

Rural-Nonrural Differences in Telemedicine Use for Mental and Substance Use Disorders Among Medicaid Beneficiaries

Timothy B. Creedon, Ph.D., Kristin E. Schrader, M.A., Peggy L. O'Brien, Ph.D., Janice R. Lin, B.S., Christopher D. Carroll, M.Sc., Norah Mulvaney-Day, Ph.D.

Objective: This study investigated recent rural-nonrural trends in the prevalence and amount of mental and substance use disorder telemedicine received by adult Medicaid beneficiaries.

Methods: An analysis of 2012–2017 claims data from the IBM MarketScan Multi-State Medicaid Database for adult beneficiaries ages 18–64 years with mental and substance use disorder diagnoses (N= 1,603,066) identified telemedicine services by using procedure modifier codes and *ICD-9* and *ICD-10* diagnosis codes. Unadjusted trends in telemedicine use were examined, and multivariate regression models compared the prevalence and amount of telemedicine and in-person outpatient treatment received by rural (N=428,697) and nonrural (N= 1,174,369) beneficiaries and by diagnosis.

Results: Rates of telemedicine treatment for mental and substance use disorders among Medicaid beneficiaries increased during the study period but remained low. Among

rural beneficiaries, there was a 5.9 percentage point increase in telemedicine for mental disorders and a 1.9 percentage point increase in telemedicine for substance use disorders. After control for other individual characteristics, rural beneficiaries were more likely than nonrural beneficiaries to receive any telemedicine for mental disorder (2.2 percentage points more likely) or substance use disorder (0.6 percentage points) treatment. Receipt of telemedicine was associated with receipt of more in-person outpatient services by rural beneficiaries (11.2 more visits for mental disorders and 8.2 more for substance use disorders).

Conclusions: Although provision of telemedicine for mental and substance use disorders increased during the study period and was somewhat more common among rural Medicaid beneficiaries, it remains an underused resource for addressing care shortages in rural areas.

Psychiatric Services in Advance (doi: 10.1176/appi.ps.201900444)

Despite growth in the use of telemedicine (1) for treating mental and substance use disorders in rural areas, studies of associated improvement in access to treatment are limited to coverage by private insurance or Medicare. Medicaid is the primary payer for mental health services in the United States and covers more than one-fifth of substance use disorder spending (2). In addition, Medicaid beneficiaries use telemedicine primarily for behavioral health disorders (3). However, studies have not addressed whether telemedicine expands access to behavioral health care for Medicaid beneficiaries in rural areas, compared with nonrural areas.

Multiple federal agencies have noted that telemedicine can help those in rural and urban areas conveniently access behavioral health services (1, 4). For the 20% of Americans living in rural areas, the Substance Abuse and Mental Health Services Administration identifies telemedicine as one tool to help people with mental and substance use disorders

access providers who may be limited in number and geographically distant (5). Although studies show that telemedicine is indeed a potentially effective option for

HIGHLIGHTS

- In a 2012–2017 sample of adult Medicaid beneficiaries with mental and substance use disorder diagnoses, telemedicine was infrequently used but became more common over time.
- Telemedicine use grew faster and was more prevalent for rural than for nonrural beneficiaries.
- Rural beneficiaries with PTSD, bipolar disorder, schizophrenia, and other psychotic disorders were more likely than those with depression to receive telemedicine for mental health treatment.

delivering behavioral health services to both rural and nonrural areas, it remains underused (3, 6, 7).

Recent evidence suggests that Medicare providers may use telemedicine to increase treatment delivery in rural areas. Only 5% of psychiatrists treating fee-for-service Medicare beneficiaries in 2014–2016 delivered any telemedicine services, as reported by Choi et al. (8), but rural states had a far higher proportion of psychiatrists using telemedicine, compared with the less rural states studied. Mehrotra et al. (9) found an increase from 2004 to 2014 in telemedicine treatment among rural Medicare beneficiaries for any mental health condition and for serious mental illness.

These findings shed light on growing telemedicine use among rural Medicare beneficiaries; however, less is known about the use of telemedicine by rural beneficiaries of Medicaid, which serves a disproportionate share of rural America. Not only do Medicaid and Medicare delivery and payment systems differ substantially, but Medicaid reimbursement for behavioral health treatment also varies greatly by state (10). Because of the notable differences between these two programs, it is vital to ascertain the extent to which telemedicine is used in rural areas to provide behavioral health services to Medicaid beneficiaries. Furthermore, whether telemedicine can address limited provider supply and enhance access to behavioral health treatment for rural Medicaid beneficiaries merits investigation.

In this study, we examined the prevalence and amount of mental and substance use disorder telemedicine use among Medicaid beneficiaries as reflected by 2012–2017 claims data. We also assessed whether patterns of telemedicine use varied between rural and nonrural areas and by diagnosis.

METHODS

Data

We analyzed 2012–2017 claims data from the IBM MarketScan Multi-State Medicaid Database, which contains deidentified claims from millions of Medicaid beneficiaries in geographically diverse states. We limited our analysis to states that continuously contributed data throughout the study period. Data use agreements preclude identification of the states. We restricted our analysis to beneficiaries ages 18–64 years who were not enrolled in Medicare, had a Medicaid plan that included mental and substance use disorder and pharmacy coverage, were continuously enrolled in Medicaid for at least 1 full calendar year during the study period, and had at least one claim with a primary mental or substance use disorder diagnosis. We identified diagnoses by using *ICD-9* codes (codes 290–316) and *ICD-10* codes (codes F01–F99). We used *ICD-9* codes for 2012–2014 and the first three quarters of 2015 and *ICD-10* codes for the last quarter of 2015 and 2016–2017. (A table listing the codes is included in an online supplement to this article.)

