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Presence of medical schools may contribute to reducing breast cancer mortality and disparities

Abstract

Understanding differences among counties more or less successful in addressing breast cancer (BC) mortality disparities is important. Medical resources may be more available in counties with BC mortality rates (BCMR) low and similar for White and Black women. Based on Black and White BCMR we classified counties in four types from failing (high BCMR for both groups of women) to successful (low BCMR for both). Medical resource data were from Area Resource Files. In multivariate analyses, number of physicians or hospitals, HMO penetration, and proportion of hospitals with mammography centers did not predict county type. The proportion of hospitals with medical schools predicted counties being with Black:White disparities vs. with reverse disparities (OR 0.96, CI 0.94–0.99), or being successful vs. failing (OR 1.03, CI 1.00–1.06) or vs. with disparities (OR 1.04, CI 1.01–1.07). Medical resources did not explain county type differences, but type of care available may be important.

Keywords

Breast cancer mortality; racial disparities; older women; medical resources

Breast cancer is expected to have affected more than 190,000 U.S. women and to have caused more than 40,000 deaths in 2009.¹ Breast cancer mortality does not affect all groups of women equally, however,^{2, 3} and Black women are more likely than White women to die of breast cancer, despite having a lower incidence of the disease.^{2, 4, 5} Moreover, the Black:White mortality rate ratio for breast cancer among women ages 65 years and older has steadily increased since the early 1990's.⁶

Disparities in US breast cancer mortality among the elderly are not uniformly distributed by region, state, or county.^{6–8} Analyzing the factors that contribute to this geographic variation may provide some insight on how to address these inequalities. County-level variation is especially important, in part, because the resources needed to achieve good health outcomes are usually available to individuals at this level.⁹ Furthermore, in studying county-level variation, it is important to consider both mortality rates and Black:White disparities. Counties with relatively high mortality rates among both Blacks and Whites, for example, may be quite different from counties with high mortality among Blacks and low mortality among Whites, a circumstance that is further complicated by the higher likelihood that Black women may be more likely to reside in the former type of counties.^{10–12} Similarly, counties with relatively low mortality among both Blacks and Whites may be different from those with relatively low mortality among Blacks and relatively high mortality among Whites. Overall, the most successful counties may be those with low mortality rates for both Black and White women, and/or no disparities or reverse disparities, while failing counties may be those that have disparities and/or high mortality rates for both Black and White women.

Currently, we have little understanding of what factors differentiate one type of county from another. Factors may predispose individuals to obtain medical care and, thus, achieve better health outcomes, such as age, gender, race, education, or enable people to get care such as income, low poverty, and the availability of other resources, for example medical resources.

¹³ Traditionally used contextual socioeconomic measures such as educational attainment, percentage of Black residents, income, poverty, income inequality, or residential segregation may not account for unusually high or unusually low disparities in mortality.^{6, 14, 15} In the present study, we therefore explore additional enabling factors, such as the availability of medical resources. In counties where medical resources are abundant, even individuals with low socioeconomic status may have easier access to medical care either to detect breast cancer early or to treat it. For example, Black women were more likely to use mammograms if they lived in counties with two or more health centers or clinics per 100,000 female population,¹⁶ and areas with more physicians had a higher proportion of breast cancer cases that were diagnosed at an early stage compared with areas with a lower number of physicians.¹⁷ In addition, the type of care delivered may also act as an enabling factor and explain differences in county types. Specifically, since there is evidence that breast cancer mortality was lower among women treated in teaching hospitals,¹⁸ counties with low mortality may be more likely to have teaching hospitals. Similarly, these counties may have a higher number of residents enrolled in Health Maintenance Organizations (HMOs) as it has been shown that older women were more likely to receive breast cancer screening in these settings.¹⁹

Given the evidence available, we hypothesized that successful counties, that is, those with low breast cancer mortality among both Blacks and Whites and/or no disparities, could be distinguished from less successful counties, in part, because of the quantity and type of available medical resources. In this paper, we test this hypothesis using breast cancer mortality data for women 65 and older from the Centers for Disease Control and Prevention (CDC) Compressed Mortality File merged with county level data on medical resources from the Area Resource File for the years 1999 to 2005. The analysis was restricted to a subset of counties with the highest numbers of breast cancer deaths for Black older women to ensure that we considered those counties with large Black older female populations.

