Research Article

Determinants of and Trends in Total and Condition Specific Health Care Spending Per Privately Insured Adult

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INTRODUCTION

This paper examines the key factors associated with the level and changes in total spending per privately insured person 18-64 over the past decade. The analysis updates and expands upon previous work examining trends in chronic disease prevalence and spending [1-2]. We also examine changes in out of pocket spending over time. This will include estimating the difference in out of pocket spending by race, gender, ethnicity as well as the mix of medical conditions under treatment. Nearly 160 million Americans are covered through employer sponsored insurance and just less than 35 million through individual/non group plans [3]. Understanding trends in private insurance spending and the underlying factors associated with these trends provides important insights into the health care system overall. The analysis will highlight key medical conditions that policymakers could target to reduce the level and growth in health care spending.

The analysis starts by looking at trends in total per capita spending, total private insurance spending and out of pocket payments from 2010 through 2020. Then the analysis focuses on spending among patients with the most expensive medical conditions. This includes:

- Trauma

- Cancer

- Mental health disorders

- COPD/Asthma

- Heart Failure and Heart Disease

In addition, we examine the impact of multiple chronic conditions on the level and growth in private insurance spending over time.

treated conditions used in our analysis: diabetes, hypertension, hyperlipidemia, mental health disorders, cancer, trauma, heart disease, rheumatoid arthritis, asthma, chronic kidney disease (CKD), and chronic obstructive pulmonary disease (COPD). The regression models focused on the top five conditions, heart disease, cancer, mental disorders, trauma and COPD/asthma. MEPS respondents self-reported medical conditions that were then professionally coded into ICD-9-CM diagnosis codes for years 2010 to 2015 and ICD-10-CM codes for 2016 to 2020. Clinical classification software was then used to collapse the ICD-9-CM codes into mutually exclusive clinical classification categories (CCC) for 2010 to 2015 and refined clinical classification software was used to collapse the ICD-10-CM into mutually exclusive refined clinical classification categories (CCR) for 2018-2020. We defined each of the eleven conditions based on CCC (2010-2015), ICD-10-CM (2016-2017), and CCR (2018-2020) codes with one or more associated inpatient, outpatient, office-based, emergency department (ED), home health, or prescription medication health care event [Appendix A].

Condition specific total spending included all spending on health care events that occurred during a given calendar year and were directly related to treating the condition. More specifically, we summed inpatient, outpatient, ED, office-based, home health, and prescription drug expenditures. When the health care event was associated with multiple conditions, the expenditures for that event were split evenly across the conditions.

Our analyses were limited to adults with 12 months of private insurance, ages 18 to 64 years old. Any respondent with a missing survey weight or missing values in any of the model covariates were excluded resulting in an analytic sample of 92,792.

DISCUSSION

We used generalized linear model (GLM) with gamma distribution and log-link function to predict three types of annual

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Appendix A

Condition	2010 – 2015 Clinical Classifications Software Codes	2016 – 2017 ICD-10-CM Codes	2018 – 2020 Clinical Classifications Software Refined Codes
Diabetes	049 050	E08 E09 E10 E11 E13	END002 END003 END004 END005 END006
Hypertension	098 099	I10 I11 I12 I13 I15 I16	CIR007 CIR008
Hyperlipidemia	053	E78	END010
Mental Health	650 651 652 653 654 655 656 657 658 659 660 661 662 663	F06 F07 F09 F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 F20 F21 F22 F23 F24 F25 F28 F29 F30 F31 F32 F33 F34 F39 F40 F41 F42 F43 F44 F45 F48 F50 F52 F53 F54 F55 F59 F60 F63 F64 F65 F66 F68 F69 F70 F71 F72 F73 F78 F79 F80 F81 F82 F84 F88 F89 F90 F91 F93 F94 F95 F98 F99 K70 T36 T37 T38 T39 T40 T41 T42 T43 T44 T45 T46 T47 T48 T49 T50 T51 T52 T53 T54 T55 T56 T57 T58 T59 T60 T61 T62 T63 T64 T65 T71 X71 X72 X73 X74 X75 X76 X77 X78 X79 X80 X81 X82 X83	MBD001 MBD002 MBD003 MBD004 MBD005 MBD006 MBD007 MBD008 MBD009 MBD010 MBD011 MBD012 MBD013 MBD014 MBD017 MBD018 MBD019 MBD020 MBD021 MBD022 MBD023 MBD024 MBD025 MBD026 MBD027 MBD028 MBD029 MBD030 MBD031 MBD032 MBD033 MBD034
Cancer	011 012 013 014 015 016 017 018 019 020 021 022 023 024 025 026 027 028 029 030 031 032 033 034 035 036 037 038 039 040 041 042 043 044 045	*First 2 characters*: C0 C1 C2 C3 C4 C5 C6 C7 C8 C9 DO	NEO001 NEO002 NEO003 NEO004 NEO005 NEO006 NEO007 NEO008 NEO009 NEO010 NEO011 NEO012 NEO013 NEO014 NEO015 NEO016 NEO017 NEO018 NEO019 NEO020 NEO021 NEO022 NEO023 NEO024 NEO025 NEO026 NEO027 NEO028 NEO029 NEO030 NEO031 NEO032 NEO033 NEO034 NEO035 NEO036 NEO037 NEO038 NEO039 NEO040 NEO041 NEO042 NEO043 NEO044 NEO045 E0046 NEO047 NEO048 NEO049 NEO050 NEO051 NEO052 NEO053 NEO054 NEO055 NEO056 NEO057 NEO058 NEO059 NEO060 NEO061 NEO062 NEO063 NEO064 NEO065 NEO066 NEO067 NEO068 NEO069 NEO070 NEO071
Trauma	225 226 227 228 229 230 231 232 233 234 235 236 239 240 244	T79 T76 T75 T74 T73 T71 T70 T69 T68 T67 T66 T34 T33 T32 T31 T30 T28 T27 T26 T25 T24 T23 T22 T21 T20 T19 T18 T17 T16 T15 T14 T07 S99 S98 S97 S96 S95 S94 S93 S92 S91 S90 S89 S88 S87 S86 S85 S84 S83 S82 S81 S80 S79 S78 S77 S76 S75 S74 S73 S72 S71 S70 S69 S68 S67 S66 S65 S64 S63 S62 S61 S60 S59 S58 S57 S56 S55 S54 S53 S52 S51 S50 S49 S48 S47 S46 S45 S44 S43 S42 S41 S40 S39 S38 S37 S36 S35 S34 S33 S32 S31 S30 S29 S28 S27 S26 S25 S24 S23 S22 S21 S20 S19 S17 S16 S15 S14 S13 S12 S11 S10 S09 S08 S07 S06 S05 S04 S03 S02 S01 S00	INJ001 INJ002 INJ003 INJ004 INJ005 INJ006 INJ007 INJ008 INJ009 INJ010 INJ011 INJ012 INJ013 INJ014 INJ015 INJ016 INJ017 INJ018 INJ019 INJ020 INJ021 INJ024 INJ025 INJ026 INJ027 INJ032 INJ038 INJ039 INJ040 INJ041 INJ042 INJ043 INJ044 INJ045 INJ046 INJ047 INJ048 INJ049 INJ050 INJ051 INJ052 INJ053 INJ054 INJ055 INJ056 INJ057 INJ058 INJ061 INJ062 INJ063 INJ064 INJ068 INJ073 INJ074
Heart Disease	096 097 100 101 102 103 104 105 106 107 108	I09 I11 I13 I20 I21 I22 I23 I24 I25 I26 I27 I28 I44 I45 I46 I47 I48 I49 I50 I51 I52 I97 I30 I31 I32 I34 I35 I36 I37 I38 I39 I40 I41 I42 I43	CIR001 CIR002 CIR003 CIR004 CIR005 CIR006 CIR010 CIR011 CIR012 CIR014 CIR015 CIR016 CIR017 CIR018 CIR019
Rheumatoid Arthritis	202	M05 M06 M45	MUS003
Asthma	128	J45	RSP009
Chronic Kidney Disease	158	N18	GEN003
COPD	127	J40 J41 J42 J43 J44 J47	RSP008

