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Predictors of Cancer Screening among Black and White Maryland Medicaid Enrollees with Serious Mental Illness

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Keywords

bipolar disorder; cancer; cancer screening; Medicaid; oncology; psycho-oncology; preventive care; racial disparities; schizophrenia; serious mental illness

Introduction

In the U.S., inequities in cancer mortality exist across social and economic class, race and ethnicity, and in groups with chronic conditions like schizophrenia and bipolar disorder, which are serious, often disabling, mental illnesses (SMI).[1] Cancer is the second leading cause of death among people with SMI, who died 10–20 years earlier than the general population.[2]

People with SMI receive cancer screening at lower rates than the general population.[3] It is important to identify factors that promote or hinder cancer screening and to determine whether these factors differ by race, given racial inequities in cancer mortality.[1] Research on the SMI population and racial disparities in cancer screening has been limited and mixed.[4,5] Here, we use a large sample of Medicaid-enrolled adults over an eight year period to quantify differences among Black and white enrollees with SMI in four categories of cancer screening and to identify predictors of screening in Maryland, a racially diverse state.

Methods

Study Data:

Using Maryland Medicaid administrative claims data from July 1, 2010 through June 30, 2018, we constructed four analytic datasets for each cancer screening group at the person-year level. The Johns Hopkins Medicine Institutional Review Board approved this study.

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Study Population:

We included adults continuously enrolled for 12 months with at least one inpatient claim or two uniquely dated outpatient claims with a diagnosis of schizophrenia or bipolar disorder (Supplemental Information). We identified eligible sub-populations based on US Preventive Services Task Force (USPSTF) guidelines: women 21–64 years for cervical cancer screening, women 50–64 years for breast cancer screening, men and women 50–64 years for colorectal cancer screening, and men 55–64 years for prostate cancer screening.[6] Prostate cancer screening was included based on USPSTF guidelines for shared-decision making among men at elevated risk. We excluded individuals with a history of relevant cancer (Supplemental Information) and those dually enrolled in Medicare.

Outcomes:

We examined receipt of pap smear for cervical cancer screening; mammogram for breast cancer screening; either colonoscopy, sigmoidoscopy, or fecal occult blood test for colorectal cancer screening; and receipt of prostate specific antigen blood test for prostate cancer screening (Supplemental Information).

Independent Variable:

Our independent variable was whether the enrollee identified in the data as Black or white race. The Medicaid enrollment file reports race and ethnicity as a single categorical variable so it was not possible to distinguish non-Hispanic and Hispanic enrollees within each group.

Other Covariates:

We included age, gender, SMI diagnosis (schizophrenia or bipolar disorder), substance use disorder diagnosis, Charlson Comorbidity Index, managed care organization, and years the enrollee contributed to the analytic sample. We calculated receipt of at least one primary care visit and, for analyses involving cervical and breast cancer screenings, receipt of at least one obstetric-gynecologic (Ob-GYN) visit within the person-year. We also included measures of county-of-residence metropolitan status, mean household income, and number of primary care physicians per capita.[7]

Statistical Analysis:

Using the first year in which an enrollee appeared in the analytic sample, we compared characteristics of Black and white enrollees using t-tests and Pearson chi-square tests. To identify characteristics associated with cancer screening, we estimated generalized estimating equations specifying a logit link. All models included calendar year fixed effects and estimated robust standard errors. To examine whether factors associated with receipt of cancer screening differed among Black and white enrollees, we estimated models stratified by race and used fully interacted models to test whether estimates differed among Black and white enrollees.

Results

Larger proportions of Black (vs. white) enrollees were diagnosed with schizophrenia or had a co-occurring substance use disorder (Table 1). Black enrollees had a higher mean Charlson Comorbidity Index score and a somewhat smaller proportion had a primary care visit. Black enrollees were more likely to live in populous metropolitan counties and in counties with lower mean household income and fewer primary care physicians per capita.

