

Uncovering Barriers: Evaluating Redlining and Health Care Access in Breast Cancer Screening Disparities

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1. Background

Historic redlining has left lasting patterns of neighborhood disinvestment and segregation. Emerging evidence links these structurally disadvantaged areas to lower breast cancer screening and worse cancer outcomes. Within The University of Kansas Cancer Center (KUCC) catchment area, many communities that overlap with formerly redlined tracts also experience high social vulnerability, as captured by the Social Vulnerability Index (SVI), including concentrated poverty, limited resources, and constrained access to care. Together, these structural and social disadvantages create place-based barriers to timely breast cancer screening, reinforcing disparities that cannot be explained by individual factors alone.

2. Goals

We will quantify how breast cancer screening rates differ across redlining grades (A-D) and SVI quintiles to determine whether structurally disadvantaged and high-SVI neighborhoods have lower screening. We will evaluate temporal trends and spatial patterns from 2016-2024 to see whether screening is improving and to identify geographic “hot spots” of low screening. Finally, we will determine which socioeconomic and health care access factors show the strongest associations with screening to inform targeted interventions in high-risk communities.

3. Solutions and Methods

We integrated data from the U.S. Centers for Disease Control and Prevention PLACES project, SVI metrics, and digitized Homeowners’ Loan Corporation redlining maps to construct a tract-level dataset spanning 2016-2024 across the KUCC catchment area. A Bayesian spatiotemporal beta regression model was implemented to evaluate how redlining and social vulnerability relate to breast cancer screening while accounting for spatial dependence and year-to-year trends. This approach was chosen because it permits simultaneous assessment of geographic clustering, temporal persistence, and localized deviations that simpler models cannot capture.

4. Outcomes

Across 1,152 census tracts in the KUCC catchment area, breast cancer screening was highest in Grade A tracts, while historically Grade C and D tracts had lower screening and higher levels of poverty, lack of insurance, and social vulnerability. After adjustment, tracts graded B-D still tended to have lower breast cancer screening than Grade A. Moderately vulnerable neighborhoods (SVI Category Two) showed slightly higher screening than the least vulnerable areas, whereas other SVI categories had imprecise associations. Poverty, lack of a high school diploma, lack of health insurance, and living in group quarters were all clearly linked to lower screening, while racially diverse tracts showed modestly higher screening after full adjustment. We also observed strong geographic clustering and a temporal pattern with rising screening between 2016-2018, relative stability through 2022, and a modest decline in 2023-2024, underscoring persistent place-based disadvantage.

5. Lessons Learned and Future Directions

These findings underscore the need for targeted, place-based interventions in historically marginalized and high-SVI communities to improve breast cancer screening equity.

Figure: Spatial-Temporal Trends in Predicted Breast Cancer Screening Across Census Tracts, 2016-2024

