Racial Disparities in Health Care Utilization at the End of Life Among New Jersey Medicaid Beneficiaries With Advanced Cancer

Annie Yang, BA¹; David Goldin, MA²; Jose Nova, MS²; Jyoti Malhotra, MD, MPH³; Joel C. Cantor, ScD²; and Jennifer Tsui, PhD, MPH^{2,3,4}

QUESTION ASKED: What is the prevalence of aggressive end-of-life (EOL) care and hospice enrollment, and are there racial and ethnic disparities in EOL care among a diverse group of nonelderly Medicaid beneficiaries with advanced cancer?

SUMMARY ANSWER: The majority of Medicaid patients with advanced cancer received aggressive EOL care and were not enrolled in hospice. Non-Hispanic (NH) Black patients were more likely to receive aggressive EOL care.

WHAT WE DID: Using an existing data linkage of New Jersey State Cancer Registry and New Jersey Medicaid enrollment and claims files from 2011 to 2016 for patients with breast and colorectal cancer, we assessed the extent of aggressive care experienced by patients and determined whether the experiences of aggressive care differed by race or ethnicity for those who were diagnosed from 2011 to 2015 with stage IV breast and colorectal cancer and who died by January 2016.

WHAT WE FOUND: In our retrospective cohort of recently diagnosed patients with breast and colorectal cancer enrolled in Medicaid, 62% of patients received

at least one of the following measures of aggressive EOL care: > 1 hospitalization (27%), > 1 emergency department visit (31%), intensive care unit admission (30%), and chemotherapy (34%). Only 39% of patients enrolled in hospice. The adjusted odds of receiving any aggressive care were 1.87 times higher (95% CI, 1.08 to 3.26) for NH Black patients compared with NH white patients.

BIAS, CONFOUNDING FACTORS: Our data set was limited to 1 state and select cancer sites (breast and colorectal) and lacked data on patient preferences or clinical decision making.

REAL-LIFE IMPLICATIONS: Patients enrolled in Medicaid are a racially and ethnically diverse and vulnerable patient population that is understudied in the area of EOL care. Mitigating racial and ethnic disparities in the quality of cancer care near the EOL requires a greater understanding of the drivers behind these disparities and may require greater awareness by clinicians of the differences in patient preferences and decision making that may occur during this critical time in cancer care.

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ASSOCIATED CONTENT

Appendix

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abstract

PURPOSE Racial and ethnic disparities in cancer care near the end of life (EOL) have been recognized, but EOL care experienced by Medicaid beneficiaries is not well understood. We assessed the prevalence of aggressive EOL care and hospice enrollment for Medicaid beneficiaries and determined whether racial and ethnic disparities exist.

PATIENTS AND METHODS We identified Medicaid beneficiaries (age 21-64 years) who were diagnosed from 2011 to 2015 with stage IV breast and colorectal cancer and who died by January 2016 through a New Jersey State Cancer Registry–Medicaid claims linked data set. We measured aggressive EOL care (> 1 hospitalization, > 1 emergency department [ED] visit, any intensive care unit [ICU] admission in the last 30 days of life, and receipt of chemotherapy in the last 14 days of life) and hospice enrollment. Multivariable logistic regression models were used to determine factors associated with aggressive EOL care and hospice enrollment.

RESULTS Of the 349 patients, 217 (62%) received at least one of the following measures of aggressive EOL care: > 1 hospitalization (27%), > 1 ED visit (31%), ICU admission (30%), and chemotherapy (34%). The adjusted odds of receiving any aggressive care were 1.87 times higher (95% CI, 1.08 to 3.26) for non-Hispanic (NH) Black patients compared with NH White patients. Only 39% of patients enrolled in hospice. No significant differences in hospice enrollment were observed by race or ethnicity.

CONCLUSION The majority of Medicaid patients with advanced cancer received aggressive EOL care and were not enrolled in hospice. NH Black patients were more likely to receive aggressive EOL care. Further work to understand processes leading to suboptimal EOL care within Medicaid populations and among racial and ethnic minority groups is warranted.

