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ORIGINAL ARTICLE – MELANOMA

Association between Medicaid Expansion and Cutaneous Melanoma Diagnosis and Outcomes: Does Where You Live Make a Difference?

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ABSTRACT

Background. Early detection and standardized treatment are crucial for enhancing outcomes for patients with cutaneous melanoma, the commonly diagnosed skin cancer. However, access to quality health care services remains a critical barrier for many patients, particularly the uninsured. Whereas Medicaid expansion (ME) has had a positive impact on some cancers, its specific influence on cutaneous melanoma remains understudied.

Methods. The National Cancer Database identified 87,512 patients 40–64 years of age with a diagnosis of non-metastatic cutaneous melanoma between 2004 and 2017. In this study, patient demographics, disease characteristics, and treatment variables were analyzed, and ME status was determined based on state policies. Standard univariate statistics were used to compare patients with a diagnosis of non-metastatic cutaneous melanoma between ME and non-ME states. The Kaplan–Meier method and log-rank tests were used to evaluate overall survival (OS) between ME and non-ME states. Multivariable Cox regression models were used to examine associations with OS.

Results. Overall, 28.6 % ($n = 25{,}031$) of the overall cohort was in ME states. The patients in ME states were more likely to be insured, live in neighborhoods with higher median income quartiles, receive treatment at academic/research cancer centers, have lower stages of disease, and receive surgery than the patients in non-ME states. Kaplan–Meier analysis found enhanced 5-year OS for the patients in ME states across all stages. Cox regression showed improved survival in ME states for stage II (hazard ratio [HR], 0.84) and stage III (HR, 0.75) melanoma.

Conclusions. This study underscores the positive association between ME and improved diagnosis, treatment, and outcomes for patients with non-metastatic cutaneous melanoma. These findings advocate for continued efforts to enhance health care accessibility for vulnerable populations.

Cutaneous melanoma is a commonly diagnosed skin cancer that accounts for 0.7 % of all annual cancer deaths worldwide.[1–3] Early diagnosis and effective treatment based on standardized guidelines are crucial for improving patient outcomes and reducing mortality.[3] However, access to quality health care services remains a critical barrier for many patients, particularly those lacking adequate health insurance.

In the American health care system, Medicaid plays a pivotal role in providing health insurance to low-income and vulnerable populations. With the implementation of the Affordable Care Act (ACA) in 2010, several states expanded their Medicaid programs, offering coverage to a broader range of individuals. Medicaid expansion (ME) aimed to increase health care access, improve health outcomes, and reduce health disparities among underserved populations. Whereas studies have examined the impact of ME on select malignancies, the specific influence of ME on the diagnosis and treatment of patients with cutaneous melanoma remains relatively unstudied.

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Prior studies have demonstrated that patients in ME states have their disease diagnosed at an earlier stage and have better overall survival (OS) rates than patients in non-ME states for colorectal, endometrial, and pancreatic cancers.[4–6] Additionally there have been secondary benefits of ME, which include heightened utilization of primary care physicians, increased rates of surgical treatments, enhanced cancer screening, and overall improvement in coordination of care.[7–9] In contrast to these studies, Kaelberer et al.[10] found no significant difference in surgical resection rates for hepatopancreatobiliary and gastrointestinal cancers between ME and non-ME states.

Two notable studies, one by Fabregas et al.[11] and another by Straker et al.,[12] used the National Cancer Database (NCDB) to assess the impact of ME on the diagnosis of various stages of cutaneous melanoma. Additionally, these studies explored the role that ME played in relation to race and sentinel lymph node biopsy for these patients. However, neither study delved into the influence of ME on the treatment or survival of patients with non-metastatic cutaneous melanoma.

Our study used a large national cancer database to evaluate non-elderly patients with non-metastatic cutaneous melanoma. The primary aim of the study was to compare the diagnosis, treatment, and outcomes of this patient population by ME status. We hypothesized that patients living in ME states will have better treatment outcomes and OS than patients living in non-ME states.