Methods

Data for this study were derived from two sources: the CDC Compressed Mortality Files and the Area Resource File (ARF). The Compressed Mortality File contains mortality data at the county level for the years 1968 to 2005. Data are based on death records for individuals who died in the fifty states and the District of Columbia. The underlying cause of death is classified based on the information from the death certificate and the rules associated with classifying diseases according to the International Classification of Disease-versions 9 (through 1998) and 10 (ICD-9 and ICD-10).

The ARF is a database containing information for U.S. counties on health facilities, health professions, resource scarcity, health status, economic activity, health training programs, and socioeconomic and environmental characteristics. The data are collected from sources such as the U.S. Census Bureau, the American Medical Association, the American Hospital Association, and the Center for Medicare and Medicaid Services. This file is sponsored by the National Center for Health Workforce Analysis, Bureau of Health Professions, which is within the Health Resources and Services Administration.

We searched the 1999–2005 Compressed Mortality File for records that listed breast cancer (ICD-10 C50) as the underlying cause of death, for White and Black females 65 years old and older. We then ranked counties by the number of breast cancer deaths for Black females with the goal of selecting the first 200 counties. We selected 203 counties that had 14 or more deaths related to breast cancer among Black women (average 61.4, SD 99.2, max 893). The total number of deaths from these counties represented 76% of all deaths in Black women 65 years old and older in the time period.

Based on the breast mortality rates for Black and White women calculated per 100,000 population, we classified counties into four types, as follows:

- 1) **Successful:** counties with Black and White mortality rates below the 203 counties' White average mortality rate.
- 2) **With reverse disparities:** counties with Black mortality rates below, and White mortality rates above the counties' White average mortality rate;
- 3) **With disparities:** counties with White mortality rates below, and Black mortality rates above, the counties' White average mortality rate; and
- 4) **Failing:** counties with Black and White mortality rates that are above the counties' White average mortality rate.

This classification considers counties as failing if they have high mortality rates even if there are no differences between Black and White women. We chose to do this in consideration of the fact that Black women may be more likely to live in areas with poor cancer outcomes, and that contributes to the overall disparities observed in the U.S.

Analysis

We conducted bivariate analyses to find the unadjusted associations between the county classification and the independent variables. A chi-squared test was used to test for significant associations with categorical variables, and a Kruskal-Wallis test to detect associations with continuous independent variables.

We used a multinomial logistic regression model to determine whether medical resources availability was independently associated with county type. To select appropriate covariates, we used the Andersen behavioral model of access to care.¹³ County medical resources were considered to be enabling factors, i.e. factors that enable individuals to access medical care and achieve better outcomes. These were the independent variables of interest and were measured by the number of physicians and the number of hospitals *per capita*. We also included variables that represented the type of care. More specifically, we included the proportion of hospitals affiliated with medical schools and of hospitals with a mammography screening center, and the HMO penetration in the county as measured by the Medicare Managed Care Penetration (i.e., the proportion of eligible Medicare beneficiaries who were enrolled in managed care in 2002). Furthermore, we included the proportion of physicians by specialty (primary care [including Obstetrics-Gynecology] and specialty care [including radiologists]) as these may be associated with recommendations of breast cancer screening, which leads to early detection and thus to better survival outcomes.