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INTRODUCTION

The National Academies of Health and Medicine has recognized the importance of providing high-quality cancer care near the end of life (EOL) by highlighting aggressive EOL care experienced by patients and encouraging clinicians to refer patients to hospice care in a timely manner.¹⁻³ Aggressive and life-sustaining treatment near the EOL does not necessarily result in better outcomes and instead may lead to poorer quality and costlier care.⁴⁻⁶ Individual socioeconomic status, insurance coverage, race and ethnicity, and geographic location have all been associated with differences in the receipt of aggressive EOL care and hospice use.⁷⁻¹³ However, few population-based studies have examined receipt of aggressive EOL care and

hospice use in recent years, particularly among diverse, medically underserved patients.

Medicaid beneficiaries are more likely to be diagnosed with late-stage cancer and have poorer prognoses at the time of diagnosis,^{14,15} but few researchers have studied EOL cancer care in the Medicaid population. Existing data suggest EOL service utilization within the Medicaid population is higher than in the Medicare or privately insured populations.¹⁶⁻¹⁹ However, prior studies of EOL care among patients with cancer enrolled in Medicaid have been limited to young adults and adolescents or less racially or ethnically diverse patient populations.^{16-18,20,21} Given that Medicaid provides critical health care coverage for 1 in 5 Americans,²² a more current understanding of EOL

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care patterns among Medicaid patients with cancer in expansion states with diverse populations is needed.

Although disparities in EOL care among the Medicare population have been documented,^{10,11,23} it is unclear whether these racial and ethnic disparities also remain among patients with cancer enrolled in Medicaid. Minority patients are more likely to receive aggressive EOL care compared with non-Hispanic (NH) White patients,^{9,11,17} and racial and ethnic minorities may be less likely to enroll in hospice.^{11,24} Although engaging patients in conversations regarding their EOL care preferences is associated with less aggressive and higher quality care, physicians are less likely to engage Black or Hispanic patients in these discussions.^{5,25} Thus, it is important to determine whether racial and ethnic disparities in EOL care exist among low-income and underserved populations, particularly within Medicaid programs to identify potential practice and policy needs for improved EOL care quality.

In this study, we used the New Jersey State Cancer Registry (NJSCR)–Medicaid claims linked data set in New Jersey to determine the prevalence of aggressive EOL care and hospice enrollment among a diverse group of nonelderly Medicaid beneficiaries diagnosed with advanced breast and colorectal cancer. New Jersey expanded its Medicaid program under the Patient Protection and Affordable Care Act in 2014. Understanding EOL care for patients with cancer in the NJ Medicaid program during more recent years can help elucidate patterns of care during this period of program expansion and redesign. We also explored whether racial and ethnic disparities exist in receipt of aggressive EOL care and hospice enrollment. We hypothesized that there would be higher rates of aggressive EOL care and lower rates of hospice enrollment among Medicaid patients with cancer compared with other non-Medicaid populations in the literature and that there would be an absence of racial and ethnic disparities in aggressive EOL care and hospice enrollment among patients within the same Medicaid program.

PATIENTS AND METHODS

Data and Study Population

We used an existing data linkage of the NJSCR and New Jersey Medicaid enrollment and claims files from 2011 to 2016 for patients with breast and colorectal cancer. The linked data set included individuals diagnosed with a first primary breast or colorectal cancer between 2011 and 2015, who were age 21–64 years old at time of diagnosis, residents of New Jersey, and were not diagnosed with subsequent primary cancers during the study period. Other details of the linked cohort have been described elsewhere.²⁶ This study was approved by the Rutgers Biomedical Health Sciences Institutional Review Board.

We limited this analysis to patients in the existing linked data set who were diagnosed with stage IV breast or

colorectal cancer between 2011 and 2015 and who died by January 31, 2016 (n = 507). We only included those with stage IV cancers because these patients would most likely be treated as having an incurable advanced cancer and receive care appropriate for a terminal illness.²⁷ We excluded those who died within 60 days of diagnosis (n = 66) and who were not continuously enrolled in Medicaid in the last 60 days of life (n = 92) to ensure complete data to assess our outcome measures. Although most studies restrict their sample to those who survive for > 30 days and have > 30 days of continuous enrollment at the end of life, only month and year of diagnosis and number of months of survival were available in our analytic data set. Thus, we used a more conservative criterion of > 60 days for length of survival and continuous enrollment to account for these estimated values.

