

Supplementary Online Content

Figueroa JF, Phelan J, Orav EJ, Patel V, Jha AK. Association of mental health disorders with health care spending in the Medicare population. *JAMA Netw Open*. 2020;3(3):e201210. doi:10.1001/jamanetworkopen.2020.1210

eTable 1. Study Sample of Medicare Beneficiaries

eTable 2. Types of Claims Classified as Mental Health Services

eTable 3. Mean Spending per Medicare Beneficiary With Mental Health Disorders, Unadjusted Results

eTable 4. Increased Medical Spending Associated With the Presence of Mental Health Disorders

eTable 5. Mean Spending per Medicare Beneficiary in 2011 and 2015 With and Without Decedents

eTable 6. Differences in Risk-Adjusted Spending in Patients with Serious Mental Illness (Excluding Depression), Major Depression, Other Common Mental Health Disorders, and With No Mental Illness

eTable 7. Additional Sensitivity Analyses With Different Inclusion and Exclusion Criteria for Decedents, New Entrants, and Dual-Eligible Beneficiaries

eTable 8. Log Gamma Distribution Model

eFigure 1. Risk-Adjusted Spending Associated With Medical Conditions in Patients With and Without Mental Health Disorders

eFigure 2. Differences in Risk-Adjusted Spending Associated With Mental Health Services in Patients With and Without Mental Health Disorders

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Study Sample of Medicare Beneficiaries

Medicare Sample	Serious Mental Illness	Other Common Mental Health Disorders	No Known Mental Illness
Total no. of beneficiaries with Part D	1,073,716	346,098	3,160,789
Excluding decedents	987,379	326,991	3,044,587
Excluding new entrants and decedents	973,910	320,335	2,931,786
Excluding decedents and dual-eligible patients	552,441	229,264	2,412,153

eTable 2. Types of Claims Classified as Mental Health Services

<p>Inpatient File</p>	<p>All admissions to acute care hospitals and critical access hospitals with a primary diagnosis for a mental health disorder or substance abuse disorder: ICD 9 codes of 239-319 and ICD 10 codes F00-F99 (starting October 2015)</p> <p>All admissions with a primary diagnosis of intentional self-harm (E950-952 and X60-X84)</p> <p>All admissions regardless of primary diagnosis to psychiatric hospitals.</p>
<p>Outpatient File, Skilled Nursing Facility File, Home Health File, Durable Medical Equipment File, and Hospice File</p>	<p>All claims in these files with the primary diagnosis of a mental health disorder or substance abuse disorder (same diagnosis codes as above)</p> <p>All claims in these files with the primary diagnosis of intentional self-harm (same diagnosis codes as above)</p>
<p>Claims from Mental Health Providers in Carrier and Outpatient File</p>	<p>All claims from providers with the following NPI specialty codes: psychiatry (26) , general psychiatry (27), clinical psychologist (78), and neuropsychiatry (86)</p>
<p>Procedures/tests in Outpatient and Carrier File</p>	<p>All billing codes related to psychiatric diagnostic evaluations, psychotherapy, psychological testing, and electroconvulsive therapy.</p> <p>CPT codes include: 90791, 90792, 90832, 90833, 90834, 90836, 90837, 90838, 90839, 90846, 90847, 90849, 90853, 90870, 96101, 96118.</p>
<p>Drugs in Part D File</p>	<p>All drugs in the following pharmacologic classes were defined as mental health drugs: antipsychotics, anti-anxiety medications, anti-depressants, barbiturates, mood stabilizers, and stimulants.</p>

We used a similar approach for defining claims as mental health claims as has been previously done by SAMHSA. For the inpatient file, we categorized all admissions for a primary diagnosis of a mental health disorder or intentional self-harm as a mental health claim. All admissions, regardless of primary diagnosis, to psychiatric hospitals were also included as mental health claims. We also categorized each claim in the outpatient file, skilled nursing facility file, home health service file, and hospice file as a mental health claim if the primary diagnosis was for a mental health disorder or intentional self-harm. Next, we categorized all claims as mental health related if filed by provider with a NPI specialty code of psychiatry, general psychiatry, clinical psychologist, and neuropsychiatry. We also categorized the following set of billing codes as mental health claims: psychiatric diagnostic evaluations, psychotherapy, psychological testing, and electroconvulsive therapy as mental health claims.

eTable 3. Mean Spending per Medicare Beneficiary With Mental Health Disorders, Unadjusted Results

