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Data from the US and eight other developed countries show that end-of-life medical spending is lower than previously reported

Abstract

Although end-of-life (EOL) medical spending is often viewed as a major component of aggregate medical expenditure, accurate measures of EOL medical spending are scarce. We use detailed health care data from nine developed countries to measure the composition and magnitude of medical spending in the three years preceding death. In all countries EOL medical spending is high relative to spending at other ages, but spending during the last 12 months of life makes up for a modest share of aggregate spending, ranging from 8.5 in the United States to 11.2 percent in Taiwan. Spending is high well before death, with up to 24.5 percent of aggregate health expenditures going to those in the last 3 years of life. This suggests that high aggregate medical costs are not due to last-ditch efforts to save lives, but to chronically ill people, many of whom eventually die.

Introduction

The high medical expenses incurred by individuals close to death have attracted considerable interest from academics and policy makers over the past thirty years, particularly in the U.S. Many consider unnecessary end-of-life (EOL) care to be a major source of wasteful medical spending.(1, 6, 8). Despite this interest, evidence on medical spending prior to death is

relatively scarce and often based on incomplete measures of expenditure. More than two decades ago, Emanuel and Emanuel calculated that only about 10-12 percent of total U.S. medical spending occurred during the year of death.(1) Not much follow-up evidence has emerged since then. Aldridge and Kelley estimate a slightly higher EOL fraction, 13 percent, but rely extensively on imputations.(2) Riley and Lubitz found that Medicare spending during the last year of life was one-quarter of total Medicare spending, a fraction essentially unchanged from 30 years before.(3) However, because Medicare only covers the expenses of the elderly and disabled, and does not pay for long-term care (LTC) and other services, Riley and Lubitz's results may not be representative of health spending as a whole.

Cross-country comparison of EOL 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, as there is much to be learned by comparing EOL spending across countries with different mechanisms for the funding and provision of health care. Polder et al. estimate that medical spending at the end of life constitutes 11 percent of total medical spending in the Netherlands, and speculate that it may be higher in the U.S.(4) Recently, Bekelman et al. compared EOL spending on hospital treatment for cancer patients across 7 countries.(5) They find the U.S to be just above the median hospital

spending per decedent and to have the lowest fraction of decedents who died in the hospital. Whether these results extend to more comprehensive measures of health expenditure, which include LTC spending and EOL spending due to all causes of death, is unclear.

We address these gaps in the evidence by estimating EOL spending in 9 countries – Canada (Quebec), Denmark, England, France, Germany, Japan, the Netherlands, Taiwan and the U.S – using consistent methods and a comprehensive measure that includes spending on both health care and LTC. We estimate spending over the last 12 months and last three years of life, which allows us to assess the rate at which medical expenditures accrue and change in composition as patients approach death. We find that spending at the end of life is modest relative to overall spending, and that the ratio of EOL spending to overall spending is relatively similar across very different health care systems.

Health Care Institutions, Datasets, and Methods

Our analysis is based on individual-level medical spending using datasets from 9 countries. Looking across these countries reveals 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 the provision) of health care and that of LTC. In the U.S., most health care costs for those under 65 are funded through private health

insurance, although many poor and disabled people receive government provided insurance. After the age of 65, Medicare provides public health insurance to almost everyone. While Medicare pays for most expenses related to short-term hospital stays, doctor visits, and pharmaceuticals, in general it does not pay for long-term non-rehabilitation nursing-home stays. These costs are paid 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. LTC is largely paid for 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 privately-owned.

A final group of countries – 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. In the Netherlands, all hospitals are private, whereas most hospitals in France are publicly owned.

