Understanding Mental Health Care Use and Outcomes Among Individuals With Reduced Access to Care

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Understanding Mental Health Care Use and Outcomes Among Individuals with Reduced Access to Care

A dissertation presented

by

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to

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Understanding Mental Health Care Use and Outcomes Among Individuals with Reduced Access to Care

Abstract

Many individuals in the United States do not have access to adequate health care. Reduced access to care contributes to physical and mental health inequities experienced by vulnerable populations. In this thesis, I studied mental health care use and outcomes among individuals with reduced access to care, focusing specifically on individuals who are transgender, gender diverse, or living with serious mental illness.

Chapter 1 characterized the health status of privately insured gender minority (i.e., transgender or gender diverse) individuals. We created a diagnosis-based algorithm to identify gender minority children and adults in a commercial claims database and found that individuals with gender minority-related diagnosis codes have a markedly higher prevalence of mental health and substance use disorders (50.6% among gender minorities versus 10.3% among non-gender minorities) with even more notable disparities among individuals younger than 18 (71.1% among gender minorities versus 8.9% among non-gender minorities). This is the first study of gender minority individuals in private health insurance claims and it provides critical new knowledge on the wellbeing of the gender minority population in the US.

Dissertation Advisor: Professor Sherri Rose   Alex McDowell

Chapter 2 evaluated the effect of state-level nondiscrimination policies on mental health outcomes among privately insured gender minority individuals. Since 2012, more than 20 states have implemented policies banning discrimination based on gender identity among private health insurers, and this is the first study to evaluate the effect of such policies on gender minority health. We used a difference-in-differences design to compare changes in suicidality before and after states implemented nondiscrimination policies and find that such policies were associated with a decrease in suicidality in the first post-implementation year among states that implemented policies in 2014-2016. Among states that implemented policies in 2013, there was no association with suicidality. Given high rates of suicidality among gender minority individuals in the US, health insurance nondiscrimination policies may offer an effective mechanism for reducing barriers to care and mitigating discrimination.

Chapter 3 classified patterns of mental health care use prior to initiation of telemental health services among rural Medicare beneficiaries living with serious mental illness. While telemental health use is growing in the US, increased uptake of telemedicine will be necessary to address the lack of access to adequate mental health treatment, particularly for individuals with serious mental illness who are living in rural areas. Using latent class analysis, we identified five distinct subgroups of enrollees based on their care patterns. By identifying common treatment patterns leading up to telemental health initiation, one can target interventions to increase telemental health use.

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Acknowledgements

Thank you to the communities upon which this research is based. This dissertation used deidentified health care claims data from over 30,000 individuals who are transgender, gender diverse, or living with bipolar disorder or schizophrenia. I am grateful to have had the opportunity to learn from these individuals and hope that my findings will contribute to efforts to address health inequities.

Thank you to my advisor and dissertation committee chair, Sherri Rose, for her exceptional mentorship and support. From our first meeting, Sherri supported me in pursuing scholarly work on the topics about which I care the most and was committed to my development as a researcher. Her thoughtful and generous mentorship not only made this dissertation possible, but also it made its completion an enjoyable process.

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Chapter 1: Estimating the Health Status of Privately Insured Gender Minority Children and Adults*

Abstract

Purpose: We describe the health status of privately insured gender minority individuals.

Methods: We create a diagnosis-based algorithm to identify gender minority children and adults in the 2009-2015 IBM® MarketScan® Commercial Database. We compare the age-adjusted health status among individuals with and without gender minority-related diagnosis codes.

Results: The percentage of the privately insured population with gender minority-related diagnosis codes increased from 0.004% in 2009 to 0.026% in 2015. Age-adjusted analyses demonstrated that individuals with gender minority-related diagnosis codes were more likely to have mental health disorders (odds ratio [OR]= 8.5; 95% confidence interval [CI] = 8.1, 9.0), substance use disorders (OR = 3.4; 95% CI = 2.9, 3.9) and diabetes (OR = 1.4; 95% CI = 1.2, 1.6), driven by high prevalence of these conditions among individuals under 18 years old.

Conclusions: Our findings highlight markedly greater prevalence of mental health and substance use disorder diagnoses among privately insured gender minority individuals. These results establish a reference point for evaluating the impact of federal and state level policies that ban

health insurance discrimination based on gender identity on the health and health care use of

gender minority individuals.

1.1 Introduction

Evidence of inequities in health outcomes and access to necessary care among gender minority individuals has informed recent federal and state level policy shifts to improve coverage of gender affirming services (health care that individuals utilize to affirm their gender, including hormone therapy and various surgical procedures).[1] Since 2012, 20 states and Washington D.C. have enacted policies that prohibit the categorical exclusion of gender affirming services in private health insurance.[2] A portion of the Patient Protection and Affordable Care Act that is currently being challenged would, if implemented, prohibit categorical exclusion of gender affirming services among insurers that either receive federal funding, are administered by a federal agency, or participate in federal or state-run marketplaces.[1,3] Further, in 2016, a federal court established that categorical exclusion of gender affirming services in employer-sponsored health plans violates Title VII of the Civil Rights Act of 1964, a ruling which has the potential to alter policies among large self-insured employers exempt from state regulations.[4,5] These policies in the private insurance market mirror shifts in regulation in public insurance programs.[2,6]

Gender minority is a term that describes transgender and gender non-binary people whose current gender identity or expressions differ from those typically associated with their sex assigned at birth.[7] The absence of measures of gender identity in representative data (e.g., the US Census or the National Health Interview Survey) limits researchers' and policymakers' ability to draw conclusions about gender minority populations at the state and federal level.[7,8] Given this lack of data as well as the diversity of identities and expressions among gender minority individuals, studies that estimate the size of the gender minority population fail to capture all gender minority individuals and vary widely based on the data source and method used to measure gender identity.[9] For example, Crissman et al. found that 0.53% of the population across

19 states reported a transgender identity in 2014, but the underlying survey data did not ask about other gender minority identities (e.g., genderqueer or gender fluid).[10]

Count estimates for transgender identity using insurance claims and electronic health record data are far smaller than those obtained via self-report of gender identity in surveys. In 2013, 0.03% of patients in Veterans Health Administration (VHA) data were identified as transgender using diagnosis codes.[11] In 2014, 0.04% of the 330,727 patients served by Kaiser Permanente Georgia, an integrated health system that provides care to patients with private insurance as well as those eligible for Medicaid and Medicare, were identified as transgender using both diagnosis codes and clinician notes.[12]

Available evidence has demonstrated that gender minority populations experience significant health inequities. Compared to the general population, gender minority individuals report increased prevalence of myocardial infarction, being overweight, HIV infection, eating disorders, depression, and suicidal thoughts and behaviors.[13–16] On average, transgender individuals report experiencing 6.3 days of poor or fair health in the past month, compared to 3.9 days among non-transgender individuals.[15] Additionally, 40.0% of gender minority people report a lifetime suicide attempt, compared to 4.6% in the general population.[14]

Health inequities occur alongside reduced access to necessary medical care for all conditions due to discrimination in health care settings, heightened rates of uninsurance, and denial of coverage for routine and specialty care.[14,17–20] Despite recent reductions in the gender minority uninsurance rate (from 19% in 2011 to 14% in 2015), gender minority populations remain insured at lower rates than non-gender minority populations.[10,14,21] Further, gender minority individuals who have insurance are frequently denied coverage for both routine health care and gender affirming services.[14] Among gender minority people with either employer-

sponsored insurance or state/federal health insurance marketplace plans who sought coverage for gender affirming surgical procedures in the past year, 55% were denied coverage. For those who tried to access gender affirming hormone therapy, 26% were denied coverage.[14]

Despite important policy shifts, gender identity remains unmeasured by most health insurers. This restricts our understanding of the health and health care utilization of insured gender minority populations, as well as our ability to evaluate the effect of recent policy changes. In the absence of self-reported gender identity in claims data, diagnosis-based algorithms have been used to identify and describe gender minority patients in both VHA and Medicare claims data.[11,22–27] These algorithms use several gender minority-related diagnosis codes (which are typically required by insurers for coverage of gender affirming services) to identify a subset of gender minority individuals.[11,28] Over 75% of the 4,098 transgender Medicare beneficiaries identified in 2013 using a diagnosis-based algorithm were under 65 years of age. Among those under 65, over 80% had been diagnosed with depression at some point in their lifetime, compared to 29% of under-65 beneficiaries in the general Medicare population.[25] In the context of these findings of increased rates of disease burden among non-elderly gender minority enrollees in Medicare, as well as the proliferation of state and federal policies to protect gender minority individuals with private insurance, there is a clear need to study privately insured gender minority people.

We provide the first description of gender minority children and adults in a private claims database in order to establish a reference point for health administrators and policymakers to improve equity for gender minority populations. In this study, we define gender minority individuals as those with a gender minority-related diagnosis code, acknowledging that this definition excludes many gender minority people who do not have a gender minority-related

diagnosis code. We report the number of persons identified as gender minority using this definition and summarize the prevalence of several chronic health conditions for gender minority and non-gender minority cohorts over seven years of data (2009-2015).

1.2 Methods

Data

We used the IBM® MarketScan® Commercial Databaseto create gender minority and non-gender minority cohorts in 2009 through 2015. The MarketScan Database includes inpatient, outpatient, and drug claims submitted by private health plans and large self-insured employers. It has been used in many rigorous population studies, as well as disease prevalence research.[29] The number of unique enrollees (including employees and their dependents) ranged from 28 to 53 million per year. The inpatient file included between 43 million and 76 million claims per year and the outpatient file included between 599 million and over one billion claims per year. (For detailed information on the number of unique enrollees and claims in 2009-2015, see eTable1-eTable2 in Appendix for Chapter 1.) The Harvard Faculty of Medicine Office of Human Research Administration determined that this work was not human subjects research.

Identifying Gender Minority Enrollees

We identified gender minority individuals using diagnosis codes developed in prior studies of gender minority people in VHA and Medicare data with some modifications for our study population (see eTable 3 in Appendix for Chapter 1).[11,22–26] Between 2009 and 2014, we searched inpatient and outpatient claims for gender minority-related *International Classification of Diseases*, Ninth Revision (ICD-9) codes: transsexualism (302.50-302.53), gender identity disorder in children (302.6), and gender identity disorder in adolescents or adults (302.85).[25] In 2015, we identified enrollees using the aforementioned ICD-9 codes as well as five gender

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minority-related ICD, Tenth Revision (ICD-10) codes to account for the transition from ICD-9 to ICD-10 that occurred in that year. Gender minority-related ICD-10 codes were transsexualism (F640), gender identity disorder in adolescence or adulthood (F641), gender identity disorder of childhood (F642), other gender identity disorders (F648), and gender identity disorder, unspecified (F649).

We used the enrollment, inpatient claims, and outpatient claims files to build gender minority and non-gender minority cohorts for each year of our analysis. We included individuals in the gender minority cohort for a given year if, in that same year, they were present in the enrollment file, had at least one inpatient or outpatient claim, and had at least one gender minority-related diagnosis code. We included individuals in the non-gender minority cohort for a given year if, in that same year, they were present in the enrollment file, had at least one inpatient or outpatient claim, and had no gender minority-related diagnosis codes. This means that we allowed an individual's gender minority status to change across years (based on the presence or absence of relevant diagnosis codes). We did not require individuals to be continuously enrolled, however average enrollment was 10 months or higher in both cohorts.

Describing Gender Minority and Non-Gender Minority Cohorts

We compared the size and age of gender minority and non-gender minority cohorts in 2009-2015 as well as the percent of each cohort with several health conditions in 2015. Health conditions included mental health disorders, substance use disorders, diabetes, and hypertension, which are prevalent conditions commonly used to assess the general health of a population.[25,30,31] Individuals were considered to have each health condition if they had a diagnosis code for that condition on one inpatient or two outpatient claims (at least one day apart) in a given year,

following previous literature.[32,33] These health codes could appear in any one of the four diagnosis positions.

To identify individuals with mental health disorders and substance use disorders in 2009-2014, we searched claims for ICD-9 codes for mental health disorders (295–316) or substance use disorders (291-292), excluding codes for gender minority-related diagnoses (302.5, 302.6, 302.85), mental health disorders due to brain damage (310), and tobacco dependence (305.1).[32] In 2015, we searched claims for the ICD-9 codes listed above as well as ICD-10 codes for mental health disorders (F01-F09, F20-F99) and substance use disorders (F10-F19), excluding codes for gender minority-related diagnoses (F640, F641, F642, F648, F649), mental health disorders due to known physiological conditions (F01-F09) and tobacco dependence (F17).

We used diagnosis codes listed in the Centers for Medicare and Medicaid Services Chronic Conditions Algorithms to identify individuals with hypertension and diabetes, using ICD-9 codes for each condition in 2009-2014 and both ICD-9 and ICD-10 codes for each condition in 2015.[33] For hypertension, ICD-9 codes included hypertensive retinopathy (362.11), hypertensive disease (401-405) and hypertensive encephalopathy (437.2); ICD-10 codes included hypertensive retinopathy (H35.03), hypertensive encephalopathy (I67.4), page kidney (N26.2), and hypertensive diseases (I10-I15). For diabetes, ICD-9 codes included secondary diabetes mellitus (249), diabetes mellitus (250), polyneuropathy in diabetes (357.2), diabetic cataract (366.41), and diabetic retinopathy (362.0) excluding diabetic macular edema (362.07); ICD-10 codes included those for diabetes mellitus (E08-E13).

Statistical Analyses

We performed nonparametric tests for trends to assess changes over time in the age of gender minority enrollees as well as the percent of the total privately insured population who are

gender minority individuals. To characterize gender minority versus non-gender minority

differences in health conditions, we used two approaches. In the first approach, we compared the

number and percentage of gender minority versus non-gender minority individuals with each

health condition (overall and within age groups). We tested for an association between the age

group-specific prevalence of each health condition and gender minority status using chi-squared

tests. In the second approach, we performed age-adjusted analyses. Specifically, we calculated

overall and age-group specific age-adjusted odds ratios for each health condition using logistic

regression. Overall age-adjusted odds ratios were calculated by regressing each health condition

on gender minority status and age group. Age-group specific odds ratios (which assessed the

interaction between gender minority status and age in relation to health status) were generated by

regressing each health condition on gender minority status and age group with an interaction

term.

1.3 Results

The percentage of gender minority individuals as a proportion of privately insured

enrollees in the MarketScan Database with at least one inpatient or outpatient claim in a given

year increased over the seven-year period, from 0.004% in 2009 to 0.026% in 2015 (Table 1.1).

There was a decrease in age among the gender minority cohort that was largely accounted for by

an increase in the percentage of 18 to 34-year-olds, who comprised more than half of the gender

minority population (compared to less than a quarter of the non-gender minority population) in

the time period 2013-2015 (Figure 1.1). We also observed an increase in the percentage of

gender minority individuals who were less than 18 years old between 2012 and 2015.

Table 1.2 shows the prevalence of select health conditions for gender minority and non-

gender minority cohorts in 2015. Most notably, 52.8% of gender minority individuals had a

Table 1.1: Sample sizes for identified gender minority individuals in Truven Health MarketScan Database

	2009	2010	2011	2012	2013	2014	2015
Full sample	30,889,483	34,118,649	39,836,283	40,989,154	33,637,204	36,274,848	22,289,605
GM individuals	1295 (0.004%)	1743 (0.005%)	2396 (0.006%)	3146 (0.008%)	3849 (0.011%)	6026 (0.017%)	5884 (0.026%)

Notes:
Non-GM individuals included in the full sample are those who had at least one inpatient or outpatient claim in the year. GM indicates gender minority.

