

Integrated care models and behavioral health care utilization: Quasi-experimental evidence from Medicaid health homes

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Abstract

Integration of behavioral and general medical care can improve outcomes for individuals with behavioral health conditions—serious mental illness (SMI) and substance use disorder (SUD). However, behavioral health care has historically been segregated from general medical care in many countries. We provide the first population-level evidence on the effects of Medicaid health homes (HH) on behavioral health care service use. Medicaid, a public insurance program in the United States, HHs were created under the 2010 Affordable Care Act to coordinate behavioral and general medical care for enrollees with behavioral health conditions. As of 2016, 16 states had adopted an HH for enrollees with SMI and/or SUD. We use data from the National Survey on Drug Use and Health over the period 2010 to 2016 coupled with a two-way fixed-effects model to estimate HH effects on behavioral health care utilization. We find that HH adoption increases service use among enrollees, although mental health care treatment findings are sensitive to specification. Further, enrollee self-reported health improves post-HH.

KEYWORDS

integrated care, Medicaid, serious mental illness, substance use disorder

1 | INTRODUCTION

Behavioral health conditions, which we define as serious mental illnesses (SMIs) and substance use disorders (SUDs), are common and costly ailments. Within the United States, the focus of our study, 4.5% and 7.6% of adults met diagnostic criteria for an SMI or SUD in 2017 (Center for Behavioral Health Statistics and Quality, 2018). These conditions are particularly common among Medicaid enrollees: In 2017, 8.2% and 10.2% of enrollees met diagnostic criteria for an SMI and SUD, respectively. Medicaid is a public insurance system jointly administered by federal and state governments and is the primary insurer of low-income people in the United States. The program covered 66 M people in 2019

(Centers for Medicare and Medicaid Services, 2019b) with expenditures of \$582B in 2017 (Martin et al., 2019). Medicaid is the largest purchaser of behavioral health care services in the United States, financing 26% of such services (Medicaid and CHIP Payment and Access Commission, 2015). Further, Medicaid enrollees are at elevated risk for behavioral health conditions, are more likely to have chronic conditions and poor health behaviors (e.g., cardiovascular disease, diabetes, and smoking), and are less likely to receive guideline-concordant care for behavioral and general health conditions than other insured populations (Busch et al., 2013; Cook et al., 2014; Janssen, McGinty, Azrin, Juliano-Bult, & Daumit, 2015; Creedon & Cook, 2016).

Health care payers and providers have long recommended integrating behavioral and general medical care to provide more comprehensive treatment to patients with behavioral health conditions, which should both improve patient health and reduce overall health care costs (American Psychiatric Association, 2016; Centers for Medicare and Medicaid Services, 2019e). However, historically, the U.S. behavioral health care delivery system has been segregated from the general medical delivery system, with patients relying on specialty behavioral health care providers and often receiving inadequate care for other health conditions (Buck, 2011). This segregation has impeded efforts to integrate the two forms of health care.

The Affordable Care Act (ACA) of 2010 created substantial changes to the U.S. health care system, with profound implications for the accessibility and quality of behavioral health care (McClellan & Woodworth, 2014). Several studies show that ACA-Medicaid income eligibility expansions—which extend eligibility to all nonelderly adults with incomes up to 138% of the federal poverty level (FPL)—substantially increase behavioral health care service use and shift financing from patients, local governments, and providers to Medicaid (Blunt et al., 2020; Cher, Morden, & Meara, 2019; Grooms & Ortega, 2019; Maclean, Carson, Cook, & Pesko, 2018; Maclean & Saloner, 2019; Meinhofer & Witman, 2018; Wen, Hockenberry, Borders, & Druss, 2017).

Beyond expanding Medicaid income eligibility, the ACA also created new programs to manage the care of enrollees with complex health needs, for example, the Medicaid health home (HH) program. However, there is surprisingly limited research on the HH program, particularly compared with the vast literature exploring Medicaid income eligibility expansion effects (Gruber & Sommers, 2019). To the best of our knowledge, although there have been studies of individual states, to date, there has not been a national analysis of HH programs that uses quasi-experimental methods (Clemans-Cope et al., 2017; Spillman & Allen, 2017). We address this important gap in the literature using National Survey on Drug Use and Health (NSDUH) data and a two-way fixed-effects model. We provide some of the first causal evidence on the effects of HHs on use of behavioral health care services, which are of particular value to enrollees but are underused.

