



Association of Declines in End-of-Life Health Care Costs With Fee-for-Service Enrollee Per Capita Expenditures

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Introduction

A dominant health policy narrative is that end-of-life (EOL) spending is a key driver of health care cost growth.¹ Recent studies suggest that EOL care intensity is rising² and that increased spending on hospice care costs more than it saves,³ raising concerns that per capita expenditures on EOL care might further accelerate.

Nonetheless, between 2000 and 2014, annual fee-for-service (FFS) Medicare spending growth was lower for decedents than for survivors,⁴ and real reductions in per capita Medicare FFS expenditures attributed to decedents accounted for most of Medicare's cost growth mitigation between 2009 and 2014.⁵ We sought to determine whether that pattern has continued.

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Methods

In this cross-sectional study, between October 1 and December 1, 2019, we examined Medicare FFS beneficiaries who were continuously enrolled in Parts A and B for at least 2 consecutive years (or until death in the second year) between 2011 and 2017. We calculated decedents' Part A and B expenditures for the 365 days before death and removed them from the prior year's survivor cohort, for which we calculated Part A and B expenditures for the calendar year. We attributed decedents' expenditures in their final year of life to the year of their death.

We calculated annual consumer price index–adjusted per capita expenditures overall and in 6 categories: inpatient (hospital or skilled nursing facility), physician, outpatient hospital, home health, hospice, and durable medical equipment. As described elsewhere,⁵ we attributed those expenditures to survivors and decedents for each year from 2012 through 2017.

For survivors and decedents, we examined absolute and relative changes in overall and category-specific attributed per capita expenditure annual growth rates for all FFS Medicare beneficiaries, for those enrolled in an accountable care organization (ACO; limited to 2013 through 2017), for dual-eligible beneficiaries, and for those living in the least and most economically distressed communities (as determined by zip code–level Distressed Communities Index scores, described elsewhere⁶).

This work was conducted following Solutions Institutional Review Board approval as non-human subject research, with Centers for Medicare and Medicaid approval. The report follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Results

A total of 41 252 443 Medicare FFS beneficiaries were included in this study from 2012 to 2017, with 8 424 016 decedents (4 527 894 women [54%]; mean [SD] age, 78 [12] years) and 32 828 427 survivors (18 105 323 women [55%]; mean [SD] age, 67 [12] years). Year-over-year growth rates in attributed per capita outpatient hospital care expenditures were positive for decedents and survivors throughout the period examined (among decedents, growth rates of 1.8% in 2012-2013, 2.5% in 2013-2014, 5.9% in 2014-2015, 1.2% in 2015-2016, and 4.2% in 2016-2017; among survivors, growth

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rates of 2.0% in 2012-2013, 5.2% in 2013-2014, 4.7% in 2014-2015, 2.8% in 2015-2016, and 3.9% in 2016-2017) (Table 1). Aside from home health and hospice care, decedents' attributed per capita expenditure growth generally was lower than survivors' (for example, year-over-year growth rates for decedents' physician care were 1.6% lower than survivors' in 2012-2013, 3.2% lower in 2013-2014, 1.3% lower in 2014-2015, 3.9% lower in 2015-2016, and 0.5% lower in 2016-2017). Invariably, attributable per capita cost growth was lower for decedents than for survivors (decedents' total per capita cost growth rates were 0.9% lower than survivors' in 2012-2013, 2.8% lower in 2013-2014, 0.4% lower in 2014-2015, 2.4% lower in 2015-2016, and 0.7% lower in 2016-2017).

Between 2012 and 2017, decedents' relative spending reductions were greatest among those enrolled in ACOs (total relative change in spending was 18% lower for decedents than for survivors) and least among the dually eligible (total relative change in spending was 3% lower for decedents than for survivors) (Table 2). Beneficiaries dying in the most economically distressed communities had greater relative spending reductions than did those dying in the least distressed communities (total relative changes in spending, -16% vs -10%).