Cervical Cancer Screening

Adjusting for covariates, Black enrollees (N=20,415) were 18% more likely than white enrollees (N=20,207) (Adjusted Odds Ratio [AOR] 1.18, 95% CI: 1.15–1.22) to receive cervical cancer screening (Table S1). In stratified models, primary care and Ob-GYN visits and smaller metro size were positive predictors, while age and substance use disorder were negative predictors of cervical cancer screening (Table 2). Comorbidity, primary care utilization, years in sample, and county-level income had stronger associations with receipt of cervical cancer screenings among Black enrollees (vs. white). The association for Ob-GYN utilization was stronger among white enrollees.

Breast Cancer Screening

Black enrollees (N=5,464) were 27% more likely than white enrollees (N=4,354) to have a mammography (AOR: 1.27, 95% CI: 1.191–1.36), adjusting for covariates (Table S1). Older age, primary care and Ob-GYN visits, and smaller metro size were positive predictors, while substance use disorder was a negative predictor, of breast cancer screening (Table 2). An Ob-GYN visit more strongly predicted receipt of mamography for white (vs Black) enrollees and length of time in the study sample strongly predicted mammography for Black (vs. white) enrollees. Substance use disorder was a stronger negative predictor for Black enrollees.

Colorectal Cancer Screening

Black enrollees (N=10,794) were more likely than white enrollees (N=8,512) (AOR: 1.07, 95% CI: 1.02, 1.13) to receive colorectal cancer screening (Table S1). Among Black and white enrollees, greater comorbidities, having a primary care visit, and smaller metro size were positive predictors, while comorbid substance use disorder was a negative predictor, of colorectal cancer screening (Table 2). Female sex and greater comorbidities were stronger positive predictors for white versus Black enrollees.

Prostate Cancer Screening

Race was not associated with prostate cancer screening among men with SMI (Black enrollees: N=2,776; White enrollees: N=2,111) (AOR 1.06; 95% CI: 0.96–1.18) (Table S1). For both Black and white enrollees, having a primary care visit and living in a county with more primary care physicians per capita were positively associated with prostate cancer screening (Table 2). Older age was a stronger predictor while having a substance use disorder was a stronger negative predictor among white versus Black enrollees.

Discussion

This study finds suboptimal cancer screening rates among Medicaid enrolled adults with SMI, consistent with other studies.[3–5] Relative to commercially insured adults with SMI, annual screening rates rates in this Medicaid-enrolled population were lower.[3] Primary care utilization, medical comorbidity, and substance use disorder were factors associated with cancer screening and offer potential intervention points. Rurality of residence was also a significant predictor. Black enrollees were more likely to receive cervical, breast, and colorectal cancer screenings than white enrollees. Similar factors predicted screening for Black and white enrollees; while the magnitude of associations differed between groups, no clear patterns emerged.

This study extends the sparse literature on cancer screening among adults with SMI. Our results suggest racial differences in cancer screenings among Medicaid-enrolled adults with SMI may not reflect patterns seen in the general population.[1] Engagement in physical healthcare services and area of residence may explain differences between Black and white populations with SMI. Primary care utilization is positively associated with increased cancer screening. [8] We found higher levels of primary care utilization among white enrollees but that primary care utilization was more strongly associated with cancer screenings among Black enrollees. Black enrollees contributed a greater mean number of years to the sample, suggesting fewer interruptions in insurance coverage. Continuous insurance coverage has been positively associated with cancer screening.[9] Finally, white enrollees were more likely to live in smaller metro or rural areas, whereas a larger proportion of Black enrollees lived in higher density metropolitan counties; this may reflect historical, often discriminatory practices of housing (e.g. redlining). Given that rural residence is associated with lower rates of cancer screening,[10] our findings may reflect systemic barriers based on area of residence (e.g. distance to screening tests, transportation).