HHs are intended to improve access to and quality of care for Medicaid enrollees with chronic behavioral and/or somatic health conditions (Centers for Medicare and Medicaid Services, 2019a). HHs targeting behavioral health typically focus on coordinating care across specialty behavioral health and general medical providers, case management, and transitional services, for example, management of the transition from an inpatient hospitalization to outpatient care. States pursuing HHs receive enhanced federal payment (90% federal medical assistance percentage [FMAP]) for qualified services in the first 2 years of an enrollee's participation in the HH program, after this period states receive the standard FMAP. Through the HH program, states can bill for services not previously reimbursed by Medicaid, including, for example, comprehensive care management, care coordination, health promotion, transitional care, patient and family support, and referral to community and social support services (Centers for Medicare and Medicaid Services, 2019a). HH program enrollment is rapidly growing among Medicaid enrollees, but, to date, there are many nonengaged enrollees who are eligible and could likely benefit from participating in the program (Centers for Medicare and Medicaid Services, 2019d).

2 | DATA, VARIABLES, AND METHODS

2.1 | Behavioral health care data

We use NSDUH data with state identifiers for the period 2010 to 2016. We begin the study in 2010 to avoid confounding from the large-scale global recession of 2007 to 2009 which is likely associated with behavioral health and health care utilization (Bradford & Lastrapes, 2013; Carpenter, McClellan, & Rees, 2017; Cawley & Simon, 2005; Maclean, Horn, & Cantor, 2020). Further, we wish to focus on the post-ACA period as the policy reflects a major shift in the U.S. health care system. If we include earlier years in our study period, we are concerned that we may not be able to adequately account for this major health care system-wide transformation in our empirical models.

The NSDUH is a household survey representative of noninstitutionalized individuals 12 or older and is used to generate the official U.S. government statistics on behavioral health and health care use. Of relevance to our study, the NSDUH includes individuals who reside in households as well as multiple noninstitutional group settings (e.g., halfway houses, partial hospitalization, and recovery homes) but does not include residents of psychiatric hospitals or full-time inpatient residential facilities, incarcerated people, or homeless people. Because the HH model focuses on community-dwelling Medicaid enrollees, we expect the NSDUH to generally include our main population of interest. However, we note that, through the use of the NSDUH, we may not capture all potentially eligible enrollees. For example, the NSDUH will not capture enrollees who may enter an institution due to lack of adequate care in noninstitutional settings or individuals who become incarcerated or homeless due to poor access to care. Therefore, we acknowledge that our use of the NSDUH, which is advantageous in many important ways, is potentially a limitation to our study. The NSDUH annually surveys approximately 70,000 people (Center for Behavioral Health Statistics and Quality, 2017).

We focus on current Medicaid enrollees 19 to 64 years of age based on self-reported insurance coverage at the time of the survey ($N = 41,700$; the observation count is rounded to the nearest hundred following the Substance Abuse and Mental Health Services Administration (2018) data use guidelines). The NSDUH separately assesses mental health treatment and SUD treatment by asking respondents about whether they received services in any of a list of settings in the prior year, for example, hospital, doctor's office, mental health clinic, or rehabilitation facility. We examine any self-reported past-year mental health treatment and SUD treatment. Ideally, we would like to study specific treatment settings, but sample sizes are too small for these outcomes to permit reliable analysis (full details are available on request).

2.2 | HH data

The HH design and components vary across states (Centers for Medicare and Medicaid Services, 2019d). While states have the option to develop HH programs for managing nonbehavioral health chronic conditions, we focus on programs that target SMI and/or SUD and are in operation in all areas of the state. Using data from CMS, we identify whether the HH covers patients with SMI only, SUD only, or both SMI and SUD.

We consider states to be HH states and in our intervention group if they adopt an HH for SMI and/or SUD (regardless of whether or not chronic conditions are also included). Three states closed their HH or combined the HH with another program during our study period. These states are included in the comparison group for the time before their HH opens and the time after their HH closes but are considered intervention group states while their HH programs are open. States in the intervention group must offer HH services. While some states have implemented HHs in specific regions within the state, we consider HH states to be only those states that have implemented statewide programs in our main analysis. That is, states with substate programs that are not available to all state residents regardless of residential location are considered non-HH states and are in our comparison group. We return to the issue of substate HH programs more formally in robustness checking.