expenditures (total amount for all health care utilization, total amount paid by private insurance, and total out-of-pocket) in three time periods: 2010 – 2013, 2014 – 2017, and 2018 – 2020. We then estimated counterfactuals for the latter two time periods by calculating predicted spending using the characteristics of the 2010 – 2013 patients with the regression coefficients for each of the respective latter two time periods.

In each of our models, we controlled for patient characteristics, including age, sex, race/ethnicity, education, region, health status, income level, smoking, and total number of treated conditions.

We used Stata, version 17.0, for data analysis [5]. Sample weights and survey estimation commands were used to adjust for the complex survey design of MEPS. All spending amounts are presented in 2020 dollars, using the GDP implicit price deflator [6].

Findings

Table 1 presents 10-year trends in average private insurance and out-of-pocket spending, as well as trends in chronic disease prevalence between 2010 and 2020. Real per insured private insurance spending increased from $3,540 in 2010 to $4,967 by 2020, an average annual increase of 3.4 percent. These results may have been impacted by the COVID-19 pandemic. The Centers

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Table 1: Averages Among Those with Private Health Insurance, Age 18-64, 2010-2020

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Real Private Spending	$3,540	$4,193	$3,659	$3,463	$3,639	$4,119	$3,678	$4,049	$4,901	$4,813	$4,967
Real Out of Pocket	$830	$823	$751	$795	$709	$791	$811	$789	$984	$993	$897
Total Chronic Conditions											
0	52.0%	51.6%	54.8%	54.3%	53.7%	53.1%	56.9%	57.9%	57.4%	57.2%	56.8%
1	26.2%	26.5%	25.3%	25.3%	26.6%	25.1%	25.5%	24.7%	24.3%	25.3%	25.0%
2	12.5%	12.1%	10.8%	11.6%	11.1%	12.3%	10.1%	10.3%	11.0%	10.9%	11.2%
3	6.1%	6.3%	5.9%	5.4%	5.5%	5.4%	4.8%	4.7%	4.8%	4.3%	4.8%
4+	3.3%	3.5%	3.1%	3.5%	3.1%	4.0%	2.7%	2.3%	2.5%	2.3%	2.2%
Treated Prevalence											
Diabetes	6.2%	6.8%	6.1%	6.6%	6.1%	6.8%	6.2%	6.1%	5.9%	5.8%	6.2%
Kidney Disease	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.1%	0.1%	0.1%
Hypertension	18.5%	18.5%	17.3%	17.4%	16.9%	17.7%	16.8%	16.3%	16.5%	15.7%	15.3%
Hyperlipidemia	15.2%	14.7%	14.1%	14.0%	13.1%	13.4%	12.7%	11.7%	11.5%	10.9%	11.2%
COPD	3.3%	3.2%	2.5%	2.9%	2.5%	3.0%	3.1%	2.8%	0.7%	0.6%	0.6%
arthritis	0.9%	1.0%	1.0%	0.8%	1.0%	1.0%	0.0%	1.0%	1.0%	0.8%	0.8%
Asthma	4.3%	4.1%	4.1%	4.2%	4.1%	4.5%	3.8%	3.9%	5.1%	4.8%	4.7%
Depression	8.0%	8.0%	7.3%	7.9%	7.5%	7.6%	6.7%	6.2%	6.9%	7.5%	8.1%
Heart Disease	5.1%	5.2%	4.4%	4.6%	4.4%	4.8%	3.1%	2.5%	3.4%	3.3%	2.9%
Trauma	12.3%	12.1%	11.3%	11.3%	11.4%	12.6%	9.4%	9.2%	9.0%	8.6%	8.8%
Mental Disorders	13.8%	14.6%	13.8%	14.3%	15.5%	15.4%	14.9%	14.1%	15.5%	15.9%	17.8%
Cancer	4.2%	4.7%	3.7%	3.9%	4.4%	4.6%	2.2%	1.9%	3.1%	3.2%	2.9%

SOURCE: Tabulations from MEPS-HC, 2010-2020

for Medicare and Medicaid Services (CMS) reported that private health spending declined by 1.2 percent in 2020 [7]. However, CMS reports that the decline was largely due to a reduction in private insurance enrollment. We report average annual increases per insured and the results are virtually identical. The average increase between 2000 and 2009 was 3.47 percent and between 2000 and 2010 was 3.45 percent. We also did the analysis dropping the year 2020 using 2018-2019 as the third time period. The regression results were virtually identical to the results reported here.

