

Cost of Post-Traumatic Stress Disorder vs Major Depressive Disorder Among Patients Covered by Medicaid or Private Insurance

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Objective: To compare healthcare costs and resource utilization among patients with post-traumatic stress disorder (PTSD) vs control subjects with major depressive disorder (MDD) in populations covered by Medicaid or private insurance.

Study Design: Retrospective analysis of Medicaid and private insurance administrative claims data.

Methods: Patients with at least 2 PTSD diagnoses during or after 1999, and at least 1 PTSD diagnosis during or after 2003, were identified from de-identified Medicaid claims from Florida, Missouri, and New Jersey (1999-2007) and from a privately insured claims database (1999-2008). Patients had continuous eligibility 6 months before (baseline) and 12 months after (study period) the index date and were aged 18 to 64 years. Potential control subjects having MDD without PTSD diagnosis were identified using similar selection criteria. Control subjects with MDD were matched to patients with PTSD on age, sex, state or region, employment status (private insurance only), index year, and race/ethnicity (Medicaid only). Study period per-patient utilization and costs, calculated as reimbursements to providers for medical services and prescription drugs, were compared using univariate and multivariate analyses.

Results: Patients with PTSD had higher rates of other mental health disorders (eg, anxiety and bipolar disorder) and higher mental health-related resource use and costs than control subjects with MDD in both Medicaid and privately insured populations. The mean study period total direct healthcare costs were higher for patients with PTSD than for control subjects with MDD (\$18,753 vs \$17,990 for Medicaid and \$10,960 vs \$10,024 for private insurance, $P < .05$ for both). The difference in total direct costs was driven by higher mental health-related resource use for patients with PTSD.

Conclusion: Patients having PTSD had 4.2% to 9.3% higher mean annual per-patient healthcare costs compared with matched control subjects having MDD among patients covered by Medicaid or private insurance.

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For author information and disclosures, see end of text.

Post-traumatic stress disorder (PTSD) is an anxiety disorder that may develop following a traumatic event or series of events (eg, car accident, military combat, natural disaster, or assault). Patients with PTSD usually are seen with the following 3 categories of symptoms: reexperiencing (eg, flashbacks and nightmares), avoidance (eg, staying away from activities that remind them of the trauma and developing emotional numbness), and hyperarousal (eg, difficulty sleeping and constantly feeling on edge). Persistent presence of these symptoms lasting more than 1 month causing distress or impairment of functioning may indicate that a patient has PTSD.¹

The National Comorbidity Survey Replication estimated that the lifetime prevalence of PTSD is 6.8%, and the 12-month prevalence is 3.5% among general adults in the United States.² Even after controlling for the type and degree of trauma, studies^{3,4} report that PTSD occurs approximately twice as frequently in women compared with men. Studies estimated high PTSD prevalence rates among military veterans (16.6%)⁵ and among urban primary care patients (23%).⁶ In contrast, analyses of mid to late 1990s Medicaid claims data estimated the annual prevalence of PTSD among the general adult US population to be much lower, at 0.4% to 0.5%,^{4,7} possibly because PTSD cannot be captured among individuals not seeking medical care.⁸

Post-traumatic stress disorder is associated with other psychiatric comorbidities, including substance abuse or dependence, major depressive disorder, panic disorder, agoraphobia, generalized anxiety disorder, obsessive-compulsive disorder, eating disorder, social phobia, and bipolar disorder.^{4,9,10} An analysis of the National Comorbidity Survey by Kessler⁸ suggested that PTSD may cause secondary mental health disorders: respondents with PTSD were more likely to develop anxiety, mood, and substance disorder than other respondents without PTSD, and the elevated risk of secondary mental health disorders disappeared with remission of PTSD. Post-traumatic stress disorder is associated with increased risk of congestive heart disease and with higher rates of hypertension, arthritis, asthma or bronchitis, kidney or liver disease, thyroid or autoimmune disease, stomach or gallbladder problems, epilepsy or neurologic disorders, and ul-

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cers.^{10,11} The few studies¹²⁻¹⁴ describing healthcare utilization by patients with PTSD suggest that PTSD is associated with higher resource use relative to that by patients without any mental health disorders or by patients with non-PTSD mental health disorders. Compared with veterans without mental health diagnoses, veterans diagnosed as having PTSD had higher adjusted relative risk (aRR) of using primary care services (aRR, 1.3), medical or surgical subspecialty services (aRR, 1.6), ancillary services (aRR, 1.4), emergency services (aRR, 1.6), and inpatient services (aRR, 3.2).¹⁴ Few studies^{15,16} report healthcare costs of patients with PTSD in the United States. A study¹⁶ of female health maintenance organization members found that costs increased with increasing severity of PTSD symptoms; women having more severe PTSD symptoms had about twice the annual costs compared with women having less severe symptoms after adjusting for comorbidities and demographics (\$3060 in 1997 US dollars among women with high scores, \$1779 among women with median scores, and \$1646 among women with low scores). Another study¹⁷ found that 12-month mental healthcare costs of patients having major depressive disorder (MDD) with PTSD were higher than those of patients having MDD without PTSD (\$1196 vs \$332).