Measures

We used the Donabedian model²⁸ as a framework to guide our assessment of how patient demographics, tumor characteristics, and Medicaid enrollment characteristics are associated with aggressive EOL care and hospice enrollment among the New Jersey Medicaid population.

Aggressive EOL care. Aggressive EOL care measures are based on those validated in prior studies^{29,30} and endorsed by national organizations, including the National Quality Forum (NQF) and Centers for Medicare and Medicaid Services.^{2,3} We used the following 4 measures: > 1 inpatient hospitalization stay in the last 30 days before death, > 1 emergency department (ED) visit in the last 30 days before death, any admission to the intensive care unit (ICU) in the last 30 days before death, and receipt of chemotherapy in the last 14 days before death (intravenous, oral, or injection). We also created a composite measure of any aggressive care using the 4 measures described. For patients who experienced ≥ 1 of the measures, any aggressive care was categorized as yes, and those who did not experience any of the measures were categorized as no.

Hospice enrollment. We identified whether patients were enrolled in hospice at any time until death (≥ 1 hospice claim after diagnosis) and whether patients were enrolled in hospice care in the last 3 days of life (≥ 1 hospice claim after diagnosis and ≤ 3 total hospice claims). We assumed patients received 1 hospice claim for each day they were enrolled in hospice, up until death.

Codes. We used the Healthcare Common Procedure Coding System, revenue center codes, International Classification of Diseases, Ninth Revision and Tenth Revision codes, and Current Procedural Terminology codes to determine ED visits, ICU admissions, hospice enrollment, and chemotherapy use (Appendix Table A1, online only). National Drug Codes (NDCs) were also used to identify chemotherapy use.^{23,31} We used specifications from NQF to determine whether a drug was considered chemotherapy.³² Claims with a provider type of hospice were also

considered to indicate hospice care. The full list of NDC chemotherapy codes are available from the authors upon request.

Covariates

Using NJSCR data, we categorized race and ethnicity as NH White (reference), NH Black (hereafter Black), Hispanic, and NH Asian/Pacific Islander (API). Patients with unknown or other race ($n = 102$) did not remain in the analysis after using our exclusion criteria described earlier.

From the NJSCR, we obtained other demographic and clinical covariates, including sex, age at diagnosis, year of diagnosis, and survival ($\geq v < 12$ months). Date of death was estimated using the month and year of diagnosis and months of survival (based on vital records) from the NJSCR. Because the date of diagnosis was assigned as the middle of each month, we added 15 days to the lookback period for each of the measures (eg, > 1 hospitalization in the last 45 days before death). Number of comorbidities (0 or ≥ 1) was based on the Charlson comorbidity index, determined from claims before diagnosis and after 2011.^{33,34}

From Medicaid claims and enrollment information, we characterized patients' Medicaid eligibility category (ie, general assistance/expansion; aged, blind, disabled; New Jersey FamilyCare) and the number of months enrolled in Medicaid in the 12 months before diagnosis. We described the managed care status in the 12 months after diagnosis as follows: enrolled in Medicaid for < 6 months, fee-for-service (FFS) only, managed care (MC) only, or a combination of FFS and MC.

Statistical Analysis

We used descriptive statistics to characterize the study sample and examine the distribution across our primary predictors of interest (eg, race and ethnicity) and outcome measures. To assess the relationship between the independent variables and aggressive EOL care and hospice use, we conducted separate multivariable logistic regression models for each outcome measure. Variables significant at $P < .05$ in the bivariate analysis and those thought to be clinically significant (sex, age at diagnosis, cancer type, Charlson comorbidity index, and Medicaid MC status) were included in all multivariable models. As a sensitivity analysis, we repeated our adjusted models for the subgroup of patients who survived ≥ 100 days after diagnosis. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

RESULTS

Study Population

We identified 349 patients diagnosed with stage IV cancers. The median survival was 14 months; 11% of patients survived ≤ 3 months and 23% survived ≥ 24 months. One quarter of patients (28%) were diagnosed under the age of 50 years (median age of diagnosis, 55 years; range, 21-64

years), and more than half (56%) identified as a racial or ethnic minority, including 33% NH Blacks, 18% Hispanics, and 5% NH APIs (Table 1). Nearly half of patients were enrolled in Medicaid for < 1 month in the year before diagnosis (47%). Compared with patients with colorectal cancer, a higher proportion of patients with breast cancer were Black, reported no comorbidities, and survived ≥ 12 months after diagnosis.

