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Abstract

We use data from the Medicare Current Beneficiary Survey (MCBS) to document the medical spending of Americans aged 65 and older. We find that medical expenses more than double between ages 70 and 90 and that they are very concentrated: the top 10% of all spenders are responsible for 52% of medical spending in a given year. In addition, those currently experiencing either very low or very high medical expenses are likely to find themselves in the same position in the future. We also find that the poor consume more medical goods and services than the rich and have a much larger share of their expenses covered by the government. Overall, the government pays for 65% of the elderly's medical expenses. Despite this, the expenses that remain after government transfers are even more concentrated among a small group of people. Thus, government health insurance, while potentially very valuable, is far from complete. Finally, while medical expenses before death can be large, on average they constitute only a small fraction of total spending, both in the aggregate and over the life cycle. Hence, medical expenses before death do not appear to be an important driver of the high and increasing medical spending found in the U.S.

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1 Introduction

We use data from the Medicare Current Beneficiary Survey (MCBS) to document the medical spending of people aged 65 and over in the United States. The medical spending of this population is notable for a number of reasons.

First, the typical elderly American receives far more medical services than those of younger ages. In 2010, average medical expenditures for an American aged 65 or older were 2.6 times the national average (Centers for Medicare and Medicaid Services, 2015). In the same year people 65 and older accounted for over one third of U.S. medical spending. As the population continues to age, this fraction will likely grow. Given that much of the elderly's medical expenditures are financed by the government, their spending is of increasing fiscal importance. A particularly contentious issue is spending at the end of life (Scitovsky, 1994; Scitovsky, 2005). Even though studies have found that over a quarter of Medicare spending on the elderly is for end-of-life care (Hoover et al., 2002), proposals to reform this spending have generated skepticism (Emanuel and Emanuel, 1994) and sometimes strident resistance (Daly, 2009).

A second notable feature of this population is that virtually every American aged 65 or older is eligible for Medicare, a government-provided health insurance program. Medicare pays much of the cost of short hospital stays, doctor visits, and, since 2006, pharmaceutical. This is in sharp contrast to the younger population. The majority of Americans younger than 65 are covered through employer-provided health insurance, but many others are covered by privately-purchased health insurance or government-provided insurance. Moreover, because privately-purchased insurance can be expensive, and because the eligibility criteria for government insurance are strict for the non-elderly, many people younger than 65 are uninsured. A number of studies suggest that access to health care in the U.S. is unequal across the income distribution (Wagstaff and van Doorslaer, 2000).[1] This inequality is likely more pronounced among the younger population than among the elderly, where Medicare mitigates disparities in health care access.

A third reason why the medical spending of the age 65 and older population is of particular interest is that the spending data for this group are of high quality. Since Medicare is provided by the government, researchers have access to administrative Medicare records. Our principal data source for this paper, the MCBS, links the administrative Medicare records to survey information from households. In addition

[1] More precisely, Wagstaff and van Doorslaer (2000) review the literature on inequalities in the *delivery* of health care.

to high quality data on Medicare payments, the MCBS contains spending data for other payors from its survey component.

A fourth reason to study medical spending among retirees is that medical expenses provide an important motive for retirement savings (De Nardi et al., 2010). These savings not only affect wages and economic growth, but are an important policy concern in their own right.

We find that medical expenses more than double between ages 70 and 90, with most of the increase coming from nursing home spending. Medical expenses are very concentrated: the top 10% of all spenders are responsible for 52% of medical spending in a given year. We also find that those currently experiencing either very low or very high medical expenses are likely to find themselves in the same position in the future. These features of the data are consistent with individuals or households facing a small risk of large medical expenses, which, once incurred, tend to be persistent over time. Because it is hard to self-insure against such risks by saving, they may be quite costly for consumers, especially if there are frictions in private health insurance markets. Government insurance mitigating these risks may thus be very valuable to consumers. This notwithstanding, and despite the fact the the government pays for 65% of the elderly's medical expenses, the expenses that remain after government transfers are even more concentrated among a small group of people. Hence, government health insurance, while potentially very valuable, is far from complete. This is in part because the government's Medicaid program is the payer of last resort, contributing only after private funding has been exhausted. As a result, even though the poor on average consume more medical goods and services than the rich, they are responsible for a much smaller share of their costs. Finally, while medical expenses before death can be large, on average they constitute only a small fraction of total spending, both in the aggregate and over the life cycle. Therefore, medical expenses before death do not appear to be an important driver of the high and increasing medical spending found in the U.S.

The rest of the paper is organized as follows. Section 2 describes the related literature. Section 3 briefly describes the health care system for older Americans. Section 4 describes the MCBS data and compares them to administrative data. Section 5 documents the concentration of medical expenditures, both within a single year and across multiple years, and the concentration of medical spending across the income distribution. Section 6 shows the evolution of medical expenses and its payors during the retirement period. Section 7 presents new estimates of medical spending in the last three years of life. Section 8 concludes.