Given the limited research available in the literature, the objective of the present study was to characterize the healthcare resource utilization and direct (medical and pharmaceutical) costs among patients with PTSD in Medicaid and privately insured populations. Based on the comorbidity burden and higher resource use reported in previous studies,⁴⁻¹⁶ it was expected that patients with PTSD would have higher costs compared with average patients without PTSD and that a more relevant comparison might be another well-studied mental health condition. Because depression often occurs after PTSD and the symptoms can overlap,¹⁸ the study sought to compare patients with PTSD vs matched control subjects with MDD, a well-characterized and costly population.¹⁹⁻²² The estimated lifetime prevalence of MDD among the adult US population is 16.2%, and the 12-month prevalence is 6.6%.²¹ The disorder is often comorbid with other psychiatric comorbidities. Among patients with lifetime prevalence of MDD, 72.1% had another mental health comorbidity, 59.2% had anxiety disorder, 24.0% had substance use disorder, and 30.0% had impulse control disorder.²³ Annual healthcare costs per patient were estimated to be \$8368 (in 1998 US dollars) among patients with treatment-resistant depression, \$3571 among patients with depression that is not treatment

Take-Away Points

While post-traumatic stress disorder (PTSD) is common among Veterans Affairs (VA) patients, it is costly even to payers outside the VA system, including those covered by Medicaid or private insurance.

- A comparison of patients diagnosed as having PTSD vs demographically matched patients diagnosed as having major depressive disorder (MDD) suggests that patients with PTSD had 4.2% to 9.3% higher annual per-patient healthcare costs among patients covered by Medicaid or private insurance.
- Patients diagnosed as having PTSD had higher mental health–related resource utilization and costs compared with control subjects having MDD; the higher mental health–related costs were the primary driver of the cost difference.

resistant, and \$2359 among a random sample of patients from a private insurance database.²⁰

METHODS

Data Sources

Two patient populations were analyzed in this study, one covered by Medicaid and the other by private insurance. The Medicaid study sample was selected from Medicaid claims databases in 3 states (Florida, Missouri, and New Jersey), covering approximately 12 million lives (1999-2007). The privately insured study sample was selected from a private insurance administrative database (Ingenix Employer Solutions, Rocky Hill, Connecticut) that included approximately 12 million beneficiaries (including employees, spouses, and dependents) from 55 large self-insured companies in the United States with claims for services provided from 1999 to 2008. Collectively, the companies have operations nationwide in a broad array of industries and job classifications.

The Medicaid and privately insured data contain deidentified information on patient demographics (eg, age and sex), monthly enrollment history, and medical and pharmacy claims. Medical services use was recorded, with dates of service, billed charges, actual amounts paid to providers, procedures performed (*Current Procedural Terminology* codes), and associated diagnoses (≤ 9 codes for Medicaid data and ≤ 2 codes for privately insured data using the *International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM]*). The databases also include pharmacy claims, with prescribed medications identified by National Drug Code, date of prescription fill, days of supply, quantity, and actual payment amounts.

Sample Selection

Patients were identified as having PTSD if they had at least 2 claims for PTSD (*ICD-9-CM* code 309.81) occurring on 2 different dates during or after 1999, with at least 1 claim for PTSD during or after 2003. Two PTSD diagnoses on 2 different dates were required to identify patients with PTSD. Because the duration of symptoms in patients who are receiv-

ing treatment is approximately 36 months and rises to 5 years or longer in patients not receiving treatment,²⁴ the criterion of being positive for PTSD at 2 time points is an approximate validation of the diagnosis. The index date was defined as the first PTSD diagnosis during or after 2003 that was not the first overall PTSD diagnosis. To focus on prevalent rather than newly diagnosed patients with PTSD, the index date was selected as a PTSD diagnosis that was not the first PTSD diagnosis. Only patients with index dates starting in 2003 were selected so that healthcare resource use and costs reflected more recent treatment patterns. To ensure that complete claims data were available, patients with PTSD were required to have continuous healthcare coverage eligibility during the 6 months before the index date (baseline period) and during the 12 months following the index date (study period). Patients were required to be aged 18 to 64 years throughout the study period. Patients with PTSD having health maintenance organization, capitated, or Medicare coverage were excluded from the analysis because payment information may be incomplete for those patients.