Figure 1.1: Age Distributions For Gender Minority versus Non-Gender Minority Cohorts in 2009-2015.
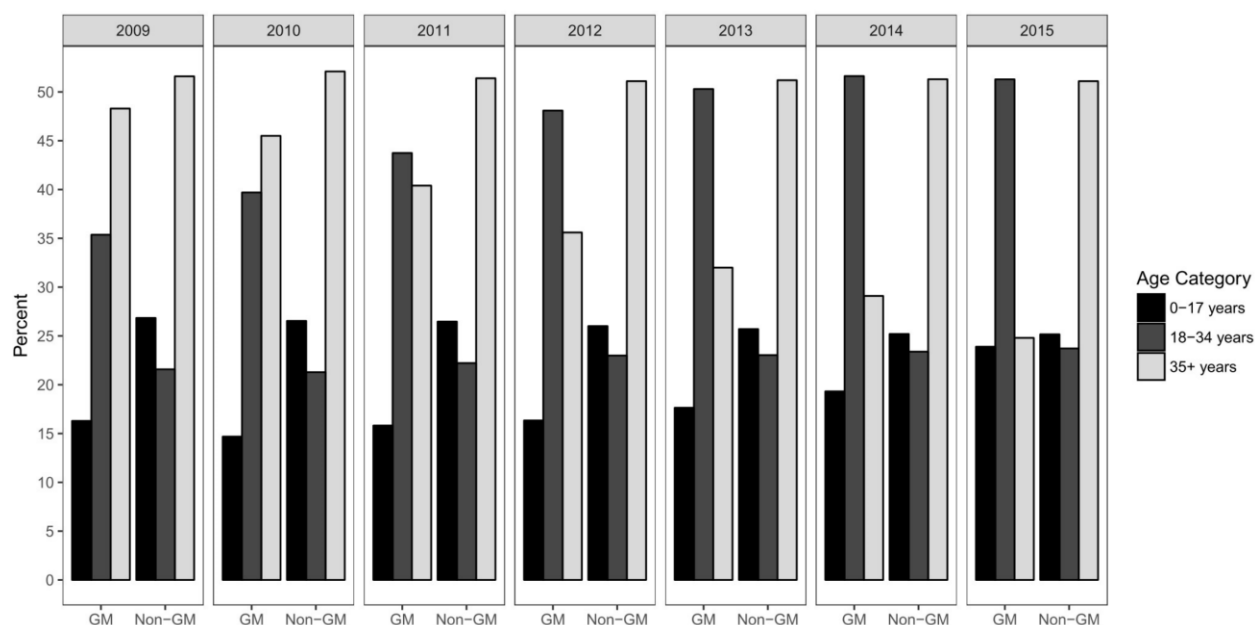
Notes:
GM indicates gender minority

mental health disorder, compared to 11.2% of non-gender minorities. When we compared within age groups, we observed that the higher prevalence of mental health disorders among gender minority individuals compared to non-gender minority individuals persisted among each of the age groups. The widest gap between gender minority and non-gender minority people appeared among enrollees less than 18 years old (63.7 percentage points). In this age group, 72.8% of gender minority individuals had a mental health disorder, compared to 9.1% of non-gender minorities. When we subset this 0-17 year-old age group into 0-9 year-olds and 10-17 year-olds, the disparity was concentrated among 10-17 year-olds (75.6% of gender minority enrollees versus 13.2% of non-gender minority enrollees had a mental health disorder) but was still large among 0-9 year-olds (40.2% of gender minority enrollees versus 5.7% among non-gender minority enrollees had a mental health disorder).

Gender minority enrollees were also more likely to be diagnosed with substance use

disorders, compared to non-gender minority enrollees (3.4% versus 0.9%). While the prevalence

Table 1.2: Health Conditions for Gender Minority versus Non-Gender Minority Cohorts by Age in 2015

	GM (%) n=5884		Non-GM (%) n=22,283,721		Age-Adjusted OR (95% CI)	
Mental Health	**3,107**	**(52.8)**	**2,506,210**	**(11.2)**	**8.5***	**(8.1, 9.0)**
0-17 years	1,023	(72.8)	511,649	(9.1)	26.6[†]	(23.7, 29.9)
18-34 years	1,484	(49.2)	680,495	(12.9)	6.5[†]	(6.1, 7.0)
35-44 years	245	(42.2)	447,985	(13.0)	4.9[†]	(4.2, 5.8)
45-54 years	205	(40.8)	466,568	(11.7)	5.2[†]	(4.4, 6.2)
55-64 years	150	(39.8)	399,513	(10.1)	5.9[†]	(4.8, 7.2)
Substance Use Disorders	**202**	**(3.4)**	**201,960**	**(0.9)**	**3.4***	**(2.9, 3.9)**
0-17 years	35	(2.5)	11,560	(0.2)	12.4[†]	(8.8, 17.3)
18-34 years	119	(3.9)	76,496	(1.4)	2.8[†]	(2.3, 3.4)
35-44 years	‡	‡	‡	‡	‡	‡
45-54 years	‡	‡	‡	‡	‡	‡
55-64 years	‡	‡	‡	‡	‡	‡
Diabetes	**224**	**(3.8)**	**1,158,437**	**(5.2)**	**1.4***	**(1.2, 1.6)**
0-17 years	25	(1.8)	17,760	(0.3)	5.7[†]	(3.8, 8.5)
18-34 years	41	(1.4)	65,446	(1.2)	1.1[†]	(0.8, 1.5)
35-44 years	31	(5.3)	144,901	(4.2)	1.3[†]	(0.9, 1.8)
45-54 years	54	(10.7)	352,889	(8.8)	1.2[†]	(0.9, 1.6)
55-64 years	73	(19.4)	577,441	(14.6)	1.4[†]	(1.1, 1.8)
Hypertension	**400**	**(6.8)**	**2,567,102**	**(11.5)**	**1.1***	**(1.0, 1.3)**
0-17 years	‡	‡	‡	‡	‡	‡
18-34 years	§	§	§	§	§	§
35-44 years	68	(11.7)	353,651	(10.3)	1.2[†]	(0.9, 1.5)
45-54 years	101	(20.1)	816,306	(20.4)	1.0[†]	(0.8, 1.2)
55-64 years	153	(40.6)	1,261,106	(32.0)	1.5[†]	(1.2, 1.8)

Notes:
*Overall age-adjusted odds ratios were calculated by regressing health condition on gender minority status and age group.
†Age-group specific odds ratios were calculated by regressing health condition on gender minority status and age group with an interaction term.
‡Age-stratified and age-adjusted results are omitted due to small cell counts.
§Hypertension results for 18-34 year-olds were omitted to eliminate the possibility of determining cell counts for the 0-17 year-old group.
All chi-squared tests for association between age stratified health conditions and gender minority status were significant at the p<0.001 level.
GM indicates gender minority; OR, odds ratio; CI, confidence interval.

of diabetes and hypertension among gender minority individuals was lower on average, this was not consistently observed across each of the age groups. Gender minority people had higher prevalence of diabetes in all five age groups, with the largest percentage point difference among 55-64 year-olds. The prevalence of hypertension was higher in the gender minority cohort among individuals ages 35-44 years and 55-64 years.

Age-adjusted analyses demonstrated that gender minority individuals were more likely to have mental health disorders (odds ratio [OR], 8.5; 95% confidence interval [CI], 8.1-9.0), substance use disorders (OR, 3.4; 95% CI, 2.9-3.9) and diabetes (OR, 1.4; 95% CI, 1.2-1.6) (Table 1.2). However, gender minority individuals were not significantly more likely to have hypertension (OR, 1.1; 95% CI, 1.0-1.3). In all age groups, the odds of having a mental health disorder were consistently greater for gender minority compared to non-gender minority individuals, with age-group specific odds ratios ranging from 4.9 (95% CI, 4.2-5.8) for 35-44 year-olds to 26.6 (95% CI, 23.7-29.9) for 0-17 year-olds. Substance use disorder disparities were also largest among 0-17 year-olds (OR, 12.4; 95% CI, 8.8, 17.3). Among individuals in the 0-17 and 55-64 age groups, gender minority individuals were more likely to have diabetes (OR, 5.7; 95% CI, 3.8-8.5 for 0-17 years-olds and OR, 1.4; 95% CI, 1.1-1.8 for 55-64 year-olds).

1.4 Discussion

In this study, we find striking disparities in mental health and substance use disorder diagnoses among gender minority versus non-gender minority enrollees, particularly for those under 18 years of age. We also identified a notable increase in the gender minority population captured via a diagnosis-based algorithm, as well as a significantly lower average age for identified gender minority individuals compared to non-gender minority individuals. Specifically, we found a six-fold increase in the identifiable gender minority population between

2009 and 2015. Similar trends were seen previously using a diagnosis-based algorithm in non-private VHA data, which found that the percentage of gender minority individuals increased from 0.013% in 2009 to 0.033% in 2013.[11] Substantial growth in the proportion of the sample with gender minority-related diagnoses may be driven by increases in the number of gender minority individuals who seek gender affirming services and/or by expansions in coverage of such services among insurers. Changes in stigma associated with gender minority identities and using gender minority-related diagnoses in medical settings may also contribute to these trends.[34] The notable growth in the size of the 18-34 year-old gender minority population may, in part, be attributable to the 2010 Affordable Care Act requirement that young adults be allowed to remain on their parents' private health insurance plans until age 26.

We find that privately insured individuals with gender minority-related diagnoses experience mental health and substance use disorders at profoundly elevated levels. Age-adjustment highlights that these inequalities are most severe among gender minority individuals age 17 and younger, among whom the odds of having a mental health diagnosis are 26 times larger and the odds of having a substance use disorder diagnosis are 12 times larger than they are among non-gender minorities. Gender minority individuals in all other age groups are also far more likely to have mental health diagnoses, compared to non-gender minorities in the same age group. Additionally, gender minority individuals under age 18 have a greater odds of having a diagnoses for diabetes. However, these disparities do not persist for gender minority individuals across age groups (except for the group of individuals who are 55-64 years old, among whom gender minority individuals are somewhat more likely to have diabetes).

These findings contribute to mixed evidence regarding the prevalence of chronic conditions among gender minority populations and are the first to describe prevalence among a

privately insured sample of gender minority children and adults.[15,25,31] The magnitude of the difference in mental health disorder prevalence among gender minority compared to non-gender minority individuals is stark (greater than 41 percentage points overall and greater than 63 percentage points among those under 18), with important implications for health inequities. In previous work on mental health among gender minority populations using the Behavioral Risk Factor Surveillance System (BRFSS), a significantly higher percentage of transgender respondents reported a lifetime diagnosis of a depressive disorder, compared to non-transgender respondents (22.3% versus 18.4%).[16]

Because private insurers require gender minority individuals to have a mental health evaluation prior to covering most gender affirming services, we might expect to see more frequent diagnosis of mental health disorders and higher mental health utilization in the gender minority cohort.[35] However, higher mental health care utilization among gender minority Medicare beneficiaries persisted after adjustment for mental health diagnoses, suggesting that factors beyond such detection bias are driving these results.[36,37] Additionally, these results bolster alarming mental health findings from the 2015 U.S. Transgender Survey (e.g., 39% of survey respondents were currently experiencing serious psychological distress and 7% of respondents had attempted suicide in the past year) and complement findings of high prevalence among specific vulnerable populations (e.g., 81% of transgender Medicare beneficiaries who are under 65 and eligible due to disability have been diagnosed with depression).[14,25]

The large difference in mental health prevalence between gender minority and non-gender minority cohorts may be driven, in part, by the even larger difference among 0-17 year-olds, who were not included in the BRFSS or the U.S. Transgender survey. Gender minority youth have high rates of depression and suicidality, though evidence is limited and no previous

studies explore all mental health disorders in this subpopulation.[38] In a representative population-based sample of high school students in California, 34% of transgender students reported past 12-month suicidal ideation, compared to 19% of non-transgender students.[39] Similarly, in a nationally representative sample of high school students in New Zealand gender minority students were more likely than non-gender minority students to have experienced serious depressive symptoms (41.3% versus 11.8%; OR = 5.7; CI = 3.6, 9.2), self-harmed in the past 12 months (45.5% versus 23.4%; OR = 2.7; CI = 1.7, 4.3), and have attempted suicide in the past 12 months (19.8% versus 4.1%; OR = 5.0; CI = 2.8, 8.8). Among transgender adolescents seeking care at a Boston-based community health center, 51% had depression, compared to 21% among non-transgender individuals.[40] Our findings that 72% of 0-17 year-old gender minority enrollees have a mental health diagnosis provides insight into the broader spectrum mental health disorders beyond depression and suicidality in a new population.

This high burden of chronic conditions among gender minority populations likely results from frequent experiences of minority stress (e.g., stigma, discrimination, and harassment).[41] For example, Bockting et al. find that, among a sample of gender minority survey respondents, experiences of minority stress were associated with increased psychological distress.[42] Greater prevalence of diabetes and risk factors for diabetes (e.g., sedentary behavior and obesity) among sexual minority (e.g., lesbian, gay, bisexual) populations have also been attributed to minority stress.[43–46] High prevalence of mental health disorders, substance use disorders, and diabetes among gender minorities under age 18 suggests that young people in this sample might experience a disproportionately high level of gender minority stress. The link between minority stress and mental health, substance use disorder or diabetes implies that efforts to improve access to and coverage of gender affirming services for gender minority populations must be

accompanied by interventions to reduce instances of discrimination, harassment, and violence in health care settings.

Limitations

Our analysis has several limitations. First, we were not able to identify gender minority people who did not have a gender minority-related diagnosis code (e.g., gender minority people who did not utilize gender affirming services, who received gender affirming services that were not covered by their insurer, or who had providers that avoided using codes due to stigma or coverage concerns). This limitation means we provide an underestimate of the gender minority population and that our results are not generalizable to the broader gender minority population. This is important given wide variation in desire to use hormone therapy and have gender affirmation surgery among gender minority individuals, as well as variation in coverage of these services across states and insurers.[14] Second, because we lack self-reported gender identity data we cannot definitively state that every individual with a gender minority-related diagnosis code has gender minority identity or expression and cannot identify important gender minority subpopulations (e.g., non-binary individuals, transgender women, and transgender men). However, in VHA data, 89.3 percent of individuals with gender minority-related diagnoses also have transgender-related terms in their clinician notes, suggesting low misclassification of gender minority individuals.[47]

Third, the MarketScan Database is not a nationally representative sample of the privately insured population. As such, we cannot generalize our study results to the entire privately enrolled United States population, and longitudinal trends may, in part, reflect shifts in the sample captured by the MarketScan Database. Fourth, we lack information on individuals' sociodemographic factors (e.g., race/ethnicity) and other key confounders. The additional

variables that are available, such as plan type, drug claims availability, and employment status are not crucial potential confounders, and frequently had high levels of missingness (e.g., 50%), making them unreliable. While the influx of high-dimensional electronic health data is an important component in advancing public health research, depending on the research question, not all data sources will be appropriate for more sophisticated multivariable or statistical learning analyses. Thus, we did not pursue them here.

1.5 Conclusion

This study finds that health care enrollees with gender minority-related diagnoses comprise a small but growing percentage of the privately insured population in the US. Compared to non-gender minorities, gender minority individuals are younger and have a significantly higher prevalence of mental health disorders. These findings are a crucial first step in efforts to understand and improve coverage for privately insured gender minority individuals. Coverage of gender affirming services has been found to be cost-effective in one recent study due to its potential to improve quality of life as well as prevent negative outcomes such as depression, suicidality, HIV, and mortality.[48] Future studies should assess whether and how insurers, employers, and policymakers have or have not ensured coverage of these services for gender minority people.

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Chapter 2: Association of Nondiscrimination Policies with Mental Health among Gender Minority Individuals*

Abstract

Importance: In recent years, many states have implemented policies prohibiting discrimination based on gender identity among private health insurers. Policies banning discrimination have the potential to improve access to care and health outcomes among gender minority (i.e. transgender and gender diverse) populations.

Design, Setting, and Participants: In this cohort study, difference-in-differences analysis comparing changes in mental health outcomes among gender minority enrollees before and after states implemented nondiscrimination policies in 2009-2017 was conducted. A sample of gender minority children and adults was identified using gender minority–related diagnosis codes obtained from private health insurance claims.

Exposure: Living in states that implemented policies banning discrimination based on gender identity in 2013, 2014, 2015, and 2016.

Main Outcomes and Measures: The primary outcome was suicidality. The secondary outcome was inpatient mental health hospitalization.

