


Association of Medicaid Enrollee Characteristics and Primary Care Utilization With Cancer Outcomes for the Period Spanning Medicaid Expansion in New Jersey

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BACKGROUND: Cancer outcomes for Medicaid enrollees may be affected by patients' primary care (PC) utilization and complex Medicaid enrollment dynamics, which have recently changed for many states under the Affordable Care Act. **METHODS:** With New Jersey State Cancer Registry and linked Medicaid claims data, a retrospective cohort study was conducted for patients with incident breast, colorectal, or invasive cervical cancer (aged 21-64 years) diagnosed in 2012-2014. Associations of Medicaid enrollment factors and PC utilization with the stage at diagnosis and treatment delays were examined with multivariate logistic regression models. **RESULTS:** The study included 19,209 total cancer cases and 3253 linked Medicaid cases. Medicaid cases were more likely to be diagnosed at a late stage and to experience treatment delays in comparison with non-Medicaid cases. In adjusted analyses, Medicaid cases with 1 or more PC visits before the diagnosis had lower odds of a late-stage diagnosis (odds ratio, 0.47; 95% confidence interval, 0.33-0.67) in comparison with Medicaid cases with no outpatient visits. New enrollees (<6 months) and longer term enrollees in fee-for-service (FFS) Medicaid had greater odds of a late-stage diagnosis and treatment delays in comparison with those in Medicaid managed care. **CONCLUSIONS:** Medicaid patients with cancer diagnosed just before and in the initial year of eligibility expansion had worse outcomes than non-Medicaid cases. Poor outcomes were especially pronounced among new enrollees, those without outpatient visits before their diagnosis, and FFS enrollees. Targeted strategies to enhance care continuity, including access to PC providers before the diagnosis and a better understanding of pathways to cancer care upon Medicaid enrollment, are needed to improve outcomes in this population. *Cancer* 2019;125:1330-1340. © 2018 American Cancer Society.

KEYWORDS: Affordable Care Act, breast cancer, cervical cancer, colorectal cancer, Medicaid enrollment, primary care, treatment delay.

INTRODUCTION

Cancer outcomes for Medicaid enrollees may be affected by patients' primary care (PC) utilization and complex program enrollment dynamics, which have recently changed for many states with Medicaid expansion under the Affordable Care Act (ACA). Studies of Medicare and privately insured populations show that PC utilization is associated with early-stage cancer diagnosis and better survival.¹⁻⁶ Few studies, however, have examined PC and other outpatient care utilization among Medicaid patients.^{7,8} This evidence gap is important because Medicaid covers large populations of low-income and racial/ethnic minority patients, and prior research has shown that Medicaid patients are more likely to experience worse cancer outcomes, including a late-stage diagnosis and lower survival, than non-Medicaid groups.⁹⁻¹³

The relation between Medicaid enrollment characteristics during recent years of Medicaid expansion and cancer outcomes has been underexplored. Medicaid enrollees have varying and complex social circumstances and health needs, which range from disabilities to challenges faced by low-income single parents, and these result in heterogeneous enrollment patterns and engagement with the health care system.¹⁴⁻¹⁷ Medicaid enrollment characteristics, including the length of enrollment and coverage through managed care (MC) versus fee for service (FFS), can drive cancer care delivery and outcomes for the Medicaid population.^{18,19} For example, patients with cancer with discontinuous Medicaid coverage are

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more likely to die within 1 year of cancer surgery than those with continuous enrollment.¹⁸ Furthermore, women diagnosed with breast or cervical cancer and enrolled in Medicaid through the National Breast and Cervical Cancer Early Detection Program (NBCCEDP) have more timely care and better outcomes than non-NBCCEDP participants in Medicaid.^{7,20,21} Medicaid eligibility expansions under the ACA make Medicaid one of the largest and fastest growing sources of coverage in the United States. Thus, a rising number of cancer cases will be diagnosed and treated within this system of care, and understanding enrollment patterns, care utilization, and cancer outcomes during Medicaid expansion is important for addressing cancer disparities and health policy.

Recent population-based studies have found improved cancer outcomes in Medicaid expansion states. Jemal et al²² found a slight shift toward early-stage diagnosis in Medicaid expansion states. Soni et al²³ observed that Medicaid expansion was associated with an increase in early-stage diagnoses of cancers in Surveillance, Epidemiology, and End Results regions, but there was no detectable impact on late-stage cancers. Other studies examining differences in screening and mortality rates across states suggest that outcomes are improving for populations in Medicaid expansion states,^{24,25} but these ecologic studies are limited in determining whether the persons with better cancer outcomes are the same ones that were newly enrolled in Medicaid. Therefore, the effect of Medicaid expansion on cancer outcomes and the degree to which it affects the stage at diagnosis and timely treatment are unclear.

This study used linked cancer registry and Medicaid claims data to examine how Medicaid enrollment factors during the period spanning Medicaid expansion and PC and other outpatient care utilization are associated with the cancer stage at diagnosis and treatment delays among breast, colorectal, and cervical cancer cases in New Jersey. We hypothesized that newly enrolled Medicaid beneficiaries and those with no visits to PC in the year before their cancer diagnosis would be more likely to have a late-stage cancer diagnosis and treatment delays in comparison with established Medicaid enrollees who had been in the program for a longer period before their cancer diagnosis.

MATERIALS AND METHODS

Setting, Design, and Data Sources

Using linked data from the New Jersey State Cancer Registry (NJSCR) and the New Jersey Medicaid Management Information System, which includes all FFS claims and MC encounter records statewide, we assembled

a retrospective cohort of incident breast cancer (BC; female only), colorectal cancer (CRC), and invasive cervical cancer (ICC) cases diagnosed between 2012 and 2014. New Jersey is a densely populated state with substantial racial/ethnic diversity and ranks fifth nationally in overall cancer incidence.²⁶ In 2017, 1.9 million individuals were covered by the state's Medicaid/Children's Health Insurance Program, which we will call Medicaid hereafter.