The average annual increase in spending between 2000 and 2009 Out-of-pocket spending among privately insured adult increased from $703 in 2010 to $897 by 2020, an average annual increase of 2.5 percent.

Trends in the prevalence of chronic disease among privately insured adults were relatively stable over time. Fifty two percent adults had no treated chronic conditions in 2010 compared to 57 percent by 2020. The percent of adults with 3 or more chronic conditions treated decreased slightly over time, falling from 9.4 percent in 2010 to 7 percent in 2020.

Table 2 examines changes in real per insured spending by the most expensive and prevalent chronic conditions. Between 2010 and 2020 private insurance spending per adult rose from $3,716 to $4,893 a 31.7 percent increase. The 2020 spending level however was most likely impacted by COVID. The pattern of spending changes varied widely across chronic condition. Per insured spending on hyperlipidemia declined nearly 50 percent per person over the ten-year period, falling from $735 to $371. This decline reflects a dramatic change in the mix of statins with a large rise in the use of generic statins and a 90 percent reduction

Table 2: Mean Real Private Health Insurance Spending per Capital by Medical Conditions, 2010-2013, 2018-2020

	2010-2013	2018-2020	% Change
Diabetes	$ 2,380	$ 4,875	104.8%
Hypertension	$ 546.	$ 459.	-16%
Hyperlipidemia	$735.	$371.	-49.5%
Mental Disorders	$1,400	$1,786	23.3%
Heart Disease	$6,997	$8,960	28.1%
Cancer	$2,423	$3,023	24.8%
Total	$3,716	$4,893	31.7%

Source: Tabulations from MEPS-HC, 2010-2020

over a ten-year period for brand name statins [8]. Similarly, increased use of generic drugs to treat hypertension (generic Lipitor) rose over the ten-year period resulting in 16 percent decrease in spending.

In contrast, spending on other chronic conditions increased sharply. Spending to treat diabetes more than doubled, rising from $2,380 in 2010 to $4,875 by 2020. Cancer spending showed the next largest rise, from $6,997 in 2010 to $8,960 by 2020, over a 28 percent increase. Spending on trauma cases and mental disorders increased by roughly the same amount 25 and 23 percent respectfully over the ten-year period.

Table 3 presents the full regression results for private insurance spending focusing on the number of chronic conditions treated. We focus on the results from 2010-2013 and 2018-2020 through the 2014-2017 results are reported as well. In both periods, women incurred higher expenses (about $2,000) than men. Self-reported health status also impacted spending, private insurance spending for those that reported poor health were over $15,000 higher compared to those reporting excellent health (results similar in both periods).

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Table 3: Real (2020$) Total Private Health Expenditures marginal effects, 18-64, 2010-2013

Average marginal effects

Number of strata = 660   Number of obs = 40,057

Number of PSUs = 1,453   Population size = 41,127,025

            Subpop. no. obs = 36,537

	Linearized					
	dy/dx	std. err.	t	P>|t|	[95% conf.	interval]
1.female	1995.323	163.5247	12.20	0.000	1674.331	2316.315
hlthstat						
very_good	713.9643	156.4876	4.56	0.000	406.7854	1021.143
good	1888.794	188.5281	10.02	0.000	1518.721	2258.867
fair	5425.748	482.1349	11.25	0.000	4479.336	6372.159
poor	15240.91	2080.745	7.32	0.000	11156.5	19325.33
racethx						
Hisp	-508.158	249.1425	-2.04	0.042	-997.2149	-19.10123
NHblack	-713.4314	214.595	-3.32	0.001	-1134.673	-292.19
NHother	-906.8461	199.5752	-4.54	0.000	-1298.604	-515.088
agegrp						
35-49	-188.8206	224.927	-0.84	0.401	-630.3433	252.7021
50-64	455.5581	259.2237	1.76	0.079	-53.28777	964.4039
povcat						
100-199%	73.18823	330.0251	0.22	0.825	-574.6378	721.0143
200-399%	526.6362	316.809	1.66	0.097	-95.24728	1148.52
400%+	1090.472	316.4289	3.45	0.001	469.3346	1711.609
region						
Midwest	454.8001	316.2648	1.44	0.151	-166.0151	1075.615
South	-614.3952	210.0326	-2.93	0.004	-1026.681	-202.1096
West	-239.53	222.9592	-1.07	0.283	-677.19	198.13
educgrp						
HSgrad	420.7144	280.017	1.50	0.133	-128.9478	970.3765
SomeColl_Assc	505.604	269.37	1.88	0.061	-23.15861	1034.367
CollegeGrad	1468.191	310.1386	4.73	0.000	859.4016	2076.981
1.smoker	-706.1203	174.4024	-4.05	0.000	-1048.465	-363.7755
totcond						
1_cond	1983.512	132.2196	15.00	0.000	1723.97	2243.054
2_cond	3616.264	318.1501	11.37	0.000	2991.748	4240.78
3_cond	5432.958	394.8348	13.76	0.000	4657.913	6208.003
4+_cond	7658.692	661.9313	11.57	0.000	6359.347	8958.036
year						
2011	627.3848	259.531	2.42	0.016	117.9358	1136.834
2012	-8.824805	236.4594	-0.04	0.970	-472.9851	455.3355
2013	90.87363	239.4017	0.38	0.704	-379.0622	560.8095

Note: dy/dx for factor levels is the discrete change from the base level.