Results: The study population included 28980 unique gender minority enrollees (mean [SD] age, 26.5 [15] years) from 2009 to 2017. Relative to comparison states, suicidality decreased in the first year after policy implementation in the 2014 policy cohort (odds ratio [OR], 0.72; 95% CI, 0.58-0.90; P = .005), the 2015 policy cohort (OR, 0.50; 95% CI, 0.39-0.64; P < .001), and the 2016 policy cohort (OR, 0.61; 95% CI, 0.44-0.85; P = .004). This decrease persisted to the second postimplementation year for the 2014 policy cohort (OR, 0.48; 95% CI, 0.41-0.57; P < .001) but not for the 2015 policy cohort (OR, 0.81; 95% CI, 0.47-1.38; P = .43). The 2013 policy cohort experienced no significant change in suicidality after policy implementation in all 4 postimplementation years (2014: OR, 1.19; 95% CI, 0.85-1.67; P = .31; 2015: OR, 0.94; 95% CI, 0.73-1.20; P = .61; 2016: OR, 0.82; 95% CI, 0.65-1.03; P = .10; and 2017: OR, 1.29; 95% CI, 0.90-1.88; P = .18). Mental health hospitalization rates generally decreased or stayed the same for individuals living in policy states vs the comparison group.

Conclusions and Relevance: Implementation of a state-level nondiscrimination policy was associated with decreased or no changes in suicidality among gender minority individuals living in states that implemented these policies from 2013-2016. Given high rates of suicidality among gender minority individuals in the U.S., health insurance nondiscrimination policies may offer an effective mechanism for reducing barriers to care and mitigating discrimination.

2.1 Introduction

Gender minority populations, defined as transgender and gender diverse (e.g., nonbinary or gender fluid) individuals, face health inequities and unique challenges in accessing health care in the U.S. The term gender minority includes a diverse range of identities and expressions and does not signify a medical or psychological condition. Many gender minority people experience gender dysphoria, which is a clinical diagnosis that describes the significant distress and difficulty functioning that can accompany discordance between an individual's current gender identity or expression and their assigned sex. Gender affirming health care services—including hormone therapy, reconstructive surgeries, and mental health services—have been identified as medically necessary and effective treatments for gender dysphoria by the American Medical Association, the American Psychiatric Association, the American Psychological Association, and numerous other professional medical associations.[1–4]

Despite these medical guidelines, many U.S. insurers categorically exclude coverage of gender affirming health care services.[5] Such exclusions have important health implications for gender minority patients and compound existing barriers to care, including limited availability of clinicians to provide gender affirming services and frequent experiences of discrimination during interactions with the health care system.[6–8] These barriers to care are particularly salient given notable mental health disparities: 40% of gender minority individuals have attempted suicide in their lifetime, compared to less than 5% in the general population.[6] Among Medicare beneficiaries, gender minority individuals are significantly more likely than those who were not identified as gender minority to have an inpatient mental health hospitalization, even after adjusting for age and mental health conditions.[9]

Between 2012 and 2018, 20 states and Washington D.C. implemented policies prohibiting insurer discrimination based on gender identity.[10] These state-level policies do not necessarily mandate that private health insurers cover gender affirming hormones and surgery, but do require that they remove these coverage exclusions. To date the effect of these policies on access to care and health outcomes remains unknown.

We examine the impact of health insurance nondiscrimination policies on mental health outcomes for gender minority individuals. Using a large private health insurance claims database, we construct a sample of enrollees with gender minority-related diagnosis codes in 2009-2017. We deploy a difference-in-differences design to evaluate changes in suicidality and inpatient mental health hospitalizations among gender minority enrollees in states with and without nondiscrimination policies.

2.2 Methods

Data Source and Sample

We used the IBM® MarketScan® Commercial Database, which contains deidentified private health insurance claims and enrollment data, including information on inpatient and outpatient health care services, for 26 to 53 million individuals per year under age 65 from a convenience sample of U.S. health plans and large employers. In 2009-2017, we identified gender minority enrollees using a set of gender minority-related International Classification of Diseases (ICD) codes that have been described previously (eMethods the in Appendix for Chapter 2).[11,12] Individuals were included in our sample if they had a gender minority-related ICD code on an inpatient or outpatient claim in any year of the study period, and we did not require continuous enrollment. The institutional review board at Harvard Medical School determined that this was not human subjects research.

Study Design

We used a difference-in-differences design to compare changes in suicidality and inpatient mental health hospitalizations among gender minority enrollees before and after states implemented nondiscrimination policies. "Nondiscrimination policies" were defined as state-level policies that provide protections for gender minority individuals who have or want to obtain private health insurance. Specifically, this includes policies that 1) ban discrimination based on gender identity among private health insurers and/or 2) ban categorical exclusion of transgender-related services among private insurers. We estimated associations in the policy implementation year (because the policy is active for a portion of this year) and for each subsequent post-implementation year. Policy references provided by the Movement Advancement Project and the National Center for Transgender Equality were used to identify these dates.[10,13] When the referenced legal document did not explicitly state when the policy took effect, we consulted alternative resources (e.g., follow-up policy bulletins, newspaper articles, and direct communication with state insurance divisions) to determine implementation dates.

We grouped states into four separate policy cohorts based on their policy implementation year to capture heterogeneity by treatment year (Figure 2.1). States that implemented policies in 2013 (n=7) were California, Colorado, Connecticut, Delaware, the District of Columbia, Oregon, and Vermont; states that implemented policies in 2014 (n=3) were Massachusetts, New York, and Washington state; states that implemented policies in 2015 (n=4) were Illinois, Minnesota, Nevada, and Rhode Island; and states that implemented policies in 2016 (n=5) were Hawaii, Maryland, Michigan, Montana, and Pennsylvania. Each of these policy cohorts was compared to the same primary comparison group, which included all states that had not implemented a policy as of December 31, 2018 (n=30).

Figure 2.1: Map Showing State Policy Cohorts and Comparison Group

Notes:
Other Years refers to states that implemented policies between January 1, 2017 and December 31, 2018. No Policy
refers to states that had not implemented a policy as of December 31, 2018.

Measures of Mental Health

Two measures were used to characterize the association of nondiscrimination policies with gender minority mental health: suicidality, our primary outcome, and inpatient mental health hospitalizations. We determined whether individuals in our sample had any suicidality or mental health hospitalization diagnosis codes in each year that they were enrolled in an observed health insurance plan. Enrollees with a suicide-related diagnosis code in any position on one inpatient or one outpatient claim were considered to have suicidality. Suicide-related diagnosis codes included codes for suicide attempt, potential suicide attempt, and suicidal ideation, incorporating those that have been previously demonstrated to indicate suicidal behavior[14,15] (eTable 1 in Appendix for Chapter 2). For inpatient mental health hospitalization, enrollees were required to have any mental health diagnosis code in the first diagnosis position on one inpatient claim[16] or have their reason for admission be a mental health condition (eMethods in Appendix for Chapter 2).

Statistical Analysis

We estimated separate, enrollee-level multivariable logistic regression models with standard errors clustered at the state level for each of the four policy cohorts (eMethods in Appendix for Chapter 2). Within these models, we interacted policy exposure with each post-implementation year to estimate associations for each year after implementation. For the 2013 cohort, 2009-2012 was the prepolicy period and 2013-2017 the post-implementation period (and thus we estimated associations in 2013, 2014, 2015, 2016, and 2017). We followed the same logic for the 2014, 2015, and 2016 cohorts: the prepolicy period was 2009-2013 for the 2014 cohort, 2009-2014 for the 2015 cohort, and 2009-2015 for the 2016 cohort. Models included year fixed effects and enrollee-level covariates, which adjusted for age (in years), documented sex,

whether the individual was enrolled in a health maintenance organization for the majority of their covered time in that year, mental health comorbidities, and physical health comorbidities. For models estimating the association between policies and mental health hospitalizations, mental health comorbidity indicators were not included because they were used to identify the outcome.

Sensitivity Analyses

We conducted several analyses to assess the robustness of our approach (eMethods in Appendix for Chapter 2). First, we tested for differential trends in the prepolicy period to evaluate the parallel trends assumption that is key to the difference-in-differences design. Second, to address concerns about confounding caused by differential trends in mental health access between treatment and comparison states, we ran models that included a metropolitan statistical area (MSA)-level psychiatrist-to-population ratio. Third, to explore potential confounding caused by differences in other state-level policies related to sexual and gender minority wellbeing (e.g., housing or employment nondiscrimination policies) in treatment and comparison states, we also ran models including state-time varying indicators for 36 state-level nondiscrimination policies that could not be used in the main analyses as they were not available for all years.[17] Fourth, we removed documented sex from our models given the possibility it is misclassified. Fifth, we limited our sample to enrollees age 18 and over because gender minority children and adolescents face unique challenges accessing gender affirming services. Finally, we estimated all models using an alternative comparison group that excluded states that were most similar to the states in each of the four policy cohorts in terms of overall policy environment related to sexual and gender minority wellbeing. All analyses used a 2-sided $P < .05$ as a threshold for statistical significance and were performed using R statistical software, version 1.1.456.[18] Results should be interpreted as exploratory.

2.3 Results

Study Population

The final sample included 106,705 person-year observations from 2009 to 2017; the total

study population included 28,980 unique gender minority individuals (mean [SD] age, 26.5 [15]

years). The number of gender minority individuals in each of the policy cohorts ranged from 442

to 2968 per year and ranged from 2967 to 7606 per year in the comparison group (eTable 2 in

Appendix for Chapter 2). Mean age and documented sex were similar in policy cohorts (age:

range, 25-27years; female sex: range, 54%-57%) and the comparison group (age: 27 years;

female sex: 54%) (Table 2.1). However, the comparison group had a higher percentage of gender

minority individuals living in a rural area (10% vs 4%-7%) and a less protective policy

environment for sexual and gender minority communities (mean,0.98vs 1.011.17).

Suicidality

The prevalence of suicidality among gender minority enrollees in all policy cohorts and

comparison groups generally increased over the study period, with 1.8% to 2.0% experiencing

suicidality in 2009 and 5.1% to 6.4% experiencing suicidality in 2017 (eTable 3 in Appendix for

Chapter 2). Across all study years and policy cohorts, suicidality prevalence was highest among

enrollees in the 2016 cohort in 2016, with 7.6% of gender minority enrollees experiencing

suicide attempt, potential suicide attempt, or suicidal ideation. The unadjusted prevalence of

gender minority individuals with suicidality in the 2013 policy cohort decreased from 2014-2015

but increased similarly to the comparison group in all other post-implementation years. The

2014, 2015, and 2016 policy cohorts had similar unadjusted drops in suicidality in the first post-

implementation year (Figure 2.2).

Figure 2.2: Unadjusted Trends in Suicidality for Each Policy Cohort versus the Comparison Group, 2009-2017
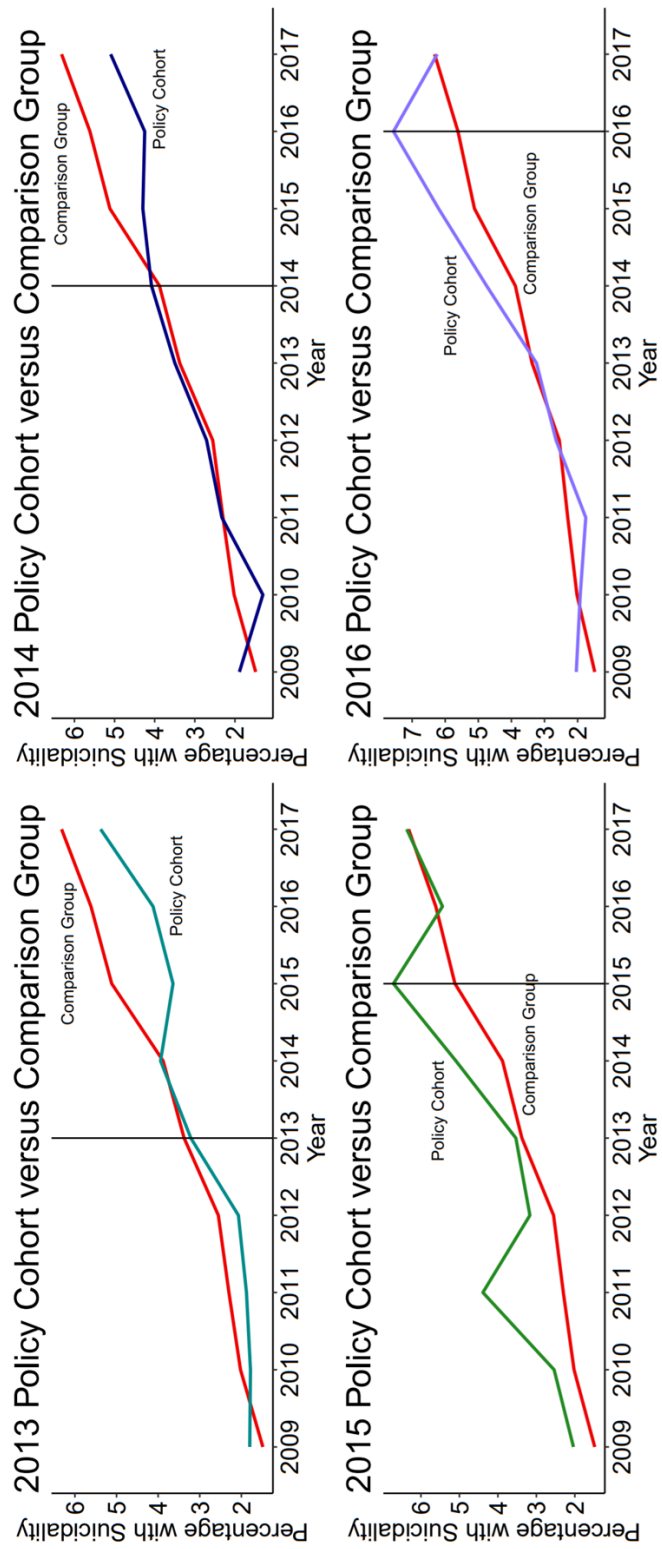
In adjusted analyses for the 2014, 2015, and 2016 policy cohorts, nondiscrimination policies were associated with no change in suicidality in the implementation year and a significant reduction in suicidality in the first post-implementation year, relative to the comparison group. For the 2014 policy cohort, suicidality also decreased by 52% in 2016, the second post-implementation year (odds ratio, 0.48 [95% CI, 0.41 to 0.57], $P <.001$), and there was a nonsignificant decrease in suicidality in the third post-implementation year (odds ratio, 0.77 [95% CI, 0.58, 1.03], P=.08). In the 2015 policy cohort, there was a similar 50% decrease in suicidality for 2016 (odds ratio, 0.50 [95% CI, 0.39 to 0.64], $P <.001$), but the decrease in 2017 was not significant (odds ratio, 0.81 [95% CI, 0.47 to 1.38], P=.43). For the 2016 policy cohort, there was a 39% decrease in suicidality in 2017 (odds ratio, 0.61 [95% CI, 0.44 to 0.85], P=.004) relative to the comparison group. For the 2013 policy cohort, there was mixed directionality in suicidality with no significant associations (Table 2.2).

Inpatient Mental Health Hospitalizations

The unadjusted percentage of the sample with inpatient mental health hospitalizations generally increased over the study period. Among enrollees in each of the policy cohorts and the comparison group, mental health hospitalizations ranged from 2.1% to 3.4% in 2009 and 5.4% to 7.0% in 2017 (eTable 4 in Appendix for Chapter 2). The unadjusted trends in mental health hospitalizations in the 2014, 2015, and 2016 policy cohorts demonstrated decreases in the first post-implementation year followed by increases, whereas the 2013 policy cohort only had a post-implementation decrease in 2015 (eFigure 1 in the Supplement).

In adjusted analyses, the association between policy implementation and mental health hospitalizations was mixed, though there was a general downward trend relative to the comparison group. For the 2013 policy cohort versus the comparison group, mental health

Table 2.1: Characteristics of Gender Minority Individuals in State Policy Cohorts and Comparison Group

	2013 Cohort	2014 Cohort	2015 Cohort	2016 Cohort	Comparison Group
State Abbreviations	CA, CO, CT, DC, DE, OR, VT	MA, NY, WA	IL, MN, NV, RI	HI, MD, MI, MT, PA	
States (n)	7	3	4	5	30
Enrollees (n)	2311	1686	657	1129	5674
Age in years (mean)	27	27	26	25	27
Documented Female Sex (%)	55	57	54	57	54
HMO[a] (%)	29	12	5	20	12
Living in rural area (%)	4	5	6	7	10
Psychiatrists per person	0.0001	0.0002	0.0001	0.0002	0.0001
Policy Tally (mean)[b]	1.15	1.17	1.12	1.01	0.98

Notes:
HMO, Health Maintenance Organization
[a]Individual spent the majority of their observed months in a given year enrolled in an HMO
[b]Larger policy tally is indicative of a more welcoming policy environment for sexual and gender minority communities.