Among the enabling factors that may act as confounders of the association between medical resources and county type are measures of socioeconomic status: in the model we controlled for the proportion of black and white residents living below the federal poverty line in 1999. Predisposing factors were the proportion of Black and White residents with less than nine years of education, the median age of the Black and White female population, and the proportion of the female population that was Black in 2000. Need factors, i.e., those clinical factors either perceived or evaluated by a doctor that make individuals more likely to access medical care and affect their mortality, were the county level age-adjusted mortality rates for diseases of the circulatory system, which included stroke and heart attack. These mortality rates were obtained for Black and White women from the CDC Compressed Mortality Files. We also included the county level incidence rates of breast cancer in Black women, obtained from the National Cancer Institute's State Cancer Profile webpage. Rates were calculated for the period 2001–2004, or 2001–2005 depending on the most recent data available for each county, were age

adjusted, and were calculated per 100,000 women of all ages. All analyses were done using the SAS software (SAS v.9.1, Cary, NC).

Results

Figure 1 is a scatter plot with Black mortality rates on the X axis and White mortality rates on the Y axis: each data point represents a county. The plot illustrates how counties are distributed according to the breast cancer mortality in White and Black women. Based on the average breast cancer mortality in White women across counties (117.2 per 100,000), there were 79 (38.9%) failing counties, 72 (34.5%) counties with disparities, 21 (10.3%) with reverse disparities and 31 (15.3%) successful. Almost 50% (101) were counties in the Southeast of the US, 15.3% (31) were in the Northeast, about 23% (47) in the Midwest and Southwest, and the rest (24) in the West. Most of the selected counties were urban counties (Table 1).

Table 1 reports predisposing, enabling and need characteristics of the selected counties. In general, there are few significant differences between failing, with disparities, with reverse disparities, and successful counties (Table 1). In unadjusted analyses, significant differences were present for characteristics such as the proportion of foreign-born population, of black residents with less than nine years of education, of residents with no health insurance, the median household income, the breast cancer incidence in black women, and the mortality due to diseases of the circulatory system. Counties with reverse disparities were characterized by the highest median household income, the lowest proportion of black population with less than 9 years of education and residents without health insurance, and the highest proportion of foreign born population (Table 1). Successful counties had the highest proportion of Black residents with less than 9 years of education and the lowest household income (Table 1). The incidence of breast cancer was lower for Black women in successful counties and counties with reverse disparities (Table 1). By virtue of our county classification, mortality for breast cancer was higher in failing counties and those with disparities. Mortality rates for diseases of the circulatory system, however, were lowest in successful counties and those with reverse disparities (Table 1).

Table 2 reports the medical care resources by type of county. We found that there was a significant association between type of county and the proportion of hospitals associated with medical schools ($p = .01$). Other associations were not significant in univariate analyses, but counties with reverse disparities had a higher number of doctors, as well as a higher number of primary care physicians and radiologists, and a higher HMO penetration.

Table 3 presents results of the multivariate analyses. Each type of county is compared to a reference county and only unique combinations of counties are presented. An odds ratio greater than one indicates that, the higher the value of a covariate, the higher the probability that a county is of one type rather than of the reference type. Vice versa, an odds ratio smaller than one indicates that, the higher the value of a covariate, the lower the probability that a county is of one type rather than of the reference type.

Of the medical resources considered here, only the proportion of hospitals associated with medical schools was independently associated with county type (Table 3). In particular, successful counties were more likely than failing or counties with disparities to have higher proportions of hospitals associated with medical schools. Similarly, counties with reverse disparities were more likely than counties with disparities to have higher proportions of hospitals associated with medical schools (Table 3). Other measures of medical resource availability did not affect county type.

Other covariates that were independently associated with county types were the proportion of black female population, of foreign born population, of black population with less than nine

years of education, of white population living below the poverty line, the breast cancer incidence in black women, and the mortality due to diseases of the circulatory system.

Successful counties had higher proportions of foreign born population and of black residents with less than 9 years of education compared to failing or counties with disparities (Table 3). They also were more likely than failing counties to have lower mortality due to diseases of the circulatory system (Table 3). Compared to counties with reverse disparities, successful counties had higher proportions of black female population as well as higher proportions of black residents with less than 9 years of education (Table 3).