METHODS

Data Source

The NCDB was queried for this retrospective cohort study. The NCDB is a large hospital-based cancer registry sponsored by the American Cancer Society and the Commission on Cancer (CoC) of the American College of Surgeons. The NCDB captures approximately 70 % of all patients with newly diagnosed cancer from 1500 CoC-accredited facilities, making it one of the most comprehensive sources of public health data on cancer in the United States.[6,13] The NCDB contains demographic information, pathology, treatment types, and survival on individual patients who received some element of their cancer care at a CoC-accredited facility. This study was deemed to be exempt from institutional review board approval.

Case Selection Criteria

The NCDB was queried for patients 40 to 64 years of age with pathologic stage I-III cutaneous melanoma diagnosed between 2004 and 2017. Patients younger than 40 years were excluded because the ME variable is suppressed for ages 0 to 39 years. Patients 65 years old or older were excluded because a large proportion of this population may be covered by Medicare insurance. Staging was determined based on the American Joint Committee on Cancer (AJCC) Staging Manual, seventh edition. Patients with missing data on clinical staging were excluded. Patients who had unknown surgical resection status, diagnosis date before the reference date at the treatment facility, or ocular, mucosal, or acral melanoma were excluded (Appendix 1).

Factors Considered

Patient demographics and characteristics that were abstracted included sex, race, insurance status, Charlson-Deyo Comorbidity Index (CDCI), median income status, and percentage of patients without a high school degree within the area of residence, and urban/rural status of home zip code. Treatment facility-related data included distance from the patient's residence and the facility, facility type, and facility location. Facility types included community cancer program, comprehensive community cancer program, academic/research cancer program, and integrated network cancer program. Facility locations were grouped into four regions of the United States: Northeast and Atlantic, South Atlantic and South East, Midwest, and West and Pacific. The characteristics of melanoma included histology, pathologic stage, and year of diagnosis. Treatment variables included surgical status, surgical margins, radiation, chemotherapy, and immunotherapy.

Defining Medicaid Expansion Status

The study determined ME status based on geographic location and state adoption of ME policies. The NCDB has four categories for ME status: non-expansion, January 2014 expansion, early expansion (2010–2013), and late expansion (after January 2014). Similar to other studies,[6] our study then stratified patients into two groups based on whether their cutaneous melanoma was diagnosed while they were living in an ME state or not.

Statistical Analysis

The differences between patient characteristics, disease factors, and treatment patterns of patients treated in ME states compared with non-ME states were analyzed using chi-square tests. To test the hypothesis that receiving care in a ME state is associated with improved OS, a Cox regression analysis was performed, with adjustment for sex, race, insurance status, CDCI, median income, education level, distance to treatment facility, facility type, facility location, pathologic stage, and surgical margins status. These variables were chosen because they were statistically significant

in the univariate analysis and considered clinically important in predicting survival. The Cox regression analysis was completed for the overall cohort in addition to each stage individually. All statistical tests were two-sided, and alpha was set at a significance of 0.05. All analyses were performed using SAS statistical software, version 9.4 (SAS Institute, Inc., Cary, NC, USA).

RESULTS

Patient Characteristics

We identified 87,512 patients from the NCDB with non-metastatic cutaneous melanoma diagnosed between 2004 and 2017. Table 1 summarizes the patient characteristics for the overall cohort stratified by the ME status of the state in which the patient lived at diagnosis. In the overall cohort, 28.6 % ($n = 25{,}031$) of the patients received their diagnosis in states wherein ME had been implemented. Among these patients, 51.1 % ($n = 12{,}785$) received their diagnosis in states that initiated ME in January 2014, whereas 24.3 % ($n = 6075$) received their diagnosis in states that expanded Medicaid early, and 24.7 % ($n = 6171$) received their diagnosis in states that adopted ME later. A larger proportion of the patients were male, white non-Hispanic, privately insured, and treated in metropolitan areas.

The patients who received their diagnosis in ME states exhibited a lower likelihood of being non-insured (ME: 1.7 % vs non-ME: 4.3 %; $p < 0.001$) and a greater likelihood of having Medicaid insurance (ME: 5.7 % vs non-ME: 3.4 %; $p < 0.001$) and private insurance (ME: 84.2 % vs non-ME: 82.4 %; $p < 0.001$) than the patients who received their diagnosis in non-ME states. The patients who received their diagnosis in ME states also had a higher probability of residing in neighborhoods characterized by higher median income quartiles and lower quartiles of residents without a high school degree than those who received their diagnosis in non-ME states ($p < 0.001$).