Our study has limitations. First, to address missing race values (6% of person-years), we used modal race across person-years. Second, cancer screenings are recommended within multi-year periods; we opted not to measure screening rates within longer periods to avoid limiting the generalizability of our study sample to enrollees with multiple years of continuous enrollment. Third, county-level measures may be insufficiently granular. Future research should explore Census-tract measures to capture contextual factors more sensitively. Finally, we narrowly defined SMI around diagnoses that are chronic, often disabling, and with psychoses to align with prior cancer screening literature. Populations with other mental health conditions, such as depression, personality or eating disorders, may have different barriers and health service utilization. We also did not assess linkage to mental health care, psychiatric symptom burden, or medication compliance, factors that may be worth exploring in future research.

Future interventions to increase cancer screening rates should target engagement with primary care, particularly for those with comorbid substance use disorder, and ensuring continuous insurance coverage. Such work should include partnerships with local organizations serving people with SMI (e.g. psychiatric rehabilitation programs) to better tailor efforts to the local environment (e.g. public transportation in rural locations for

mammography). Our findings suggest that attention to these issues could improve cancer screening rates for both Black and white Medicaid enrollees with SMI and reduce cancer-related mortality through earlier detection.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data Availability Statement

The data that support the findings of this study are available from the Hilltop Institute, which is Maryland's Medicaid administrative data repository. Restrictions apply to the availability of these data, which were analyzed under a data use agreement for this study.

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Key Points

- Cancer screening rates are low among Medicaid-enrolled adults with serious mental illness (SMI).
- Black Medicaid enrollees with SMI were more likely than white enrollees to receive cervical, breast, and colorectal cancer screenings.
- Many of the same key factors were associated with cancer screening among both Black and white enrollees.
- Primary care utilization, medical comorbidity status, and more years of continuous Medicaid enrollment were positively associated with higher rates of cancer screening.Having a co-occurring substance use disorder and living in smaller counties with lower mean incomes were negatively associated with cancer screening.