2.3 | Methods

We estimate the two-way fixed-effects model outlined in Equation 1:

$$H_{i,s,p} = \alpha_0 + \alpha_1 \text{home}_{s,p} + P_{i,s,p} \alpha_2 + X_{s,p} \alpha_3 + \theta_s + \tau_p + \varepsilon_{i,s,p}, \quad (1)$$

$H_{i,s,p}$ is a behavioral health care service use outcome for individual i in state s in period p (quarter-year). $\text{home}_{s,p}$ is an indicator for an HH in state s in period p . $P_{i,s,p}$ is a vector of individual characteristics. $X_{s,p}$ is a vector of annual-level state characteristics: unemployment rate, e-cigarette tax, e-cigarette indoor use ban, tobacco cigarette tax, indoor smoking bans, prescription drug monitoring program, medical marijuana law, ACA Medicaid income eligibility expansion, and the Medicaid-to-Medicare reimbursement rate ratio for a set of 146 primary care services (Ali, Dowd, Clssen, Mutter, & Novak, 2017; Centers for Disease Control and Prevention, 2019; Flood, King, Ruggles, & Warren, 2017; Maclean, Pesko, & Hill, 2019; Sabia & Nguyen, 2018; Smith et al., 2015; Zuckerman & Goin, 2012; Zuckerman, Skopec, & McCormack, 2014). We also control for state and period fixed-effects, which account for time-invariant state-level factors and secular trends in our outcomes that affect the nation as a whole, respectively. We apply linear probability models, use NSDUH survey weights, and calculate 95% confidence intervals that account for within-state clustering.

3 | RESULTS

Table 1 reports summary statistics; 23.4% and 4.5% of the sample report any mental health and SUD treatment, respectively. 11.9% of enrollees reside in states with an HH for SMI and/or SUD. HH effective dates for each state that adopted an HH for SMI and/or SUD by the end of our study period (2016) are listed in Table S1.

We next attempt to shed some light on HH program penetration within Medicaid. To the best of our knowledge, CMS has not consistently tracked this information. However, we use information available in the NSDUH data to provide some suggestive evidence on state-specific program penetration. To this end, we calculate the number and share of nonelderly Medicaid enrollees in each state with an SUD and/or SMI (Table 2). These numbers reflect the potentially HH-eligible subgroup of the Medicaid enrollee population. However, we acknowledge that there are many additional

TABLE 1 Past year behavioral health outcomes and service use in all states and states that adopted and did not adopt a state-wide Medicaid health home for SMI and/or SUDs by 2016 among nonelderly Medicaid enrollees: National Survey on Drug Use and Health 2010–2016

Sample	All states, all years	Adopted, all years	Did not adopt, all years	Difference ^a
<i>Behavioral health care use (past year)</i>				
Proportion with mental health treatment	0.234	0.231	0.245	0.003
Proportion with SUD treatment	0.045	0.042	0.057	<0.000
<i>Medicaid Health Home for SMI/SUD</i>				
Proportion with any	0.119	-	--	-
<i>Individual-level characteristics</i>				
Age	38.38	38.31	38.59	0.052
Male	0.366	0.361	0.385	<0.000
Female	0.634	0.639	0.615	<0.000
White	0.656	0.671	0.607	<0.000
African American	0.248	0.238	0.281	<0.000
Asian	0.045	0.040	0.060	<0.000
Hispanic	0.235	0.250	0.187	<0.000
Less than high school	0.278	0.282	0.264	<0.000
High school	0.365	0.370	0.351	<0.000
Some college	0.275	0.275	0.274	0.854
College	0.082	0.073	0.111	<0.000
Married	0.281	0.286	0.265	<0.000
Divorced	0.035	0.035	0.034	0.527
Widowed	0.225	0.227	0.220	0.123
Single	0.459	0.452	0.481	<0.000
<i>State-level characteristics</i>				
Unemployment rate	7.018	7.17	6.532	<0.000
Tobacco cigarette excise tax per pack (2016 \$)	1.617	1.302	2.650	<0.000
Tobacco cigarette venue bans (0–3) ^b	0.722	0.667	0.901	<0.000
Electronic cigarette tax (any)	0.036	0.02	0.088	<0.000
Electronic cigarette venue ban (0–3) ^b	0.049	0.058	0.018	<0.000
Prescription drug monitoring program	0.942	0.959	0.889	<0.000
Medical marijuana law	0.460	0.471	0.425	<0.000
ACA-Medicaid income expansion	0.110	0.033	0.360	<0.000
Medicaid-to-Medicare fee ratio ^c	0.398	0.392	0.418	<0.000
Observations	41,700	11,900	29,900	--

Note. The unit of observation is a Medicaid nonelderly enrollee in a state in a quarter in a year. NSDUH sample weights are applied to the data. Sample sizes are rounded to the nearest 100 (Substance Abuse and Mental Health Services Administration, 2018).

