Supplementary Appendix

Appendix Table 1. ICD-9 diagnostic codes used to identify medical and mental health conditions.

Conditions	ICD-9 Codes
Circulatory	
Hypertension	36211; 4372; 401; 402; 403; 404; 405; 642
Ischemic Heart Disease	410; 411; 412; 413; 414
Congestive Heart Failure	39891; 40201; 40211; 40291; 40401; 40403; 40411; 40413; 40491; 40493; 428
Peripheral Vascular Disease	441; 443
Stroke	430; 431; 432; 43301; 43311; 43321; 43331; 43381; 43391; 434; 435; 436; 437 (except 4372); 438
Endocrine	
Diabetes	249; 250; 648; 3620; 3572; 36641; v4585; v5391
Thyroid Disorder	240; 246; 7945
Musculoskeletal	
Lower Back Pain	72142; 72293; 72402; 7242; 7243; 73720; 73721; 73722; 73729; 73742; 7393; 8472; 7201; 7202; 7246; 7394; 8461; 8462; 8463; 8468; 8469; 8473; 72470; 72471; 72479; 8474; 72251; 7244; 7245; 7213; 72210; 72232; 72252; 72273; 72283; 75611; 75612; 8460
Arthritis	711; 712; 713; 714; 715; 716
Osteoporosis	7330
Genitourinary	
Chronic Renal Failure	584; 585; 586; E8791; V451; V560; V561; V568
Benign Prostatic Hyperplasia	600
Urinary Incontinence	3076; 5951; 6256; 7881; 7882; 7883; 7884; 7886; 7889
Cancer	14; 15; 16; 18; 20 ;170; 171; 172; 173; 174; 175; 176; 179; 190; 191; 192; 193; 194; 195; 196; 197; 198; 199; 230; 231; 232; 233; 234
Respiratory	
Chronic Obstructive Pulm Disease	4912; 4932; 491; 492; 494; 496
Asthma	493
Nervous System/Sense Organs	
Parkinson's Disease	332; 3330; 9482
Multiple Sclerosis	340
Vision Problem	367; 368; 369; V410
Hearing Problem	38801; 38802; 3881; 3885; 389; V412; V413; V532; V721
Gastrointestinal	
Acid Related Disorders	531; 532; 533; 534; 5301; 5302; 5350; 53081; 5368
Infectious Diseases	
Hepatitis C	07041; 07044; 07051; 07054; 0707
HIV/AIDS	043; 044; 07953; 79571; V08
Spinal Cord Injury	
Spinal Cord Injury	806; 9520; 9521; 9522; 9523; 9524; 9528; 9529; 3441; 9072; 3440
Mental Health and Dementia	
Depression	311; 29682; 2962; 2963; 2969; 3004
Post-Traumatic Stress Disorder	30981
Bipolar Disorder/Manic Depression	2960; 2961; 2964; 2965; 2966; 2967; 29680; 29681; 29689
Alcohol or Drug Dependence or Abuse	30500; 30501; 30502; 30390; 30391; 30392; 291; 30300; 30301; 30302; 292; 30580; 30581; 30582; 30590; 30591; 30592; 30460; 30461; 30462; 30480; 30481; 30482; 30490; 30491; 30492
Schizophrenia	295
Other Psychosis	297; 298
Alzheimer's Disease	3310

Appendix Table 2. Association between mutually exclusive mental health condition groupings and proportion of costs generated by mental health care.

The table below depicts a multivariate linear regression model in which we explored the association between mutually exclusive groups of mental health conditions and the proportion of costs generated by mental health care. In descending order, the strongest association is seen for condition groups that include serious mental illness (SMI), substance use disorder (SUD), post-traumatic stress disorder (PTSD), and then depression.

