

Online Supplementary Materials

Regional Analysis Masks Substantial Local Geographic Variation

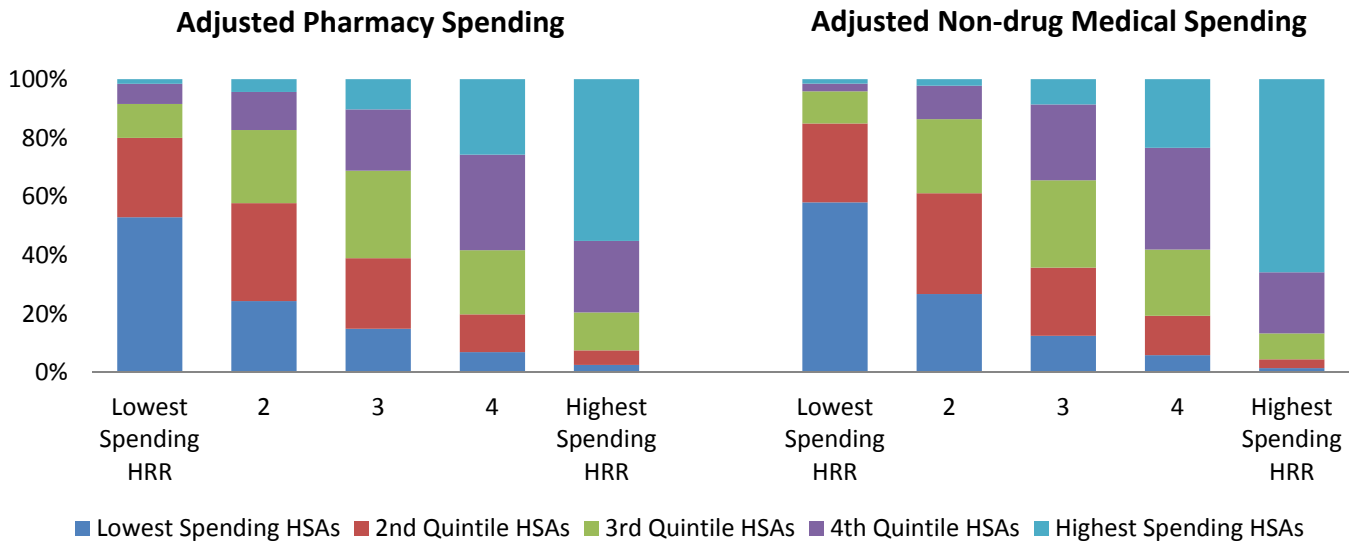
Yuting Zhang, Seo Hyon Baik, A. Mark Fendrick, Katherine Baicker

Table of Contents

Figure S 1. Quintile Analysis for Adjusted Pharmacy Spending and Non-drug Medical Spending Between Hospital-referral Regions and Hospital-service Areas, <i>Without Adjusting for Risk Scores</i>	2
Table S 1. Sensitivity Analysis for Variation in Adjusted Outcomes as in Table 1 in Different Hospital-Service Areas.....	4
Table S 2. Quintile Analysis for Adjusted Pharmacy Spending and Non-drug Medical Spending Between Hospital-referral Regions and Hospital-service Areas.....	6
Table S 3. Sensitivity Analysis With Exclusion of Risk Scores in the Model: Quintile Analysis for Adjusted Pharmacy Spending and Non-drug Medical Spending Between Hospital-referral Regions and Hospital-service Areas.....	8

