The Geography of HIV in Harris County, Texas, 1999-2003

Author: Arianna Jezari
Faculty Mentor: Joseph R. Oppong, Department of Geography, College of Arts and Sciences
Department and College Affiliation: Department of Anthropology, College of Public Affairs and Community Service
Bio:

Arianna Jezari is a junior majoring in Anthropology at the University of North Texas. She is a member of the Delta Gamma sorority, the National Society for Collegiate Scholars, and Baha’i Fellowship Club. She is also a member of NT40, an organization that is comprised of forty top students at UNT who show academic excellence, leadership, and involvement on campus. She has previously presented her research at UNT Scholar’s Day in 2009. After receiving her bachelor’s degree, Arianna plans to pursue a masters degree in medical anthropology, focusing on health-related issues in Africa.
Abstract:

This research examines the geography of Human Immunodeficiency Virus (HIV) in Harris County, Texas and the factors associated with areas of high prevalence. Zip code-level prevalence rates obtained from the Texas State Department of Health for 1999–2003 is the dependent variable, while education, race/ethnicity, and income taken from the 2000 Census are used as explanatory variables with Spearman’s rank correlation analysis. The results suggest that race/ethnicity, level of education, and income have significant relationships with the HIV rate in Harris County Zip codes. Zip codes with a high percentage of African Americans, a high percentage of adults with an education level of eighth grade or less, and a high percentage of people with income below the poverty line, tend to have higher HIV rates.
Introduction

With a total of 70,127 cases, Texas has the fourth highest number of HIV/AIDS cases in the United States (Centers for Disease Control [CDC], 2006). The number of people with HIV/AIDS in Texas increased 30% in the five years between January 2003 and December 2007 (Texas Department of State Health Services [Texas DSHS], 2008). In the U.S. and Texas, most of the HIV/AIDS cases are found in metropolitan areas. In Texas, Harris County, which includes Houston, the largest city in Texas, reports the largest number of HIV/AIDS cases. Since 1981, there has been a total of 23,007 AIDS cases reported in Houston and every day there are two new HIV infections among the youth under age 30 (AIDS Foundation Houston, 2009).

This paper examines the geography of HIV in Harris County zip codes and the factors associated with areas of high prevalence. The goal is to provide information for the necessary programs needed to lessen the risk of HIV/AIDS within the zip code areas.

Literature Review

Although HIV is a continuous concern for metropolitan areas such as Harris County, the characteristics of the disease vary from one area to another and in severity between different racial and ethnic groups. This research will look into further detail regarding how poverty, education, and race/ethnicity play a role in explaining the spread of HIV.

Poverty

People who are extremely poor are more likely to contract HIV than other people because of what they have to do to find income or work. Poverty leads to poor nutrition and poor health, which makes a person more vulnerable to HIV infection and even more likely to contract HIV during unprotected sex (Gillespie, Stuart, & Greener, 2006). Poverty may force people, particularly women, to use sex as a form of payment or as a way to earn money. A significant
number of young women partake in ‘transactional sex’ relationships with older men to secure gifts, money, or greater financial security (Pettifor, Measham, Rees, & Padian, 2004). Often a woman in such a relationship will not be in a position to negotiate condom use, making it more likely that she could become infected with HIV herself, or that she could pass HIV on to her partner if she already has it. Poverty also makes education and access to mass media and other sources of information more difficult (Food and Agriculture Organization [FAO], 2006).

**Education**

Education is critical to the prevention of HIV. Educated women are more likely to know how to prevent HIV infection, to delay sexual activity and to take measures to protect themselves. Education speeds up behavior change among young men, making them more receptive to prevention messages (United Nations Population Fund [UNFPA], 2006). Not only is a basic education essential to be able to process and evaluate information, it also gives the most insignificant groups in society, notably young women, the status and confidence needed to act on information and refuse unsafe sex. Higher levels of education provide much more than specific information on HIV transmission. Education also provides adults and young people with the larger life skills they need to make informed choices and to develop both economic and personal independence.

**Race/Ethnicity**

African Americans only account for 12% of the adults in the United States but account for 46.1% of the total number of people living with HIV in the United States (Campsmith, Rhodes, Hall, & Green, 2006). The HIV prevalence rates for African Americans (1,715.1 per 100,000) and Hispanics (585.3 per 100,000) were, respectively, 7.6 and 2.6 times the rate for White Americans (224.3 per 100,000) (CDC, 2006). The CDC suggests that the disproportionate
rates of HIV infection among African Americans in the United States could be due to higher poverty, limited access to health care, racism and stigma, and greater use of drugs (Prejean, Song, An, & Hall, 2006).