Characteristics	Coefficient	95% CI
Mental health groups*		
All 4 conditions	.47	.45–.48
SMI + SUD + PTSD	.44	.42–.45
SMI+ SUD + depression	.42	.41–.44
SMI + PTSD + depression	.37	.35–.39
SUD + PTSD + depression	.42	.40–.43
SMI + SUD	.42	.40–.43
SMI + PTSD	.29	.27–.31
SMI + depression	.29	.28–.31
SUD + PTSD	.32	.30–.34
SUD + depression	.31	.29–.33
PTSD + depression	.20	.19–.22
SMI alone	.31	.30–.33
SUD alone	.16	.14–.18
PTSD alone	.11	.10–.12
Depression alone	.07	.06–.07
Age	.00	.00–.00
Male	.00	-.01–.00
Race/ethnicity*		
Black, non-Hispanic	.02	.01–.02
Hispanic	.00	-.01–.01
Other	.02	.00–.03
Unknown	-.03	-.04– -.02
Marital status*		
Single	.03	.03–.04
Separated/divorced/widowed	.01	.00–.01
Insurance status*		
Major medical/HMO/PPO/Champus/Indem	.02	.01–.02
Medicare/Medicaid supplemental	.02	.01–.02
All other	.00	-.01–.01
Homeless	.23	.21–.24

*Comparison group is "No mental health condition" for Mental health groups; "White, non-Hispanic" for Race/ethnicity; "Married" for Marital status; and "No insurance" for Insurance status. The regression also adjusted for the 27 chronic medical conditions listed in Table 2 and the footnote to Table 2.

Appendix Table 3. Baseline demographic characteristics of alternative groupings of mutually exclusive diagnoses

Characteristics	SMI + any comorbid conditions		SUD + PTSD and/or depression		PTSD + depression		SMI alone		SUD alone		PTSD alone		Depression alone		P*
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
Total number of patients	21,295	8.1	26,614	10.2	13,089	5.01	11,824	4.5	13,156	5.0	10,736	4.1	27,665	10.6	—
Age, (M±SD)	53.8±11.4		52.9±12.5		58.8±10.7		61.4±12.0		57.5±9.3		62.6±11.8		63.5±12.4		< .001
Male	19,080	89.6	25,291	95	11,576	88.4	10,910	92.3	12,966	98.6	10,407	96.9	25,323	91.5	< .001
Race/ ethnicity															< .001
White, non-Hispanic	13,133	61.7	15,719	59.1	9,432	72.1	8,082	68.4	7,138	54.3	7,574	70.5	21,121	76.3	—
Black, non-Hispanic	6,246	29.3	8,406	31.6	2,140	16.3	2,794	23.6	4,840	36.8	2,004	18.7	4,002	14.5	—
Hispanic	1,294	6.1	1,428	5.4	953	7.3	638	5.4	613	4.7	710	6.6	1,650	6	—
Other	348	1.6	475	1.8	317	2.4	176	1.5	177	1.35	251	2.3	361	1.3	—
Unknown	274	1.3	586	2.2	247	1.9	134	1.1	388	2.9	197	1.8	531	1.9	—
Marital status															< .001
Single	5,677	26.7	5,736	21.6	1,222	9.3	4,295	36.3	2,931	22.3	859	8	2,985	10.8	—
Married	4,750	22.3	5,720	21.5	7,226	55.2	2,770	23.4	2,428	18.5	6,423	59.8	12,619	45.6	—
Separated/ divorced/ widowed	10,868	51	15,158	56.9	4,641	35.5	4,759	40.3	7,797	59.3	3,454	32.2	12,061	43.6	—
Insurance															< .001
None	12,799	60.1	19,803	74.4	6,247	47.7	5,346	45.2	9,792	74.4	4,812	44.8	11,433	41.3	—
Major medical/ HMO/ PPO/ Champus/ Indem	1,156	5.4	1,650	6.2	1,604	12.2	583	4.9	559	4.2	1,165	10.8	2,383	8.6	—
Medicare/ Medicaid supplemental	6,688	31.4	4,343	16.3	4,856	37.1	5,649	47.8	2,481	18.9	4,525	42.2	13,151	47.5	—
All other	652	3.1	818	3.1	382	2.9	246	2.1	324	2.5	234	2.2	698	2.5	—
Homeless	9,103	42.7	13,514	50.8	1,165	8.9	1,583	13.4	4,950	37.6	562	5.2	2,095	7.6	< .001

*P-values are for ANOVA and χ2 tests analyzing differences between patients in each of the five diagnostic groups.

