

Rural–urban disparities and trends in utilization of palliative care services among US patients with metastatic breast cancer

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Parts of the data were presented at the 2023 American Public Health Association Annual Meeting & Expo (APHA 2023) in Atlanta, GA, November 12–15, 2023.

Funding information

Susan G. Komen, Grant/Award Number: TREND21675016; National Institute on Aging, Grant/Award Number: T32AG000243

Abstract

Purpose: To assess trends and rural–urban disparities in palliative care utilization among patients with metastatic breast cancer.

Methods: We analyzed data from the 2004–2019 National Cancer Database. Palliative care services, including surgery, radiotherapy, systemic therapy, and/or other pain management, were provided to control pain or alleviate symptoms; utilization was dichotomized as “yes/no.” Rural–urban residence, defined by the US Department of Agriculture Economic Research Service’s Rural–Urban Continuum Codes, was categorized as “rural/urban/metropolitan.” Multivariable logistic regression was used to examine rural–urban differences in palliative care use. Adjusted odds ratios (AORs) and 95% confidence intervals (CIs) were calculated.

Findings: Of 133,500 patients (mean age 62.4 [SD = 14.2] years), 86.7%, 11.7%, and 1.6% resided in metropolitan, urban, and rural areas, respectively; 72.5% were White, 17.0% Black, 5.8% Hispanic, and 2.7% Asian. Overall, 20.3% used palliative care, with a significant increase from 15.6% in 2004–2005 to 24.5% in 2008–2019 (7.0% increase per year; p -value for trend < 0.001). In urban areas, 23.3% received palliative care, compared to 21.0% in rural and 19.9% in metropolitan areas ($p < 0.001$). After covariate adjustment, patients residing in rural (AOR = 0.84; 95% CI: 0.73–0.98) or metropolitan (AOR = 0.85, 95% CI: 0.80–0.89) areas had lower odds of having used palliative care than those in urban areas.

Conclusions: In this national, racially diverse sample of patients with metastatic breast cancer, the utilization of palliative care services increased over time, though remained suboptimal. Further, our findings highlight rural–urban disparities in palliative care use and suggest the potential need to promote these services while addressing geographic access inequities for this patient population.

KEYWORDS

metastatic breast cancer, NCDB, palliative care, rural–urban disparities, trend

INTRODUCTION

In the United States, breast cancer is the most common cancer and the second leading cause of cancer-related mortality among women.^{1,2} In 2022, the incidence rate of metastatic breast cancer was estimated to

be 7.3 per 100,000,² and more than 160,000 women were approximated to be living with the disease.^{3,4} The diagnosis and treatment of metastatic breast cancer negatively affect patients’ health and survival outcomes. Early and timely intervention of palliative care improves the physical and mental health symptoms, quality of life, and short-term

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survival of patients with metastatic cancers.^{5–10} Palliative care services are designed to help these patients address not only their physical health problems and challenges but also their and family members' psychological, social, financial, and/or spiritual needs.^{11–13} In 2018 and 2021, The American Society of Clinical Oncology (ASCO) and the National Comprehensive Cancer Network (NCCN) established guidelines that recommended early integration of palliative care and other supportive services into the standard model of care for all oncology patients.^{11,13,14}

Despite ASCO and NCCN's recommendations, palliative care services remain underutilized among patients diagnosed with metastatic cancers. Literature has documented a 5%–33% prevalence of palliative care utilization among patients with stage III or IV ovarian, cervical, uterine, liver, or colorectal cancer.^{15–19} However, data on palliative care use, trends, and geographic disparities for metastatic breast cancer patients are lacking. A recent study reported that one in seven patients aged ≥ 65 years with metastatic breast cancer used palliative care,²⁰ and another three retrospective analyses found a similar rate of utilization in late-stage breast cancer patients.^{16,19,21} Only two studies explored the overall trends and rural–urban differences in this patient population; however, these studies are largely descriptive.^{20,22} Despite reports that geographic and residential areas can serve as a barrier in patients with metastatic breast cancer to access health care and services, little is known about the relationship between rural–urban residence and palliative care use in this patient population.

To fill the existing knowledge gap, the present study aims to assess national trends and rural–urban disparities in the utilization of palliative care services among patients with metastatic breast cancer using a large US cancer database.

