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The Association Between the Affordable Care Act and Insurance Status, Stage and Treatment in Patients with Testicular Cancer

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Abstract

Purpose—We aimed to determine whether insurance expansions implemented through the Affordable Care Act (ACA) were associated with changes in coverage status, disease stage, and treatment of younger adults with testicular germ cell tumors (GCT).

Materials and Methods—We identified men aged 18–64 diagnosed with testicular GCTs between 2010 and 2015 in the National Cancer Data Base. We defined time periods as: pre-ACA (2010–2013) and post-ACA (2014–2015) and used difference-in-differences (DID) modeling to examine associations between state Medicaid expansion status and changes in insurance, stage at diagnosis, and treatment.

Results—Following the ACA, the proportion of patients with any health insurance increased 3.7% (95% CI 3–4.5) in Medicaid expansion states and 3.0% (95% CI 1.5–4.5) in non-expansion states, mainly by gaining Medicaid and private insurance, respectively. The largest increases occurred in low-income patients, where Medicaid expansion was associated with an adjusted increase of 14.5 percentage points (95% CI 7.2–21.8) in Medicaid coverage following the ACA. We did not observe reductions in late-stage diagnoses during the observation period. Changes in the proportion of patients receiving chemotherapy or radiation for advanced-stage cancers were ongoing prior to the ACA and differed between expansion and non-expansion states, limiting assessment of ACA-related effects on individual treatments.

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Conclusions—Post-ACA, the proportion of newly diagnosed testicular cancer patients with health insurance increased, with the largest effects seen among lowest income individuals. Our findings that changes in practice preceded the ACA and differed by expansion status highlight the need for caution in assessing the legislation's impact.

Keywords

Affordable Care Act; Testicular Cancer; Uninsurance; Medicaid Expansion

Introduction

In 2014, key provisions of the Affordable Care Act (ACA) were implemented that led to substantial increases in insurance coverage for Americans.[1–3] These included expansion of Medicaid coverage to adults in families with income up to 138% of the federal poverty guideline (FPG) in 24 states and Washington, D.C., the establishment of insurance marketplaces, and the institution of an individual mandate. As a result of historically high uninsured rates and the targeting of the ACA coverage provisions, younger adults aged 19–34 experienced the greatest increase in insurance coverage of any age group.[1] Thus, the rollout of the ACA was expected to have a favorable impact on cancer care for younger adults. [4, 5]

Testicular cancer is primarily diagnosed in younger males, with highest incidence between the ages of 15–44 years.[6, 7] With the availability of highly effective treatment, approximately 95% will experience long-term survival. Prior studies have shown that insurance status is an important determinant of disease stage, treatment, and outcomes for men with testicular germ cell tumors (GCT)[8–11] Recent analyses suggest that early implementation of ACA-related Medicaid expansions led to a small shift towards early-stage diagnosis of some common cancers,[13,14] though investigation of such shifts in cancers most common among younger patients, such as testicular cancer, remains limited.[15,16] Therefore, we evaluated how Medicaid expansion associated with the ACA impacted insurance status, clinical stage at diagnosis, and initial treatment of men newly diagnosed with testicular GCTs.

Methods

Data

We used data from the National Cancer Data Base (NCDB), a hospital-based registry database of Commission on Cancer (CoC)-accredited hospitals, representing more than 70% of newly diagnosed cancer cases in the U.S. We accessed a version of the dataset which included state-specific geographic identifiers, as well as other contextual measures linked to the NCDB based on year and zip code. State Medicaid expansion status was obtained from the Kaiser Family Foundation.[17] Metropolitan designation was derived from the 2013 U.S. Department of Agriculture Economic Research Service as reported through NCDB. Median income and high school education were derived from the 2012 American Community Survey data as reported through NCDB.

Sample Selection

Our sample included men aged 18–64 who were diagnosed with testicular GCTs (based on histology codes relevant to seminoma and non-seminoma) from 2010 through 2015. The inclusion and exclusion criteria are displayed in Figure 1.

Outcomes

The primary outcome was insurance status at diagnosis, classified as follows: uninsured, Medicaid, private, and other (including Medicare or other government). We also evaluated changes in the proportion of patients with advanced-stage disease at diagnosis (clinical stage ≥II) and any treatment for advanced-stage disease (defined as chemotherapy, radiation therapy, or retroperitoneal lymph node dissection [RPLND]) as secondary outcomes.[15]

Key Covariates

Patient clinical and demographic characteristics and diagnosis year were extracted from the NCDB dataset, including age, race/ethnicity, median family income, education, residence, facility type, and histology (seminoma and non-seminoma). Median family income linked at the zip code level was converted to percent FPG by assuming a family size of four and applying poverty thresholds. We stratified patients into low (≤138% FPG), middle (139–400% FPG), and high-income (≥401% FPG) groups, which correspond to the qualifying levels for Medicaid eligibility or marketplace tax credits as delineated by the ACA. States that implemented Medicaid expansions before January 1, 2016 were designated as expansion states, and further classified as early (2010–2011) or late (2014–2015) expanders (Appendix Table 1).

