Poverty and HIV/AIDS in East Texas

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Abstract

Compared to the rest of the country, Texas has very high rates of HIV/AIDS, but the disease is not uniformly distributed across Texas. East Texas has the highest rates and the virus is spreading more rapidly here than any other region (Texas Department of State Health Services, 2010). Nationally, high HIV/AIDS rates are highest in areas with extreme poverty and low socioeconomic status. In fact, the CDC asserts that HIV infection is analogous to poverty (CDC, 2011). This paper seeks to understand the spatial distribution of HIV/AIDS in East Texas and analyze the explanatory factors. Specifically, it will focus on the role of poverty in HIV infection in urban and rural areas of east Texas.
Introduction

According to the CDC, the number of Americans living with HIV in 2010 was 1.1 million. Since the epidemic began, HIV/AIDS has claimed the lives of over 550,000 people (Texas Department of State Health Services, 2010). Due to increased access to antiretroviral treatments, people with the disease are living longer. These treatments prolong the lives of those who are infected, significantly reducing the death rates. Thus, more people become infected with HIV than die from the disease each year. Consequently, as HIV prevalence increases, the opportunity for transmission to others increases as well (CDC, 2008).

Although HIV incidence in the U.S. has remained stable since the epidemic began in the 1980’s, transmission rates have dramatically declined (CDC, 2008), and certain geographic areas and demographics are affected more than others (AVERT 2011). AIDS mortality rates vary as well, and this is also true for Texas. Texas ranked fourth highest among the 50 states in cumulative AIDS cases from the 1980’s to 2008, with 77,070 total cases (CDC, 2010).

Mode of Transmission among MSM, IDU, and Heterosexuals

The United States has a concentrated HIV epidemic among those who engage in high-risk behaviors such as men who have sex with men (MSM), and injection drug users (IDU). At the beginning of the epidemic, AIDS affected gay and bisexual men the most. According to a study conducted by the CDC in 2010, one-fifth of MSM has HIV and almost half are unaware of their status. New HIV infections spread through MSM are rising every year and this is due to unprotected sex (AVERT, 2011).

Nationally, MSM accounts for 53% of new infections and IDU accounts for 12% (CDC, July 2010). But heterosexuals have been affected just as much in recent years. About 31% of new HIV infections in the U.S. in 2010 were heterosexual transmission (CDC, August 2010). The CDC (2011) released an
analysis that showed that 2.1% of heterosexuals living in high-poverty urban areas are infected with HIV in the United States (CDC, 2011).

In 2008, 20% those living with AIDS in America were infected through IDU. Prevention efforts have been implemented, such as needle exchange services where users can exchange old needles in for new ones, but the social consequences of such are still evident (AVERT, 2011).

**HIV and Socioeconomic Status**

While not having a broad impact on the U.S. population, the HIV epidemic has affected the economically disadvantaged in urban areas more significantly. Prevalence rates in urban poverty areas do not significantly differ by ethnicity or race, contrasting with evidence of ethnic differences found in rates for the overall U.S. population (CDC, August 2010).

Socioeconomic status can be defined as a combination of education, income, and occupation, commonly conceptualized as the class of a population of people or an individual. There is a variance in socioeconomic status that affects the distribution of wealth, income and access to resources (American Psychological Association, 2012). More disadvantaged people tend to live in disadvantaged places and are more vulnerable to poor health whereas socio-economically advantaged people tend to live in more affluent places (Oppong and Harold, 2009). HIV prevalence is especially high with the lowest socioeconomic status. Factors that can be attributed to this include limited access to healthcare and substance abuse. With limited access to healthcare, HIV testing and prevention services are limited and substance abuse can increase sexual risk behavior (CDC, July 2010). Socioeconomic status is a factor in contracting HIV but also in determining the quality of life after infection (American Psychological Association, 2012).
**Level of Education**

Socioeconomic status is an important measure of the level of education a person has. When HIV/AIDS first made its appearance in the 1980’s, studies were conducted showing that there was a direct, positive correlation between the rates in an area and level of education. Research shows that education of HIV/AIDS and prevention reduces the vulnerability of risky behaviors (Kim 2006). Current evidence shows that the more educated a person is the better chance they have at protecting themselves. This is a great concern for Texas because the state ranks 25th in the country for teens not in school (Sessions, 2007).

