Using Surveillance Epidemiology and End Results data to explore breast cancer mortality trend in an underserved population of Alabama, USA

Sejong Bae[1,2], Bradford E Jackson[1], Rohit P Ojha[3], Minyong Uhm[1], Mona Fouad[1], Edward Partridge[2], Karan P Singh[1,2]

1. *Division of Preventive Medicine, University of Alabama at Birmingham*
2. *Comprehensive Cancer Center, University of Alabama at Birmingham*
3. *Department of Epidemiology and Cancer Control, St. Jude Children's Research Hospital*
Email: bsejong@uab.edu

Abstract:

BACKGROUND

Although Deep South Network for Cancer Control (DSNCC) was implemented to reduce the breast cancer mortality by increasing awareness and screening, its effect on cancer outcomes has been difficult to assess. Our objective is to explore temporal trends in breast cancer mortality with the implementation of DSNCC using Surveillance Epidemiology and End Results **(**SEER) data.

METHODS

We compared the trend in breast cancer specific and all-cause mortality for Black female breast living in DSNCC target counties using SEER data. We also compared trends in the mortality among DSNCC Black females with those in NON-DSNCC counties. The Health Disparities Calculator (HD*Calc) was used to calculate the association of the DSNCC with mortality.

RESULTS

From 1990 to 2009 there has been a general decrease in breast cancer mortality rates in both DSNCC and non-DSNCC counties, where the DSNCC counties have higher mortality rates. In terms of all-cause mortality the DSNCC counties had overall higher rates. After the year 2000, both DSNCC and non-DSNCC counties saw a decrease in all-cause mortality rates. From 2005 to 2009 the rates of all-cause mortality was significantly lower in the DSNCC than non-DSNCC (RR=0.94; 95%CL= 0.97, 0.91).

CONCLUSIONS

Breast cancer-specific and all-cause mortality among Black females in DSNCC-targeted counties have decreased subsequent to implementation of the DSNCC. These changes were similar to those seen nationally. The population-level trend observed in our study suggest that the DSNCC program may be contributing to a decrease in breast cancer mortality, particularly in early years post implementation among Black females in historically underserved areas of Alabama.

Keywords: *Breast cancer mortality, Deep South Network for Cancer Control, Black females*

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1. INTRODUCTION

Breast cancer mortality rates in the United States are higher among Black females compared to White females (Howe et al., 2001). Black females who reside in rural or medically underserved areas have higher breast cancer mortality (Jones & Chilton, 2002). In Alabama, the 2010 female breast cancer mortality rates were 32 deaths/100,000 among Blacks compared to 23 deaths/100,000 among Whites. Black females in underserved areas are therefore a high risk group for whom interventions are needed to reduce breast cancer mortality (Autier & Boniol, 2012).

One such intervention is the Deep South Network for Cancer Control (DSNCC) (Partridge et al., 2005). The DSNCC was implemented in 2000 to target Black females for breast cancer screening and education in historically underserved areas including the Alabama Black Belt and the Mississippi Delta regions to reduce the risk of breast and cervical cancer mortality. Notably, the DSNCC is a community based-participatory program that uses behavioral theories to improve intervention acceptance and uptake by fostering community development, empowerment, and diffusion. The program emphasizes community involvement and culturally relevant strategies, which are promising approaches for reducing the burden of breast cancer in these areas (Hinton, Downey, Lisovicz, Mayfield-Johnson, & White-Johnson, 2005; Lisovicz et al., 2006).

To date no formal assessment of the impact of the DSNCC on breast cancer mortality in Alabama has been conducted. Previous analyses of the DSNCC have been qualitative in nature and focused on the intervention's community health advisors (Lisovicz et al., 2006) and lessons learned from the community-based participatory approach (Wynn et al., 2011). However there has been little empirical evidence available about the impact of the DSNCC on Black females to date. Therefore the aim of this study was to assess the trend in breast-cancer specific and all-cause mortality among Black females in Alabama counties targeted by the DSNCC between 1990 and 2009. Additionally we compare trends in breast cancer-specific and all-cause mortality between Black females in DSNCC-targeted counties and Black females in non-DSNCC counties.

