Breast Cancer in Texas Counties
1980-1998

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Bio:

My name is Djenabou Barry. I was born and raised in Guinea located on the west coast of Africa. I moved to the U.S. at the age of eight. I am an international studies major and plan to graduate fall of 2011 with my bachelor of arts degree in international development. Before transferring to UNT I was on the Dean's and President's list in 2006-08 at the City College of New York and 2009-10 at Richland College where I was a member of the Peace Studies Club. I presented my research on the epidemiology of breast cancer in Texas at University Scholar's Day in 2011 and was awarded third place in the paper competition. I am a member of the UNICEF chapter at UNT, working with fellow members to help end the suffering of children around the globe. After graduation I plan to work with a non-profit organization and eventually plan to develop my own organization in my home land of Guinea.

Abstract:

The geographic distribution of breast cancer in Texas counties from 1980 to 1998 was examined using data from the U.S. Census Bureau and the Texas Vital Statistics. The effects of race/ethnicity, socioeconomic status, genes and environment on cancer morbidity and mortality was examined using ArcGIS and statistical analysis of secondary data in a human ecology framework. In the study age-adjusted mortality rates in Texas counties were found to be positively correlated with percentage of the population of the county that was Black ($r = .123$, $p < .05$), the percentage of the county population that was White ($r = .172$, $p < .05$), the percentage of the county population uninsured ($r = .103$, $p < .05$), and the population density of the county ($r = .136$, $p < .05$). Age-adjusted mortality rates were inversely correlated with percentage of the county population that was Hispanic ($r = -.166$, $p < .05$), the percentage of the county population that was employed ($r = -.203$, $p < .05$), the average income of the population of the county ($r = -.281$, $p < .05$), and the average years of education of the population ($r = -.249$, $p < .05$).

Introduction

Breast cancer is the most commonly diagnosed cancer in women and the second leading cause of cancer deaths in Texas women (BreastCancer.org, 2010). From 2002 to 2006, urban counties had much higher female breast cancer incidence and mortality rates compared to rural counties. Breast cancer was the second leading cause of cancer deaths among black females in Texas. This paper I examine the geographic distribution of breast cancer in Texas counties from 1980 to1998 and the reasons for this pattern. In addition, I examine the relationships between breast cancer mortality and race/ethnicity, socioeconomic status, genes, and environment. Using ArcGIS and statistical analysis in a human ecology framework, I will show *who* gets breast cancer *where* in Texas and *why*.

Breast cancer is a malignant tumor that has developed from cells in the breast. It is considered a heterogeneous disease, differing by individual, age group, and even the kinds of cells within the tumors themselves. Usually breast cancer either begins in the cells of the lobules, which are the milk-producing glands, or the ducts, the passages that drain milk from the lobules to the nipple. Less commonly, breast cancer can begin in the stromal tissues, which include the fatty and fibrous connective tissues of the breast (Breastcancer.org, 2010). Over time, cancer cells can invade nearby healthy breast tissue and make their way into the underarm lymph nodes, small organs that filter out foreign substances in the body. If cancer cells get into the lymph nodes, they then have a pathway into other parts of the body.

Breast cancer is always caused by a genetic abnormality, a mistake in the genetic material. However, only 5 to10% of cancers are due to an abnormality inherited from your mother or father. About 90% of breast cancers are due to genetic abnormalities that happen as a

result of the aging process and "wear and tear" of life in general (Breastcancer.org, 2010). Even though Breast cancer is always a genetic abnormality, if diagnosed early it will not lead to death.

Breast cancer has been attributed to many factors including race/ethnicity, socio-economic status, genes and environment, either in a rural or urban community. Race/ethnicity appears to be a major factor in breast cancer. Black women are more prone to breast cancer than White women. The disparity in mortality rates between White and Black women increased between 1980 and 2000, so that by 2000 the age-standardized death rate was 32% higher in African Americans (Ghafor et al., 2003). While the rate of breast cancer diagnosed among black women has decreased the mortality rate has increased. This difference in breast cancer death rates between Black women and White women in Texas may be explained by the differences in the time of diagnoses. Use of mammography in the 1980's and early 1990's was lower in Black than in White women. Black women are less likely to receive radiation therapy after breast conserving surgery (Ghafor, et al., 2003). Because they generally have lower incomes, Black women may not have the money to cover these costs, so they never go back for follow ups or therapy.