Most of the countries that we consider provide nationally representative EOL data. The exceptions are Germany and Japan, with each relying on data from an individual insurance company; the data are therefore not fully representative, but are highly accurate and include many types of care. Our US data accurately measures medical spending, but only for the

age 65+ population who are responsible for 73% of all deaths in the US. For the US, we assume that EOL medical spending for those under 65 is the same as EOL spending for those over 65. The online appendix gives evidence that this is a reasonable assumption.(6) The appendix also contains detailed description of our data sources, including more information on the financing and provision of both health care and LTC in each country.(6)

We estimate the fraction of aggregate annual medical spending that occurs in the final years of life with two measures of EOL spending: spending in the last 12 months of life and spending over the last 3 calendar years of life. For ease of comparability, we restrict all samples to individuals who died in 2011. Medical spending in the last 3 calendar years of life is the sum of medical spending in calendar years 2009 through 2011.

Because our data 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 'year of death') and those who died in December 2011 (and so had 12 months of spending), along with those dying in other months. For some countries (Denmark, Germany, Taiwan and England) we measure the exact total medical spending over the previous 12 months, using data from both 2011 as well as 2010. For the remaining countries, the data is only for the calendar year 2011 and therefore does not directly measure medical spending in the last 12 months of

life. We therefore follow Hoover et al.(7) and regress 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 include the square of the number of months and its square root in the regression. We use the resulting regression estimates to predict medical spending over the last 12 months of life. The appendix provides more details about this technique and presents spending measures for the last 3 and 6 months of life and the last calendar year of life.(6)

Our microdata measure personal health care expenditures, defined as total expenditures less expenditures such as research and development. Although the data are high quality, in many countries the way in these data are recorded causes the microdata averages to not match up with aggregate spending statistics. We adjust our estimates to account for known sources of under or over-recording so that mean medical spending per capita in our micro data matches the national aggregate. We describe and justify these adjustments in our online appendix.(6)

There are several limitations in our analysis. First, we do 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 EOL spending are still apparent. Second, we do 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 EOL spending.(8) Third, we are not able to judge the quality of care among decedents across countries. For these reasons, we cannot judge which country's rate or composition of EOL spending is the "right" one. Finally, because the organization and funding of health care occurs at the provincial level in Canada, we use data from the province of Quebec, the second most populous province. However, with the exception of language, Quebec is largely representative of Canada as a whole.

Results

We begin with Exhibits 1 and 2, which display per capita medical spending for each country, decomposed by medical service category, during the last 12 months of life and the last 3 calendar years of life, respectively. All quantities are expressed in 2014 USD. Exhibit 1 shows that medical spending in the last 12 months of life is high, reaching $80,000 for the U.S., over $60,000 for the Netherlands and Denmark, and over $50,000 for Germany. Exhibit 2 shows that medical spending is high also during the last three calendar years of life. The composition of medical spending changes across periods, however, at least in the countries for which we have complete data. Hospital spending is more important in the final 12 months of life than in prior years. Hospital

spending is particularly important in the final 3 months of life, the results for which are in our online appendix.(6) In earlier years spending on LTC, which includes nursing home care and home help, is more important. Finally, hospital care spending, the one measure we observe in all datasets, varies greatly across countries.

[Exhibit 1 about here]

[Exhibit 2 about here]

Although dying is expensive in all countries, the fraction of each country's population that dies in a year is small. Exhibit 3 shows the fractions of aggregate medical spending (in 2011) devoted to people in their last 12 months of life and last 3 calendar years of life. The first column of Exhibit 3 displays results for all medical care services. The top panel shows that medical spending in the last 12 months of life accounts for approximately 8-11 percent of aggregate medical spending in most countries, with the US spending the least (8.5 percent) and Taiwan the most (11.20) in percentage terms. There is no strong link between this percentage and the type of health care system.

[Exhibit 3 about here]

As can be seen in the bottom panel, total medical spending in the last 3 calendar years of life is approximately twice as large as the fraction attributable to individuals last 12 months of their lives, ranging from 16.7% in the US to 24.5% in Taiwan.