Control subjects with MDD were selected using similar criteria. Controls included beneficiaries with no diagnosis of PTSD in the available data and with at least 2 claims for MDD (*ICD-9-CM* code 296.2 [MDD, single episode] or 296.3 [MDD, recurrent episode]) occurring on 2 different dates during or after 1999, with at least 1 claim for MDD during or after 2003. The index date for controls with MDD was defined as the first MDD diagnosis during or after 2003 that was not the first overall MDD diagnosis. Controls with MDD were also required to have continuous healthcare coverage eligibility during the 6 months before the index date (baseline period) and during the 12 months following the index date (study period), be aged 18 to 64 years throughout the study period, and have no health maintenance organization, capitated, or Medicare coverage. Note that this does not require the controls with MDD to have an MDD diagnosis during the 6-month baseline period.

Patients having PTSD were randomly matched one-to-one to controls having MDD within each of the databases on age, sex, state or region, employment status (privately insured only), index year, and race/ethnicity (Medicaid only). Almost all (99.9%) identified patients with PTSD were matched to controls with MDD. Patients who were not matched were generally younger, in the range of 18 to 19 years.

Patient Characteristics

Patients with PTSD and controls with MDD were compared on the following characteristics: demographics (age, sex, state or region, and race/ethnicity [the latter for Medicaid only]), employment status (privately insured only), and baseline rates

of selected comorbidities over the 6-month baseline period. Baseline comorbidities included the following: mental health disorders, such as anxiety (excluding PTSD), bipolar disorder, depression (MDD or other depression), substance abuse or dependence, insomnia, and schizophrenia; chronic pain conditions, such as arthritis, back or neck pain, fibromyalgia, and migraine; and the Charlson Comorbidity Index (CCI), which includes 17 physical conditions predictive of 1-year mortality (including common conditions like cancer, diabetes mellitus, and cardiovascular disease).^{25,26}

Cost Calculations

Healthcare costs, including medical service and prescription drug costs, were calculated for the 12-month study period. Cost analyses were conducted from the payer's perspective (ie, costs were defined as Medicaid or private insurer payments to providers). Medical service costs were calculated for inpatient, emergency department (ED), and outpatient or other medical services. Prescription drug costs were calculated as mental health–related prescriptions (ie, antidepressants, antipsychotics, anxiolytics, anticonvulsants, and hypnotics or sedatives), cardiovascular drugs, antidiabetic drugs, gastrointestinal drugs, and other prescription drugs. Direct healthcare costs included both mental health–related and all-cause costs. Mental health–related costs included costs for mental health–related drugs, medical claims with a primary or secondary mental health disorder diagnosis (*ICD-9-CM* codes 290-319), and outpatient psychiatric treatment.

All costs were inflated to 2008 US dollars. These were obtained using the Consumer Price Index for medical care.

Healthcare Resource Utilization

Medical services were classified into the following mutually exclusive categories: inpatient care, ED visits (identified using *Current Procedural Terminology* procedure codes associated with ED care and place and type of service codes), and outpatient or other services. Prescription drugs were identified and classified using National Drug Codes from a pharmacy database (Master Drug Database; MediSpan, Indianapolis, Indiana). Resource utilization also included mental health–related and all-cause resource use.

Statistical Analysis

Patient baseline characteristics, study period resource use, and costs were compared between beneficiaries treated for PTSD and matched controls with MDD. Categorical variables were compared using χ^2 test. Bias-corrected bootstrapping *t* test was used for univariate comparisons of resource use counts and costs.

■ **Table 1.** Sample Selection

Step	Criterion	No. (%) of All Beneficiaries	
		Medicaid ^a (n = 12,748,010)	Privately Insured ^b (n = 12,022,701)
Patients With PTSD			
1.1	≥2 Claims for PTSD on 2 different dates	59,601 (0.5)	26,929 (0.2)
1.2	≥1 Claim for PTSD starting in 2003	43,318 (0.3)	22,759 (0.2)
1.3	Continuous eligibility 6 mo before and 12 mo following the index date	20,586 (0.2)	11,809 (0.1)
1.4	Age 18-64 y on index date and throughout the 12-mo study period	9130 (0.1)	9724 (0.1)
1.5	Matched to control subjects with MDD	9114 (0.1)	9720 (0.1)
Control Subjects With MDD			
2.1	≥2 Claims for MDD on 2 different dates	279,028 (2.2)	271,732 (2.3)
2.2	No PTSD diagnosis at any time in the claims history	249,856 (2.0)	260,374 (2.2)
2.3	≥1 Claim for MDD starting in 2003	177,836 (1.4)	219,269 (1.8)
2.4	Continuous eligibility 6 mo before and 12 mo following the index date	79,895 (0.6)	117,287 (1.0)
2.5	Age 18-64 y on index date and throughout the 12-mo study period	61,814 (0.5)	93,203 (0.8)
2.6	Matched to patients with PTSD	9114 (0.1)	9720 (0.1)

MDD indicates major depressive disorder; PTSD, post-traumatic stress disorder.
^aMedicaid claims data from Florida, Missouri, and New Jersey, 1999 to 2007.
^bPrivately insured claims database, 1999 to 2008.