2 Related Literature and Contribution

In this paper, we combine the 1996 to 2010 waves of the MCBS with secondary data sources in a general review of medical spending among the U.S. age-65+ population. While Medicare expenditures have been studied extensively, to our knowledge the format of our study is novel. Related studies include Crystal et al. (2000), Goldman and Zissimopoulos (2003) and Hurd and Rohwedder (2009), who document out-of-pocket medical spending. Spillman and Lubitz (2000), Lubitz et al. (2003) and Joyce et al. (2005) use the MCBS to project total expenditures by the elderly over their remaining lives. The MCBS sourcebook series (CMS, multiple years) provides annual data summaries.

This paper is part of a series of studies examining the properties of individual-level medical spending both across several data sets for a given country and across countries. More specifically, Fahle et al. (2015), Calonico et al. (2015), Pashchenko and Porapakkarm (2015), and Evans and Humpherys (2015) focus on U.S. data sets, while Christensen et al. (2015) study Denmark, Lagasnerie et al. (2015) study France, Karlsson et al. (2015) study Germany, Ibuka and Chen (2015) study Japan, Bakx et al. (2015) study the Netherlands, Aragón et al. (2015), Cookson and Propper (2015), and Kelley et al. (2015) study England, Côté-Sergent et al. (2015), study the province of Quebec in Canada, and Chen and Chen (2015) study Taiwan. Finally, Banks et al. (2015) analyze differences in health between the U.S. and the U.K.

Earlier international summaries of medical spending for the elderly are limited. Brockmann (2002) and Polder et al. (2006) document end-of-life care in Germany and the Netherlands, respectively. Campbell et al. (2010) discuss how introducing public long-term care insurance affected expenditures in Germany and Japan and contrast long-term care expenditures in these countries with those in the U.S. Comparative analyses have more focused on how expenditures are financed (Stabile and Thomson, 2014; Wagstaff et al., 1999) or on access to care (van Doorslaer et al. 1997). There is also a large literature examining international differences in aggregate medical expenditures: Gerdtham and Jönsson (2000) provide a review. Of note is Seshamani and Gray (2002), who find significant cross-country differences in the growth rates of per capita medical expenditures on the elderly.

3 Health Care for the Age-65+ Population in the United States

3.1 Institutional Background

With some exceptions, U.S. health care is privately provided. Most U.S. hospitals are run either by non-profit institutions such as universities or religious organizations, or by private for-profit companies. The employees of those hospitals, including doctors and nurses, are then paid by the hospitals. Hospitals, doctors and other health care providers are largely free to charge what they wish for their services. However, health care insurers (public and private) usually negotiate prices for their insurees.

The main payor of health care amongst the elderly is Medicare, a federal program that provides health insurance to almost every person over the age of 65. Individuals covered by Medicare have the option of traditional Medicare, where Medicare pays the providers, or Medicare Advantage, where Medicare provides payments to Health Maintenance Organizations, who then provide care. Under traditional Medicare, the government sets a schedule of payments for most services. In order to discourage the over-provision of health care services, many health care treatments performed by hospitals are paid on the basis of the diagnosis rather than the treatment. Traditional Medicare pays for the great majority of the cost of short term hospital stays, 80% of the cost of doctor visits, and since 2006, most of the costs associated with pharmaceuticals. Medicare Advantage pays for close to 100% of the cost of hospital stays, doctor visits, and pharmaceuticals.

Many older individuals have private insurance plans that cover medical expenses not covered by Medicare, such as the residual share of the costs of doctor visits. However, some forms of care are largely uninsured by either Medicare or private health insurance, with the most important category being nursing home spending. A large share of nursing home costs are paid out of pocket. Because nursing home stays are expensive, on the order of $77,000 to $88,000 a year in 2014, most individuals will be impoverished by a long nursing home stay. Those made financially destitute will be covered by Medicaid, a means-tested program that is run jointly by the federal and state governments.[2] In 2013, around 29% of nursing home costs were paid out of pocket, while around 30% were covered by Medicaid. Medicaid covers almost all the nursing home costs of poor old recipients. More generally, Medicaid ends up financing 63% of nursing home residents (Kaiser Foundation, 2013, Figure 4). In 2009, 62% of

[2]De Nardi et al. (2013) and Gardner and Gilleskie (2006) document many important aspects of Medicaid insurance in old age.

Medicaid's transfers to the elderly were for long-term care (Kaiser Foundation, 2013, Figure 12). In large part because of its role in funding nursing home care, Medicaid is the second most important public health insurance program for the elderly in the U.S. Nonetheless, Medicaid is the payer of last resort, contributing only after private funding and Medicare support have been (nearly) exhausted.

	Type of Expenditure					
Payor	Hospitals	Professional Services	Nursing Care	Retail Drugs	Other	All
Out-of-pocket	1.1%	9.4%	28.2%	18.6%	27.9%	13.2%
Private Insurance	13.4%	18.6%	7.8%	23.4%	3.8%	13.3%
Medicaid	6.8%	2.1%	29.7%	1.3%	21.9%	11.1%
Medicare	69.7%	64.3%	24.3%	52.8%	36.5%	54.4%
Other	9.0%	5.6%	10.0%	4.0%	10.0%	8.0%

Notes: Data from the National Health Expenditure Accounts.