Few covariates predicted being a county with reverse disparities rather than another type of county. Compared to successful counties, counties with reverse disparities were more likely to have lower proportions of black female population and blacks with less than 9 years of education (Table 3). Compared to failing counties, these counties were also less likely to have high rates of breast cancer incidence among black women. Counties with reverse disparities did not differ in any of the covariates from counties with disparities.

Failing counties were more likely than successful counties, to have lower proportions of foreign born population and black residents with less than 9 years of education, and higher mortality rates for diseases of the circulatory system. They were also more likely to have a higher incidence of breast cancer in black women compared to counties with reverse disparities (Table 3). Lastly, compared to counties with disparities, failing counties had a lower proportion of the white population living below the federal poverty line and higher mortality rates for diseases of the circulatory system (Table 3).

Counties with disparities were more likely than successful counties to have lower proportions of foreign born population and of blacks with less than 9 years of education. Compared to failing counties, they had a higher proportion of the white population living below the federal poverty line and lower mortality due to diseases of the circulatory system. Lastly, none of the covariates significantly predicted being a county with disparities rather than a county with reverse disparities (Table 3).

Discussion

In this study, we examined 203 counties with high number of deaths due to breast cancer in Black women 65 and older. Counties were classified based on their breast cancer mortality rates of Black and White women from counties that were Failing, i.e., where the mortality rates were high in both groups of women, to counties with Reverse Disparities, i.e., where the Black mortality rate was lower and the White mortality rate was higher than the White county average mortality rate. We find that the availability of medical resources as measured by the number of physicians or the hospitals do not explain differences in county type. Similarly, variables that measure the type of care, such as HMO penetration, affiliation with medical school or proportion of hospitals with mammography centers, did not predict type of county except in one instance: having a higher proportion of hospitals affiliated with medical schools was associated with a higher probability of being a successful rather than a failing or a county with disparities, and being a county with reverse disparities rather than a county with disparities. This was the only significant association we found between medical resources and type of county.

Based on the existing literature, we expected to find that counties with more physicians and more hospitals would be more likely to be successful, in our terms. For example, areas with higher numbers of physicians had a higher proportion of breast cancer cases that were diagnosed at an early stage compared to areas with a lower number of physicians.¹⁷ Similarly, in Surveillance, Epidemiology and End Results (SEER) counties with more than 30,000 White

or Black women, the proportion of breast cancer cases detected *in situ* was higher in counties with a higher number of mammography facilities per woman.²⁰ However, the availability of medical resources may be a necessary but not sufficient condition for achieving lower mortality and/or disparities: the type of care offered and the context in which medical resources are available may also play an important role.²¹ Older women, for example, were more likely to receive mammography screening in HMO-rich markets.¹⁹ Therefore, mortality rates may be lower in HMO-rich markets; however, in our study, the HMO penetration was not significantly associated with county type. On the other hand, we found that the proportion of hospitals affiliated with medical schools was associated with being a successful or a county with reverse disparities vs. a failing or a county with disparities. This finding is not surprising. A number of studies have examined the association between the teaching status of a hospital and the quality of care provided as well as risk-adjusted mortality rates for a number of conditions.^{18, 22, 23} Mortality among women treated for breast cancer was lower when treated in teaching hospitals.¹⁸ In addition, another study found that the top quartile of hospitals that cared for the largest volume of Black patients cared for about 90% of elderly Black patients. These high-volume hospitals were more likely to be teaching hospitals than those with low volumes of Black patients.²⁴ Thus, medical schools may be providing better quality of care to Black breast cancer patients than non-medical schools and may be contributing to lower mortality rates.