Statistical analysis

We used chi-squared statistics to compare clinical and demographic characteristics at diagnosis between patients in Medicaid expansion and non-expansion states. We assessed trends in insurance status stratified by the Medicaid expansion status of the patient's state. We calculated the absolute percentage point change (APC) and relative percent change (RPC) for each insurance category between the pre-ACA and post-ACA periods. We used a quasi-experimental design and difference in differences (DID) modeling to examine the association between Medicaid expansion status and change in insurance coverage and other outcomes. A central assumption for DID modeling is that outcome trajectories between the "treated" and comparison groups were similar prior to the intervention (parallel trends assumption).[18] If this assumption is not met (i.e. study outcomes are changing in different ways in the treated and comparison groups prior to the intervention), use of DID approach would lead to biased estimates. Therefore, we evaluated trends in insurance, stage and treatment practices for advanced-stage GCT between Medicaid expansion and non-expansion states in the period prior to the implementation of the ACA, and applied DID modeling only if the parallel trend assumption was met.

We estimated linear probability DID models separately for each outcome. The models included an indicator for whether the state expanded Medicaid, whether the time period was after the state's expansion date, and an interaction between the two, which captures the differential effect of expansion in post-ACA. We further adjusted models for age, sex, race/

ethnicity, and FPG group. As Medicaid expansions extended insurance coverage principally to low-income individuals, we also stratified analyses by income (low income, middle income, and high income). Analyses of treatment patterns were limited to patients diagnosed before June 30, 2015 to avoid bias from lags in reporting. Analyses included early and late adopters of Medicaid expansion; however, we performed a pre-specified sensitivity analysis with the exclusion of early and late Medicaid expansion states. Analysis was performed using SAS 9.4 software (SAS Institute, Cary, NC). We used an alpha of 0.05; all statistical tests were two-sided.

Results

Of the 30,842 patients identified with newly diagnosed testicular GCT, 19,898 and 10,944 resided in Medicaid expansion and non-expansion states, respectively (Table 1). Patients with testicular GCTs living in Medicaid expansion states were more frequently white, resided in metropolitan areas, had higher income levels, higher education levels, and were more likely to be treated at academic medical facilities. Overall, 93.6% of patients with advanced-stage GCT were treated after orchiectomy, which did not differ between Medicaid expansion and non-expansion states, 93.7% versus 93.6%, respectively (P=0.90).

Trends in quarterly insurance status among patients with testicular cancer revealed diverging rates of insurance between Medicaid expansion and non-expansion states post-ACA (Figure 2). Prior to implementation, the proportion of uninsured men with testicular GCTs was lower in expansion (10.2%) compared to non-expansion states (19.2%). However, there were similar declines in uninsurance in both Medicaid expansion (APC, −3.7%; 95% CI, −4.5% to −3.0%) and non-expansion states (APC, −3.0%; 95% CI, −4.5% to −1.5%) (Table 2). As a result, adjusted DID estimates revealed no difference in uninsurance by state expansion status. Yet, increases in insurance were attributable to different mechanisms in Medicaid expansion and non-expansion states. In expansion states, coverage increases were achieved primarily through increases in Medicaid coverage, from 10.5% to 15.9% (APC, 5.5%; 95% CI 4.5% to 6.4%; RPC, 51.4%), adjusted DID 4.6; 95% CI, 3.0 to 6.2), (Table 2). In contrast, private insurance coverage decreased in expansion states, from 75.8% to 73.4% (APC, −2.4%; 95% CI, −3.6% to −1.2%; RPC, −3.2%), and increased from 70.0% to 73.7% (APC, 3.7%; 95% CI, 1.9% to 5.5%; RPC, 5.3%) in non-expansion states, (adjusted DID 3.5; 95% CI, −5.5 to −1.5; Table 2). These findings were robust to sensitivity analyses conducted with the exclusion of six states that were early adopters and five states that were late adopters of Medicaid expansion.

We further examined changes in insurance status by income level. Among low income patients, reductions in uninsurance were similar in both expansion and non-expansion states (adjusted DID, −1.4; 95% CI, −3.1 to 0.4). However, the proportion of low-income patients insured through Medicaid increased from 19.3% to 34.1% in states that expanded Medicaid, while remaining stable (12.2% to 10.7%) in non-expansion states (adjusted DID, 14.5; 95% CI, 7.2 to 21.8) (Table 2). Increases in Medicaid coverage among low-income patients were offset by declines in private insurance in expansion states (adjusted DID, −12.8; 95% CI, −22.3 to −3.3). In middle-income patients, there were significant overall reductions in uninsurance among patients in Medicaid expansion states (uninsured adjusted DID −2.4,

95% CI −4.1 to −0.7) contributed by increases in Medicaid and proportionally smaller declines in private insurance. No significant insurance changes in the two study periods between expansion and non-expansion states were observed for high-income patients.

We did not detect differences in the proportion of men with advanced-stage testicular GCTs overall, or among low and middle-income patients. There was an isolated increase in the proportion of patients with advanced-stage disease at diagnosis in the high-income subgroup in the non-expansion states (APC, 10.9; 95% CI, 4.0–17.8) which translated into a DID reduction in expansion states versus non-expansion for high-income patients (Table 3). DID modeling for treatment patterns was used to examine overall rates of treatment, but not specific treatment modalities, as treatment outcomes (radiation, chemotherapy, and RPLND) did not satisfy the parallel trends test (Appendix Figure S1). We did not observe significant associations between the ACA-related expansions and receipt of treatment (Table 4).