Additionally, the patients in ME states were more likely to receive treatment at academic/research cancer centers (ME: 53 % vs non-ME: 49.4 %; $p < 0.001$) than at community cancer centers. The patients in states that adopted ME had higher proportions of stage I disease (ME: 62.6 % vs non-ME: 47.2 %; $p < 0.001$) and a greater tendency to receive surgical treatment (ME: 99 % vs non-ME: 98.7 %; $p < 0.001$) than the patients in non-ME states. Moreover, ME states had a higher prevalence of superficial spreading melanoma (ME: 44.5 % vs non-ME: 35.3 %; $p < 0.001$), whereas non-ME states had a larger share of nodular melanoma (ME: 11.1 % vs non-ME: 14.2 %; $p < 0.001$) and melanoma categorized as not otherwise specified (NOS) (ME: 37 % vs non-ME: 42.9 %; $p < 0.001$).

Kaplan–Meier Analysis of Overall Survival

The patients with stages I to III cutaneous melanoma diagnosed in ME states had longer 5-year OS than the patients who received their diagnosis in non-ME states ($p < 0.05$ for all stages) (Fig. 1A–D).

Multivariate Cox Regression Analyses

Table 2 illustrates the results of multivariate Cox regression analyses stratified by each pathologic stage of non-metastatic melanoma, exhibiting the variables affecting survival. For the patients with stage II or III melanoma, receiving a diagnosis in a ME state compared with a non-ME state was associated with longer survival (stage II: hazard ratio [HR], 0.84; 95 % confidence interval [CI], 0.77–0.91; $p < 0.001$; stage III: HR, 0.75; 95 % CI 0.70–0.80; $p < 0.001$). The females with all stages of non-metastatic melanoma had longer survival than the male patients (overall cohort: HR, 0.64; 95 % CI 0.62–0.67; $p < 0.001$), whereas the African Americans with stage III disease had an overall shorter survival than the white non-Hispanic patients (HR, 1.46; 95 % CI 1.18–1.81; $p < 0.001$). Across all stages, we found patients were more likely to have shorter survival if they had Medicaid, Medicare, or no insurance compared with private insurance. Finally, in the overall cohort, the patients treated at community (HR, 1.15; 95 % CI 1.06–1.25, $p < 0.001$) or comprehensive community (HR, 1.08; 95 % CI 1.03–1.12; $p < 0.001$) cancer programs had a shorter OS than the patients treated at academic/research cancer programs.

DISCUSSION

Cutaneous melanoma represents a significant public health concern. Mortality rates have decreased dramatically during the last decade due to advances in systemic treatment options,[14–17] but these treatments are costly. Health care access continues to pose a significant obstacle for uninsured individuals seeking timely diagnosis and appropriate treatment. Since the expansion of Medicaid after the implementation of the ACA, studies have demonstrated improved screening and OS rates for multiple cancer subtypes for patients treated in ME states.[4–9]

To our knowledge, this study is the first to specifically evaluate the correlation between ME and the treatment and outcomes including survival for patients with cutaneous melanoma. Our study demonstrated that patients with melanoma treated in ME states were overall more likely to be insured, receive treatment at an academic/research cancer center, have earlier stages of disease, undergo surgical resection, and have improved OS compared with those managed in non-ME states.

TABLE 1 Description and univariate analysis of non-metastatic cutaneous melanoma patients comparing Medicaid expansion (ME) status (n = 87,512)