METHODS

Study design and data collection

This was a retrospective study. Data were obtained from the 2004–2019 National Cancer Database (NCDB), a joint project of the Commission on Cancer (CoC) of the American College of Surgeons and the American Cancer Society. The NCDB is a nationwide clinical oncology registry that collects data from more than 1500 CoC-accredited hospitals capturing approximately 72% of newly diagnosed cancer cases in the United States each year.^{23–25} Eligibility criteria included ages ≥ 18 years at diagnosis and stage IV disease (only de novo metastatic breast cancer cases were collected by the NCDB), with available records on rural–urban residence and palliative care use. The study was deemed exempt from the Institute Review Board because the NCDB is a de-identified database that does not identify hospitals, health care providers, or patients. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.²⁶

Measures

Use of palliative care services was the primary outcome of interest. Per the NCDB, palliative care was defined as noncurative cancer treatment, including surgery, radiotherapy, systemic therapy, other pain management, or any combination, offered to control pain or alleviate symptoms and side effects. Palliative care utilization was dichotomized as yes and no.

The main independent variable of this analysis was rural–urban residence. According to the NCDB, this variable was defined and categorized using Rural–Urban Continuum Codes that match the state and country FIPS code of the patient recorded at the time of breast cancer diagnosis against 2013 files published by the US Department of Agriculture Economic Research Service.²⁷ We further classified it as rural, urban, and metropolitan.

Other sociodemographic and clinical characteristics were also assessed, including age at diagnosis, year of initial cancer diagnosis, sex assigned at birth, racial/ethnic groups (non-Hispanic Asian, non-Hispanic Black, Hispanic, non-Hispanic White, other/multiracial), percent no high school education quartile, health insurance coverage (uninsured, private/managed care, Medicaid, Medicare, other government/unknown), median household income quartile, Charlson–Deyo comorbidity index (CCI), histologic type, molecular subtype, tumor grade, and type of cancer program.

Statistical analysis

Summary statistics were used to describe the study cohort. Means and standard deviations (SDs) were calculated for continuous variables and compared using analysis of variance (ANOVA). Frequencies and proportions were tabulated and compared using Pearson's chi-squared tests. To estimate the percent change per year and 95% confidence intervals (CIs) overall and across rural–urban areas, we fit separate generalized linear models with the binomial distribution and log link and obtained *p*-values for trend. To examine the association between rural–urban residence and palliative care utilization, we conducted multivariable logistic regression, controlling for potential confounders. Adjusted odds ratios (AORs) and 95% CIs were calculated. Hypothesis tests were two sided, with a significance level of 0.05. All statistical analyses were performed using Stata 17 (StataCorp).

RESULTS

Patient characteristics

Of 133,500 patients with metastatic breast cancer identified, the mean age was 62.4 (SD = 14.2) years and 98.6% were female. Most patients (72.5%) were non-Hispanic White, followed by 17.0% non-Hispanic Black, 5.8% Hispanic, and 2.7% non-Hispanic Asian. A total of 41.7% had Medicare, 38.7% were privately insured, and 11.8% were on

TABLE 1 Sociodemographic and clinical characteristics of patients with metastatic breast cancer, overall and by residence.