Using mainly deterministic matching techniques followed by probabilistic matching methods for cases with incomplete matching across identifiers (eg, Social Security number, date of birth, name, and address), the New Jersey Division of Medical Assistance and Health Services linked NJSCR-eligible cancer cases ($n = 19,314$) with Medicaid claims/enrollment files. The Division of Medical Assistance and Health Services provided a linked data set to investigators after removing personal identifying information. All study activities were approved by the institutional review board at the lead author's institution.

Inclusion Criteria

Eligible cases included nonelderly individuals (aged 21-64 years) with a first primary diagnosis of BC (female only), CRC, or ICC. We excluded cases diagnosed at autopsy or by death certificate, cases diagnosed with subsequent primary cancers occurring within the same time frame (2012-2014), and nonresidents of New Jersey at the time of diagnosis. We further excluded linked Medicaid cases without an eligibility file record or with a duplicate ID ($n = 440$), cases with 0 claims during the study period ($n = 163$), and cases with an unknown month of diagnosis ($n = 12$). The final analytic linked Medicaid cohort consisted of 3253 cases.

Measures

We examined late-stage diagnoses, treatment delays, and 2-year survival for all cancer cases. The diagnosis stage was defined as early (in situ or localized) or late (regional or distant).²⁷⁻²⁹ A treatment delay was defined as more than 90 days between diagnosis and treatment. Prior studies on treatment delays have designated 60-day timeliness benchmarks between the definitive diagnosis and the first treatment.^{20,30} Because only the month and year of diagnosis were available from NJSCR, we defined a treatment delay as longer than 90 days to account for uncertainty in the exact date of diagnosis within each diagnosis month. *Current Procedural Terminology* and Healthcare Common Procedure Coding System codes for treatment were used to identify the first date of treatment from Medicaid claims. Cases with a time to treatment exceeding 30 days before

the diagnosis were considered data anomalies and were excluded from the treatment delay analysis (n = 68). Two-year survival was determined from vital statistics information at the time of the NJSCR cohort selection (May 2016).

Physician office visits in the 3 to 12 months before diagnosis were determined for each individual with ambulatory-based evaluation and management *Current Procedural Terminology*/Healthcare Common Procedure Coding System codes in the New Jersey Medicaid Management Information System. Following Ferrante et al¹ (2011), we excluded visits within the 3 months before the diagnosis to omit visits potentially related to diagnostic follow-up or associated with abnormal screening results. The physician specialty for each outpatient visit was categorized as PC (general practice, family medicine, internal medicine, obstetric/gynecological, women's health, or community clinic) or other specialty care (SPC). A composite measure of outpatient visits and physicians was created because more than 30% of the office visits in our analytic sample were to non-PC specialties (eg, cardiology, surgery, and gastroenterology). Categories for the composite measure included the following: no visits, 1 or more office visits to PC only, 1 or more office visits to SPC only, and 2 or more visits to a PC/SPC mix.

Medicaid enrollment characteristics, including the eligibility category, length of enrollment before the diagnosis, continuous enrollment (defined as no gaps longer than 30 days in the prediagnosis year), and MC plan enrollment, were obtained from monthly enrollment and claims files. New Jersey's adult Medicaid beneficiaries are enrolled according to the following eligibility criteria: 1) NJ FamilyCare, which covers parents and caretakers of children up to 200% of the Federal Poverty Level (FPL); 2) low-income aged, blind, and disabled (ABD) individuals, including higher income individuals who become eligible when they have exhausted their resources because of medical expenses (n = 5); and 3) general assistance (GA), which covers childless adults below 24% of the FPL. After the ACA Medicaid expansion in New Jersey (January 1, 2014), the GA category was administratively merged with the expansion category, and it now includes individuals up to 138% of the FPL. We categorized the MC status for the majority of days in the prediagnosis year as enrollment in FFS only, MC only, or a combination of FFS and MC or as new enrollment in Medicaid (less than 6 months). The New Jersey Medicaid program considers those enrolled for less than 6 months to be new enrollees because it can take anywhere from 60 to 180 days to become fully enrolled in a Medicaid health maintenance organization.

We identified cases enrolled in Medicaid through the New Jersey Cancer Education and Early Detection (NJCEED) program, the state's screening program, funded in part by the NBCCEDP, for low-income ($\leq 250\%$ of the FPL) uninsured/underinsured individuals. NJCEED provides comprehensive screening services for BC, cervical cancer, prostate cancer, and CRC, including education, outreach, screening, case management, and follow-up.³¹ NJCEED participants diagnosed with BC and cervical cancer are provided access to treatment through Medicaid via the Breast and Cervical Cancer Prevention and Treatment Act.³²

Demographic information, including race/ethnicity, age at diagnosis, sex, and year of diagnosis, were obtained from NJSCR. We used *International Classification of Diseases, Ninth Revision*, codes in all Medicaid claims for the period before diagnosis for each cancer patient to construct the Charlson Comorbidity Index, excluding cancer as a condition, similarly to other studies using claims data.^{33,34} We conducted a sensitivity analysis to confirm that the bivariate relationship between number of comorbidities and the 2 outcomes of interest (late-stage diagnoses and treatment delays) remained consistent after accounting for the enrollment length before diagnosis.