Table 1: Funding Sources of the Elderly's Personal Health Care Expenditures, 2010

The National Health Expenditure Accounts (NHEA), maintained by the Centers for Medicare and Medicaid Services (CMS, 2015) document how much is being spent on each type of health care service, as well as the payors of those services.[3] Tables 1 and 2 use these data to summarize the sources and uses of personal health care spending. Personal health care measures the total amount spent on all treatments for all individuals. It excludes government administration, government public health activities, and investment. We focus on personal health care expenditures since it is the concept that the MCBS data are designed to measure. Moreover, the bulk – in 2013, 85% – of total national health care expenditures go to personal health care.

Table 1 shows how the personal health care expenditures of the elderly were funded in 2010, the most recent year the age-specific data are available in the CMS data set. Each column of the table corresponds to a particular type of service: hospital care; professional services such as doctor and dental visits; nursing home care; drugs; and other. Each row corresponds to a payor: out-of-pocket; private health insurance; Medicare; Medicaid; and other. Table 1 shows the fraction of each expenditure subtotal paid by each payor. For example, the first column shows that only 1% of the costs of hospital care are paid out of pocket, while almost 70% of the costs are covered

[3]These data are available at: `http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html`.

by Medicare. In fact, Medicare is the largest payor for every type of expenditure, with the exception of nursing home care. The final column of Table 1 shows that Medicare covers well over half of the elderly's medical expenditures. Private health insurance, Medicaid, and out-of-pocket expenditures each cover between 11 and 13% of the total.

3.2 Trends in Health Care Expenditures

	65+ population	Whole population			
	2010	1970	1990	2010	2013
Fraction by Payor					
Out-of-pocket	13.2%	39.6%	22.5%	13.9%	13.7%
Private Insurance	13.3%	22.2%	33.3%	34.4%	34.3%
Medicaid	11.1%	7.9%	11.3%	16.7%	16.6%
Medicare	54.4%	11.6%	17.4%	22.3%	22.3%
Other	8.0%	18.7%	15.6%	12.7%	13.0%
Fraction by Type of Expenditure					
Nursing Care	16.2%	6.3%	7.3%	6.5%	6.3%
Hospitals	35.3%	43.1%	40.6%	37.1%	38.0%
Professional Services	23.2%	31.4%	33.7%	31.6%	31.5%
Retail Drugs	10.3%	8.7%	6.5%	11.7%	11.0%
Other	15.0%	10.5%	11.9%	13.1%	13.2%
Total Personal Health Care Expenditures ($ billions)	800	310	990	2,350	2,500

Notes: Data from the National Health Expenditure Accounts. Adjusted to 2014 dollars.

Table 2: Personal Heath Care Expenditures, by Payors and Expenditures, National Data

Table 2 compares the spending of the elderly to that of the general population. The top panel of Table 2 shows the shares of medical spending covered by different payors. The first column in this panel repeats the final column of Table 1. The next four columns of Table 2 show results for the entire U.S. population, for 1970, 1990, 2010 and 2013. While Medicare pays a much bigger share of health care expenditures for the age 65+ population than for the population as a whole, in 2010 the share spent out of pocket barely falls after age 64. Instead, the rise in Medicare expenditures after age 64 mostly displaces private insurance expenditures.

The second panel of Table 2 shows the shares of total medical spending across service categories. The biggest changes in expenditure shares for those aged 65+ are a rise in nursing home care and a fall in professional services such as doctor visits.

As is well known, the United States spends large and increasing amounts on medical care. The bottom panel of Table 2 shows that in 2013 personal health care expenditures amounted to $2.5 trillion in 2014 dollars, representing 14.7% of GDP. This translates to $7,930 per person. Figure 1 shows personal health care spending in the U.S., both per person and as a percentage of GDP, from 1960 to present. By either measure, health care spending has risen dramatically. Table 2 reveals that while the shares of spending going to each category have been fairly stable over time, the share of spending covered out of pocket has fallen by nearly two-thirds. For most of this period, per capita expenditures on the elderly have grown more rapidly than expenditures on the young. Meara et al. (2004, Exhibit 4) calculate that in 1963, average expenditures in the age-65+ population were 2.4 times the expenditures of those under 65. In 2000, the ratio had risen to 4.4. Meara et al. (2004) also find, however, that this trend has reversed in recent decades, and per capita expenditures on the elderly are now growing more slowly than those on the young. The spending ratio calculated with the National Health Expenditure Accounts has fallen from 3.7 in 2002 to 3.4 in 2010.