We excluded states with no Medicaid telemedicine claims for mental and substance use disorders during the

study period. The unit of analysis was the beneficiary-year, and each unique beneficiary could contribute multiple beneficiary-years to the sample. Our final analytic sample of beneficiaries with primary mental disorder diagnoses was 2,654,339 beneficiary-years from 1,335,138 unique beneficiaries. The final analytic sample of beneficiaries with primary substance use disorder diagnoses was 663,068 beneficiary-years from 420,305 unique beneficiaries. Because some beneficiaries had both mental and substance use disorders, the total sample was 1,603,066 unique beneficiaries contributing 2,986,100 beneficiary-years of data.

Behavioral Health Telemedicine and Outpatient Visits

We measured telemedicine claims and in-person outpatient claims with a primary diagnosis of a mental disorder and, separately, with a primary diagnosis of a substance use disorder. We used the Centers for Medicare and Medicaid Services definition of telemedicine for Medicaid policy. The definition specifies that telemedicine involves real-time communication between the patient and a provider at a distant site using interactive telecommunications equipment with audio and video capabilities. This excluded telephone, e-mail, online portal, and other electronic services. We included telemedicine sessions that occurred in outpatient, inpatient, and emergency department settings.

We created two types of outcome measures—a binary indicator of any mental or substance use disorder telemedicine (or outpatient) treatment and a continuous indicator of the number of such visits. To address skewness caused by outliers at the high end of the visit distribution, we used a maximum value of 52 (i.e., an average of one visit per week), a value above the 99th percentile.

Beneficiary Characteristics

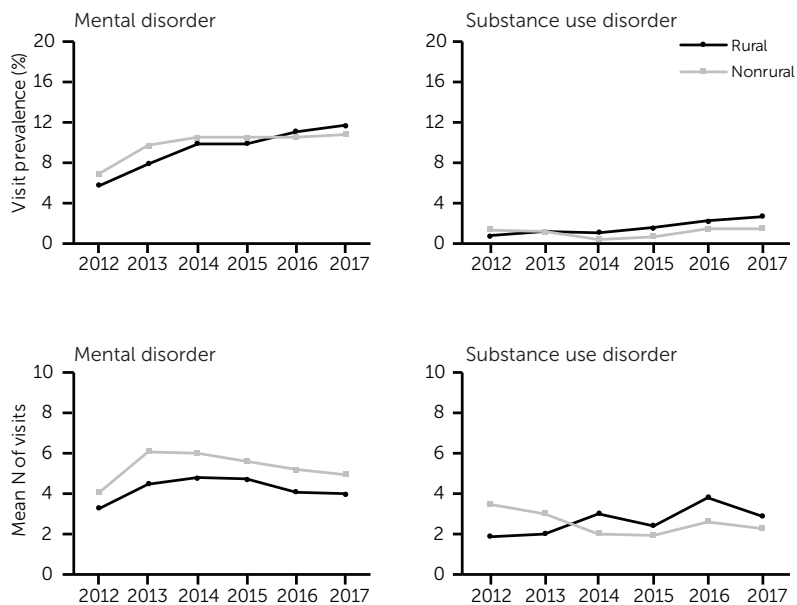
We defined beneficiaries as residing in rural or nonrural areas on the basis of the U.S. Census Bureau's metropolitan statistical area (MSA) associated with their five-digit zip code (11). We classified beneficiaries who did not live in an MSA as rural and those who lived in an MSA as nonrural.

Other beneficiary characteristics examined included age, sex, race-ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, or other), Medicaid health plan type (fee for service or managed care), year in which the beneficiary-year was observed, and number of years that the beneficiary was continuously enrolled in Medicaid (number of beneficiary-years). For mental disorders, we identified attention-deficit hyperactivity disorder, anxiety disorder, bipolar disorder, depression, schizophrenia and other psychotic disorders (schizophrenia), posttraumatic stress disorder, and other mental disorders. For substance use disorders, we identified alcohol use disorder, opioid use disorder, and others.

Statistical Analysis

We compared unadjusted rural and nonrural trends in the prevalence and mean number of mental and substance use

FIGURE 1. Rural and nonrural trends in prevalence of receipt of any telemedicine visits for mental and substance use disorder and mean number of visits per beneficiary-year, 2012–2017^a



^a Analysis of 2012–17 claims data from the IBM Watson Health MarketScan Multi-State Medicaid Database. Prevalence is reported as receipt of any telemedicine visit per beneficiary-year (mental disorder, N=2,654,339; substance use disorder, N=663,068). Mean N of visits per person-year includes only person-years with at least one telemedicine visit (mental disorder, N=262,430; substance use disorder, N=8,943). Visits for mental disorder treatment had a primary diagnosis of mental disorder. Visits for substance use disorder had a primary diagnosis of substance use disorder. (For additional details, see the online supplement.)

disorder telemedicine visits per beneficiary-year. We made unadjusted comparisons between rural and nonrural beneficiaries on beneficiary-level characteristics. Next, we used multivariate regression models to estimate adjusted rural-nonrural differences in the prevalence and amount of mental and substance use disorder telemedicine received per beneficiary-year, controlling for all other characteristics. To test whether there were differences by diagnosis in telemedicine utilization and whether the variation depended on rurality, we extended these models with interaction terms between mental and substance use disorder diagnosis and rurality. We used an interaction between rurality and receipt of any mental and substance use disorder telemedicine to test whether telemedicine use was associated with more or less outpatient treatment and whether that relationship varied by rurality.