Aggressive EOL Care

The majority of patients (62%) received at least one form of aggressive EOL care in the last month of life. Almost one third had > 1 hospitalization (27%), had > 1 ED visit (31%), were admitted to the ICU (30%) in the last 30 days of life, or received chemotherapy (34%) in the last 14 days of life.

Rates of aggressive EOL care differed substantially by race and ethnicity (Fig 1). Black patients had higher rates of aggressive care across all measures compared with all other races and ethnicities. Nearly three quarters of all Black patients (73%) received some sort of aggressive EOL care, compared with 60% of NH Whites, 59% of NH APIs, and 48% of Hispanic patients. Approximately 40% of Black patients were hospitalized, visited the ED, were admitted to the ICU, or received chemotherapy in the last few weeks of life. In contrast, Hispanic and NH API patients had the lowest rates of hospitalizations, ED visits, and ICU admissions compared with all other races and ethnicities.

Hospice Enrollment

Less than half of all patients (39%) enrolled in hospice, whereas 14% enrolled in hospice in the last 3 days of life. A similar proportion of NH White patients (42%) and Black patients (43%) enrolled in hospice, compared with a lower proportion of NH API patients (29%) and Hispanic patients (35%). The proportion of patients enrolled in hospice in the last 3 days of life was similar across all racial and ethnic groups.

Adjusted Models

After adjusting for sociodemographic and clinical characteristics, aggressive EOL care differed significantly by race and ethnicity (Table 2). We adjusted for sex, age at diagnosis, year of diagnosis, cancer type, survival ≥ 12 months, comorbidities, and MC enrollment category. We did not adjust for the number of months enrolled in Medicaid before diagnosis because this was not significant in the bivariable analysis. Compared with NH White patients, Black patients had higher odds of receiving any aggressive EOL care (odds ratio [OR], 1.87; 95% CI, 1.07 to 3.26), having > 1 hospitalization (OR, 1.98; 95% CI, 1.13 to 3.47), and having > 1 ED visit (OR, 1.79; 95% CI, 1.05 to 3.06). Hispanic patients had lower odds of being admitted to the ICU than NH White patients (OR, 0.44; 95% CI, 0.21 to 0.93). After excluding patients who survived < 100 days ($n = 38$), Black patients remained more likely to receive

TABLE 1. Characteristics of New Jersey Medicaid Beneficiaries Diagnosed With Advanced Cancer Who Died by 2016

Characteristic	No. of Patients (%)
Total sample	349
Sex	
Female	205 (59)
Male	144 (41)
Race/ethnicity	
NN White	64 (44)
NH Black	115 (33)
Hispanic	153 (18)
NH API	17 (5)
Age at diagnosis, years	
< 50	96 (38)
≥ 50	253 (72)
Cancer type	
Breast	106 (30)
Colorectal	243 (70)
Year of diagnosis	
2011	72 (21)
2012	51 (15)
2013	93 (27)
2014	76 (22)
2015	57 (16)
Survival time, months	
< 12	142 (41)
≥ 12	207 (59)
Charlson comorbidity index	
0	206 (59)
1+	143 (41)
Medicaid eligibility	
GA/expansion	108 (31)
Aged/blind/disabled	190 (54)
NJ FamilyCare	51 (15)
Enrollment in the year before diagnosis, months	
< 1	163 (47)
1-3	18 (5)
3-10	44 (13)
≥ 11	124 (36)
Enrolled at diagnosis	
Yes	248 (71)
No	101 (29)
MC and FFS enrollment	
FFS/MC mix	136 (39)
Enrolled < 6 months	109 (31)
MC only	79 (23)
FFS only	25 (7)

NOTE. Percentages may not sum to 100% due to rounding.