Discussion

Using national cancer registry data with a novel linkage to state-specific identifiers for purposes of linking expansion policy, we assessed the early effects of the ACA-related coverage expansions on insurance, staging, and initial treatment for younger adults diagnosed with testicular cancer. We found that coverage rates increased overall, but with no differential effect for patients in states that expanded Medicaid in the full sample, or in the low and high-income strata. The coverage mechanism differed by expansion status, with Medicaid enrollment increases in expansion states and private insurance increases in non-expansion states. The largest increase was in Medicaid coverage for low-income patients, where there was a 15 percentage point increase in expansion states. We did not detect changes in stage of disease at diagnosis or rates of any treatment for advanced-stage disease overall or separately in expansion or non-expansion states. Our study results provide important insights into the effects of the ACA on cancer care for younger men diagnosed with testicular GCTs.

Although there were increases in insurance among all patients with GCTs, we detected notable differences between patients residing in Medicaid expansion and non-expansion states. Increases in Medicaid insurance were expected as a consequence of state-level Medicaid expansion, as was growth in private coverage in both groups of states attributable to individual coverage mandate, new insurance marketplaces with cost-sharing reductions for the low income, and premium subsidies for adults up to 400% of FPG. However, we observed decreases in private insurance in Medicaid expansion states, possibly suggesting a ‘crowd-out’ of private insurance toward federal programs with a private insurance migration to Medicaid. Additionally, as our models were constructed to evaluate the effects of Medicaid expansion, we did not account for other ACA provisions, including dependent coverage and the individual insurance mandates. Although these background forces did not differ between Medicaid expansion and non-expansion states, they likely contributed other mechanisms for increasing insurance coverage. Yet, our primary focus was to evaluate the effects of Medicaid expansion, which varied at the state level and contributed most significantly to increases in insurance status for Americans compared to other ACA provisions. Nevertheless, our findings that overall insurance coverage did not differ by state

expansion status must be interpreted in the context of other ACA-related forces that likely improved insurance status.

The greatest effects of Medicaid expansion on insurance status in men with testicular GCTs were seen in low-income individuals. Relative shifts toward Medicaid might be attributable to prior relative underinsurance, and the new availability of comparatively favorable coverage afforded through Medicaid. Prior to the ACA, patients aged 30–49 and those with an income level below 133% of FPG were the most likely to be under-insured compared to other age groups and income levels.[21] After the implementation of the ACA, increased availability of Medicaid may have been viewed as preferable for young cancer patients with significant financial burden. From this perspective, these findings are consistent with developing evidence that the financial burden from cancer may be reduced following the implementation ACA provisions, though direct validation is needed.[22] Therefore, increasing insurance rates as well as improving the financial quality of underinsured plans may be seen as an incremental step in improving accessibility to urological cancer care and subsequently care of GCT.

Despite overall increases in insurance, we did not observe the expected reductions in advanced-stage diagnosis. Rrior research suggests a shift to early-stage diagnosis following the ACA, however detection of testicular cancer may not be sensitive to improved primary care access that might be facilitated by insurance coverage, given that testicular cancer screening is no longer recommended.[23] Therefore, the null finding between insurance coverage expansions and stage of diagnosis may be seen as expected, but offers an opportunity to re-examine this relationship as greater time elapses and differences between Medicaid expansion and non-expansion states become more pronounced. In addition, wedid not identify differences in receipt of any therapy for advanced-stage disease. As baseline rates of treatment were high in both expansion and non-expansion states, it is likely that small increases in insurance did not result in measurable changes in practice. Existing changes in treatment trends that in the pre-ACA era could have also masked differences in treatment patterns attributable to the ACA. Finally, given the migration of privately insured patients to Medicaid and no observed changes in diagnosis staging for testicular cancer patients, Medicaid coverage may not have had an adverse effect in this population.

Despite the strengths of our study, there are several limitations that must be acknowledged. Although the NCDB is derived from CoC facility registries and represents the majority of cancer care delivered in the U.S., it is not population-based. As a result, this dataset disproprortioantely refects patients treated at centers with greater expertise in oncology care, serving to under-represent those with lower socioeconomic status and/or racial minorities.[24] We anticipate that future studies may further clarify ACA-related effects on a population-level, and with longer period of follow-up to assess oncologic outcomes. Although roughly half of the states expanded Medicaid by 2014, variation in the timing of implementation might also under-estimate the legislation’s impact because the provisions were not uniformly implemented. Additionally, our measures of income relative to the FPG eligibility thresholds for Medicaid and private insurance market premium subsidies was subject to error, as we used zip-code level information on income and applied assumptions for average family size. Lastly, specification tests revealed non-parallel trends in treatment modalities between

Medicaid expansion and non-expansion states for advanced-stage disease in the pre-ACA period, which underscore the need to ensure validity of a quasi-experimental approach in similar studies. Consequently, our findings highlight the importance of exercising caution when attributing causal effects to Medicaid expansion in observational data.