Table 2.2: Estimated Changes in Suicidality Associated with State-Level Non-Discrimination Policies[a]

	2013 Cohort		2014 Cohort		2015 Cohort		2016 Cohort	
	Odds Ratio (95% CI)	*P* value	Odds Ratio (95% CI)	*P* value	Odds Ratio (95% CI)	*P* value	Odds Ratio (95% CI)	*P* value
2013	1.16 (0.77, 1.73)	.49						
2014	1.19 (0.85, 1.67)	.31	0.84 (0.68, 1.04)	.12				
2015	0.94 (0.73, 1.20)	.61	0.72 (0.58, 0.90)	.005	1.10 (0.79, 1.52)	.58		
2016	0.82 (0.65, 1.03)	.10	0.48 (0.41, 0.57)	<.001	0.50 (0.39, 0.64)	<.001	0.93 (0.81, 1.07)	.35
2017	1.29 (0.90, 1.88)	.18	0.77 (0.58, 1.03)	.08	0.81 (0.47, 1.38)	.43	0.61 (0.44, 0.85)	.004

Notes:
[a]All models use data from 2009 to 2017 and cluster standard errors at the state level.

hospitalizations decreased by 17% in 2013 (odds ratio, 0.83 [95% CI, 0.70 to 0.99], P =.04), 29% in 2015 (odds ratio, 0.71 [95% CI, 0.54 to 0.91], P =.01), and 24% in 2016 (odds ratio, 0.76 [95% CI, 0.60 to 0.97], P =.03). In the 2014 policy cohort, mental health hospitalizations increased by 28% in 2014 (odds ratio, 1.28 [95% CI, 1.03 to 1.58], P =.03) and had a nonsignificant reductions in 2016 (odds ratio, 0.86 [95% CI, 0.71 to 1.04], P =.13) and 2017 (odds ratio, 0.87 [95% CI, 0.64 to 1.17], P =.37). Mental health hospitalizations decreased significantly in the implementation year and the two post-implementation years for the 2015 cohort relative to the comparison group: 26% lower in 2015 (odds ratio, 0.74, [95% CI, 0.58 to 0.94], P=.02), 39% lower in 2016 (odds ratio, 0.61, [95% CI, 0.52 to 0.72], *P*<.001), and 21% lower in 2017 (odds ratio, 0.79, [95% CI, 0.63 to 0.99], P=.04). There was a downward but nonsignificant trend in mental health hospitalizations for the 2016 policy cohort versus the comparison group (Table 2.3).

Sensitivity Analyses

In sensitivity analyses, there were no differences in prepolicy suicidality trends between the policy cohorts and the comparison groups (eTable 5-eTable 6 in Appendix for Chapter 2). However, there was a difference in the prepolicy trends in mental health hospitalizations between the 2013 policy cohort and both the main and alternative comparison groups. Our multivariable regression findings were robust to the inclusion of a mental health access covariate, removing the documented sex variable, and to an alternative comparison group that dropped states with policy environments most similar to those in the policy cohort in question (eTable 7-eTable 10 in Appendix for Chapter 2). Overall, restricting our sample to enrollees age 18 and older and models that controlled for 36 other state-level policies related to sexual and gender minority well-being generated findings with similar directionality. Divergent results included reductions

in suicidality that were slightly larger or smaller and became nonsignificant in one post-implementation year; mental health hospitalization findings remained mixed.

Table 2.3: Estimated Changes in Inpatient Mental Health Hospitalization Associated with State-Level Non-Discrimination Policies[a]

	2013 Cohort		2014 Cohort		2015 Cohort		2016 Cohort	
	Odds Ratio (95% CI)	*P* value	Odds Ratio (95% CI)	*P* value	Odds Ratio (95% CI)	*P* value	Odds Ratio (95% CI)	*P* value
2013	0.83 (0.70, 0.99)	.04						
2014	1.12 (0.93, 1.36)	.23	1.28 (1.03 1.58)	.03				
2015	0.71 (0.54, 0.91)	.01	1.02 (0.78, 1.34)	.90	0.74 (0.58, 0.94)	.02		
2016	0.76 (0.60, 0.97)	.03	0.86 (0.71, 1.04)	.13	0.61 (0.52, 0.72)	<.001	0.90 (0.71, 1.15)	.41
2017	0.85 (0.61, 1.19)	.36	0.87 (0.64, 1.17)	.37	0.79 (0.63, 0.99)	.04	0.81 (0.57, 1.16)	.26

Notes:
[a]All models use data from 2009 to 2017 and cluster standard errors at the state level.

2.4 Discussion

In this national study of mental health outcomes among gender minority individuals, implementation of a state-level health insurance nondiscrimination policy was associated with a significant reduction in suicidality in three of four policy cohorts defined by implementation year. Among states that implemented policies in 2014, 2015, and 2016, there was no change in the implementation year and a significant decrease in suicidality in the first post-implementation year relative to the comparison group. This significant decrease in suicidality persisted to the

second post-implementation year for the 2014 policy cohort, disappeared for the 2015 policy

cohort, and was not observed for the 2016 policy cohort (because the first post-implementation

year was the final study year). In the 2013 policy cohort, there was no association with

suicidality. Lang[19] finds a similar reduction in suicide rate in the first year after implementation

of state-level mental health parity laws. These findings are consistent with evidence that gender

minority mental health is positively impacted by gender affirming hormones and surgery,

knowledgeable providers, and nondiscrimination laws.[20–25]

Among gender minority individuals in the 2013 and 2015 policy cohorts, inpatient mental

health hospitalizations decreased (by 17% and 26%, respectively) in the implementation year,

relative to the comparison group. However, gender minority individuals in the 2014 policy

cohort experienced a 28% increase in mental health hospitalizations compared to those living in

nonpolicy states in the implementation year. Though mental health hospitalizations were

somewhat mixed, there appears to be a general downward trend in mental health hospitalizations

after policy implementation. Together with findings of decreased suicidality, these results

suggest that health insurance nondiscrimination policies overall may have, at worst, no

association with gender minority mental health and, at best, a notable impact on gender minority

suicidality and mental health hospitalization.

Health insurance nondiscrimination policies may improve mental health outcomes for

gender minority populations through several mechanisms, including reduced gender minority

stress and increased access to gender affirming services. Gender minority stress, which includes

internal stressors (e.g., nondisclosure of one's gender identity) and external stressors (e.g.,

gender based victimization) related to an individual's gender identity, has been linked to poor

mental health.[20,26–29] Insurance nondiscrimination policies could lessen gender minority stress

through multiple pathways, including reduced internalized and ambient stigma due to knowledge of new policies among patients and clinicians. Decreased discrimination in health care settings due to increased clinician experience may also reduce gender minority stress. Additionally, several recent studies highlight that gender affirming services are associated with improved mental health.[20,21,24,25]

Barriers to implementation of health insurance nondiscrimination policies may be lower than expected. Because these policies do not necessarily require private health insurers to cover gender affirming hormones and surgery, but rather prohibit categorical exclusion of these services from their policies, they do not necessitate increased health care spending. Further, many states that have already enacted these policies have done so in the form of a bulletin or memo that is released by the state insurance division and amends an existing insurance nondiscrimination policy (e.g., a state has an existing policy that prohibits discrimination by private insurers on the basis of sex and gender identity is added to this policy).

Debates over gender minority nondiscrimination policies are ongoing at the local, state, and federal level. This study suggests that there may be a significant benefit of such policies on gender minority health and adds to the evidence base available to policymakers and other stakeholders when considering implementation of a state-level health insurance nondiscrimination policy. Additionally, this work serves as a model for future studies seeking to evaluate health policies that have an impact on gender minority individuals.

Limitations

First, the difference-in-differences design relies on the assumption that outcome trends are parallel in exposure and comparison groups and would remain so if not for the

implementation of the policy. We did not find evidence of differential trends in suicidality before

policy implementation. However, we did find evidence of differential trends in mental health

hospitalizations in 2013 and therefore use caution when interpreting these findings. Second,

potential unmeasured confounders include availability of gender affirming providers, insurers'

coverage decisions related to gender affirming services, health plan generosity, socioeconomic

factors, and coding practices. However, for these potential confounders to influence our findings,

they must have been changing differentially over time between policy and non-policy states.[30]

Third, suicide-related ICD-10 codes, which were used for study years 2015-2017, have not been

validated.[14,15] The change from validated ICD-9 to ICD-10 codes could distort who we identified

as having suicidality in 2009-2014 versus 2015-2017, though we do not have reason to believe

that this would be different across policy and non-policy states. Fourth, we do not observe

suicide death or other suicidal behavior that is not captured in insurance claims, which

underestimates the overall level of suicidality among gender minority individuals, although this

would not affect our conclusions unless the proportion of suicidality that appears in our data

changed differentially over time between policy and comparison states. Similarly, our sample is

not representative of all privately insured gender minority individuals in the states studied

because not all gender minority individuals have a gender minority-related diagnosis code.[11]

Finally, our sample includes individuals enrolled in plans that may not be regulated by state

insurance policies. However, all of the proposed mechanisms for the relationship between policy

implementation and suicidality do not rely on enrollment in a state-regulated plan.

2.5 Conclusion

Implementation of a state-level nondiscrimination policy was associated with decreased

suicidality or no change in suicidality among gender minority individuals living in states that

implemented these policies from 2013-2016. In the setting of rising suicidality among gender

minority individuals in the U.S., states should consider health insurance nondiscrimination

policies as a compelling mechanism for reducing barriers to care and mitigating discrimination.

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Chapter 3: Understanding Patterns of Care Prior to Initiation of Telemental Health Care for Rural Medicare Beneficiaries with Schizophrenia or Bipolar Disorder

Abstract

Background: While telemental health use is growing in the U.S., increased uptake of telemedicine will be necessary to address the lack of access to adequate mental health treatment, particularly for individuals with serious mental illness (SMI) who are living in rural areas. Research on how telemental health services are currently being used can help inform interventions aimed to increase uptake.

Objective: To classify the different patterns of mental health care use prior to initiation of telemental health services.

Methods: A cohort of rural beneficiaries with SMI (defined as schizophrenia/related psychotic disorders or bipolar disorder) with an index telemental health visit in 2010-2017 was identified using a 20% random sample of fee-for-service Medicare claims. We used latent class analysis to identify and describe distinct patterns of inpatient and outpatient mental health care in the 6 months prior to telemental health initiation.

Results: The cohort included 4,095 Medicare beneficiaries with SMI. Five classes of mental health care use prior to telemental health initiation were identified. Across the 5 classes, we identified 3 broad care patterns: minimal care (Class 1), regular outpatient care (Class 2 and Class 3), and recent inpatient or ED care (Class 4 and Class 5).

Conclusions: By characterizing the different treatment patterns leading up to telemental health initiation, this study informs stakeholders seeking to target interventions to increase telemental health care use in the US.

3.1 Introduction

Telemental health, wherein patients and providers can engage in diagnosis and treatment of mental health conditions through videoconferencing, is one potential strategy to increase access to mental health treatment.[1–5] Prior research has found that telemental health is effective and likely equivalent to in-person care and may be particularly useful for patients who have difficulty accessing in-person care due to distance or difficulty traveling.[6–9] Use of telemental health has increased substantially in recent years, growing by 56% annually between 2005 and 2017 among commercially insured individuals[10] and by over 45% annually between 2004 and 2014 among rural Medicare beneficiaries.[3] Medicare beneficiaries most likely to use telemental health are younger than 65, eligible due to disability, and living in low-income settings. Though its use has grown among rural Medicare beneficiaries, telemental health is likely supplementing rather than replacing in-person visits, and many believe that telemental health utilization must be increased in order to substantially improve access to mental health treatment.[3]

The shortage of mental health providers and the low rate of adequate mental health treatment in the U.S. are well documented.[11–14] Ninety-six percent of U.S. counties have a shortage of mental health providers who can prescribe medications and, in 2017, over 20% of adults with any mental illness reported an unmet need for mental health treatment.[11,14] Among adults with serious mental illness, 41% received no mental health treatment in the past year.[15] Targeted interventions to increase use of telemental health services are particularly important for the for rural Medicare beneficiaries, among whom 3.7% are living with serious mental illness (SMI).[3] However, such interventions require an understanding of real-world implementation of telemental health. It is unclear what clinical circumstances trigger a telemental health visit. To fill this gap in knowledge, we categorized the different patterns of care that most often result in

telemental health care use for individuals with serious mental illness. Specifically, we describe

the treatment patterns prior to initiation of a patient's first telemental health visit among a cohort

of Medicare beneficiaries with schizophrenia and related psychotic disorders or bipolar disorder.

Using latent class analysis, we identified distinct subgroups of beneficiaries based on their care

patterns. By identifying common treatment patterns leading up to telemental health initiation,

one can target interventions to increase telemental health use.

3.2 Methods

Data Source and Study Cohort

We used health insurance claims from 2010-2017 for a 20 percent random sample of

traditional, fee-for-service Medicare beneficiaries. The study cohort included rural Medicare

beneficiaries over age 18 with SMI (schizophrenia/related psychotic disorders or bipolar

disorder) who had at least one telemental health visit in 2010-2017. Consistent with Medicare's

definition of rural eligibility for telemedicine reimbursement, we defined rural beneficiaries as

those residing in zip codes that are outside of a Core Based Statistical Area or within an area

assigned a rural urban commuting area code 4 to 10.[3] Among fee-for-service Medicare

beneficiaries, 31.7% live in areas that meet this definition of rurality. To be included in the

cohort, beneficiaries were required to have continuous enrollment in Medicare Parts A and B for

18 months preceding their index telemental health visit and 12 months following this index visit.

Figure 3.1 displays the study timeline, which spans the full 30-month continuous enrollment

period for each beneficiary. The 18 months prior to the index telemental health visit are

comprised of the 12-month baseline period (between 18 and 6 months prior to telemental health

initiation) and the 6-month pre-initiation period (the final 6 months prior to telemental health

initiation). The post-initiation period is defined as the 12 months following the index telemental health visit.

Figure 3.1 Study Timeline
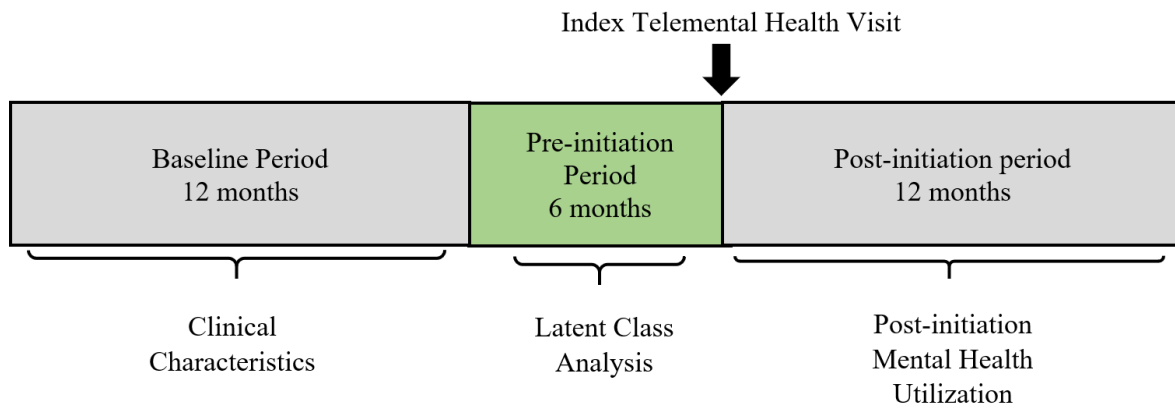
To identify patients with SMI, we used claims in the 12-month baseline period. Patients with schizophrenia were those with two outpatient claims with diagnosis codes for schizophrenia/related psychotic disorders in any diagnostic position on two different days or one inpatient hospitalization with primary diagnosis of schizophrenia/related psychotic disorders. We used the following International Classification of Diseases, Ninth Revision (ICD-9) and International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) codes to identify schizophrenia/related psychotic disorders: 295, 297 (ICD-9) and F20-F29 (ICD-10). The same approach was used to identify individuals with bipolar disorder, substituting the following diagnosis codes: 296.0, 296.1, 296.4-296.6, 296.7, 296.80, 296.81, 296.89, 296.9, 301.11, 301.13 (ICD-9) and F30-F31, F34.0 (ICD-10).[3] If an individual met criteria for both schizophrenia/related psychotic disorders and bipolar disorder, we considered that individual to have schizophrenia/related psychotic disorders only.