Our results confirm findings by others that successful counties are not necessarily characterized by higher socio-economic status.⁶ Overall, successful counties or counties with reverse disparities do not differ from counties that are failing or with disparities in many of the predisposing, enabling and need characteristics measured in this study. Successful counties differ from failing counties in some of the predisposing variables, namely the proportion of the population that was foreign born and with lower education. The direction of these relationships is contrary to what we would have expected: that is, higher rates of foreign born population and of lower education predicted a county being successful. These effects were significant even after controlling for age of the female population, a covariate that may have confounded these relationships. Moreover, counties with reverse disparities do not differ significantly from counties with disparities or failing counties. Those with reverse disparities had higher incomes than counties of other types. However, they were mainly urban counties in the Northeast such as Nassau County in New York or Suffolk County in Massachusetts: the higher income levels may be due to the higher cost of living and may not indicate greater wealth.

We also found other interesting results. For example, successful counties, i.e., those with lower than average rates of breast cancer mortality, were also those with lower rates of mortality for diseases of the circulatory system which included heart attacks and strokes. Failing counties had the highest mortality rates for these diseases even compared to counties with disparities. We expected to find that rates of breast cancer mortality may be higher in counties where women were not dying from other diseases such as stroke or myocardial infarction. However, Black women especially, present with multiple medical comorbidities,^{25, 26} such as diabetes and hypertension.²⁶ Moreover, in one study, among Black women with breast cancer, the probability of dying not only from breast cancer but also from diabetes, hypertension, coronary heart disease, and cerebrovascular disease was higher than for White women.²⁷

While this study has not found that the availability of medical resources is associated with county types, there are still several other factors that may differ across county types and that should be investigated. Communities may differ in the beliefs or attitudes toward health care in general and toward early breast cancer detection in particular. For example, among women who lived in rural counties in the state of Washington, those living in communities with attitudes that supported breast cancer screening were more likely to use mammography than women who lived in less supportive communities.²⁸ This result held when controlling for ease

of access to medical services.²⁸ In another study, performed with women 60 to 84 years old, those who perceived that no friends had obtained a mammogram were less likely to have had a mammogram in two years.²⁹ Similarly, there are contextual factors related to the specific cancer outcomes. The effect of racial segregation on the disparity in the stage of cancer was analyzed using the SEER-Medicare linked data for breast, colorectal, prostate, and lung patients; the association between higher stage of disease and race (Black and White race) was highest in areas with low segregation and low income, but it was lower in high segregation areas regardless of income.³⁰ Therefore there is a need to better understand differences across counties and why differences occur: such understanding may enable the development of transferable models for less successful areas.

This study has some limitations. We did not collect information on resources that may be available in neighboring counties. Some residents may be travelling to such counties to get their medical care; therefore, the resources available to county residents may be much more than what was considered in this study. We do not know whether one type of county, e.g., a successful one, was more likely to have a contiguous county with abundant medical resources. Similarly, we do not know how medical resources are distributed within the counties. It may be the case that resources are located in predominantly White neighborhoods and easily accessible by that population and not the Black population in counties with disparities. Or, *vice versa*, in counties with reverse disparities resources may not be easily accessible by White women. Therefore, even if the number of resources is the same, accessibility may affect the outcomes of each population.

In conclusion, we found that the measures of availability of medical resources chosen for this study do not explain the difference in types of counties with different levels of breast cancer mortality and disparities for older women. It may be that the type of medical care delivered, such as the care delivered by teaching medical institution, rather than the quantity needs to be examined. Moreover, other county specific measures of resource locations and accessibility may need to be considered. Ultimately, to reduce or eliminate disparities in breast cancer mortality, a better understanding of why counties are or become successful is needed. Qualitative studies that can provide an in-depth exploration of factors not captured in administrative data may, thus, be warranted.

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Figure 1. Breast Cancer Mortality Rates and County Classification

Each data point represents one county. The classification of counties into Successful, With Reverse Disparities, With Disparities and Failing is based on the average county mortality rate for white women.

Characteristics of 203 counties by county type. Data from CDC Compressed Mortality Files (1999–2005) and the Area Resource File (ARF).