Multivariate models were used to compare risk-adjusted mental health–related costs, total direct costs, and mental health–related and all-cause hospitalization rates between patients with PTSD and controls with MDD. The models adjusted for differences in patient characteristics, such as age, sex, state or region, CCI, and baseline comorbidities of back or neck pain, arthritis, schizophrenia, substance abuse or dependence, fibromyalgia, and migraine among the Medicaid population. Schizophrenia, substance abuse or dependence, arthritis, fibromyalgia, and migraine were not included as covariates in the model for the privately insured sample because the prevalences of these baseline diagnoses were low among the privately insured participants with PTSD or MDD. Logistic regression analysis was used to compare hospitalization rates. A generalized linear model with log link and gamma distribution for the error term was used to compare costs between patients with PTSD and controls with MDD.

All analyses were conducted using commercially available statistical software (SAS version 9.2; SAS Institute Inc, Cary, North Carolina). *P* <.05 was considered statistically significant.

RESULTS

Baseline Characteristics and Comorbidities

The prevalence of PTSD in this study was 0.5% among the Medicaid sample (1999-2007) and 0.2% among the privately insured sample (1999-2008; **Table 1**). The study samples in-

cluded 9114 Medicaid patients diagnosed as having PTSD and 9720 privately insured patients diagnosed as having PTSD. Medicaid patients, compared with privately insured patients, were younger (37.5 vs 43.3 years) and had a higher proportion of women (78.9% vs 70.0%; **Table 2**). Medicaid patients having PTSD had a significantly lower mean CCI compared with matched controls having MDD (0.55 vs 0.69; *P* <.001), while there was no significant difference in CCI between the privately insured patients with PTSD and the controls with MDD (0.31 vs 0.29, *P* = .20). Medicaid patients having PTSD had higher rates of mental health–related and chronic pain comorbidities compared with privately insured patients having PTSD, notably schizophrenia (11.1% vs 1.0%), bipolar disorder (25.4% vs 8.1%), and drug abuse or dependence (18.3% vs 3.6%). Both Medicaid and privately insured patients having PTSD had significantly higher baseline rates of anxiety (excluding PTSD), bipolar disorder, substance abuse or dependence, and chronic pain conditions compared with controls having MDD.

All-Cause and Mental Health–Related Resource Use

As summarized in **Table 3**, during the 12-month study period, patients with PTSD had significantly higher rates and mean numbers of days or visits for almost all measures of mental health–related resource use. The measures for all-cause healthcare resource use showed more modest differences between patients with PTSD and matched controls with MDD.

■ **Table 2.** Baseline Characteristics and Comorbidities^a

Variable	Medicaid			Privately Insured		
	Patients With PTSD (n = 9114)	Control Subjects With MDD (n = 9114)	P	Patients With PTSD (N = 9720)	Control Subjects With MDD (n = 9720)	P
Age on index date, y			>.99			>.99
Mean (SD)	37.5 (11.7)	37.5 (11.7)		43.3 (11.5)	43.3 (11.5)	
Median	38	38		44	44	
Age cohort, y, %						
18-24	17.9	17.9	>.99	7.8	7.8	>.99
25-34	22.3	22.3	>.99	15.1	15.1	>.99
35-44	28.6	28.6	>.99	27.6	27.6	>.99
45-54	23.7	23.7	>.99	29.8	29.8	>.99
55-64	7.5	7.5	>.99	19.7	19.7	>.99
Female sex, %	78.9	78.9	>.99	70.0	70.0	>.99
Employed, %	NA			46.4	46.4	>.99
Race/ethnicity, %						
White	60.2	60.2	>.99	NA		
Hispanic	7.6	7.6	>.99			
African American	23.1	23.1	>.99			
Other	9.1	9.1	>.99			
Medicaid state, %						
Florida	11.3	11.3	>.99	NA		
Missouri	71.2	71.2	>.99			
New Jersey	17.5	17.5	>.99			
US Census Bureau region, %						
Northeast	NA			33.4	33.4	>.99
Midwest				14.9	14.9	>.99
West				16.7	16.7	>.99
South				35.1	35.1	>.99
Charlson Comorbidity Index, mean (SD)				0.55 (1.13)	0.69 (1.43)	<.001
Other mental health disorders, %						
Anxiety, excluding PTSD	24.3	18.9	<.001	19.7	18.6	.047
Bipolar disorder	25.4	13.9	<.001	8.1	4.7	<.001
Depression ^b	53.4	78.7	<.001	42.9	85.8	<.001
Major depressive disorder	37.7	72.0	<.001	29.2	83.1	<.001
Other depression	30.6	26.7	<.001	22.4	21.0	.02
Insomnia	4.0	3.2	.006	4.2	3.7	.07
Schizophrenia	11.1	10.2	.05	1.0	0.5	<.001
Substance abuse or dependence, %						
Alcohol	7.7	6.5	.002	3.4	3.1	.33
Drug	18.3	15.4	<.001	3.6	2.9	.007
Chronic pain condition, %						
Arthritis	8.6	7.5	.006	5.4	4.4	.001
Back or neck pain	31.1	25.8	<.001	26.2	22.5	<.001
Fibromyalgia	6.2	4.9	<.001	4.7	3.9	.005
Migraine	7.5	5.0	<.001	4.7	3.8	.004