Real (2020$) Total Private Health Expendtures marginal effects, 18-64, 2014-2017

Average marginal effects

Number of strata = 777   Number of obs = 39,737

Number of PSUs = 1,707   Population size = 43,554,880

            Subpop. no. obs = 34,682

	Linearized					
	dy/dx	std. err.	t	P>|t|	[95% conf.	interval]

[continued from right column]

year						
2011	627.3848 259.531 2.42 0.016 117.9358 1136.834	6.725614		33.23019 0.20 0.840 -58.50392 71.95514		
2012	-8.824805 236.4594 -0.04 0.970 -472.9851 455.3355					
2013	90.87363 239.4017 0.38 0.704 -379.0622 560.8095	-20.46487		35.06566 -0.58 0.560 -89.29736 48.36761		

Note: dy/dx for factor levels is the discrete change from the base level.

Real (2020$) Total out-of-pocket spending marginal effects, 18-64, 2014-2017

Average marginal effects

Number of strata = 777   Number of obs = 39,737

Number of PSUs = 1,707   Population size = 43,554,880

            Subpop. no. obs = 34,682

	Linearized					
	dy/dx	std. err.	t	P>|t|	[95% conf.	interval]
1.female	353.6019	25.19495	14.03	0.000	304.1563	403.0474
hlthstat						
very_good	87.16979	30.03582	2.90	0.004	28.22395	146.1156
good	163.1072	34.02968	4.79	0.000	96.32337	229.8911
fair	516.5662	66.59355	7.76	0.000	385.8751	647.2572
poor	783.4051	170.7659	4.59	0.000	448.274	1118.536
racethx						
Hisp	-282.2319	34.66339	-8.14	0.000	-350.2594	-214.2043
NHblack	-367.6007	30.27213	-12.14	0.000	-427.0103	-308.1911
NHother	-321.3087	30.96833	-10.38	0.000	-382.0846	-260.5328
agegrp						
35-49	-188.8206 224.927 -0.84 0.401 -630.3433 52.7021	38.62786		30.06198 1.28 0.199 -20.36931 97.62503		
50-64	455.5581 259.2237 1.76 0.079 -53.28777 4.4039	201.4485		30.81292 6.54 0.000 140.9776 261.9194		
povcat						
100-199%	-76.40574	63.93363	-1.20	0.232	-201.8766	49.06516
200-399%	26.11468	61.71868	0.42	0.672	-95.00935	147.2387
400%+	231.7134	61.12645	3.79	0.000	111.7517	351.6752
region						
Midwest	109.5119	41.26408	2.65	0.008	28.53035	190.4934
South	37.97976	39.93753	0.95	0.342	-40.39836	116.3579
West	110.9818	42.98803	2.58	0.010	26.61703	195.3466
educgrp						
HSgrad	-72.68969	91.82671	-0.79	0.429	-252.9013	107.5219
SomeColl_Assc	-.6659862	93.48409	-0.01	0.994	-184.1302	182.7982
CollegeGrad	230.8402	94.17284	2.45	0.014	46.02427	415.6561
1.smoker	-706.1203 174.4024 -4.05 0.000 -1048.465 -363.7755			41.26408 2.65 0.008 28.53035 190.4934		
totcond						
1_cond	452.5405	27.85817	16.24	0.000	397.8683	507.2126
2_cond	644.4768	34.52524	18.67	0.000	576.7204	712.2333
3_cond	1056.148	67.54476	15.64	0.000	923.5905	1188.706
4+_cond	1184.645	78.21692	15.15	0.000	1031.143	1338.147
year						
2015	627.3848 259.531 2.42 0.016 117.9358 1136.834			33.23019 0.20 0.840 -58.50392 71.95514		
2016	-8.824805 236.4594 -0.04 0.970 -472.9851 455.3355					
2017	90.87363 239.4017 0.38 0.704 -379.0622 560.8095			35.06566 -0.58 0.560 -89.29736 48.36761		

Note: dy/dx for factor levels is the discrete change from the base level.

Real (2020$) Total out-of-pocket spending marginal effects, 18-64, 2018-2020

Average marginal effects

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2011	627.3848 259.531 2.42 0.016 117.9358 1136.834	6.725614	33.23019 0.20 0.840 -58.50392 71.95514
2012	-8.824805 236.4594 -0.04 0.970 -472.9851 455.3355		
2013	90.87363 239.4017 0.38 0.704 -379.0622 560.8095	-20.46487	35.06566 -0.58 0.560 -89.29736 48.36761

Note: dy/dx for factor levels is the discrete change from the base level.