Generally speaking survival in White women from breast cancer is greater than for Black women, but the disparity is less in situations where equality of treatment is the same across racial and ethnic groups. An analysis of the survival experience of women with breast cancer treated in U.S. military health care facilities suggests that the disparity in breast cancer survival between Black and White women could be reduced by 70% by providing equal treatment to all women (Ghafor, et al., 2003). It appears that this survival gap can be decreased by eliminating disparities in access to health care services and improving access for lower socioeconomic status people.

Disparities exist between rural and urban populations in the stage of disease at first diagnosis. Early staging is considered an indicator of quality medical care and improves outcomes for many cancer types. Conversely, delayed diagnosis (unstated or late stage) can result in poorer outcomes (Gosschalk & Carozza, 2003). For environmental or geographic reasons, it may be harder for Black women to access mammogram facilities or equal mammographic quality compared to White women.

Genetics may also be a factor in who gets breast cancer. Recent studies have shown that the Ashkenazi, a population of Eastern European Jews, may have a higher chance of breast cancer because they have a higher proportion of BRCA1 and BRCA2 mutations than the general U.S. population. However this alone may not make a significant difference in the disparity of breast cancer between White and Black women. These groups of women may still have faster and easier access to health and treatment than Black women do. Researchers indicate that because of these new findings more women will benefit from closer monitoring for breast cancers. Nonetheless this may only benefit the specific groups of women that carry the gene. I think it will take attention away from the groups of women that do not have access to early detection, due to their economic status and or environment.

Insurance and socioeconomic status may play a role in cancer screening, diagnosis, staging, and treatment. A statewide Michigan study found that low income groups, defined as receiving Medicaid, had a disproportionately large share of cancer. Many Black people that live in urban areas are there because they do not have other choices. An average mammogram costs $200 for uninsured women in Texas. This does not include the diagnoses fee or the treatment fees if cancer is found. A Florida study found that those insured by Medicaid and the uninsured were at a greater risk of late-stage diagnosis than the insured (Gosschalk & Carozza, 2003). It

seems that a person's economic status affects the kind of service they get. The quality of a person's insurance may define her prognosis.

Differences in breast cancer mortality rates between Black and White women have been observed in previous studies. Many of the results seem to reveal that Black women with breast cancer have a much higher mortality rate than White women (Ghafor et al., 2003). There are several explanations for this, which I have touched on, ranging from poor socioeconomic status to genetics. Indeed these are factors that should be examined further.

Hypotheses

I will be focusing on 3 primary hypotheses. They are as follows:

1. Race/ethnicity is a predictor of breast cancer mortality. Counties with higher number of Black people will have a higher rate of breast cancer mortality.
2. Counties with a higher number of uninsured people and low income areas will have higher rates of breast cancer mortality.
3. Population density will also be an indicator in breast cancer mortality in Texas counties; urban counties, with a larger population density, will have higher breast cancer mortality rates.

Methods

I test these hypotheses by examining the relationship of breast cancer mortality rate in the counties with the percentage of Blacks, Whites, and Hispanics in each county; indicators of socioeconomic status in the counties including employment, income, and education; the percentage of the population of the counties that is uninsured; and the population density of the county. Existing datasets were used to construct the dataset for this study. The cancer mortality data were taken from the Vital®Health Statistics (Expert Health Data

Programming, Inc.). The data on health insurance coverage were taken from the Texas County Health Rankings data set constructed by the Population Health Institute at the University of Wisconsin with funding from the Robert Wood Johnson Foundation. Socio demographic data were taken from the U.S. Census Bureau. Population density was calculated by using Census data on county population and then dividing the total population by the area of the county, obtained from the GIS software or some other source such as the North Central Texas Council on Governments (NCTCOG).

Results

Breast cancer mortality rate seems to be higher in the far eastern and western parts of the state. When looking at the Crude death rates for breast cancer the counties in the center and in far-east of Texas have much higher rates (Figure 1). Counties such as Cooke and Gillespie have a rate of 44 per 100,000 or more. Lower mortality rates are mostly in the western part of the state. Counties such as Webb, Zapata and Hudspeth have a mortality rate of 18 per 100,000 which is less than the state average of 27.9 per 100,000. However, on the age-adjusted map, the death rate for breast cancer is not concentrated in just one area of the state (Figure 2). For example, we have high mortality rates in Dallas County which is in the northeast and we also have a high mortality rate in Presidio and Brewster which are on the western part of the state.

