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# End-Of-Life Medical Spending In Last Twelve Months Of Life Is Lower Than Previously Reported

**ABSTRACT** Although end-of-life medical spending is often viewed as a major component of aggregate medical expenditure, accurate measures of this type of medical spending are scarce. We used detailed health care data for the period 2009–11 from Denmark, England, France, Germany, Japan, the Netherlands, Taiwan, the United States, and the Canadian province of Quebec to measure the composition and magnitude of medical spending in the three years before death. In all nine countries, medical spending at the end of life was high relative to spending at other ages. Spending during the last twelve months of life made up a modest share of aggregate spending, ranging from 8.5 percent in the United States to 11.2 percent in Taiwan, but spending in the last three calendar years of life reached 24.5 percent in Taiwan. This suggests that high aggregate medical spending is due not to last-ditch efforts to save lives but to spending on people with chronic conditions, which are associated with shorter life expectancies.

The high medical expenses that people incur close to death have attracted considerable interest from academics and policy makers over the past thirty years, particularly in the United States. Many consider unnecessary end-of-life care to be a major source of wasteful medical spending.<sup>1</sup> Despite this interest, evidence on medical spending shortly before death is relatively scarce and often based on incomplete measures of expenditure. More than two decades ago Ezekiel Emanuel and Linda Emanuel calculated that only about 10–12 percent of total US medical spending occurred during the year of death.<sup>1</sup> Not much follow-up evidence has emerged since then. Melissa Aldridge and Amy Kelley estimated a slightly higher end-of-life spending fraction, 13 percent, but relied extensively on imputations.<sup>2</sup> Gerald Riley and James Lubitz found that Medicare spending

during the last year of life was one-quarter of total Medicare spending, a fraction essentially unchanged from thirty years before.<sup>3</sup> However, because Medicare covers the expenses only of the elderly and disabled and does not pay for long-term care and other services, Riley and Lubitz's results might not be representative of health spending as a whole.

Cross-country comparison of end-of-life medical spending has been difficult because most studies examine just one country, and each of those studies uses a different measure of medical spending. This is unfortunate; there is much to be learned by comparing end-of-life spending across countries with different mechanisms for the funding and provision of health care. Johan Polder and coauthors estimate that medical spending at the end of life constitutes 11 percent of total medical spending in the Netherlands, and they speculate that it may be higher in the

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United States.<sup>4</sup> Recently, Justin Bekelman and coauthors compared end-of-life spending on hospital treatment for cancer patients across seven countries.<sup>5</sup> They found the United States to have just above the median hospital spending per decedent and to have the lowest fraction of decedents who died in the hospital. It is not clear whether these results extend to more comprehensive measures of health expenditure, which include long-term care spending and end-of-life spending due to all causes of death.

We addressed these gaps in the evidence by estimating end-of-life spending in Canada (Quebec only), Denmark, England, France, Germany, Japan, the Netherlands, Taiwan, and the United States, using consistent methods and a comprehensive measure that includes spending on both health care and long-term care. We estimated spending over the last twelve months and the last three calendar years of life, which allowed us to assess the rate at which medical expenditures accrue and change in composition as patients approach death. We found that spending at the end of life is modest relative to overall spending and that the ratio of end-of-life to overall spending is relatively similar across very different health care systems.

## Study Data And Methods

**DATA** Our analysis was based on individual-level medical spending, using data sets from nine countries. Comparing these countries revealed that there is no one-to-one mapping between how a country's health care services are funded and how they are provided, nor between the funding (and provision) of health care and that of long-term care. In the United States, most health care costs for people under age sixty-five are funded through private health insurance, although many poor and disabled people receive government-provided insurance. Medicare provides public health insurance to almost everyone ages sixty-five and older. But while Medicare pays for most expenses related to short-term hospital stays, doctor visits, and pharmaceuticals, in general it does not pay for nonrehabilitation long-term nursing-home stays. These costs are paid for out of pocket or by Medicaid, a means-tested public program.

Denmark and England both have health care systems primarily funded through taxation and dominated by public-sector provision of care. Long-term care is largely paid for by public sources in Denmark but is mainly privately funded and provided in England. In the Canadian province of Quebec, health care is funded through taxation, but providers are in the private sector.

The remaining countries in our study—France,

Germany, Japan, the Netherlands, and Taiwan—finance health care through mandatory insurance. Public-sector involvement in the provision of insurance and health services varies across these countries. For example, in the Netherlands all hospitals are private, whereas most hospitals in France are publicly owned.