Beneficiaries in the study cohort were required to have at least one telemental health visit in 2010-2017, with their first telemental health visit in this time period serving as the index visit.

Consistent with previous literature,[1,3,5,16] we defined telemedicine visits as outpatient visits with a place of service code for telemedicine (02) or with telemedicine Healthcare Common Procedure Coding System (HCPCS) code modifiers of GT, GQ, or 95. We considered a telemedicine visit to be a telemental health visit if the primary or secondary diagnosis was for a mental health condition, which included the following codes: 295–302, 306–309, 311–316 (ICD-9) and F20–F69, F80–F99 (ICD-10).[1]

Summary Measures for Latent Class Analysis

We used 10 summary measures to identify patterns in the 6-month pre-initiation period using latent class analysis (Figure 3.1). These included two measures quantifying care in the 6 months prior to the index telemental health visit and 8 measures quantifying care in the 28 days prior to the index telemental health visit. The two measures capturing care in the 6-month pre-initiation period were the number of months in the pre-initiation period with any outpatient mental health visits and the number of months in the pre-initiation period with any inpatient mental health admissions. We defined outpatient mental health visits as those with a mental health diagnosis code (described above) in the primary or secondary diagnosis position and inpatient mental health admissions as those with a mental health diagnosis code in the primary position.[3] Measures quantifying care in the 28 days prior to the index telemental health included any inpatient admissions or emergency department (ED) visits for mental health, any outpatient mental health visits with a primary care provider, any outpatient mental health visits with a non-prescribing specialty provider, and any outpatient mental health visits with a prescribing specialty provider. We grouped providers into the three categories using Medicare specialty codes. Primary care providers included codes for general practice, family practice, internal medicine, pediatric medicine, geriatric medicine, nurse practitioners, and physician assistants.

We considered psychologists, clinical psychologists, and licensed clinical social workers to be non-prescribing specialty providers and psychiatrists, neuropsychiatrists, and addiction medicine physicians to be prescribing specialty providers. For each of these measures, we separately examined use in the 1-14 days prior to the index visit and use in the 15-28 days prior to the index visit.

Characteristics of Latent Classes

We examined cohort characteristics and post-initiation mental health utilization for each of the identified classes. Cohort characteristics included demographics, which were assessed in the year of the index telemental health visit and clinical characteristics, which were measured in the 12-month baseline period. Demographics included age, documented sex, reason for Medicare eligibility, race/ethnicity, and census region. For clinical characteristics, we examined diagnoses for schizophrenia/related psychotic disorders, bipolar disorder, and substance use disorders (SUD). Indicators for schizophrenia/related psychotic disorders and bipolar disorder were generated with the same approach used to determine whether beneficiaries met inclusion criteria for the study cohort. Similarly, individuals were considered to have SUD if they had two outpatient claims with diagnoses codes for SUD in any diagnostic position on two different days or one inpatient hospitalization with primary diagnosis of SUD. Diagnosis codes for SUD were 291-292, 303, 304, 305.0, 305.2-305.7, 305.9 (ICD-9) and F10-F16, F18-F19 (ICD-10).[1]

In the 12-month post-initiation period, we examined two main measures of mental health utilization: number of months with any telemental health visits and number of months with any in-person outpatient mental health visits. We also report the number of months with any in-person outpatient mental health visit with each of three providers types: primary care providers, non-prescribing specialty providers, and prescribing specialty providers.

50

Statistical Analyses

We used latent class analysis (LCA) to categorize groups of Medicare beneficiaries with differing patterns of care prior to initiation of telemental health services. LCA is a patient-centered rather than variable-centered approach and one of many unsupervised learning techniques that can be used to identify underlying groups using a set of observed variables.[17] We ran latent class analyses allowing for 1 to 10 classes and selected the number of classes based on the Bayesian information criterion, which we specified a priori. This criterion was selected given our interest in identifying a set of explanatory classes (as opposed to choosing the best predictive tool, which is the goal in supervised learning).[17,18] All latent class analyses (with classes 1 through 10) were estimated 50 times with different starting values for the expectation-maximization algorithm, each repeating the expectation-maximization algorithm up to 5,000 times if needed to reach convergence.[19,20]

We also described demographics, clinical characteristics, and post-initiation mental health utilization for the identified classes. To generate these descriptive statistics, we assigned individuals in the study cohort to the class to which they had the highest probability of belonging.[20,21] Analyses were performed using the poLCA package, version 1.4.1, in the RStudio statistical software, version 1.2.1335. [20,22] The Institutional Review Board of the Harvard Faculty of Medicine approved this study and waived the requirement for informed consent.

3.3 Results

The final cohort included 4,095 Medicare beneficiaries with SMI. Table 3.1 displays demographic information for the entire cohort. The mean age of the cohort was 31 years (SD, 13 years). Eleven percent of beneficiaries were Black or African American, 4% were Hispanic, 2%

were American Indian or Alaska Native, and 82% were non-Hispanic white. 2,022 beneficiaries

(54%) had female documented sex and 3,438 (84%) were eligible for Medicare due to disability.

Table 3.1: Cohort Characteristics (N=4,095)[a]

Age in years, mean (SD)[b]	31	(13)
Female documented sex, No. (%)	2202	(54)
Reason for eligibility, No. (%)[c]		
Age	648	(16)
Disability	3438	(84)
Race/ethnicity, No. (%)		
Non-Hispanic white	3340	(82)
Black or African American	443	(11)
Hispanic	165	(4)
American Indian/Alaska Native	83	(2)
Asian/Pacific Islander	21	(1)
Other	21	(1)
Unknown	22	(1)
Census region, No. (%)		
West	450	(11)
Midwest	1520	(37)
Northeast	188	(5)
South	1935	(47)

Notes:
[a] Sample characteristics are derived from the Master Beneficiary Summary File in the year of the index telemental health visit.
[b] Beneficiary age is captured at the end of the year in which the index telemental health visit occurs.
[c] Cells containing the number and percent of beneficiaries eligible due to end stage renal disease (ESRD) or due to disability and ESRD were suppressed due to small sample size.

Table 3.2 presents summary measures for the entire cohort in the 6-month pre-initiation

period. In the pre-initiation period, 14.1% of beneficiaries had no outpatient mental health visits

and 15.4% of beneficiaries had at least one inpatient mental health admission. A small proportion

of beneficiaries had an inpatient admission or emergency department visit for mental health in

the month prior to their index telemental health visit (3.1% in the 1-14 days prior and 2.9% in the

15-28 days prior). For outpatient mental health care in the month prior to telemental health

initiation, between 4% and 8.9% of the cohort had at least one visit in the 1-14 or 15-28 days

prior across the three provider types (specialty prescribers, specialty non-prescribers, and

primary care providers).

Table 3.2: Overview of Summary Measures in Pre-Initiation Period (N=4,095)

	No.	(%)
Number of months with any outpatient MH visits		
0 months	576	(14.1)
1-3 months	2493	(60.9)
4-6 months	1026	(25.1)
Number of months with any inpatient MH visits		
0 months	3467	(84.7)
1-3 months	600	(14.7)
4-6 months	28	(0.7)
Any emergency department visit or inpatient hospitalization for MH		
In 1-14 days prior to index visit	125	(3.1)
In 15-28 days prior to index visit	118	(2.9)
Any outpatient MH visit with specialty provider (prescriber)		
In 1-14 days prior to index visit	164	(4.0)
In 15-28 days prior to index visit	270	(6.6)
Any outpatient MH visit with specialty provider (non-prescriber)		
In 1-14 days prior to index visit	365	(8.9)
In 15-28 days prior to index visit	359	(8.8)
Any outpatient MH visit with primary care provider (including NP, PA)		
In 1-14 days prior to index visit	252	(6.2)
In 15-28 days prior to index visit	294	(7.2)

Patterns of Mental Health Care Use Prior to Telemental Health Initiation

We identified 5 classes of mental health treatment patterns for Medicare beneficiaries with SMI in the 6 months leading up to their first telemental health visit (eTable 1 in Appendix for Chapter 3). As described in Table 3.3, the first class is defined by minimal care. In contrast, in the next two classes most beneficiaries received regular outpatient care. In these regular outpatient care classes, outpatient care in the month prior to telemental health initiation is most often received from either specialty non-prescribers or specialty prescribers and primary care providers. In the final two classes, beneficiaries have had recent inpatient or ED care, either in the 1-2 weeks prior to telemental health initiation or the 3-4 prior to telemental health initiation.

Table 3.4 displays the percentage of the cohort that we would expect to appear in each of these 5 classes, as well as the percentage of beneficiaries with each of the summary measures, conditional on belonging to each class. The minimal care class, which included 63% of

Table 3.3: Description of 5 Latent Classes

	Minimal Care	Regular outpatient care		Recent inpatient or ED care	
	Class 1	Class 2	Class 3	Class 4	Class 5
Details	Likely to have no inpatient admissions in pre-initiation period.	Minimal inpatient hospitalizations in the pre-initiation period.		At least one inpatient hospitalization in pre-initiation period.	
	Likely to have < 3 months with an outpatient visit in pre-initiation period.	At least one outpatient visit in pre-initiation period.		Mixed use of outpatient visits in pre-initiation period.	
	No inpatient or ED visits in month prior.	No inpatient or ED visits in month prior.		Very likely to have an inpatient or ED visit in prior first or second week.	Very likely to have an inpatient or ED visit in prior third or fourth week.
	No specialty provider visits in month prior.	Outpatient visits in month prior are likely to be with a non-prescribing specialty provider.	Outpatient visits in month prior are likely to be with a prescribing specialty provider or PCP.		

Notes:
ED is emergency department. PCP is primary care provider.

beneficiaries in our cohort, was characterized by individuals who had minimal mental health care use prior to their first telemental health visit. In this class, the 21% of beneficiaries had no outpatient mental health visits in the 6 months prior to the index telemental health visit and 79% had 1-3 months with at least one outpatient mental health visit. The percentage of beneficiaries with any inpatient mental health admissions was very low (7%), with no individuals in this group having an inpatient admission or emergency department visit for mental health in the month prior to the index telemental health visit. Similarly, outpatient mental health care in the month prior to

the index visit was very low, with only 3% seeing a primary care provider in the both the 1-14 days and 15-28 days prior to the index visit.

The two regular outpatient care classes, which together constituted over 30% of the cohort, were characterized by regular outpatient mental health care use and infrequent inpatient

Table 3.4: Percentage with each Summary Measures Across 5 Classes (N=4,095)

	Minimal care	Regular outpatient care		Recent inpatient or ED care	
		Specialty non-prescribers	Specialty prescribers and PCPs	Prior first or second week	Prior third or fourth week
	(n=2,568)	(n=537)	(n=749)	(n=124)	(n=117)
Proportion of overall cohort	63	13	18	3	3
Number of months with any outpatient MH visits[b]					
0 months	21	0	0	14	9
1-3 months	79	35	20	54	59
4-6 months	0	65	80	32	32
Number of months with any inpatient MH admissions[c]					
0 months	93	88	80	0	0
1-3 months	7	12	19	98	85
4-6 months	0	d	d	d	15
Any emergency department visit or inpatient hospitalization for MH					
In 1-14 days prior to index visit	0	0	0	94	d
In 15-28 days prior to index visit	0	0	0	d	100
Any outpatient MH visit with specialty provider (prescriber)					
In 1-14 days prior to index visit	0	3	14	20	14
In 15-28 days prior to index visit	0	4	25	15	37
Any outpatient MH visit with specialty provider (non-prescriber)					
In 1-14 days prior to index visit	0	64	0	8	11
In 15-28 days prior to index visit	0	62	d	13	9
Any outpatient MH visit with primary care provider (including NP, PA)					
In 1-14 days prior to index visit	3	6	14	35	9
In 15-28 days prior to index visit	3	8	14	11	41

Notes:
[a] Based on probability of class membership, by modal assignment.
[b] The number of months out of the 6 months prior to the index telemental health visit in which the beneficiary had at least one outpatient mental health visit.
[c] The number of months out of the 6 months prior to the index telemental health visit in which the beneficiary had at least one inpatient mental health admission.
[d] Suppressed due to small sample size (n<10)

mental health care use for most beneficiaries in the 6 months prior to the index telemental health visit. In both regular outpatient care classes, all beneficiaries had at least one month with an outpatient mental health visit in the 6-month pre-initiation and more than two-thirds had between 4-6 months with an outpatient mental health visit. Additionally, no beneficiaries had an inpatient admission or emergency department visit for mental health in the month prior to their index telemental health. The two regular outpatient care classes are distinguished by the specialty of the outpatient providers they are most likely to see in the month prior to their index telemental health visit. Among beneficiaries in the regular outpatient care, specialty non-prescriber class, 64% had an outpatient mental health visit with a specialty non-prescriber in the 1-14 days prior to their index telemental health visit and 62% had a visit with a specialty non-prescriber in the 15-28 days prior. However, in the regular outpatient care, specialty prescriber and PCPs class 14% had an outpatient mental health visit with a primary care provider and 14% had an outpatient mental health visit with a specialty prescriber in the 1-14 days prior to their index telemental health visit. In the 15-28 days prior to their index telemental health visit, 14% of individuals in this class had an outpatient mental health visit with a primary care provider and 25% had an outpatient mental health visit with a specialty prescriber.

The two recent inpatient or ED care classes, each of which included 3% of the cohort, were characterized by beneficiaries who had moderate outpatient and inpatient mental health care use. In both recent inpatient or ED care classes, 32% had 4-6 months with at least one outpatient mental health care visit in the 6 months prior to the index telemental health visit; the portion with 1-3 months with at least one outpatient mental health care visit ranged from 54% to 59% in the two classes. The recent inpatient or ED care classes were the only two classes in which all beneficiaries had at least one inpatient mental health admissions in the 6 months prior

to telemental health initiation. These two classes are differentiated by the timing of their inpatient admissions and emergency department visits for mental health in the month prior to their index visit. In the recent inpatient or ED care, prior first or second week class, 94% had at least one inpatient admission or emergency department visit for mental health in the 1-14 days prior to their index telemental health visit; in the recent inpatient or ED care, prior third or fourth week class, 100% of beneficiaries had at least one inpatient or emergency department visit for mental health in the 15-28 days prior.

Cohort Characteristics for 5 Classes

Figure 3.2 presents demographic characteristics observed in the year of the index telemental health visit and clinical characteristics measured in the 12-month baseline period for each of the five classes. The mean age ranged from 28 (in the recent inpatient or ED care, prior third or fourth week class) to 32 (in the minimal care class) (eTable 2 in Appendix for Chapter 3). The majority of beneficiaries had female documented sex in all classes, except for the recent inpatient or ED care, prior third or fourth week class, within which only 43% of beneficiaries were documented female sex. Across all 5 classes, disability was the primary reason for Medicare eligibility and the majority of beneficiaries were non-Hispanic white. The percentage of beneficiaries who were Black or African American was highest in the recent inpatient or ED care classes (14%-15%) and second highest in the minimal care class (11%). The minimal care class also had the highest percentage of Hispanic individuals (5%). Across all classes, individuals living in the South comprised the largest portion of the cohort and individuals living in the Midwest comprised the second largest portion. The two recent inpatient or ED care classes had the highest percentage of beneficiaries living in the south (55%-59%) and fewer than 10 individuals living in the West or Northeast.