	Overall (N = 133,500) n (%)	Rural-urban areas ^a			p-value ^b
		Metropolitan (n = 115,725 [86.7%]) n (%)	Urban (n = 15,655 [11.7%]) n (%)	Rural (n = 2120 [1.6%]) n (%)	
Age at diagnosis (years), mean (SD)	62.4 (14.2)	62.3 (14.3)	62.6 (13.5)	63.6 (13.4)	<0.001
Sex assigned at birth					
Male	1896 (1.4)	1648 (1.4)	220 (1.4)	28 (1.3)	0.911
Female	131,604 (98.6)	114,077 (98.6)	15,435 (98.6)	2092 (98.7)	
Race/ethnicity					
Non-Hispanic White	96,823 (72.5)	81,600 (70.5)	13,381 (85.5)	1842 (86.9)	<0.001
Non-Hispanic Black	22,659 (17.0)	20,879 (18.0)	1585 (10.1)	195 (9.2)	
Non-Hispanic Asian	3586 (2.7)	3490 (3.0)	81 (0.5)	15 (0.7)	
Hispanic	7766 (5.8)	7418 (6.4)	326 (2.1)	22 (1.0)	
Other/multiracial	2666 (2.0)	2338 (2.0)	282 (1.8)	46 (2.2)	
Percent no high school education quartile ^c					
≥17.6%	27,589 (23.0)	22,495 (21.6)	4422 (31.5)	672 (35.8)	
10.9%–17.5%	31,722 (26.4)	26,123 (25.1)	5000 (35.7)	599 (31.9)	
6.3%–10.8%	33,232 (27.7)	29,448 (28.3)	3379 (24.1)	405 (21.6)	
<6.3%	27,532 (22.9)	26,114 (25.1)	1215 (8.7)	203 (10.8)	
Type of health insurance					
Uninsured	6749 (5.1)	5848 (5.1)	804 (5.1)	97 (4.6)	<0.001
Private/managed care	51,679 (38.7)	45,548 (39.4)	5514 (35.2)	617 (29.1)	
Medicaid	15,811 (11.8)	13,747 (11.9)	1807 (11.5)	257 (12.1)	
Medicare	55,709 (41.7)	47,563 (41.1)	7104 (45.4)	1042 (49.2)	
Other government/unknown	3552 (2.7)	3019 (2.6)	426 (2.7)	107 (5.0)	
Median household income quartile ^d					
<\$40,227	24,615 (20.5)	18,743 (18.0)	5019 (36.0)	853 (46.1)	<0.001
\$40,227–\$50,353	25,923 (21.6)	20,198 (19.4)	5209 (37.4)	516 (27.9)	
\$50,354–\$63,332	27,562 (23.0)	24,269 (23.3)	2964 (21.3)	329 (17.8)	
≥\$63,333	41,760 (34.8)	40,855 (39.3)	753 (5.4)	152 (8.2)	
Charlson–Deyo comorbidity index					
0	106,996 (80.1)	92,908 (80.3)	12,423 (79.4)	1665 (78.5)	0.010
1	18,130 (13.6)	15,570 (13.5)	2243 (14.3)	317 (15.0)	
≥2	8374 (6.3)	7247 (6.3)	989 (6.3)	138 (6.5)	
Histologic type					
Ductal	81,955 (61.4)	71,016 (61.4)	9655 (61.7)	1284 (60.6)	<0.001
Lobular	13,918 (10.4)	12,171 (10.5)	1545 (9.9)	202 (9.5)	
Ductal and lobular	4596 (3.4)	4062 (3.5)	463 (3.0)	71 (3.3)	
Other	33,031 (24.7)	28,476 (24.6)	3992 (25.5)	563 (26.6)	
Molecular subtype					
HR+/HER2–	51,448 (61.4)	44,611 (61.4)	6007 (61.5)	830 (62.5)	0.530
HR+/HER2+	13,300 (15.9)	11,530 (15.9)	1572 (16.1)	198 (14.9)	
HR–/HER2+	7154 (8.5)	6253 (8.6)	800 (8.2)	101 (7.6)	
TNBC	11,849 (14.1)	10,260 (14.1)	1391 (14.2)	198 (14.9)	

(Continues)

TABLE 1 (Continued)

	Overall (N = 133,500) n (%)	Rural-urban areas ^a			p-value ^b
		Metropolitan (n = 115,725 [86.7%]) n (%)	Urban (n = 15,655 [11.7%]) n (%)	Rural (n = 2120 [1.6%]) n (%)	
Tumor grade					
1	7891 (8.1)	6757 (8.0)	1000 (8.7)	134 (8.7)	0.001
2	41,464 (42.3)	35,829 (42.2)	4963 (43.2)	672 (43.8)	
3	48,565 (49.6)	42,308 (49.8)	5527 (48.1)	730 (47.5)	
Type of facility/cancer program					
Community	10,382 (8.3)	7398 (6.8)	2686 (18.1)	298 (14.7)	<0.001
Comprehensive community	49,849 (39.7)	41,903 (38.6)	6872 (46.2)	1074 (53.0)	
Academic/research	39,311 (31.3)	35,816 (33.0)	3127 (21.0)	368 (18.2)	
Integrated network	25,939 (20.7)	23,477 (21.6)	2176 (14.6)	286 (14.1)	

Abbreviations: AJCC, American Joint Committee on Cancer; HER2, human epidermal growth factor receptor 2; HR, hormone receptor; IQR, interquartile range; SD, standard deviation; TNBC, triple negative breast cancer.

^aMeasured by matching the state and county FIPS code of the patient recorded at the time of diagnosis against 2013 files published by the US Department of Agriculture Economic Research Service.