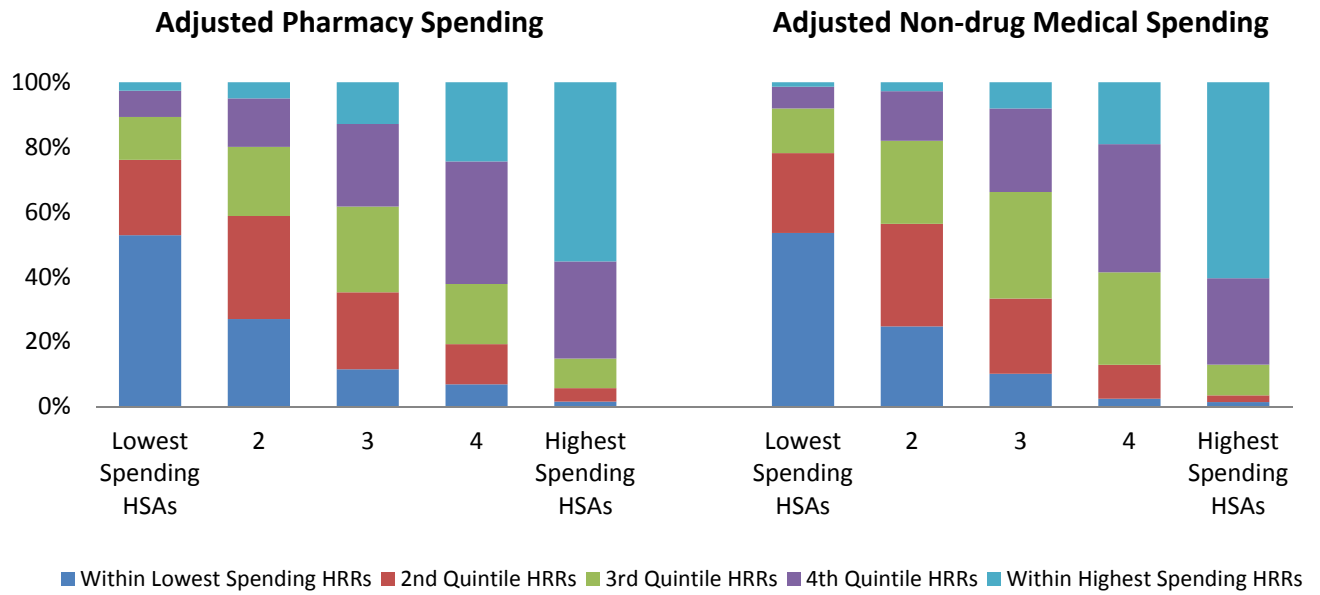
Figure S 1. Quintile Analysis for Adjusted Pharmacy Spending and Non-drug Medical Spending Between Hospital-referral Regions and Hospital-service Areas, *Without Adjusting for Risk Scores*

Panel A. The Type of HSAs Located within High and Low-Spending HRRs



For each quintile of HRR based on HRR spending, this chart shows what shares of the HSAs located within that type of HRR are high or low spending HSAs. For example, 55.2% of the HSAs in the highest drug-spending HRR quintile are in the highest drug-spending quintile of HSAs; 52.9% of the HSAs in the lowest drug-spending HRR quintile are in the lowest HSA quintile.

Panel B. The Type of HRRs where High and Low Spending HSAs are Located



For each quintile of HSA based on HSA spending, this chart shows what share of that type of HSA are located in high and low spending HRRs. For example, for adjusted pharmacy spending, 55.2% of the highest spending quintile HSAs are in the highest-spending quintile HRR; 52.8% of the lowest drug-spending HSAs are in the lowest drug-spending HRR quintile.

Table S 1. Sensitivity Analysis for Variation in Adjusted Outcomes as in Table 1 in Different Hospital-Service Areas

Panel A. For those with full enrollment for the year or until death

	Min	10th	25th	Median	75th	90th	Max	Mean	S.D.	75th/ 25th	COV
Drug spending	1885	2315	2575	2788	3032	3250	4502	2799	373	1.18	0.13
Drug counts	41	47	50	53	56	58	72	53	4.53	1.11	0.09
Medical spending	7301	9257	10203	10967	11796	12891	16322	11060	1445	1.16	0.13
IP counts	0.20	0.33	0.36	0.40	0.44	0.52	0.70	0.41	0.08	1.24	0.19
OP counts	3.20	4.89	5.55	6.21	6.76	7.19	7.93	6.09	0.92	1.22	0.15
ER Counts	0.36	0.56	0.63	0.72	0.82	0.92	2.02	0.74	0.18	1.30	0.24
Total Spending	9520	11939	12966	13712	14755	15763	19013	13859	1497	1.14	0.11