ICD-9-CM indicates *International Classification of Diseases, Ninth Revision, Clinical Modification*; MDD, major depressive disorder; NA, not applicable; PTSD, post-traumatic stress disorder.

^aPatients with PTSD were matched to control subjects with MDD on age, sex, state or region, employment status (privately insured only), index year, and race/ethnicity (Medicaid only). The distribution of demographic characteristics is representative of that in the PTSD samples from the Medicaid and privately insured populations.

^bBecause patients could have both a diagnosis of major depression (ICD-9-CM codes 296.2 and 296.3) and other depression (ICD-9-CM codes 300.4 and 311) during the baseline period, the sum of the proportions of patients with major depression diagnosis and with other depression diagnosis is higher than the proportion of patients with any depression diagnosis.

Cost of PTSD vs Major Depressive Disorder

Table 3. Study Period Healthcare Resource Use

Variable	Medicaid			Privately Insured		
	Patients With PTSD (n = 9114)	Control Subjects With MDD (n = 9114)	P	Patients With PTSD (n = 9720)	Control Subjects With MDD (n = 9720)	P
All Cause						
Medical service use						
≥1 Claim, %						
Inpatient	41.3	41.1	.84	19.9	18.7	.03
Emergency department	63.7	60.0	<.001	32.2	28.4	<.001
Outpatient or other	99.9	99.9	>.99	100.0	99.9	.06
Total days or visits, mean (SD)						
Inpatient	9.0 (27.7)	8.5 (27.5)	.27	2.1 (8.9)	2.0 (11.0)	.68
Emergency department	3.4 (9.5)	2.9 (10.0)	<.001	0.9 (2.9)	0.8 (3.8)	.005
Outpatient or other	166.5 (139.0)	157.8 (139.6)	<.001	35.0 (32.1)	28.6 (29.0)	<.001
≥1 Prescription drug use, %						
Mental health–related	92.0	91.7	.40	72.8	84.7	<.001
Cardiovascular	44.0	43.1	.27	35.4	36.1	.32
Antidiabetic	12.0	12.8	.10	6.3	6.4	.79
Gastrointestinal	48.6	46.1	<.001	27.4	27.8	.51
Other prescription	92.3	91.5	.05	86.8	87.5	.12
Mental Health–Related						
Medical service use						
≥1 Inpatient stay, %	31.2	30.1	.11	10.2	9.6	.16
1 Inpatient stay	14.0	15.2	.02	5.6	5.6	.95
≥2 Inpatient stays	17.2	14.9	<.001	4.6	4.0	.04
≥1 Claim, %						
Emergency department	26.1	22.1	<.001	6.5	5.3	<.001
Outpatient or other	99.4	98.7	<.001	99.7	99.3	<.001
Psychiatric or psychological treatment	90.7	86.1	<.001	97.0	92.3	<.001
Total days or visits, mean (SD)						
Inpatient	6.9 (23.2)	5.5 (19.5)	<.001	1.3 (7.2)	1.1 (6.1)	.02
Emergency department	0.8 (3.6)	0.6 (3.1)	<.001	0.2 (1.0)	0.1 (0.8)	<.001
Outpatient or other	61.6 (89.5)	56.6 (92.4)	<.001	19.4 (22.3)	13.7 (18.1)	<.001
Psychiatric or psychological treatment	34.7 (60.5)	25.2 (51.1)	<.001	17.5 (20.0)	12.2 (16.4)	<.001
≥1 Prescription drug use, %						
Antidepressants	83.5	84.4	.13	62.5	78.9	<.001
Antipsychotics	58.5	48.9	<.001	18.6	14.8	<.001
Typical, eg, haloperidol	14.9	12.3	<.001	4.8	4.0	.003
Atypical, eg, olanzapine	55.5	45.2	<.001	16.3	12.4	<.001
Anxiolytics	50.9	46.2	<.001	32.4	32.0	.54
Anticonvulsants	57.1	49.2	<.001	29.9	26.2	<.001
Hypnotics or sedatives	26.7	24.6	<.001	22.5	21.9	.35

MDD indicates major depressive disorder; PTSD, post-traumatic stress disorder.