For models of the prevalence of telemedicine or outpatient visits, we used logistic regression. For models of the number of such visits, we used generalized linear models with gamma distributions and log links. To aid interpretation, we present the primary estimates of interest from the regression analyses as predictive margins and contrasts (12–14) (see online supplement for the full output for each model).

In all stages of the analysis, we used listwise deletion to address missing values and clustered standard errors to

account for the sampling of multiple beneficiary-years from unique beneficiaries.

The MarketScan data used in this study were statistically deidentified and have been certified to satisfy the applicable conditions of HIPAA. Thus this study was exempt from Department of Health and Human Services regulations requiring institutional review board approval, and patient consent was not required.

RESULTS

Rural-Nonrural Trends in Telemedicine Use (Unadjusted)

In general, the prevalence and amount of treatment received for mental and substance use disorders increased over time for rural and nonrural beneficiaries (N=428,697 and N=1,174,369 unique beneficiaries, respectively). Figure 1 shows unadjusted trends in telemedicine use. In 2012, 5.8% of rural beneficiaries had a telemedicine visit for mental disorder treatment, compared with 7.0% of nonrural beneficiaries. By 2017, rural beneficiaries overtook their nonrural counterparts, with 11.7% and 10.8%, respectively, having any telemedicine visits for mental disorder treatment. Among those who had any telemedicine visits for mental disorders, nonrural beneficiaries had more visits each year than did rural beneficiaries, and the difference remained relatively constant.

Telemedicine visits for substance use disorder treatment were less common. Nonetheless, 2.7% of rural beneficiaries with a substance use disorder diagnosis had telemedicine visits for treatment in 2017, compared with 0.9% in 2012. However, for nonrural beneficiaries, levels remained relatively flat (1.4% in 2012 and 1.5% in 2017). The mean number of visits per year increased over time for rural beneficiaries (1.9 visits in 2012 and 2.9 visits in 2017), and the mean number of visits decreased for nonrural beneficiaries (3.5 visits in 2012 and 2.3 visits in 2017).

Characteristics of Rural-Nonrural Medicaid Beneficiaries

Demographic and other individual characteristics were comparable between rural beneficiaries (N=706,157 beneficiary-years) and nonrural beneficiaries (N=1,948,182 beneficiary-years) with any mental disorder diagnosis (Table 1). Of note, rural beneficiaries were more likely than nonrural beneficiaries to be non-Hispanic white (81.8% and 63.5%, respectively) and less likely to have a Medicaid managed care health plan (57.4% and 62.3%, respectively).

TABLE 1. Characteristics of rural and nonrural Medicaid beneficiaries with mental and substance use disorders, 2012–2017^a

Characteristic	Mental disorder (N=2,654,339)				Substance use disorder (N=663,068)			
	Rural (N=706,157)		Nonrural (N=1,948,182)		Rural (N=170,469)		Nonrural (N=492,699)	
	N	%	N	%	N	%	N	%
Outcome								
Telemedicine treatment								
Any visits	67,714	9.6	194,716	10.0	3,062	1.8	5,882	1.2
N of visits, if any (M±SD)	4.3±6.1		5.4±7.3		3.0±4.2		2.6±3.4	
Outpatient (in-person) treatment								
Any visits	701,850	99.4	1,934,793	99.3	167,651	98.4	482,466	97.9
N of visits, if any (M±SD)	4.3±6.1		10.2±14.5		13.2±16.7		13.7±17.6	
Covariate								
Age								
18–24	128,269	18.2	359,556	18.5	26,186	15.4	67,460	13.7
25–34	206,770	29.3	563,726	28.9	63,698	37.4	166,352	33.8
35–49	222,571	31.5	605,224	31.1	52,767	31.0	156,703	31.8
50–64	148,547	21.0	419,676	21.5	27,818	16.3	102,185	20.7
Sex								
Male	207,759	29.4	591,378	30.4	67,090	39.4	200,335	40.7
Female	498,398	70.6	1,356,804	69.6	103,379	60.6	292,364	59.3
Race-ethnicity								
Non-Hispanic white	577,636	81.8	1,237,680	63.5	142,478	83.6	335,824	68.2
Non-Hispanic black	105,924	15.0	630,627	32.4	21,172	12.4	141,947	28.8
Hispanic	9,039	1.3	46,367	2.4	1,671	1.0	7,637	1.6
Other	13,488	1.9	33,509	1.7	5,148	3.0	7,292	1.5
Health plan type								
Fee for service	301,003	42.6	735,503	37.8	64,827	38.0	159,590	32.4
Managed care	405,154	57.4	1,212,679	62.3	105,642	62.0	333,109	67.6
Study year								
2012	112,311	15.9	284,751	14.6	23,888	14.0	63,140	12.8
2013	97,416	13.8	260,699	13.4	20,179	11.8	56,203	11.4
2014	107,644	15.2	304,169	15.6	24,373	14.3	72,583	14.7
2015	121,143	17.2	341,431	17.5	29,038	17.0	86,845	17.6
2016	132,744	18.8	374,059	19.2	34,955	20.5	102,768	20.9
2017	134,899	19.1	383,073	19.7	38,036	22.3	111,161	22.6
Beneficiary-year ^b								
1	349,446	49.5	949,355	48.7	87,142	51.1	247,157	50.2
2	169,944	24.1	471,117	24.2	43,166	25.3	123,868	25.1
3	90,389	12.8	253,490	13.0	21,381	12.5	62,862	12.8
4	51,335	7.3	145,609	7.5	10,803	6.3	32,899	6.7
5	28,891	4.1	82,174	4.2	5,462	3.2	17,340	3.5
6	16,152	2.3	46,437	2.4	2,515	1.5	8,574	1.7
Diagnosis								
Mental disorder								
Attention-deficit hyperactivity disorder	20,055	2.8	60,783	3.1	1,500	.9	4,434	.9
Anxiety disorder	151,118	21.4	361,583	18.6	17,081	10.0	39,170	8.0
Bipolar disorder	57,269	8.1	157,218	8.07	7,961	4.7	23,502	4.8
Depression	165,241	23.4	453,342	23.3	17,371	10.2	51,044	10.4
Posttraumatic stress disorder	12,711	1.8	37,405	1.9	1,892	1.1	5,666	1.2
Schizophrenia ^c	35,943	5.1	135,593	7.0	3,205	1.9	15,126	3.1
Other	44,841	6.4	139,295	7.2	2,267	1.3	7,390	1.5
Multiple	218,979	31.0	602,768	30.9	37,554	22.0	114,602	23.3
None	—	—	—	—	81,621	47.9	231,667	47.0

