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Association of the Maryland Medicaid Behavioral Health Home Program with Cancer Screening in People with Serious Mental Illness

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Abstract

Objective: Cancer is the second leading cause of death in people with serious mental illness (SMI), yet cancer screening rates are low. This study evaluated the association of the Maryland Medicaid behavioral health home (BHH) integrated care program on cancer screening.

Methods: Using administrative claims data from October, 2012-September, 2016 among adults eligible for cervical (n=6,811), breast (n=1,658), and colorectal (n=3,430) cancer screening, 27% (n=3298) of the population had ever enrolled in a BHH and the remaining never enrolled. Marginal structural modeling was used to examine the association between BHH enrollment and receipt of annual cancer screening.

Results: Relative to non-enrollment, BHH enrollment was associated with increased screening for cervical and breast cancer but not for colorectal cancer. Predicted annual rates remained low, even in BHHs.

Conclusions: Despite potential improvements after BHH implementation, cancer screening rates remain suboptimal. Broader interventions are needed to improve cancer screening for people with SMI.

Introduction

People with serious mental illness (SMI) die 10–20 years earlier than the general population, primarily due to physical health conditions (1). Cancer is the second leading cause of death (1) following cardiovascular disease. While data is mixed on cancer incidence (2–4), cancer mortality is higher in the SMI population (4) which may be due to lower cancer screening rates (4–6).

Behavioral health homes (BHHs) have proliferated as a model that integrates general medical services into specialty mental health settings (7). Early studies have demonstrated BHH's promising results for screening and management of chronic diseases, and randomized trials suggested that BHHs can improve quality of preventive care, including cancer screening (8). However, no study has examined cancer screening in real-world BHH programs. We evaluated whether enrollment in a Maryland Medicaid BHH was associated with cancer screening in adults with SMI.

Methods

Data

We used Maryland Medicaid administrative claims data from October 1, 2012 to September 30, 2016, which included a year baseline prior to and three years after BHH implementation. Unit of analysis was person-year. This study was waived by the Institutional Review Board at Johns Hopkins University.

Sample

In Maryland, 53 (37%) out of 145 psychiatric rehabilitation programs (PRPs) implemented BHHs during the study period (9). To qualify for PRP services, individuals must have significant functional impairment as a result of mental illness. Our sample consisted of 12,176 Medicaid enrollees with greater than five uniquely dated PRP services during study period. We censored individuals when no longer enrolled in Medicaid.

Consistent with US Preventive Services Task Force (USPSTF) guidelines, we measured cervical cancer screening among women ages 21–64 (n=6876), breast cancer screening among women 50–64 years (n=1914), and colorectal cancer screening among men and women ages 50–64 (n=3670) (10). We excluded individuals with a history of cervical cancer (n=52), endometrial cancer (n=13), breast cancer (n=256), colorectal cancer (n=39) or symptoms within three months (n=201) that may indicate testing for non-screening purposes. We performed sensitivity analyses including all of these individuals.

Cancer Screening Measures

Outcomes were receipt of pap smear for cervical cancer screening, mammography for breast cancer screening, and colonoscopy, sigmoidoscopy, or fecal occult blood test (FOBT) for colorectal cancer screening (10). Online Supplement A contains procedure and diagnostic codes. Claims from acute settings (emergency department, inpatient hospital) were excluded as these were unlikely to represent routine screening events.

BHH Enrollment

BHH enrollment occurred on a rolling basis throughout the study period. All Medicaid beneficiaries receiving services at a PRP with a BHH program were eligible and had to consent to participation in that BHH. BHH staff reported attempting to enroll all eligible clients but also reported staffing shortages that may impede enrollment (9). We assumed that once an individual was enrolled in a BHH, they remained enrolled for the remainder of the study, consistent with intent-to-treat analysis principles. Approximately 27% (n=3298) of

the population were enrolled in a BHH at some point during the study, 25% (n=3040) received psychosocial rehabilitation services at a PRP without a BHH, and 48% (n=5838) received psychosocial rehabilitation services at a PRP with a BHH but never enrolled in a BHH.