Statistical Analysis

We used chi-square and Fisher exact tests to compare the stage of diagnosis, survival, and other tumor and demographic factors among longer term/established Medicaid cases (enrolled 6 months or longer), newly enrolled Medicaid cases (enrolled less than 6 months), and non-Medicaid cases. We plotted survival curves to illustrate differences in the study cohorts at different time points after diagnosis. We then examined the association of outpatient visits and Medicaid enrollment factors with 2 outcomes of interest for the Medicaid population (late-stage diagnoses and treatment delays) via multivariate logistic regression models. Model specifications were based on significant relations observed in bivariate analyses and prior literature. We conducted a sensitivity analysis using random effects models to account for county-level effects for late-stage diagnoses and treatment delays. However, random effects were not significant in these analyses and are not presented in this article. We also estimated cancer site-specific models for each outcome. All analyses were conducted with Stata 15 (StataCorp, College Station, Texas), which was used to calculate 95% confidence intervals (CIs) and 2-sided statistical tests at the 5% significance level.

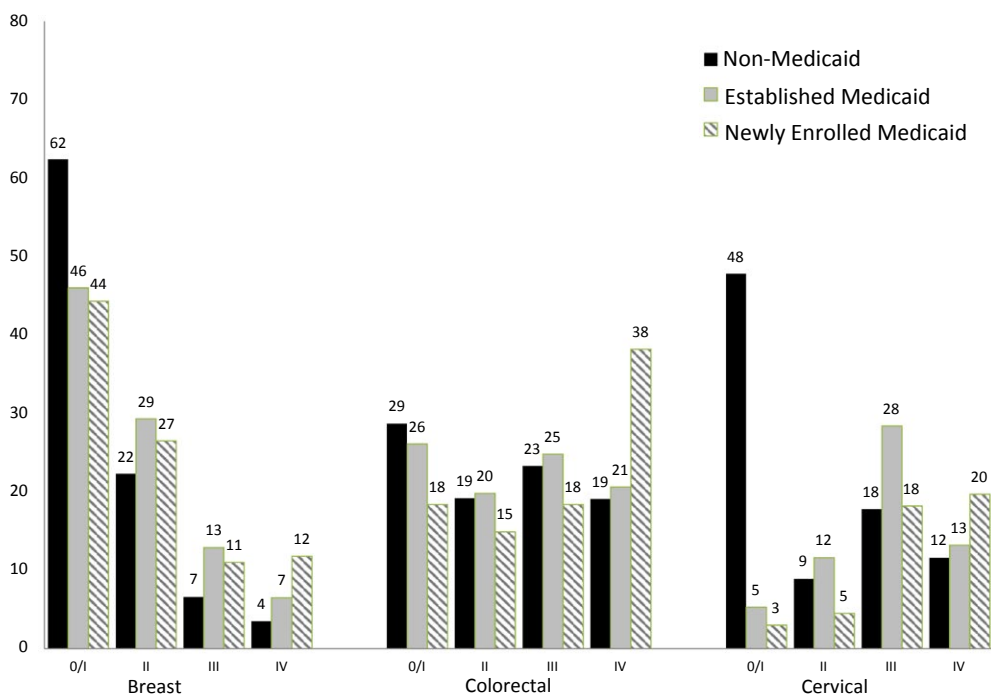


Figure 1. Stage at diagnosis by Medicaid enrollment status among breast, colorectal, and cervical cancer cases diagnosed in 2012-2014 (unadjusted analyses) in the New Jersey State Cancer Registry. There is an inverse relationship between Medicaid coverage (non-Medicaid compared to Medicaid/newly Medicaid enrolled) and stage at diagnosis. Therefore, there is a lower proportion of Medicaid patients with an early-stage diagnosis across all 3 cancer types, and there is an increasing proportion of Medicaid patients with late-stage disease for each cancer type.

RESULTS

A total of 19,209 nonelderly patients with new BC, ICC, or CRC were diagnosed between 2012 and 2014 and were eligible for study inclusion. Of the 3253 cancer cases linked to Medicaid claims, 819 were newly enrolled in Medicaid. For all cancer sites, significantly higher proportions of Medicaid cases and especially newly enrolled Medicaid cases were diagnosed with late-stage cancer in comparison with non-Medicaid cases (BC, 20% and 23% vs 11%, $P < .001$; CRC, 46% and 56% vs 42%, $P = .025$; ICC, 41% and 38% vs 30%, $P < .001$; Fig. 1). Late-stage diagnoses of BC and CRC were more frequent among newly enrolled Medicaid cases than non-Medicaid cases and established Medicaid cases (Fig. 1). Newly enrolled Medicaid cases had the lowest 2-year survival in comparison with established Medicaid cases and non-Medicaid cases ($P < .001$ for all curves; Fig. 2). Medicaid patients with cancer were more likely to be diagnosed at a younger age, to be female, and to be of a minority race/ethnicity (Table 1). Nearly half of the patients with cancer (49%) in the linked cohort were African American or Hispanic.

Table 2 shows the Medicaid enrollment characteristics and physician outpatient visits among cases in the

NJSCR-Medicaid cohort. Nearly 40% of the cases were enrolled for 1 month or less in the year before diagnosis. Few cases (3.4%) had gaps in Medicaid enrollment in the year before diagnosis, regardless of whether the length of enrollment was a full year (>11 months) or less than a full year. Approximately 16% of BC patients and 7% of ICC patients were flagged as being enrolled via the NJCEED program on the basis of monthly enrollment file indicators (Table 2). The majority of NJCEED participants overlapped with the ABD category (96%) in the aggregated enrollment files for the diagnosis year, and a smaller proportion of NJCEED enrollees overlapped with the NJ FamilyCare or GA categories (2% each; data not shown). Only 13% of the Medicaid cases had 1 or more outpatient visits before the diagnosis. Less than one-third of the cases were in MC for the majority of enrollment days in the prediagnosis year.