	Non-ME-expansion state (n = 62,481) n (%)	ME-expansion state (n = 25031) n (%)	p Value
Sex			<0.001
Male	35,571 (56.9)	13,486 (53.9)	
Female	26,910 (43.1)	11,545 (46.1)	
Race			<0.001
White non-Hispanic	58,328 (93.4)	23,643 (94.5)	
White Hispanic	867 (1.4)	306 (1.2)	
African American	305 (0.5)	67 (0.3)	
Asian Pacific Islander	266 (0.4)	107 (0.4)	
Other/unknown	2715 (4.3)	908 (3.6)	
Insurance status			<0.001
Not insured	2713 (4.3)	435 (1.7)	
Private	51,512 (82.4)	21,068 (84.2)	
Medicaid	2155 (3.4)	1418 (5.7)	
Medicare	4039 (6.5)	1575 (6.3)	
Other government	997 (1.6)	230 (0.9)	
Unknown	1065 (1.7)	305 (1.2)	
Charlson-Deyo score			0.639
None/few comorbidities	61,207 (98)	24,533 (98)	
Multiple comorbidities	1274 (2)	498 (2)	
Median income quartile			<0.001
<$38,000	6268 (10)	1411 (5.6)	
$38,000–47,999	11,196 (17.9)	3520 (14.1)	
$48,0000–62,999	14,587 (23.3)	5682 (22.7)	
>$63,000	22,407 (35.9)	10,437 (41.7)	
Unknown	8023 (12.8)	3981 (15.9)	
Percentage with no high school degree per zip code (%)			<0.001
>17.6	7519 (12)	1806 (7.2)	
10.9–17.5	12,472 (20)	4249 (17)	
6.3–10.8	16,203 (25.9)	6816 (27.2)	
<6.3	17,699 (28.3)	8051 (32.2)	
Unknown	8588 (13.7)	4109 (16.4)	
Urban rural status			<0.001
Metropolitan	51,038 (81.7)	20,754 (82.9)	
Rural adjacent to metropolitan area	6739 (10.8)	2626 (10.5)	
Rural	2465 (3.9)	867 (3.5)	
Unknown	2239 (3.6)	784 (3.1)	
Distance traveled to treatment facility (miles)			<0.001
1–49	54,000 (86.4)	22,347 (89.3)	
50+	8481 (13.6)	2684 (10.7)	
Facility type			<0.001
Community cancer program	2299 (3.7)	1080 (4.3)	
Comprehensive community cancer program	17,753 (28.4)	6210 (24.8)	
Academic/research cancer program	30,861 (49.4)	13,256 (53)	
Integrated network cancer program	11,568 (18.5)	4485 (17.9)	
Facility location			<0.001
Northeast and Atlantic	10,658 (17.1)	8200 (32.8)	
South Atlantic and South East	22,379 (35.8)	2297 (9.2)	

Table 1 (continued)

	Non-ME-expansion state (n = 62,481) n (%)	ME-expansion state (n = 25031) n (%)	p Value
Midwest	18,728 (30)	9071 (36.2)	
West and Pacific	10,716 (17.2)	5463 (21.8)	
Histology			<0.001
Superficial spreading	22,074 (35.3)	11,136 (44.5)	
Nodular	8849 (14.2)	2766 (11.1)	
Lentigo maligna	2088 (3.3)	1048 (4.2)	
Melanoma NOS	26,823 (42.9)	9270 (37)	
Other	2647 (4.2)	811 (3.2)	
Pathologic stage			<0.001
I	29,511 (47.2)	15,659 (62.6)	
II	16,494 (26.4)	4671 (18.7)	
III	16,476 (26.4)	4701 (18.8)	
ME status			<0.001
Non-expansion state	30,604 (49)	0 (0)	
Jan 2014-expansion state	14,307 (22.9)	12,785 (51.1)	
Early-expansion state	11,112 (17.8)	6075 (24.3)	
Late-expansion state	6458 (10.3)	6171 (24.7)	
Year of diagnosis			<0.001
2004–2013	39,791 (63.7)	6075 (24.3)	
2014–2017	22,690 (36.3)	18,956 (75.7)	
Surgery			<0.001
No surgery	799 (1.3)	238 (1)	
Surgery received	61,682 (98.7)	24,793 (99)	
Margins			<0.001
Positive margins	1495 (2.4)	469 (1.9)	
Negative margins	60,986 (97.6)	24,562 (98.1)	
Chemotherapy			<0.001
No chemotherapy	60,023 (96.1)	24,539 (98)	
Chemotherapy received	1710 (2.7)	362 (1.4)	
Unknown	748 (1.2)	130 (0.5)	
Immunotherapy			<0.001
No immunotherapy received	55,158 (88.3)	23,001 (91.9)	
Immunotherapy received	6716 (10.7)	1886 (7.5)	
Unknown	607 (1)	144 (0.6)	