Real (2020$) Total out-of-pocket spending marginal effects, 18-64, 2014-2017

Average marginal effects

Number of strata = 777   Number of obs = 39,737

Number of PSUs = 1,707   Population size = 43,554,880

Subpop. no. obs = 34,682

	Linearized		
	dy/dx std. err. t P>|t| [95% conf. interval]		
1.female	353.6019 25.19495 14.03 0.000 304.1563 403.0474		
hlthstat			
very_good	87.16979 30.03582 2.90 0.004 28.22395 146.1156		
good	163.1072 34.02968 4.79 0.000 96.32337 229.8911		
fair	516.5662 66.59355 7.76 0.000 385.8751 647.2572		
poor	783.4051 170.7659 4.59 0.000 448.274 1118.536		
racethx			
Hisp	-282.2319 34.66339 -8.14 0.000 -350.2594 -214.2043		
NHblack	-367.6007 30.27213 -12.14 0.000 -427.0103 -308.1911		
NHother	-321.3087 30.96833 -10.38 0.000 -382.0846 -260.5328		
agegrp			
35-49	-188.8206 224.927 -0.84 0.401 -630.3433 52.7021	38.62786	30.06198 1.28 0.199 -20.36931 97.62503
50-64	455.5581 259.2237 1.76 0.079 -53.28777 4.4039	201.4485	30.81292 6.54 0.000 140.9776 261.9194
povcat			
100-199%	-76.40574 63.93363 -1.20 0.232 -201.8766 49.06516		
200-399%	26.11468 61.71868 0.42 0.672 -95.00935 147.2387		
400%+	231.7134 61.12645 3.79 0.000 111.7517 351.6752		
region			
Midwest	109.5119 41.26408 2.65 0.008 28.53035 190.4934		
South	37.97976 39.93753 0.95 0.342 -40.39836 116.3579		
West	110.9818 42.98803 2.58 0.010 26.61703 195.3466		
educgrp			
HSgrad	-72.68969 91.82671 -0.79 0.429 -252.9013 107.5219		
SomeColl_Assc	-.6659862 93.48409 -0.01 0.994 -184.1302 182.7982		
CollegeGrad	230.8402 94.17284 2.45 0.014 46.02427 415.6561		
1.smoker	-706.1203 174.4024 -4.05 0.000 -1048.465 -363.7755		41.26408 2.65 0.008 28.53035 190.4934
totcond			
1_cond	452.5405 27.85817 16.24 0.000 397.8683 507.2126		
2_cond	644.4768 34.52524 18.67 0.000 576.7204 712.2333		
3_cond	1056.148 67.54476 15.64 0.000 923.5905 1188.706		
4+_cond	1184.645 78.21692 15.15 0.000 1031.143 1338.147		
year			
2015	627.3848 259.531 2.42 0.016 117.9358 1136.834		33.23019 0.20 0.840 -58.50392 71.95514
2016	-8.824805 236.4594 -0.04 0.970 -472.9851 455.3355		
2017	90.87363 239.4017 0.38 0.704 -379.0622 560.8095		35.06566 -0.58 0.560 -89.29736 48.36761

Note: dy/dx for factor levels is the discrete change from the base level.

Real (2020$) Total out-of-pocket spending marginal effects, 18-64, 2018-2020

Average marginal effects

Number of strata = 327	Number of obs = 27,761	
Number of PSUs = 819	Population size = 33,951,518	
Subpop. no. obs = 21,573		
	Linearized	
	dy/dx std. err. t P>|t| [95% conf. interval]	
1.female	385.9663 42.42095 9.10 0.000 302.6177 469.3148	
hlthstat		
very_good	118.9276 42.41185 2.80 0.005 35.59689 202.2583	
good	313.2483 62.04145 5.05 0.000 191.3495 435.1472	
fair	719.5106 132.062 5.45 0.000 460.0355 978.9857	
poor	1071.651 269.8622 3.97 0.000 541.4261 1601.875	
racethx		
Hisp	-347.0093 45.61811 -7.61 0.000 -436.6397 -257.379	
NHblack	-418.7708 80.21721 -5.22 0.000 -576.3814 -261.1603	
NHother	-355.9838 58.22933 -6.11 0.000 -470.3927 -241.575	
agegrp		
35-49	-188.8206 224.927 -0.84 0.401 -630.3433 252.7021	-3.611623	51.87324 -0.07 0.945 -105.532 98.30879
50-64	455.5581 259.2237 1.76 0.079 -53.28777 64.4039	
povcat		
100-199%	107.4156 109.222 0.98 0.326 -107.1835 322.0147	
200-399%	135.055 92.21461 1.46 0.144 -46.12805 316.238	
400%+	339.5286 91.83284 3.70 0.000 159.0956 519.9615	
region		
Midwest	110.2337 60.56904 1.82 0.069 -8.772207 229.2396	
South	23.35172 62.21167 0.38 0.708 -98.8816 145.585	
West	19.37645 57.57367 0.34 0.737 -93.74414 132.497	
educgrp		
HSgrad	-17.13086 75.19877 -0.23 0.820 -164.8812 130.6195	
SomeColl_Assc	170.0514 77.38554 2.20 0.028 18.00452 322.0983	
CollegeGrad	400.1915 82.03416 4.88 0.000 239.011 561.372	
1.smoker	-161.2051 49.75993 -3.24 0.001 -258.9733 -63.43694	
1_cond	627.0462 44.77842 14.00 0.000 539.0657 715.0268	
2_cond	769.5137 67.18709 11.45 0.000 637.5046 901.5227	
3_cond	1175.277 115.7188 10.16 0.000 947.9132 1402.641	
4+_cond	1235.621 123.4258 10.01 0.000 993.1142 1478.128	
year		
2019	-12.07607 46.67606 -0.26 0.796 -103.7851 79.63294	
2020	-117.8587 51.86508 -2.27 0.023 -219.763 -15.95429	

Note: dy/dx for factor levels is the discrete change from the base level.

Private insurance spending was considerably lower for racial and ethnic minorities. In 2010-2013 and 2018-2020 spending was approximately $900 lower for Non-Hispanic other adults compared to Non-Hispanic White adults. Insurance spending was $713 lower in 2010-2013 and $619 lower in 2018-2020 for Non-Hispanic Black adults compared to Non-Hispanic White adults. Finally, spending on Hispanic adults was over $500 lower in the earlier period, and $213 lower in the latter period compared to non-Hispanic White adults.

In both time periods, higher levels of education were associated with higher private insurance spending. In the 2018-2020 time period, adults with a college degree spending $2,700 more than adults with no degree.

Somewhat surprisingly smokers incurred lower health care spending in both periods, ranging from $700 to over $840 lower per year.

Finally, even when controlling for self-reported health status, the number of chronic conditions treated has a substantial impact on private insurance spending.

The incremental spending for each additional condition was about $2,000 in 2010-2013 and was similar in 2018-2020. The major difference was the incremental spending associated with moving from 3 to 4 or more conditions treated in 2018-2020. In this case, the additional spending was over $4,200 higher (p< 10).

Table 4 presents the same set of results for out-of-pocket spending trends over time. Like total spending, females spent approximately $380 more out of pocket compared to males in both time periods. Reported health status also influenced spending as those reporting in poor health spent $1,000 to $1,200 more out-of-pocket in the two time periods. Racial minorities spent less out-of-pocket compared to non-Hispanic White adults. In the latest period, out-of-pocket spending was approximately $350 to $419 lower per year for racial and ethnic minorities.