Patients with cancer who were enrolled in Medicaid MC had the lowest proportion of late-stage cancer diagnoses (39.5%) in comparison with the newly enrolled patients (<6 months; 53.2%) and those enrolled in FFS (54.9%; $P < .001$; Table 2). Cancer cases enrolled in Medicaid for 1 month or less before their diagnosis had the highest proportion of late-stage diagnoses (57.5%)

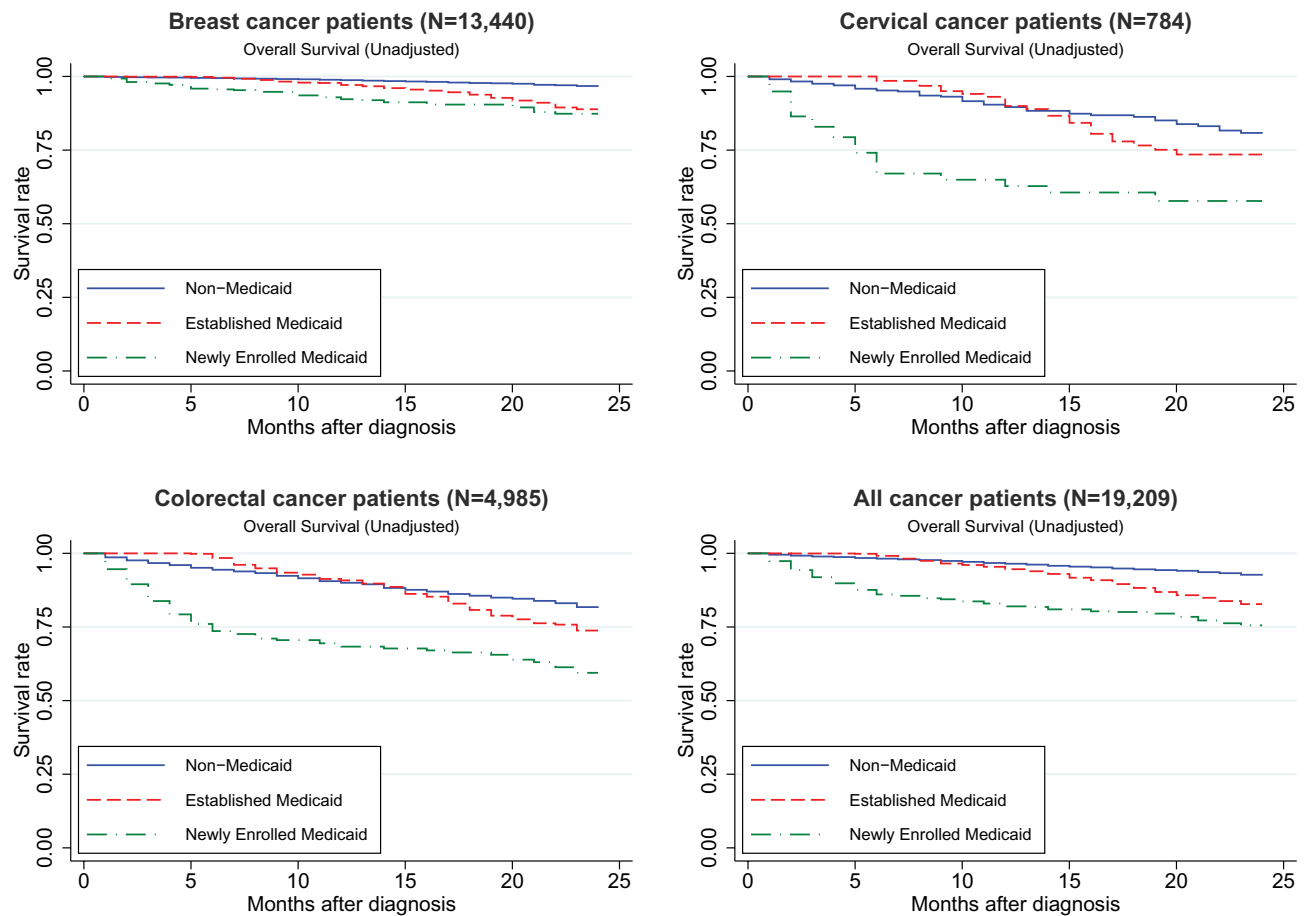


Figure 2. Two-year survival by Medicaid enrollment status among breast, colorectal, and cervical cancer cases diagnosed in 2012-2014 (unadjusted analyses) in the New Jersey State Cancer Registry.

and treatment delays (76.3%). We also observed higher proportions of late-stage diagnoses among Medicaid cases with no outpatient visits before the diagnosis (51.1%) in comparison with cases with 1 or more PC (33.0%) or SPC visits (37.8%; differences significant at $P < .001$).

In multivariate models for all cancer sites combined, Medicaid cases with 1 or more outpatient visits to a PC provider had half the odds of a late-stage diagnosis in comparison with Medicaid cases with no visits after adjustments for other factors described previously (Table 3). Cases with visits to a PC/SPC mix had 40% lower odds of a late-stage diagnosis. FFS (odds ratio [OR], 1.75; 95% CI, 1.32-2.31), mixed FFS/MC (OR, 1.71; 95% CI, 1.39-2.11), and newly enrolled cases (OR, 1.85; 95% CI, 1.49-2.30) had significantly higher odds of a late-stage diagnosis in comparison with those in MC. Similar relations were observed in the site-specific models with only a few exceptions. For example, PC visits, but not SPC visits, were significantly associated with lower odds of late-stage

BC and ICC. Although FFS and being newly enrolled in Medicaid were significantly associated with late-stage BC and CRC, these categories were not associated with late-stage ICC. In addition, being diagnosed in 2014 was significantly associated with a late stage for CRC (Table 3). In models stratified by eligibility category (ABD enrollees only, NJ FamilyCare only, and GA/expansion only), we observed the relation between 1 or more outpatient visits to a PC provider and a late-stage diagnosis to be consistent for all models (output not shown).