	Serious Mental Illness N=3,044,587	Other Common Mental Health Disorders N=326,991	No Known Mental Illness N=987,379
Total Spending	\$26,122	\$17,628	\$10,763
Mental Health	\$2,369	\$386	\$72
Medical Health	\$23,752	\$17,242	\$10,690
Inpatient Spending	\$5,735	\$3,486	\$1,565
Mental Health	\$524	\$13	\$1
Medical Health	\$5,210	\$3,473	\$1,564
Outpatient Spending	\$3,901	\$3,122	\$2,070
Mental Health	\$269	\$34	\$5
Medical	\$3,632	\$3,088	\$2,065
Physician Services	\$2,361	\$1,684	\$1,004
Mental Health	\$404	\$93	\$7
Medical	\$1,957	\$1,591	\$997
Tests/Procedures	\$1,940	\$1,897	\$1,388
Mental Health	\$30	\$10	\$2
Medical	\$1,911	\$1,887	\$1,386
Skilled Nursing Facility	\$2,800	\$1,028	\$394
Mental Health	\$77	\$9	\$2
Medical	\$2,723	\$1,019	\$391
Home Health Services	\$1,165	\$636	\$300
Mental Health	\$35	\$5	\$1
Medical	\$1,130	\$631	\$298
Hospice	\$427	\$269	\$128
Mental Health	\$1	\$0	\$0
Medical	\$427	\$269	\$128
Drugs (Part D)	\$6,162	\$4,177	\$2,965
Mental Health	\$996	\$217	\$53
Medical	\$5,166	\$3,960	\$2,913

eTable 4. Increased Medical Spending Associated With the Presence of Mental Health Disorders

Medicare Beneficiaries	No. of Patients	Mean total spending	Total Spending	Total Medical Spending	Total Mental Health Spending	Excess Medical Spending	Total Spending Related to Mental Health
Serious Mental Illness	987,379	\$19,676	\$19,427,669,204	\$17,428,226,729	\$1,998,553,834	\$4,707,823,072	\$6,706,376,906
Other Common Mental Health Disorders	326,991	\$15,596	\$5,099,751,636	\$4,987,593,723	\$112,278,900	\$774,968,670	\$887,247,570
No Known Mental Illness	3,044,587	\$13,072	\$39,798,841,264	\$39,223,414,321	\$575,183,376	0	\$575,183,376
All Beneficiaries	4,358,957	\$48,344	\$64,326,262,104	\$61,639,234,773	\$2,686,016,110	\$5,482,791,742	\$8,168,807,852
				% of Total:	4.2%	8.5%	12.7%

eTable 5. Mean Spending per Medicare Beneficiary in 2011 and 2015 With and Without Decedents

	2011		2015	
	Excluding Decedents	Including Decedents	Excluding Decedents	Including Decedents
Total Spending	\$14,564	\$15,780	\$14,757	\$15,873
Mental Health	\$950	\$965	\$616	\$620
Substance Abuse	\$31	\$31	\$0	\$0
Medical Health	\$13,583	\$14,785	\$14,140	\$15,253
Inpatient Spending	\$3,141	\$3,850	\$2,654	\$3,274
Mental Health	\$207	\$209	\$121	\$127
Substance Abuse	\$19	\$19	\$0	\$0
Medical Health	\$2,915	\$3,622	\$2,533	\$3,147
Outpatient Spending	\$2,235	\$2,263	\$2,564	\$2,605
Mental Health	\$77	\$76	\$67	\$67
Substance Abuse	\$4	\$4	\$0	\$0
Medical	\$2,153	\$2,183	\$2,497	\$2,538
Physician Services & Tests	\$3,563	\$3,706	\$3,658	\$3,783
Mental Health	\$126	\$126	\$120	\$121
Substance Abuse	\$7	\$7	\$0	\$0
Medical	\$3,430	\$3,573	\$3,537	\$3,662
Skilled Nursing Facility	\$1,112	\$1,308	\$986	\$1,166
Mental Health	\$28	\$33	\$20	\$23
Substance Abuse	\$1	\$1	\$0	\$0
Medical	\$1,083	\$1,274	\$967	\$1,143
Home Health Services	\$620	\$653	\$521	\$554
Mental Health	\$12	\$12	\$9	\$10
Substance Abuse	\$0	\$0	\$0	\$0
Medical	\$608	\$641	\$512	\$544
Hospice	\$204	\$357	\$207	\$374
Mental Health	\$36	\$55	\$0	\$0
Substance Abuse	\$0	\$0	\$0	\$0
Medical	\$168	\$302	\$206	\$374
Drugs (Part D)	\$3,288	\$3,235	\$3,780	\$3,724
Mental Health	\$463	\$452	\$279	\$271
Medical	\$2,825	\$2,783	\$3,502	\$3,454

eTable 6. Differences in Risk-Adjusted Spending in Patients with Serious Mental Illness (Excluding Depression), Major Depression, Other Common Mental Health Disorders, and With No Mental Illness