ME, Medicaid expansion; NOS, not otherwise specified

We found that patients with non-metastatic cutaneous melanoma diagnosed in ME states exhibited favorable characteristics, including higher rates of Medicaid and private insurance coverage, higher median income status, lower percentage of patients with no high school degree per area of residence, and higher proportion of patients receiving treatment at academic/research cancer centers. These demographic findings are similar to those published in other studies evaluating the effect of ME on cancer treatment and highlight factors indicative of improved access to specialized care and resources for patients in ME states.[4,12,18]

We additionally found that the patients who received their diagnosis and treatment in ME states were more likely to be diagnosed with lower-stage disease and more likely to undergo surgical resection than those in non-ME states. Our results support the findings of Fabregas et al.,[11] who found that patients with cutaneous melanoma diagnosed in ME states were 15 % less likely to have stage IV disease than those who received their diagnosis in non-ME states. Straker et al.[12] also focused on disease stage and found that ME was associated with a decrease in the diagnosis of T1b stage or higher-stage melanoma. Similar results have been demonstrated among the pancreatic cancer population,[6] with

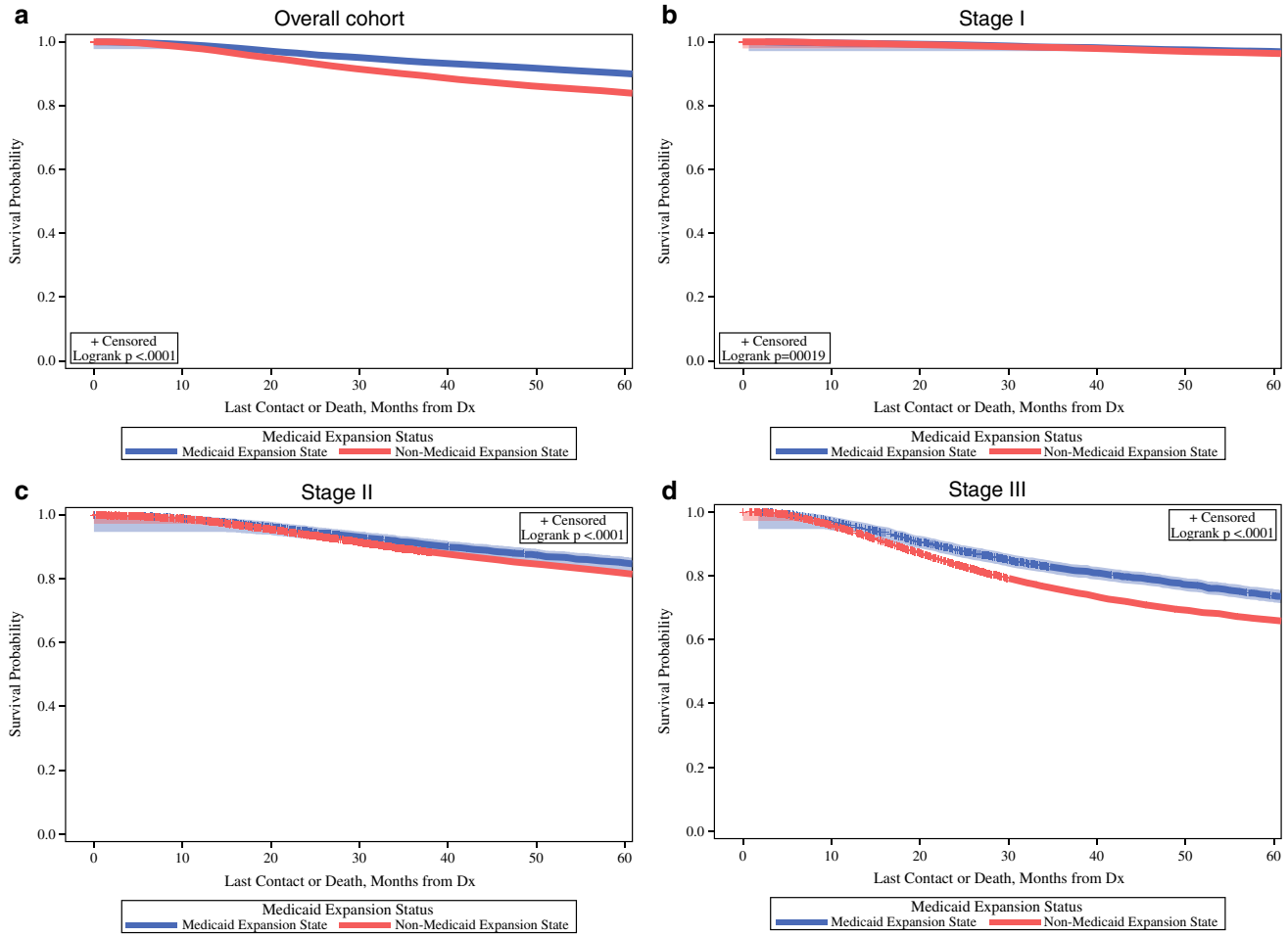

FIG. 1 The 5-year overall survival (OS) for the entire cohort stratified by pathologic stage of disease. **A** Kaplan–Meier analysis of patients in the overall cohort living in a Medicaid-expansion (ME) state versus those living in a non-ME state (n = 87,512). **B** Kaplan–Meier analysis of stage I patients living in an ME state versus those living in a non-ME state (n = 45,170). **C** Kaplan–Meier analysis of stage II patients living in an ME state versus those living in a non-ME state (n = 21,165). **D** Kaplan–Meier analysis of stage III patients living in an ME state versus those living in a non-ME state (n = 21,177).