Abbreviations: API, Asian/Pacific Islander; EOL, end of life; FFS, fee-for-service; GA, general assistance; MC, managed care; NH, non-Hispanic; NJ, New Jersey.

any aggressive EOL care (OR, 1.92; 95% CI, 1.07 to 3.44) and have > 1 hospitalization (OR, 1.95; 95% CI, 1.06 to 3.59).

No significant differences by race or ethnicity were observed for hospice enrollment. Patients who survived for < 12 months had higher odds of enrolling in hospice in the last 3 days of life (OR, 2.61; 95% CI, 1.33 to 5.11). These findings did not change after excluding patients who survived < 100 days.

DISCUSSION

This is one of the few studies to examine racial and ethnic disparities in aggressive EOL care and hospice enrollment during the Medicaid expansion period among a cohort of nonelderly Medicaid beneficiaries with advanced-stage breast and colorectal cancer. Nearly two thirds of patients in our study experienced aggressive EOL care. Prior studies have found similarly high rates, including 79% of adolescent and young adult Medicaid patients in New York.¹⁶ Our data support the hypothesis that a higher proportion of patients with cancer enrolled in Medicaid receive aggressive EOL care compared with Medicare or privately insured populations.¹⁶⁻¹⁹ For example, the proportion of Medicaid patients with cancer having > 1 ED visit in the last month of life can range from 19% to 44%,^{16,18} compared with an estimated 5%-10% in the Medicare population¹¹ and < 2% in the privately insured population.³⁵

We also observed that 61% of our patients did not enroll in hospice. Others have presented estimates of 70%-80% among Medicaid enrollees in other states,^{16,17} compared with 50% of Medicare beneficiaries.³⁶ Medicaid beneficiaries likely have more complex social and health needs compared with privately insured or Medicare insured groups.⁹ These factors may relate to lower use of hospice and higher use of aggressive treatment. New Jersey is also one of the most racially, ethnically, and geographically diverse states in the country, with 1.7 million inhabitants enrolled in Medicaid across the state.³⁷ The diversity in cultures may be associated with lower health literacy, lower rates of advance directives, and lack of awareness regarding EOL care resources, and may pose challenges for clinicians in providing culturally competent care.³⁸ Medicaid beneficiaries, representing a younger population with more complex social needs, may be more resistant to services such as hospice, and physicians may be more willing to treat them more aggressively.^{39,40} Furthermore, a large proportion of the study sample was enrolled in Medicaid within a month of diagnosis, potentially limiting the amount of time they had to engage with the health care system, establish relationships with clinicians, and properly discuss EOL care plans.

Although all patients in our study were low-income Medicaid beneficiaries, Black patients were twice as likely to receive aggressive EOL care compared with NH White patients. Although others have found racial and ethnic

disparities in EOL care in the Medicare population,^{10,23} we did not expect to find disparities among a population that has experienced similar socioeconomic barriers to obtaining health care. The literature is mixed. Studies of young adult and adolescent Medicaid patients with cancer in New York and California found minimal disparities by race.^{16,20} In contrast, Guadagnolo et al¹⁸ showed that Black and Hispanic Medicaid patients with cancer in Texas were more likely to be hospitalized or visit the ED in the last month of life. Our results similarly showed that Black patients were twice as likely to be hospitalized or visit the ED in the last month of life, compared with NH White patients. Even after omitting patients who survived < 100 days after their cancer diagnosis, racial and ethnic disparities remained for receiving aggressive EOL care.

The disparities observed here and by Guadagnolo et al¹⁸ could be influenced by various patient factors. Aggressive care received by Black patients has been attributed to cultural preferences, religious beliefs, lack of trust in the medical profession, a higher likelihood of requesting life-extending treatments, and hospital-level variation in quality.^{9,10,12,41,42} Differences in communication or biases inherent to physicians may also play a role. Even when EOL conversations occur between physicians and Black patients at the same rates as White patients, Black patients are still more likely to receive life-prolonging care at the EOL.⁴³ Effective EOL discussions require competent communication skills, use of a patient-centered approach, and regular integration of these discussions throughout the course of care.⁴⁴ In addition to these fundamental strategies, clinicians may need increased knowledge of EOL cultural competencies when engaging in these conversations to begin to mitigate disparities.³⁸

