

Effects of socioeconomic status on access to next-generation sequencing in patients with metastatic breast cancer



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Background

Breast cancer is the most common cancer diagnosis in women. Metastatic breast cancer (MBC) is difficult to treat and is a major cause of mortality related to breast cancer. Standard treatment includes therapeutic options that target specific molecular signals and pathways responsible for cancer growth and other malignant features. These advances have necessitated new biomarkers that can identify tumor molecular features to select the right patients who will maximally benefit from these therapies. Focused next-generation sequencing (NGS) on DNA isolated from the tumor tissue or circulating tumor DNA in the blood has quickly become standard of care to create actionable and personalized treatment plans. However, these tests are often expensive, limiting their clinical implementation. We hypothesized that limited access to these therapies increases health disparities in clinical oncology.

Figure 1: Typical flow of when to order NGS testing for MBC patients



Objective

The aim of this study is to examine if neighborhood socioeconomic status (SES), as defined by area of deprivation index (ADI), as well as factors including race, ethnicity, and insurance status influence access to NGS testing in the Dallas area.

Methods

- Data from 183 patients with recurrent MBC were obtained from the Dallas Metastatic Breast Cancer Study database
- Chart review was performed to record whether NGS testing was performed by Tempus and FoundationOne and subsequent results between the years 2014 through 2022.

Table 1: Population characteristics and odds ratio of receiving NGS testing

	Received NGS testing	Did NOT receive NGS testing	Odds ratio (CI)	Prob>Chi sq
Total (n=183)	67	116		
Ethnicity				
Hispanic or Latino (n=43)	7	36	3.99 (CI 1.66-9.60)	0.002
NOT Hispanic or Latino (n=135)	59	76		
Race				
White (n=127)	48	79	1.01 (CI 0.36-2.31)	0.975
Black or African American (n=32)	12	20		
Insurance Status				
Has Insurance (n=145)	60	85		
Private (n=64)	30	34	7.35 (CI 2.28-33.07)	0.0004
Public (n=81)	30	51	4.00 (CI 1.55-21.61)	0.0052
No Insurance (n=28)	3	25		
Status				
Alive (n=78)	27	51		
Deceased (n=85)	34	49		
National ADI quartile				
First quartile (least disadvantaged) (n=36)	19	17	2.54 (CI 1.07-6.20)	0.0337
Fourth quartile (most disadvantaged) (n=33)	12	23		

Figure 2: Hispanic and Latino patients have a lower survival probability

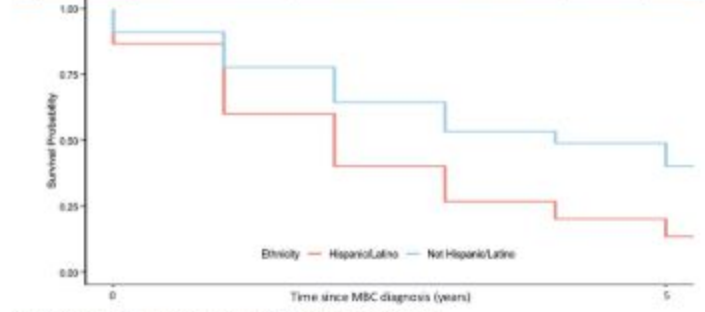


Figure 2: Kaplan Meier curve comparing survival probabilities across ethnicities

Figure 3: Most deceased patients did not receive NGS testing

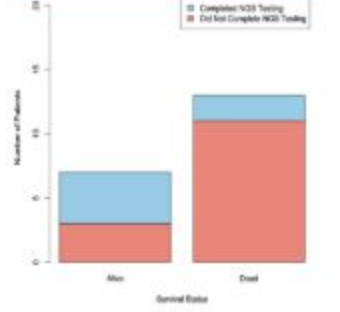
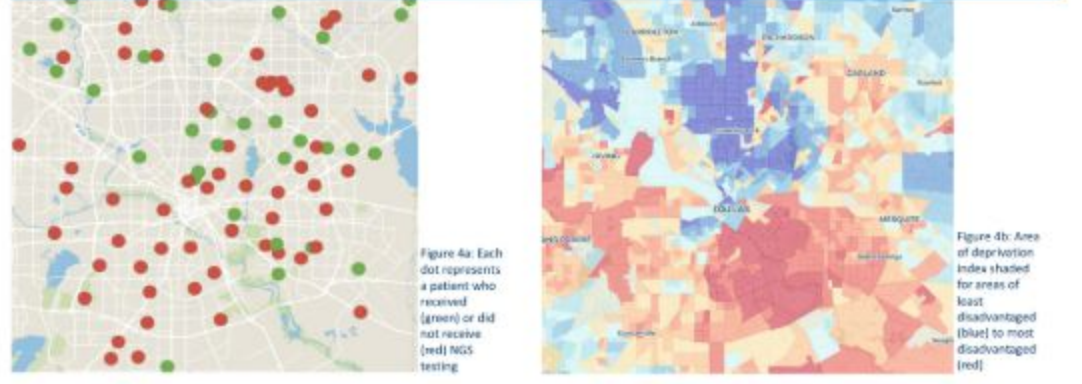


Figure 4: Patients who received NGS testing are concentrated to areas of lower ADI in Dallas



Results and Discussion

- 39% of patients received NGS testing, which may improve survival outcome.
- Patients in the lowest quartile ADI are 2.5 times more likely to have NGS testing compared to those in the highest quartile.
- Patients who are not Hispanic or Latino are about 4 times more likely to receive NGS compared to those who are Hispanic or Latino.
- Having insurance significantly increased the likelihood of receiving NGS testing and the survival probability compared to those without insurance.
- There is a geographical disparity of NGS testing among patients in the Dallas area.

In conclusion, NGS testing is disproportionately offered to patients who are insured and with a higher SES. This may lead to decreased likelihood of survival. Furthermore, the Dallas area is prominently segregated based on SES factors as defined by the ADI, and this is further shown by seeing where patients who receive NGS testing reside. Whether these discrepancies are inherent in clinical practice (e.g. physician awareness) or from legitimate financial and geographical barriers related to access should be defined in future studies. However, identifying that these disparities in NGS testing exists promotes awareness and encouragement for clinicians to offer NGS more broadly.