In all combined and cancer site-specific models, FFS enrollees (OR, 2.19; 95% CI, 1.60-2.99) and new enrollees (OR, 4.90; 95% CI, 3.75-6.39) had significantly higher odds for treatment delays in comparison with Medicaid cases enrolled in MC (Table 4). The relation with visits to PC only or SPC only before diagnosis was not significant in the adjusted models. In contrast, cases with 1 or more visits to a mix of PC/SPC providers had increased odds of having treatment delays in comparison with those with no

TABLE 1. Demographic and Tumor Characteristics by Medicaid Enrollment Status Among Breast, Cervical, and Colorectal Cancer Cases Diagnosed in 2012-2014

	All Cases*		Established Medicaid		Newly Enrolled Medicaid		Non-Medicaid	
	No.	%	No.	%	No.	%	No.	%
All Cases	19,209	100.0	2422	12.6	819	4.3	15,969	83.1
Clinical								
Cancer site								
Breast	13,440	70.0	1455	60.1	465	56.8	11,521	72.1
Cervical	784	4.1	190	7.8	66	8.1	528	3.3
Colorectal	4985	26.0	777	32.1	288	35.2	3920	24.5
Summary stage								
In situ/localized	11,792	61.4	1240	51.2	368	44.9	10,185	63.8
Regional	4745	24.7	782	32.3	228	27.8	3735	23.4
Distant	1775	9.2	308	12.7	186	22.7	1281	8.0
Unknown	897	4.7	92	3.8	37	4.5	768	4.8
Time to treatment								
≤90 d	14,067	73.2	1659	68.5	548	66.9	11,860	74.3
>90 d	3406	17.7	213	8.8	113	13.8	2698	16.9
Survival, mean (SD), d	454.6 (309.6)		426.6 (285.0)		452.8 (320.5)		459.1 (312.5)	
Demographic								
Age at diagnosis								
<40 y	1591	8.3	277	11.4	91	11.1	1223	7.7
40-49 y	5307	27.6	692	28.6	218	26.6	4397	27.5
50-59 y	7724	40.2	1004	41.5	341	41.6	6379	40.0
60-64 y	4587	20.6	449	18.5	169	20.6	3969	24.9
Race/ethnicity								
Hispanic	2234	11.6	549	22.7	177	21.6	1509	9.4
NH white	12,467	64.9	990	40.9	372	45.4	11,105	69.5
NH black	2553	13.3	684	28.2	198	24.2	1671	10.5
NH API	1185	6.2	98	4.0	38	4.6	1049	6.6
Other/unknown	770	4.0	101	4.2	34	4.2	635	4.0
Sex								
Male	2732	14.2	405	16.7	155	18.9	2172	13.6
Female	16,477	85.8	2017	83.3	664	81.1	13,797	86.4

Abbreviations: API, Asian/Pacific Islander; NH, non-Hispanic; SD, standard deviation.

*A small number of cases (<10) are missing or unknown for some subgroups. N's for subcategories for each variable may not add to the total n.

P was <.001 for all comparisons according to chi-square tests for categorical variables and *t* tests for a continuous variable (survival in days).

outpatient visits (OR, 1.8; 95% CI, 1.12-2.86) in the adjusted model with all sites combined. These relations were also observed in the model for BC cases only but not in the models for CRC and ICC cases. In models stratified by Medicaid eligibility category (ABD, NJ FamilyCare, and GA), the relation between 1 or more outpatient visits to a PC provider and treatment delays was significant only among NJ FamilyCare enrollees.

DISCUSSION

Our findings indicate that Medicaid enrollees diagnosed with BC, CRC, or ICC just before and in the first year of Medicaid expansion are significantly more likely to have late-stage disease and lower 2-year survival in comparison with corresponding non-Medicaid cases diagnosed in the same years. These findings are consistent with previously published studies on disparities in cancer outcomes

by insurance status.^{11,13,35-37} Similarly to recent studies on treatment delays, we did not observe significant differences between the years before and after the first year of expansion.³⁸ However, although recent national studies have observed increases in early-stage cancer diagnoses among patients in expansion states versus nonexpansion states,^{22,23} we found greater odds of a late-stage diagnosis among CRC cases in the Medicaid expansion year (2014) in comparison with cases diagnosed in the pre-expansion years (2012-2013). This difference may be due to variations in demographic and other unmeasured characteristics across states. Unlike BC and ICC cases diagnosed through the NJCEED program, CRC cases diagnosed through NJCEED are not eligible for medical assistance through Medicaid under the Breast and Cervical Cancer Prevention and Treatment Act of 2000, and this may lead to a lower proportion of early-stage cases among new enrollees.

TABLE 2. Medicaid Enrollment Characteristics and Primary Care Utilization of New Jersey State Cancer Registry–Medicaid Linked Breast, Cervical, and Colorectal Cancer Cases Diagnosed in 2012–2014