Conclusion

Among young men newly diagnosed with testicular GCTs, the proportion of uninsured individuals decreased following implementation of key ACA provisions in 2014. We did not detect differences in the proportion of patients with advanced-stage cancer or receiving treatment for advanced-stage disease. As vigorous debate continues regarding the future of the ACA, our findings offer insights about how such measures have affected insurance status and access to care for younger, vulnerable cancer populations. Future research is warranted to assess downstream effects of the ACA coverage expansions on testicular cancer diagnosis and treatment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key Definition of Abbreviations

ACA	Affordable Care Act
GCT	germ cell tumor
DID	difference-in-differences
FPG	federal poverty guidelines
NCDB	National Cancer Database
CoC	Commission on Cancer
RPC	relative percent chance
APC	absolute percentage point change

References

1. Smith JCM, Carla. Health Insurance Coverage in the United States: 2014: United States Census Bureau; 2015.

2. Wherry LR, Miller S. Early Coverage, Access, Utilization, and Health Effects of the Affordable Care Act Medicaid Expansions: A Quasi-Experimental Study. Annals of internal medicine. 2016;164:795–803. [PubMed: 27088438]

3. Sommers BD, Gunja MZ, Finegold K, Musco T. Changes in self-reported insurance coverage, access to care, and health under the affordable care act. JAMA. 2015;314:366–374. [PubMed: 26219054]

4. Bleyer WA. Potential Favorable Impact of the Affordable Care Act of 2010 on Cancer in Young Adults in the United States. The Cancer Journal. 2010;16:563–571. [PubMed: 21131786]

5. Kirchhoff AC, Lyles CR, Fluchel M, Wright J, Leisenring W. Limitations in health care access and utilization among long-term survivors of adolescent and young adult cancer. Cancer. 2012;118:5964–5972. [PubMed: 23007632]

6. Znaor A, Lortet-Tieulent J, Jemal A, Bray F. International Variations and Trends in Testicular Cancer Incidence and Mortality. European Urology. 2014;65:1095–1106. [PubMed: 24268506]

7. Siegel RL, Miller KD, Jemal A. Cancer Statistics, 2017. CA: a cancer journal for clinicians. 2017;67:7–30. [PubMed: 28055103]

8. Markt SC, Lago-Hernandez CA, Miller RE, et al. Insurance status and disparities in disease presentation, treatment, and outcomes for men with germ cell tumors. Cancer. 2016;122:3127–3135. [PubMed: 27500561]

9. Kamel MH, Elfaramawi M, Jadhav S, Saafan A, Raheem OA, Davis R. Insurance Status and Differences in Treatment and Survival of Testicular Cancer Patients. Urology. 2016;87:140–145. [PubMed: 26477833]

10. Lerro CC, Robbins AS, Fedewa SA, Ward EM. Disparities in stage at diagnosis among adults with testicular germ cell tumors in the National Cancer Data Base. Urologic Oncology: Seminars and Original Investigations. 2014;32:23.e15–23.e21.

11. Koroukian SM, Bakaki PM, Raghavan D. Survival disparities by Medicaid status. Cancer. 2012;118:4271–4279. [PubMed: 22213271]

12. Withington J, Cole AP, Meyer CP, et al. Comparison of testis cancer-specific survival: an analysis of national cancer registry data from the USA, UK and Germany. BJU international. 2018.

13. Han X, Yabroff KR, Ward E, Brawley OW, Jemal A. Comparison of Insurance Status and Diagnosis Stage Among Patients With Newly Diagnosed Cancer Before vs After Implementation of the Patient Protection and Affordable Care Act. JAMA oncology. 2018.

14. Jemal A, Lin CC, Davidoff AJ, Han X. Changes in Insurance Coverage and Stage at Diagnosis Among Nonelderly Patients With Cancer After the Affordable Care Act. Journal of Clinical Oncology.0:JCO.2017.2073.7817.

15. Network. NCC. Testicular Cancer, Version 2.2017. 2017.

16. Chipollini J, Tang DH, Zhou J, et al. Trends in Insurance Status during Initial Presentation of Testicular Carcinoma: Examining Health Outcomes and Implications of Health Reform for Young Adults in the United States. Urology Practice. 2019;6:18–23.

17. Status of State Action on the Medicaid Expansion Decision. Kaiser Family Foundation 2018.

18. Ryan AM, Burgess JF Jr., Dimick JB. Why We Should Not Be Indifferent to Specification Choices for Difference-in-Differences. Health services research. 2015;50:1211–1235. [PubMed: 25495529]

19. Miller S, Wherry LR. Health and Access to Care during the First 2 Years of the ACA Medicaid Expansions. New England Journal of Medicine. 2017;376:947–956.

20. Sommers BD, Buchmueller T, Decker SL, Carey C, Kronick R. The Affordable Care Act has led to significant gains in health insurance and access to care for young adults. Health affairs (Project Hope). 2013;32:165–174. [PubMed: 23255048]

21. Schoen C, Collins SR, Kriss JL, Doty MM. How many are underinsured? Trends among U.S. adults, 2003 and 2007. Health affairs (Project Hope). 2008;27:w298–309. [PubMed: 18544591]

22. Nipp RD, Shui AM, Perez GK, et al. Patterns in health care access and affordability among cancer survivors during implementation of the affordable care act. JAMA oncology. 2018.

23. Screening for testicular cancer: U.S. Preventive Services Task Force reaffirmation recommendation statement. Ann Intern Med. 2011;154:483–486. [PubMed: 21464350]

24. Boffa DJ, Rosen JE, Mallin K, et al. Using the National Cancer Database for Outcomes Research: A Review. JAMA oncology. 2017.