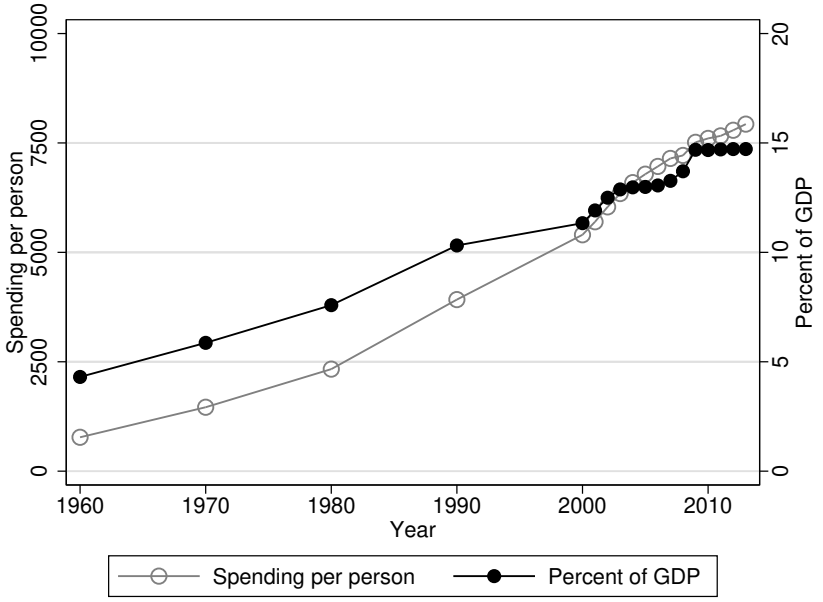


Figure 1: Personal Health Care Expenditures for whole population, per person (2014 Dollars, left scale), and as a Percentage of GDP (right scale).

4 The MCBS Dataset

4.1 Description

Our principal data source is the 1996 to 2010 waves of the Medicare Current Beneficiary Survey (MCBS). The MCBS is a nationally representative survey of disabled and elderly (age-65+) Medicare beneficiaries.[4] Although the sample misses elderly individuals who are not Medicare beneficiaries, virtually everyone aged 65+ is a beneficiary. The survey contains an over-sample of beneficiaries older than 80 and disabled individuals younger than 65. We exclude disabled individuals younger than 65, and use population weights throughout.

MCBS respondents are interviewed up to 12 times over a 4-year period, and are asked about (and matched to administrative data on) health care utilization over 3 of the 4 years, forming panels on medical spending for up to 3 years. We aggregate the data to an annual level. These sample selection procedures leave us 66,790 different individuals who contribute 152,193 person-year observations.

The MCBS's unit of analysis is an individual. Respondents are asked about health status, income, health insurance, and health care expenditures paid out of pocket, by Medicaid, by Medicare, by private insurance, and by other sources. The MCBS survey data are then matched to Medicare records.

The key variable of interest is medical spending. This includes the cost of hospital stays, doctor visits, pharmaceutical, nursing home care, and other long term care. The MCBS's medical expenditure measures are created through a reconciliation process that combines survey information with Medicare administrative files. As a result, the MCBS contains accurate data on Medicare payments and fairly accurate data on out-of-pocket, Medicaid, and other insurance payments. Out-of-pocket expenses include hospital, doctor and other bills paid out of pocket, but does not include insurance premia paid out of pocket. Because the MCBS includes information on people who enter a nursing home or die, its medical spending data are very comprehensive.

We adjust all dollar amounts to 2014 dollars using the personal consumption expenditure index. Some people have zero medical spending, and so the log of their medical spending is undefined. To address this problem, we bottom code the medical spending data anytime we take logs. We treat all values of medical spending less than 10% of the mean of medical spending as equal to 10% of the mean. So, if someone has medical spending equal to 5% of the mean, we recode their medical spending as 10% of the mean.

[4] Adler (1998) describes the MCBS in some detail.

In the MCBS, individuals are asked to report "...your and your spouse's total income before taxes during the past 12 months". Respondents are asked to provide an income interval, rather than an exact dollar amount. The MCBS income measure appears to include household income, including transfer and asset income. In contrast, medical spending and most other variables in the MCBS are measured at the individual level. To make the income data compatible with the other variables, we rescale household income by standardized household size (Citro and Michael, 1995): standardized household income = total household income/(# of adults)$^{0.7}$. When taking logs, we bottom code income in the same way as medical spending.

4.2 Comparisons to Administrative Data

Although there is no high quality administrative information for out-of-pocket and private insurance payments for the age-65+ population, we can compare the MCBS data to administrative data from the Medicare and Medicaid programs.

The first set of columns in Table 3 compares Medicare enrollment and average Medicare expenditures in the MCBS to the corresponding values in the aggregate data from the Census Bureau. Table 3 shows that, when using population weights, the number of Medicare beneficiaries and expenditures per beneficiary line up closely with the aggregate statistics. Over the 1996 to 2010 period, MCBS Medicare enrollment for the age-65+ population averages 36.7 million, only 3% more than the average of 35.8 million. Over the same period, expenditures per beneficiary in the MCBS are $7,670, 15% smaller than the value of $9,060 in the official statistics.[5] The expenditure match weakens over time, as mean expenditures in the MCBS go from 92% of the data in 1996 to 79% of the data in 2010.

The MCBS uses administrative data to determine whether an individual is receiving Medicaid benefits, but it does not have administrative data on the value of those payments. In order to assess the quality of the Medicaid expenditure data in the MCBS, we benchmark it against administrative data from the Medicaid Statistical Information System (MSIS). Table 3 shows that the MCBS also accurately measures the share of the population receiving Medicaid payments, after ajusting the MCBS estimates to account for the fact that it is a sample of the Medicare population, and not the full population. [6] According to MCBS data, there were on average 5.78 mil-

[5]Medicare statistics are located at `http://www.census.gov/compendia/statab/cats/health_nutrition/medicare_medicaid.html`.