continued

TABLE 1, continued

Characteristic	Mental disorder (N=2,654,339)				Substance use disorder (N=663,068)			
	Rural (N=706,157)		Nonrural (N=1,948,182)		Rural (N=170,469)		Nonrural (N=492,699)	
	N	%	N	%	N	%	N	%
Substance use disorder								
Alcohol use disorder	18,219	2.6	60,199	3.1	34,725	20.4	114,996	23.3
Opioid use disorder	23,656	3.4	67,212	3.5	55,539	32.6	152,835	31.0
Other	28,529	4.0	81,239	4.8	50,595	29.7	144,854	29.4
Multiple	18,501	2.6	52,211	2.7	29,593	17.4	80,064	16.3
None	617,322	87.4	1,687,320	86.6	—	—	—	—

^a Analysis of 2012–17 claims data from the IBM MarketScan Multi-State Medicaid Database. The unit of analysis is a beneficiary-year. Telemedicine and outpatient visits for mental disorder had a primary diagnosis of mental disorder. Telemedicine and outpatient visits for substance use disorder had a primary diagnosis of substance use disorder. Mental and substance use disorders are shown in mutually exclusive categories.

^b Indicates the number of complete calendar years that each unique beneficiary was observed.

^c Includes other psychotic disorders.

Compared with the sample with mental disorders, fewer beneficiaries had a substance use disorder diagnosis: rural, N=170,469 beneficiary-years; and nonrural, N=492,699 beneficiary-years. However, the same patterns in characteristics were observed. Rural beneficiaries with substance use disorders were more likely than nonrural beneficiaries to be non-Hispanic white (83.6% versus 68.2%) and less likely to have Medicaid managed care (62.0% versus 67.6%).

TABLE 2. Adjusted rural-nonrural differences in telemedicine and outpatient treatment for mental and substance use disorders among Medicaid beneficiaries, 2012–2017^a

Variable	Mental disorder	Substance use disorder
Telemedicine visits		
Rural-nonrural difference in visits		
Any (percentage point difference)	2.2***	.6***
Amount, if any (difference in N of visits)	.2***	.6***
Outpatient visits		
Telemedicine–no telemedicine difference in N of visits		
Among rural beneficiaries	11.2***	8.2***
Among nonrural beneficiaries	10.5***	7.6***
Difference (rural–nonrural)	.7***	.6

^a Analysis of 2012–17 claims data from the IBM MarketScan Multi-State Medicaid Database. Sample size (beneficiary-years) for receipt of any mental disorder telemedicine: N=2,654,339; for mean N of mental disorder telemedicine and outpatient visits, N=262,430; for receipt of any substance use disorder telemedicine: N=663,068; for mean N of substance use disorder telemedicine and outpatient visits, N=8,943. Adjusted differences are marginal effects computed from multivariate regression models controlling for age, sex, race-ethnicity, Medicaid program and type, mental and substance use disorder diagnoses, study year, number of beneficiary years, and state fixed effects. Statistical significance of marginal effects was calculated with clustered standard errors. (For parameter estimates and measures of uncertainty from each model, see the online supplement.)