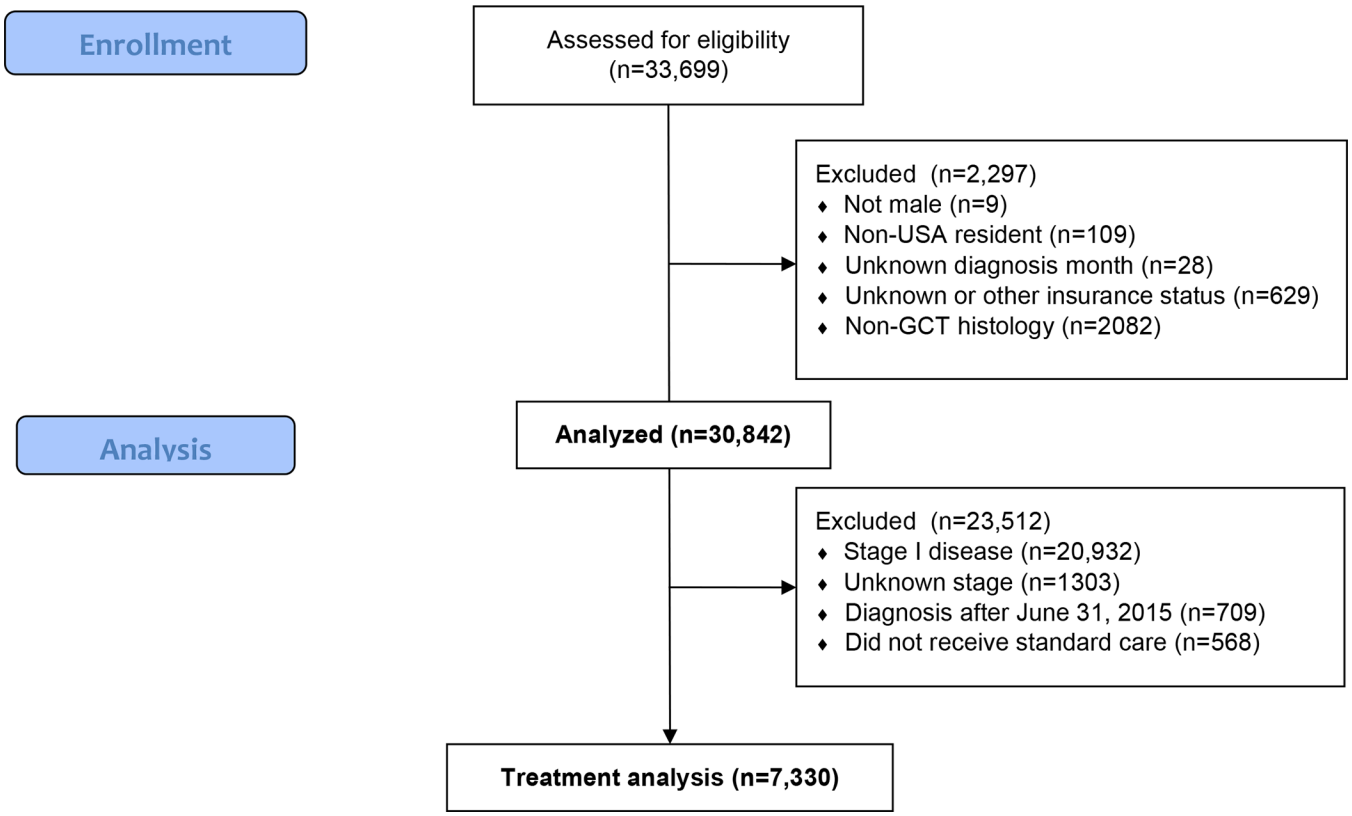

Figure 1:
Sample selection inclusion and exclusion criteria

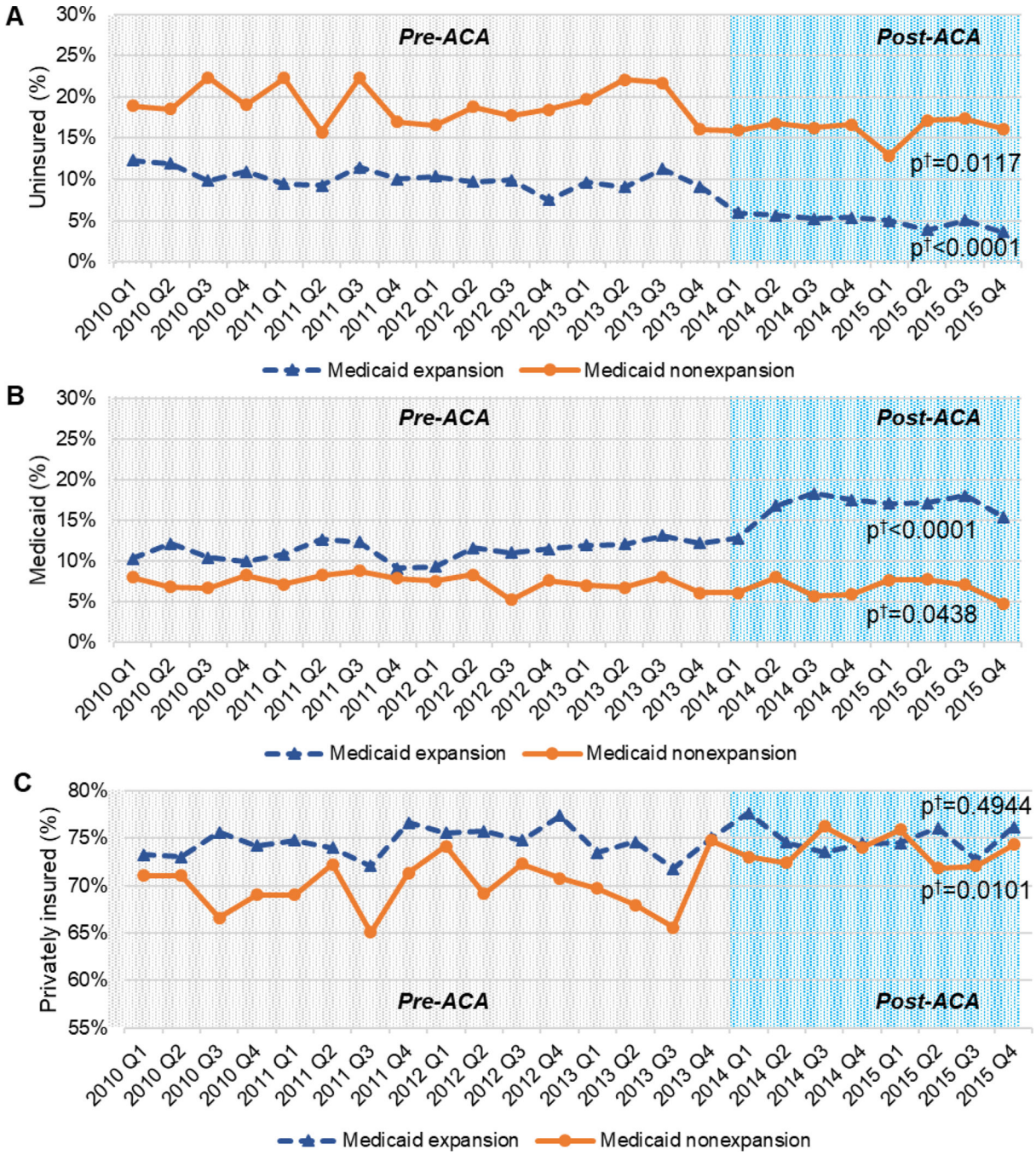

Figure 2:

Trends in quarterly insurance status among patients with newly diagnosed testicular cancer age 18–64 years by (A) uninsured, (B) Medicaid insurance, and (C) privately insured.

†p values represent pre- vs post-ACA differences

Table 1:

Clinical and demographic characteristics among men diagnosed with testicular cancer within the NCDB between 2010 and 2015 by state Medicaid expansion status.

Category		Total		Medicaid Expansion States		Medicaid Non-expansion States, %		*P*
		Number	Col %	Number	Col %	Number	Col %	
Total patients		30842	100	19898	64.5	10944	35.5	
Median income as percent of FPG								<.0001
	Low (≤138% FPG)	1681	5.5	911	4.6	770	7.0	
	Middle (139–400% FPG)	25876	83.9	16386	82.4	9490	86.7	
	High (≥401% FPG)	3173	10.3	2526	12.7	647	5.9	
	Unknown	112	0.4	75	0.4	37	0.3	
Race								<.0001
	Non-Hispanic white	24531	79.5	15933	80.1	8598	78.6	
	Non-Hispanic black	984	3.2	471	2.4	513	4.7	
	Hispanic	3906	12.7	2417	12.1	1489	13.6	
	Asian or Pacific Islander	600	1.9	494	2.5	106	1.0	
	Other	381	1.2	226	1.1	155	1.4	
	Missing	440	1.4	357	1.8	83	0.8	
Age at diagnosis, years								0.0206