[6]In order to construct the table, we made a number of adjustments to the raw counts in both the MSIS and MCBS. Most importantly, we adjusted thto MCBS to account for the fact that it does not

	Medicare				Medicaid				
	MCBS		U.S. Census Bureau		MCBS			MSIS	
Year	Population (millions)	Mean Expenditure	Population (millions)	Mean Expenditure	Population (millions)	Mean Expenditure	Adjusted Mean Expenditure*	Population (millions)	Mean Expenditure
1996	34.8	6,430	33.4	6,970	5.18	9,800	10,500	–	–
1997	34.8	6,480	33.7	7,380	5.15	9,830	10,500	–	–
1998	34.9	6,170	33.8	7,380	5.1	9,590	10,300	–	–
1999	35	6,450	33.9	7,160	5.11	9,380	10,100	4.85	12,370
2000	35.1	6,650	34.3	7,120	5.27	9,830	10,500	4.98	13,140
2001	35.5	7,030	–	–	5.38	9,990	10,800	5.15	13,590
2002	35.9	7,490	–	–	5.59	10,100	10,900	5.55	13,600
2003	36.2	7,510	35	8,240	5.67	9,810	10,700	5.88	13,390
2004	36.3	7,690	35.4	8,590	5.93	9,560	10,500	5.92	13,900
2005	36.6	7,880	35.8	9,220	6.05	9,940	11,000	6.06	13,970
2006	36.9	8,640	36.3	10,100	5.91	8,760	9,980	6.12	12,220
2007	37.8	8,990	37	11,100	5.91	8,940	10,200	5.94	12,100
2008	38.7	9,110	37.9	11,000	6	8,760	10,000	6.04	12,280
2009	39.6	9,210	38.8	11,700	6.24	7,980	9,240	5.81	12,110
2010	40.6	9,340	39.6	11,800	6.29	8,820	10,200	6.33	12,430

Notes: observations listed as '–' denotes that the data is unavailable. MSIS is the Medicaid Statistical Information System. Adjusted to 2014 dollars.

* Adjusted mean expenditure is observations listed as '–' denotes that the data is unavailable. MSIS is the Medicaid Statistical Information System. Adjusted to 2014 dollars.

Table 3: Medicare and Medicaid Enrollment and Expenditures for the Age-65+ Population, Comparisons.

lion aged Medicaid beneficiaries over the 1999-2009 period, versus 5.72 million aged Medicaid beneficiaries in the MSIS data, an overstatement of 1 percent. However, for the period 1999 to 2009, MCBS Medicaid payments for the age-65+ population are on average 28% smaller than what the MSIS data suggest. Part of this is explained by the MCBS payment data not including Medicaid payments to Medicare. After adjusting the MCBS estimates to also include estimated Medicaid contributions to Medicare, the MCBS captures 80% of all Medicaid spending. As with the Medicare data, the discrepancy between the MCBS data and the administrative data is growing overtime.[7]

De Nardi et al. (2013) benchmark the MCBS data to survey data from the Assets and Health Dynamics of the Oldest Old (AHEAD) dataset. They show that, conditional on income quintile, average total income (including asset and other non-annuitized income), out-of-pocket medical spending, and Medicaid recipiency rates in the AHEAD data are slightly lower than their counterparts in the MCBS data. The MCBS uses administrative data to identify Medicaid recipiency, which greatly reduces underreporting problems. In addition, the MCBS imputes forgotten out-of-pocket expenses if Medicare had to pay a share of the total cost. In contrast, the AHEAD uses a more detailed set of questions to measure out-of-pocket medical spending, including "unfolding brackets", where respondents can give ranges for their spending, instead of a point estimate or "don't know" as in the MCBS.

include Medicaid beneficiaries who are not Medicare beneficiaries. Being a sample of Medicare beneficiaries, the MCBS does not include those not receiving Medicare. Although about 98% of Americans age 65+ receive Medicare, a big share of those not receiving Medicare wind up receiving Medicaid. Young et al. (2012) show that 91% of all age 65+ Medicaid beneficiaries. Thus we multiplied the Medicaid population in the MCBS by 1/.91, bringing the Medicaid population up from 5.26 to 5.78 million over the sample period. We assume that those with only Medicaid benefits receive the same average Medicaid benefits as those receiving both Medicaid and Medicare. To the extent that those receiving only Medicaid benefits get bigger Medicaid benefits then those receiving both Medicaid and Medicare, we are understating MCBS Medicaid payments. Medicaid MSIS statistics are located at `https://www.cms.gov/Research-Statistics-Data-and-Systems/Computer-Data-and-Systems/MedicaidDataSourcesGenInfo/MSIS-Tables.html`.

[7]In appendix Table A1, we compare the distribution of Medicaid spending in the MCBS to the distribution of Medicaid spending in the MSIS administrative payment data reported by Young et al. (2012).

5 Medical Expenditures in the Cross-Section and Over Time

5.1 The Cross-Sectional Distribution

The top panel of Table 4 shows a breakdown of medical spending in the MCBS among payors: out-of-pocket; private insurance; uncollected liabilities for treatments that have not been paid for; and government. The bottom panel shows a breakdown of spending among expenditure categories: hospital spending, by inpatients and outpatients; professional services; nursing home care; pharmaceutical costs; and home help and hospice care. Both panels use data from all waves.