	Distribution of Medicaid Cases*		Medicaid Cases With Late-Stage Diagnosis			Medicaid Cases With Treatment Delay		
	No.	%	No.	%	<i>P</i>	No.	%	<i>P</i>
Total	3185	100.0	1495	48.3		1891	59.4	
Cancer site								
Breast	1899	59.6	752	40.5	<.001	1160	61.1	.011
Cervical	254	8.0	132	56.4		157	61.8	
Colorectal	1032	32.4	611	62.7		574	55.6	
Diagnosis year								
2012	972	30.5	437	46.7	.018	750	77.2	<.001
2013	1164	36.5	584	52.2		800	68.7	
2014	1049	32.9	474	47.0		341	32.5	
Comorbidities ^a								
0	2662	83.6	1272	49.6	.107	1726	64.8	<.001
1	301	9.5	129	44.9		95	31.6	
≥2	222	6.9	94	43.9		70	31.5	
Medicaid eligibility								
GA/expansion	965	30.3	452	30.2	<.001	596	31.5	.201
ABD	1353	42.5	707	47.3		776	41.0	
NJ FamilyCare	850	26.7	330	22.1		510	27.0	
Prediagnosis year								
Enrollment length								
≥11 mo	1131	35.5	448	41.5	<.001	587	51.9	<.001
6 to <11 mo	288	16.0	109	39.9		134	46.5	
1 to <6 mo	510	9.0	235	48.1		212	41.6	
<1 mo	1256	39.4	703	57.5		958	76.3	
Continuous coverage								
Yes	2173	96.6	964	46.3	.856	1020	46.9	.452
No	76	3.4	33	45.2		39	51.3	
Enrolled via NJCEED								
Yes	324	10.2	147	45.9	.278	149	46.0	<.001
No	2861	89.8	1348	49.1		1742	60.9	
MC enrollment ^b								
Newly enrolled (<6 mo)	826	25.9	420	53.2	<.001	683	82.7	<.001
FFS only	375	11.8	200	54.9		260	69.3	
MC only	876	27.5	331	39.5		449	51.3	
FFS/MC mix	1108	34.8	544	50.8		499	45.0	
Outpatient visits ^c								
0	2800	87.9	1375	51.1	<.001	1748	62.4	<.001
≥1 to PC only	188	5.9	59	33.0		68	36.2	
≥1 to SPC only	77	2.4	28	37.8		24	31.2	
≥2 to PC/SPC mix	120	3.8	33	28.2		51	42.5	

Abbreviations: ABD, aged, blind, and disabled; FFS, fee for service; GA, general assistance; MC, managed care; NJCEED, New Jersey Cancer Education and Early Detection; PC, primary care; SPC, specialty care.

*A small number of cases (<10) are missing or unknown for some subgroups. N's for subcategories for each variable may not add to the total n.

^aComorbidities were calculated with the Charlson Comorbidity Index, which excluded cancer.

^bMC enrollment versus FFS enrollment was based on the most days enrolled in each category in the 12 months before the diagnosis.

^cOutpatient visits were limited to the 3 to 12 months before the cancer diagnosis.

Importantly, we observed that newly enrolled Medicaid patients with cancer had higher odds of late-stage disease and treatment delays than longer term enrollees in MC. These findings stress the need to better understand the pathways of cancer care upon Medicaid enrollment and the need to connect newly enrolled patients with cancer to providers and care management services to prevent delays in treatment initiation. Surprisingly, we also found that less than 30% of our Medicaid cohort was enrolled in MC in

the prediagnosis year. In our Medicaid claims/encounter data overall (ie, not restricted to cancer cases), more than 90% of the enrollees are in an MC plan, and this is consistent with official reports from the New Jersey Department of Human Services.³⁹ Since 1980, MC enrollment has been mandatory for most New Jersey Medicaid beneficiaries with exceptions for certain groups such as those receiving services for long-term care or behavioral health. Since July 2014, MC enrollment has been mandatory for the exempted

TABLE 3. Bivariate and Multivariate Models for Late-Stage Diagnosis Among Medicaid Patients With Cancer Diagnosed in 2012-2014.

	All Sites				Breast (n = 1855):		Colorectal (n = 974):		Cervical (n = 234):	
	Bivariate		Multivariate		Multivariate		Multivariate		Multivariate	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Outpatient visits										
0	1.00		1.00		1.00		1.00		1.00	
≥1 to PC only	0.47	0.34-0.66	0.47	0.33-0.67	0.43	0.25-0.72	0.57	0.32-1.03	0.21	0.06-0.76
≥1 to SPC only	0.56	0.36-0.94	0.57	0.34-0.94	0.65	0.32-1.31	0.50	0.22-1.12	0.19	0.02-2.61
≥2 to PC/SPC	0.37	0.25-0.57	0.40	0.26-0.64	0.43	0.22-0.83	0.31	0.16-0.64	1.22	0.16-9.30
MC enrollment										
MC only	1.00		1.00		1.00		1.00		1.00	
FFS only	2.05	1.62-2.59	1.75	1.32-2.31	1.64	1.13-2.38	2.17	1.36-3.45	1.55	0.35-6.78
FFS/MC mix	1.61	1.35-1.92	1.71	1.39-2.11	1.73	1.31-2.29	1.76	1.22-2.54	1.61	0.73-3.56
Newly enrolled	1.54	1.25-1.90	1.85	1.49-2.30	1.75	1.31-2.34	2.49	1.70-3.68	0.85	0.37-1.94
Eligibility category										
ABD	1.00		1.00		1.00		1.00		1.00	
GA/expansion	0.82	0.69-0.97	0.64	0.52-0.79	0.56	0.42-0.74	0.67	0.78-0.94	0.83	0.32-2.17
NJ FamilyCare	0.60	0.50-0.71	0.70	0.56-0.88	0.63	0.47-0.84	0.85	0.55-1.29	0.73	0.31-1.74
Enrolled via NJCEED										
No	1.00		1.00		1.00		—	—	1.00	
Yes	0.87	0.69-1.10	0.75	0.57-0.99	0.67	0.48-0.92	—	—	0.99	0.25-3.92
Diagnosis year										
2012-2013	1.00		1.00		1.00		1.00		1.00	
2014	0.90	0.77-1.04	1.18	0.99-1.42	0.89	0.71-1.12	2.02	1.41-2.86	1.48	0.67-3.24
Race/ethnicity										
NH white	1.00		1.00		1.00		1.00		1.00	
Hispanic	0.80	0.66-0.96	0.84	0.69-1.02	0.95	0.74-1.22	0.65	0.41-0.92	0.84	0.39-1.84
NH black	1.14	0.96-1.35	1.17	0.98-1.40	1.34	1.06-1.71	0.88	0.63-1.21	0.84	0.38-1.83
NH API	1.05	0.73-1.50	1.11	0.76-1.61	1.06	0.68-1.69	1.87	0.82-4.28	0.10	0.01-0.99
Other/unknown	0.62	0.42-0.92	0.67	0.44-1.02	0.92	0.55-1.53	0.45	0.20-1.03	0.14	0.03-0.75
Age at diagnosis										
<40 y	0.81	0.62-1.05	0.93	0.69-1.27	1.00		1.00		1.00	
40-49 y	0.73	0.59-0.89	0.91	0.72-1.15	1.55	1.02-2.33	0.79	0.45-1.37	0.06	0.01-0.25
50-59 y	0.92	0.76-1.12	0.99	0.80-1.22	1.11	0.82-1.51	0.85	0.54-1.31	0.09	0.02-0.36
60-65 y	1.00		1.00		1.08	0.82-1.43	0.97	0.68-1.39	0.25	0.07-0.95
Comorbidities										
0	1.00		1.00		1.00		1.00		1.00	
1	0.83	0.65-1.05	0.86	0.65-1.13	0.95	0.65-1.39	0.80	0.50-1.26	0.60	0.23-1.60
≥2	0.79	0.60-1.05	0.84	0.60-1.17	0.82	0.49-1.34	0.76	0.46-1.25	1.35	0.22-8.34
Cancer site										
Breast	1.00		1.00		—	—	—	—	—	—
Colorectal	1.89	1.44-2.49	2.41	2.02-2.86	—	—	—	—	—	—
Cervical	2.46	2.10-2.89	2.08	1.56-2.78	—	—	—	—	—	—