Potential Confounders

We accounted for rolling enrollment into BHHs using time-invariant and time-varying confounders. Time-invariant confounders included: baseline age, sex, race, psychiatric diagnosis, size of PRP, region of residence, and Medicaid managed care organization. Observed time-varying confounders, measured yearly, included: eligibility for Medicaid via disability, substance use diagnosis, Charlson comorbidity index, number of PRP services, somatic vs. psychiatric hospitalizations, primary care visits, and prior receipt of cancer screening

Analysis

Traditional regression adjustment in cases of time-varying confounding can introduce bias into results; therefore, we used a marginal structural modeling approach (11). First, we constructed inverse probability of treatment weights. We estimated the inverse probability of BHH enrollment for each person-year, adjusting for time-invariant and time-varying confounders. The inverse probability of treatment weights for each individual-year were calculated as the product of the inverse probabilities up to that year and therefore controlled for an individual's history of treatment and confounders. Second, we calculated censoring weights, which account for confounding factors that may influence censoring from the sample due to Medicaid disenrollment. We calculated the inverse probability of censoring for each person-year, adjusting for confounders. The censoring weight for a given person-year was the product of the inverse probabilities up to that year. The final weight for any given person-year observation was the product of the treatment weight and censoring weight. For full weighting details, see Online Supplement B. Third, we fit weighted logistic regression models to estimate the average effect of BHH participation on annual cancer screening. To improve interpretability of results, we calculated predicted annual screening rates, interpreted as the expected screening rate if all participants were enrolled versus not enrolled in a BHH. As a sensitivity analysis, we tested for interaction between BHH enrollment and baseline characteristics: psychiatric disease, sex, substance use disorder, and PRP or primary care utilization.

Results

Unweighted baseline demographic characteristics differed by BHH enrollment (Online Supplement C, Table C1). BHH participants (n=3298, 27%) (vs. non-BHH participants [n=8878, 73%]) were more likely to be white (47 vs. 35%, p<.001), have schizophrenia (64 vs. 36%, p<.001), qualify for Medicaid by disability (86 vs. 56%, p<.001), and utilize more PRP services (10 vs. 5% services, p<.001); they were less likely to have substance use disorder (22 vs. 27%, p<0.001). While BHH participants had fewer baseline primary care visits (5.1 vs. 5.4 visits, p<0.001), the percentage of individuals without any primary care visits did not differ by BHH enrollment (27 vs. 27%; p=.2). These demographic differences

were similar in the subsets of comparison individuals who (a) received psychosocial services at a PRP implementing a BHH but were not enrolled in the BHH, and (b) who received services at a PRP not implementing a BHH (Online Supplement C, Table C2). Relative to PRPs without BHHs, PRPs with BHHs were larger (Online Supplement C, Table C3). For example, 28% (n=15) of PRPs with BHHs compared with 5% (n=5) of PRPs without BHHs were larger than 500 clients (p<.001). Weighting improved the balance of baseline characteristics between BHH and non-BHH participants to a level that indicates minimal residual confounding due to these factors (Online Supplement C, Figures C1–C3).

Cervical Cancer Screening

During the post-intervention period, 3,576 (53%) women received a pap smear. BHH enrollment was associated with a 21% (OR=1.21; 95% CI=1.08–1.36) increase in likelihood of receiving cervical cancer screening compared with no BHH enrollment (p=.001) (Table 1). The predicted annual screening rate was 31% for BHH enrollment and 27% for non-enrollment.

Breast Cancer Screening

During the post-intervention period, 737 (44%) women had a mammogram. BHH enrollment was associated with a 30% (OR=1.30; 95% CI=1.06–1.59) increase in likelihood of receiving breast cancer screening compared with no BHH enrollment (p=0.01). The predicted annual screening rate was 28% for BHH enrollment and 23% for non-enrollment.

Colorectal Cancer Screening

During the post-intervention period, 1,021 (30%) individuals received colorectal screening, of which 911 (27%) had a colonoscopy, 13 (.4%) had a sigmoidoscopy, and 252 (7%) had a FOBT. BHH enrollment was not associated with likelihood of colorectal cancer screening (OR=.96; 95% CI=.82–1.12, p=.6). Similar results were observed when we stratified by screening modality for colonoscopy, sigmoidoscopy, or FOBT.

Sensitivity Analyses

Our findings were unchanged when we included participants where testing may not have been for routine screening (Online Supplement D, Table D2). Results were similar in magnitude and statistical significance when we looked at cervical and colorectal cancer screening over a 3-year interval, and breast cancer screening over a 2-year interval.

When we examined whether population subsets benefited more from BHH enrollment, we found that the positive association between BHH enrollment and cancer screening was stronger among low-utilizers of PRP services (OR=1.08; 95% CI=1.04–1.12) relative to high utilizers for cervical cancer screening, among individuals without schizophrenia (OR=1.10; 95% CI=1.04–4.58) relative to those with schizophrenia for breast cancer screening, and among individuals with a substance use disorder (OR=1.05; 95% CI=1.01–1.08) compared with individuals without for colorectal cancer screening. We found no further differences by other patient/PRP characteristics (Online supplement D, Table D1).