	18–29	11386	36.9	7279	36.6	4107	37.5	
	30–39	10279	33.3	6592	33.1	3687	33.7	
	40–64	9177	29.8	6027	30.3	3150	28.8	
% Region w/ no high school degree								<.0001
	>21% (Low educational attainment)	4956	16.1	2838	14.3	2118	19.4	
	13% – 20.9%	6897	22.4	4133	20.8	2764	25.3	
	7%–12.9%	10025	32.5	6649	33.4	3376	30.8	
	<7% (Highest educational attainment)	8874	28.8	6215	31.2	2659	24.3	
	Unknown	90	0.3	63	0.3	27	0.2	
Residence								<.0001
	Metropolitan	26099	84.6	17167	86.3	8932	81.6	
	Non-metropolitan	3891	12.6	2137	10.7	1754	16.0	
	Unknown	852	2.8	594	3.0	258	2.4	
Facility type								<.0001
	Academic	11530	37.4	8415	42.3	3115	28.5	
	Community	15356	49.8	9458	47.5	5898	53.9	
	Other	3956	12.8	2025	10.2	1931	17.6	
Histology								0.0174
	Seminoma	17276	56.0	11245	56.5	6031	55.1	

Category		Total		Medicaid Expansion States		Medicaid Non-expansion States, %		*P*
		Number	Col %	Number	Col %	Number	Col %	
	Non-seminoma	13566	44.0	8653	43.5	4913	44.9	
Advanced Clinical Stage (II or III) in treatment analysis		7330	100	4728	64.5	2602	35.5	
	Any Therapy	6863	93.6	4428	93.7	2435	93.6	0.9026
	None	467	6.4	300	6.3	167	6.4	
Weighted Charlson-Deyo Score								0.0084
	0	28916	93.8	18709	94.0	10207	93.3	
	1+	1926	6.2	1189	6.0	737	6.7	

Table 2.