Abbreviations: ABD, aged, blind, and disabled; API, Asian or Pacific Islander; CI, confidence interval; FFS, fee for service; GA, general assistance; MC, managed care; NH, non-Hispanic; NJCEED, New Jersey Cancer Education and Early Detection; OR, odds ratio; PC, primary care; SPC, specialty care. Bolded values indicate significance at $P < .05$.

groups specified previously.³⁹ New Jersey Medicaid MC plans receive risk-adjusted per-member per-month payments from the state to cover the costs of care (including cancer diagnosis and treatment) for their enrollees, although some services (eg, abortion and certain psychiatric procedures) remain covered under Medicaid FFS. Plans also receive additional payments to support state policy goals such as expanding networks of PC providers. Although it can take new enrollees up to 6 months to enroll in an MC plan, we found low MC enrollment to be common even among established Medicaid cancer cases with more than 6 months

of Medicaid coverage before diagnosis. In our sensitivity analyses, we did not find FFS cases to be composed of only NJCEED enrollees or medically needy individuals, and this suggests that further analysis is needed to understand how the unique enrollment characteristics of Medicaid patients with cancer interact with the complexities of Medicaid eligibility. Comparisons with enrollment processes in other states among patients with cancer are warranted and would inform whether there are systematic barriers to care for this population during the enrollment process at the broader level.

TABLE 4. Bivariate and Multivariate Models for Treatment Delays Among Medicaid Patients With Cancer Diagnosed in 2012-2014

	All Sites				Breast (n = 1855): Multivariate		Colorectal (n = 974): Multivariate		Cervical (n = 234): Multivariate	
	Bivariate		Multivariate		OR	95% CI	OR	95% CI	OR	95% CI
	OR	95% CI	OR	95% CI						
Outpatient visits										
0	1.00		1.00		1.00		1.00		1.00	
≥1 to PC only	0.34	0.25-0.46	0.84	0.57-1.22	1.17	0.71-1.94	0.55	0.26-1.15	0.53	0.16-1.78
≥1 to SPC only	0.27	0.16-0.44	0.63	0.35-1.11	0.56	0.25-1.26	0.58	0.22-1.56	1.38	0.07-26.9
≥2 to PC/SPC	0.44	0.31-0.64	1.80	1.12-2.86	2.67	1.44-4.93	1.25	0.55-2.82	0.49	0.06-4.01
MC enrollment										
MC only	1.00		1.00		1.00		1.00		1.00	
FFS only	2.14	1.69-2.72	2.19	1.60-2.99	2.45	1.61-3.75	1.65	1.00-2.75	5.76	1.16-28.6
FFS/MC mix	0.86	0.72-1.01	1.07	0.86-1.34	1.28	0.96-1.73	0.78	0.52-1.18	0.97	0.44-2.15
Newly enrolled	7.12	5.39-9.40	4.90	3.75-6.39	8.79	5.91-13.1	3.02	1.94-4.71	2.47	1.00-6.15
Eligibility category										
ABD	1.00		1.00		1.00		1.00		1.00	
GA/expansion	1.20	1.02-1.42	1.33	1.05-1.69	1.24	0.88-1.76	1.43	0.97-2.11	1.91	0.70-5.19
NJ FamilyCare	1.12	0.94-1.33	0.92	0.71-1.17	0.80	0.58-1.11	1.03	0.65-1.65	1.38	0.54-3.53
Enrolled via NJCEED										
No	1.00		1.00		1.00		–		1.00	
Yes	0.55	0.43-0.68	0.34	0.25-0.46	0.31	0.22-0.45	–	–	0.46	0.13-1.58
Diagnosis year										
2012-2013	1.00		1.00		1.00		1.00		1.00	
2014	0.18	0.16-0.21	0.20	0.16-0.25	0.22	0.17-0.29	0.15	0.10-0.22	0.18	0.08-0.39
Race/ethnicity										
NH white	1.00		1.00		1.00		1.00		1.00	
Hispanic	0.95	0.79-1.14	0.90	0.72-1.12	0.83	0.63-1.10	0.71	0.47-1.06	2.31	0.99-5.36
NH black	0.97	0.81-1.16	1.11	0.90-1.37	1.09	0.82-1.43	1.15	0.80-1.66	1.07	0.49-2.31
NH API	0.92	0.64-1.32	0.90	0.60-1.38	0.65	0.38-1.09	2.16	0.91-5.10	1.72	0.14-20.0
Other/unknown	1.24	0.86-1.81	1.30	0.81-2.08	1.14	0.63-2.07	1.55	0.57-4.23	1.47	0.33-6.50
Age at diagnosis										
<40 y	1.22	0.94-1.59	1.10	0.78-1.53	1.00		1.00		1.00	
40-49 y	1.25	1.01-1.54	1.24	0.95-1.63	0.77	0.48-1.24	1.19	0.65-2.18	2.36	0.70-8.00
50-59 y	1.29	1.06-1.57	1.30	1.03-1.65	1.27	0.89-1.82	1.03	0.64-1.66	1.85	0.62-5.51
60-65 y	1.00		1.00		1.32	0.95-1.82	1.16	0.77-1.67	2.18	0.80-5.90
Comorbidities										
0	1.00		1.00		1.00		1.00		1.00	
1	0.25	0.19-0.32	0.35	0.26-0.48	0.31	0.20-0.47	0.30	0.18-0.52	0.87	0.34-2.24
≥2	0.24	0.19-0.34	0.32	0.22-0.47	0.24	0.14-0.41	0.39	0.22-0.69	0.92	0.15-5.44
Late-stage diagnosis										
No	1.00		1.00		1.00		1.00		1.00	
Yes	0.89	0.77-1.02	0.75	0.63-0.89	1.06	0.85-1.33	0.47	0.33-0.65	0.40	0.20-0.83
Cancer site										
Breast	1.00		1.00		–	–	–	–	–	–
Colorectal	0.80	0.68-0.93	0.62	0.50-0.75	–	–	–	–	–	–
Cervical	1.03	0.79-1.34	0.96	0.69-1.33	–	–	–	–	–	–