- Improving cancer screening rates among people with SMI should focus on facilitating continuous insurance coverage and access to primary care.

Table 1.

Characteristics of Black and White Medicaid Enrollees with Serious Mental Illness Eligible for Cancer Screening During First Year of Entry into the Analytic Sample, 2010–2018

	Cervical Cancer		Breast Cancer		Colorectal Cancer		Prostate Cancer	
	Black	**White**	**Black**	**White**	**Black**	**White**	**Black**	**White**
N	20415	20207	5464	4354	10794	8512	2776	2111
Received Screening, N (%)	7708 (37.8)	6868 (34.0)*	1311 (24.0)	1029 (23.6)	1310 (12.1)	1065 (12.5)	659 (23.7)	454 (21.5)
Individual-Level Characteristics Among those Eligible for Cancer Screening								
Age, mean (SD)	36.1 (11.9)	35.4 (11.5)*	52.8 (3.6)	53.3 (3.9)*	52.8 (3.6)	53.2 (3.9)*	56.4 (2.3)	56.7 (2.4)*
Female, N (%)	20415 (100.0)	20207 (100.0)	5464 (100.0)	4354 (100.0)	5980 (55.4)	4745 (55.7)	0 (0.0)	0 (0.0)
Psychiatric Diagnosis								
Bipolar disorder, N (%)	15821 (77.5)	18518 (91.6)*	3538 (64.8)	3558 (81.7)*	6597 (61.1)	6704 (78.8)*	1434 (51.7)	1463 (69.3)*
Schizophrenia, N (%)	4594 (22.5)	1689 (8.4)*	1926 (35.2)	796 (18.3)*	4197 (38.9)	1808 (21.2)*	1342 (48.3)	648 (30.7)*
SUD Diagnosis, N (%)	5260 (25.8)	6885 (34.1)*	1996 (36.5)	1246 (28.6)*	4533 (42.0)	2882 (33.9)*	1302 (46.9)	784 (37.1)*
Charlson Comorbidity, mean (SD)	0.8 (1.6)	0.6 (1.2)*	1.6 (2.3)	1.1 (1.7)*	1.5 (2.3)	1.2 (1.7)*	1.6 (2.5)	1.3 (1.9)*
Any Primary Care Visit, N (%)	14903 (73.0)	15805 (78.2)*	4216 (77.2)	3538 (81.3)*	7949 (73.6)	6584 (77.3)*	1958 (70.5)	1513 (71.7)
Any Ob-Gyn Visit, N (%)	7123 (34.9)	6279 (31.1)*	1232 (22.5)	606 (13.9)*	N/A	N/A	N/A	N/A
Characteristics of County of Residence Among those Eligible for Cancer Screening								
Metro Status, N (%)								
Metro, >=1 million pop	18894 (92.6)	15023 (74.5)*	5136 (94.0)	3355 (77.2)*	10086 (93.5)	6661 (78.4)*	2586 (93.3)	1721 (81.7)*
Metro, 250,000–1 million pop	922 (4.5)	2597 (12.9)	187 (3.4)	516 (11.9)	417 (3.9)	983 (11.6)	109 (3.9)	226 (10.7)
Metro, <250,000 pop	233 (1.1)	1493 (7.4)	49 (0.9)	269 (6.2)	111 (1.0)	487 (5.7)	32 (1.2)	97 (4.6)
Nonmetro, 2,500–19,999 pop, metro-adjacent	347 (1.7)	1054 (5.2)	89 (1.6)	205 (4.7)	172 (1.6)	365 (4.3)	46 (1.7)	63 (3.0)
Household Income, mean (SD)	55447.8 (19740.8)	65339.1 (18599.2)*	53520.7 (18895.8)	65763.4 (19291.6)*	53272.3 (18739.4)	65686.0 (19652.3)*	53578.7 (18636.6)	65795.8 (20819.3)*
# of PCPs/100,000 Population, mean (SD)	1230.8 (449.2)	1509.1 (597.4)*	1201.8 (425.5)	1443.3 (577.5)*	1201.4 (419.9)	1424.6 (570.2)*	1203.5 (411.8)	1349.0 (544.9)*
# of Years in Sample, mean (SD)	5.5 (2.3)	5.1 (2.3)*	4.4 (2.4)	4.0 (2.3)*	4.5 (2.4)	4.1 (2.3)*	3.6* (2.1)	3.5 (2.1)