	Serious Mental Illness Redefined as Schizophrenia/Related Psychotic Diseases or Bipolar Disorder	Major Depression	Other Common Mental Health Disorders	No Known Mental Illness
Total Spending	\$22,025	\$18,535	\$15,597	\$13,042
Mental Health	\$4,628	\$760	\$345	\$155
Medical Health	\$17,397	\$17,775	\$15,252	\$12,886
Inpatient Spending	\$4,966	\$3,404	\$2,861	\$2,209
Mental Health	\$1,265	\$15	-\$2	\$25
Medical Health	\$3,701	\$3,388	\$2,863	\$2,184
Outpatient Spending	\$2,814	\$3,030	\$2,820	\$2,410
Mental Health	\$531	\$89	\$31	\$13
Medical	\$2,282	\$2,941	\$2,788	\$2,397
Physician Services	\$2,303	\$1,731	\$1,509	\$1,161
Mental Health	\$647	\$229	\$89	\$16
Medical	\$1,656	\$1,501	\$1,420	\$1,145
Tests/Procedures	\$1,518	\$1,790	\$1,731	\$1,486
Mental Health	\$42	\$18	\$10	\$3
Medical	\$1,477	\$1,772	\$1,721	\$1,483
Skilled Nursing Facility	\$2,765	\$1,410	\$822	\$712
Mental Health	\$138	\$9	\$6	\$10
Medical	\$2,626	\$1,401	\$816	\$702
Home Health Services	\$782	\$847	\$533	\$422
Mental Health	\$52	\$16	\$4	\$4
Medical	\$731	\$831	\$530	\$418
Hospice	\$366	\$291	\$285	\$162
Mental Health	\$1	\$0	\$0	\$0
Medical	\$365	\$291	\$285	\$162
Drugs (Part D)	\$5,328	\$4,716	\$3,865	\$3,398
Mental Health	\$1,882	\$378	\$202	\$82
Medical	\$3,445	\$4,338	\$3,663	\$3,316

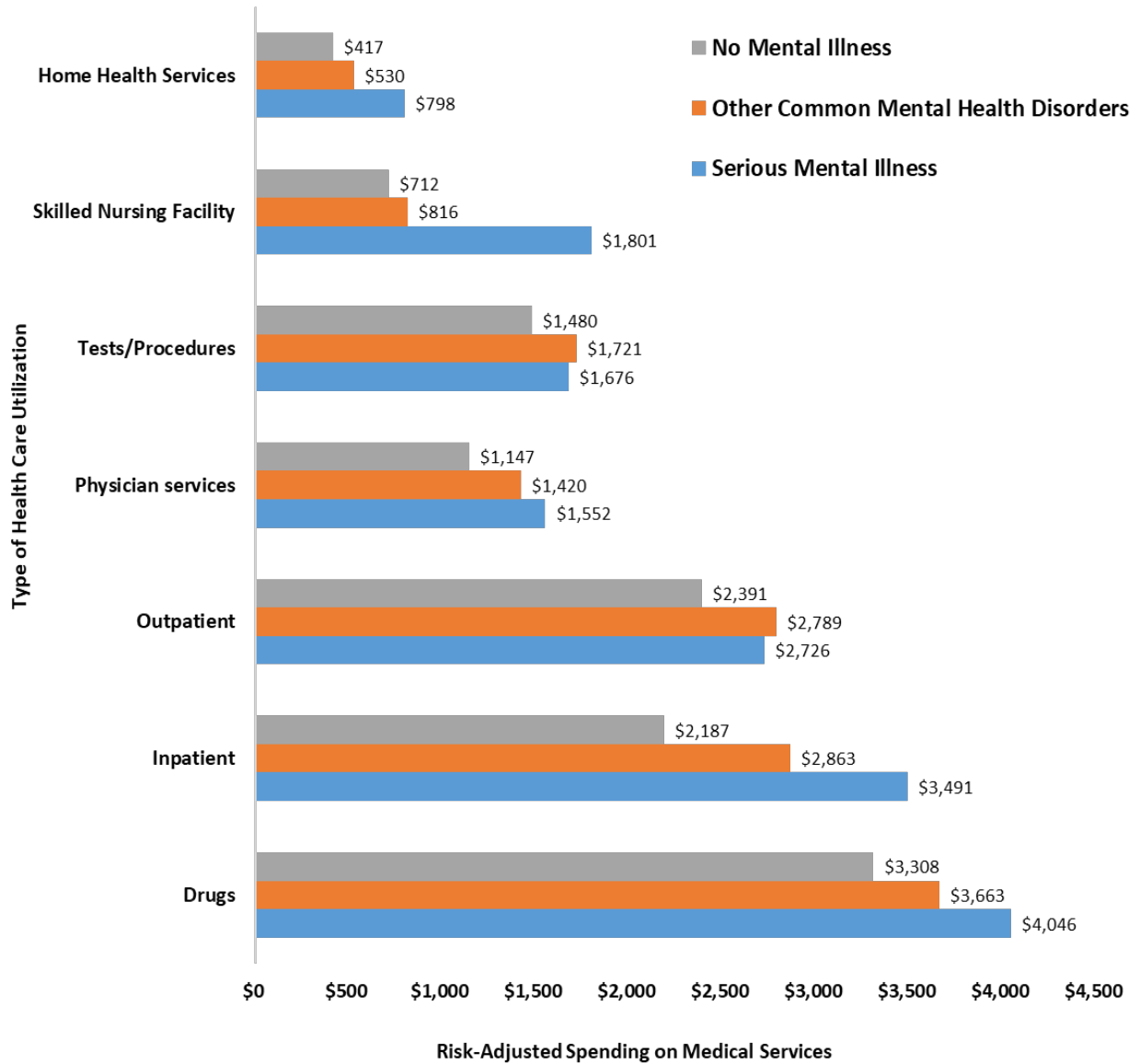
eTable 7. Additional Sensitivity Analyses With Different Inclusion and Exclusion Criteria for Decedents, New Entrants, and Dual-Eligible Beneficiaries