Abbreviations: ABD, aged, blind, and disabled; API, Asian or Pacific Islander; CI, confidence interval; FFS, fee for service; GA, general assistance; MC, managed care; NH, non-Hispanic; NJCEED, New Jersey Cancer Education and Early Detection; OR, odds ratio; PC, primary care; SPC, specialty care. Bolded values indicate significance at $P < .05$.

Our findings highlight the importance of outpatient utilization and Medicaid enrollment factors to cancer outcomes. We found that patients who saw a PC provider alone or in conjunction with an SPC physician were least likely to have a late-stage diagnosis. This is consistent with findings from prior work in the Medicare population.^{2,5} Early and improved access to PC providers among Medicaid patients is necessary for

improved cancer outcomes in vulnerable populations. Improving PC access depends heavily on adequate physician reimbursement, which is generally low in most state Medicaid programs.^{40,41} Value-based system- and practice-level initiatives to improve care and speed the adoption of best practices are gaining momentum within state Medicaid programs.^{42,43} Newly emerging Medicaid accountable care organizations and the implementation of

patient-centered medical home models may also provide increased access to PC and SPC for Medicaid patients with cancer.^{22–24,44,45} Interestingly, we did not find a consistent association between PC visits before the diagnosis and treatment delays except for the NJ FamilyCare subgroup. Further exploration of health system, provider, and Medicaid enrollee–specific factors that contribute to treatment delays are needed.

This study is one of the few to examine longitudinal patterns of care and cancer outcomes among Medicaid patients during the period spanning New Jersey Medicaid expansion. However, some limitations should be noted. First, we had a large proportion of cases enrolled in Medicaid only in the month of or shortly before diagnosis, and this limited our ability to examine outpatient care received in the full year before the diagnosis. This also limited our ability to assess the receipt of screening services and to calculate the Charlson Comorbidity Index with consistent enrollment lengths before diagnosis. Second, although our data linkage provides timely information relevant to larger changes in the Medicaid program, longitudinal data were limited to the 1 year before diagnosis for cases diagnosed in 2012 and to less than 1 year after the diagnosis for those diagnosed in 2014. Further analyses with more years of postexpansion data would strengthen the analysis of the complex care patterns of this population. Lastly, our study focused on Medicaid enrollees in 1 state, albeit a state with a large population with significant racial/ethnic diversity, and it did not include health care utilization data for non-Medicaid cases. Future studies comparing health care encounter and claims data between Medicaid and non-Medicaid patients with cancer are needed.

Evidence from pre-ACA Medicaid policy changes in other states, including Tennessee (2005 eligibility reduction) and Oregon (2011–2013 expansion lottery), as well as recent emerging literature indicates the significant impact that Medicaid coverage has on increasing cancer screening utilization and reducing late-stage diagnoses for vulnerable populations.^{22,23,46,47} Our findings add to this literature by providing guidance for targeted strategies, including promoting early PC access, the need to better understand pathways to MC enrollment for patients with cancer, and necessary partnerships with comprehensive cancer education and screening programs to reduce late-stage cancer diagnoses and treatment delays. These strategies can be incorporated into ongoing care improvement efforts within current Medicaid delivery system innovations, particularly for those newly enrolled in Medicaid.

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CONFLICT OF INTEREST DISCLOSURES

The authors made no disclosures.

AUTHOR CONTRIBUTIONS

Jennifer Tsui: Conceptualization and methodology, data curation and formal analysis, resources, writing—original draft, writing—review and editing, supervision, and funding acquisition. **Derek DeLia:** Conceptualization and methodology, data curation and formal analysis, resources, writing—original draft, writing—review and editing, supervision, and funding acquisition. **Antoinette M. Stroup:** Conceptualization and methodology, resources, writing—review and editing, supervision, and funding acquisition. **Jose Nova:** Data curation and formal analysis and writing—review and editing. **Aishwarya Kulkarni:** Data curation and formal analysis and writing—review and editing. **Jeanne M. Ferrante:** Conceptualization and methodology and writing—review and editing. **Joel C. Cantor:** Conceptualization and methodology, resources, writing—review and editing, supervision, and funding acquisition.

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