

Disparities in Surgical Treatment of Early-Stage Breast Cancer Among Female Residents of Texas: The Role of Racial Residential Segregation

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Abstract

In this study of female residents of Texas diagnosed with in situ or localized breast cancer between 1995 and 2012, increasing racial residential segregation was associated with a decreased likelihood of being treated with mastectomy or breast-conserving surgery plus radiotherapy. Racial residential segregation also moderated racial disparities in surgical treatment.

Introduction: Early-stage breast cancer can be surgically treated by using mastectomy or breast-conserving surgery and adjuvant radiotherapy, also known as breast-conserving therapy (BCT). Little is known about the association between racial residential segregation, year of diagnosis, and surgical treatment of early-stage breast cancer, and whether racial residential segregation influences the association between other demographic characteristics and disparities in surgical treatment. **Methods:** This was a retrospective study using data from the Texas Cancer Registry composed of individuals diagnosed with breast cancer between 1995 and 2012. The dependent variable was treatment using mastectomy or BCT (M/BCT) and the independent variables of interest (IVs) were racial residential segregation and year of diagnosis. The covariates were race, residence, ethnicity, tumor grade, census tract (CT) poverty level, age at diagnosis, stage at diagnosis, and year of diagnosis. Bivariate and multivariable multilevel logistic regression models were estimated. The final sample size was 69,824 individuals nested within 4335 CTs. **Results:** Adjusting for the IVs and all covariates, there were significantly decreased odds of treatment using M/BCT, as racial residential segregation increased from 0 to 1 (odds ratio [OR] 0.47; 95% confidence interval [CI], 0.41-0.54). There was also an increased likelihood of treatment using M/BCT with increasing year of diagnosis (OR 1.14; 95% CI, 1.13-1.16). A positive interaction effect between racial residential segregation and race was observed (OR 0.56; 95% CI, 0.36-0.88). **Conclusion:** Residents of areas with high indices of racial residential segregation were less likely to be treated with M/BCT. Racial disparities in treatment using M/BCT increased with increasing racial residential segregation.

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Introduction

Breast cancer is the most common type of cancer and the second leading cause of cancer deaths among women in the United States; 40,450 breast cancer–related deaths are projected to occur in year 2016.¹ Early-stage diagnosis of breast cancer increases the chances of

survival and, therefore, reduces mortality rates.² However, to maintain the survival advantage of early-stage diagnosis, initiation of recommended therapy after diagnosis is crucial.³ Treatment of breast cancer is dependent on the stage at which the tumor was diagnosed⁴; surgical treatment using either mastectomy or breast-conserving surgery (BCS) plus radiation therapy, also known as breast-conserving therapy (BCT), is recommended for individuals diagnosed with early, localized, or operable breast cancer.⁴ The survival advantage of BCS is diminished if adjuvant radiotherapy is not administered.^{2,5-8}

Although the advantage of surgical treatment of early-stage breast cancer is well documented,^{4,9} demographic disparities in treatment still exist. Community characteristics, such as rural residence or area poverty, have been associated with decreased likelihood of surgical

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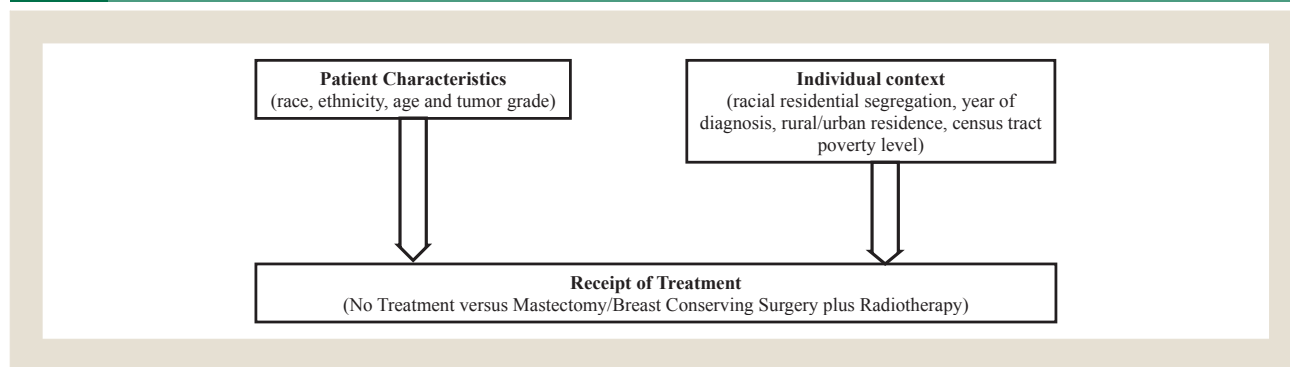
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Racial Residential Segregation and Breast Cancer Treatment

