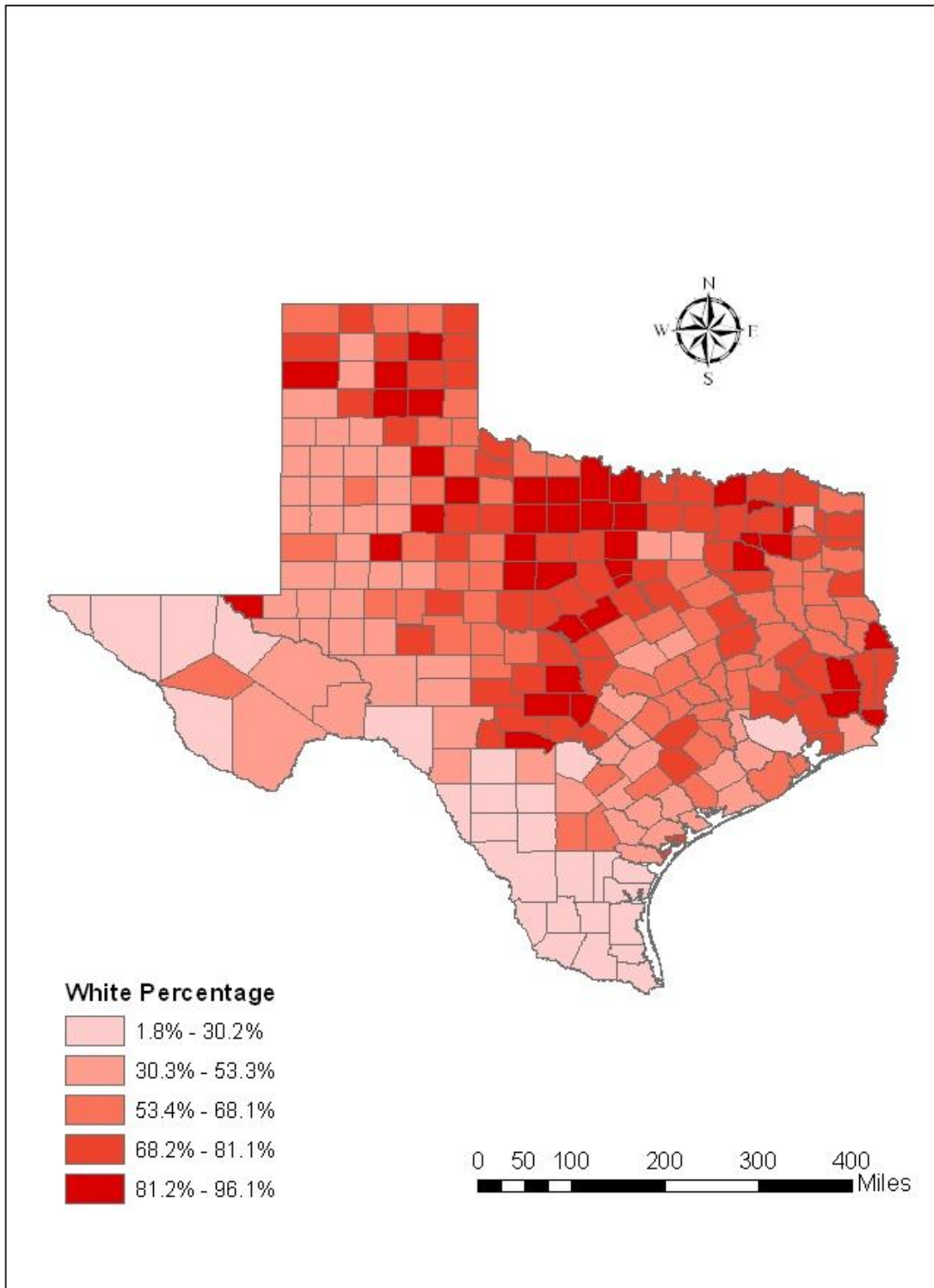Figure 7. Percentage of the County Population White in Texas, 2000