**Income & Poverty**

These impoverished settings can exacerbate health disadvantage which can be geographically located. Many health problems are intensified by poverty in terms of access to care, transportation, education, and individual and family well-being (CDC, 2008). It has also been said that physicians may communicate less effectively with people of a lower socioeconomic status, and in turn, some people may lack trust in their provider (Horton, 2010). The lack of resources for a person infected with HIV living in poverty can determine their treatment, whereas more affluent infected persons can increase their chance of survival with treatment that is available (American Psychological Association, 2012, 2012). Many health problems are intensified by poverty in terms of access to care, transportation, education, and individual and family well-being (CDC, January 2008). But treatment is crucial in reducing the transmission of HIV, and the gap in racial disparities needs to be eliminated so that infection can decrease altogether (Horton, 2010).

**HIV/AIDS & Race/Ethnicity**
Race/ethnicity also plays an important role, and as reported by the CDC, the U.S. epidemic is characterized by austere ethnic and racial disparities (CDC, July 2010). For the overall U.S. population, the HIV prevalence rate for Blacks (1.7%) is eight times higher than Whites (0.2%), and the rate for Hispanics (0.6%) is three times the rate for Whites (CDC, August 2010). Racial and ethnic disparities can be attributed to many factors, but most importantly, poverty. For the overall U.S. population, almost 50% of Blacks live in poverty areas compared to just 10% of Whites (CDC, August 2010).

In the US, AIDS has become a serious threat among Black communities and has taken the lives of over 200,000 Blacks since the epidemic began (Horton 2010). The epidemic has greatly affected the economically disadvantaged and poverty seems to account for some of the racial and ethnic disparities in HIV prevalence (CDC, August 2010). An estimated 46% of US Blacks live in poverty areas compared to just 10% of Whites, and Blacks have a rate 8 times more than Whites (CDC, August 2010).

Alarming rates in the Black community continue to be present in the surveillance of HIV/AIDS diagnoses and deaths among persons living with AIDS. There are also higher rates of other sexually transmitted infections (STIs) in Black communities where there are higher levels of poverty, limited access to health care and treatment, institutionalized racial discrimination, and high rates of incarceration which all play in contribution (CDC, 2009).

In Texas, HIV cases for Blacks in 2006 were five times higher than for Whites or Hispanics (Texas State Department of Health Services, 2010). Youths and teens are just as affected, as 64% of youths and teens with HIV infections in 2008 were Black (CDC, 2011). It is apparent that race/ethnicity plays a vital role in HIV infection, but the reason for this remains unclear. Factors that disproportionately affect Blacks, such as increased poverty levels, lower socioeconomic status, limited access to preventive care, and limited access to health care and services and testing centers may provide some explanation (CDC, 2009).
Vulnerability Framework

Diseases are neither random nor uniform, but rather they vary spatially (Oppong and Harold, 2009). This is the basis of the disease ecology framework; it attributes the uneven geographic distribution of diseases to genetics, environment, and behavior (Meade and Emch 2010). In terms of environment, there is the natural, built, and social environment.

The geographic distribution of HIV/AIDS is an example of how the social environment affects the risk and spread of disease. Sexual behavior norms differ spatially, creating a variable risk of exposure to disease. Where there are poor health systems in areas with HIV rates, the chance for people’s risk of exposure to HIV in these facilities increases (Oppong and Harold, 2009).

A person’s social context, including cultural and social groups and their relationships, can significantly affect their vulnerability to a disease (Oppong and Harold 2009). Differences in income, gender, culture, and education are also a part of the social environment. The social environment is also closely related to poverty, which has often been positively correlated with disease. Socially constructed environments are responsible for creating the circumstances that are necessary for exposure to disease inducing agents. On a global scale, this is true in low-income countries that face widespread poverty, lack of access to healthcare, poor nutrition and diet, and inadequate sanitation (Oppong and Harold 2009). The World Health Organization estimates that 45% of diseases are associated with poverty in the poorest countries in the world (Stevens 2004).