Out-of-pocket was over $200 higher for adults aged 50 to 64 compared to those under 50. Out-of-pocket spending also increased with higher levels of education. Adults with a college degree spent $340 to $400 more per year out-of-pocket compared to those without a high school diploma. As before smokers spend less out-of-pocket ($120 to $160) compared to non-smokers.

As before, even accounting for self-reported health status, out-of-pocket spending increased sharply with the number of chronic conditions treated. In both time periods examined, out-of-pocket spending was $1,200 to nearly $1,300 more per year for those with 4 or more conditions compared to those with no chronic conditions.

The results in [Table 5], estimates the marginal impact of race and ethnicity and the most expensive and prevalent chronic conditions on private insurance spending in two time periods (2010-2013 and 2018 and 2020) as well as over the two periods. Other demographic results were similar in these models that were reported above and therefore are not shown.

In both time periods, health spending was approximately $2,000 higher for females. Spending on racial and ethnic minorities in the 2010-2013 time period were uniformly lower compared to non-Hispanic White adults. This ranged from $508 per year lower for Hispanic Adults to over $900 per year for non-Hispanic other adults.

Spending increased sharply with the number of chronic conditions treated. In 2010-2013 incremental spending was $1,983 higher and those with 4 or more conditions $7,659 higher for those with 4 or more conditions compared to those with no chronic conditions. Spending on chronic disease increased sharply over the ten-year period. Private insurance spending for each category of the number of chronic conditions increased by nearly $1,200 (for those with one condition) to over $4,500 more in 2018-2020 for those with 4 or more conditions. These changes within each category were all statistically significant (p<05).

Table 4: Real (2020$) Total out-of-pocket spending marginal effects, 18-64, 2010-2013.

Average marginal effects		
Number of strata = 660 Number of obs = 40,057		
Number of PSUs = 1,453 Population size = 41,127,025		
Subpop. no. obs = 36,537		
| Linearized		
| dy/dx std. err. t P>|t| [95% conf. interval]		
1.female | 373.6866 23.3429 16.01 0.000 327.8654 419.5077		
hlthstat |		
very_good | 76.86804 25.31669 3.04 0.002 27.17239 126.5637		
good | 217.1564 35.60013 6.10 0.000 147.2747 287.038		
fair | 574.4637 68.27431 8.41 0.000 440.444 708.4834		
poor | 1214.077 178.1707 6.81 0.000 864.3351 1563.819		
racethx |		
Hisp | -291.2019 27.56302 -10.56 0.000 -345.307 -237.0968		
NHblack | -391.8161 25.75718 -15.21 0.000 -442.3765 -341.2558		
NHother | -171.8883 47.62473 -3.61 0.000 -265.3737 -78.40284		
agegrp |		
35-49 | -188.8206 224.927 -0.84 0.401 -630.3433 252.7021	22.598	28.30305 0.80 0.425 -32.95976 78.15575
50-64 | 455.5581 259.2237 1.76 0.079 -53.28777 964.4039	262.5501	34.33086 7.65 0.000 195.16 329.9402
povcat |		
100-199% | 175.9181 79.20286 -2.22 0.027 -331.3901 -20.44604		
200-399% | -75.09815 76.81253 -0.98 0.329 -225.8781 75.68177		
400%+ | 35.10354 77.28725 0.45 0.650 -116.6082 186.8153		
region |		
Midwest | 196.8679 31.58485 6.23 0.000 134.8681 258.8677		
South | 146.7547 34.18499 4.29 0.000 79.65089 213.8584		
West | 238.5506 39.18327 6.09 0.000 161.6354 315.4658		
educgrp |		
HSgrad | 35.13912 38.89257 0.90 0.367 -41.20543 111.4837		
SomeColl_Assc | 152.8567 35.29145 4.33 0.000 83.58104 222.1324		
CollegeGrad | 338.6766 38.36374 8.83 0.000 263.3701 413.9831		
1.smoker | 373.6866 23.3429 16.01 0.000 327.8654 419.5077		
totcond |		
1_cond | 415.2717 23.75265 17.48 0.000 368.6463 461.8972		
2_cond | 773.8486 44.10294 17.55 0.000 687.2763 860.4209		
3_cond | 946.4466 50.92685 18.58 0.000 846.4793 1046.414		
4+_cond | 1293.191 85.96375 15.04 0.000 1124.448 1461.935		
year |		
2011 | 627.3848 259.531 2.42 0.016 117.9358 1136.834	6.725614	33.23019 0.20 0.840 -58.50392 71.95514
2012 | -8.824805 236.4594 -0.04 0.970 -472.9851 455.3355		
2013 | 90.87363 239.4017 0.38 0.704 -379.0622560.8095	-20.46487	35.06566 -0.58 0.560 -89.29736 48.36761
Note: dy/dx for factor levels is the discrete change from the base level.		
Real (2020$) Total out-of-pocket spending marginal effects, 18-64, 2014-2017		
Average marginal effects		
Number of strata = 777 Number of obs = 39,737		
Number of PSUs = 1,707 Population size = 43,554,880		
Subpop. no. obs = 34,682		
| Linearized		
| dy/dx std. err. t P>|t| [95% conf. interval]		
1.female | 353.6019 25.19495 14.03 0.000 304.1563 403.0474		
hlthstat |		
very_good | 87.16979 30.03582 2.90 0.004 28.22395 146.1156		