*Lack of access to healthcare.* The risk of death from AIDS is around seven times greater among HIV-positive African Americans than among HIV-positive White Americans (CDC, 2008a). This is because African Americans are usually diagnosed with HIV in much later stages, and are less likely to receive treatment once they are diagnosed. HIV/AIDS is now the leading cause of death in African American women that are aged 25 to 34 (CDC, 2008b). Access to antiretrovirals is also an issue for pregnant women who are HIV-positive; with the treatment, the risk of an HIV-positive woman passing HIV on to her baby is less than 2% (CDC, 2007). If she does not, however, get access to medical services during pregnancy or labor, or remains undiagnosed, the risk of infecting her baby is much higher. Of the estimated 3,592 children under 13 years old living with AIDS who were infected during pregnancy, labor or through breastfeeding, around two-thirds were African American (Avert, 2009).

*Drug use.* One final factor that may play a role in the high numbers of HIV among African Americans is injection drug use. About 24% of all HIV/AIDS cases among African Americans in the United States are due to injection drug use; 19% of the cases were exclusively connected to injection drug use, while 5% were caused by injection drug use in combination with male-to-male sexual contact (Espinoza, Hall, Campsmith, & Lee, 2005). Injection drug use is the second leading cause of HIV infection in African American women and the third leading cause of HIV infection in African American men (CDC, 2008c). HIV infection risk is high with injection drug use because users may share non-sterile needles to inject themselves. This can also make the user
more likely to participate in sex work to pay for their activities. Someone who is desperate for a drug fix, or is intoxicated after drug use, is also less likely to insist on condom use.

Hypotheses

Based on this brief review of the literature, the following three hypotheses are tested in this study for Harris County:

Hypothesis 1. Poverty, defined by the percentage of households with an income below the poverty line, is directly related to the HIV prevalence rate; thus zip codes with high rates of poverty will have high rates of HIV.

Hypothesis 2. Education, defined by the percentage of the population above the age of 25 with an education of eighth grade or less, is directly related to the HIV prevalence rate; thus zip codes with highest education levels will have low HIV rates.

Hypothesis 3. Race/ethnicity, defined by the percentage within a population, is a predictor of HIV prevalence. Zip codes with a higher percentage of African Americans will have higher HIV rates. In contrast, zip codes with a high percentage of Whites will have a lower HIV prevalence rate.

Methodology

Data on the reported cases of HIV were provided by the Texas State Department of Health Services. The dependent variable that is used in this paper is the number of HIV cases per 100,000 people in the population. Data on poverty levels, education, and race/ethnicity were obtained from the 2000 Census on American Fact Finder. The Spearman’s rank correlation analysis was used in order to determine the correlation levels between the dependent and explanatory variables. A total of 6,391 total HIV cases were reported for Harris County zip codes from 1999 to 2003. Of the total reported cases, 147 were not used in the analysis due to
incorrectly entered zip codes, leaving 6,244 cases. There are a total of 135 zip codes in Harris County and all but four have at least one case of HIV. Figure 1 shows the HIV prevalence rate, as defined by the number of HIV cases per zip code divided by the population and multiplied by 100,000. Figure 2 shows poverty levels, as defined by the percentage of people living in Harris County zip code areas who have a household income below the poverty line. Figure 3 shows education and is defined as the percentage of the population over age 25 with an education of eighth grade or less in each zip code. Figures 4 and 5 are the geographic distribution of the percentage of White Americans and African Americans in Harris County zip codes. SPSS 15.0 was used for the statistical analysis and ArcGIS was used for mapping.

Results

Geography of HIV in Harris County

Figure 1 shows the spatial distribution of HIV rates per 100,000 by zip code areas in Harris County. The zip codes in the center of Harris County have the highest concentrations of HIV. The high HIV rates spill over to the south, giving it similarly high HIV rates. As our focus radiates away from the center of Harris County, except the southern portion, the high concentrations of HIV gradually decline. The zip codes that are furthest away from the central portion of Harris County have the lowest rates of HIV per 100,000. The northwestern and northeastern areas of the county are a cluster of zip codes that also have very low HIV rates.