Abbreviations: SMI, serious mental illness; SUD, substance use disorder.

^a*p* value is from a difference in proportions test (binary variable) or *t*-test (continuous variable) between states that adopted and did not adopt a Medicaid Health Home for SMI and/or SUD by 2016.

^bTobacco and electronic cigarette venue bans include restaurants, bars, and private worksites.

^cTwelve-month moving average.

TABLE 2 Average annual number of nonelderly Medicaid enrollees with a behavioral health condition 2010–2016 and number of any Medicaid enrollees engaged with a Medicaid health home

Outcome	Has HH for SMI and/or SUD by 2016	Average annual number of nonelderly enrollees with a behavioral health condition	Share of nonelderly enrollees with a behavioral health condition
Alabama	Y	90,213	0.350
Alaska		17,090	0.399
Arizona		240,797	0.388
Arkansas		79,977	0.405
California		977,736	0.283
Colorado		120,846	0.361
Connecticut	Y	86,198	0.322
Delaware		35,673	0.387
District of Columbia	Y	28,783	0.312
Florida		370,901	0.318
Georgia		174,398	0.385
Hawaii		43,235	0.369
Idaho	Y	31,197	0.501
Illinois		305,707	0.291
Indiana		156,338	0.442
Iowa	Y	56,815	0.357
Kansas	Y	^a	^a
Kentucky		162,034	0.430
Louisiana		119,117	0.352
Maine	Y	60,021	0.432
Maryland	Y	131,300	0.359
Massachusetts		285,195	0.398
Michigan		336,747	0.386
Minnesota	Y	167,327	0.366
Mississippi		66,151	0.367
Missouri	Y	147,171	0.469
Montana		18,179	0.439
Nebraska		32,546	0.414
Nevada		53,268	0.360
New Hampshire		29,717	0.557
New Jersey		17,4193	0.355
New Mexico		76,370	0.352
New York	Y	718,156	0.320
North Carolina		215,292	0.413
North Dakota		10,844	0.382
Ohio		381,086	0.399
Oklahoma	Y	83,811	0.462
Oregon	Y	145,795	0.473
Pennsylvania		330,894	0.415
Rhode Island	Y	37,537	0.407
South Carolina		125,688	0.397
South Dakota	Y	14,503	0.502
Tennessee		174,723	0.372
Texas		316,211	0.347
Utah		45,561	0.497
Vermont	Y	36,135	0.456
Virginia		128,633	0.417
Washington		193,579	0.456
West Virginia		79,980	0.433
Wisconsin		163,664	0.378

(Continues)

TABLE 2 (Continued)

Outcome	Has HH for SMI and/or SUD by 2016	Average annual number of nonelderly enrollees with a behavioral health condition	Share of nonelderly enrollees with a behavioral health condition
Wyoming		8,610	0.397

Notes: Number of nonelderly enrollees 2010 to 2016 who screen positive for an SMI and/or an SUD. NSDUH survey weights are applied to the data.

Abbreviations: HH, health home; NSDUH, National Survey on Drug Use and Health; SMI, serious mental illnesses; SUD, substance use disorder.

^aEstimates suppressed in accordance with confidentiality guidelines.

factors that could limit a Medicaid enrollee's ability to participate in the HH program. Therefore, we likely overstate the number of Medicaid enrollees eligible to participate in an HH program in our calculations reported here.

In Table 2, the first column reports (pooled across all years of our study period, 2010 to 2016) the estimate of nonelderly Medicaid enrollees with an SMI and/or an SUD in the NSDUH. Our measures of behavioral health symptomatology are indicators for an SMI in the past year and an SUD in the past year based on screeners used to capture individuals at elevated risk for these conditions in survey settings. The NSDUH SMI screener is derived from combining two validated scales measuring psychological distress and functional impairment (Substance Abuse and Mental Health Services Administration, 2013). The NSDUH measure of SUD is derived from a series of questions that measure symptoms of substance dependence (e.g., experiencing withdrawal after substance nonuse) and abuse (e.g., experiencing negative legal, social, or occupational consequences from substance use) that were developed to be in line with diagnostic criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Revision (Center for Behavioral Health Statistics and Quality, 2016; Substance Abuse and Mental Health Services Administration, 2016).