Table 1

	County types			
	Successful	With reverse disparities	With disparities	Failing P (Kruskal Wallis)
PREDISPOSING CHARACTERISTICS				
Black women (%)	27.8	19.7	25.2	27.0 0.26
Women 65 and older (%)	15.0	14.3	13.7	13.7 0.38
Median age				
Black women	31.2	31.9	31.2	31.5 0.26
White women	40.5	39.5	38.9	39.1 0.19
Foreign born residents (%)	11.3	13.7	8.6	7.3 0.02
Population 25 and older with < 9 years of education (%)	7.7	6.8	7.4	6.3 0.07
Black	9.7	6.3	8.2	7.5 0.01
White	5.5	5.4	5.4	4.9 0.66
ENABLING CHARACTERISTICS				
Metropolitan Area	90.3	100	81.9	88.6
Median Household Income (\$)	39,983	48,475	40,659	43,412 0.02
Residents living in poverty (%)	13.2	11.0	13.0	11.9 0.09
Black	25.8	21.9	25.1	24.5 0.23
White	8.7	8.5	9.3	7.7 0.06
Residents with no health insurance (%)	15.4	13.5	15.5	13.7 0.002
NEED CHARACTERISTICS				
Incidence of breast cancer				
Black women	110.2	107.5	114.6	118.4 0.01
White women	126.8	133.3	127.0	128.7 0.10
Breast cancer mortality*				
Black women	100.3	103.1	150.6	149.5 <0.0001
White women	100.3	127.5	104.4	132.7 <0.0001
Diseases of the circulatory system mortality*	1872.5	1921.7	1958.9	2023.7 0.01

* per 100,000 females 65 and older

Table 2

Medical resources in 203 counties by county type: Means (standard deviations). Data from CDC Compressed Mortality Files (1999–2005) and the Area Resource File (ARF) (various years).

	County types				P
	Successful	With reverse disparities	With disparities	Failing	
Number of MDs* (2002)	580.0 (242.5)	806.3 (446.1)	581.6 (356.8)	623.9 (398.7)	0.09
Number of primary care MDs* (2002)	160.1 (49.5)	195.0 (74.4)	155.8 (69.3)	165.4 (68.3)	0.11
Number of radiologists* (2002)	6.4 (3.1)	8.3 (5.4)	6.3 (4.0)	6.7 (4.3)	0.53
Number of hospitals (2003)	3.5 (1.8)	3.2 (1.9)	3.8 (2.5)	3.6 (2.5)	0.78
Hospitals with mammography (%) (2003)	51.3 (17.8)	56.2 (21.4)	55.5 (24.5)	57.0 (24.0)	0.81
Hospitals with affiliated medical school (%) (2003)	32.7 (25.6)	53.4 (22.3)	31.0 (28.9)	35.6 (26.9)	0/01
HMO penetration (%) (2002)	12.7 (15.3)	15.9 (14.5)	9.7 (12.9)	10.5 (11.0)	0.10

* Per 100,000 female

Table 3

Adjusted odds ratios and confidence intervals of being a county of one type compared to another for unique combinations of county types. Multinomial logistic regression model.