	All	Men	Women
Fraction by Payor			
Out-of-Pocket*	19.4%	17.2%	21.0%
Private Insurance	12.5%	14.3%	11.3%
Uncollected liabilities	1.5%	1.7%	1.4%
Government	66.5%	66.9%	66.3%
Medicaid	9.4%	6.0%	11.6%
Medicare	54.7%	57.5%	52.8%
Other government	2.5%	3.4%	1.9%
Fraction by Type of Expenditure			
Nursing Home Care	20.6%	14.4%	24.8%
Hospitals	34.7%	40.0%	31.1%
Inpatients	25.8%	29.8%	23.0%
Outpatients	8.9%	10.1%	8.0%
Professional Services	27.1%	28.9%	25.9%
Drugs	13.1%	13.1%	13.2%
Home Health and Hospice	4.5%	3.7%	5.0%
*Premium to Total Expenditure Ratio***	0.13	0.14	0.13

Notes: This table reports total spending in each category divided by total overall medical spending. *Out-of-pocket medical spending includes all medical bills paid out of pocket, but does not include insurance premia. **Premium to Total Expenditure Ratio is total insurance premia paid by individuals divided by total billed medical expenses.

Table 4: Percentage of Total Expenditures, by Payor and Expenditure, MCBS Data.

The ratios shown in Table 4 are constructed in the same way as the ratios in Table 2. Mean spending in each category is divided by the mean of total medical spending, so that the ratios equal the distribution of aggregate medical spending.[8] The percentages calculated for the MCBS are fairly similar to those for the aggregate data for the elderly in 2010 shown in Table 2. In both tables, the government covers over 65% of the elderly's medical expenditures. The fraction of costs paid out of pocket is higher in the MCBS (19.4%) than in the aggregate statistics (13.2%), while the fraction covered by Medicaid is lower. Drug expenditures are relatively higher in the MCBS. These differences may in part reflect the lack of Medicare drug coverage in the years preceding 2006.

The two most notable differences between men and women in Table 4 involve Medicaid and nursing home care. The fraction of medical expenditures covered by Medicaid is nearly twice as large for women as it is for men. Similarly, women spend twice as much on nursing care as men. This is consistent with Table 1, which shows that Medicaid plays a particularly large role in funding nursing home care. Table 4 also shows that in the aggregate men rely more on Medicare (57.5%) and spend relatively more on hospital care (40.0%) than women (52.8% and 31.1%, respectively). This too is consistent with Table 1, which shows that Medicare reimburses nearly 70% of hospital costs.

The last row of Table 4 presents the "premium to total expenditure ratio", which is calculated by dividing the average private insurance premium by average total medical spending. Many elderly individuals have "Medigap" health insurance plans that pay for items such as Medicare co-pays for doctor visits. As it turns out, this ratio is 13% (for all), which is very close to the 12.5% share of aggregate costs paid for by private insurers.

Table 5 shows the cross-sectional distribution of medical spending by expenditure type and for the most important payor types, with the results for each spending type sorted by that type's spending. The first panel shows the distributions of total medical spending, total spending excluding nursing home care, and spending on hospitals. Individuals in the top 5% of the total expenditure distribution spend $97,880 apiece, nearly 7 times the overall average of $14,120, and constitute nearly 35% of all medical spending. For hospitals, 50% of individuals have almost zero spending and those in the top 5% of the distribution account for over 52% of the the spending. The bottom panel shows results for out-of-pocket expenditures, Medicare, and Medicaid. Although out-of-pocket expenditures are on average much lower than total expenditures, the

[8] An alternative approach is to construct spending ratios for each individual and calculate the means of these ratios. Appendix Table A2 displays these ratios.

By Expenditure Type						
	All		All (excl. nursing homes)		Hospitals	
Spending Percentile	Average Spending	Perc. of total	Average Spending	Perc. of total	Average Spending	Perc. of total
All	14,120	100.0%	11,210	100.0%	4,890	100.0%
95-100%	97,880	34.6%	76,860	34.3%	51,400	52.5%
90-95%	48,890	17.3%	34,360	15.3%	18,880	19.3%
70-90%	20,540	29.1%	16,080	28.7%	6,030	24.6%
50-70%	7,750	11.0%	6,980	12.4%	760	3.1%
0-50%	2,250	8.0%	2,080	9.3%	50	0.1%
By Payor						
	Out-of-Pocket		Medicare		Medicaid	
Spending Percentile	Average Spending	Perc. of total	Average Spending	Perc. of total	Average Spending	Perc. of total
All	2,740	100.0%	7,720	100.0%	1,320	100.0%
95-100%	26,930	49.1%	67,560	43.7%	24,980	94.7%
90-95%	6,700	12.2%	28,370	18.4%	1,360	5.2%
70-90%	2,920	21.3%	10,280	26.6%	10	0.1%
50-70%	1,360	9.9%	2,980	7.7%	0	0.0%
0-50%	420	7.6%	550	3.5%	0	0.0%

Notes: The results for each expenditure type or payor are sorted by that expenditure or payor's spending. Adjusted to 2014 dollars.

Table 5: Medical Spending Percentiles, MCBS.

distribution of out-of-pocket expenditures is more concentrated. Almost half of the out-of-pocket expenditures are made by the top 5%. Even with public and private insurance, out-of-pocket medical expenditure risk is significant.