Figure 1 Conceptual Model of Access to Cancer Care



treatment of breast cancer^{10,11} or receipt of adjuvant radiotherapy.¹² African American race also has been associated with a decreased likelihood of surgical treatment,¹³ including BCS.¹⁴ A study, however, found that some of the racial disparities in breast cancer treatment were explained by racial residential segregation,¹⁵ which is defined as the physical separation of a racial group living in an area away from other racial groups.¹⁵⁻¹⁷ This study, however, focused on only Medicare-insured individuals. Another study also reported that greater black residential segregation was associated with increased likelihood of breast cancer mortality.¹⁸ It is therefore important to explore the associations between surgical treatment of breast cancer and racial residential segregation among both Medicare and non-Medicare populations. There also is a need to analyze whether residential segregation influences other demographic disparities in surgical treatment of breast cancer, such as black race¹³ or living in a rural area^{10,11} or lower socioeconomic census tract (CT).^{12,15}

Survival outcomes for women treated with mastectomy are similar when compared with women treated with BCT, which is less invasive.^{5,9,19} Various studies have therefore explored trends in mastectomy versus BCS.²⁰⁻²² Because type of surgical treatment is usually individualized and dependent on various factors, such as patient preference⁹ and tumor characteristics,²⁰ it is also important to look at trends in treatment of early-stage breast cancer with either mastectomy or BCT. It is also important to examine variations in these trends across various demographic groups accounting for racial residential segregation.

This study aimed to bridge the gap in reported literature by analyzing the following:

- (1) The independent associations between racial residential segregation and year of diagnosis, and treatment using mastectomy or BCT (M/BCT) among female residents of Texas diagnosed with in situ or localized (referred to as early-stage hereafter) breast cancer.
- (2) Whether year of diagnosis or racial residential segregation moderates racial and residential disparities in treatment using M/BCT.
- (3) Trends in predicted probabilities of treatment with M/BCT by levels of racial residential segregation.

Identifying the role of racial residential segregation on disparities in surgical treatment of early-stage breast cancer could guide development and implementation of interventions aimed at reducing these disparities.

Conceptual Framework and Hypotheses

Our model specification was based on a modified version of the access to cancer care conceptual framework²³ (Figure 1) and past literature.^{10,12,17,24} Our framework identifies 2 sets of variables that would influence early-stage breast cancer treatment: (1) patient characteristics (race, ethnicity, age, and tumor grade) and (2) the individual context (rural/urban residence, CT poverty estimates, year of diagnosis, and racial residential segregation). We expect that these variables will be associated with receipt of M/BCT.

A previous literature has reported that racial residential segregation is associated with decreased likelihood of receiving adequate treatment for breast cancer¹⁵ and increased breast cancer mortality.¹⁸ There also has been an increase in breast cancer awareness and advocacy over the years; thus, it is important to identify whether this increased awareness and advocacy also has resulted in increased access to treatment, as well as the impact on associated disparities. Identifying changes over the years as well as variations across different demographic groups could guide policies and strategies aimed at reducing breast cancer treatment disparities. We hypothesized that increasing racial residential segregation is associated with decreased likelihood of receiving M/BCT, and there is an increased likelihood of receipt of M/BCT with increasing year of diagnosis (ie, passage of time).

In line with past literature¹⁰⁻¹⁴ and our conceptual model, we also hypothesized that African Americans, rural and urban nonmetropolitan residents, and residents of middle and high-poverty CTs have a decreased likelihood of being treated using M/BCT compared with their counterparts.

Racial residential segregation has been previously reported to influence racial disparities in breast cancer treatment among Medicare patients.¹⁵ In line with this finding, we hypothesized that with increasing racial residential segregation, there is a widening of disparities associated with race; we also hypothesized that the disparities are widened for the other geographical level variables (poverty level and rural-urban residence). Finally, we hypothesized that the gap in disparities is reduced with increasing year of diagnosis.

Material and Methods

Study Population

The Texas Cancer Registry was used for this study. The study sample consisted of all women ages 18 and older diagnosed with

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