Figure 3.2 Cohort Characteristics for 5 Classes (N=4,095)

Female Documented Sex

Minimal Care: 53
Regular Outpatient, Spec. Non-Prescriber: 56
Regular Outpatient, Spec. Prescriber/PCP: 56
Recent ED, Prior: 54
Recent Inpatient/ Weeks 3-4: 43

Non–Hispanic white

Minimal Care: 80
Regular Outpatient, Spec. Non-Prescriber: 85
Regular Outpatient, Spec. Prescriber/PCP: 84
Recent ED, Prior: 78
Recent Inpatient/ Weeks 3-4: 81

Latino/a

5, 3, 3, 3

Black or African American

11, 9, 9, 15, 14

Census Region – South

47, 50, 44, 55, 59

Census Region – Midwest

37, 34, 40, 37, 32

Census Region – West

12, 10, 9

Census Region – Northeast

4, 6, 6

Eligible Due to Disability

83, 88, 85, 77, 86

Schizophrenia

53, 45, 51, 63, 68

Bipolar disorder

47, 55, 49, 37, 32

Substance use disorder

12, 14, 14, 14, 27

Category axis (x-axis) labels: Minimal Care; Regular Outpatient, Spec. Non-Prescriber; Regular Outpatient, Spec. Prescriber/PCP; Recent ED, Prior Weeks 1-2; Recent Inpatient/ ED, Prior Weeks 3-4

Notes: Spec., specialist. PCP, primary care provider, ED, emergency department. Schizophrenia includes diagnoses for schizophrenia and related psychotic disorders. Documented sex, reason for entitlement, race/ethnicity, and geography are derived from the Master Beneficiary Summary File in the year of the index telemental health visit. Mental health conditions are identified in the 12-month baseline period. Bars for Classes 4 and 5 in Census Region West were suppressed due to small sample size (n<10). Individuals with schizophrenia/related psychotic disorders and bipolar disorder are considered to have only schizophrenia/related psychotic disorders.

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The minimal care class had the smallest percentage of beneficiaries with a co-occurring substance use disorder and the recent inpatient or ED care, prior third or fourth week class had the highest percentage with a co-occurring substance use disorder (12% vs. 27%). Beneficiaries in the recent inpatient or ED care classes had the highest percentage with schizophrenia/related psychotic disorders (63%-68%) and beneficiaries in the regular outpatient care, specialty non-prescribers class had the lowest percentage with schizophrenia/related psychotic disorders (45%).

Utilization for 5 Classes in 12-month Post-Initiation Utilization

Table 3.5 displays mental health care utilization in the 12 months following the index telemental health visit for each of the 5 classes. Beneficiaries in the regular outpatient care, specialty non-prescribers class had the highest mean number of months with any telemental health visits (3.2) and the highest mean number of months with any in-person outpatient mental health visits (8.1) in the 12-month post-initiation period. Within these in-person outpatient visits, individuals in this group were most likely to see a specialty non-prescriber, with a mean of 6.3 months with this type of visit. The regular outpatient care, specialty prescribers and PCPs class had the second highest number of months with any telemental health visits (3.3) and in-person outpatient mental health visits (7.0). The minimal care class had the lowest mean number of months with any in-person outpatient mental health visit (4.1) and the two recent inpatient or ED care classes had the lowest mean number of months with any telemental health visits.

3.4 Discussion

We identified three broad patterns of care (encompassing 5 distinct groups of beneficiaries) in the 6 months prior to beneficiaries' first telemental health visit. The largest class

Table 3.5 Utilization for 5 Classes in 12-months Following Index Telemental Health Visit (N=4,095)

	Minimal care (n=2,568)	Regular outpatient care, specialty non-prescribers (n=537)	Regular outpatient care, specialty prescribers and PCPs (n=749)	Recent inpatient or ED care, prior first or second week (n=124)	Recent inpatient or ED care, prior third or fourth week (n=117)
Number of months with any telemental health visits, mean (SD)[a]	3.2 (2.2)	3.6 (2.6)	3.3 (2.7)	2.5 (2.3)	2.9 (2.3)
Number of months with any in-person outpatient MH visits, mean (SD)[b]	4.1 (2.7)	8.1 (3.4)	7.0 (3.4)	6.8 (3.7)	6.2 (3.2)
Specialty prescriber	2.4 (2.1)	2.7 (2.4)	3.8 (3.2)	4.1 (3.2)	3.7 (3.1)
Specialty non-prescriber	1.6 (1.7)	6.3 (4.0)	2.4 (2.8)	2.9 (3.3)	2.2 (2.0)
Primary care provider	2.2 (1.8)	2.6 (2.2)	3.1 (2.6)	2.9 (2.4)	2.8 (2.2)

Notes:
[a] The number of months out of the 12 months following the index telemental health visit in which the beneficiary had at least one telemental health visit.
[b] The number of months out of the 12 months following the index telemental health visit in which the beneficiary had at least one in-person outpatient mental health visit.

(63% of the cohort) is defined by minimal care for both inpatient and outpatient mental health services. Another 30% of the cohort is likely to use regular outpatient mental health care, with 13% of the overall cohort belonging to the class that tends to receive outpatient care from specialty non-prescribers in the month prior to telemental health initiation and 18% belonging to the class that tends to receive outpatient care from specialty prescribers and primary care providers in the month prior to telemental health initiation. The least prevalent pattern (approximately 6% of the cohort) is defined by beneficiaries being likely to have recent inpatient or ED care for mental health, either in the 1-2 weeks prior to telemental health initiation or the 3-4 weeks prior to telemental health initiation. These patterns provide useful insight into what

leads rural Medicare beneficiaries with SMI to initiate telemental health services and can inform interventions aimed to further increase telemental health use.

The minimal care class shows that almost two-thirds of beneficiaries (63%) who initiated telemental health care used minimal inpatient or outpatient mental health care in the 6 months prior to their first telemental health visit and had no inpatient admissions or emergency department visits in the month immediately preceding this first visit. Among individuals in the minimal care class and the two regular outpatient care classes, who comprised approximately 94% of the entire study cohort, no beneficiaries had an inpatient mental health admission or emergency department visit in the month prior to telemental health initiation. This finding suggests that referral to telemental health services does not frequently occur in inpatient settings in the month prior to initiation of such services. Thus, interventions aimed to increase telemental health use among rural Medicare beneficiaries with SMI might be targeted toward outpatient providers (specialty non-prescribers, specialty prescribers, and PCPs). However, such interventions would likely fail to reach the significant portion beneficiaries in the minimal care class, who have limited interaction with outpatient providers. For individuals who are not actively engaged in care, targeting interventions outside of the mental health care system (e.g., through community centers, health centers without mental health services, or online advertising) may be necessary.

The demographics and clinical characteristics of the 5 classes provide additional insight into the common patterns of care leading up to telemental health initiation and could be useful in developing targeted interventions. For example, it is perhaps not surprising to find that the two classes defined by recent inpatient or ED care in the pre-initiation period had the highest rates of schizophrenia/related psychotic disorders. In addition, the class with recent inpatient or ED care

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in the 3-4 weeks prior to telemental health initiation had a notably high percentage of beneficiaries with co-occurring substance use disorder (27%). Interventions designed to increase uptake for individuals who have more frequent inpatient and ED care due to exacerbations of SMI or chronic severity may be directed toward emergency departments, specialty prescribers, and primary care providers seeing patients for SMI. In addition, interventions might benefit from inclusion of services that can treat co-occurring substance use disorders.

While we are unable to draw conclusions about whether telemental health initiation is altering the trajectory of mental health service utilization in the 12-month post-initiation period, there may be a continuation of similar outpatient service utilization across the five classes. For example, a large percentage of individuals in the regular care classes had at least one outpatient mental health visit per month in 4-6 months in the pre-initiation period. This pattern of regular in-person outpatient mental health care use appears to remain consistent in the 12 months following telemental health initiation, with a mean number of months with at least one visit of 8.1 in the regular outpatient care, specialty non-prescriber class and 7.0 in the regular outpatient care, specialty prescriber and primary care provider class. In addition to in-person outpatient visits for mental health in the 12 months following telemental health initiation, individuals in these two classes have a mean number of months with at least one telemental health visits of 3.6 and 3.3, respectively. Additionally, it is plausible that telemental health initiation in the minimal care class might contribute to observed increases in outpatient care utilization.

This study has potential limitations. In utilizing LCA, we assumed that the study cohort consisted of two or more homogenous subgroups and that the summary measures used in the LCA were independent, conditional on these subgroups.[23,24] If this local independence assumption is violated, it is possible that results with fewer than five classes were incorrectly

bypassed.[24] However, it is reasonable to assume that dependence among summary measures used in our LCA is accounted for by class membership and that the 5-class approach is representative of underlying subgroups. Additionally, when describing the summary measures, cohort characteristics, and post-initiation mental health care utilization across the 5 classes, we assigned beneficiaries to one of the five classes using their predicted probability of class membership. This approach does not account for the probability that beneficiaries might be assigned to alternative classes.[18,25] As a result, descriptions of the 5 classes do not incorporate uncertainty in class assignment and should be interpreted as exploratory. Additionally, this study does not assess patterns of mental health care use for rural beneficiaries with SMI who did not access telemental health in the study period and it is possible that we fail to capture telemental health visits that were not billed as such. Finally, our use of insurance claims limits our ability to capture clinical nuances.

In this study of 4,095 rural Medicare beneficiaries with schizophrenia and bipolar disorders, we classified five patterns of mental health care use prior to telemental health. By identifying and describing the subgroups of beneficiaries with these differing patterns of care, we highlight the need for multiple targeted interventions in order to increase telemental health use in this population. Importantly, the landscape of telemental health has changed dramatically in the context of the recent COVID-19 pandemic and many providers have implemented telemental health. The ways in which this shift this will impact utilization patterns in the future (i.e., whether providers will revert to in-person visits only or continue to use telemedicine) is unknown. This research serves as an important baseline for understanding the various patterns that lead rural Medical beneficiaries with SMI to their first telemental health visit.

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A. Appendix for Chapter 1

eTable 1. Yearly counts of claims in Truven Health MarketScan Commercial Claims and Encounters Database

	Inpatient	Outpatient	Drug	Total
2009	61,558,782	766,136,540	274,768,637	1,102,463,959
2010	66,857,742	850,404,030	293,188,920	1,210,450,692
2011	75,838,811	1,006,649,900	335,322,521	1,417,811,232
2012	76,803,037	1,055,380,337	335,933,638	1,468,117,012
2013	62,632,638	875,696,525	283,685,940	1,222,015,103
2014	67,268,872	952,082,337	302,885,295	1,322,236,504
2015	43,216,824	599,918,568	230,601,475	873,736,867

eTable 2. Yearly counts of unique individuals in Truven Health MarketScan Commercial Claims and Encounters Database

	N
2009	39,970,145
2010	45,239,752
2011	52,194,324
2012	53,131,420
2013	43,737,217
2014	47,258,528
2015	28,348,363

eTable 3. Gender minority-related *International Classification of Diseases*, Ninth Revision (ICD-9) and Tenth Revision (ICD-10) codes

ICD-9 Codes	ICD-10 Codes
Transsexualism (302.50-302.53)	Transsexualism (F640)
Gender identity disorder in children (302.6)	Gender identity disorder in adolescence or adulthood (F641)
Gender identity disorder in adolescents or adults (302.85)	Gender identity disorder of childhood (F642)
	Other gender identity disorders (F648)
	Gender identity disorder, unspecified (F649)

B. Appendix for Chapter 2

Association of Nondiscrimination Policies with Mental Health among Gender Minority Individuals

Regression Equations

<u>Difference-in-Differences Analysis</u>

$$Y_{ist} = \beta_0 + \beta_1 Exposure_s + \beta_2 Exposure_s 2013_t + \beta_3 Exposure_s 2014_t + \beta_4 Exposure_s 2015_t$$
$$+ \beta_5 Exposure_s 2016_t + \beta_6 Exposure_s 2017_t + \boldsymbol{\beta_7 Year_t} + \boldsymbol{\beta_8 X_{ist}} + e_{ist},$$

(Equation 1)

where Y_{ist} is the mental health outcome for individual i in state s in year t. $Exposure_s$ is an indicator for policy exposure in state s. β_2 through β_6 are the effects of interest in each of the post policy years. $\boldsymbol{\beta_7}$ is a vector and $\boldsymbol{Year_t}$ is a vector of year fixed effects for each year. $\boldsymbol{\beta_8}$ is a vector and $\boldsymbol{X_{ist}}$ is a vector of enrollee-level covariates, including age (in years), documented sex, whether the individual was enrolled in a health maintenance organization for the majority of their covered time in that year, and physical health comorbidities. (For models estimating the association between policies and suicidality, we also included mental health comorbidities.) Standard errors are clustered at the state level.

Pseudo R^2 values for the suicidality models were 0.53, 0.54, 0.55, and 0.55 for the 2013, 2014, 2015, and 2016 policy cohorts, respectively. For the mental health hospitalization models, pseudo R^2 values were 0.07 for the 2013 policy cohort and 0.08 for the 2014, 2015, and 2016 policy cohorts.

Because documented sex does not reliably indicate sex assigned at birth for transgender and gender diverse populations, we also conducted a robustness check in which we drop documented sex from this model.

<u>Difference-in-Differences Analysis with Controls for Mental Health Access</u>

To explore potential confounding caused by differential trends in mental health access between treatment and comparison states, we included the psychiatrist-to-population ratio at the metropolitan statistical area (MSA) level. Because this data was not available for 2009 or 2017, we dropped those years from this secondary analysis. We specified the model for the 2013 cohort as follows:

$$Y_{imst} = \beta_0 + \beta_1 Exposure_s + \beta_2 Exposure_s 2013_t + \beta_3 Exposure_s 2014_t$$
$$+ \beta_4 Exposure_s 2015_t + \beta_5 Exposure_s 2016_t + \beta_6 Exposure_s 2017_t + \boldsymbol{\beta_7 Year_t}$$
$$+ \boldsymbol{\beta_8 M_{mst}} + \boldsymbol{\beta_9 X_{imst}} + e_{imst},$$

(Equation 2)

where Y_{imst} is the mental health outcome for individual i in MSA m in state s in year t. $Exposure_s$ is an indicator for policy exposure in state s. β_2 through β_6 are the effects of interest

in each of the post policy years. $\boldsymbol{\beta_7}$ is a vector and $\boldsymbol{Year_t}$ is a vector of year fixed effects for each year. $\boldsymbol{\beta_8}$ is a vector and $\boldsymbol{M_{mst}}$ is a vector that includes the MSA-level psychiatrist-to-population ratio, as well as missingness variables for whether the individual was missing MSA or was living in a rural area outside of an MSA. $\boldsymbol{\beta_9}$ is a vector and $\boldsymbol{X_{imst}}$ is a vector of enrollee-level covariates, including age (in years), documented sex, whether the individual was enrolled in a health maintenance organization for the majority of their covered time in that year, and physical health comorbidities. (For models estimating the association between policies and suicidality, we also included mental health comorbidities.) Standard errors are clustered at the state level.

<u>Difference-in-Differences Analysis with Controls for State Policy Environment</u>

We explored concerns about confounding caused by differences in other state level policies related to sexual and gender minority wellbeing by including a vector of state-time varying indicators for 36 state-level nondiscrimination policies. Because this data was not available for 2017, we dropped 2017 from this secondary analysis. We specified the model for the 2013 cohort as follows:

$$Y_{ist} = \beta_0 + \beta_1 Exposure_s + \beta_2 Exposure_s 2013_t + \beta_3 Exposure_s 2014_t + \beta_4 Exposure_s 2015_t$$
$$+ \beta_5 Exposure_s 2016_t + \beta_6 Exposure_s 2017_t + \boldsymbol{\beta_7 Year_t} + \boldsymbol{\beta_8 Z_{st}} + \boldsymbol{\beta_9 X_{ist}}$$
$$+ e_{ist},$$

(Equation 3)

where Y_{ist} is the mental health outcome for individual i in state s in year t. $Exposure_s$ is an indicator for policy exposure in state s. β_2 through β_6 are the effects of interest in each of the post policy years. $\boldsymbol{\beta_7}$ is a vector and $\boldsymbol{Year_t}$ is a vector of year fixed effects for each year. $\boldsymbol{\beta_8}$ is a vector and $\boldsymbol{Z_{st}}$ is the vector of state-time varying indicators for 36 state-level nondiscrimination policies related to sexual and gender minority wellbeing (this set of policy indicators does not include the policy in question). $\boldsymbol{\beta_9}$ is a vector and $\boldsymbol{X_{ist}}$ is a vector of enrollee-level covariates, including age (in years), documented sex, whether the individual was enrolled in a health maintenance organization for the majority of their covered time in that year, and physical health comorbidities. (For models estimating the association between policies and suicidality, we also included mental health comorbidities.) Standard errors are clustered at the state level.