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good | 163.1072 34.02968 4.79 0.000 96.32337 229.8911
fair | 516.5662 66.59355 7.76 0.000 385.8751 647.2572
poor | 783.4051 170.7659 4.59 0.000 448.274 1118.536
racethx |
Hisp | -282.2319 34.66339 -8.14 0.000 -350.2594 -214.2043
NHblack | -367.6007 30.27213 -12.14 0.000 -427.0103 -308.1911
NHother | -321.3087 30.96833 -10.38 0.000 -382.0846 -260.5328
agegrp |
35-49 | -188.8206 224.927    38.62786    30.06198 1.28 0.199 -20.36931 97.62503
-0.84 0.401 -630.3433 52.7021
50-64 | 455.5581 259.2237    201.4485    30.81292 6.54 0.000 140.9776 261.9194
1.76 0.079 -53.28777 4.4039
povcat |
100-199% | -76.40574 63.93363 -1.20 0.232 -201.8766 49.06516
200-399% | 26.11468 61.71868 0.42 0.672 -95.00935 147.2387
400%+ | 231.7134 61.12645 3.79 0.000 111.7517 351.6752
region |
Midwest | 109.5119 41.26408 2.65 0.008 28.53035 190.4934
South | 37.97976 39.93753 0.95 0.342 -40.39836 116.3579
West | 110.9818 42.98803 2.58 0.010 26.61703 195.3466
educgrp |
HSgrad | -72.68969 91.82671 -0.79 0.429 -252.9013 107.5219
SomeColl_Assc | -.6659862 93.48409 -0.01 0.994 -184.1302 182.7982
CollegeGrad | 230.8402 94.17284 2.45 0.014 46.02427 415.6561
1.smoker | -706.1203 174.4024 -4.05 0.000    41.26408 2.65 0.008 28.53035
-1048.465 -363.7755    190.4934
totcond |
1_cond | 452.5405 27.85817 16.24 0.000 397.8683 507.2126
2_cond | 644.4768 34.52524 18.67 0.000 576.7204 712.2333
3_cond | 1056.148 67.54476 15.64 0.000 923.5905 1188.706
4+_cond | 1184.645 78.21692 15.15 0.000 1031.143 1338.147
year |
2015 | 627.3848 259.531    33.23019
2.42 0.016 117.9358    0.20 0.840
1136.834    -58.50392 71.95514
2016 | -8.824805 236.4594
-0.04 0.970 -472.9851
455.3355
2017 | 90.87363 239.4017    35.06566 -0.58 0.560
0.38 0.704 -379.0622    -89.29736 48.36761
560.8095
```
Note: dy/dx for factor levels is the discrete change from the base level.

Real (2020$) Total out-of-pocket spending marginal effects, 18-64, 2018-2020

Average marginal effects

Number of strata = 327   Number of obs = 27,761

Number of PSUs = 819   Population size = 33,951,518

Subpop. no. obs = 21,573

```
| Linearized
| dy/dx std. err. t P>|t| [95% conf. interval]
---------------+------------------------------------------------------------
1.female | 385.9663 42.42095 9.10 0.000 302.6177 469.3148
hlthstat |
very_good | 118.9276 42.41185 2.80 0.005 35.59689 202.2583
good | 313.2483 62.04145 5.05 0.000 191.3495 435.1472
fair | 719.5106 132.062 5.45 0.000 460.0355 978.9857
poor | 1071.651 269.8622 3.97 0.000 541.4261 1601.875
racethx |
Hisp | -347.0093 45.61811 -7.61 0.000 -436.6397 -257.379
NHblack | -418.7708 80.21721 -5.22 0.000 -576.3814 -261.1603
NHother | -355.9838 58.22933 -6.11 0.000 -470.3927 -241.575
agegrp |
35-49 | -188.8206 224.927    -3.611623    51.87324 -0.07
-0.84 0.401 -630.3433    0.945 -105.532
252.7021    98.30879
```