Change in health insurance coverage between 2010 and 2015 among patients with newly diagnosed testicular cancer aged 18–64.

	Medicaid Expansion States				*Medicaid Non-expansion States*					
Insurance Coverage	**Pre-ACA[†], %**	**Post-ACA, %**	**APC (95% CI)**	**RPC**	**Pre-ACA, %**	**Post-ACA, %**	**APC (95% CI)**	**RPC**	**Unadjusted DID, % (95% CI)**	**Adjusted DID[‡], % (95% CI)**
All Income										
Uninsured	10.2	6.4	**−3.7 (−4.5, −3)**	−37.3	19.2	16.2	**−3 (−4.5, −1.5)**	−15.6	−0.7 (−2.4, 1)	−1.4 (−3.1, 0.4)
Medicaid	10.5	15.9	**5.5 (4.5, 6.4)**	51.4	7.4	6.6	−0.8 (−1.8, 0.2)	−10.8	**6.2 (4.9, 7.6)**	**4.6 (3, 6.2)**
Private	75.8	73.4	**−2.4 (−3.6, −1.2)**	−3.2	70.0	73.7	**3.7 (1.9, 5.5)**	5.3	**−6.1 (−8.3, −4)**	**−3.5 (−5.5, −1.5)**
Low Income (≥138% FPG)										
Uninsured	16.9	10.0	**−6.8 (−11.2, −2.5)**	−40.8	33.4	24.2	**−9.2 (−15.9, −2.5)**	−27.5	2.3 (−5.6, 10.3)	0.2 (−8, 8.4)
Medicaid	19.3	34.1	**14.8 (9, 20.5)**	76.7	12.2	10.7	−1.4 (−6.2, 3.3)	−12.3	**16.2 (8.8, 23.7)**	**14.5 (7.2, 21.8)**
Private	55.9	47.8	**−8.1 (−14.6, −1.6)**	−14.5	51.2	57.9	6.8 (−0.7, 14.2)	13.1	**−14.8 (−24.7, −4.9)**	**−12.8 (−22.3, −3.3)**
Middle Income (139–400% FPG)										
Uninsured	10.5	6.7	**−3.8 (−4.6, −2.9)**	−36.2	18.8	16.3	**−2.5 (−4.1, −0.9)**	−13.3	−1.3 (−3.1, 0.5)	**−2.4 (−4.1, −0.7)**
Medicaid	10.8	17.0	**6.2 (5.1, 7.2)**	57.4	7.4	6.7	−0.7 (−1.8, 0.4)	−9.5	**6.9 (5.4, 8.4)**	**5.4 (3.9, 6.8)**
Private	75.2	72.0	**−3.2 (−4.6, −1.9)**	−4.3	70.2	73.7	**3.5 (1.6, 5.4)**	5.0	**−6.7 (−9, −4.4)**	**−3.5 (−5.8, −1.3)**
High Income (≥401% FPG)										
Uninsured	4.3	3.4	−1.0 (−2.5, 0.5)	−20.9	7.4	6.1	−1.3 (−5.3, 2.7)	−17.6	0.3 (−3.9, 4.6)	0.7 (−3.3, 4.7)
Medicaid	4.2	4.6	0.4 (−1.2, 2)	9.5	1.2	1.3	0.1 (−1.7, 1.9)	8.3	0.3 (−2.1, 2.7)	0.2 (−4.4, 4.8)
Private	89.4	89.4	0 (−2.4, 2.4)	0	90.7	90.8	0.2 (−4.5, 4.8)	0.1	−0.2 (−5.4, 5.1)	0.3 (−4.6, 5.2)

[†]Pre-ACA (2010–2013); Post ACA (2014–2015); DID (Difference in differences); APC (Absolute percentage point change); RPC (relative percent change); FPG (federal poverty guidelines).

[‡]Models adjusted for age-group, race/ethnicity, metropolitan status, Charlson-Deyo score, and income level (only in the models for “All income”). Estimates that are significant at p<.05 are highlighted in bold.

Table 3.

Change in proportion of patients with advanced (AJCC collaborative stage II and III) germ cell testicular cancer between 2010 and 2015 by Medicaid expansion status and tumor histology.