^bThe *p*-values were calculated using analysis of variance (ANOVA) for continuous data and Pearson's χ^2 tests for categorical data.

^cMeasure of educational attainment for each patient's residence estimated by matching the ZIP code of the patient with files derived from the 2016 American Community Survey data, spanning years 2012–2016.

^dBased on the 2016 American Community Survey data, spanning years 2012–2016 and adjusted for 2016 inflation.

Medicaid. Regarding patient residence, 86.7%, 11.7%, and 1.6% resided in metropolitan, urban, and rural areas, respectively. The distributions of sociodemographic and clinical characteristics, except sex assigned at birth and molecular subtype, varied significantly across rural-urban areas (Table 1).

Rural-urban disparities and trends in palliative care utilization

Overall, 20.3% of patients with metastatic breast cancer used palliative care services, with a significant increase from 15.6% in 2004–2005 to 24.5% in 2008–2019 (7.0% increase per year [95% CI: 6.4%–7.5%]; *p*-value for trend <0.001). By residence, 23.3% of the patients living in urban areas received palliative care, compared to 21.0% in rural and 19.9% in metropolitan areas. Percent increase per year (7.3% [95% CI: 3.3%–11.5%]) was highest among those living in rural areas, followed by 7.1% (95% CI: 6.6%–7.7%) and 5.9% (95% CI: 4.5%–7.3%) in metropolitan and urban areas, respectively, with statistically significant increasing trends over time (all *p*-values for trend <0.001) (Table 2).

After controlling for sociodemographic and clinical factors (Model 3), patients residing in rural (AOR = 0.84; 95% CI: 0.73–0.98) or metropolitan (AOR = 0.85, 95% CI: 0.80–0.89) areas had lower odds of palliative care utilization than those residing in urban areas (Table 3). In the same adjusted model, Hispanic (AOR = 0.68, 95% CI: 0.63–0.75), non-Hispanic Asian (AOR = 0.73, 95% CI: 0.65–0.82), and non-Hispanic Black (AOR = 0.91, 95% CI: 0.86–0.95) patients were less likely than non-Hispanic White patients to have received palliative

care services. Having greater CCI, lack of insurance or Medicaid, and lower median household income quartiles were all associated with a higher likelihood of palliative care utilization (Table 3).

DISCUSSION

This is the largest study to date assessing national trends and rural-urban disparities in the utilization of palliative care services among US patients with metastatic breast cancer. Significant increasing patterns of palliative care usage were observed overall and across rural-urban areas; however, utilization remained low. Patients living in rural areas were less likely to have used palliative care services compared to those in urban areas. Furthermore, we observed racial/ethnic and socioeconomic disparities in palliative care use.

Despite ASCO and NCCN's recommendations on timely palliative care intervention,^{11,13,14} we found that only one in five patients with metastatic breast cancer received palliative care services, even though the usage increased from 2004–2005 to 2018–2019. This finding is consistent with prior research on palliative care utilization in patients with metastatic breast or other cancers.^{15–17,19–21,28} However, trends in palliative care use were not evaluated across rural-urban areas previously. This study demonstrated a significant increasing pattern among patients with metastatic breast cancer across all residential areas. The increased utilization of palliative care services over time may be attributed to increased knowledge, awareness, and acceptance of palliative care use among patients and their providers, as well as an increase in the availability of these services offered at hospitals. Moreover, ASCO and NCCN's call for early

TABLE 2 Estimated rate of and trend in utilization of palliative care services among patients with metastatic breast cancer, overall and by residence.

	Total (N = 133,500)	Rural–urban areas ^a		
		Metropolitan (n = 115,725)	Urban (n = 15,655)	Rural (n = 2120)
	Yes, n (%)	Yes, n (%)	Yes, n (%)	Yes, n (%)
Overall	27,107 (20.3)	23,008 (19.9)	3654 (23.3)	445 (21.0)
Year of diagnosis				
2004–2005	1680 (15.6)	1411 (15.1)	240 (19.5)	29 (16.2)
2006–2007	1930 (16.4)	1629 (15.9)	275 (19.7)	26 (14.3)
2008–2009	2479 (17.0)	2109 (16.7)	328 (19.1)	42 (18.1)
2010–2011	2974 (18.6)	2519 (18.1)	403 (21.9)	52 (19.6)
2012–2013	3527 (20.1)	2996 (19.7)	467 (23.0)	64 (23.3)
2014–2015	4301 (22.2)	3656 (21.8)	577 (25.0)	68 (22.2)
2016–2017	4866 (22.5)	4144 (22.0)	651 (25.8)	71 (22.2)
2018–2019	5350 (24.5)	4544 (24.1)	713 (27.4)	93 (25.9)
P for trend ^b	<0.001	<0.001	<0.001	<0.001
Percent increase per year, % (95% CI)	7.0 (6.4–7.5)	7.1 (6.6–7.7)	5.9 (4.5–7.3)	7.3 (3.3–11.5)

Abbreviation: CI, confidence interval.