Most of the countries that we studied provide nationally representative end-of-life data. The exceptions are Germany and Japan, each of which rely on data from a single insurance company. The data for these two countries are therefore not fully representative, but they are highly accurate and include many types of care. The US data we used accurately measure medical spending, but only for the population ages sixty-five and older—whose members account for 73 percent of all deaths in the United States. For the United States, we assumed that average end-of-life medical spending for people younger than sixty-five is the same as end-of-life spending for older people. The online Appendix provides evidence that this is a reasonable assumption; it also contains a detailed description of our data sources, including more information on the financing and provision of both health care and long-term care in each country.<sup>6</sup>

**METHODS** To estimate the fraction of aggregate annual medical spending that occurs in the final years of life, we used two measures: spending in the last twelve months of life and spending in the last three calendar years of life. For ease of comparison, we restricted all samples to people who died in 2011. Medical spending in the last three calendar years of life was the sum of medical spending in calendar years 2009–11.

Because the data we used are collected annually, the data for 2011 mix together those who died in January 2011 (and so had only one month of spending in the calendar year of death) and those who died in December 2011 (and so had twelve months of spending in that year), along with those dying in other months. For some countries (Denmark, England, Germany, and Taiwan) we measured exact total medical spending over the twelve months before death, using data from both 2011 and 2010. For the remaining countries, the data were from 2011 only and therefore did not directly measure medical spending in the last twelve months of life. We followed the approach of Donald Hoover and coauthors<sup>7</sup> and regressed medical spending for calendar year 2011 on the number of months between the start of 2011 and the month of death of each decedent. To allow a flexible fit to the data, we also included the square of the number of months and its square root in the regression. We used the resulting regression estimates to predict medical spending over the last twelve

months of life. The Appendix provides more details about this technique and presents spending measures for the last three and six months of life and the last calendar year of life.<sup>6</sup>

Our microdata measured personal health care expenditures, defined as total expenditures less such expenditures as those for research and development. Although the data are high quality, in many countries the way in which these data are recorded causes the microdata averages not to match aggregate spending statistics. We adjusted our estimates to account for known sources of under- or overrecording so that the mean per capita medical spending in our microdata matched the national aggregate. We describe and justify these adjustments in the Appendix.<sup>6</sup>

**LIMITATIONS** There were several limitations to our analysis. First, we did not have complete data on spending on all types of care for all countries. Yet for the most commonly observed measure—spending on hospital care—similar patterns of end-of-life spending were apparent across countries.

Second, we did not adjust for the level of health and the causes of death across countries. Having a higher fraction of decedents with dementia, for example, could lead to higher end-of-life spending in a given country.<sup>8</sup>

Third, we were not able to judge the quality of care among decedents across countries. For these reasons, we could not judge which country's rate or composition of end-of-life spending is the "right" one.

Finally, because the organization and funding of health care occurs at the provincial level in Canada, we used data from the province of Quebec, the country's second-most-populous province. However, with the exception of language, Quebec is largely representative of Canada as a whole.

## Study Results

Mean per capita medical spending in the last twelve months of life is high, reaching \$80,000 in the United States, over \$60,000 in Denmark and the Netherlands, and over \$50,000 for Germany (Exhibit 1). Medical spending is high also during the last three calendar years of life (Exhibit 2). The composition of the spending changes across periods, however, at least in the countries for which we had complete data. Hospital spending typically represents a greater percentage of spending in the last twelve months of life than in the last three calendar years of life. For example, in the United States hospital spending accounts for 44.2 percent of spending in the last twelve months, compared to 36.3 percent in the last three years. The

share of hospital spending is even higher in the final three months of life (57.6 percent for the United States), the results for which are shown in the Appendix.<sup>6</sup> Compared to the last twelve months of life, in the last three years of life the share of spending on long-term care, which includes nursing home care, is higher. Finally, hospital spending, the one measure we observed in all data sets, varied greatly across countries.

Although dying is expensive in all of the countries we studied, the fraction of each country's population that dies in a given year is small. Medical spending in the last twelve months of life accounted for approximately 8–11 percent of aggregate medical spending in most countries, with the United States spending the least (8.5 percent) and Taiwan the most (11.2 percent) (Exhibit 3). There was no strong association between this percentage and the type of health care system in a given country. Medical spending in the last three calendar years of life accounted for approximately twice the percentage of aggregate medical spending as spending in the last twelve months of life did, ranging from 16.7 percent in the United States to 24.5 percent in Taiwan.