For all-cause healthcare resource use, Medicaid patients having PTSD had a significantly higher proportion of patients with at least 1 ED visit (63.7% vs 60.0%), mean number of total ED days per patient (3.4 vs 2.9 days), and total outpatient or other days per patient (166.5 vs 157.8) compared with controls having MDD (Table 3). Privately insured patients having

PTSD had a significantly higher proportion of patients with at least 1 inpatient stay (19.9% vs 18.7%) and 1 ED visit (32.2% vs 28.4%), as well as a significantly higher mean number of total ED days per patient (0.9 vs 0.8) and total outpatient or other days per patient (35.0 vs 28.6) compared with controls having MDD. Privately insured patients with PTSD had a sig-

■ **Table 4.** Study Period Direct Healthcare Costs

Variable	Cost, Mean [Median] (SD), \$					
	Medicaid			Privately Insured		
	Patients With PTSD (n = 9114)	Control Subjects With MDD (n = 9114)	P	Patients With PTSD (n = 9720)	Control Subjects With MDD (n = 9720)	P
Total direct	18,753 [11,054] (25,312)	17,990 [10,157] (24,072)	.03	10,960 [5219] (22,593)	10,024 [4794] (20,147)	.003
Medical	13,183 [6019] (23,103)	12,646 [5254] (21,419)	.10	8537 [3368] (21,268)	7481 [2673] (18,839)	<.001
Inpatient	4294 [0] (16,201)	4129 [0] (13,421)	.44	2658 [0] (15,272)	2398 [0] (13,351)	.20
Emergency department	303 [44] (1048)	243 [27] (876)	<.001	426 [0] (1506)	334 [0] (1779)	<.001
Outpatient or other	8586 [4272] (14,240)	8275 [3596] (14,592)	.14	5453 [2860] (10,422)	4749 [2261] (9563)	<.001
Prescription drugs	5569 [3676] (6251)	5344 [3220] (6847)	.01	2422 [982] (4560)	2543 [1287] (4268)	.048
Mental health–related	3240 [1837] (3865)	2725 [1451] (3552)	<.001	1094 [260] (2072)	1104 [555] (1661)	.70
Cardiovascular drugs	270 [0] (814)	265 [0] (600)	.56	164 [0] (610)	201 [0] (739)	<.001
Antidiabetic drugs	116 [0] (514)	132 [0] (578)	.03	49 [0] (336)	56 [0] (363)	.15
Gastrointestinal drugs	215 [0] (721)	211 [0] (814)	.73	180 [0] (1119)	183 [0] (734)	.80
Other prescription drugs	1729 [639] (3626)	2011 [622] (4888)	<.001	935 [203] (3119)	998 [228] (3047)	.14
Mental health–related	11,395 [5157] (19,854)	9222 [3954] (16,501)	<.001	3489 [1490] (7739)	2893 [1392] (6151)	<.001
Medical	8156 [2197] (18,511)	6497 [1413] (15,158)	<.001	2396 [850] (6943)	1789 [531] (5647)	<.001
Inpatient	3169 [0] (12,434)	2527 [0] (9781)	<.001	838 [0] (5281)	680 [0] (4415)	.02
Emergency department	79 [0] (488)	50 [0] (227)	<.001	66 [0] (469)	42 [0] (323)	<.001
Outpatient or other	4907 [1456] (12,308)	3920 [850] (10,858)	<.001	1492 [796] (2691)	1067 [484] (2193)	<.001
Psychiatric or psychological treatment	2696 [581] (7116)	1407 [295] (3850)	<.001	1125 [658] (1551)	770 [396] (1162)	<.001
Other outpatient or other costs	2211 [250] (9673)	2513 [158] (10,137)	.03	368 [0] (1915)	297 [0] (1694)	.006
Prescription drugs	3240 [1837] (3865)	2725 [1451] (3552)	<.001	1094 [260] (2072)	1104 [555] (1661)	.70
Antidepressants	806 [487] (937)	789 [461] (926)	.18	452 [86] (730)	630 [368] (788)	<.001
Antipsychotics	1537 [185] (2637)	1231 [0] (2583)	<.001	271 [0] (1100)	182 [0] (856)	<.001
Anxiolytics	86 [0] (194)	79 [0] (185)	.008	34 [0] (172)	35 [0] (195)	.63
Anticonvulsants	708 [49] (1411)	535 [0] (1210)	<.001	266 [0] (867)	187 [0] (677)	<.001
Hypnotics or sedatives	103 [0] (294)	91 [0] (272)	.005	71 [0] (232)	70 [0] (233)	.96

MDD indicates major depressive disorder; PTSD, post-traumatic stress disorder.

nificantly lower proportion of mental health–related prescriptions, which was driven by a lower rate of antidepressant use.