To examine how the cross-sectional distribution of medical spending differs by gender, we sort medical spending for men and women into quintiles. Table 6 shows mean medical spending within each spending quintile. Total expenditures are higher for women than men at every spending quintile. This difference is largely due to expenditures on nursing home care. Once we exclude nursing home care, men have higher expenditures on average ($11,540 vs. $10,970) and at the top two spending quintiles. Men in particular incur higher hospital costs ($5,390 vs. $4,530), consistent

	Total Expenditure			Total Expenditure (excl. nursing homes)			Hospitals		
	All	Men	Women	All	Men	Women	All	Men	Women
All	14,120	13,480	14,600	11,210	11,540	10,970	4,900	5,390	4,530
Bottom	740	600	860	670	560	760	0	0	0
Fourth	2,640	2,390	2,840	2,450	2,270	2,580	30	20	40
Third	5,430	5,100	5,670	4,980	4,820	5,090	310	270	330
Second	11,690	11,090	12,170	10,090	10,100	10,090	2,110	2,230	2,030
Top	50,110	48,250	51,440	37,870	39,970	36,330	22,030	24,410	20,260

Notes: Adjusted to 2014 dollars.

Table 6: Mean Medical Expenditures sorted by Expenditure Quintile and Gender.

with Table 4. However, the overall shapes of the medical spending distributions are similar across genders.

5.2 The Distribution by Income

To document how medical spending is distributed by income, Table 7 displays mean income and medical expenditures by gender in the MCBS, broken down by income quintile. Low-income people consume more medical resources per year. The higher spending on the poor consists mostly of greater expenditure on nursing homes. When nursing home care is excluded, the income gradient is much less pronounced. Excluding nursing home expenditures, men consume more medical resources at each income quintile. But because women use more nursing home care than men, they have higher total medical spending at every income quintile.

The top panel of Table 8 shows how these expenditures are funded. Medicare is an important payor at every income quintile, spending an average of $9,490 on individuals in the lowest income quintile and $6,270 on those at the top. Out-of-pocket spending is almost constant across the income distribution. In contrast, Medicaid pays an average of $3,900 to those in the bottom quintile and only $270 to those at the top, while private insurance pays an average of $2,420 a year to those in the top quintile and only $860 to those at the bottom.

The bottom panel of Table 8 shows a breakdown of expenditures by service item for each income quintile. Those at the bottom of the income distribution receive more medical services ($17,410) than those at the top ($12,430). Interestingly, this difference seems to be mainly driven by nursing home care expenditures. Once nurs-

Income	Mean Income			Mean Expenditure		
Quintile	All	Men	Women	All	Men	Women
All	28,280	31,920	25,600	14,120	13,480	14,590
Bottom	8,000	8,700	7,630	17,410	16,180	18,020
Fourth	14,260	16,060	13,250	14,940	14,050	15,890
Third	20,620	23,150	18,890	13,180	12,720	13,380
Second	30,080	33,410	27,650	12,650	12,120	13,050
Top	68,930	79,080	60,910	12,430	12,360	12,620

Income	Mean Expenditure (excl. nursing homes)			Mean Hospitals		
Quintile	All	Men	Women	All	Men	Women
All	11,210	11,540	10,970	4,890	5,390	4,530
Bottom	11,890	12,190	11,650	5,660	6,280	5,300
Fourth	11,490	11,990	11,420	5,370	6,080	5,070
Third	10,990	11,240	10,680	4,840	5,170	4,430
Second	10,900	11,020	10,730	4,430	4,720	4,190
Top	10,800	11,280	10,370	4,180	4,680	3,670

Notes: Adjusted to 2014 dollars.

Table 7: Income and Medical Expenditures by Income Quintile and Gender

ing home care is excluded the difference in spending between those at the bottom ($11,890) and those at the top ($10,800) almost disappears.

5.3 The Correlation Over Time

The distribution of cumulative medical spending depends not only on the distribution of spending at each age, but also on its persistence: if an individual has high medical spending this year, how likely is she to have high medical spending next year as well? Relative to the concentration of medical spending over a single year, there has been much less work on the concentration of medical spending over multiple years. Spillman and Lubitz (2000), Lubitz et al. (2003) and Alemayehu and Warner (2004) describe how lifetime expenditures vary by health and time of death, but they do not describe the expenditures' concentration. For the U.S., most of the research has focussed on the persistence of medical spending across multiple years (e.g., French and Jones, 2004; Feenberg and Skinner, 1994).