The greatest variation across countries in spending by category was in hospital spending. That spending ranged from 8.2 percent in Japan to 22.7 percent in Quebec in the last twelve months of life, and from 13.5 percent in Japan to 34.9 percent in Taiwan in the last three calendar years of life (Exhibit 3). The United States is toward the bottom of the range for both periods. The potential implications are twofold. First, the larger variation in hospital spending relative to the variation in total spending is consistent with health care systems' using differing combinations of services to provide care for people at the end of life. Second, previous work that has focused on hospital spending may have overestimated the variation in total end-of-life spending across countries.<sup>5</sup>

As is well known, health care spending accounts for a much larger share of the gross domestic product (GDP) in the United States than in any other developed country. Exhibit 4 shows that even though the United States devotes a smaller fraction of its health care spending to people at the end of life, compared to most of the other countries examined here, it still devotes a similar if not larger fraction of its GDP to end-of-life care.

## Discussion

At least since Anne Scitovsky's pioneering study on end-of-life health spending,<sup>9</sup> analysts have noted the high cost of dying, with some suggesting that these costs are central to understanding

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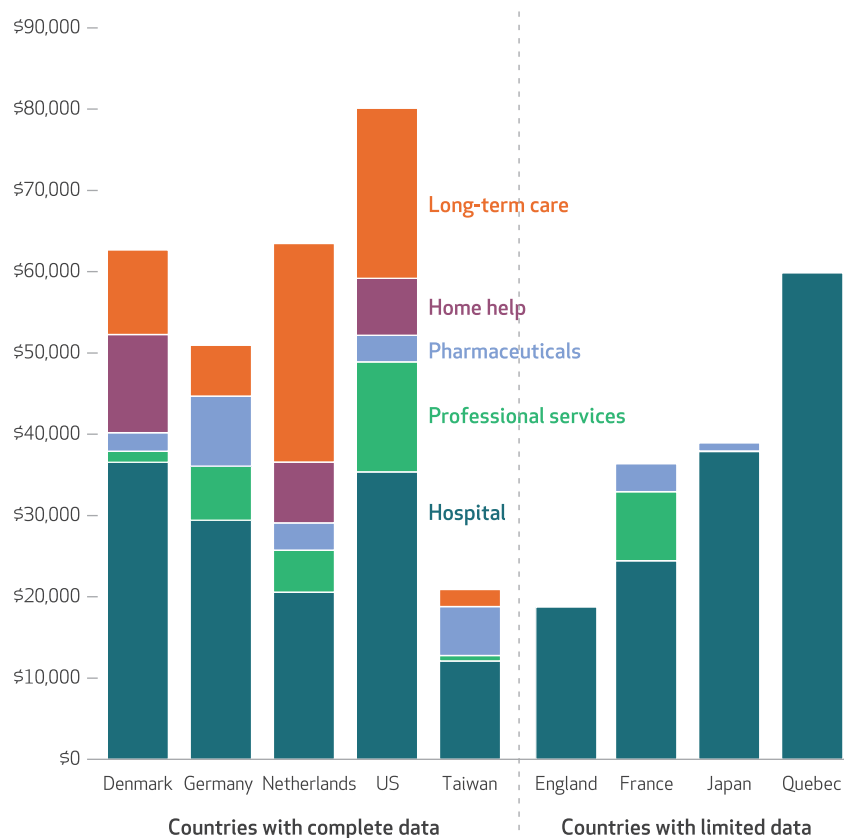
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## EXHIBIT 1

Mean per capita medical spending (in 2014 US dollars) in 9 countries in the last 12 months of life, by category of spending



**SOURCE** Authors' analysis of administrative or insurance data for each region. The Appendix provides a full description of country- or province-specific data sources (see Note 6 in text). **NOTES** The year of death is 2011 except for Denmark and France, for which the years of death are 2012 and 2013, respectively. Hospital spending refers to both inpatient and outpatient care except in England, France, and Quebec, for which it refers to inpatient care only. The Japanese data include only hospitals, dentists (counted as professional services), and pharmaceuticals. Long-term care includes home help for Taiwan. The German data include all spending except for home help and therefore may not be directly comparable to data for the other countries with complete data.

why health care spending rises with age.<sup>10</sup> Nonetheless, comparisons of end-of-life spending across countries remain relatively scarce. We used high-quality data from eight countries and the Canadian province of Quebec to examine medical spending in the last three years of life. We found, as others have done,<sup>1</sup> that end-of-life care is expensive, but not necessarily as concentrated in the last twelve months of life as is often claimed. In fact, the share of health care expenditures devoted to care in the last twelve months of life is relatively modest, ranging from 8.5 percent to 11.2 percent.