On average each year approximately 7.9 million Medicaid nonelderly enrollees screen positive for these conditions nationally over our study period, with the mean share of Medicaid nonelderly enrollees with SMI and/or SUD across states ranging from a low of 28% in California to a high of 56% in New Hampshire. According to CMS, approximately 1 million nonelderly Medicaid enrollees participate in state HHs—this number includes HHs for SMI and/or SUD and other chronic conditions (Centers for Medicare and Medicaid Services, 2019c). Our NSDUH data thus are in line with a substantial number of potentially eligible nonelderly Medicaid enrollees not participating in HHs. The relatively low participation rate in HHs suggests that there are likely to be additional enrollees who could qualify for HH participation and, in turn, benefit from the program.

The extent to which low HH program engagement (relative to the population that potentially qualifies for the program) may impact our estimated HH effect sizes is unclear. On the one hand, if Medicaid enrollees with the most serious behavioral health conditions participate in the HH program, then we may overstate HH effects for the average Medicaid enrollee with an SMI and/or SUD. On the other hand, if enrollees who participate in the HH program have relatively mild behavioral health conditions, then we may understate HH effects. As participation by Medicaid enrollees in HH grows, future studies could reassess program effects.

Table 3 reports selected results from our DD regression models (Panel A). Receipt of SUD treatment increased by 1.3 percentage points (“ppts”), or 23% relative to the baseline, in adopting states relative to nonadopting states after HH adoption. The relative effect is large because the baseline rate of SUD treatment use is low (4.5%). While the coefficient estimate in the mental health care regression is positive, it is not statistically distinguishable from zero.

To explore dynamics in HH effects, we estimate a model that includes the number of periods the HH has been in effect (Table 3, Panel B). Initially, we observe that both mental health and SUD treatment increase (3.9 ppts and 2.6 ppts, respectively), but these effects appear to decline as time passes. These findings may capture better treatment and reduced need for treatment over time, potentially stemming from pent-up demand among enrollees who were unable to access care prior to HH adoption.

We also stratify the analysis sample by median share of Medicaid enrollees with SMI and/or SUD in 2010 (i.e., prior to HH adoption in any state). This stratification allows us to assess whether HH effects are larger in states with potentially greater shares of the Medicaid population with a qualifying health condition and are therefore potentially eligible for the program. Results are reported in Table 3 Panels C and D. Coefficient estimates are larger in magnitude and statistically distinguishable from zero in the sample with above median share of Medicaid enrollees with SMI and/or SUD. This pattern of results is in line with the hypothesis that HH effects should be larger in states where more enrollees could potentially enroll in and benefit from the HH program. However, 95% confidence intervals for the estimates generated in the two stratified samples overlap, and thus, we do not wish to overstate heterogeneity in effect size.

TABLE 3 Effect of a Medicaid health home targeting SMI and/or SUD on treatment use among nonelderly Medicaid enrollees: National Survey on Drug Use and Health 2010–2016

Outcome	Mental health	SUD
<i>Sample proportion in treatment states, pretreatment</i>	0.266	0.057
Panel A: Differences-in-differences		
Medicaid health home for SMI and/or SUD	0.010 [−0.011, 0.032]	0.013** [0.001, 0.026]
Panel B: Dynamic differences-in-differences		
Medicaid health home for SMI and/or SUD	0.039** [0.001, 0.077]	0.026** [0.003, 0.049]
Medicaid health home for SMI and/or SUD *linear trend since adoption	−0.017* [−0.035, 0.002]	−0.008* [−0.016, 0.001]
Panel C: Differences-in-differences, states below median SMI and/or SUD prevalence among Medicaid enrollees in 2010		
<i>Sample proportion in treatment states, pretreatment:</i>	0.233	0.052
Medicaid health home for SMI and/or SUD	−0.002 [−0.027, 0.023]	0.016 [−0.008, 0.039]
Observations	24,200	24,400
Panel D: Differences-in-difference, states at or above median SMI and/or SUD prevalence among Medicaid enrollees in 2010		
<i>Sample proportion in treatment states, pretreatment:</i>	0.303	0.063
Medicaid health home for SMI and/or SUD	0.036* [−0.001, 0.072]	0.018*** [0.006, 0.03]
Observations	16,500	16,600