For mental health–related resource use, patients having PTSD had a significantly higher rate and mean annual number of days with ED, outpatient or other, and psychiatric or psychological treatment visits, as well as a higher mean number of hospitalization days compared with controls having MDD. Patients diagnosed as having PTSD had a significantly higher proportion of prescriptions for antipsychotics (58.5% vs 48.9% for Medicaid and 18.6% vs 14.8% for privately insured) and anticonvulsants (57.1% vs 49.2% for Medicaid and 29.9% vs 26.2% for privately insured) compared with controls having MDD (Table 3). Medicaid patients with PTSD also had a significantly higher proportion of patients with at least

1 prescription for anxiolytics and hypnotics or sedatives. Privately insured patients with PTSD had a significantly lower proportion of patients with at least 1 prescription for antidepressants (62.5% vs 78.9%).

Unadjusted All-Cause and Mental Health–Related Costs

Annual total direct healthcare costs were \$18,753 per Medicaid patient with PTSD, 4.2% higher than for controls with MDD (\$17,990), while privately insured patients with PTSD had total healthcare costs that were 9.3% higher than those of controls with MDD (\$10,960 vs \$10,024; Table 4). The 3 largest cost components of all-cause total healthcare costs for patients with PTSD were outpatient or other services

■ **Table 5.** Study Period Risk-Adjusted Outcomes

Outcome	Medicaid			Privately Insured		
	Patients With PTSD (n = 9114)	Control Subjects With MDD (n = 9114)	P	Patients With PTSD (n = 9720)	Control Subjects With MDD (n = 9720)	P
All-cause hospitalization rate, % (SD)	40.9 (14.9)	41.5 (14.9)	.43	19.8 (6.8)	18.8 (6.6)	.08
Mental health–related hospitalization rate, % (SD)	30.6 (15.2)	30.7 (15.2)	.95	10.1 (3.8)	9.6 (3.6)	.23
Total direct costs, mean (SD), \$	19,407 (12,333)	17,960 (11,414)	<.001	11,287 (14,848)	10,442 (13,737)	<.001
Mental health–related costs, mean (SD), \$	11,272 (6737)	9372 (5602)	<.001	3425 (681)	2944 (586)	<.001

MDD indicates major depressive disorder; PTSD, post-traumatic stress disorder.

(45.8% for Medicaid and 49.8% for privately insured), inpatient services (22.9% for Medicaid and 24.3% for privately insured), and mental health–related prescription drugs (17.3% for Medicaid and 10.0% for privately insured).

Mental health–related medical and drug costs accounted for 60.8% of total direct costs among Medicaid patients with PTSD and for 31.8% of total direct costs among privately insured patients with PTSD. Annual mental health–related costs were 23.6% higher for Medicaid patients having PTSD (\$11,395 vs \$9222) and 20.6% higher for privately insured patients with PTSD (\$3489 vs \$2893) compared with controls having MDD (Table 4). Most components of mental health–related medical costs were significantly higher for patients having PTSD compared with controls having MDD. Mental health–related prescription drug costs were significantly higher for Medicaid patients having PTSD compared with controls having MDD but were not significantly different among privately insured patients. The mental health–related cost component with the largest absolute difference between patients with PTSD and controls with MDD was psychiatric or psychological treatment services (\$2696 vs \$1407 among Medicaid patients with PTSD vs controls and \$1125 vs \$770 among privately insured patients with PTSD vs controls).

Risk-Adjusted Costs and Hospitalization Rates

After adjusting for differences in baseline patient characteristics, annual total direct cost differences between patients with PTSD and controls with MDD remained statistically significant and were 8.1% higher in both populations (\$19,407 vs \$17,960 for Medicaid and \$11,287 vs \$10,442 for privately insured; Table 5). Annual risk-adjusted mental health–related costs were also significantly higher for patients having PTSD compared with controls having MDD (\$11,272 vs \$9372 for Medicaid and \$3425 vs \$2944 for privately insured). The risk-adjusted outcomes for all-cause and mental health–related hospitalization rates were not significantly different between the 2 groups.