higher rates of curative-intent resection for patients treated in ME states.

Our results could be due in part to the established benefit of ME in increasing access to and use of primary care physicians, allowing for earlier detection, diagnosis, and referral to a surgical oncologist.[7,8] Prior studies evaluating the benefits of ME in terms of health care access have specifically demonstrated improved screening rates for colorectal, breast, prostate, and cervical cancer and subsequent earlier detection in ME states.[5,9,18–20] Although there are no definite screening guidelines for cutaneous melanoma for asymptomatic adults as defined by the USPTF, and thus no specific outcome in our study, a similar argument can be made that earlier access to care leads to earlier diagnosis and definitive treatment. However, it should be noted that the non-ME states had lower rates of superficial spreading melanoma (35.3 % vs 44.5 %) and higher rates of nodular melanoma (14.2 % vs 11.1 %), which could also contribute to the rates of earlier-stage disease in ME states.

Additionally, multivariate Cox regression analysis provided evidence of the association between ME and positive survival outcomes, particularly for patients with stage II or III disease. Females demonstrated superior survival rates across all stages, whereas disparities in survival outcomes were observed between racial groups, with African Americans having worse survival with stage III disease. Across all stages of disease, treatment at an academic/research cancer institution was associated with overall improved survival rates, again consistent with previously published literature.[4]

Similar to other studies, we found that patients without insurance and those with Medicare and Medicaid had lower OS rates across all stages of disease than those with private insurance. Sussman et al.[21] found improved OS for patients with stage IV melanoma who had private insurance. Ellis

TABLE 2 Multivariable Cox regression analyses of factors contributing to overall survival of non-metastatic cutaneous melanoma patients stratified by pathologic stage