The vector of policy indicators includes the following state-level policies:

– Same-sex marriage licensed
– Same-sex marriage recognized
– Private employment discrimination based on sexual orientation
– Private employment discrimination based on gender identity
– Housing discrimination based on sexual orientation
– Housing discrimination based on gender identity
– Public accommodation discrimination based on sexual orientation

- Public accommodation discrimination based on gender identity
- Education discrimination based on sexual orientation
- Education discrimination based on gender identity
- Credit discrimination based on sexual orientation
- Healthcare discrimination based on sexual orientation
- Healthcare discrimination based on gender identity
- Restroom access
- Medicaid exclusion
- Anti-bullying laws based on sexual orientation
- Anti-bullying laws based on gender identity
- Laws prohibiting favorable or neutral discussion of homosexuality in schools
- (aka "No promo homo laws")
- Hate crime data collection based on sexual orientation
- Hate crime data collection based on gender identity
- Hate crime minimum sentence based on sexual orientation
- Hate crime minimum sentence based on gender identity
- Sodomy prohibition
- Unequal age of consent
- Adoption
- Second parent adoption
- Foster care adoption
- HIV criminalization
- Informed consent law
- Religious freedom law

Pre-Policy Trend Assessment

For the 2013 treatment cohort, we used the following model to test for differential trends:

$$Y_{ist} = \beta_0 + \beta_1 Exposure_s + \boldsymbol{\beta_2 Year_t} + \beta_3 Trend_t * Exposure_s + \boldsymbol{\beta_4 X_{ist}} + e_{ist},$$

(Equation 4)

where Y_{ist} is the mental health outcome for individual i in state s in year t. $Exposure_s$ is an indicator for policy exposure in state s. $\boldsymbol{\beta_2}$ is a vector and $\boldsymbol{Year_t}$ is a vector of year fixed effects for each year. $Trend_t$ is a linear time trend for 2009 through 2013. $\boldsymbol{\beta_4}$ is a vector and $\boldsymbol{X_{ist}}$ is a vector of enrollee-level covariates, including age (in years), documented sex, whether the individual was enrolled in a health maintenance organization for the majority of their covered time in that year, and physical health comorbidities. (For models estimating the association between policies and suicidality, we also included mental health comorbidities.) β_3 is the effect of interest. Standard errors are clustered at the state level.

The purpose of this test is to provide insight into the appropriateness of the unverifiable parallel trends assumption by assessing whether trends in the outcome for the policy cohort and comparison group are differential the pre-implementation period. Differential trends in the pre-implementation period would indicate that there is a violation of the counterfactual assumption. However, null results to do not confirm that the parallel trends assumption is valid. Additionally, we take caution in interpreting results because this traditional approach to assessing trends has a low threshold for type II errors and has low power to detect a divergence in trend.[1]

Overall Sample

Enrollees with ICD-9 and ICD-10 codes for gender minority-related diagnoses were included in our sample. In 2009-2014, we used ICD-9 codes 302.6 (gender identity disorder in children), 302.85 (gender identity disorder in adolescents or adults), and 302.50-302.53 (transsexualism). In 2015-2017, we used ICD-10 codes Z87.890 (personal history of sex reassignment), F641 (gender identity disorder in adolescence or adulthood), F642 (gender identity disorder of childhood), F648 (other gender identity disorders), and F649 (gender identity disorder, unspecified).[2,3]

Exposure and Comparison Groups

Four exposure groups were defined by the year of policy implementation (2013, 2014, 2015, and 2016). We included Oregon, which implemented a policy on December 19, 2012 in the 2013 treatment group.

The main comparison group included all states that had not implemented a policy as of December 31, 2018. We used an alternative comparison group that dropped states most similar to states in the policy cohort in question in terms of other sexual and gender minority policies. We determined similarity using a policy tally, which we created for all 50 states and the District of Columbia for each year between 2009 and 2016 (as the database containing this policy information did not include 2017 data). For each of the 36 individual policies, each state had a score that ranged from -2 to 2 (where -2 was the most restrictive category and 2 was the progressive category). For example, a state would have a -2 in the "same sex marriage recognized" category if it had a constitutional ban on same sex marriage, a -1 in the "same sex marriage recognized" category if same sex marriage was prohibited by statute, and a 1 in the "same sex marriage recognized" category if it legally recognized same sex marriage, but a prohibitory statute or constitutional amendment remained on the books. The policy tally was a sum of the 36 policy scores.

The states that had the policy tally most similar to states in the 2013, 2014, and 2015 policy were New Hampshire, Maine, and Iowa. For the 2016 cohort, the states with the most similar policy tally were New Hampshire and Wisconsin. Thus, the alternative comparison group included all states with no policy except for New Hampshire, Main and Iowa when estimating associations for the 2013, 2014, and 2015 policy cohorts and all states with no policy except New Hampshire

and Wisconsin when estimating associations for the 2016 policy cohort. Use of comparison groups that included only these similar policy states was not possible due to small sample size. We also did not consider an analysis that restricted to enrollees who were observed for the entire study period because requiring continuous enrollment cut the sample size by approximately 90% in each of the cohorts and the comparison group.

Identifying Inpatient Mental Health Hospitalizations

We used the following mental health ICD-9 codes to identify mental health hospitalizations in 2009-2014: 295-302, 306-316. However, we excluded ICD-9 codes for gender minority-related diagnoses (302.5, 302.6, 302.85) and mental health disorders due to brain damage (310).

We used the aforementioned ICD-9 codes as well as the following ICD-10 codes to identify mental health hospitalizations in 2015-2017: F20-F99. However, we excluded codes for gender minority-related diagnoses (F640, F641, F642, F648, F649).

Selecting Covariates

We selected covariates that could confound the causal relationship between policy implementation and outcomes of interest. To identify potential confounders, we first listed all covariates (measured and unmeasured) that we thought might be associated with both the exposure (living in a state with policy implementation) and outcomes of interest. Next, we use directed acyclic graphs to determine whether these potential covariates met the criteria for confounding in difference-in-differences work. More specifically, a covariate was considered to be a confounder if 1) the covariate was thought to be associated with policy implementation and 2) the covariate and the mental health outcome of interest likely had a time varying relationship or the covariate trend likely differed between the policy cohort and the comparison group.[4]

Beneficiary-level covariates included age, documented sex, plan type, and physical and mental health conditions. (Mental health condition covariates were not included in inpatient hospitalization models because this outcome is based on mental health diagnoses.) Area-level covariates included a measure of mental health access and indicators for other non-discrimination policies relevant to sexual and gender minority communities.

We operationalized plan type as whether an individual was enrolled in a health maintenance organization for the majority of the year. Based on a review of literature, we included as covariates health conditions that are associated with outcomes of interest. We then built indicators for these health conditions using the Clinical Classification Software tool, which groups diagnosis codes into meaningful clinical categories.[5] We measured mental health access with a metropolitan statistical area (MSA)-level psychiatrist-to-population ratio. Data for this psychiatrist-to-population ratio was obtained from the Health Resources & Services Administration Area Health Resource File at the county level for 2010-2017.[6] We converted county-level ratios to MSA-level ratios using crosswalks from the National Bureau of Economic Research.[7] Mental health provider ratios from the Robert Wood Johnson Foundation County Health Rankings were also considered given that this measure includes both psychiatrist and non-psychiatrist mental health providers. However, we did not use this measure because it was

not available in 2009-2012 or 2014, which were important years in our analysis. We also considered using a count of mental health providers that appear in the MarketScan data. We ultimately decided not to use this measure because we could not identify clinicians who were providing services that were not directly billed to the insurer (i.e., in the data, the "provider type" could be either a facility or an individual clinician and it is difficult to know how many different clinicians are employed by a single billing facility). Finally, we used data on the presence of 36 state-level non-discrimination policies in 2009-2016 and included binary indicators for each policy.[8]

The mental health access and policy indicator covariates were included in sensitivity analyses, rather than the main analysis because their inclusion required dropping years of data, which we believe are crucial to our main analysis.

eTable 1. Mapping of Validated ICD-9 Codes to New ICD-10 Codes for Suicidality

ICD 9	Description	ICD 10	Description
E95	Injuries of intentional intent	X71	Intentional self-harm by drowning and submersion
		X72	Intentional self-harm by handgun discharge
		X73	Intentional self-harm by rifle, shotgun and larger firearm discharge
		X74	Intentional self-harm by other and unspecified firearm and gun discharge
		X75	Intentional self-harm by explosive material
		X76	Intentional self-harm by smoke, fire and flames
		X77	Intentional self-harm by steam, hot vapors and hot objects
		X78	Intentional self-harm by sharp object
		X79	Intentional self-harm by blunt object
		X80	Intentional self-harm by jumping from a high place
		X81	Intentional self-harm by jumping or lying in front of moving object
		X82	Intentional self-harm by crashing of motor vehicle
		X83	Intentional self-harm by other specified means
965 967 969	Poisoning by analgesics, antipyretics, and antirheumatics Poisoning by sedatives and hypnotics Poisoning by psychotropic agents	T36-T50 where fifth or sixth digit is 2	Poisoning, intentional self-harm
881	Open wound of elbow forearm and wrist	S5180	Unspecified open wound of forearm
		S5181	Laceration without foreign body of forearm
		S6150	Unspecified open wound of wrist
		S6151	Laceration without foreign body of wrist
V6284	Suicidal ideation	R45.851	Suicidal ideation

eTable 2. Characteristics of Gender Minority Individuals in State Policy Cohorts and Comparison Groups

	2013 Cohort	2014 Cohort	2015 Cohort	2016 Cohort	Comparison Group 1	Comparison Group 2
State Abbreviations	CA, CO, CT, DE, DC, OR, VT	MA, NY, WA	IL, MN, NV, RI	HI, MD, MI, MT, PA		
States (n)	7	3	4	5	30	27[a]; 28[b]
Enrollees (n)						
2009	1223	794	442	735	2967	2863
2010	1853	997	512	781	3860	3655
2011	2184	1161	615	1083	4654	4413
2012	2559	1515	726	1207	5405	5126
2013	2800	2316	651	1141	5954	5695
2014	2968	2476	707	1432	7009	6696
2015	2361	2165	700	1226	6744	6530
2016	2547	2142	772	1309	7606	7374
2017	2304	1609	785	1250	6867	6637
Age in years (mean)	27	27	26	25	27	27
2009	26	24	26	24	24	24
2010	27	25	26	23	25	25
2011	27	26	26	24	25	25
2012	27	26	26	25	26	26
2013	27	26	25	25	26	26
2014	27	27	26	26	27	27
2015	27	27	26	24	27	27
2016	27	27	26	26	28	28
2017	28	28	27	26	28	28
Documented Female Sex (%)	55	57	54	57	54	54
2009	53	57	45	53	51	51
2010	52	55	50	55	50	51
2011	53	55	52	55	51	52
2012	53	56	53	56	51	51
2013	53	57	55	56	54	54
2014	55	57	55	57	55	55
2015	56	57	57	59	56	56
2016	57	58	57	60	56	56
2017	56	60	57	61	58	58

	2013 Cohort	2014 Cohort	2015 Cohort	2016 Cohort	Comparison Group 1	Comparison Group 2
Majority HMO in given year (%)	29	12	5	20	12	12
2009	42	11	10	27	21	21
2010	36	8	9	23	17	16
2011	33	6	7	19	15	15
2012	31	8	3	18	14	14
2013	29	12	4	21	14	14
2014	23	13	3	17	12	12
2015	24	15	3	21	7	7
2016	24	14	4	20	7	7
2017	25	17	4	19	9	9
Living in rural area (%)	4	5	6	7	10	9
2009	6	3	8	7	10	10
2010	6	3	7	8	11	10
2011	5	3	8	9	11	10
2012	5	4	8	9	11	10
2013	4	5	7	8	10	10
2014	3	5	6	6	10	9
2015	3	6	5	5	9	8
2016	3	5	4	5	8	8
2017	3	3	4	6	8	8
Psychiatrists per person	0.0001	0.0002	0.0001	0.0002	0.0001	0.0001
2009	c	c	c	c	c	c
2010	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001
2011	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001
2012	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001
2013	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001
2014	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
2015	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001
2016	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001
2017	c	c	c	c	c	c
Policy Tally (mean)[d]	1.148	1.168	1.119	1.014	0.975	0.969
2009	1.083	1.086	1.064	0.993	0.947	0.941
2010	1.084	1.103	1.063	0.988	0.953	0.944

	2013 Cohort	2014 Cohort	2015 Cohort	2016 Cohort	Comparison Group 1	Comparison Group 2
2011	1.091	1.111	1.086	0.988	0.956	0.947
2012	1.133	1.160	1.088	0.988	0.956	0.947
2013	1.165	1.171	1.085	0.994	0.955	0.946
2014	1.174	1.183	1.149	1.016	0.957	0.948
2015	1.193	1.196	1.179	1.056	1.014	1.010
2016	1.198	1.214	1.189	1.059	1.018	1.014
2017	c	c	c	c	c	c

Abbreviations: HMO, Health Maintenance Organization
[a]Comparison Group 2 for states that implemented policies in 2013, 2014, and 2015 included all states with no policies except Maine, Iowa, and New Hampshire
[b]Comparison Group 2 for states that implemented policies in 2016 included all states with no policies except Wisconsin and New Hampshire
[c]Data on these variables was not available in these years.
[d]Larger policy tally is indicative of a more welcoming policy environment for sexual and gender minority communities.

eTable 3. Unadjusted Prevalence of Suicidality Before and After Non-Discrimination Policies

Year	2013 Cohort Prevalence, n (%)	2014 Cohort Prevalence, n (%)	2015 Cohort Prevalence, n (%)	2016 Cohort Prevalence, n (%)	Comparison Group Prevalence, n (%)
2009	22 (1.8)	15 (1.9)	[a]	15 (2.0)	44 (1.5)
2010	33 (1.8)	13 (1.3)	13 (2.5)	15 (1.9)	78 (2.0)
2011	41 (1.9)	27 (2.3)	27 (4.4)	19 (1.8)	107 (2.3)
2012	53 (2.1)	41 (2.7)	23 (3.2)	32 (2.7)	138 (2.6)
2013	90 (3.2)	81 (3.5)	23 (3.5)	37 (3.2)	201 (3.4)
2014	117 (3.9)	101 (4.1)	36 (5.1)	68 (4.7)	272 (3.9)
2015	86 (3.6)	93 (4.3)	47 (6.7)	76 (6.2)	345 (5.1)
2016	105 (4.1)	91 (4.2)	42 (5.4)	99 (7.6)	427 (5.6)
2017	124 (5.4)	82 (5.1)	50 (6.4)	78 (6.2)	434 (6.3)

[a]Cells with fewer than 12 observations are suppressed.

eTable 4. Unadjusted Prevalence of Inpatient Mental Health Hospitalizations Before and After Non-Discrimination Policies