Discussion

Under BHH participation and non-participation, the predicted annual rates for cervical cancer (23–28%) and breast cancer (27–31%) screening were lower than estimated annual rates in the general population, which are 42% and 43% for cervical and breast cancer screening, respectively (5, 6). Our study screening rates were similar to reports in a California Medicaid population with SMI (5, 6).

The higher rates of breast and cervical cancer screening associated with BHH are consistent with clinical trial findings (8). While the relative increase in screening is modest, it suggests BHHs may have a clinically meaningful impact. The core care coordination, population health management and health home activities implemented by BHH programs in Maryland and across the country (12, 13) are designed to improve delivery of preventive services like cancer screening. In our study sample, the majority of individuals were connected to primary care: the proportion of individuals with no primary care visit was 26.9% among BHH participants and 26.5% among non-participants during baseline period (p=.2) and 11.1% and 11.0% at the end of follow-up (p=.06). Thus, increases in screening are more likely to be due to BHH care coordination activities than new linkages to primary care providers. Maryland implemented its BHH program within PRPs, which engaged in coordination of mental health and social services prior to the BHH program (9). PRPs' existing capacity for care coordination may have facilitated the ability to improve cancer screening rates. Prior research has identified differences in the degree of behavioral health/general medical integration at Maryland BHH sites (14); future research should consider the effects of these differences.

The low overall rates of cancer screening suggest that some screening barriers remain unaddressed. While we found subsets of BHH-enrolled participants were more likely to get specific types of cancer screening, no overarching trend was observed. Potential reasons include impairment in memory or executive function, which may influence understanding of risks and benefits of screening (15), or the high prevalence of poverty, disability, and housing instability (9, 15), which has been associated with lower cancer screening rates (16). People with SMI may prioritize preventive services differently or experience greater levels of stigma,(15) which may influence care. Colorectal cancer screening may have additional barriers, such as consumers' perception of its invasive nature, and requirement for bowel preparation (16).

These results should be considered in light of several limitations. We analyzed data at the person-year level to account for potential time-dependent confounding. Our primary analyses therefore examined annual screening rates rather than the multi-year intervals recommended by clinical guidelines (10). Second, our marginal structural modeling approach assumes no unobserved confounders. No data existed on which clients were approached for enrollment, so we could not delineate between eligible participants who (a) were not invited to participate in the BHH versus (b) were invited to participate but declined to enroll. Third, Maryland's Medicaid BHH program was implemented in the subset of people who qualify for PRP services, which may limit our study's generalizability. Finally, while we accounted for PRP size and utilization, we were unable to determine programmatic

differences or cancer screening priorities at the level of the BHH. Improving cancer screening is an explicit BHH goal set by the state of Maryland (12), but the degree to which such screening was prioritized across different BHHs is unknown.

Our study provides exploratory evidence that enrollment in BHHs is associated with higher rates of cervical and breast cancer screening for individuals with SMI in real-world settings but no effect on colorectal cancer screening. Despite improvements observed after BHH implementation, cancer screening rates remain suboptimal, which suggests that future interventions are needed to improve cancer screening rates for people with SMI.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Abbreviations:

BHH	behavioral health home
PRP	psychiatric rehabilitation program

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Table 1:

Likelihood of screening for study populations and predicted annual cancer screening rates with adjustment for participant and psychiatric rehabilitation program characteristics.

	Enrolled in BHH versus Not enrolled in BHH (Ref)			Enrolled in BHH		Not Enrolled in BHH	
	Odds Ratio	**95% CI**	**p-value**	**Predicted Annual Rate (%)**	**95% CI**	**Predicted Annual Rate (%)**	**95% CI**
Cervical Cancer	1.20	**1.07–1.35**	**.002**	30.9	28.5–33.2	27.1*	26.3–28.0
Breast Cancer	1.30	**1.06–1.59**	**.01**	27.9	24.3–31.5	22.9*	21.2–24.7
Colorectal Cancer	.97	.82–1.13	.66	11.3	10.0–12.7	11.7	10.8–12.5
Colonoscopy	1.05	.9–1.24	.53	10.2	9.0–11.4	9.7	9.0–10.5
Sigmoidoscopy	1.21	.27–5.50	.80	.2	.0–.5	.1	.0–.3
Fecal occult blood test	1.09	.77–1.54	.64	3.4	2.3–4.3	3.1	2.6–3.6

Effects of behavioral health home (BHH) enrollment were estimated using marginal structural models. Results of logistic regression analysis are at the person-year level, with $Pr(Outcome\ Event_{ij}) = B_0 + B_1(HealthHome_{ij}) + B_2(year)$, where $HealthHome_{ij}$ represents any BHH enrollment in a given person-year period. Wald chi-square tests were used to compare differences in groups with * $p<0.05$.