Another aspect, which influences disease risk, is the built environment. These are structures that humans have created, and include houses, office buildings, factories, highways, and also building and zoning codes. Because humans spend much of their time inside, examining the exposures that people undergo while occupying these spaces is important. The urban built environment can be advantageous to good health in terms of access to education, social support, health care, and resources.
However, it can also bring risks, such as crowding, social disorder, poor sanitation, pollution, and industrial accidents. The built environments in areas of low socioeconomic status reflect the lack of developmental infrastructure such as sanitation. Thus, disease control in such areas can be challenging because of a lack of development in public health infrastructure. Low-income families are also more likely to face difficulties in paying for HIV testing and antiretroviral medications (Oppong and Harold, 2009).

The vulnerability to a disease is predictably tied to specific places where risk behaviors, place characteristics, and populations are more susceptible. The behaviors of vulnerable people, in turn, create vulnerable environments that lessen people’s resilience, resulting in poor health. More disadvantaged people tend to live in places where people are more vulnerable in terms of health. In contrast, people that are not considered vulnerable to disease live in more affluent areas where access to health care is more present and poor sanitation is not a problem (Oppong and Harold, 2009).

The geographic concentration of vulnerable places creates an environment where vulnerability to a disease is more likely, all the while attracting vulnerable people to these vulnerable places. The poor are more likely to not be able to oppose environmentally unsafe development whereas the wealthy are more able to migrate to a safer location. This is the reason for an increase in the spatial concentration of vulnerable people. It is clear that the environment is a huge factor in where and why diseases spread, and it is even more significant to include social and built environments. Consequently, the overwhelming weight of evidence suggests that physical, service, and social characteristics of places influence health in important ways, including by shaping choices and behaviors (Oppong and Harold, 2009).

**Extreme Urban Poverty and HIV Infection**
The environment in which one lives plays perhaps the most crucial role in HIV infection. According to the CDC, HIV prevalence rates in urban poverty areas are inversely related to socioeconomic status, meaning that HIV prevalence rates are higher in impoverished areas (CDC, August 2010). The CDC also states that poverty plays a significant role in HIV infection and considers it the single most important demographic factor (CDC, July 2010). Many studies show that HIV strikes the economically disadvantaged, and this is mainly associated with access to testing centers and healthcare facilities, but also can be linked to engaging in high-risk behaviors, such as substance abuse, which can increase sexual risk taking (CDC, July 2010). Frequently, prevention efforts fail to reach HIV-infected and uninfected individuals in poverty stricken areas (CDC, 2008).

The CDC released a report in 2011 showing a powerful link between poverty and HIV risk where prevalence was especially high in areas with the lowest socioeconomic status. The analysis revealed that a greater risk was evident for individuals living below the poverty line than those living above the poverty line (2.4% vs. 1.2% risk) in low-income urban areas. The study concluded that the lower the socioeconomic status, the greater the HIV prevalence rate (CDC, July 2010). These findings, which have significant implications for future research on HIV prevention, aim towards looking at the epidemic in isolation from the environment that people live, prioritizing prevention efforts where disadvantaged communities are most affected (CDC, July 2010).

In the US, HIV prevalence in poor urban neighborhoods was four times the national average (AVERT, 2011). These high HIV rates were attributed not to race or ethnicity, but to limited access to healthcare and other services. The poorest segments of urban centers have the highest risk for HIV. Poor neighborhoods are common in urban centers, and the poorest residents live in the inner cities - a concentration of economically blighted neighborhoods with high rates of unemployment and a lack of
public safety indicators. Drug abuse is commonly connected to the exchange of sexual behaviors, which can be a gateway of infections, including HIV and other STIs (Akuwe, 2000).