The remaining three columns of Exhibit 3 display spending shares within different medical service categories. The greatest variation across countries is in hospital spending, where the share of spending accounted for by those in the last 12 months of life ranges from 8.2% in Japan to 22.7% in Quebec, and for those in the last 3 calendar years of life varies from 13.5% in Japan to 34.9% in Taiwan. The US is towards the bottom of these ranges for both periods. The potential implications are two-fold. First, the larger variation in hospital spending relative to total spending is consistent with health care systems using differing combinations of services to provide care for those 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.

Exhibit 4 shows total health care spending and spending over the last 12 months of life as percentages of GDP for Denmark, Germany, the Netherlands, the U.S., and Taiwan, using 2011 OECD GDP data. Total spending as a share of GDP is included for countries with limited data. As is well known, health care spending comprises a much larger share of GDP in the US than

in any other developed country. Exhibit 4 shows that even though the U.S. devotes a smaller fraction of its healthcare spending to those at the ends of their lives than do most of the countries examined here, it still devotes a similar if not larger fraction of its GDP to EOL care.

[Exhibit 4 about here]

Discussion

At least since Scitovsky,(9) analysts have noted the high cost of dying, with some suggesting that these costs are central to understanding why health care spending rises with age.(10) Nonetheless, comparisons of EOL spending across countries remain relatively scarce. We use high quality data from 9 countries to examine medical spending in the last three years of life. We find, as others have, that EOL care is expensive, but not necessarily as concentrated in the last 12 months of life as often claimed. In fact, the share of health care expenditures devoted to care in the last 12 months of life is relatively modest, ranging between 8.5 and 11.2 percent. The U.S. is a clear outlier in total medical spending as a share of GDP, but the share of U.S. healthcare spending that goes to those in the last 12 months of life is towards the bottom of the range of estimates for the 9 countries that we consider. And while spending in dollar terms is still higher in the U.S. – because the U.S. spends so much per-capita on

health care – the exceptionalism of U.S. health care spending does not translate into a higher share for EOL care. (11) While our findings may appear to be inconsistent with Bekelman et al.,(5) who find EOL spending in the U.S. to be in the middle of 8 countries, their study uses a "purchasing price parity" approach that adjusts away the higher prices charged in the U.S. compared to European health systems.(12) By contrast, we include any price differences across countries in our comparisons.(13)

The composition of EOL spending varies greatly, with some countries spending considerably more on LTC and less on acute care. While our sample of countries is small, our evidence also suggests that countries with stronger LTC 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 the spending at the end of life is attributable to LTC, while hospital spending is relatively modest. One possibility is that in the Netherlands more medical care is provided in nursing homes due, for instance, to the presence of a doctor on site. 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 U.S. administrative data to plot medical spending trajectories near

the end of life, Davis et al. reach similar conclusions.(14) They find 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 EOL care, including patient directives that stipulate preferences for EOL 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.(1, 6, 8). The success of these approaches in reducing costs has been decidedly mixed.(15-17). Efforts to reform EOL care have often proven highly controversial. The Affordable Care Act (Obamacare) in the U.S. initially included provisions to pay physicians to counsel patients about advanced directives and EOL decisions. Political opponents decried these as 'death panels' and forced their removal from the legislation (12), although a Medicare provision was subsequently included reimbursing physicians for advanced-care planning discussions with patients.(18) In the U.K., rulings of the National Institute for Health and Care Excellence (NICE) 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.(19)

Achieving the appropriate mix between spending on long-term care for the chronically ill, nursing care for 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 LTC. In England, austerity measures designed to improve public finances resulted in large cuts to social care and LTC, while funding for health care was protected. The impact of these measures on the quality and quantity of LTC provided to the elderly and the consequent increased pressures on public hospitals have aroused a fierce political debate. Partly in response, England's Better Care Fund was established in 2013 to improve integration between health and social care, and has seen the National Health Service voluntarily transfer money toward publicly-funded LTC.

