Community Profiles Associated with Late-stage TNBC Diagnosis: A Machine Learning Approach

Courtney Pisano, DO, MS, MPH[1]; Reine Abou Zeidane, MD[1];Fatima Hussain, MPH[2]; Weichuan Dong, PhD[2]; Trisha Lal, MD[1]; Long Vu, MS[2];Nihit Mehta, DO, MPH[1]; Corey Speers, MD, PhD[3]
Siran M. Koroukian, PhD[2]; Johnie Rose, MD, PhD[1,2]

[1]University Hospitals, Cleveland Medical Center/Case Western Reserve University; [2]Case Western Reserve School of Medicine; [3]University of Alabama, Birmingham

San Antonio Breast Cancer Symposium
December 9-12, 2025

Introduction

- Triple negative breast cancer (TNBC) is an aggressive subtype of breast cancer that disproportionately affects Black women.
- Early detection through timely screening is critical to improving outcomes.
- Community-level factors may influence the likelihood of late-stage TNBC diagnosis.
- This study aimed to identify community-level risk clusters associated with higher proportions of late-stage TNBC, which are not well characterized in prior literature.

Materials and Methods

- Women diagnosed with triple-negative breast cancer (TNBC) from 2010–2021 were identified using SEER 22-Registry data (excluding Alaska).
- County-level proportions of late-stage TNBC were calculated, and the Max-P regionalization algorithm was applied to generate stable geographic units. Counties with ≤11 late-stage cases were merged with adjacent counties of similar sociodemographic profiles, defined by the Area Deprivation Index, to create composite counties (CCs).
- For each CC, the proportion of women up-to-date on mammography was estimated using CDC PLACES data. Additional community-level characteristics—including smoking prevalence, binge drinking, educational attainment, and obesity—were obtained from the 2014–2018 American Community Survey and CDC PLACES.
- Classification and Regression Tree (CART) analysis was used to identify combinations of community characteristics associated with higher-than-median proportions of late-stage TNBC.

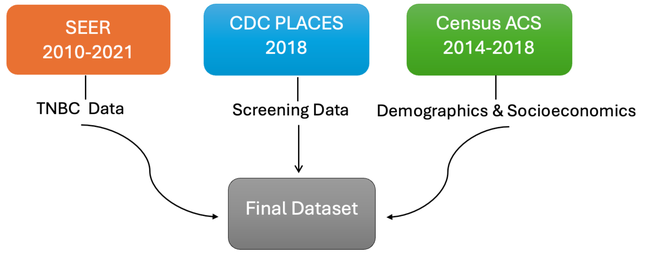


Figure 1: Data sources examined.

Results

Table 1: All Composite Counties	(n = 539) Median % [IQR]
Outcome	
TNBC Late-Stage	38.80 [34.90, 43.60]
Demographics	
Black race	5.00 [1.70, 14.40]
Hispanic	7.40 [3.30, 19.30]
Preventive Screening & Health Metrics	
Mammography uptake	72.40 [69.60, 74.80]
Routine Checkup visits	74.30 [71.80, 77.80]
Obesity	34.70 [31.20, 37.60]
Socioeconomic Status	
Median Income	$53,511.00 [$45,276.43, $63,684.13]
Lack of Insurance	14.50 [11.80, 22.50]
Female Unemployment	34.60 [31.00, 38.80]
High School only	32.20 [26.80, 36.90]
Housing Units with no Vehicle Available	6.30 [4.60, 8.10]
Received Public Assistance Income	2.00 [1.50, 2.80]
Rural-Urban Continuum Codes (RUCC) = Non-Metro (%)	210 (35.9)
Persistent Poverty = Yes (%)	202 (34.1)

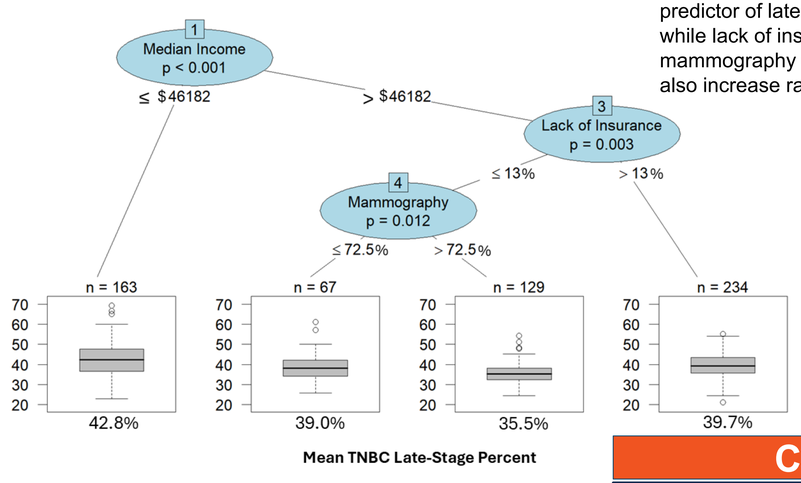


Figure 2: Lower-income areas are the strongest predictor of late stage TNBC at presentation, while lack of insurance (<13%) and decreased mammography use (<72.5% of population screened) also increase rates of late-stage TNBC cases.

CC Profile (n= 539)	Characteristics	% of CC with high late-stage TNBC
1. n = 163	**Median income <= $46,182**	**42**
2. n = 67	**Median income > $46,182 Lack of insurance <= 13% Mammogram <= 72.5%**	**39**
3. n = 129	**Median income > $46,182 Lack of insurance <= 13% Mammogram > 72.5%**	**35.5**
4. n = 234	**Median income > $46,182 Lack of insurance > 13%**	**39.7**

Table 2: Tabular Representation of Figure 2

Conclusion

- Community-level socioeconomic, behavioral, and screening-access factors contribute to late-stage TNBC diagnosis patterns.
- Improving insurance coverage and mammography uptake may reduce late-stage presentation, even in higher-income regions.
- Results underscore the importance of community-informed screening interventions.
- Further studies should assess how system-level barriers and biological factors intersect with community risk profiles.

Funding

- Hennessy Highland Master Clinician funding to CS.
- Miracles Fund in memory of Becky Hennessy

This presentation is the intellectual property of the author/presenter. Contact them at <<Courtney.pisano@uhhosptials.org>> for permission to reprint and/or distribute.

© Poster Template by Genigraphics® 1.800.790.4001 www.genigraphics.com