Advanced stage (II-III)	***Medicaid Expansion States***				***Medicaid Non-expansion States***					
	Pre-ACA, %	**Post-ACA, %**	**APC (95% CI)**	**RPC**	**Pre-ACA, %**	**Post-ACA, %**	**APC (95% CI)**	**RPC**	**Unadjusted DID, % (95% CI)**	**Adjusted DID, % (95% CI)**
	Seminoma									
All Income	18.3	18.7	0.3 (−1.1, 1.8)	2.2	19	19.4	0.4 (−1.7, 2.5)	2.1	−0.1 (−2.6, 2.5)	0 (−2.6, 2.5)
Low Income	18.1	20.5	2.4 (−4.6, 9.4)	13.3	22.3	23.2	0.9 (−7.5, 9.4)	4	1.5 (−9.5, 12.4)	3.6 (−7.4, 14.5)
Middle Income	18.7	19	0.3 (−1.3, 1.9)	1.6	19.2	18.8	−0.3 (−2.6, 1.9)	−2.1	0.6 (−2.1, 3.4)	0.3 (−2.4, 3.1)
High Income	15	16.5	1.5 (−2.2, 5.2)	10	12.4	22.4	**10 (1.8, 18.2)**	80.6	−8.5 (−17.5, 0.5)	−7.6 (−16.6, 1.4)
	Non-Seminoma									
All Income	39.7	39.9	0.3 (−1.8, 2.3)	0.5	38.7	40.4	1.7 (−1.2, 4.6)	4.4	−1.5 (−5, 2.1)	−1.9 (−5.5, 1.6)
Low Income	49.1	48.9	−0.2 (−9.9, 9.5)	−0.4	42	45.5	3.5 (−7.8, 14.7)	8.3	−3.6 (−18.5, 11.2)	−2.8 (−17.5, 12)
Middle Income	40.1	40.1	0 (−2.2, 2.3)	0	39.3	40.3	1 (−2.1, 4.1)	2.5	−1 (−4.8, 2.8)	−1.7 (−5.6, 2.1)
High Income	32.6	35.7	3.1 (−2.6, 8.8)	9.5	24.4	36.8	**12.4 (0.8, 24)**	50.8	−9.3 (−22.3, 3.6)	−8 (−20.9, 5)
	Combined									
All Income	27.4	28.2	0.7 (−0.5, 2)	2.9	27.8	28.8	1 (−0.8, 2.8)	3.6	−0.3 (−2.5, 1.9)	−0.8 (−3, 1.3)
Low Income	32	33.6	1.6 (−4.6, 7.7)	5	31.1	32.9	1.9 (−5.2, 8.9)	5.8	−0.3 (−9.6, 9.1)	−0.9 (−10.1, 8.4)
Middle Income	27.7	28.5	0.8 (−0.6, 2.1)	2.9	28.2	28.6	0.4 (−1.6, 2.3)	1.4	0.4 (−2, 2.8)	−0.3 (−2.7, 2)
High Income	22.5	24.5	2 (−1.4, 5.3)	8.9	17.5	28.4	**10.9 (4.0, 17.8)**	62.3	**−9.0 (−16.6, −1.3)**	**−9.2 (−16.8, −1.6)**

*Pre-ACA (2010–2013); Post ACA (2014–2015); DID (Difference in differences); RPC (relative percent change), APC (Absolute percent change).

**Models adjusted for age-group, race/ethnicity, metropolitan status, Charlson-Deyo score, and income level (only in the models for “All income”). Estimates that are significant at p<.05 are highlighted in bold.

Source: Authors’ analysis of the NCDB.

Table 4.

Failure to receive any treatment among patients with advanced (AJCC collaborative stage II and III) germ cell testicular cancer between 1/1/2010 and 6/30/2015 by Medicaid expansion status and tumor histology.

Income group	*Medicaid Expansion States*				*Medicaid Non-Expansion States*					
	Pre-ACA†	**Post-ACA**	**APC (95% CI)**	**RPC**	**Pre-ACA**	**Post-ACA**	**APC (95% CI)**	**RPC**	**Unadjusted DID, % (95% CI)**	**Adjusted DID‡, % (95% CI)**
	Seminoma									
All Income	6.3	7.1	0.8 (−1.6, 3.1)	12.7	7.7	5.8	−1.9 (−5.3, 1.5)	−24.7	2.7 (−1.4, 6.8)	2.4 (−1.7, 6.5)
Low Income	11.6	7.1	−4.5 (−18, 9)	−38.8	15.0	15.4	0.4 (−16.2, 16.9)	2.7	−4.9 (−26.2, 16.5)	0.7 (−39.2, 40.6)
Middle Income	6.2	7.2	1 (−1.6, 3.5)	16.1	6.7	5.1	−1.6 (−5, 1.9)	−23.9	2.5 (−1.8, 6.8)	2.1 (−2.3, 6.5)
High Income	6.5	8.8	2.3 (−6.4, 10.9)	35.4	17.1	0	−17.1 (−68.3, 34.2)	−100	19.3 (−32.6, 71.3)	13.9 (−37.3, 65.2)
	Non-Seminoma									
All Income	5.5	6.9	1.4 (−0.4, 3.1)	25.5	5.6	7.0	1.3 (−1.3, 4.0)	25.0	0 (−3.2, 3.2)	−0.1 (−3.3, 3)
Low Income	4.9	10.8	5.9 (−2.8, 14.5)	120.4	7.1	8.3	1.3 (−9.3, 11.8)	16.9	4.6 (−9, 18.2)	4.9 (−18, 27.7)
Middle Income	5.4	6.5	1.1 (−0.8, 3)	20.4	5.3	6.8	1.5 (−1.3, 4.3)	28.3	−0.4 (−3.8, 3)	−0.5 (−3.8, 2.9)
High Income	0.2	7.8	0.6 (−5.2, 6.4)	8.3	9.5	4.0	−5.5 (−17.3, 6.2)	−57.9	6.1 (−7, 19.2)	5.6 (−16.4, 27.7)

†Pre-ACA (2010–2013); Post ACA (2014–2015); DID (Difference in differences); APC (Absolute percentage point change); RPC (relative percent change); FPG (federal poverty guidelines).

‡Models adjusted for age-group, race/ethnicity, metropolitan status, Charlson-Deyo score, and income level (only in the models for “All income”). Estimates that are significant at p<.05 are highlighted in bold.