	No Known Mental Illness	Other Common Mental Health Disorders	Serious Mental Illness	Difference: Other Common Mental Disorders vs. No Known Mental Illness	Difference: Serious Mental Illness vs. No Known Mental Illness
Original analyses (excludes decedents; allows new entrants)					
Mean Total Spending	\$13,072	\$15,596	\$19,675	\$2,524 [\$2,444 to \$2,604]	\$6,603 [\$6,548 to \$6,659]
Mental Health	\$189	\$343	\$2,024	\$154 [\$141 to \$167]	\$1,835 [\$1,826 to \$1,844]
Medical Health	\$12,883	\$15,253	\$17,651	\$2,369 [\$2,290 to \$2,449]	\$4,768 [\$4,713 to \$4,823]
Using 2-years of data to classify people with mental illness					
Mean Total Spending	\$13,145	\$14,912	\$18,374	\$1,767 [\$1,691 to \$1,843]	\$5,230 [\$5,177 to \$5,282]
Mental Health	\$200	\$281	\$1,666	\$82 [\$69 to \$94]	\$1,466 [\$1,457 to \$1,474]
Medical Health	\$12,945	\$14,630	\$16,708	\$1,686 [\$1,610 to \$1,761]	\$3,764 [\$3,712 to \$3,815]
Analyses excluding decedents and no new entrants					
Mean Total Spending	\$14,157	\$16,068	\$19,490	\$1,912 [\$1,834 to \$1,989]	\$5,333 [\$5,280 to \$5,386]
Mental Health	\$200	\$283	\$1,617	\$82 [\$70 to \$95]	\$1,417 [\$1,408 to \$1,425]
Medical Health	\$13,956	\$15,786	\$17,872	\$1,829 [\$1,752 to \$1,906]	\$3,916 [\$3,863 to \$3,968]
Analyses including both decedents and new entrants					
Mean Total Spending	\$14,447	\$16,355	\$19,775	\$1,907 [\$1,828 to \$1,987]	\$5,328 [\$5,274 to \$5,382]
Mental Health	\$206	\$286	\$1,627	\$80 [\$67 to \$92]	\$1,421 [\$1,412 to \$1,429]
Medical Health	\$14,241	\$16,069	\$18,148	\$1,828 [\$1,749 to \$1,906]	\$3,908 [\$3,854 to \$3,961]
Analyses excluding dual-eligible patients					
Mean Total Spending	\$11,774	\$13,644	\$16,905	\$1,871 [\$1,790 to \$1,951]	\$5,131 [\$5,073 to \$5,189]
Mental Health	\$86	\$193	\$986	\$107 [\$98 to \$116]	\$900 [\$893 to \$906]
Medical Health	\$11,688	\$13,451	\$15,919	\$1,763 [\$1,684 to \$1,843]	\$4,231 [\$4,174 to \$4,289]

eTable 8. Log Gamma Distribution Model

	Difference between those with other common mental health disorders vs. those with no known mental illness			Difference between people with SMI vs. those with no known mental illness		
	Model parameter: People with common mental health disorders vs. those with no known mental illness	% relative difference	p-value	Model Parameter: People with SMI vs. those with no known mental illness	% relative difference	p-value
Mean Total Spending	0.23	26.7%	<0.001	0.42	52.3%	<0.001
Mental Health	1.59	390.4%	<0.001	2.98	1871.3%	<0.001
Medical Health	0.31	24.5%	<0.001	0.31	36.6%	<0.001

eFigure 1. Risk-Adjusted Spending Associated With Medical Conditions in Patients With and Without Mental Health Disorders



eFigure 2. Differences in Risk-Adjusted Spending Associated With Mental Health Services in Patients With and Without Mental Health Disorders