U.S. efforts to shift the share of EOL spending towards hospice care have been successful, as evidenced by rising rates of hospice care. Yet this paradigm shift has not been accompanied by a reduction in EOL costs, since hospice care is also expensive and inpatient care costs have not fallen commensurately.(20)

Our finding that EOL costs comprise a modest fraction of total medical spending suggests that none of these measures are likely to have a large impact on aggregate healthcare cost growth. For example, since spending in the last 12 months of life in the U.S. is only 8.5 percent of total health expenditure, a fundamental 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. That spending in the last 3 years of life is considerably larger, accounting for as much as 24.5% (in Taiwan) of overall costs, points to the greater importance of cost reduction in the treatment of high-risk and chronically-ill patients.(21)

The high fraction of Medicare spending taking place near the end of life is sometimes viewed as a reason why U.S. health care is uniquely expensive among developed economies. Our results do not support this conjecture. First, we find that U.S. health spending near the end of life is less than one-tenth of total US health care spending, and thus cannot be the primary cause of why U.S. health care is so much higher than in other countries. Second, the fraction of medical spending devoted to EOL care is lower in the US than in other countries, many with far lower total costs, suggesting that high medical spending prior to death is common to all health care systems.

Our finding that restraining EOL spending would only modestly restrain total medical spending is in no way an argument against reform. Exhibit 4 shows that spending in the last 3 years of life usually exceeds 2% of GDP. The potential cost savings may be large. A perhaps even stronger argument for focusing on EOL care is to improve the quality of care for the growing elderly population, who face the risk of expensive and painful therapy at the ends of their lives.(1) Examples of these low-quality treatments include regular treatments in the place early palliative care for metastatic lung cancer,(22) burdensome transitions for patients near death,(23) and feeding tubes in dementia patients.(23-25). 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 prior to death can make health care sustainable is not supported by this study. Spending in the last 12 months of life accounted for between 8.5 and 11.2% of overall spending in our nine countries, with the U.S. at the bottom of that ranking. Reducing this spending will thus have a modest effect on total medical spending. In contrast, spending in the last 3 years of life accounts for as much as 24.5% of overall costs, suggesting that the focus should be on reducing costs of

caring for the chronically ill, many of whom are approaching death. The task of containing or reducing EOL spending likely requires a multi-faceted approach from policy makers and clinicians. For those near death, an appropriate mix of long-term care, hospice, and home care will ensure that only patients who want and need to be in hospitals are treated there, with the primary payoff being better quality care, along with modestly lower costs.

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6. To access the Appendix, click on the Appendix link in the box to the right of the article online.