Table Notes: Asterisk(*) indicates p-value<0.05 in Pearson chi-square tests of differences in percentages for categorical variables and from t-tests of differences in means for continuous variables.

Table 2.

Factors Associated with Annual Receipt of Cancer Screenings among Black and White Medicaid Enrollees with Serious Mental Illness, 2010–2018

	Adjusted Odds Ratios (95% Confidence Intervals)							
	Cervical Cancer		Breast Cancer		Colorectal Cancer		Prostate Cancer	
	Black	White	Black	White	Black	White	Black	White
Age	0.99** (0.98 – 0.99)	0.99**† (0.99 – 1.00)	1.03** (1.02 – 1.04)	1.03** (1.01 – 1.04)	0.99 (0.99 – 1.00)	1.01† (1.00 – 1.02)	1.01 (0.99 – 1.04)	1.04** (1.02 – 1.07)
Female (ref: male)					0.97 (0.92 – 1.03)	1.11**† (1.03 – 1.19)		
Schizophrenia diagnosis (ref: bipolar disorder)	1.02 (0.98 – 1.07)	1.04 (0.96 – 1.12)	0.98 (0.90 – 1.07)	1.11 (0.98 – 1.26)	0.90** (0.84 – 0.95)	0.98 (0.90 – 1.07)	1.03 (0.91 – 1.17)	0.95 (0.81 – 1.12)
Substance use disorder diagnosis (ref: none)	0.85** (0.82 – 0.88)	0.80**† (0.78 – 0.83)	0.63** (0.58 – 0.68)	0.71**† (0.65 – 0.78)	0.93* (0.87 – 0.99)	0.91* (0.84 – 0.98)	0.90 (0.80 – 1.02)	0.73**† (0.62 – 0.85)
Charlson comorbidity index	1.03** (1.02 – 1.04)	1.00† (0.99 – 1.01)	1.02** (1.01 – 1.04)	1.01 (0.98 – 1.03)	1.04** (1.03 – 1.05)	1.08**† (1.06 – 1.09)	0.99 (0.96 – 1.01)	1.01 (0.97 – 1.04)
>=1 primary care visit (ref: none)	2.52** (2.41 – 2.65)	2.13**† (2.02 – 2.25)	2.75** (2.47 – 3.07)	2.60** (2.25 – 3.00)	3.12** (2.83 – 3.45)	2.80** (2.49 – 3.16)	4.51** (3.75 – 5.42)	3.90** (3.15 – 4.83)
>=1 ob-gyn visit (ref: none)	4.35** (4.20 – 4.51)	7.97**† (7.66 – 8.30)	1.63** (1.51 – 1.77)	2.64**† (2.38 – 2.94)				
County Metro Status (ref: ≥1 million)								
Metro, 250,000–1 million pop	2.05** (1.87 – 2.25)	1.76**† (1.64 – 1.88)	1.73** (1.40 – 2.14)	1.41** (1.20 – 1.66)	1.24** (1.06 – 1.45)	1.30** (1.15 – 1.47)	1.23 (0.92 – 1.63)	1.31* (1.00 – 1.72)
Metro, <250,000 pop	0.90 (0.75 – 1.07)	1.47**† (1.35 – 1.59)	0.86 (0.59 – 1.25)	1.22 (0.99 – 1.49)	0.59** (0.44 – 0.80)	1.06† (0.90 – 1.25)	0.75 (0.47 – 1.19)	1.27 (0.93 – 1.75)
Nonmetro, 2,500–19,999 pop, metro-adjacent	1.58** (1.36 – 1.85)	1.35** (1.22 – 1.49)	1.77** (1.27 – 2.46)	1.52** (1.18 – 1.96)	1.46** (1.16 – 1.85)	1.37** (1.14 – 1.65)	0.63 (0.35 – 1.12)	1.19 (0.76 – 1.88)
County HH Income	1.01** (1.00 – 1.01)	1.00† (1.00 – 1.00)	1.01** (1.00 – 1.01)	1.00† (0.99 – 1.01)	1.00** (1.00 – 1.01)	1.00 (0.99 – 1.01)	1.00* (1.00 – 1.01)	1.00 (0.99 – 1.02)
# of PCPs/1,000 Population	1.01** (1.01 – 1.02)	0.99**† (0.99 – 1.00)	1.01 (1.00 – 1.02)	1.03** (1.01 – 1.04)	1.01 (1.00 – 1.01)	1.01 (1.00 – 1.02)	1.02* (1.01 – 1.04)	1.04** (1.02 – 1.07)
# of Years in Sample	1.02** (1.01 – 1.03)	1.00† (0.99 – 1.01)	1.06** (1.04 – 1.08)	1.01† (0.99 – 1.04)	0.97** (0.96 – 0.99)	0.98* (0.96 – 1.00)	1.00 (0.97 – 1.03)	1.02 (0.98 – 1.05)
Constant	0.16** (0.15 – 0.18)	0.17** (0.15 – 0.20)	0.01** (0.01 – 0.03)	0.02** (0.01 – 0.04)	0.07** (0.04 – 0.10)	0.03** (0.02 – 0.06)	0.03** (0.01 – 0.13)	0.01** (0.00 – 0.04)

	Adjusted Odds Ratios (95% Confidence Intervals)							
	Cervical Cancer		Breast Cancer		Colorectal Cancer		Prostate Cancer	
	Black	White	Black	White	Black	White	Black	White
Observations	99,516	90,928	20,677	14,815	41,583	29,596	8,553	6,276

Table Notes: Models also control for enrollment in nine managed care organizations and include year fixed effects. Robust standard errors were estimated to account for correlation between observations among individuals contributing >1 person-years to the models. Adjusted odds ratios generated from generalized estimating equations for panel data specifying a binomial family and logit link function. Two asterisks (**) indicate p-value<0.01. One asterisk (*) indicates p-value<0.05.

†indicates significant difference in association between characteristic and probability of receipt of screening between Black and white enrollees assessed using fully interacted models.