Although we provide new insight into EOL care in nonelderly Medicaid beneficiaries using population claims data, our study has some limitations. First, our study did not include patients' preferences or clinical decision making. Thus, we were unable to determine whether the care provided was aligned with patients' desires or medically appropriate. Second, our cohort was limited to patients diagnosed with breast and colorectal cancers and thus may not be generalizable to other cancer types. Third, we did not have data regarding income within our data set to better characterize the socioeconomic status of our cohort. Fourth, this was a retrospective study of EOL care, a methodology that has previously raised concerns over studying a group of patients who have died.²⁷ However, retrospective studies still provide a valuable tool for systematically studying EOL care,⁴⁵ and we sought to better capture the experiences of the dying by only including patients who presented with advanced-stage cancers at diagnosis. Our analysis was based on a limited sample, which hinders the statistical power to detect some differences of interest. We also found the statistical significance varied between our primary analysis and sensitivity analysis. Future studies could benefit from more years of data, additional cancer types, or larger geographic areas. Finally, our data were obtained from one state, limiting generalizability. However, one of the strengths of the New Jersey data was the racial and ethnic diversity, which allowed us to more robustly assess disparities in EOL care by race and ethnicity. We also accounted for contextual change in the Medicaid program by adjusting for year of diagnosis (2011-2016) that spans the expansion period.⁴⁶

FIG 1. Rates of aggressive EOL care and hospice enrollment by race and ethnicity. Any aggressive care indicates whether the patient experienced any of the following measures: > 1 hospitalization, > 1 emergency department (ED) visit, intensive care unit (ICU) admission in the last 30 days, or chemotherapy received in the last 14 days. API, Asian/Pacific Islander; EOL, end of life; NH, non-Hispanic.

TABLE 2. Adjusted Analysis of Aggressive Care and Hospice Enrollment Near the EOL

Characteristic	Aggressive EOL Care				Hospice Enrollment		
	> 1 Hospitalization in Last 30 Days	> 1 ED Visit in Last 30 Days	ICU Admission in Last 30 Days	Chemotherapy in Last 14 Days	Any Aggressive Care	Any Hospice Enrollment	Enrolled in Hospice in Last 3 Days
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Race/ethnicity							
NH White	Reference	Reference	Reference	Reference	Reference	Reference	Reference
NH Black	1.98 (1.13 to 3.47) ^a	1.79 (1.05 to 3.06) ^a	1.42 (0.83 to 2.42)	1.52 (0.89 to 2.59)	1.87 (1.07 to 3.26) ^a	1.45 (0.86 to 2.44)	1.29 (0.64 to 2.61)
Hispanic	0.89 (0.44 to 1.83)	0.93 (0.47 to 1.81)	0.44 (0.21 to 0.93) ^a	0.53 (0.26 to 1.08)	0.61 (0.33 to 1.12)	1.37 (0.74 to 2.52)	0.91 (0.37 to 2.23)
NH API	0.60 (0.16 to 2.29)	0.48 (0.13 to 1.81)	0.39 (0.10 to 1.48)	1.38 (0.48 to 4.00)	0.85 (0.29 to 2.47)	0.68 (0.22 to 2.10)	0.94 (0.19 to 4.59)
Sex							
Female	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Male	1.12 (0.62 to 2.03)	1.30 (0.73 to 2.33)	1.21 (0.67 to 2.20)	0.73 (0.41 to 1.29)	0.96 (0.54 to 1.69)	1.05 (0.62 to 1.80)	1.16 (0.55 to 2.44)
Age at diagnosis, years							
≥ 50	Reference	Reference	Reference	Reference	Reference	Reference	Reference
< 50	1.09 (0.62 to 1.91)	1.04 (0.61 to 1.77)	0.95 (0.54 to 1.65)	1.07 (0.63 to 1.83)	1.08 (0.63 to 1.84)	0.80 (0.48 to 1.34)	1.15 (0.57 to 2.32)
Cancer type							
Breast	Reference	Reference	Reference	Reference	Reference	Reference	Reference
Colorectal	1.47 (0.75 to 2.87)	1.0 (0.54 to 1.89)	0.77 (0.41 to 1.46)	1.29 (0.79 to 2.38)	1.65 (0.85 to 2.88)	1.57 (0.87 to 2.84)	1.17 (0.51 to 2.71)
Survival time, months							
≥ 12	Reference	Reference	Reference	Reference	Reference	Reference	Reference
< 12	1.02 (0.59 to 1.77)	0.84 (0.50 to 1.41)	1.01 (0.59 to 1.73)	1.89 (1.12 to 3.19)	1.92 (1.14 to 3.25)	1.35 (0.83 to 2.21)	2.61 (1.33 to 5.11) ^a
Year of diagnosis							
2011	Reference	Reference	Reference	Reference	Reference	Reference	Reference
2012	1.26 (0.56 to 2.82)	1.91 (0.87 to 4.22)	1.06 (0.46 to 2.43)	1.37 (0.62 to 3.05)	1.80 (0.81 to 4.00)	0.71 (0.33 to 1.52)	1.05 (0.37 to 2.98)
2013	0.59 (0.28 to 1.23)	1.14 (0.56 to 2.32)	1.08 (0.52 to 2.22)	1.06 (0.52 to 2.16)	0.90 (0.47 to 1.70)	0.60 (0.31 to 1.16)	0.94 (0.37 to 2.39)
2014	1.09 (0.52 to 2.28)	1.40 (0.67 to 2.94)	1.69 (0.80 to 3.56)	1.32 (0.64 to 2.76)	2.05 (1.00 to 4.22)	0.98 (0.50 to 1.93)	0.96 (0.37 to 2.53)
2015	0.78 (0.33 to 1.84)	1.53 (0.66 to 3.51)	1.43 (0.61 to 3.33)	1.32 (0.59 to 3.00)	1.53 (0.69 to 3.42)	0.98 (0.46 to 2.10)	0.97 (0.34 to 2.78)
Charlson comorbidity index							
0	Reference	Reference	Reference	Reference	Reference	Reference	Reference
1+	1.31 (0.78 to 2.22)	0.81 (0.49 to 1.35)	1.15 (0.69 to 1.91)	0.86 (0.52 to 1.42)	0.95 (0.58 to 1.56)	0.79 (0.49 to 1.27)	0.75 (0.39 to 1.47)