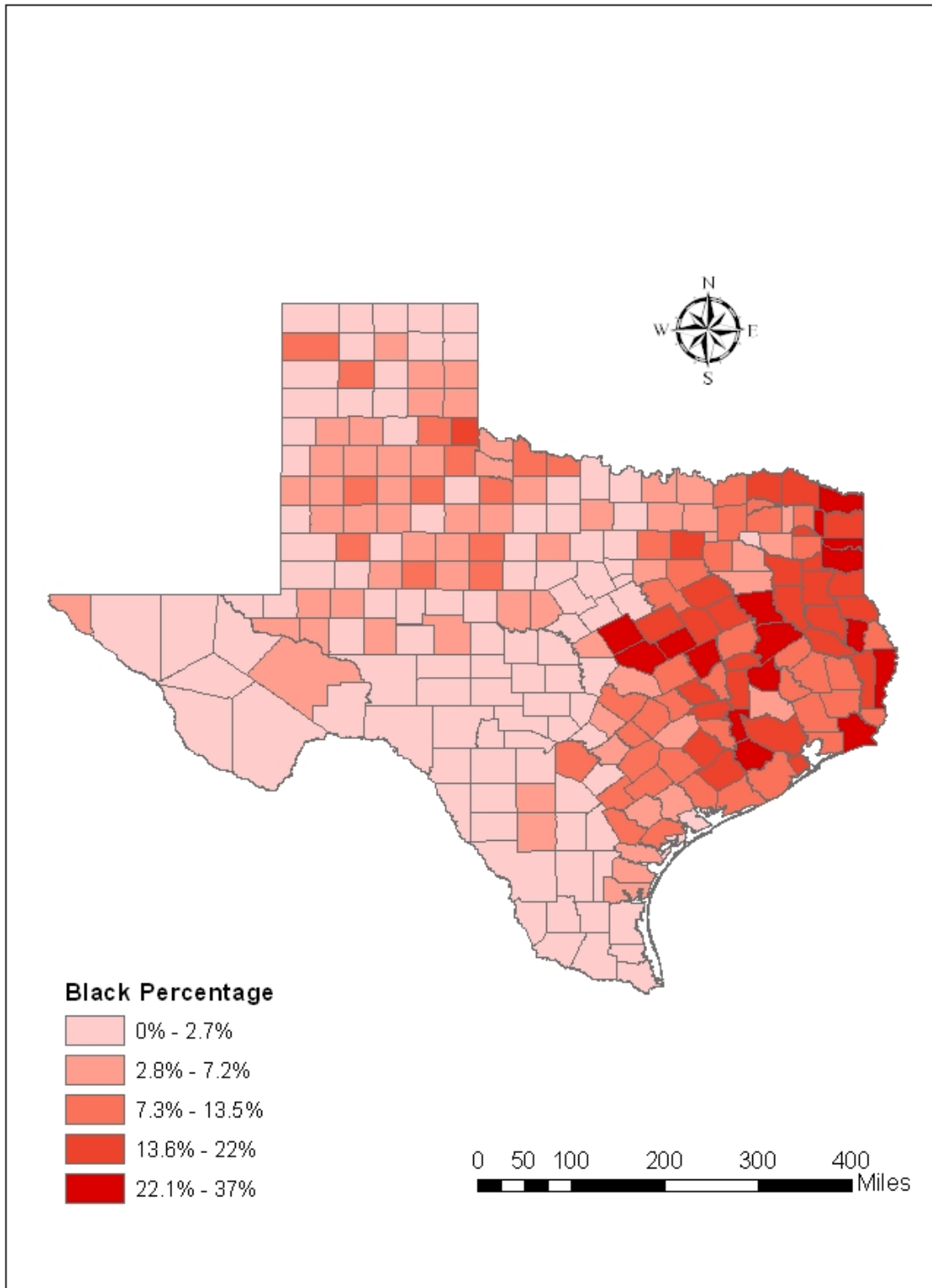Figure 8. Percentage of the County Population Black in Texas, 2000

Figure 9. Percentage of the County Population Hispanic in Texas, 2000

Hispanic Percentage

- 2.1% - 14%
- 14.1% - 27.4%
- 27.5% - 43.1%
- 43.2% - 65.9%
- 66% - 97.9%