Note. The unit of observation is a Medicaid nonelderly enrollee in a state in a quarter in a year. See Table S1 for SMI and/or SUD HH adoption states and dates. The pretreatment period is 2010 to the year prior to adopting for HH adopting states. NSDUH survey weights are applied to the data. All models estimated with a linear probability model and control for individual characteristics, state characteristics, state fixed-effects (i.e., a separate indicator for each state), and period fixed-effects (i.e., a separate indicator for each quarter-by-year period); 95% confidence intervals account for within-state clustering and are reported in square brackets. Sample sizes are rounded to the nearest 100 (Substance Abuse and Mental Health Services Administration, 2018).

Abbreviations: HH, health home; NSDUH, National Survey on Drug Use and Health; SMI, serious mental illnesses; SUD, substance use disorder.

*Statistically different from zero at the 10% level.

**Statistically different from zero at the 5% level.

***Statistically different from zero at the 1% level.

The key assumption of two-way fixed-effects models is that adopting and nonadopting states would have followed the same trends in outcomes had the adopting states not implemented their HH. We estimate an event-study to investigate parallel trends (Autor, 2003). In particular, we construct quarter leads and lags surrounding the HH adoption, with the quarter prior to adoption as the omitted group. We do not report coefficient estimates for quarters more than 3 years before the event and 2 years after the event as sample sizes become small, but we do control for these indicators in the regression model. Results do not suggest that these groups of states followed differential trends prior to HH adopting states passing the policy (Table 4). We interpret these findings as suggestive evidence that our NSDUH data satisfy parallel trends.

A concern with our analysis is that we are potentially capturing the effects of increases in SMI and/or SUD within the nonelderly Medicaid enrollee population, which could lead to increased treatment but through a very different causal channel than the program allowing better access to care. That is, events coincident to the adoption of HH prompts SMI and/or SUD among nonelderly Medicaid enrollees rather than increasing service within a stable population of enrollees with these health conditions. We do not expect HH participation to lead to a reduction in the probability that an enrollee meets criteria for an SMI and/or SUD given the chronic nature of these conditions and the features of the programs (see Section 1). To explore the possibility that HH adoption is associated with increases, the probability

TABLE 4 Effect of a Medicaid health home targeting SMI and/or SUD on treatment use among nonelderly Medicaid enrollees using an event-study: National Survey on Drug Use and Health 2010–2016

Outcome:	Mental health treatment	SUD treatment
<i>Sample proportion in treatment states, pretreatment:</i>	0.266	0.057
Twelve quarters pre-HH adoption	−0.116** [−0.227, −0.005]	−0.018 [−0.090, 0.054]
Eleven quarters pre-HH adoption	−0.063 [−0.185, 0.058]	0.024 [−0.051, 0.099]
Ten quarters pre-HH adoption	−0.021 [−0.123, 0.082]	−0.028 [−0.077, 0.022]
Nine quarters pre-HH adoption	−0.022 [−0.095, 0.051]	−0.022 [−0.076, 0.033]
Eight quarters pre-HH adoption	0.046 [−0.099, 0.192]	−0.018 [−0.048, 0.013]
Seven quarters pre-HH adoption	−0.020 [−0.160, 0.120]	0.022 [−0.064, 0.108]
Six quarters pre-HH adoption	−0.035 [−0.149, 0.079]	−0.021 [−0.071, 0.030]
Five quarters pre-HH adoption	0.008 [−0.096, 0.112]	−0.017 [−0.058, 0.024]
Four quarters pre-HH adoption	0.009 [−0.070, 0.088]	−0.014 [−0.065, 0.036]
Three quarters pre-HH adoption	0.0004 [−0.084, 0.085]	−0.016 [−0.054, 0.023]
Two quarters pre-HH adoption	−0.026 [−0.136, 0.085]	−0.028* [−0.061, 0.005]
One quarter prior to HH adoption (omitted category)	--	--
Quarter of HH adoption	0.056 [−0.033, 0.146]	−0.003 [−0.052, 0.046]
One quarters post-HH adoption	−0.045 [−0.143, 0.054]	−0.019 [−0.087, 0.049]
Two quarters post-HH adoption	−0.009 [−0.095, 0.077]	−0.004 [−0.051, 0.042]
Three quarters post-HH adoption	0.079 [−0.022, 0.181]	0.066** [0.006, 0.126]
Four quarters post-HH adoption	0.029 [−0.071, 0.128]	0.003 [−0.046, 0.051]
Five quarters post-HH adoption	0.047 [−0.090, 0.183]	0.014 [−0.043, 0.070]
Six quarters post-HH adoption	−0.038 [−0.130, 0.053]	−0.005 [−0.060, 0.051]
Seven quarters post-HH adoption	0.008 [−0.093, 0.109]	−0.001 [−0.033, 0.031]
Eight quarters post-HH adoption	0.038 [−0.009, 0.085]	0.014 [−0.079, 0.107]
Observations	40,700	41,000