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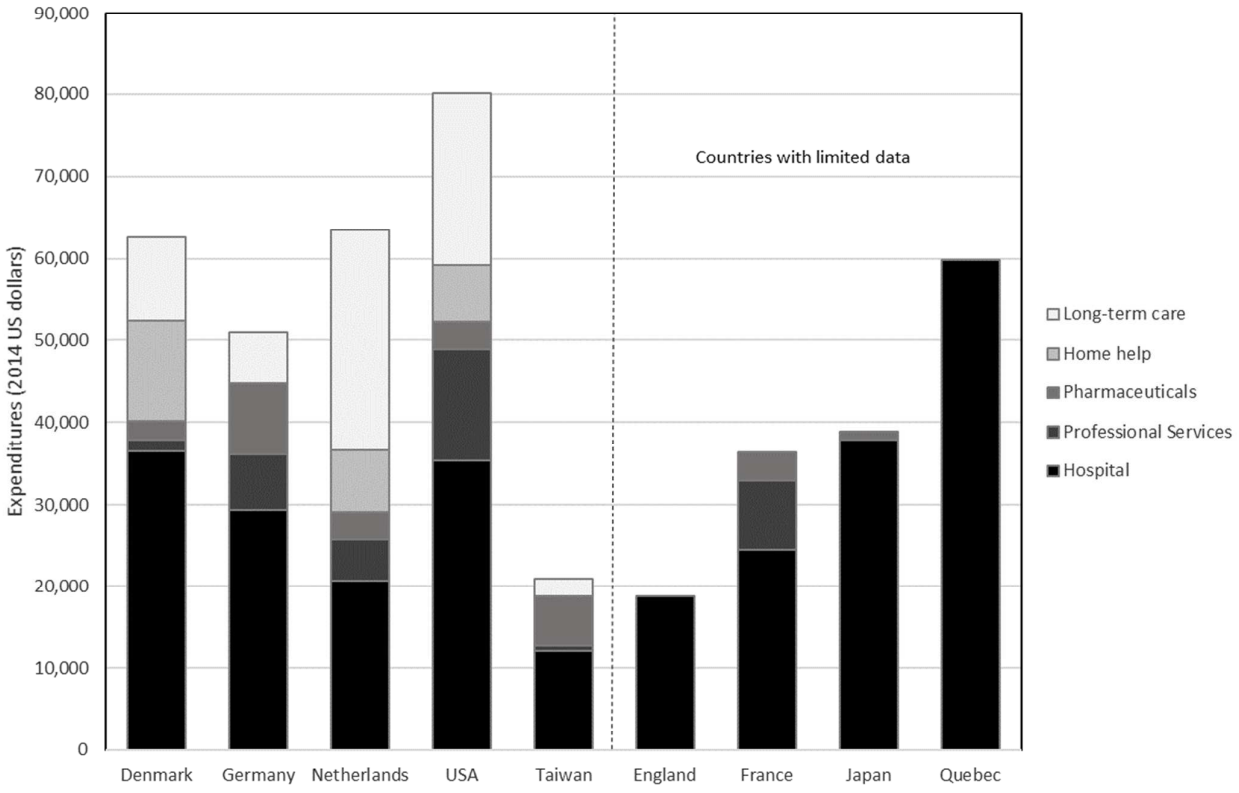
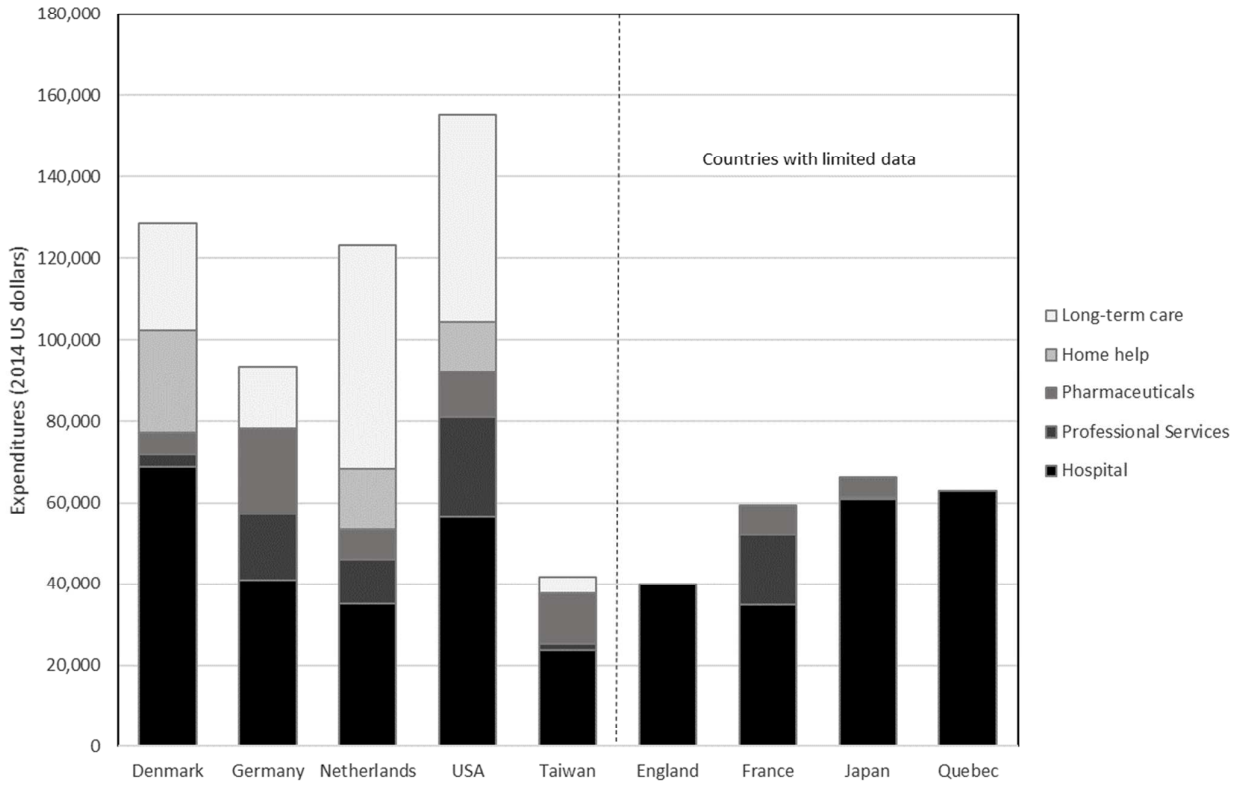
Exhibit 1: *Medical expenditure in the last 12 months of life*