DISCUSSION

While previous research on the cost outcomes of PTSD has focused largely on the Veterans Affairs population, the results of this study suggest that PTSD is associated with substantial healthcare costs among the privately insured and Medicaid populations in the United States. Annual healthcare costs per patient were on average \$18,753 among Medicaid patients with PTSD and \$10,960 among privately insured patients with PTSD. Medicaid patients diagnosed as having PTSD had on average \$763 (4.2%) higher annual healthcare costs, while privately insured patients had \$936 (9.3%) higher annual healthcare costs compared with controls having MDD, which is a costly condition. Differences in cost between patients with PTSD and controls with MDD can largely be attributed to higher mental health–related costs for patients with PTSD (\$2173 higher annual mental health–related costs among Medicaid patients and \$596 higher among privately insured patients). The total annual healthcare cost differences remain significant even after controlling for differences in available baseline comorbidity and demographic characteristics to the extent possible with claims data, while recognizing that clinical markers of severity were unavailable.

Consistent with the literature, a high proportion of patients with PTSD in this study were women, and other mental health comorbidities were common among both the PTSD and MDD cohorts.^{3,4,8,9} Patients with PTSD had significantly higher baseline mental health and chronic pain comorbidity burden compared with controls with MDD. On the other hand, the mean CCI was 20.3% lower for patients having PTSD compared with controls with MDD among Medicaid patients (0.55 vs 0.69, *P* <.001) and was not significantly different among privately insured patients. The higher rates of mental health comorbidities without higher mean CCIs among patients with PTSD add to the evidence that mental health–related costs are the primary driver of the difference in costs between patients with PTSD and controls with MDD.

Patients having PTSD had higher all-cause ED and outpatient resource use compared with controls having MDD, driven by higher mental health–related resource use by patients with PTSD. Patients with PTSD had 37.7% to 43.4% more total calendar days of psychiatric or psychological treatment than controls with MDD. The increased days of psychiatric or psychological treatment among patients with PTSD may be due to differences in recommended treatment between PTSD and MDD. Psychotherapy is usually the recommended first-line treatment for PTSD, while medication is often a preferred treatment in moderate-to-severe MDD.^{9,27} The proportion of patients with at least 1 all-cause or mental health–related hospitalization was not significantly different between patients with PTSD and controls with MDD, except for the significantly higher rate of all-cause inpatient visits among privately insured patients having PTSD compared with controls having MDD (19.9% vs 18.7%). However, there was a tendency for more calendar days with mental health–related hospitalization among patients with PTSD.

The substantial healthcare costs among patients with PTSD were likely driven not only by the high use of medical services associated with PTSD but also by the psychiatric and non–mental health comorbidity burden. Previous research suggested that PTSD may cause secondary mental health disorders, and that PTSD is a predictor of poor health.^{8,10} Further research is needed to understand the effect of PTSD psychotherapy and medication treatment on costs and on comorbidity burden.

Limitations that are associated with the use of claims data and the absence of clinical measures apply herein. To identify patients with PTSD and controls with MDD, the research relied on the accuracy of diagnosis coding in claims data and was limited to the period of claims data availability. Information was also unavailable about the time from first PTSD diagnosis or about clinical measures, such as intensity and frequency of PTSD symptoms, as well as MDD severity. The study sample may not be generalizable to the overall population of patients with PTSD or MDD. The sample was limited to Medicaid and privately insured beneficiaries, aged 18 to 64 years, with 2 diagnoses of PTSD or MDD. Controls with MDD were matched to patients with PTSD on demographic characteristics; therefore, the sample of controls with MDD may not be representative of the overall MDD population. Moreover, it was impossible to match patients with PTSD and controls with MDD based on race/ethnicity in the employer data. In addition, risk-adjusted estimates may not account for unobservable differences between patients with PTSD and controls with MDD. For example, data on socioeconomic status were unavailable.

To ensure that patients with PTSD and MDD were included in the study, the sample selection required patients to have

at least 2 PTSD or MDD diagnoses, and the index date for the study period was based on a PTSD or an MDD diagnosis that was not the first PTSD or MDD diagnosis observed in the claims history. Patients with at least 2 PTSD or MDD diagnoses may be sicker than patients who have PTSD or MDD but have only 1 diagnosis or who do not seek medical care. Moreover, costs may be higher following a PTSD or an MDD diagnosis. Requiring 2 diagnoses may cause annual healthcare costs among patients with PTSD or MDD to be higher than costs reported in other studies. In addition, this may have contributed to the low rate of PTSD or MDD found in the claims data compared with the incidence and prevalence rates reported in the epidemiological survey data.

In conclusion, PTSD is costly to payers even outside the Veterans Affairs system, including Medicaid and private insurance. Post-traumatic stress disorder is associated with a higher direct economic burden per patient relative to MDD, which is a costly condition. The excess costs of patients having PTSD compared with demographically matched controls having MDD can be primarily attributed to mental health–related resource use, namely, psychological or psychiatric treatment services.

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