HIV Prevalence and Explanatory Variables

Poverty and HIV prevalence. It was initially hypothesized that zip codes with the higher percentage of people who make a household income under the poverty line would also have a higher HIV prevalence rates; the data confirms this hypothesis. Using the Spearman rho correlation, a strong positive correlation was found ($\rho (132) = .696, p < .001$), indicating a
significant relationship between the two variables. As the number of households that make an income below the poverty line increases, the HIV rate increases correspondingly among the zip code areas. Refer to Figure 2.

*Education and HIV prevalence.* It was initially hypothesized that zip codes with higher percentages of people above the age of 25 with an education level less than eighth grade would have higher rates of HIV prevalence; the data also confirms this hypothesis. Using the Spearman *rho* correlation, a moderate positive correlation was found (*rho* (132) = .469, *p* < .001), indicating a significant relationship between the two variables at the zip code level. As the number of people above 25 with an education level of eighth grade or less increases, the HIV rate increases among the zip codes. Refer to Figure 3.

*Race/Ethnicity and HIV Prevalence Rate*

It was hypothesized that zip codes in Harris County with a greater percentage of African Americans would have higher HIV rates; this hypothesis was confirmed from the data. Using the Spearman *rho* correlation, a strong positive correlation was found (*rho* (132) = .570, *p* < .001), indicating a significant relationship between the two variables. As the percentage of African Americans increases, HIV prevalence increases among the zip code areas. Refer to Figure 4.

It was also hypothesized that zip codes with higher percentages of Whites would have lower rates of HIV; this hypothesis was confirmed. Using the Spearman *rho* correlation shown in Table 1, a statistically significant, strong negative correlation was found (*rho* (132) = -.653, *p* < .001) between the two variables. Among zip code areas, as the percentage of Whites increased, the HIV prevalence rate decreased. Refer to Figure 5.
Conclusion

Based on the data, HIV rates in zip code areas in Harris County are related to the race/ethnicity, income, and education in those areas. The correlations in this study point to general trends in the spatial distribution of HIV in Harris County and reinforce the finding for similar explanatory variables that are present on the national level.

Recommendations for Prevention

Understanding the local variation of HIV allows local authorities to produce specific HIV intervention programs targeted to Harris County, which will effectively target zip codes where residents are at the greatest risk. In central parts of Harris County, not only do facilities need to promote sexual education, but also education about drug use and needles. Educational campaigns should be held in central Harris County and should be free and open to the public. Education helps decrease stigma. Coming together as a community to inform and help one another will allow individuals greater opportunity to learn the benefits of being open about their status and how others can use strategies to prevent themselves from being infected.

Limitations

Some of the limitations that were most significant in this research were that AIDS was not included in this study, and trends of HIV were not taken into consideration between different time periods. If this study included AIDS, it would allow us to see the differences between the geography of HIV and AIDS.

A last limitation would be that this research does not present any trends in HIV rates in Harris County within two or more time periods. The data that are presented show the HIV prevalence rates between the years of 1999 and 2003 combined. If multiple time periods were being studied, it would be possible to determine if rates of HIV are increasing or decreasing. It
would also be possible to determine how HIV spread in the past and to predict trends for the future.
References


Table 1. Rho Correlations of Race/Ethnicity, Education, and Poverty Status With HIV Prevalence

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rho Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>% African American</td>
<td>.570</td>
<td>.001</td>
</tr>
<tr>
<td>% White</td>
<td>-.653</td>
<td>.001</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>.294</td>
<td>.001</td>
</tr>
<tr>
<td>% &lt; 8th Grade</td>
<td>.469</td>
<td>.001</td>
</tr>
<tr>
<td>% &lt; Poverty Line</td>
<td>.696</td>
<td>.001</td>
</tr>
</tbody>
</table>
Figure 1. HIV Rates for All Races/Ethnicities in Harris County, Texas by Zip Code, 2000
Figure 2. Percentage of Households That Have an Income Below Poverty in Harris County, Texas by Zip Code, 2000
Figure 3. Percentage of Population Over Age 25 With an Education Level of Eighth Grade or Less in Harris County, Texas by Zip Code, 2000
Figure 4. Percentage of African Americans Living in Harris County, Texas by Zip Code, 2000
Figure 5. Percentage of White Americans Living in Harris County, Texas by Zip Code, 2000