Year	2013 Cohort Prevalence, n (%)	2014 Cohort Prevalence, n (%)	2015 Cohort Prevalence, n (%)	2016 Cohort Prevalence, n (%)	Comparison Group Prevalence, n (%)
2009	27 (2.2)	22 (2.8)	15 (3.4)	23 (3.1)	61 (2.1)
2010	52 (2.8)	19 (1.9)	17 (3.3)	26 (3.3)	117 (3.0)
2011	78 (3.6)	27 (2.3)	32 (5.2)	39 (3.6)	136 (2.9)
2012	66 (2.6)	66 (4.4)	36 (5.0)	50 (4.1)	184 (3.4)
2013	96 (3.4)	97 (4.2)	31 (4.8)	62 (5.4)	257 (4.3)
2014	134 (4.5)	131 (5.3)	44 (6.2)	88 (6.1)	301 (4.3)
2015	87 (3.7)	111 (5.1)	41 (5.9)	90 (7.3)	366 (5.4)
2016	116 (4.6)	111 (5.2)	44 (5.7)	96 (7.3)	470 (6.2)
2017	124 (5.4)	87 (5.4)	55 (7.0)	88 (7.0)	462 (6.7)

eFigure 1. Unadjusted Trends in Inpatient Mental Health Hospitalization in Policy Cohorts versus Comparison Group in 2009-2017
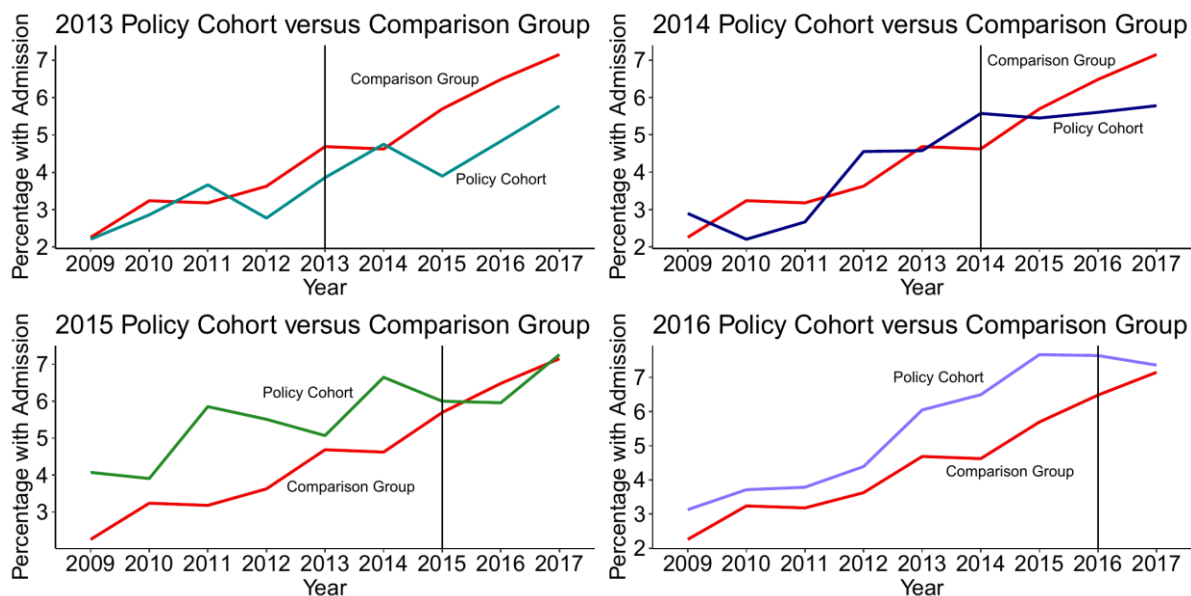
eTable 5. Pre-policy Yearly Trend Differences Between each Policy Cohort and Comparison Group 1

	2013 Cohort	2014 Cohort	2015 Cohort	2016 Cohort
	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Suicidality	0.93	0.93	0.97	0.99
	(1.11)	(1.08)	(1.05)	(1.03)
MH Hosp.	0.88[*]	1.03	0.98	1.02
	(1.06)	(1.10)	(1.04)	(1.04)

Abbreviations: MH Hosp., Mental Health Hospitalizations
*p<0.05 **p<0.01 ***p<0.001

eTable 6. Pre-policy Yearly Trend Differences Between each Policy Cohort and Comparison Group 2

	2013 Cohort	2014 Cohort	2015 Cohort	2016 Cohort
	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Suicidality	0.92	0.91	0.95	0.98
	(1.11)	(1.08)	(1.05)	(1.03)
MH Hosp.	0.88[*]	1.03	0.98	1.02
	(1.06)	(1.10)	(1.04)	(1.04)

Abbreviations: MH Hosp., Mental Health Hospitalizations
*p<0.05 **p<0.01 ***p<0.001

eTable 7. Alternative Model Specifications and Comparison Groups for 2013 Policy Cohort

	Base Model Comparison Group 1	Excluding <18 Comparison Group 1	MH Access Comparison Group 1	Other Policies Comparison Group 1	Excluding Sex Comparison Group 1	Base Model Comparison Group 2	MH Access Comparison Group 2	Other Policies Comparison Group 2
	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Suicidality								
2013	1.16	1.24	1.19	1.17	1.16	1.12	1.14	1.21
	(0.77, 1.73)	(0.73, 2.08)	(0.79, 1.79)	(0.79, 1.75)	(0.77, 1.73)	(0.75, 1.67)	(0.76, 1.68)	(0.81, 1.8)
2014	1.19	0.98	1.22	1.29	1.18	1.14	1.16	1.24
	(0.85, 1.67)	(0.7, 1.39)	(0.84, 1.79)	(0.89, 1.9)	(0.85, 1.65)	(0.81, 1.6)	(0.79, 1.7)	(0.77, 2.01)
2015	0.94	1.04	0.97	0.83	0.93	0.91	0.93	0.76
	(0.73, 1.2)	(0.73, 1.49)	(0.69, 1.36)	(0.58, 1.2)	(0.73, 1.2)	(0.7, 1.17)	(0.66, 1.31)	(0.45, 1.27)
2016	0.82	0.56	0.85	0.69	0.82	0.81	0.83	0.64
	(0.65, 1.03)	(0.38, 0.84)	(0.66, 1.09)	(0.52, 0.9)	(0.65, 1.03)	(0.63, 1.02)	(0.64, 1.07)	(0.43, 0.95)
2017	1.29	1.44			1.29	1.23		
	(0.9, 1.88)	(0.96, 2.18)			(0.89, 1.86)	(0.84, 1.79)		
MH Hosp.								
2013	0.83	0.81	0.85	0.83	0.83	0.82	0.84	0.88
	(0.7, 0.99)	(0.63, 1.04)	(0.73, 0.99)	(0.56, 1.23)	(0.69, 0.98)	(0.68, 0.99)	(0.71, 0.98)	(0.62, 1.26)
2014	1.12	1.21	1.15	1.02	1.12	1.13	1.17	1.15
	(0.93, 1.36)	(0.9, 1.6)	(0.93, 1.42)	(0.78, 1.34)	(0.93, 1.35)	(0.94, 1.36)	(0.94, 1.43)	(0.83, 1.62)
2015	0.71	0.74	0.72	0.8	0.7	0.70	0.71	0.83
	(0.54, 0.91)	(0.52, 1.06)	(0.54, 0.95)	(0.63, 1)	(0.54, 0.91)	(0.54, 0.91)	(0.54, 0.94)	(0.68, 1.02)
2016	0.76	0.69	0.78	0.85	0.76	0.76	0.77	0.88
	(0.6, 0.97)	(0.55, 0.88)	(0.63, 0.97)	(0.59, 1.21)	(0.59, 0.97)	(0.59, 0.96)	(0.62, 0.96)	(0.61, 1.26)
2017	0.85	0.87			0.85	0.84		
	(0.61, 1.19)	(0.54, 1.42)			(0.61, 1.19)	(0.6, 1.17)		

Abbreviations: MH Hosp., Mental Health Hospitalizations

eTable 8. Alternative Model Specifications and Comparison Groups for 2014 Policy Cohort

	Base Model Comparison Group 1	Excluding <18 Comparison Group 1	MH Access Comparison Group 1	Other Policies Comparison Group 1	Excluding Sex Comparison Group 1	Base Model Comparison Group 2	MH Access Comparison Group 2	Other Policies Comparison Group 2
	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Suicidality								
2014	0.84	0.79	0.83	0.85	0.84	0.82	0.82	0.83
	(0.68, 1.04)	(0.53, 1.19)	(0.66, 1.03)	(0.62, 1.17)	(0.68, 1.04)	(0.66, 1.02)	(0.66, 1.02)	(0.6, 1.15)
2015	0.72	0.79	0.73	0.64	0.72	0.71	0.72	0.65
	(0.58, 0.9)	(0.45, 1.38)	(0.59, 0.89)	(0.35, 1.15)	(0.58, 0.9)	(0.57, 0.9)	(0.59, 0.88)	(0.38, 1.12)
2016	0.48	0.31	0.48	0.41	0.48	0.48	0.49	0.41
	0.41, 0.57	(0.17, 0.57)	(0.41, 0.58)	(0.26, 0.64)	(0.41, 0.57)	(0.41, 0.57)	(0.41, 0.58)	(0.28, 0.6)
2017	0.77	0.58			0.76	0.74		
	(0.58, 1.03)	(0.33, 1.02)			(0.57, 1.02)	(0.55, 1)		
MH Hosp.								
2014	1.28	1.44	1.39	1.32	1.28	1.30	1.46	1.33
	(1.03, 1.58)	(1.15, 1.79)	(1.16, 1.67)	(1, 1.75)	(1.03, 1.58)	(1.05, 1.62)	(1.23, 1.73)	(1.01, 1.75)
2015	1.02	1.25	1.06	1.98	1.01	1.02	1.07	1.88
	(0.78, 1.34)	(1.09, 1.43)	(0.78, 1.46)	(1.32, 2.94)	(0.77, 1.32)	(0.78, 1.34)	(0.79, 1.48)	(1.28, 2.75)
2016	0.86	0.91	0.9	1.78	0.86	0.86	0.90	1.50
	(0.71, 1.04)	(0.76, 1.08)	(0.73, 1.09)	(1.34, 2.36)	(0.7, 1.04)	(0.71, 1.04)	(0.73, 1.11)	(1.16, 1.92)
2017	0.87	0.88			0.87	0.86		
	(0.64, 1.17)	(0.7, 1.11)			(0.64, 1.17)	(0.64, 1.16)		

Abbreviations: MH Hosp., Mental Health Hospitalizations

eTable 9. Alternative Model Specifications and Comparison Groups for 2015 Policy Cohort

	Base Model Comparison Group 1	Excluding <18 Comparison Group 1	MH Access Comparison Group 1	Other Policies Comparison Group 1	Excluding Sex Comparison Group 1	Base Model Comparison Group 2	MH Access Comparison Group 2	Other Policies Comparison Group 2
	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Suicidality								
2015	1.10	1.53	1.05	1.21	1.09	1.09	1.05	1.20
	(0.79, 1.52)	(0.99, 2.34)	(0.73, 1.54)	(0.73, 1.97)	(0.79, 1.52)	(0.78, 1.52)	(0.71, 1.54)	(0.69, 2.10)
2016	0.50	0.66	0.49	0.66	0.50	0.50	0.49	0.67
	(0.39, 0.64)	(0.48, 0.92)	(0.37, 0.65)	(0.44, 0.98)	(0.39, 0.64)	(0.39, 0.66)	(0.36, 0.66)	(0.44, 1.01)
2017	0.81	0.89			0.80	0.78		
	(0.47, 1.38)	(0.53, 1.52)			(0.47, 1.38)	(0.45, 1.34)		
MH Hosp.								
2015	0.74	0.81	0.75	0.71	0.74	0.74	0.74	0.64
	(0.58, 0.94)	(0.57, 1.14)	(0.58, 0.96)	(0.49, 1.03)	(0.58, 0.93)	(0.58, 0.94)	(0.58, 0.96)	(0.40, 1.03)
2016	0.61	0.54	0.62	0.68	0.61	0.61	0.61	0.60
	(0.52, 0.72)	(0.31, 0.94)	(0.54, 0.72)	(0.50, 0.91)	(0.52, 0.72)	(0.52, 0.71)	(0.53, 0.71)	(0.46, 0.79)
2017	0.79	0.72			0.78	0.77		
	(0.63, 0.99)	(0.55, 0.95)			(0.63, 0.98)	(0.61, 0.98)		

Abbreviations: MH Hosp., Mental Health Hospitalizations

eTable 10. Alternative Model Specifications and Comparison Groups for 2016 Policy Cohort

	Base Model Comparison Group 1	Excluding <18 Comparison Group 1	MH Access Comparison Group 1	Other Policies Comparison Group 1	Excluding Sex Comparison Group 1	Base Model Comparison Group 2	MH Access Comparison Group 2	Other Policies Comparison Group 2
	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Suicidality								
2016	0.93	1.02	0.95	0.90	0.93	0.95	0.96	0.88
	(0.81, 1.07)	(0.74, 1.42)	(0.80, 1.13)	(0.69, 1.16)	(0.80, 1.07)	(0.83, 1.08)	(0.82, 1.14)	(0.68, 1.15)
2017	0.61	0.94			0.61	0.62		
	(0.44, 0.85)	(0.58, 1.51)			(0.44, 0.85)	(0.44, 0.87)		
MH Hosp.								
2016	0.90	0.86	0.91	0.91	0.90	0.89	0.90	0.89
	(0.71, 1.15)	(0.66, 1.11)	(0.70, 1.17)	(0.68, 1.22)	(0.71, 1.15)	(0.70, 1.14)	(0.70, 1.17)	(0.66, 1.2)
2017	0.81	0.85			0.81	0.80		
	(0.57, 1.16)	(0.66, 1.09)			(0.57, 1.16)	(0.56, 1.15)		

Abbreviations: MH Hosp., Mental Health Hospitalizations

References for Chapter 2 Appendix

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C. Appendix for Chapter 3

Identifying the Sample

We identified 43,244 index telemental health visits in 2010-2017. When we subset to those with schizophrenia/related psychotic disorders or bipolar disorder in the 12-month baseline period, our sample size was reduced to 12,633 enrollees. When we subset to those who were 18 years or older and living in rural areas, our sample size was reduced to 6,773 enrollees. (This drop is largely due to rurality.) When we subset to those continuously enrolled in fee-for-service Medicare for 18 months before and 12 months after index visit, our sample size was reduced to 4,396 enrollees. When we subset to those in the 20% sample, our sample size was reduced to 4,095 enrollees. 4,095 was our final sample size.

eTable 1. Fit Statistics for Latent Class Analysis by Number of Classes

Number of	BIC	AIC	Log Likelihood	Likelihood Ratio	Residual DF	Absolute Entropy	Relative Entropy
1	25,870	25,794	-12,885	3,369	2291	3.15	NA
2	24,454	24,296	-12,123	1,845	2278	2.96	0.61
3	23,674	23,434	-11,679	957	2265	2.85	0.74
4	23,600	23,278	-11,588	775	2252	2.83	0.60
5	23,556	23,152	-11,512	622	2239	2.81	0.34
6	23,590	23,104	-11,475	549	2226	2.80	0.41
7	23,628	23,059	-11,439	478	2213	2.79	0.44
8	23,685	23,034	-11,414	427	2200	2.79	0.39
9	23,749	23,016	-11,392	383	2187	2.78	0.63
10	23,832	23,017	-11,379	357	2174	2.78	NA

Notes:
BIC, Bayesian information criterion. AIC, Akaike information criterion. DF, degrees of freedom.

eTable 2. Sample Characteristics for 5 Classes (N=4,095)[a]

	Minimal care		Regular outpatient care				Recent inpatient or ED care			
			Specialty non-prescribers		Specialty prescribers and PCPs		Prior first or second week		Prior third or fourth week	
	(n=2,568)		(n=537)		(n=749)		(n=124)		(n=117)	
Age in years, mean (SD)	32	(13)	29	(13)	30	(13)	31	(15)	28	(14)
Female documented sex, No. (%)	1368	(53)	300	(56)	417	(56)	67	(54)	50	(43)
Reason for eligibility, No. (%)[b]										
Age	430	(17)	63	(12)	112	(15)	28	(23)	15	(13)
Disability	2132	(83)	473	(88)	636	(85)	96	(77)	101	(86)
Race/ethnicity, No. (%)[c]										
Non-Hispanic white	2065	(80)	456	(85)	627	(84)	97	(78)	95	(81)
Black or African American	292	(11)	47	(9)	69	(9)	19	(15)	16	(14)
Hispanic	118	(5)	15	(3)	23	(3)	d		d	
Census region, No. (%)										
West	314	(12)	52	(10)	69	(9)	d		d	
Midwest	954	(37)	181	(34)	301	(40)	46	(37)	38	(32)
Northeast	102	(4)	34	(6)	47	(6)	d		d	
South	1197	(47)	270	(50)	331	(44)	68	(55)	69	(59)
Clinical characteristics, No. (%)[e]										
Schizophrenia/related psychotic disorders	1371	(53)	240	(45)	385	(51)	78	(63)	79	(68)
Bipolar disorder	1197	(47)	297	(55)	364	(49)	46	(37)	38	(32)
Substance use disorder	306	(12)	77	(14)	104	(14)	17	(14)	32	(27)

Notes:

[a]Age, documented sex, reason for entitlement, race/ethnicity, and geography are derived from the Master Beneficiary Summary File in the year of the index telemental health visit. Mental health conditions are identified in the 12-month baseline period.

[b]Cells containing the number and percent of enrollees eligible due to end stage renal disease (ESRD) or due to disability and ESRD were suppressed due to small sample size.

[c]Cells containing the number and percent of enrollees with race/ethnicity defined as "unknown", "other", and "Asian/Pacific Islander" were suppressed due to small sample size.

[d] Suppressed due to small sample size (n<10).

[e] Individuals with schizophrenia/related psychotic disorders and bipolar disorder are considered to have only schizophrenia/related psychotic disorders.