The United States is a clear outlier in total medical spending as a share of GDP, but the share of US health care spending that goes to people in the last twelve months of life is toward the bottom of the range of estimates for the nine

countries that we studied. And while spending in dollar terms is still higher in the United States—because the country spends so much per capita on health care—the exceptionalism of US health care spending does not translate into a higher share for end-of-life care.<sup>11</sup> While our findings may appear to be inconsistent with those of Bekelman and coauthors,<sup>5</sup> who found end-of-life spending in the United States to be in the middle of spending for seven countries, their study used a “purchasing power parity” approach that adjusted away the higher prices charged in the United States, compared to European countries.<sup>12</sup> By contrast, we included any price differences across countries in our comparisons.<sup>13</sup>

The composition of end-of-life spending varies greatly, with some countries spending considerably more on long-term care and less on acute care. While our sample of countries is small, our findings also suggest that countries with stronger long-term care sectors tend to have less acute care spending, which might indicate some substitution of services across the two sectors. For example, in the Netherlands, approximately half of spending at the end of life is attributable to long-term care, while hospital spending is relatively modest. One possibility is that nursing homes in the Netherlands are more likely than other countries to have medical care on site, which means that residents are able to receive medical care without a stay in the hospital. In such a case, it is unclear whether costs have been reduced overall or just shifted from one category to another.

Our results thus suggest that while some terminal illnesses generate short periods of concentrated expenditure, many are the culmination of chronic conditions. Using US administrative data to plot medical spending trajectories near the end of life, Matthew Davis and coauthors reached similar conclusions.<sup>14</sup> They found that while 49 percent of decedents had “high persistent spending,” only 12 percent had “late rise spending.”

### Policy Implications

Since the 1980s there have been many proposals to reform end-of-life care, including using patient directives that stipulate preferences for end-of-life care in advance of life-threatening conditions, greater use of hospice and home care in place of medical treatment, and hospital guidelines for the identification and reduction of futile care. Although these proposals have been motivated in large part by a desire to improve care quality, their advocates have often argued that the measures would also reduce wasteful spending.<sup>1,8</sup> The success of these ap-

proaches in reducing costs has been decidedly mixed.<sup>15-17</sup>

Efforts to reform end-of-life care have often proved highly controversial. The Affordable Care Act in the United States initially included provisions to pay physicians to counsel patients about advance directives and end-of-life decisions. Political opponents decried these as “death panels,” and the relevant provisions were ultimately removed from the legislation.<sup>18</sup> However, a Medicare provision was subsequently included that reimbursed physicians for advance care planning discussions with patients.<sup>18</sup> In the United Kingdom, decisions by the National Institute for Health and Care Excellence to deny National Health Service patients access to expensive, but not cost-effective, cancer drugs have sometimes been difficult to implement in the face of public pressure.<sup>19</sup>