Discussion

Between 2012 and 2017, year-over-year overall and service-specific growth rates in inflation-adjusted Medicare FFS per capita expenditures attributable to decedents and survivors were generally negative, except in 2014 to 2015. Growth rates for home health and hospice services were higher

Table 1. Inflation-Adjusted Per Capita Expenditures in 2012 and Year-Over-Year Growth in Inflation-Adjusted Expenditures Attributed to Decedents and Survivors^a

Expenditure	2012 Per Capita Expenditures (in 2017 Dollars), \$	Year-Over-Year Change in Inflation-Adjusted Spending Growth Rates, %				
		2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Attributed to decedents						
Inpatient	1718	-2.5	-4.3	1.3	-3.4	-1.3
Physician	453	-3.8	-3.1	1.3	-3.5	0.1
Outpatient hospital	244	1.8	2.5	5.9	1.2	4.2
Home health	124	-2.9	-2.3	2.3	-2.7	-1.3
Hospice	276	-1.6	-2.8	0.4	1.8	1.9
DME	44	-6.8	-15.9	-1.4	-7.2	-13.0
Total	2860	-2.3	-3.4	1.6	-2.5	-0.4
Attributed to survivors						
Inpatient	3345	-1.1	-2.4	0.2	-1.1	-0.8
Physician	2527	-2.2	0.2	2.6	0.4	0.6
Outpatient hospital	1502	2.0	5.2	4.7	2.8	3.9
Home health	471	-2.8	-4.5	1.4	-3.3	-3.4
Hospice	97	-4.4	-8.2	2.7	-2.9	0.7
DME	278	-13.0	-10.8	4.3	-7.6	-7.7
Total	8219	-1.4	-0.6	2.0	-0.1	0.3
Decedents' minus survivors' year-over-year expenditure growth rate						
Inpatient	NA	-1.4	-1.9	1.1	-2.4	-0.5
Physician	NA	-1.6	-3.2	-1.3	-3.9	-0.5
Outpatient hospital	NA	-0.2	-2.7	1.2	-1.6	0.3
Home health	NA	-0.1	2.2	0.9	0.5	2.0
Hospice	NA	2.8	5.3	-2.3	4.7	1.2
DME	NA	6.2	-5.2	-5.8	0.4	-5.2
Total	NA	-0.9	-2.8	-0.4	-2.4	-0.7

Abbreviations: DME, durable medical equipment; NA, not applicable.

^a Relative year-over-year growth of decedents' minus survivors' per capita expenditure growth is shown at the bottom of the table. Negative values indicate a negative growth rate.

Table 2. Number of Beneficiaries and Per Capita Expenditures Attributed to Survivors and Decedents in 2012 and 2017

Cohort	Overall Per Capita Expenditures (in 2017 Dollars), \$				Relative Change in Decedent Spending, %
	Survivors		Decedents		
	2012	2017	2012	2017	
All					
No. of beneficiaries	25 894 756	26 549 803	1 418 804	1 393 901	NA
Total per capita Part A and B spending	8219	8235	2860	2663	-7
Inpatient	3345	3176	1718	1547	-5
Physician	2527	2565	453	413	-10
Outpatient hospital	1502	1802	244	285	-3
Home health	471	414	124	116	6
Hospice	97	86	276	275	13
DME	278	191	44	28	-10
ACO enrolled^a					
No. of beneficiaries	2 672 401	6 674 400	116 797	245 523	NA
Total per capita Part A and B spending	8933	8986	2413	1996	-18
Inpatient	3643	3377	1482	1169	-15
Physician	2868	2942	397	328	-20
Outpatient hospital	1623	1969	220	242	-9
Home health	477	434	102	91	-2
Hospice	70	53	177	143	7
DME	252	210	35	22	-23
Dual eligible					
No. of beneficiaries	5 250 135	4 846 544	368 071	341 429	NA
Total per capita Part A and B spending	11 193	11 191	4072	3947	-3
Inpatient	4985	4899	2575	2439	-4
Physician	2684	2670	587	565	-3
Outpatient hospital	2110	2513	348	414	0
Home health	800	652	148	132	10
Hospice	154	142	347	352	10
DME	459	314	68	45	-3
Least distressed					
No. of beneficiaries	6 000 442	6 736 148	311 671	323 951	NA
Total per capita Part A and B spending	8091	8181	2727	2474	-10
Inpatient	2032	2156	541	517	-10
Physician	414	397	122	118	1
Outpatient hospital	2641	2489	1258	1113	-6
Home health	2654	2881	454	400	-19
Hospice	95	90	313	304	3
DME	254	168	39	23	-12
Most distressed					
No. of beneficiaries	4 597 128	4 258 715	263 830	245 970	NA
Total per capita Part A and B spending	7558	8581	3147	3017	-16
Inpatient	2018	2549	597	632	-16
Physician	378	497	144	125	-34
Outpatient hospital	2638	2910	1631	1520	-16
Home health	2156	2309	478	452	-12
Hospice	96	90	245	253	10
DME	273	226	52	35	-19