The incidences of HIV/AIDS in urban areas are higher probably because of high levels of STIs, IDU, poverty, and an influx of people. Poor neighborhoods are common in urban areas, a concentration of low-income housing, often of ethnic minorities, where a number of risk factors are prevalent among these poorest segments (Akuwe, 2000).

**Income Inequality and HIV Infection**

Cross-country studies reveal a significant link between income inequality and HIV prevalence. Income inequality is normally measured by the Gini coefficient, a statistical measure of dispersion for inequality among values. A coefficient of zero means that there is complete equality where all the values are the same, whereas a coefficient of 1 indicates maximum inequality (World Bank, 2011). The link between income inequality and HIV prevalence persists when there is a control on various other indicators of poverty and economic development (Holmqvist, 2009). This indicates that societies with high income distribution have an enhanced exposure to risky sexual behavior thereby increasing HIV infection. The primary reason for this relationship is due to wealth inequality in the context of desired sexual habits from the wealthier and little resistance from the poor. Another reason for this may be high rates of urbanization, which can lead to acts of desperation, dependency, and sexual exploitation (Anim and Dasmani, 2011)

**Research Hypotheses:**

1. Counties with high percentages of Blacks will have high rates of HIV/AIDS.
2. Counties with high rates of poverty will have high rates of HIV/AIDS.
3. More urban areas have higher HIV/AIDS rates.
4. Counties with a high percentage of people that have less than a high school diploma, will also have high rates of HIV/AIDS.

**Methodology**

Zip-code level data on all HIV/AIDS cases reported in each East Texas county from 1999-2008 were provided by Texas State Department of Health Services through my research mentor, Dr. Joseph Oppong. Population data on race/ethnicity (White, Black, Hispanic) were provided by the 2010 Census. Level of education is measured by the percent of population twenty-five years and older with less than a high school diploma, and obtained from the 2010 Census. The poverty threshold used, which determined the percent of households in a county below the poverty level, was extracted from the 2010 Census. Other socioeconomic variables, such as percent urban area in a county, were also obtained from the 2010 Census data. The 2010 Texas Epidemiologic Profile defined the area of East Texas that was used in this study. Simple correlations were used to test the relationship among the variables, and the maps were created using ArcGIS software.

**Background and Study Area Characteristics**

For this study, East Texas is defined to include all counties east of Interstate 35 in the north to Harris County, which is centered on Houston. It includes the major metropolitan areas of Texas such as Austin, Dallas-Fort Worth, and Houston. East Texas is more urbanized, has a much higher percent of Black population, and has higher median income and a higher income inequality. The state median income in 2010 was $39,493 (2010 Census). The highest median income per capita is $33,335.00 in Collin County (2010 Census), and the county with the highest percentage of poverty is Brazos with 29.7%
HIV infection rates also vary significantly within the region and Harris County has the highest rates at 443 cases per 100,000 (Figure 2).

**Results**

The results of the analysis are presented in Table 1. Poverty, percent Blacks, percent Hispanics, and percent urban areas had a positive, significant correlation with the rate of HIV/AIDS in a county. Percent Whites and percent rural areas had a negative, significant correlation with the rate of HIV/AIDS in a county. Level of education was not statistically significant (Table 1).

The rate of HIV/AIDS in East Texas seems to be much higher in the central portion of east Texas, particularly in urban areas or neighboring a county defined as such (Figure 2). Counties with the highest rates (160-1016 cases per 100,000) include: Anderson, Bowie, Dallas, Ellis, Galveston, Gregg, Grimes, Harris, Houston, Jefferson, Marion, Matagorda, Navarro, Shelby, Tarrant, Travis, Trinity, Walker, Waller, and Wharton counties (Figure 2).

The northern and western portions and the central eastern region have the highest percent White population (Figure 3). But Blacks are concentrated in the eastern border, the DFW metroplex area, and the south central region (Figure 4).

The southwestern border and northwestern counties in the DFW metroplex area have the highest percent Hispanic population (Figure 5).