***p<.001.

Rural-Nonrural Differences in Telemedicine Treatment (Adjusted)

Table 2 presents adjusted estimates of rural-nonrural differences in receipt of telemedicine visits for mental and substance use disorder treatment. All else equal, rural beneficiaries were 2.2 percentage points more likely than nonrural beneficiaries to receive any telemedicine visits for mental disorder in any given year (p<0.001). Among those receiving any telemedicine visits for mental disorder treatment, rural beneficiaries received on average 0.2 more telemedicine visits than did nonrural beneficiaries (p<0.001). Rural beneficiaries were also more likely than nonrural beneficiaries to have any telemedicine visits for substance use disorder in a given year, although the difference was smaller than for those with mental disorders (0.6 percentage points, p<0.001). Among those who received any telemedicine visits for substance use disorder, rural beneficiaries had on average about one-half of a visit more per year, compared with nonrural beneficiaries (0.6 visits, p<0.001).

Relationship Between Use of Telemedicine and Outpatient Visits

Receipt of any telemedicine treatment for a mental disorder was associated with a large increase in the amount of outpatient (in-person) mental health services received (Table 2). When rural beneficiaries received any telemedicine visits for mental disorder treatment, they had on average 11.2 more outpatient mental health visits, compared with beneficiaries who had no telemedicine visits for mental disorder treatment (p<0.001). Among nonrural beneficiaries, the average difference was 10.5 more outpatient (in-person) mental health visits for beneficiaries with any telemedicine visits for mental disorder treatment, compared with beneficiaries who had no telemedicine visits for mental disorder treatment (p<0.001). The rural-nonrural difference was small but statistically significant (+0.7 visits, p<0.001).

We observed similar patterns in the relationship between telemedicine visits for substance use disorder and outpatient (in-person) substance use disorder treatment. After the

TABLE 3. Adjusted rural-nonrural differences in telemedicine visits for mental disorder treatment among Medicaid beneficiaries, by diagnosis, 2012–2017^a

Diagnosis	Rural	Nonrural	Difference in difference
Receipt of any telemedicine for mental disorders (percentage points)			
Depression (reference)	8.9	7.6	
Attention-deficit hyperactivity disorder	4.5***	2.9***	.3
Anxiety disorder	4.3***	2.7***	.3*
Bipolar disorder	14.8***	13.1***	.4
Posttraumatic stress disorder	15.5***	10.4***	3.8***
Schizophrenia ^b	19.6***	16.5***	1.7***
Other mental disorder	2.6***	1.6***	-.3*
Multiple mental disorders	16.8***	14.0***	1.5***
Mean N of telemedicine visits for mental disorders, if any received			
Depression (reference)	4.7	4.5	
Attention-deficit hyperactivity disorder	5.0	4.3	.5
Anxiety disorder	4.4*	3.9***	.3*
Bipolar disorder	4.8	5.0***	-.4**
Posttraumatic stress disorder	4.9	4.6	.1
Schizophrenia ^b	5.1**	5.5***	-.6***
Other mental disorder	4.7	4.2*	.3
Multiple disorders	5.2***	5.3***	-.4***

^a Analysis of 2012–17 claims data from the IBM MarketScan Multi-State Medicaid Database. Sample size (beneficiary-years) for receipt of any telemedicine: N=2,654,339; for mean N of visits, N=262,430. The displayed estimates are predictive margins and average marginal effects computed from multivariate regression models controlling for age, sex, race-ethnicity, Medicaid program and type, mental and substance use disorder diagnoses, study year, number of beneficiary years, and state fixed effects. Statistical significance of all differences was calculated with clustered standard errors. (For parameter estimates and measures of uncertainty from each model, see the online supplement.)

^b Includes other psychotic disorders.

*p<.05, **p<.01, ***p<.001.

analysis controlled for other factors, rural beneficiaries with any telemedicine visits for substance use disorder had on average 8.2 more outpatient substance use disorder visits than did those without telemedicine visits for substance use

only (6.6 percentage points, p<0.001), bipolar disorder only (5.9 percentage points, p<0.001), or multiple mental disorder diagnoses (7.8 percentage points, p<0.001). Among rural beneficiaries who received any telemedicine visits for

TABLE 4. Adjusted rural-nonrural differences in telemedicine visits for substance use disorder treatment among Medicaid beneficiaries, by diagnosis, 2012–2017^a

Diagnosis	Rural	Nonrural	Difference in difference
Receipt of any telemedicine for substance use disorders (percentage points)			
Alcohol use disorder (reference)	1.5	1.0	
Opioid use disorder	1.3*	.8***	.0
Other substance use disorder	1.7	1.3***	-.1
Multiple substance use disorders	2.6***	1.8***	.3*
Mean N of telemedicine visits for substance use disorders, if any received			
Alcohol use disorder (reference)	2.4	2.2	
Opioid use disorder	4.2***	2.7***	1.3***
Other substance use disorder	2.6	2.6**	-.2
Multiple substance use disorders	3.0**	2.4	.4

^a Analysis of 2012–17 claims data from the IBM MarketScan Multi-State Medicaid Database. Sample size (beneficiary-years) for receipt of any telemedicine, N=663,068; for mean N of visits, N=8,943. The displayed estimates are predictive margins and average marginal effects computed from multivariate regression models controlling for age, sex, race-ethnicity, Medicaid program and type, mental and substance use disorder diagnoses, study year, number of beneficiary-years, and state fixed effects. Statistical significance of all differences was calculated with clustered standard errors. (For parameter estimates and measures of uncertainty from each model, see the online supplement.)