```
50-64 | 455.5581 259.2237
1.76 0.079 -53.28777 64.4039
povcat |
100-199% | 107.4156 109.222 0.98 0.326 -107.1835 322.0147
200-399% | 135.055 92.21461 1.46 0.144 -46.12805 316.238
400%+ | 339.5286 91.83284 3.70 0.000 159.0956 519.9615
region |
Midwest | 110.2337 60.56904 1.82 0.069 -8.772207 229.2396
South | 23.35172 62.21167 0.38 0.708 -98.8816 145.585
West | 19.37645 57.57367 0.34 0.737 -93.74414 132.497
educgrp |
HSgrad | -17.13086 75.19877 -0.23 0.820 -164.8812 130.6195
SomeColl_Assc | 170.0514 77.38554 2.20 0.028 18.00452 322.0983
CollegeGrad | 400.1915 82.03416 4.88 0.000 239.011 561.372
1.smoker | -161.2051 49.75993 -3.24 0.001 -258.9733 -63.43694
1_cond | 627.0462 44.77842 14.00 0.000 539.0657 715.0268
2_cond | 769.5137 67.18709 11.45 0.000 637.5046 901.5227
3_cond | 1175.277 115.7188 10.16 0.000 947.9132 1402.641
4+_cond | 1235.621 123.4258 10.01 0.000 993.1142 1478.128
year |
2019 | -12.07607 46.67606 -0.26 0.796 -103.7851 79.63294
2020 | -117.8587 51.86508 -2.27 0.023 -219.763 -15.95429
```
Note: dy/dx for factor levels is the discrete change from the base level.

Table 5: Marginal Effects on Private Health Insurance Spending by Numbers of Chronic Conditions 10-2013, 2018-2020

Variable	2010-2013	2018-2020
Female	$1,995*	$ 2,764*
Relative to Non-Hispanic White		
Hispanic	-$508*	- $212*
Non-Hispanic Black	- $713*	-$619*
Non-Hispanic Other	-$907*	-$905*
Number of Chronic Conditions		
1	$1,983*	$3,175*
2	$3,616*	$ 5,330*
3	$5,432*	$ 7,950*
4+	$7,659*	$12,197*
SOURCE: Analysis from MEPS-HC		
*Significant different from Fewer conditions p< .05 (4 vs 3, 3 vs. 2, 2 vs 1)		
Significant different p< .05 across the two time periods.		

Table 6: Marginal Effects on Out-Of-Pocket Health Insurance Spending, By Number of Chronic Conditions, 2010-2013, 2018-2022

Variable	2010-2013	2018-2020
Female	$374*	$ 385*
Relative to Non-Hispanic White		
Hispanic	-$291*	- $347*
Non-Hispanic Black	- $392*	-$419*
Non-Hispanic Other	-$172*	-$356*
Number of Chronic Conditions		
1	$415*	$627*
2	$774*	$ 770*
3	$946*	$ 1,175*
4+	$1,293*	$1,235*

Source Analysis from MEPS-HC
*Significant different p< .05
Significant different p< .05 across the two time periods.

The results presented in [Table 6], estimate the incremental out-of-pocket expenditures by race and ethnicity and number of chronic conditions treated. Out-of-pocket spending increased sharply as the number of chronic conditions treated increased. Relative to adults with no chronic conditions, out-of-pocket spending was $415 higher for those with 1 condition rising to nearly $1,300 higher for those with 4 or more conditions treated. As before, out-of-pocket spending for racial and ethnic minorities were lower than from Non-Hispanic White adults.

We next estimate the change in private insurance spending for five of the most expensive chronic conditions over time. Using a Wald Chi-Square test we compare the impact of changes in chronic care spending on total private insurance spending [Table 7], and out-of-pocket spending [Table 8], for three time periods; 2014-2017 and 2010-2013 and 2018-2020 and 2010-2013.

Spending for four of the five chronic conditions examined increased significantly between 2018-2020 and 2010-2013. Cancer spending was $4,282 higher in the latter period compared to the earlier period. Similarly spending to treat heart disease was $3,417 higher, trauma spending $1.300 and treatment of mental disorders $965 higher in 2018-2020 compared to 2010-2013. Spending to treat heart disease was also higher ($2,592) in 2014-2017 compared to 2010-2013.

Out-of-pocket spending to treat two chronic conditions also increased over time (Table 8). Spending to treat trauma patients was $201 higher in 2018-2020 compared to 2010-2013. Out-of-pocket spending for patients treated for mental disorders was $280 in 2018-2020 compared to 2010-2013.

CONCLUSIONS, LIMITATIONS AND RECOMMEN-DATIONS

Real per capita private insurance spending increased an

Table 7: Fully Interacted Model Impact of Key Chronic Disease on Level 1 Private Insurance Spending, 2010-2020

Conditions	(2014-2017 vs 2010-2013)	(2010-2013 vs 2018-2020)
Heart Disease	$2,592*	$3,417*
Trauma	$630	$1,300*
Cancer	$417	$4,282*
Mental Disease	$190	$965*
COPD/Asthma	$502	$510
Source: Analysis from MEPS-HC ·Significantly different from zero, p<.05		

Table 8: Fully Interacted Model Impact of Key Chronic Conditions on Out-of-Pocket Spending Privately Insurance Audits, 2010-2020

Conditions	(2014-2017 vs 2010-2013)	(2010-2013 vs 2018-2020)
Heart Disease	-$75	$102
Trauma	$67	$201*
Cancer	$7	$180
Mental Disease	$8	$280*
COPD/Asthma	-$65	-$61
Source: Analysis from MEPS-HC · Significantly different from zero, p<.05		

average of 3.4 percent per year between 2010 and 2020. Out-of-pocket spending also increased over this period but by a lower amount of 2.5 percent per year. The analysis highlights several important demographic differences in the level of both total insurance spending and out-of-pocket spending over this period. First, health care spending, even controlling for reported health status and chronic health conditions, were lower for racial and ethnic minorities compared to non-Hispanic White adults. Out-of-pocket spending was also lower for racial and ethnic minorities. These differences however have not increased over the ten-year period examined. The result also show that spending rises with educational attainment and age. Total and out-of-pocket spending were also higher for women.

As may be expected the most important determinants of total and out-of-pocket were self-reported health status and the number of chronic health care conditions treated. Total spending on those with self-reported poor health was over $15,000 higher compared to those reporting excellent health. The significantly higher spending among those with fair or poor health compared to patients with excellent health was observed even when controlling for the number of chronic health care conditions treated.

The analysis also highlighted the substantial increase in total and out-of-pocket spending among patients a greater number of chronic conditions treated. Private insurance spending for adults under treatment for 4 or more chronic conditions were over $12,000 higher compared to adults with no chronic conditions treated. Even among chronically ill adults, spending increased substantially for each additional chronic condition treated. A similar result was found for out-of-pocket spending for chronically ill adults. These high levels of out-of-pocket spending for chronically ill patients are a concern if they deter patients from adhering to medications and seeking timely treatment. One approach would be to lower or eliminate cost sharing on clinically important medications used to treat patients with highly prevalent chronic conditions.

The analysis highlights several areas of interest. The lower spending overall on racial minorities even after accounting for health status raises some issues that require additional study. The analysis also highlighted that higher spending on several chronic conditions were an important factor accounting for the growth in total private insurance spending. Additional treatment costs of cancer and heart disease were the two leading conditions accounting for the increased spending. The increased spending was not associated with higher prevalence of the conditions, they were relatively stable over the ten- year period. Higher treatment costs per case then accounted for the rise.

The analysis showed that the treatment costs of some conditions like hyperlipidemia and hypertension actually declined over time. The lower level of spending is linked to the increased use of generic medications to treat both conditions. A limitation is understanding the factors associated with the growth in spending on other conditions. These factors could include changes in the intensity of treatment, or changes in the mix of services provided to treat.

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The results provide important information for capitated health insurance plans in general (Medicare, Medicaid, and private insurance). These plans must predict forward looking treatment costs in setting premiums or negotiation per capita payments. The fact that both reported health status and the number and mix of chronic conditions (which are used in risk adjusting per capita rates for Medicare Advantage plans) are highly predictive of spending highlights the important role that health risk assessments in addition to clinical data in predicting levels of spending. Relying solely on risk adjusting simply using claims data on clinical data could result in underpredicting next year's spending levels. Both risk assessment information and the clinical data are two of the most important determinants of the level and change in health care spending.

Finally, the results allow policymakers to target chronic conditions with the highest level and growth in spending. Approaches for reducing the level and growth in spending include effective chronic care management (transitional care, education, medication therapy management). Effective medication therapy management programs have been founds to reduce disease specific health care spending and should be more broadly expanded and used [9].

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