2. METHODS

2.1. Data Source

Breast cancer specific and all-cause mortality data were obtained from the Surveillance Epidemiology and End Results (SEER) mortality database of the United States National Cancer Institute. These data are provided by the National Center for Health Statistics (NCHS) an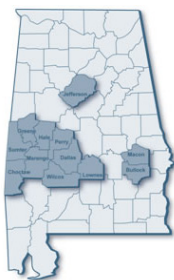d are aggregated at the county level in 3-year intervals which allows for state- and county-level estimation of mortality rates (Surveillance Epidemiology and End Results (SEER) Program). The NCHS data are collected using standard forms and procedures from death certificates compiled by the National Vital Statistics System (Center for Disease Control and Prevention, 2013). The outcomes of interest for this study were breast-cancer specific (ICD-O-3 site codes: C50.0-C50.9) and all-cause mortality as identified from the underlying cause of death.

Figure 1. Deep South Network for Cancer Control targeted counties in Alabama

2.2. Study Population

We selected all Black females in Alabama between 1990 and 2009 for this study. We categorized DSNCC targeted counties using Federal Information Processing Standards (FIPS) codes for Bullock, Choctaw, Dallas, Greene, Hale, Jefferson, Lowndes, Macon, Marengo, Perry, Sumter, and Wilcox counties (*Figure* 1).

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2.3. Data Analysis

SEER*Stat was used to estimate age-standardized breast cancer and all-cause mortality rates which were standardized to the US 2000 standard population. SEER*Stat aggregated the mortality estimates into the multiple year groupings: 1990-1992, 1993-1995, 1996-1998, 1999-2001, 2002-2004, 2005-2009. The mortality data from SEER*Stat was entered into the Health Disparities Calculator (HD*Calc) to estimate mortality rate ratios (RR) and their corresponding 95% confidence limits (CL). HD*Calc is a statistical software extension of SEER*Stat designed to evaluate and monitor health disparities (Surveillance Research Program National Cancer Institute, 2012). The trends are represented in line graphs where the blue vertical line is a marker for when the DSNCC was implemented.

3. RESULTS

3.1. Breast-cancer specific mortality

There was a general decrease in breast-cancer specific mortality over the study period (*Figure 2*), where the DSNCC counties have had a higher mortality rate per 100,000 over most of the time period.
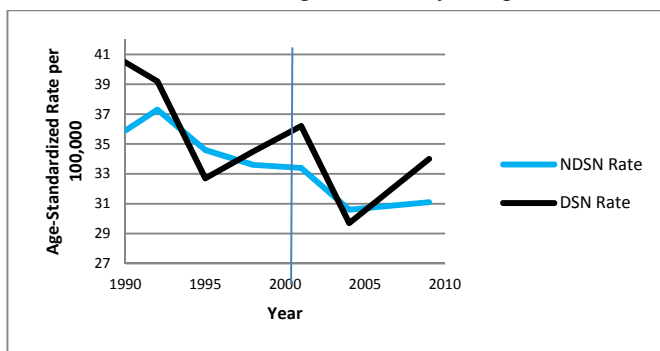

Examination of DSNCC-targeted vs. non-DSNCC targeted county mortality rate ratios over time reveals that the rate ratios do not fluctuate much. Even during the 2005-2009 time period, the CI's for the RR show that the mortality rates are not that different (*Figure 3*).

Figure 2. Breast cancer-specific mortality trend for Black females in DSNCC and non-DSNCC targeted counties (1990-2009)

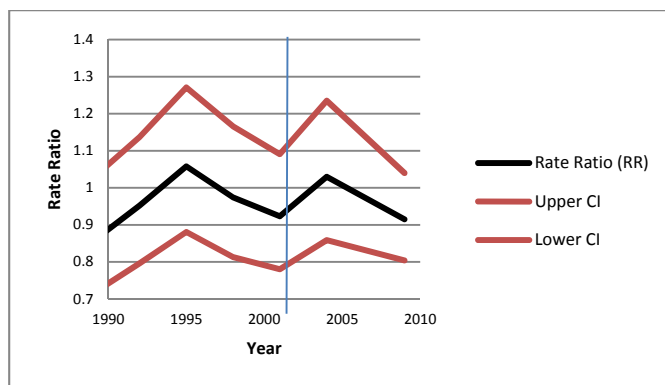### 3.2. All-cause mortality

Figure 3. Time trend of breast cancer-specific mortality rate ratios for DSNCC vs non-DSNCC counties (1990-2009)