Panel B. For those Aged ≥ 65

	Min	10th	25th	Median	75th	90th	Max	Mean	S.D.	75th/ 25th	COV
Drug spending	1595	1944	2152	2382	2637	2832	4032	2398	362	1.23	0.15
Drug counts	40	47	49	52	55	58	77	53	4.81	1.12	0.09
Medical spending	6607	9045	9821	10670	11699	12873	16876	10837	1554	1.19	0.14
IP counts	0.09	0.32	0.34	0.39	0.43	0.51	0.81	0.40	0.09	1.26	0.22
OP counts	3.01	4.58	5.30	5.95	6.60	7.07	7.87	5.89	0.95	1.25	0.16
ER Counts	0.16	0.46	0.51	0.59	0.68	0.78	1.33	0.61	0.14	1.32	0.23
Total Spending	8430	11365	12139	13049	14141	15230	20884	13236	1602	1.16	0.12

Panel C. Sensitivity analysis with exclusion of risk scores in the model

	Min	10th	25th	Median	75th	90th	Max	Mean	S.D.	75th/ 25th	COV
Drug spending	1764	2191	2465	2720	3021	3238	4470	2736	409	1.23	0.15
Drug counts	40.78	46.06	49.77	52.33	55.12	57.96	71.25	52.33	4.73	1.11	0.09
Medical spending	5934	8235	9048	10144	11093	12139	15337	10143	1542	1.23	0.15
IP counts	0.09	0.28	0.32	0.37	0.42	0.49	0.69	0.38	0.08	1.31	0.22
OP counts	2.53	4.28	5.13	5.77	6.43	7.02	7.94	5.67	1.06	1.25	0.19
ER Counts	0.40	0.50	0.58	0.68	0.79	0.88	1.86	0.70	0.19	1.37	0.27
Total Spending	8057	10736	11680	12885	14016	15057	17949	12879	1704	1.2	0.13

Total drug spending includes Part D plan payment before rebates, beneficiary out-of-pocket spending, and subsidy amount. Drug counts are number of monthly prescription drugs (=1 if days supply ≤ 30 ; =days supply/30 if days supply > 30). Total medical spending included Medicare and beneficiary payment for all medical services (including inpatient, outpatient, physician, home health, hospice, skilled nursing home, and medical devices) and was adjusted for local price-level differences using county-level factor prices given to us by the Medicare Payment Advisory Commission. We did not adjust drug spending for regional price differences because the variation in drug prices among regions was negligible. To account for the difference in population mix across regions, we adjusted for three major categories of beneficiary-level variables: patient demographics, insurance status, and clinical characteristics in the individual-level regressions for each outcome. All outcomes in the table are after adjustment.

Abbreviations: IP = inpatient, OP = outpatient, ER = emergency room, COV = coefficient of variation.

Table S 2. Quintile Analysis for Adjusted Pharmacy Spending and Non-drug Medical Spending Between Hospital-referral Regions and Hospital-service Areas