Variable	Overall cohort				Stage I				Stage II				Stage III			
	HR	95 % Lower	95 % Upper	*p* Value	HR	95 % Lower	95 % Upper	*p* Value	HR	95 % Lower	95 % Upper	*P* Value	HR	95 % Lower	95 % Upper	*p* Value
ME state at time of diagnosis	0.79	0.76	0.83	<0.001	0.92	0.82	1.02	0.12	0.84	0.77	0.91	<0.001	0.75	0.70	0.80	<0.001
Sex																
Male	Reference				Reference				Reference				Reference			
Female	0.64	0.62	0.67	<0.001	0.55	0.50	0.61	<0.001	0.65	0.61	0.69	<0.001	0.67	0.64	0.71	<0.001
Race																
White non-Hispanic	Reference				Reference				Reference				Reference			
White Hispanic	1.04	0.92	1.18	0.55	0.86	0.53	1.40	0.55	0.90	0.70	1.15	0.41	1.11	0.95	1.29	0.19
African American	1.39	1.17	1.65	<0.001	0.93	0.35	2.47	0.88	1.34	0.99	1.80	0.06	1.46	1.18	1.81	<0.001
Asian Pacific Islander	1.22	0.98	1.52	0.08	0.79	0.33	1.89	0.59	0.96	0.62	1.48	0.85	1.39	1.07	1.83	0.02
Other/unknown	0.98	0.91	1.06	0.63	0.75	0.57	0.98	0.03	0.97	0.85	1.10	0.61	1.04	0.94	1.15	0.46
Insurance																
Private	Reference				Reference				Reference				Reference			
Medicaid	1.93	1.81	2.06	<0.001	2.87	2.36	3.49	<0.001	1.91	1.69	2.16	<0.001	1.78	1.63	1.94	<0.001
Medicare	2.06	1.96	2.17	<0.001	3.30	2.90	3.75	<0.001	2.15	1.97	2.34	<0.001	1.73	1.61	1.87	<0.001
Not insured	1.65	1.54	1.76	<0.001	2.88	2.32	3.56	<0.001	1.57	1.40	1.77	<0.001	1.55	1.42	1.69	<0.001
Other government	1.10	0.96	1.26	0.19	1.29	0.88	1.91	0.19	1.10	0.86	1.40	0.47	1.06	0.89	1.28	0.51
Unknown	1.22	1.08	1.37	0.001	1.40	0.99	2.00	0.06	1.24	1.00	1.54	0.047	1.15	0.99	1.34	0.07
Charlson-Deyo score																
None/few comorbidities	Reference				Reference				Reference				Reference			
Multiple comorbidities	1.92	1.77	2.09	<0.001	2.69	2.21	3.29	<0.001	2.01	1.76	2.31	<0.001	1.67	1.48	1.88	<0.001
Median income quartiles																
<$38,000	Reference				Reference				Reference				Reference			
$38,000–47,999	0.89	0.84	0.95	<0.001	1.00	0.83	1.21	0.99	0.85	0.77	0.95	0.001	0.89	0.82	0.96	0.004
$48,000–62,999	0.89	0.83	0.94	<0.001	0.90	0.74	1.09	0.27	0.82	0.74	0.91	<0.001	0.92	0.85	1.01	0.07
>$63,000	0.79	0.74	0.85	<0.001	0.80	0.65	0.98	0.04	0.71	0.63	0.80	<0.001	0.85	0.77	0.94	<0.001
Unknown	0.59	0.50	0.70	<0.001	0.61	0.39	0.97	0.04	0.60	0.45	0.80	<0.001	0.57	0.46	0.71	<0.001

Table 2 (continued)

Variable	Overall cohort				Stage I				Stage II				Stage III			
	HR	95 % Lower	95 % Upper	*p* Value	HR	95 % Lower	95 % Upper	*p* Value	HR	95 % Lower	95 % Upper	*P* Value	HR	95 % Lower	95 % Upper	*p* Value
Percentage with no high school degree quartile (%)																
>17.5	Reference				Reference				Reference				Reference			
10.9–17.5	0.95	0.90	1.00	0.06	0.91	0.76	1.08	0.27	1.01	0.92	1.11	0.80	0.92	0.85	0.99	0.02
6.3–10.8	0.92	0.86	0.97	0.004	0.91	0.76	1.09	0.30	0.95	0.85	1.05	0.30	0.90	0.83	0.98	0.01
<6.3	0.82	0.77	0.88	<0.001	0.75	0.62	0.92	0.01	0.90	0.80	1.01	0.07	0.80	0.73	0.88	<0.001
Unknown	1.09	0.93	1.27	0.29	1.15	0.74	1.80	0.53	1.03	0.79	1.36	0.82	1.12	0.91	1.37	0.28
Distance traveled to treatment facility (miles)																
1–49	Reference				Reference				Reference				Reference			
50+	0.95	0.90	0.99	0.03	1.10	0.95	1.28	0.20	0.96	0.88	1.05	0.37	0.91	0.86	0.98	0.01
Facility type																
Academic/ research program	Reference				Reference				Reference				Reference			
Community cancer program	1.15	1.06	1.25	<0.001	1.11	0.88	1.42	0.38	1.14	0.99	1.30	0.06	1.17	1.05	1.31	0.01
Comprehensive community cancer program	1.08	1.03	1.12	<0.001	1.17	1.05	1.31	0.004	1.11	1.03	1.18	0.005	1.04	0.98	1.09	0.20
Integrated network cancer program	1.04	0.99	1.09	0.15	1.09	0.96	1.24	0.18	1.05	0.96	1.14	0.28	1.02	0.95	1.08	0.61
Facility location																
Northeast and Atlantic	Reference				Reference				Reference				Reference			
Midwest	1.07	1.01	1.12	0.01	0.95	0.83	1.09	0.50	1.09	0.99	1.19	0.07	1.07	1.00	1.14	0.05
South Atlantic and South East	0.99	0.94	1.04	0.74	1.05	0.92	1.21	0.48	1.00	0.92	1.10	0.92	0.97	0.90	1.04	0.32
West and Pacific	0.96	0.91	1.02	0.16	0.94	0.81	1.09	0.42	0.95	0.86	1.05	0.31	0.97	0.90	1.05	0.42
Stage																
I	Reference															
II	4.20	3.98	4.43	<0.001												
III	7.63	7.25	8.03	<0.001												
Surgical margins																
Negative margin	Reference				Reference				Reference				Reference			