Note. The unit of observation is a Medicaid nonelderly enrollee in a state in a quarter in a year. We construct indicators for four pre-HH adoption years and 4 years post-HH adoption, states that do not adopt an HH are coded as zero for all event-time indicators. The quarter prior to HH adoption is the omitted category. We suppress quarters outside those reported in the table as sample sizes become small. We incorporate states' adoption of HHs for SMI and/or SUD that occur after our study period. We suppress coefficient estimates on indicators for 4 years in advance, and 3 and 4 years following HH adoption as sample sizes (in event-time) become very small. See Table S1 for SMI and/or SUD HH adoption states and dates. The pretreatment period is 2010 to the year prior to adopting for HH adopting states. NSDUH survey weights are applied to the data. All models estimated with a linear probability model and control for individual characteristics, state characteristics, state fixed-effects (i.e., a separate indicator for each state), and period fixed-effects (i.e., a separate indicator for each quarter-by-year period); 95% confidence intervals account for within-state clustering and are reported in square brackets. Sample sizes are rounded to the nearest 100 (Substance Abuse and Mental Health Services Administration, 2018).

Abbreviations: HH, health home; NSDUH, National Survey on Drug Use and Health; SMI, serious mental illnesses; SUD, substance use disorder.

*Statistically different from zero at the 10% level.

**Statistically different from zero at the 5% level.

***Statistically different from zero at the 1% level.

that a nonelderly Medicaid enrollee has an SMI and/or SUD, we regress the probability of screening positive an SMI and SUD separately (we use variables described earlier in this section). We find no evidence that adoption of an HH leads to changes in these outcomes among Medicaid enrollees (Table 5).

We consider additional health and health care outcomes that could be influenced by HH adoption (Table 5): self-rated excellent health, tobacco product use, and a measure of potentially unnecessary care that could be avoided through appropriate preventive and ambulatory care (hospitalizations). Examining these outcomes allows us to assess

TABLE 5 Effect of a state-wide Medicaid health home for SMI and/or SUD on SMI, SUD, general health, past month tobacco product use, and past year hospitalizations among nonelderly Medicaid enrollees: National Survey on Drug Use and Health 2010–2016

Outcome:	Serious mental illness (SMI)	Substance use disorder (SUD)	Excellent self-reported health	Tobacco product use	Hospitalizations (number)
<i>Sample proportion in treatment states, pretreatment</i>	0.097	0.121	0.146	0.442	0.188
Medicaid health home for SMI and/or SUD	0.002 [−0.015, 0.02]	0.008 [−0.021, 0.037]	0.022*** [0.008, 0.036]	0.005 [−0.029, 0.038]	0.001 [−0.029, 0.031]
Observations	41,000	41,000	41,000	41,000	40,800

Note. The unit of observation is a Medicaid nonelderly enrollee in a state in a quarter in a year. SMI is an indicator coded as one if the respondent meets criteria for an SMI based on responses to survey items in NSDUH and zero otherwise. Excellent self-reported health is an indicator coded as one if the respondent reports that their general health is excellent at the time of the survey and zero otherwise. Tobacco product use is an indicator coded one if the respondent reports that they used a tobacco product (cigarettes, cigar, snus, smokeless tobacco, etc.) within the past month at the time of the survey and zero otherwise. Hospitalization is the number of hospital admissions in the past year reported by the respondent at the time of the survey. See Table S1 for SMI and/or SUD HH adoption states and dates. The pretreatment period is 2010 to the year prior to adopting for HH adopting states. NSDUH survey weights are applied to the data. All models estimated with a linear probability model when the outcome is binary and least squares with the outcome is continuous, and control for individual characteristics, state characteristics, state fixed-effects (i.e., a separate indicator for each state), and period fixed-effects (i.e., a separate indicator for each quarter-by-year period); 95% confidence intervals account for within-state clustering and are reported in square brackets. Sample sizes are rounded to the nearest 100 (Substance Abuse and Mental Health Services Administration, 2018).