Abbreviations: ACO, accountable care organization; DME, durable medical equipment; NA, not applicable.

^a For the ACO-enrolled cohort, the baseline year is 2013.

among decedents than survivors; otherwise, growth generally was lower for decedents than for survivors. Among defined cohorts, decedents who had been enrolled in an ACO or who died in more economically distressed communities had the greatest relative spending declines, but all cohorts experienced relative increases in decedents' attributable per capita hospice care expenditures.

Although this study is limited by its focus on the 2012 to 2017 FFS Medicare population, its findings suggest that EOL care is not a driver but rather a mitigator of Medicare FFS cost growth, seemingly because EOL care patterns continue to shift to less intensive, more conservative care strategies. Although we could not adjust for demographic or health differences in our defined cohorts, main outcomes were robust across all of them. More study is required to understand the reasons for that shift, whether relative reductions in EOL expenditures influence care quality, and why relative changes in per capita expenditures on decedents varied so dramatically across the cohorts we examined.

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REFERENCES

1. Riley GF, Lubitz JD. Long-term trends in Medicare payments in the last year of life. *Health Serv Res*. 2010;45(2):565-576. doi:[10.1111/j.1475-6773.2010.01082.x](https://doi.org/10.1111/j.1475-6773.2010.01082.x)
2. Aldridge MD, Bradley EH. Epidemiology And patterns of care at the end of life: rising complexity, shifts in care patterns and sites of death. *Health Aff (Millwood)*. 2017;36(7):1175-1183. doi:[10.1377/hlthaff.2017.0182](https://doi.org/10.1377/hlthaff.2017.0182)
3. Gozalo P, Plotzke M, Mor V, Miller SC, Teno JM. Changes in Medicare costs with the growth of hospice care in nursing homes. *N Engl J Med*. 2015;372(19):1823-1831. doi:[10.1056/NEJMsa1408705](https://doi.org/10.1056/NEJMsa1408705)
4. Cubanski J, Neuman T, Griffin S, Damico A. Medicare spending at the end of life: a snapshot of beneficiaries who died in 2014 and the cost of their care. The Kaiser Family Foundation. July 2016. Accessed October 23, 2019. <http://files.kff.org/attachment/Data-Note-Medicare-Spending-at-the-End-of-Life>

5. Weeks WB, Kirkland KB, Freeh C, Weinstein JN. Proportion of decedents' expenditures among recent reductions in Medicare expenditures. *JAMA Intern Med.* 2018;178(5):717-719. doi:[10.1001/jamainternmed.2017.8213](https://doi.org/10.1001/jamainternmed.2017.8213)
6. Weeks WB, Ouayogodé MHL, Ventelou B, Mackenzie T, Weinstein JN. Community economic distress and changes in Medicare patients' end-of-life care costs. *J Palliat Med.* 2018;21(6):742-743. doi:[10.1089/jpm.2018.0047](https://doi.org/10.1089/jpm.2018.0047)