Notes: Spending in 2014 US dollars. 'Final 12 months' displays the average medical spending, by category, incurred over the final 12 months of life by those who died in 2011. For all countries year death of death is 2011, apart from Denmark, which uses 2012 data, and France, which uses 2013 data. Hospital spending refers to both inpatient and outpatient care, apart from France, England, and Quebec, which only have data on inpatients. Japanese data only includes hospital, dentist, and pharmaceuticals. "Long term care" for Taiwan also includes home help. Data from Germany excludes home help.

Exhibit 2: *Medical expenditure in the last 3 calendar years of life*



Notes: Spending in 2014 US dollars. 'Last 3 calendar years of life' displays the average total spending, by category, incurred over 2009 to 2011 by those who died in 2011. For all countries year death of death is 2011, apart from Denmark, which uses 2012 data, and France, which uses 2013 data. Hospital spending refers to both inpatient and outpatient care, apart from France, England, and Quebec, which only have data on inpatients. Japanese data only includes hospital, dentist, and pharmaceutical expenses. "Long term care" for

Taiwan also includes home help. Data from Germany exclude home help.

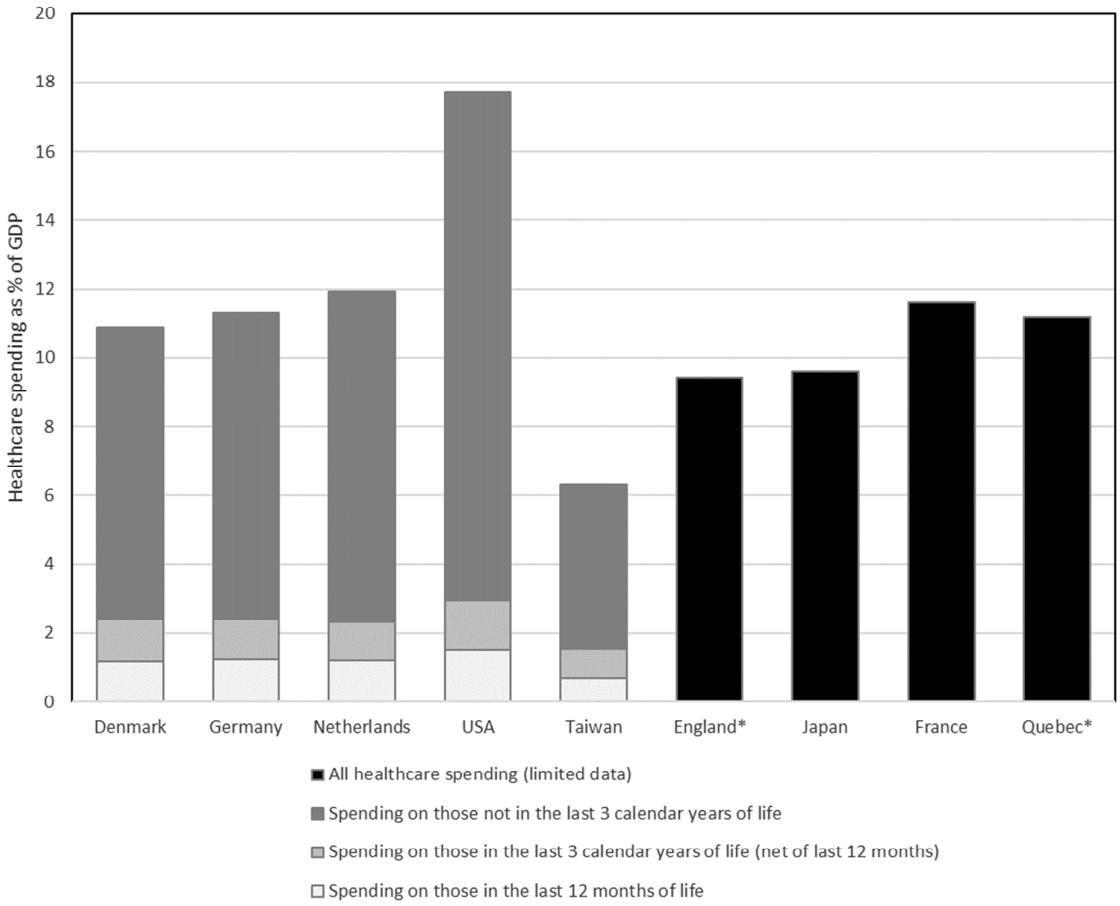
Exhibit 3: *Spending on those at the end of life as a percent of aggregate spending*