The all-cause mortality rate has been higher in DSNCC-targeted counties over the entire study period. After the year 2000, there was a decrease from 962 deaths/100,000 to 920 deaths/100,000 for DSNCC counties (*Figure 4*). The DSNCC and non-DSNCC all-cause mortality rates have been relatively stable from 1990-2001, where the DSN has had a much higher rate per 100,000
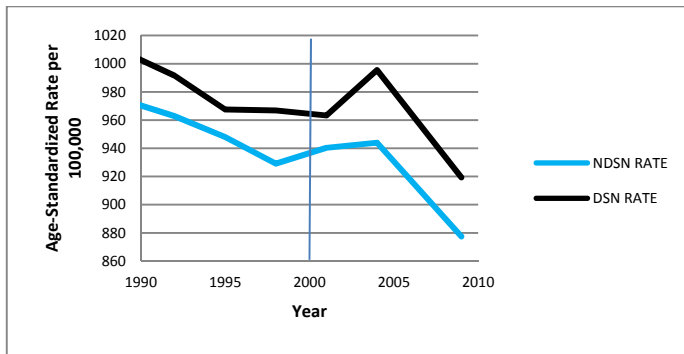
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Figure 4. All-cause mortality trend for Black females in DSNCC and non-DSNCC targeted counties (1990-2009)
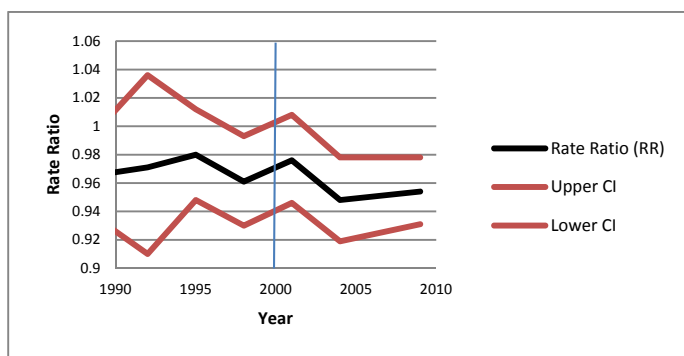
period, breast-cancer specific mortality among

Figure 5. Time trend of all-cause mortality rate ratios for DSNCC vs non-DSNCC counties (1990-2009)

Around 2001, the all-cause mortality rates in the DSN start to decrease. From 2005 to 2009 the rates of all-cause mortality was significantly lower in the DSNCC than non-DSNCC (RR=0.94; 95%CL= 0.97, 0.91) (*Figure 5*).

4. DISCUSSION and CONCLUSIONS

Despite a modest increase in all-cause mortality during the study

Black females in DSNCC-targeted counties has been decreasing subsequent to implementation of the DSNCC. The breast cancer-specific mortality rate among Black females in DSNCC-targeted counties is currently similar to Black females in non-DSNCC counties. Despite the decline in mortality rates, Black females in DSNCC-targeted counties still have a higher risk of mortality.

The results of this study should be considered in light of some limitations. First, our ecologic study design is incapable of conveying individual-level trends for breast cancer mortality in DSNCC-targeted and non-DSNCC targeted counties. The limitations of the data available did not allow us to determine whether patients had been in contact with the DSNCC or not. Second, consistent with studies that rely on death certificate data, our results may be sensitive to potential misclassification for the cause of death (German et al., 2011; Hoel, Ron, Carter, & Mabuchi, 1993; Johnson, Hahn, Fink, & German, 2012). Additionally, other programs have been developed to target underserved areas with high breast cancer mortality, such as the National Breast and Cervical Cancer Early Detection program (NBCCEDP), which was implemented in 1990 and facilitated the creation of state- and community-level infrastructure for cancer control (Henson, Wyatt, & Lee, 1996).

The population-level trend observed in our study suggest that the DSNCC program may be contributing to a decrease in breast cancer mortality, particularly in early years post implementation, among Black females in historically underserved areas of Alabama. Individual-level data from Black females in DSNCC-targeted counties would be more informative about the direct impact of the DSNCC program. Continued monitoring of breast cancer mortality will help inform investigators whether or not the program has a sustainable impact.

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