Panel A. Adjusted Pharmacy Spending

HSA Frequency		Quintiles of Adjusted HSA Drug Spending					Total	
		1	2	3	4	5		
Cell %	Row %	Column %						
			[\$1001, \$2580]	(\$2580, \$2815]	(\$2815, \$3022]	(\$3022, \$3260]	(\$3260, \$5261]	
Quintiles of Adjusted HRR Drug Spending	1	[\$2347, \$2740]	288 9.9 50.3 49.6	156 5.4 27.2 26.8	72 2.5 12.6 12.4	42 1.4 7.3 7.2	15 0.5 2.6 2.6	573 19.7
	2	(\$2740, \$2877]	142 4.9 26.1 24.4	178 6.1 32.7 30.6	132 4.5 24.2 22.7	63 2.2 11.6 10.8	30 1.0 5.5 5.2	545 18.7
	3	(\$2877, \$3026]	77 2.6 15.1 13.3	114 3.9 22.4 19.6	149 5.1 29.3 25.6	107 3.7 21.0 18.4	62 2.1 12.2 10.7	509 17.5
	4	(\$3026, \$3178]	56 1.9 8.1 9.6	99 3.4 14.3 17.0	161 5.5 23.3 27.7	200 6.9 28.9 34.4	175 6.0 25.3 30.1	691 23.8
	5	(\$3178, \$4211]	18 0.6 3.1 3.1	35 1.2 5.9 6.0	68 2.3 11.5 11.7	170 5.8 28.8 29.2	299 10.3 50.7 51.5	590 20.3
Total			581 20.0	582 20.0	582 20.0	582 20.0	581 20.0	2908 100

Panel B. Adjusted Non-drug Medical Spending

HSA Frequency		Quintiles of Adjusted HSA Drug Spending					Total	
		1	2	3	4	5		
Cell %	Row %	Column %						
			[\$6487, \$10532]	(\$10532, \$11425]	(\$11425, \$12246]	(\$12246, \$13269]	(\$13269, \$23888]	
Quintiles of Adjusted HRR Drug Spending	1	[\$8123, \$10864]	267 9.2 54.0 46.0	121 4.2 24.5 20.8	57 2.0 11.5 9.8	35 1.2 7.1 6.0	14 0.5 2.8 2.4	494 17.0
	2	(\$10864, \$11482]	163 5.6 26.8 28.1	187 6.4 30.7 32.1	141 4.8 23.2 24.2	82 2.8 13.5 14.1	36 1.2 5.9 6.2	609 20.9
	3	(\$11482, \$12130]	90 3.1 14.0 15.5	159 5.5 24.7 27.3	171 5.9 26.6 29.4	141 4.8 21.9 24.2	83 2.9 12.9 14.3	644 22.1
	4	(\$12130, \$12836]	45 1.5 7.1 7.7	89 3.1 14.0 15.3	156 5.4 24.6 26.8	199 6.8 31.3 34.2	146 5.0 23.0 25.1	635 21.8
	5	(\$12836, \$19478]	16 0.6 3.0 2.8	26 0.9 4.9 4.5	57 2.0 10.8 9.8	125 4.3 23.8 21.5	302 10.4 57.4 52.0	526 18.1
Total			581 20.0	582 20.0	582 20.0	582 20.0	581 20.0	2908 100

This table shows a cross-tab of HSA spending quintiles and HRR spending quintiles, with Panel A based on adjusted drug spending and Panel B based on adjusted non-drug medical spending. Each cell represents the number of HSAs falling into that row and column. The columns are defined based on dividing HSAs into spending quintiles. The first column of Panel A, for example, is HSAs with less than \$2580 annual adjusted drug spending. Thus there are by definition 20% of HSAs in each column. The rows are defined based on dividing HRRs into quintiles of HRR spending and then looking at the HSAs within those HRRs. The first row of Panel A, for example, is HSAs located within HRRs where the average adjusted annual drug spending is less than \$2740 (threshold of 1st quintile of HRR drug spending). Thus there may be more or fewer than 20% of HSAs represented in each row. The more geographically clustered together HSAs are based on their spending level, the more they should be located in the diagonal cells.