Table 2 (continued)

Variable	Overall cohort				Stage I				Stage II				Stage III			
	HR	95 % Lower	95 % Upper	*p* Value	HR	95 % Lower	95 % Upper	*p* Value	HR	95 % Lower	95 % Upper	*P* Value	HR	95 % Lower	95 % Upper	*p* Value
Positive margin	1.66	1.53	1.80	<0.001	1.65	1.27	2.15	<0.001	1.73	1.49	2.01	<0.001	1.61	1.45	1.78	<0.001

HR hazard ratio, *ME* Medicaid expansion

et al.[22] queried the California Cancer Registry and found that patients with a diagnosis of breast, prostate, colorectal, or lung cancer had better OS if they had either private or Medicare insurance than patients who had other public insurances or no insurance. These findings highlight the importance of insurance coverage in ensuring optimal cancer care. However, they also demonstrate that the OS benefit for patients receiving their diagnosis in ME states is likely due to various demographic and socioeconomic factors as well as many of the proposed secondary benefits in care access that have resulted from ME as opposed to ME itself.

A substantial body of research demonstrates that health insurance reforms can have spill-over effects on patients not targeted by the reform.[23,24] Some of the broad systemic impacts of ME include increased use of clinical preventive services, improved population health, reduced uncompensated care burden, support for public health initiatives, and expanded health care services. For example, one study demonstrated that ME significantly increased the use of recommended clinical preventive services in both the low-income (targeted) group and the high-income (untargeted) group.[25] Another study found that Medicaid expansions targeted at low-income adults are associated with increased uptake of recommended pediatric preventive care for their children.[26]

The survival benefit of ME for patients with stages I to III cutaneous melanoma is apparent in the survival curves, especially for patients with stage II or III disease. Although a higher proportion of patients in non-ME states received either chemo- or immunotherapy, this is explained by the significantly higher proportion of stages II and III melanoma in these states. Despite the survival benefits of current immunotherapy, our findings support early diagnosis as the most effective tool to improve survival of patients with cutaneous melanoma. The significantly higher proportion of patients with stage I melanoma in ME states suggests that ME supports health care access and utilization, leading to better outcomes.

The findings of this study should considered with the following limitations. As a retrospective analysis of the NCDB, which abstracts data from CoC-approved hospitals, this study had potential for selection bias because patients receiving treatment at outpatient centers may have been excluded. The limited level of the database's granularity prevented us from discerning the proportion of patients receiving care from a specific surgical specialty. However, the large sample and data elements included useful patient demographic and socioeconomic information.

The NCDB does not report cancer-specific survival. Moreover, the study was susceptible to the potential coding and clerical errors inherent to a multicenter database. Nonetheless, this is the first large-scale national study to examine the influence of ME on the treatment and outcomes of patients with non-metastatic cutaneous melanoma.

CONCLUSION

In summary, our study showed a positive association between ME and improved outcomes for patients with non-metastatic cutaneous melanoma, highlighting the potential benefits of ME in enhancing access to specialized care.

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