^aMeasured by matching the state and county FIPS code of the patient recorded at the time of diagnosis against 2013 files published by the US Department of Agriculture Economic Research Service.

^bThe *p*-value for trend was obtained from the score test of odds by year of diagnosis.

^cPercent change per year and 95% CI were computed using the generalized linear model with a binomial distribution and a log link.

palliative care integration into oncology care may also have contributed to the observed growth in utilization. However, palliative care use remained suboptimal, with almost 80% of the patients not having received palliative care services. Given the benefits and increased demand for palliative care, breast oncology programs may consider educating patients on these benefits and ensuring patients' needs are met.

Our analysis revealed that patients with metastatic breast cancer living in rural areas were less likely than those in urban areas to access palliative care services, consistent with the existing literature.^{20,22} Giap et al. reported an 8% prevalence of utilization among patients in rural areas versus 17% among those in urban areas.²⁰ Using the National Inpatient Sample, Chen et al. found that patients treated at urban teaching hospitals were more than twice as likely as those treated at rural hospitals to use palliative care services.²² However, these previous studies were descriptive, were largely homogenous, and did not consider multivariable adjustment, whereas current results showed that patients residing in rural areas were 15% less likely to receive palliative care than those residing in urban areas. This important finding suggests the potential geographic inequity in accessing palliative care among patients with metastatic breast cancer. Therefore, oncology programs should evaluate how they can improve the delivery of palliative care and other supportive services. Future research is also necessary to investigate multilevel or intersectional factors that contribute to the rural–urban disparities in this patient population.

Additionally, racial/ethnic minority patients with metastatic breast cancer had a lower likelihood of palliative care utilization than their

White counterparts. There have been, however, variable findings of palliative care use among various racial/ethnic groups. For example, Kim et al. reported a significantly lower usage of palliative care services in Black patients than in White patients but did not observe statistically significant differences between other racial/ethnic minority patients and White patients, likely due to the relatively small sample size.²⁸ Moreover, Kim et al.'s study looked at an inpatient sample, while our cohort consisted of patients in both inpatient and outpatient clinics. An analysis of SEER-Medicare data found no difference in palliative care use by race/ethnicity.²⁰ However, their study population was limited to patients aged ≥65 years only, whereas this study included both younger and older patient populations. Furthermore, the current analysis also uncovered that lack of insurance or Medicaid, lower median household income quartiles, higher percent no high school education quartiles, and greater CCI were all linked to increased use of palliative care services. These findings suggest that the differential level of palliative care utilization may reflect disparities in patients' socioeconomic status. Addressing these disparities may help improve equitable access to palliative care and other supportive services for patients with metastatic breast cancer.

Limitations

There are several limitations to the current study. First, given its retrospective design and the nature of the NCDB registry, underreporting and misclassification of palliative care use were possible. Thus,

TABLE 3 Rural-urban differences in palliative care use among patients with metastatic breast cancer: Logistic regression.