Race/ Ethnicity and Breast Cancer Mortality

Percentage of county population that is Black. My hypothesis was that race/ethnicity played a significant role in breast cancer mortality rates in Texas. It was expected that counties with higher percent of Blacks would have higher mortality rates from breast cancer. This is the case when you look at the age-adjusted map for breast cancer mortality (Figure 1). In counties like Dallas, Tarrant, and Jefferson, the Black population is 12% and over of the total population;

this percentage is higher than the state's average at 11.7% (Figure 3) and the age-adjusted mortality rates for these counties are above the state's average also, at 27 per 100,000. Table 1 shows that there is a low but positive and significant correlation between the percent of Black people in the counties and the age-adjusted mortality rate; the higher the percent of Black people in a county, the higher the mortality rate from breast cancer.

Percentage of county population that is Hispanic. The percentage of the population that was Hispanic population was also significantly negatively correlated with age-adjusted mortality from breast cancer (Table 1). As the percentage of the population that is Hispanic increases, the breast cancer mortality rates decreases. Webb County is an example. Webb County has an population that is more than 50% Hispanic which is higher than the state average at 27.10%, but the death rate in Webb county is less than 20 per 100,00 (Figure 4). There was also a significant positive correlation between percent White and breast cancer mortality. However, this can be seen a cofounding variable because in many counties where the percentage White is high, there are also high percentage of the population that is Black. Counties such as Angelina has a higher white percent population above the state average at 61.15% (Figure 5) but also has a high percentage of its population that is Black, higher than the state average at 11.70% (Figure 3).

The Uninsured and Breast Cancer Mortality

It was hypothesized that counties with a high number of uninsured people will have high breast cancer mortality rates. This is only true when examining the age-adjusted death rate map. With the exception of Harris county in the eastern part of the state, Counties along the western border of the state, especially the southwest border, show 30% of the population without insurance (Figure 6). It seems that the percentage of the county that is uninsured is not a

significant predictor of breast cancer mortality rates in Texas counties (Table 1). Even though the uninsured is high in some counties, the breast cancer mortality is very low. The percentage of the population that is Hispanic is also very high in these counties (Figure 4). This could be a cofounding variable, because many Hispanics do not have legal jobs in order to get health insurance, which is the most common way for one to get insurance.

Socioeconomic Status and Breast Cancer Mortality

Socioeconomic status was found to be a significant predictor of breast cancer mortality in counties (Table 2). Using the z-score for education, employment and income, I found that there was a significant negative correlation ($r = -.249$, $p < 0.05$); ($r = -.203$, $p < 0.05$); ($r = -.281$, $p < 0.05$) with mortality rates from breast cancer; as the z-scores for these three variables increase, cancer mortality rate for the counties decreases.

Population Density and Breast Cancer Mortality

As indicated in Table 1, population density did prove to be an indicator for breast cancer mortality with a significant positive correlation ($r = .136$, $p > 0.05$). This indicates that when population density increases, so does breast cancer mortality. Counties such as Dallas, Denton, and Tarrant, where population density is very high at 372 people per square mile or more (Figure 7), breast cancer mortality is also high at 28 per 100,000 or more, higher than the state rate of 27.9 (Figure 2). In urban counties, where the population density would be higher, there are different levels of urbanizations within that one county. For example Dallas, there is a downtown Dallas where the rich work and buildings are tall and clean and health care is relatively accessible, but there is also Oak Cliff where there are high crimes rates and that is not the best area to live when one needs medical care. This may explain the positive correlation between breast cancer mortality and population density.

Change in Breast Cancer Mortality

To calculate the change in breast cancer mortality in Texas counties, I used two different time periods, 1980-89 and 1991-98 (Figure 8). Throughout Texas there was no significant change; counties such as Brewster and Cameron had a -6.8 per 100,000 change, indicating that there was not a significant change. The breast cancer mortality rate stayed pretty much the same thought out the years of 1980-1998. The change rate between the two time periods was a decrease of -.08. However there were counties that showed a big increase in breast cancer mortality, counties such as Newton and Motley had an increase of 6.2 and higher mortality rate . Some also showed a significant decrease, counties like Hartley and Real.

Conclusion

Breast cancer mortality rates in Texas counties appear to be related to the race/ethnicity, socioeconomic status, and population density of the counties. The percent of the county population that is uninsured does not seem to be correlated with breast cancer mortality rates in Texas counties. Counties that appear to have higher percentage of uninsured actually have low rates of breast cancer mortality. However, the high percentage of Hispanics in those counties might also be the reason for those high uninsured rates. One limitation of this work is the absence of data on access to mammogram facilities in each county. The available data is inadequate. Some counties were missing information, others did not report any. This is one area variable that should be included in future research. It may explain breast cancer distribution across Texas. To have information on which counties have mammogram facilities and the cost of a mammogram will be very helpful to further researchers.