Percent poverty by county shows that the area most affected is the central portion of this region (Figure 6). These counties include: Marion, Shelby, San Augustine, Nacogdoches, Houston, Walker, Brazos, Falls, and San Saba. Percent urban by county shows that metropolitan areas in the northwest and southeast have the highest percentages and the highest include Dallas, Tarrant, and Harris counties (Figure 7). Percentage of those with less than a high school graduate degree by county shows that the
highest percentages are located in the central and southern central region as well as eastern border counties (Figure 8).

**Analysis:**

The geography of HIV/AIDS in East Texas counties cannot be determined on one factor alone. It is shown that the rate is highest near urban centers (Figure 2), which can be attributed to several factors. A few of these factors include high-density populations, diversity of people (race/ethnicity), and the influx of diseases from other locations. Where there are high concentrations of people, a disease is more likely to spread because urban centers gather numerous people by means of traveling and work. The analysis shows that where there is a high percentage of urban area in a county, there are also high rates of HIV/AIDS.

In terms of race/ethnicity, there are high percentages of Blacks living in and near urban areas (Figure 4) and high percentages of Hispanics occurred also in and near here (Figure 5). This shows that where there are a high percentage of Blacks or Hispanics, the rate is also likely to be high, and where there is a high percentage of Whites, the rate is likely to be low.

Another factor to consider is poverty. The analysis showed that where there are high rates, there is likely to be high concentrations of poverty as well. Urban extreme poverty may be a factor in the high rates of HIV/AIDS in urban areas (Figure 7). Poverty (Figure 6) is seen most in the central region. There is a strong link between income inequality and HIV prevalence. Wealth inequality is a factor here to consider, as those who are impoverished may engage in risky sexual behavior thereby increasing HIV infection. It is shown that poverty is highest among the Black populations, which is also the population most affected by HIV/AIDS. The analysis shows that where there are high rates of poverty, there are high rates of HIV/AIDS and likely to be high rates of Blacks.
As far as those living with less than a high school graduate degree (Figure 8), these percentages were highest in the central regions and the eastern border regions. The higher percentages were in urban areas but more frequent in rural areas. There was no significance between the rate of HIV/AIDS in a county and the percentage of those with a high school diploma.

**Future Recommendations:**

The spatial analysis of HV/AIDS in East Texas shows us many things: first, that the geography cannot be determined by one factor alone, and second, that in order to pinpoint risk factors, a more in-depth analysis should occur. In previous research, Hispanics always seemed to be a confounding variable or to have no significance with the rate of HIV/AIDS in a county, but this research has shown otherwise. I would suggest a further look into the Hispanic population in counties with high rates of HIV/AIDS. Another recommendation would be to investigate further other factors that could be associated with such high percentages among the Black population. Perhaps a neighborhood geospatial analysis on the counties with the highest rates of HIV/AIDS in East Texas would show more substantial results.

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Poverty</th>
<th>White</th>
<th>Black</th>
<th>Hispanic</th>
<th>Urban</th>
<th>Rural</th>
<th>Less than HS Grad Degree</th>
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<tbody>
<tr>
<td>Rate</td>
<td>.217*</td>
<td>-.459**</td>
<td>.336**</td>
<td>.333**</td>
<td>.323**</td>
<td>-.323**</td>
<td>.171</td>
</tr>
</tbody>
</table>

- Significant at >1%
- ** Significant at >3%
Figure 1: Study area of East Texas counties
Figure 2: Rate of HIV/AIDS in East Texas counties
Figure 3: Percent White by county
Figure 4: Percent Black by county
Figure 5: Percent Hispanic by county

Percent Hispanic by County
Data Provided Retrieved from the 2010 Census

Percent

EastTexas
- 2.80 - 8.60
- 8.51 - 14.70
- 14.71 - 20.80
- 20.81 - 29.00
- 29.01 - 47.10

Map created by Meagan Hatton in ArcMap
Figure 6: Percent poverty by county
Figure 7: Percent urban area by county
Figure 8: Percent with less than a high school graduate degree by county
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