Abbreviations: HH, health home; NSDUH, National Survey on Drug Use and Health; SMI, serious mental illnesses; SUD, substance use disorder.

*Statistically different from zero at the 10% level.

**Statistically different from zero at the 5% level.

***Statistically different from zero at the 1% level.

whether HH adoption improved health and health behaviors among enrollees and improved care quality. HH adoption leads to a 2.2 ppt (15%) increase in the probability of reporting excellent health in adopting states; other outcomes are unchanged: Coefficients estimates are small and imprecise.

4 | ROBUSTNESS

We conduct several robustness checks. In particular, we use a definition of any HH regardless of targeted chronic condition (Table S2, Panel A), exclude from the analysis sample states with HHs that are only available in specific regions of a state—that is, states with programs that are limited to certain geographic regions are considered non-HH states and are included in our comparison group (Table S2, Panel B), exclude states that close their HH during the study period from the analysis sample (Table S2, Panel C), and focus on enrollees with SMI and/or SUD symptomatology (Table S2, Panel D). Results are broadly robust.

We note that within the sample of enrollees with SMI and/or SUD, we observe an increase in mental health care treatment of 5.8 ppts and of SUD treatment of 3.8 ppts, compared with increases of 1.0 ppts and 1.3 ppts among the full analysis sample. Due to smaller sample sizes for those with SMI and/or SUD, the coefficient on SUD treatment is not statistically significant.

A possible threat to our ability to estimate the causal effect of HHs on behavioral health care service utilization among nonelderly Medicaid enrollees are that HH adoption may prompt some previously Medicaid-eligible individuals to take up this form of public insurance to access the newly available services. Such behaviors are a form of program induced migration and could lead to changes in the composition of Medicaid enrollees, leaving our coefficient estimates vulnerable to conditional on positive bias. However, we find no evidence that HH program adoption affects Medicaid enrollment in our data (Table S3).

We report a full set of coefficient estimates for all time-varying state-level controls and individuals controls included in Equation 1 in Table S4. We reestimate Equation 1 including only (a) individual characteristics and state- and period-

fixed effects and (b) state- and period-fixed effects (Table S4). We acknowledge that our coefficient estimates are less precise when we exclude these controls from the regression model.

Finally, to explore the importance of access to behavioral health care services, we include the number of offices of physicians and nonphysicians specializing in mental health care treatment, specialty outpatient and residential mental illness and SUD treatment providers, and psychiatric hospitals using data on the universe of establishments in the United States from the U.S. Census Bureau's County Business Patterns data (Table S2, Panel E).

5 | DISCUSSION

We provide among the first causal evidence on the effects of an under-studied ACA-related policy: Medicaid HHs targeting SMI and/or SUD. These programs are designed to increase access to comprehensive care among enrollees with SMI and/or SUD. Given that Medicaid enrollees have higher rates of these conditions and are less likely to receive appropriate care than the privately or Medicare insured populations, HHs may offer an important opportunity to improve access to/quality of care for enrollees. Using a two-way fixed-effects model, we show that following HH adoption the probability of using mental health care and SUD treatment increases in adopting states, although we note that mental health care findings are sensitive to specification. While HH adoption appears to improve enrollee general health, we do not observe declines in unnecessary care or improvements in chronic conditions.

Although novel in many ways, our study has limitations. We rely on survey data to classify respondents as Medicaid enrollees which could contain error (Lo Sasso & Buchmueller, 2004). We examine only the early effects of HHs. HHs involve complex implementation activities, such as establishing coordinated relationships between specialty behavioral and general medical care providers (McGinty et al., 2018). Thus, effects may vary over time. Finally, our study period (2010 to 2016) was characterized by numerous changes to the Medicaid program and to insurance generally within the United States, which implies that we may not fully isolate HH effects from other changes. This limitation is salient in our context as HH engagement is not substantial.

Our findings suggest that Medicaid HHs targeting behavioral health conditions may be a promising model for addressing the low utilization of behavioral health care treatment among enrollees and for improving overall health within this population. HHs provide additional screening and case management, which may be especially helpful for SUD given widespread underdiagnosis and poor care coordination.

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CONFLICT OF INTEREST

None declared.

DISCLAIMER

The views expressed in this paper are those of the authors, and no official endorsement by the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services is intended or should be inferred.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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