*p<.05, **p<.01, ***p<.001.

disorder treatment (p<0.001). Among nonrural beneficiaries, those with any telemedicine visits for substance use disorder treatment had 7.6 more outpatient substance use disorder visits on average (p<0.001).

Variation in Telemedicine Use by Diagnosis

The likelihood of receiving any telemedicine treatment for a mental disorder and the amount of telemedicine visits for mental disorder treatment received varied substantially by diagnosis (Table 3). Most mental disorder diagnosis-related differences were larger for rural than for nonrural beneficiaries. Compared with beneficiaries with a depression diagnosis only, beneficiaries in rural settings who had schizophrenia only were more likely to receive telemedicine treatment for a mental disorder (10.6 percentage points, p<0.001), as were those with posttraumatic stress disorder (10.6 percentage points, p<0.001), bipolar disorder only (5.9 percentage points, p<0.001), or multiple mental disorder diagnoses (7.8 percentage points, p<0.001). Among rural beneficiaries who received any telemedicine visits for mental disorders, those with any telemedicine visits for schizophrenia only (0.4 visits, p<0.001) and multiple mental disorders (0.5 visits, p<0.001) had more visits on average than those with depression only. However, differences in the average number of telemedicine visits were smaller for rural than for nonrural beneficiaries for the following diagnoses compared with depression only: bipolar disorder only (-0.4 visits, p<0.01), schizophrenia only (-0.6 visits, p<0.001), and multiple mental disorder diagnoses (-0.4 visits, p<0.001).

Diagnosis-based differences in the likelihood of receiving any telemedicine for substance

use disorder treatment were smaller than for mental disorders (Table 4). For example, compared with beneficiaries with an alcohol use disorder diagnosis, beneficiaries with opioid use disorder only were slightly less likely to receive any telemedicine visits for substance use disorder treatment (rural, 0.2 percentage points, $p < 0.05$; nonrural, 0.2 percentage points, $p < 0.001$). Among beneficiaries who received any telemedicine visits for substance use disorder, those with opioid disorder only had more visits on average than those with alcohol use disorder only, and the difference was larger for rural beneficiaries than for those from nonrural areas (1.3 more visits, $p < 0.001$).

DISCUSSION

In this study of 2012–17 Medicaid claims data, we found low overall telemedicine use for behavioral health treatment among rural and nonrural beneficiaries alike. Telemedicine use for substance use disorder services was particularly low, consistent with recent findings for Medicare beneficiaries and commercially insured individuals (9, 15). Over the study period, the prevalence of telemedicine visits for mental disorder treatment increased more than for substance use disorder treatment, especially in rural areas. In contrast, we found that among rural beneficiaries receiving any telemedicine treatment for mental or substance use disorders, the amount of telemedicine visits for substance use disorder treatment increased more than for mental disorders. Although we cannot infer a causal relationship, this finding could reflect a response to increasing need for opioid use disorder treatment amid the opioid crisis (16).

We also found that after adjustment for individual characteristics, rural Medicaid beneficiaries with diagnoses of behavioral health disorders were more likely than nonrural beneficiaries to receive telemedicine treatment for those disorders. This result was consistent with recently published findings on behavioral health telemedicine treatment in other samples of Medicaid beneficiaries (3), Medicare beneficiaries (8, 9), and commercial insurance enrollees (15). In addition, in our study, the average number of behavioral health telemedicine visits among those receiving any visits was higher for rural than for nonrural beneficiaries.

Our findings complement a 2018 U.S. Department of Agriculture (USDA) report on a broader set of telehealth services for all health conditions, in which receipt of telehealth services for all causes was more common for urban than for rural individuals (17). The USDA study relied on 2015 census data, and the sample was not limited to Medicaid patients. Our results demonstrate that Medicaid populations with behavioral health treatment needs have unique telemedicine utilization patterns and emphasize the importance of considering differences in specific patterns across rural and nonrural populations.

Given overall higher rates of unmet need for behavioral health services and lack of behavioral health provider capacity in rural areas (5), we might expect to see greater

uptake and a larger rural-nonrural difference in use of behavioral health telemedicine. However, issues related to insufficient infrastructure supporting telemedicine in rural areas, as well as patient and provider attitudes toward telemedicine use, may need to be addressed to expand telemedicine availability for rural beneficiaries (18–20). The growth of behavioral health telemedicine in rural settings also may be affected by disparities in provider reimbursement rates, the extent to which behavioral health providers accept insurance, the extent to which substance use disorder treatment is financed with block grants and other public funding sources, and broadband–high-capacity Internet access (21–24). In addition, although many patients seem open to using telemedicine, some may face bandwidth or other technological barriers or simply prefer in-person visits (25, 26).

Our findings suggest that there is opportunity to broaden the use of telemedicine, but further research is needed to support specific policy implications. Of particular interest may be future research on the use of waivers to convert Medicaid funding to block grants and how these block grants may affect the use of telemedicine. Finally, additional research is needed on how specific populations can best utilize telemedicine services, including individuals excluded from this study because of noncontinuous Medicaid enrollment.