Table S 3. Sensitivity Analysis With Exclusion of Risk Scores in the Model: Quintile Analysis for Adjusted Pharmacy Spending and Non-drug Medical Spending Between Hospital-referral Regions and Hospital-service Areas

Panel A. Adjusted Pharmacy Spending

HSA Frequency		Quintiles of Adjusted HSA Drug Spending					Total	
		1	2	3	4	5		
Cell %	Row %	Column %						
			[\$806, \$2495]	(\$2495, \$2763]	(\$2763, \$3002]	(\$3002, \$3263]	(\$3263, \$5563]	
Quintiles of Adjusted HRR Drug Spending	1	[\$2222, \$2687]	307 10.6 52.9 52.8	157 5.4 27.1 27.0	67 2.3 11.6 11.5	40 1.4 6.9 6.9	9 0.3 1.6 1.5	580 19.9
	2	(\$2687, \$2844]	135 4.6 24.4 23.2	185 6.4 33.4 31.8	138 4.7 24.9 23.7	72 2.5 13.0 12.4	24 0.8 4.3 4.1	554 19.1
	3	(\$2844, \$3008]	77 2.6 14.9 13.3	124 4.3 24.0 21.3	154 5.3 29.8 26.5	108 3.7 20.9 18.6	53 1.8 10.3 9.1	516 17.7
	4	(\$3008, \$3187]	47 1.6 7.0 8.1	87 3.0 12.9 14.9	148 5.1 21.9 25.4	220 7.6 32.5 37.8	174 6.0 25.7 29.9	676 23.2
	5	(\$3187, \$4548]	15 0.5 2.6 2.6	29 1.0 5.0 5.0	75 2.6 12.9 12.9	142 4.9 24.4 24.4	321 11.0 55.2 55.2	582 20.0
	Total		581 20.0	582 20.0	582 20.0	582 20.0	581 20.0	2908 100

Panel B. Adjusted Non-drug Medical Spending

HSA Frequency		Quintiles of Adjusted HSA Drug Spending					Total	
		1	2	3	4	5		
Cell %	Row %	Column %						
			[\$4569, \$9706]	(\$9706, \$10860]	(\$10860, \$11993]	(\$11993, \$13348]	(\$13348, \$28276]	1
Quintiles of Adjusted HRR Drug Spending	1	[\$5993, \$10175]	311 10.7 58.0 53.5	144 5.0 26.9 24.7	59 2.0 11.0 10.1	14 0.5 2.6 2.4	8 0.3 1.5 1.4	536 18.4
	2	(\$10175, \$11084]	143 4.9 26.7 24.6	184 6.3 34.4 31.6	135 4.6 25.2 23.2	61 2.1 11.4 10.5	12 0.4 2.2 2.1	535 18.4
	3	(\$11084, \$11991]	80 2.8 12.5 13.8	149 5.1 23.2 25.6	191 6.6 29.8 32.8	166 5.7 25.9 28.5	55 1.9 8.6 9.5	641 22.0
	4	(\$11991, \$13046]	39 1.3 5.9 6.7	89 3.1 13.4 15.3	150 5.2 22.6 25.8	230 7.9 34.7 39.5	155 5.3 23.4 26.7	663 22.8
	5	(\$13046, \$23200]	8 0.3 1.5 1.4	16 0.6 3.0 2.7	47 1.6 8.8 8.1	111 3.8 20.8 19.1	351 12.1 65.9 60.4	533 18.3
Total			581 20.0	582 20.0	582 20.0	582 20.0	581 20.0	2908 100

This table shows a cross-tab of HSA spending quintiles and HRR spending quintiles, with Panel A based on adjusted drug spending and Panel B based on adjusted non-drug medical spending. Each cell represents the number of HSAs falling into that row and column. The columns are defined based on dividing HSAs into spending quintiles. The first column of Panel A, for example, is HSAs with less than \$2495 annual adjusted drug spending. Thus there are by definition 20% of HSAs in each column. The rows are defined based on dividing HRRs into quintiles of HRR spending and then looking at the HSAs within those HRRs. The first row of Panel A, for example, is HSAs located within HRRs where the average adjusted annual drug spending is less than \$2687 (threshold of 1st quintile of HRR drug spending). Thus there may be more or fewer than 20% of HSAs represented in each row. The more geographically clustered together HSAs are based on their spending level, the more they should be located in the diagonal cells.