	Model 1 OR (95% CI)	p-value	Model 2 AOR (95% CI) ^a	p-value	Model 3 AOR (95% CI) ^b	p-value
Rural-urban areas						
Metropolitan	0.82 (0.78–0.85)	<0.001	0.86 (0.3–0.90)	<0.001	0.85 (0.80–0.89)	<0.001
Urban	1.0 (reference)		1.0 (reference)		1.0 (reference)	
Rural	0.87 (0.78–0.97)	0.016	0.87 (0.77–0.98)	0.023	0.84 (0.73–0.98)	0.022
Age at diagnosis (per 10-year increase)			0.99 (0.98–1.01)	0.272	0.97 (0.95–0.99)	0.001
Race/ethnicity						
Non-Hispanic White			1.0 (reference)		1.0 (reference)	
Non-Hispanic Black			0.90 (0.86–0.94)	<0.001	0.91 (0.86–0.95)	<0.001
Non-Hispanic Asian			0.76 (0.69–0.84)	<0.001	0.73 (0.65–0.82)	<0.001
Hispanic			0.68 (0.64–0.73)	<0.001	0.68 (0.63–0.75)	<0.001
Other/multiracial			0.96 (0.87–1.07)	0.462	0.95 (0.84–1.08)	0.471
Percent no high school education quartile ^c						
≥17.6%			1.0 (reference)		1.0 (reference)	
10.9%–17.5%			1.18 (1.12–1.23)	<0.001	1.16 (1.10–1.22)	<0.001
6.3%–10.8%			1.27 (1.21–1.33)	<0.001	1.24 (1.17–1.32)	<0.001
<6.3%			1.28 (1.21–1.36)	<0.001	1.25 (1.16–1.34)	<0.001
Type of health insurance						
Uninsured			1.22 (1.14–1.31)	<0.001	1.31 (1.21–1.42)	<0.001
Private/managed care			1.0 (reference)		1.0 (reference)	
Medicaid			1.14 (1.09–1.20)	<0.001	1.13 (1.07–1.20)	<0.001
Medicare			1.0 (0.96–1.04)	0.984	1.03 (0.97–1.08)	0.334
Other government/unknown			0.81 (0.74–0.90)	<0.001	0.84 (0.74–0.95)	0.005
Median household income quartile ^d						
<\$40,227			1.21 (1.14–1.28)	<0.001	1.21 (1.13–1.29)	<0.001
\$40,227–\$50,353			1.17 (1.12–1.23)	<0.001	1.18 (1.11–1.25)	<0.001
\$50,354–\$63,332			1.08 (1.04–1.13)	<0.001	1.09 (1.03–1.15)	0.001
≥\$63,333			1.0 (reference)		1.0 (reference)	
Charlson–Deyo comorbidity index						
0			1.0 (reference)		1.0 (reference)	
1			1.09 (1.05–1.14)	<0.001	1.10 (1.05–1.16)	<0.001
≥2			1.19 (1.13–1.26)	<0.001	1.22 (1.13–1.31)	<0.001
Type of facility/cancer program						
Community					1.0 (reference)	
Comprehensive community					1.09 (1.02–1.16)	0.015
Academic/research					1.08 (1.01–1.16)	0.037
Integrated network					1.25 (1.16–1.34)	<0.001

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

^aAdditionally adjusted for sex assigned at birth and year of initial diagnosis.^bAdditionally adjusted for sex assigned at birth, year of initial diagnosis, histologic type, and tumor grade.^cMeasure of educational attainment for each patient's residence estimated by matching the ZIP code of the patient with files derived from the 2016 American Community Survey data, spanning years 2012–2016.^dBased on the 2016 American Community Survey data, spanning years 2012–2016 and adjusted for 2016 inflation.

prospective studies are needed to confirm our findings. Second, the NCDB's definition of palliative care was not comprehensive, so our rate and trend may be underestimated because hospice and end-of-life care were not specifically captured. Third, although we controlled for potential confounders, there are other unmeasured factors, including cancer and its treatment symptoms/side effects, lifestyle behaviors, and cultural background/beliefs, that could better explain the associations observed in this study. Lastly, NCDB participants may not be representative of all patients with metastatic breast cancer in the United States, limiting the generalizability of our findings. However, the present and previous results regarding the rate of and trend in palliative care utilization were consistent.

CONCLUSIONS

In this national, racially diverse sample of US patients with metastatic breast cancer, the utilization of palliative care services increased over time, overall and by rural–urban residence; however, it remained sub-optimal. Further, our findings highlight rural–urban and socioeconomic disparities in palliative care use, suggesting the potential need to promote palliative care services and improve the delivery of these services while addressing geographic access inequities and disparities for this patient population.

ACKNOWLEDGMENTS

The National Cancer Database (NCDB) is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The data used in the study are derived from a de-identified NCDB file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology employed or the conclusions drawn from these data by the investigators. This work was supported in part by Susan G. Komen (TREN21675016) and the National Institute on Aging under grant award T32AG000243. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the National Institutes/National Institute on Aging.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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How to cite this article: Freeman JQ, Scott AW, Akhiwu TO. Rural-urban disparities and trends in utilization of palliative care services among US patients with metastatic breast cancer. *J Rural Health*. 2024;1-8. <https://doi.org/10.1111/jrh.12826>