	Successful Counties compared to reference counties below			Failing counties compared to reference counties below		Counties with disparities compared to reference county below	
	Failing	With Disparities	With reverse Disparities	With Disparities	With reverse Disparities	With reverse Disparities	With reverse Disparities
<u>MEDICAL RESOURCES</u>							
Number per 100,000 female of:							
- Primary care MDs	0.99	0.99	0.99	1.00	1.00	0.99	0.99
	0.97-1.01	0.97-1.01	0.97-1.01	0.97-1.01	0.98-1.02	0.98-1.02	0.98-1.02
- Radiologists	0.91	0.97	0.86	1.06	0.94	0.89	0.89
	0.72-1.15	0.77-1.22	0.63-1.18	0.91-1.23	0.73-1.22	0.69-1.15	0.69-1.15
- Hospitals	0.81	0.76	0.77	0.94	0.94	1.00	1.00
	0.56-1.18	0.53-1.11	0.46-1.28	0.75-1.18	0.62-1.44	0.66-1.52	0.66-1.52
Percent of hospitals with:							
- Mammography center	0.98	0.99	0.98	1.01	0.99	0.99	0.99
	0.96-1.00	0.96-1.01	0.94-1.01	0.99-1.03	0.96-1.03	0.95-1.02	0.95-1.02
- Affiliated medical school	1.03	1.04	1.00	1.01	0.97	0.96	0.96
	1.00-1.06	1.01-1.07	0.97-1.04	0.99-1.03	0.99-1.030	0.94-0.99	0.94-0.99
HMO penetration	1.00	1.03	1.01	1.02	1.01	0.98	0.98
	0.95-1.06	0.97-1.08	0.94-1.08	0.98-1.07	0.95-1.07	0.93-1.04	0.93-1.04
<u>PREDISPOSING COVARIATES</u>							
Black female population	1.02	1.04	1.07	1.02	1.06	1.03	1.03
	0.97-1.06	0.997-1.08	1.00-1.15	0.99-1.06	0.99-1.12	0.97-1.10	0.97-1.10
Median age							
- Black women	0.82	0.88	0.91	1.08	1.11	1.03	1.03
	0.62-1.08	0.66-1.17	0.61-1.35	0.88-1.32	0.79-1.57	0.73-1.46	0.73-1.46
- White women	1.14	0.99	0.86	0.87	0.75	0.87	0.87
	0.90-1.45	0.80-1.22	0.63-1.18	0.71-1.06	0.55-1.03	0.65-1.16	0.65-1.16
Population foreign born	1.13	1.11	1.12	0.98	0.99	1.01	1.01
	1.01-1.25	1.002-1.23	0.99-1.27	0.91-1.06	0.89-1.10	0.91-1.12	0.91-1.12
Population 25+ with <9 years education							

	Successful Counties compared to reference counties below			Failing counties compared to reference counties below			Counties with disparities compared to reference county below
	Failing	With Disparities	With reverse Disparities	With Disparities	With reverse Disparities	With reverse Disparities	
- Black	1.75	1.71	1.77	0.98	1.01	1.04	
	1.30-2.35	1.27-2.29	1.11-2.82	0.78-1.22	0.66-1.56	0.67-1.59	
- White	0.70	0.78	0.65	1.12	0.92	0.83	
	0.48-1.03	0.55-1.12	0.39-1.08	0.83-1.50	0.58-1.48	0.53-1.30	
ENABLING COVARIATES							
Population living below poverty							
- Black	0.91	0.95	1.03	1.05	1.13	1.08	
	0.78-1.06	0.81-1.11	0.85-1.24	0.94-1.16	0.97-1.32	0.92-1.26	
- White	1.14	0.80	0.86	0.70	0.76	1.08	
	0.86-1.53	0.62-1.03	0.61-1.23	0.55-0.89	0.53-1.07	0.79-1.48	
NEED COVARIATES							
Incidence of breast cancer, black women							
	0.99	1.01	1.05	1.01	1.05	1.03	
	0.96-1.04	0.97-1.05	0.99-1.10	0.98-1.04	1.00-1.10	0.99-1.08	
Mortality due to diseases of the circulatory system	0.66	0.86	0.71	1.31	1.09	0.83	
	0.48-0.90	0.63-1.18	0.48-1.06	1.04-1.65	0.79-1.50	1.60-1.15	

An odds ratio greater than one indicates that, the higher the value of a covariate, the higher the probability that a county is of one type rather than of the reference type. Vice versa, an odds ratio smaller than one indicates that, the higher the value of a covariate, the lower the probability that a county is of one type rather than of the reference type. Bolded odds ratios are significantly different from 1 at the 5% significance level.