	All medical care, including long-term care	*All medical care, excluding long-term care*	*Long-term care*	*Hospital care*
Last 12 months				
Denmark	10.95	9.97	21.74	10.01
England	--	--	--	14.59
France	--	8.50	--	15.00
Germany	10.96	10.59	14.89	21.17
Japan	--	5.93	--	8.21
Netherlands	10.01	7.32	22.12	8.85
Quebec	--	--	--	22.73
Taiwan	11.20	10.10	23.08	15.53
United States	8.45	7.11	18.12	9.91
Last 3 calendar years of life				

Denmark	22.16	19.23	54.24	18.65
England	--	--	--	29.78
France	--	14.10	--	22.08
Germany	21.40	19.85	36.59	29.87
Japan	--	10.36	--	13.50
Netherlands	19.40	14.28	44.86	15.12
Quebec	--	--	--	25.65
Taiwan	24.48	22.07	54.92	34.88
United States	16.70	12.77	44.92	16.27

Notes: Spending is as a percentage of spending in that medical spending category. 'Last 12 months of life' displays the percentage of medical spending in 2011 incurred by those who were in their last 12 months of life. 'Last 3 calendar years of life' displays the percentage of medical spending in 2011 incurred by those who were in their last 3 calendar years of life. For all countries the year of death is 2011, apart from Denmark, which uses 2012 data, and France, which uses 2013 data. Hospital spending refers to both inpatient and outpatient care, apart from France, England, and Quebec, which only have data on inpatients. Japanese data only includes hospital, dentist, and pharmaceuticals. "Long term care" for Taiwan also includes home help. Data from Germany excludes home help. '—' denotes data unavailable.

Exhibit 4: *Healthcare spending devoted to the final 12 months of life and to other uses, as a percent of GDP*



Notes: 2011 data for healthcare spending as a % of GDP comes from OECD,(26) apart from for Taiwan which is an estimate for 2012 from Chen and Chuang.(27) Our calculations for the percentage of GDP that goes towards those at the end of life comes from multiplying the percentages in Exhibit 4 by the healthcare spending as a % of GDP. This can only be calculated for the group of countries for which we have a percentage for

"*All medical care, including long-term care*" in Exhibit 4.

*Values for England and Quebec were unavailable, so spending for the UK and Canada are displayed instead.