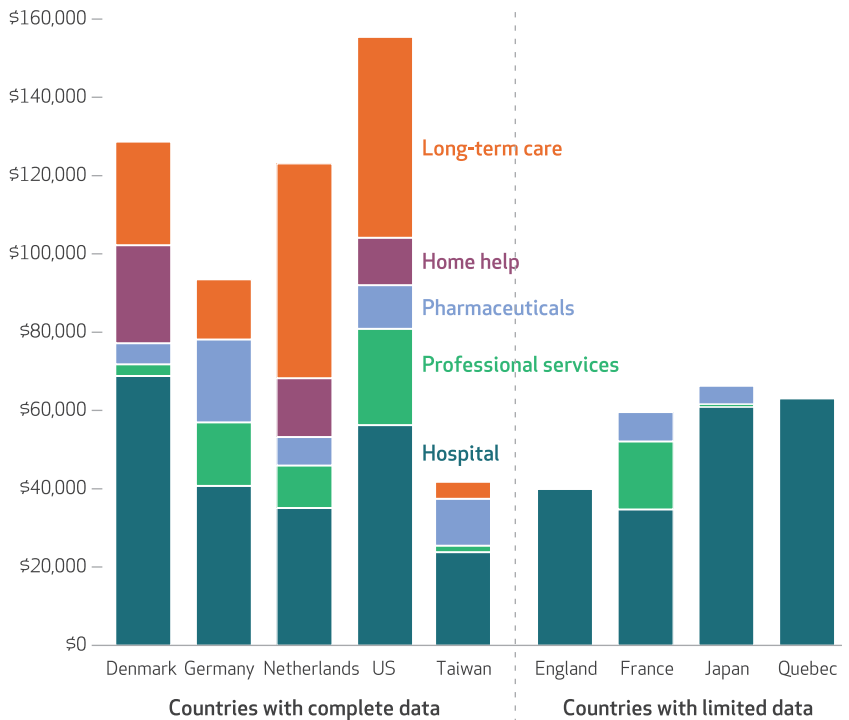
Achieving the appropriate balance between spending on long-term care for the chronically ill, nursing care for the terminally ill, and hospital care for the acutely ill is a major challenge for health systems under pressure from the costs of an aging population. It is interesting to note that the Netherlands has relatively low hospital expenditures at the end of life, but high spending on long-term care. In England, austerity measures designed to improve public finances resulted in large cuts to social care and long-term care, while funding for health care was protected. The impact of these measures on the quality and quantity of long-term care provided to the elderly and the consequent increased pressures on public hospitals have sparked a fierce political debate. Partly in response, England’s Better Care Fund was established in 2013 to improve the coordination of health care and social care services, which are provided by separate public institutions. This has resulted in the voluntary transfer of money by the National Health Service, which provides health care, to publicly funded long-term care, which is provided by local governments.

US efforts to increase the share of end-of-life spending accounted for by hospice care have been successful, as shown by rising rates of hospice care. Yet this paradigm shift has not been accompanied by a reduction in end-of-life costs, since hospice care is also expensive and inpatient care costs have not fallen commensurately.<sup>20</sup>

Our finding that end-of-life costs account for a modest fraction of total medical spending suggests that none of these measures is likely to have a large impact on aggregate health care cost growth. For example, since spending in the last twelve months of life in the United States is only 8.5 percent of total health expenditure, a funda-

## EXHIBIT 2

Mean per capita medical expenditure (in 2014 US dollars) in 9 countries in the last 3 calendar years of life, by category



**SOURCE** Authors’ analysis of administrative or insurance data for each region. The Appendix provides a full description of country- or province-specific data sources (see Note 6 in text). **NOTE** For explanatory and descriptive notes, see Exhibit 1.

mental reorganization of end-of-life care that results in a 10 percent cut in such spending would translate to a 0.85 percent reduction in overall spending—a scaling back that would be swamped by normal growth in health care costs. The fact that, compared to spending in the last twelve months of life, spending in the last three years of life is a much greater share of overall spending—accounting for as much as 24.5 percent (in Taiwan) of overall costs—points to the greater importance of cost reduction in the treatment of high-risk patients with chronic conditions.<sup>21</sup>

The high fraction of Medicare spending that takes place near the end of life is sometimes viewed as a reason why US health care is uniquely expensive among developed countries. Our results do not support this conjecture. First, we found that US health spending near the end of life was less than one-tenth of total US health care spending and thus cannot be the primary cause of why US health care is so much more expensive than care in other countries. Second, the fraction of medical spending devoted to end-of-life care is lower in the United States than in other countries, many of which have far lower

EXHIBIT 3

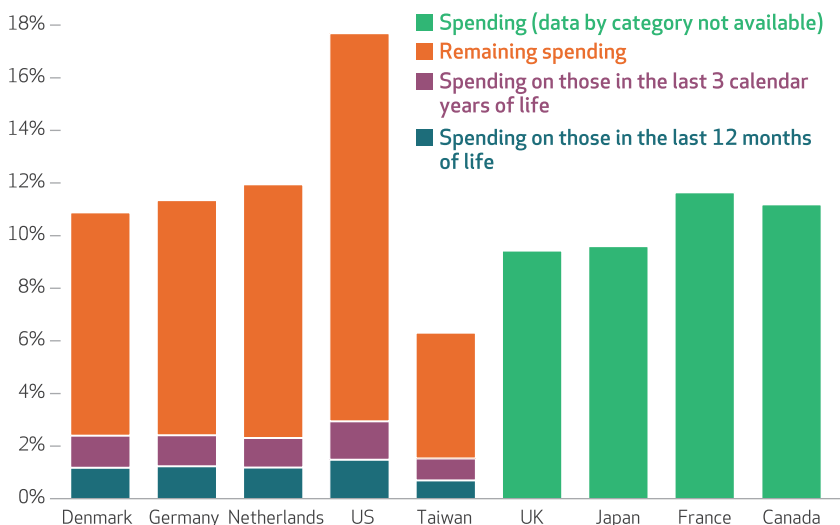
Spending on people in 9 countries at the end of life as a percentage of overall spending, by category of spending