(continued on following page)

TABLE 2. Adjusted Analysis of Aggressive Care and Hospice Enrollment Near the EOL (continued)

Characteristic	Aggressive EOL Care				Hospice Enrollment	
	> 1 Hospitalization in Last 30 Days	> 1 ED Visit in Last 30 Days	ICU Admission in Last 30 Days	Chemotherapy in Last 14 Days	Any Hospice Enrollment	Enrolled in Hospice in Last 3 Days
MC and FFS enrollment	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
MC only	Reference	Reference	Reference	Reference	Reference	Reference
FFS/MC mix	2.55 (1.25 to 5.23) ^a	1.70 (0.88 to 3.30)	2.60 (1.31 to 5.17) ^a	1.00 (0.54 to 1.89)	0.95 (0.52 to 1.76)	1.19 (0.50 to 2.83)
Enrolled < 6 months	1.87 (0.87 to 4.01)	1.30 (0.64 to 2.63)	1.47 (0.71 to 3.07)	0.37 (0.18 to 0.73) ^a	0.71 (0.37 to 1.36)	0.73 (0.29 to 1.84)
FFS only	1.42 (0.46 to 4.41)	1.16 (0.40 to 3.36)	1.21 (0.39 to 3.70)	0.49 (0.17 to 1.41)	1.00 (0.38 to 2.65)	1.23 (0.35 to 4.30)

NOTE. Any aggressive care indicates whether the patient experienced any of the following measures: > 1 hospitalization, > 1 ED visit, ICU admission in the last 30 days, or chemotherapy received in the last 14 days.

Abbreviations: API, Asian/Pacific Islander; ED, emergency department; EOL, end of life; FFS, fee-for-service; ICU, intensive care unit; MC, managed care; NH, non-Hispanic; OR, odds ratio.

^aSignificant at $P < .05$.