We observed the greatest difference between rural and nonrural beneficiaries in amount of telemedicine for opioid use disorder (versus telemedicine for alcohol use disorder), with rural beneficiaries having more telemedicine visits on average. Telemedicine for medication-assisted treatment has been shown to be effective (6) but underutilized (3). These findings suggest possible inroads for opioid use disorder telemedicine in rural areas. However, providers may be apprehensive about prescribing because of the Ryan Haight Online Pharmacy Consumer Protection Act of 2008, which requires providers to conduct an in-person visit before prescribing a controlled substance, such as buprenorphine. Recent Drug Enforcement Agency (DEA) guidance, however, exempts practitioners from this requirement if the practitioner is engaged in telemedicine and meets specific DEA requirements (27). The 2018 SUPPORT for Patients and Communities Act also seeks to expand the use of telemedicine visits for substance use disorder by addressing statutory requirements for telehealth services.

Particularly in rural areas, telemedicine was associated with greater use of in-person outpatient services. This may indicate that telemedicine's role in improving access has been limited and that people who are already engaged in in-person treatment are the most likely to receive telemedicine. Alternatively, telemedicine may help retain people in treatment and allow them to receive more in-person treatment than they would have otherwise. Given the cross-sectional design of this study, we cannot identify the causal mechanism underlying this association, but future work should investigate this relationship further to inform how

telemedicine can be harnessed to best serve Medicaid beneficiaries with behavioral health treatment needs.

State Medicaid policies related to behavioral health treatment and telemedicine coverage vary, and some policies may discourage the expansion of telehealth (10, 28). For example, some states limit the types of providers that may deliver services via telemedicine, limit locations that can be originating or distant sites, or do not reimburse originating site facility or transmission fees (28). States with robust Medicaid telemedicine coverage also may have greater availability of behavioral health providers who accept Medicaid. Future work should consider this state-to-state variability and the extent to which other government programs provide behavioral health telemedicine (29), possibly filling in apparent treatment gaps.

Policy makers have multiple avenues for addressing underutilization of telemedicine for providing behavioral health services. An initial step for states may be revisiting policies that limit the ability of originating sites to recoup expenses or that greatly restrict provider and location types. Policies that enhance broadband access and other infrastructure components would expand the reach of telemedicine, as would clarifying reimbursement and regulatory requirements.

This study had some limitations. Because it relied on Medicaid claims data, we did not include beneficiaries who had behavioral health conditions but who received no behavioral health treatment for which Medicaid was billed during the study period. Thus we could not estimate the prevalence of telemedicine use for behavioral health treatment among all Medicaid beneficiaries or compare beneficiaries who received and did not receive such services. These data also did not capture telephone or online portal contacts that may have occurred in addition to—and that may reinforce—in-person outpatient visits. In addition, although our large sample yielded significant results, in some instances the differences were small.

Our study period included the October 2015 transition from *ICD-9* to *ICD-10* diagnosis coding. Therefore, our measures of mental and substance use disorders are not consistent for the whole study period, and beneficiaries added to our sample in 2016 and 2017 could be systematically different from those identified between 2012 and 2015.

Finally, our study sampled a limited subset of Medicaid programs. Although the states represented are geographically diverse, our results cannot be used to make nationally representative inferences about rural and non-rural use of telemedicine among all Medicaid beneficiaries. Furthermore, we limited the sample to those continuously enrolled for at least 1 year, which may omit a high-risk subgroup.

CONCLUSIONS

Telemedicine is a promising tool for addressing unmet behavioral health treatment needs among rural Medicaid

beneficiaries, but it remains underutilized. Although we observed increases between 2012 and 2017 in telemedicine visits for behavioral health services in rural and nonrural areas, overall use remained low—especially for telemedicine treatment of substance use disorders. Medicaid programs have multiple policy options available to increase provider and beneficiary participation in telemedicine and facilitate more use by rural beneficiaries, but technology, infrastructure, and other factors outside the health care system also must be addressed for telemedicine to meet its full potential.

AUTHOR AND ARTICLE INFORMATION

Health Equity Research Lab, Cambridge Health Alliance, Cambridge, Massachusetts (Creedon); IBM Watson Health, Cambridge, Massachusetts (Schrader, O'Brien, Lin, Mulvaney-Day); Substance Abuse and Mental Health Services Administration, Rockville, Maryland (Carroll). Send correspondence to Ms. Schrader (kschrader@us.ibm.com).

Preparation of this article was funded under contract HSS2832012000311/HHSS28342002T with the Substance Abuse and Mental Health Services Administration (SAMHSA), Department of Health and Human Services (HHS). The opinions expressed are those of the authors and not necessarily those of SAMHSA or HHS.

The authors report no financial relationships with commercial interests.

Received September 6, 2019; revisions received December 19, 2019, and February 21, 2020; accepted March 5, 2020; published online April 15, 2020.