	All medical care		Long-term care	Hospital care
	Including long-term care	Excluding long-term care		
<b>SPENDING ON PEOPLE IN THE LAST 12 MONTHS OF LIFE</b>				
Denmark	10.95%	9.97%	21.74%	10.01%
England	— <sup>a</sup>	— <sup>a</sup>	— <sup>a</sup>	14.59
France	— <sup>a</sup>	8.50	— <sup>a</sup>	15.00
Germany	10.96	10.59	14.89	21.17
Japan	— <sup>a</sup>	5.93	— <sup>a</sup>	8.21
Netherlands	10.01	7.32	22.12	8.85
Quebec	— <sup>a</sup>	— <sup>a</sup>	— <sup>a</sup>	22.73
Taiwan	11.20	10.10	23.08	15.53
United States	8.45	7.11	18.12	9.91
<b>SPENDING ON PEOPLE IN THE LAST 3 CALENDAR YEARS OF LIFE</b>				
Denmark	22.16%	19.23%	54.24%	18.65%
England	— <sup>a</sup>	— <sup>a</sup>	— <sup>a</sup>	29.78
France	— <sup>a</sup>	14.10	— <sup>a</sup>	22.08
Germany	21.40	19.85	36.59	29.87
Japan	— <sup>a</sup>	10.36	— <sup>a</sup>	13.50
Netherlands	19.40	14.28	44.86	15.12
Quebec	— <sup>a</sup>	— <sup>a</sup>	— <sup>a</sup>	25.65
Taiwan	24.48	22.07	54.92	34.88
United States	16.70	12.77	44.92	16.27

**SOURCE** Authors' analysis of administrative or insurance data for each region. The Appendix provides a full description of country- or province-specific data sources (see Note 6 in text). **NOTE** For explanatory and descriptive notes, see Exhibit 1. <sup>a</sup>Not available.

EXHIBIT 4

Health care spending in 9 countries as a percentage of GDP overall and for the last 3 calendar years and last 12 months of life



**SOURCE** Authors' analysis of administrative or insurance data for each region from sources that are provided in the online Appendix (see Note 6 in text). **NOTES** All spending is for 2011 from the OECD item except for Taiwan (2012). The percentages of gross domestic product (GDP) come from multiplying the percentages in Exhibit 3 by health care spending as a percentage of GDP. This could be calculated only for the group of countries for which we had a percentage for "All medical care, including long-term care" in Exhibit 3. Values for England and Quebec were unavailable, so values for the United Kingdom and Canada are displayed instead. Spending categories are mutually exclusive.

total spending—which suggests that high medical spending shortly before death is common to all health care systems.

Our finding that restraining end-of-life spending would only modestly restrain total medical spending is in no way an argument against reform. Exhibit 4 shows that a country's medical spending in the last three years of life usually exceeds 2 percent of its GDP. The potential cost savings may be large. Perhaps an even stronger argument for focusing on end-of-life care is to improve the quality of care for the growing elderly population, who face the risk of expensive and painful therapy at the end of life.<sup>1</sup> Examples of these low-quality treatments include regular treatments instead of early palliative care for metastatic lung cancer,<sup>22</sup> burdensome transitions for patients near death,<sup>23</sup> and the use of feeding tubes in patients with dementia.<sup>23-25</sup> We hope that health systems can learn from both successful and unsuccessful approaches around the world in treating patients at high risk of dying.

**Conclusion**

The idea that reducing wasteful spending just before death can make the growth in health care costs sustainable is not supported by this study. Spending in the last twelve months of life accounted for 8.5–11.2 percent of overall spending in eight countries and Quebec, with the United States at the bottom of that ranking. Reducing this spending would thus have only a modest effect on total medical spending. In contrast, spending in the last three years of life accounted for as much as 24.5 percent of overall costs, which suggests that the focus should be on reducing the costs of caring for people with chronic conditions—many of whom are approaching death. The task of containing or reducing end-of-life spending likely requires a multifaceted approach by policy makers and clinicians. For people near death, an appropriate mix of long-term care, hospice, and home care would ensure that only those patients who wanted and needed to be in hospitals were treated there. The primary payoff would be better quality care, along with modestly lower costs. ■

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## NOTES

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