We found that the majority of Medicaid patients diagnosed with advanced breast and colorectal cancer experienced aggressive EOL care and that significant racial and ethnic disparities were present. Black patients were significantly more likely to have received aggressive EOL care. We examined patients with cancer from a single state; thus, further exploration of EOL care patterns among racial and ethnic subgroups using larger data sets across more years, cancer types, and states is warranted, as well as incorporating information regarding patient preferences. Our

work points to several policy implications and areas for future research. Strategies to increase awareness of community preferences for EOL care at the provider, health system, and policy levels, as well as strengthening communication strategies between clinicians and patients, are needed to achieve optimal EOL care for low-income and vulnerable populations. Future research should assess trends in the quality of EOL cancer care for Medicaid enrollees and examine how quality differs across states, especially during a critical time of health care redesign and greater emphasis on health care quality.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Racial Disparities in Health Care Utilization at the End of Life Among New Jersey Medicaid Beneficiaries With Advanced Cancer

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Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians ([Open Payments](#)).

Jyoti Malhotra

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APPENDIX

TABLE A1. Codes for Identifying Utilization of Health Services

Type of Codes	Codes
ICU	
Revenue center codes	0200, 0201, 0202, 0202, 0204, 0206, 0207, 0208, 0209
ED	
Revenue center codes	0450, 0451, 0452, 0456, 0459, 0981
HCPCS	99281, 99282, 99283, 99284, 99285, 99291
Chemotherapy	
Revenue center codes	331, 332, 335
ICD-9 diagnoses	V58.11, V58.12, V66.2, V67.2
ICD-10 diagnoses	Z51.1, Z51.11, Z51.12, Z08
ICD-9 procedures	99.25
ICD-10 procedures	3E03305, 3E04305, XW03351, XW033B3, XW033C3, XW04351, XW043B3, XW043C3
HCPCS	J0594, J0640, J0641, J0894, J7150, J8510, J8520, J8521, J8530, J8540, J8560, J8561, J8562, J8565, J8597, J8600, J8610, J8655, J8700, J8705, J8999, J9000, J9001, J9002, J9010, J9015, J9017, J9019, J9020, J9025, J9027, J9032, J9033, J9035, J9039, J9040, J9041, J9042, J9043, J9045, J9047, J9050, J9055, J9060, J9062, J9065, J9070, J9080, J9090, J9091, J9092, J9093, J9094, J9095, J9096, J9097, J9098, J9100, J9120, J9130, J9140, J9150, J9151, J9155, J9160, J9170, J9171, J9178, J9179, J9181, J9182, J9185, J9190, J9200, J9201, J9202, J9206, J9207, J9208, J9209, J9211, J9214, J9217, J9218, J9219, J9228, J9230, J9245, J9250, J9260, J9261, J9262, J9263, J9264, J9265, J9266, J9267, J9268, J9271, J9280, J9290, J9291, J9293, J9299, J9300, J9301, J9302, J9303, J9305, J9306, J9307, J9308, J9310, J9315, J9320, J9328, J9330, J9340, J9350, J9351, J9354, J9355, J9357, J9360, J9370, J9371, J9375, J9390, J9395, J9400, J9600, J9999, Q0083, Q0084, Q0085, G0355, G0357, G0358, G0359, G0360, G0361, G0362, G8372, G8373, G8374, G9021, G9022, G9023, G9024, G9025, G9026, G9027, G9028, G9029, G9030, G9031, G9032
CPT	96400, 96401, 96402, 96405, 96406, 96408, 96409, 96411, 96413, 96414, 96415, 96416, 96417, 96420, 96422, 96423, 96425, 96440, 96445, 96446, 96450, 96520, 96521, 96522, 96523, 96530, 96542, 96545, 96549
NDC Codes	Full list of codes available upon request
Hospice	
Revenue center codes	115, 125, 135, 145, 155, 235, 650, 651, 652, 655, 656, 657, 658, 659
HCPCS	G0182, Q5001, Q5002, Q5003, Q5004, Q5005, Q5006, Q5007, Q5008, Q5009, Q5010, S0271, S9126, T2042, T2043, T2044, T2045, T2046
CPT	99377, 99378
Provider type	63 (hospice)

Abbreviations: CPT, Current Procedural Terminology; ED, emergency department; HCPCS, Healthcare Common Procedure Coding System; ICD, International Classification of Diseases; ICU, intensive care unit; NDC, National Drug Codes.