Appendix Table 4. Predicted inpatient and outpatient utilization for alternative groupings of mutually exclusive diagnoses

Utilization categories	SMI + any comorbid conditions	SUD + PTSD and/or Dep	PTSD + Dep	SMI alone	SUD alone	PTSD alone	Depression alone
Inpatient utilization							
Number of stays	2.5*	2.5*	1.6	1.8*	2.1*	1.5*	1.8*
Cumulative LOS behavioral	14.0*	9.4*	4.5*	14.0*	2.2	2.8*	2.5*
Cumulative LOS residential/ domiciliary	7.9*	20.2*	5.0	2.0*	17.9*	5.3	4.7
Cumulative LOS medical/ surgical	6.2*	7.1*	6.5*	6.5*	10.0*	6.8*	8.8
Cumulative LOS long term care	15.7*	12.0	15.1*	34.8*	9.9*	17.4*	14.4*
Outpatient utilization							
Mental health visits	43.0*	40.8*	22.9*	29.8*	21.1*	14.1*	9.5*
ER visits	2.9*	2.6*	1.9	2.1*	2.3*	1.6*	2.1*
Primary care visits	6.5*	6.5*	6.8*	5.5*	5.7*	6.1*	6.5*
Subspecialty visits	3.4*	3.6*	5.1*	3.4*	3.9*	5.3*	5.1*

*Values are statistically significant (p<.001), using "No mental health condition" as the comparison group.

Appendix Table 5. Percent of costs generated by mental health care for alternative groupings of mutually exclusive diagnoses

Cost categories	SMI + any comorbid conditions $ or %	SUD + PTSD and/or Dep $ or %	PTSD + Dep $ or %	SMI alone $ or %	SUD alone $ or %	PTSD alone $ or %	Depression alone $ or %
Inpatient costs							
Behavioral	$16,471*	$10,041*	$5,529*	$17,146*	$1,699	$3,328*	$3,011*
Residential/ domicilliary	$2,960*	$7,526*	$1,894	$736*	$6,693*	$1,997	$1,742
Medical/ surgical	$17,175*	$19,413*	$19,782*	$18,946*	$29,207	$21,814*	$26,622*
Long term care	$5,623	$5,079*	$6,160	$8,675	$5,199*	$6,631	$7,200
Other	$986*	$1,112*	$1,626*	$1,546*	$1,701*	$2,502*	$2,878*
Outpatient costs							
Behavioral	$11,277*	$7,779*	$5,870*	$10,811	$3,552*	$3,323*	$2,704*
Medical/ surgical	$8,089*	$8,379*	$10,165*	$7,787*	$9,274*	$11,126*	$11,399*
Diagnostic	$2,838	$3,202*	$2,953	$2,315*	$3,158*	$2,903	$2,942*
Pharmacy	$4,134*	$5,093*	$3,049	$4,478	$2,814*	$4,709	$5,203
Other	$1,529	$1,660	$2,089	$1,753	$1,342	$2,428*	$1,956
Mental health costs	$30,708	$25,346	$13,294	$28,693	$11,944	$8,649	$7,457
Total costs	$71,081	$69,284	$59,117	$74,191	$64,637	$60,764	$65,658
Percent of costs generated by mental health care (%)	43%	37%	22%	39%	18%	14%	11%

*Values are statistically significant (p<.001), using "No mental health condition" as the comparison group.