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Table 1. Correlation of Age-Adjusted Mortality Rate for Texas Counties with Percentage Black, Percentage Hispanic, Percentage White, Percentage Uninsured, and Population Density

	Percent Black	Percent Hispanic	Percent White	Percent Uninsured	Population Density
Breast Cancer AADR	.123*	-.166*	.172**	.103	.136*

*Correlation is significant at the 0.05 level (2-tailed).

Table 2. Socioeconomic Status

	Z-Score Employment	Z-Score Income	Z-Score Education
Breast Cancer AADR	-.203**	-.281**	-.249**

*Correlation is significant at the 0.05 level (2-tailed).
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Figure 1. Breast Cancer Mortality in Texas Counties, 1980-1998

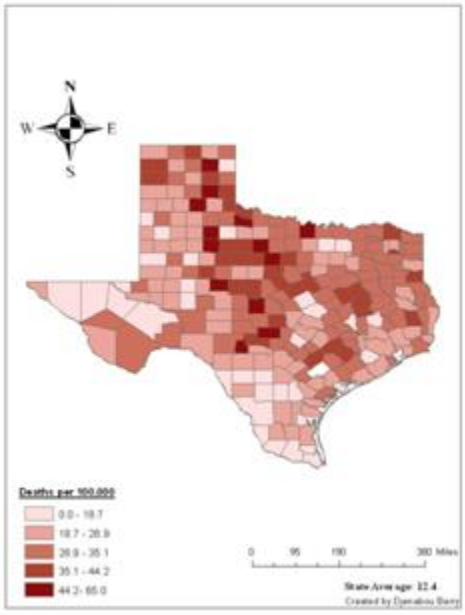

Figure 2. Age-Adjusted Breast Cancer Mortality in Texas, 1980-1998

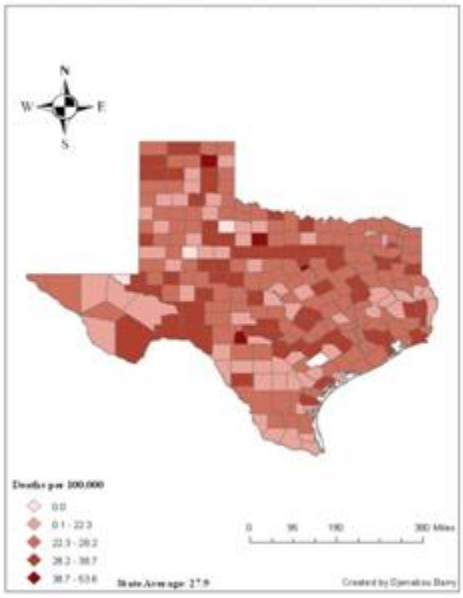

Figure 3. Black Population in Texas Counties, 1980-1998

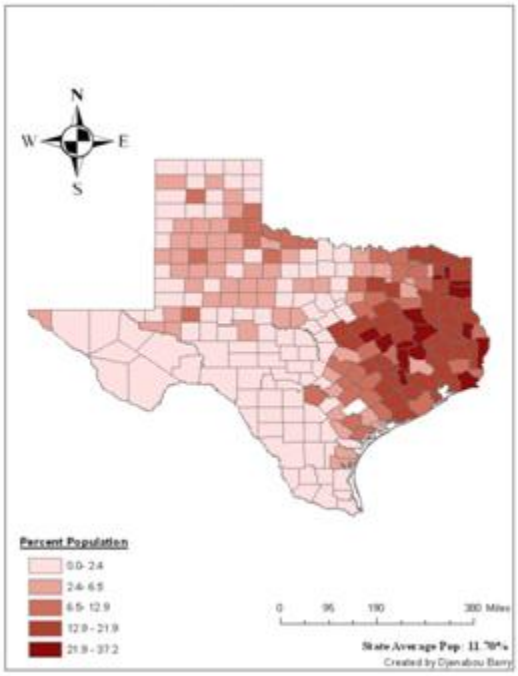

Figure 4. Hispanic Population in Texas Counties, 1980-1998

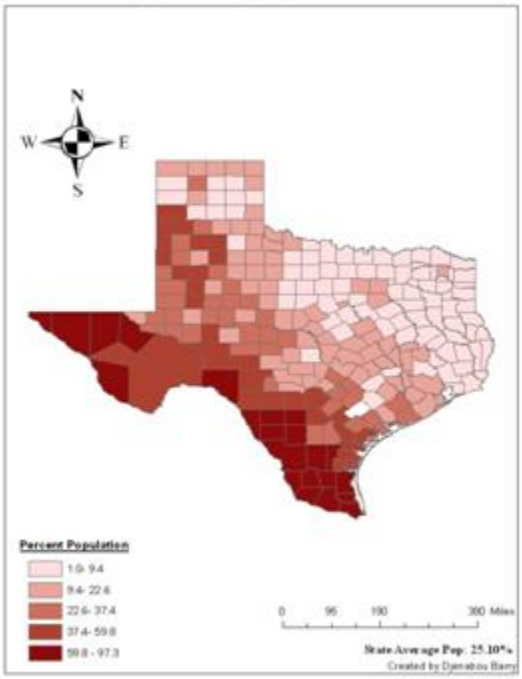

Figure 5. White Population in Texas Counties, 1980-1998

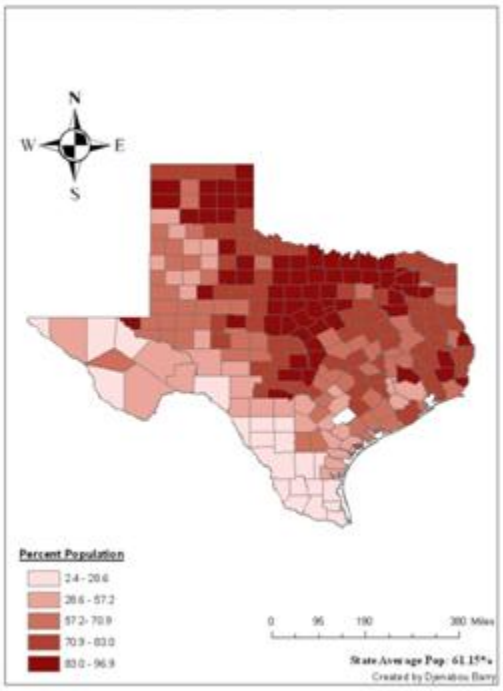

Figure 6. The Uninsured in Texas Counties, 2007

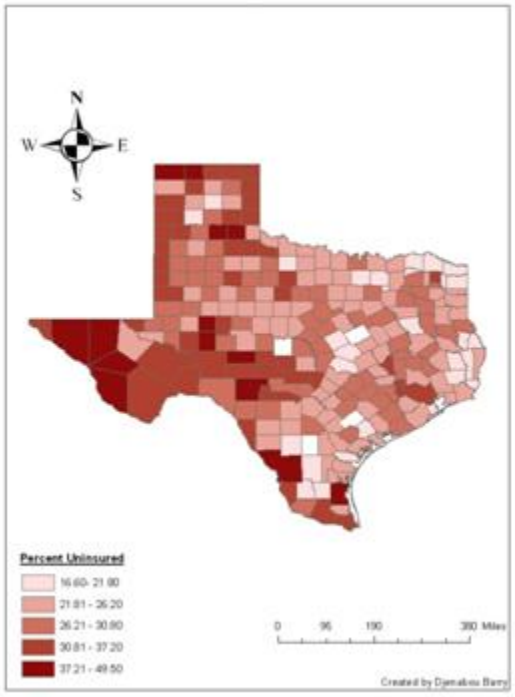

Figure 7. Population Density of Texas Counties

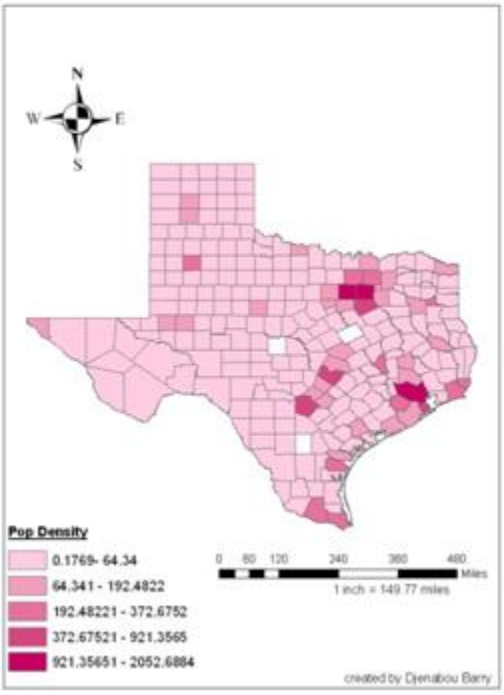

Figure 8. Change in Breast Cancer Mortality, 1980-1990 and 1991-1998