REFERENCES

1. Telemedicine. Baltimore, Centers for Medicare and Medicaid Services, 2019. <https://www.medicaid.gov/medicaid/benefits/telemed/index.html>. Accessed June 14, 2019
2. Behavioral Health Spending and Use Accounts 2006–2015. Rockville, MD, Substance Abuse and Mental Health Services Administration, 2019
3. Douglas MD, Xu J, Heggs A, et al: Assessing telemedicine utilization by using Medicaid claims data. *Psychiatr Serv* 2017; 68:173–178
4. Telehealth Programs. Rockville, MD, Health Resources and Services Administration, Federal Office of Rural Health Policy, May 2019. <https://www.hrsa.gov/rural-health/telehealth/index.html>. Accessed June 14, 2019
5. Rural Behavioral Health: Telehealth Challenges and Opportunities. Rockville, MD, Substance Abuse and Mental Health Services Administration, 2016. <https://store.samhsa.gov/system/files/sma16-4989.pdf>. Accessed June 14, 2019
6. Eibl JK, Gauthier G, Pellegrini D, et al: The effectiveness of telemedicine-delivered opioid agonist therapy in a supervised clinical setting. *Drug Alcohol Depend* 2017; 176:133–138
7. Gros DF, Yoder M, Tuerk PW, et al: Exposure therapy for PTSD delivered to veterans via telehealth: predictors of treatment completion and outcome and comparison to treatment delivered in person. *Behav Ther* 2011; 42:276–283
8. Choi S, Wilcock AD, Busch AB, et al: Association of characteristics of psychiatrists with use of telemental health visits in the Medicare population. *JAMA Psychiatry* 2019; 76:654–657
9. Mehrotra A, Huskamp HA, Souza J, et al: Rapid growth in mental health telemedicine use among rural Medicare beneficiaries, wide variation across states. *Health Aff* 2017; 36:909–917
10. Medicaid Behavioral Health Services Database. San Francisco, Kaiser Family Foundation, Feb 2019. <https://www.kff.org/data-collection/medicaid-behavioral-health-services-database>. Accessed Dec 2, 2019

11. About Metropolitan and Micropolitan Statistical Areas. Washington, DC, US Census Bureau, 2018. <https://www.census.gov/programs-surveys/metro-micro/about.html>. Accessed Dec 2, 2019
12. Ai C, Norton EC: Interaction terms in logit and probit models. *Econ Lett* 2003; 80:123–129
13. Muller CJ, MacLehose RF: Estimating predicted probabilities from logistic regression: different methods correspond to different target populations. *Int J Epidemiol* 2014; 43:962–970
14. Williams R: Using the margins command to estimate and interpret adjusted predictions and marginal effects. *Stata J* 2012; 12:308–331
15. Huskamp HA, Busch AB, Souza J, et al: How is telemedicine being used in opioid and other substance use disorder treatment? *Health Aff* 2018; 37:1940–1947
16. Abbasi J: Opioid epidemic in Appalachia receives USDA telemedicine funding. *JAMA* 2016; 316:808
17. Stenberg PL: Rural Individuals' Telehealth Practices: An Overview. Washington, DC, US Department of Agriculture, Economic Research Service, 2018. <https://www.ers.usda.gov/webdocs/publications/90530/eib-199.pdf>. Accessed June 17, 2019
18. Steele R, Lo A: Telehealth and ubiquitous computing for bandwidth-constrained rural and remote areas. *Pers Ubiquitous Comput* 2013; 17:533–543
19. Schopp LH, Demiris G, Glueckauf RL: Rural backwaters or front-runners? Rural telehealth in the vanguard of psychology practice. *Prof Psychol Res Pr* 2006; 37:165–173
20. Grubaugh AL, Cain GD, Elhai JD, et al: Attitudes toward medical and mental health care delivered via telehealth applications among rural and urban primary care patients. *J Nerv Ment Dis* 2008; 196:166–170
21. Bishop TF, Press MJ, Keyhani S, et al: Acceptance of insurance by psychiatrists and the implications for access to mental health care. *JAMA Psychiatry* 2014; 71:176–181
22. Mark TL, Olesiuk W, Ali MM, et al: Differential reimbursement of psychiatric services by psychiatrists and other medical providers. *Psychiatr Serv* 2018; 69:281–285
23. Mark TL, Yee T, Levit KR, et al: Insurance financing increased for mental health conditions but not for substance use disorders, 1986–2014. *Health Aff* 2016; 35:958–965
24. Mapping Broadband Health in America. Washington, DC, Federal Communications Commission, 2017. <https://www.fcc.gov/health/maps>. Accessed June 27, 2019
25. Donelan K, Barreto EA, Sossong S, et al: Patient and clinician experiences with telehealth for patient follow-up care. *Am J Manag Care* 2019; 25:40–44
26. Ravindranath M: Telemedicine could keep older patients out of the hospital. So why hasn't it taken off? *Politico*, Aug 20, 2019. <https://www.politico.com/story/2019/08/20/telemedicine-virtual-care-eldery-1667072>. Accessed Dec 12, 2019
27. Use of Telemedicine While Providing Medication Assisted Treatment (MAT). Washington, DC, US Department of Justice, Drug Enforcement Administration, 2018. www.hhs.gov/opioids/sites/default/files/2018-09/hhs-telemedicine-dea-final-508compliant.pdf
28. Report to Congress on Medicaid and CHIP. Washington, DC, Medicaid and CHIP Payment and Access Commission, 2018. <https://www.macpac.gov/wp-content/uploads/2018/03/Report-to-Congress-on-Medicaid-and-CHIP-March-2018.pdf>
29. Federal Telehealth Compendium. Washington, DC, Health Resources and Services Administration, Federal Office of Rural Health Policy, Office of the National Coordinator for Health Information Technology, 2016. https://www.healthit.gov/sites/default/files/federal_telehealth_compendium_final_122316.pdf. Accessed June 24, 2019