Feenberg and Skinner (1994) and French and Jones (2004) analyzed the persistence

	All	Bottom	Fourth	Third	Second	Top
Income	28,280	8,000	14,260	20,620	30,080	68,930
By Payor						
All Payors	14,120	17,410	14,940	13,180	12,650	12,430
Out-of-Pocket	2,740	2,480	2,780	2,700	2,750	3,000
Medicare	7,720	9,490	8,430	7,460	6,950	6,270
Medicaid	1,320	3,900	1,590	570	260	270
Government Other	360	510	460	320	270	230
Private Insurance	1,760	860	1,450	1,920	2,170	2,420
Uncollected liability	220	170	230	210	230	240
By Expenditure						
All	14,120	17,410	14,940	13,180	12,650	12,430
Nursing Home Care	2,910	5,520	3,450	2,190	1,750	1,630
All (excl. nursing homes)	11,210	11,890	11,490	10,990	10,900	10,800
Professional Services	3,830	3,510	3,580	3,750	4,030	4,270
Drugs	1,860	1,780	1,810	1,860	1,940	1,900
Home Health and Hospice	630	930	740	550	490	450
Hospitals	4,900	5,660	5,370	4,840	4,430	4,180
Inpatient	3,640	4,420	4,020	3,610	3,240	2,920
Outpatient	1,250	1,250	1,350	1,220	1,190	1,250

Notes: All variables sorted by income and adjusted to 2014 dollars.

Table 8: Mean Medical Expenditure by Income Quintile and Payor/Expenditure Type

of *out-of-pocket* medical spending. Table 9 shows correlations, both in levels and logs, of all medical spending, all spending excluding nursing home care, and hospital spending, 1 and 2 years apart: i.e., it shows the correlation of medical spending in year t with medical spending in years $t+1$ and $t+2$. The correlation of total medical spending between adjacent years is 0.57 in levels and 0.61 in logs. The correlation of total medical spending between years two years apart is 0.40 in levels and 0.53 in logs. Although medical spending is not perfectly correlated over time, its serial correlation is still relatively high two years later. Thus, even on a lifetime basis, there is likely to be a large amount of concentration of medical spending. The correlation drops slightly when nursing home care is excluded, and it drops considerably when we only consider hospital spending. Table A3 in the appendix shows the results disaggregated by gender.

	A: Spending in Levels		B: Spending in Logs	
	t+1	t+2	t+1	t+2
All	0.57	0.40	0.61	0.53
All (excl. nursing homes)	0.45	0.28	0.56	0.48
Hospitals	0.27	0.19	0.30	0.25

Table 9: Correlation of Medical Spending in Year t with Spending in Year t+1 and Year t+2

Correlation coefficients provide a single linear measure of comovement. Table 10 presents transition matrices, which allow for more flexible relationships across time periods and spending bins. Panel A displays one-year transition probabilities and Panel B displays two-year probabilities for movements between the total medical spending quintiles shown in Table 6. The row j, column k element of a transition matrix gives the probability that an individual is in spending quintile k in year t+1 or t+2, given that the individual was in spending quintile j at year t. The tables show that the correlation of medical spending is concentrated in the top and bottom tails of the medical spending distribution. Conditional on being in the top quintile of the spending distribution in a given year, there is a 53.8% chance of being in the top quintile in the following year, and a 48.2% chance of being in the top of the spending distribution in two years. Tables A4 and A5 in the appendix report the transition matrices for total expenditures net of nursing home costs and for hospital costs, respectively.

Figure 2 displays a more direct measure of how accumulated medical spending is concentrated, by displaying the cumulative distribution function for medical spending averaged over 1-, 2- and 3-year periods. Medical spending is highly concentrated even when the data are averaged across 3 years. For this to be the case, medical spending must be persistent across time, consistent with the preceding results.

Table 11 displays more measures of the concentration of medical spending over different durations, namely the Gini coefficient and the shares of total medical spending, total spending excluding nursing home costs, and hospital spending, for the top 1% and top 10% of spenders. Again, results are shown for 1-year, 2-year, and 3-year periods. Although medical spending becomes less concentrated as the averages cover more years, even at 3 years medical spending remains very concentrated.

Panel A: One-year transitions					
Quintile	Next year				
Current Year	Bottom	Fourth	Third	Second	Top
Bottom	61.9	17.8	8.9	6.5	5.0
Fourth	24.1	36.6	19.4	12.1	7.8
Third	9.8	25.4	32.3	21.0	11.5
Second	6.0	13.6	25.9	34.2	20.3
Top	3.5	6.6	11.9	24.3	53.8

Panel B: Two-year transitions					
Quintile	Two years ahead				
Current Year	Bottom	Fourth	Third	Second	Top
Bottom	58.3	17.6	10.3	7.5	6.3
Fourth	26.0	32.2	19.0	12.7	10.2
Third	11.9	25.6	28.3	20.5	13.8
Second	7.3	15.3	25.7	31.0	20.6
Top	4.7	8.5	13.5	25.1	48.2

Table 10: Transition Matrices for Total Medical Expenditure

6 Average Medical Spending Over the Life Cycle

Figure 3 shows life cycle profiles of mean total medical spending. The two graphs in this figure plot spending profiles, first by expenditure type, then by payor type.[9] The estimates show that average medical spending exceeds $25,000 per year for those in their 90s. The top panel shows this is almost entirely due to nursing home expenditure. In fact, other forms of expenditure fall with age after age 90. The bottom panel shows medical spending by payor. Given that nursing home care is mostly paid either out of pocket or by Medicaid, and that nursing home spending rises quickly with age, it should come as no surprise that most of the increase in spending with age is paid either out of pocket or by Medicaid.

An interesting question is to what extent the way in which medical expenses rise with age is due to the fact that people require more expensive medical services at older ages and to what extent is is due to large medical expenditures right before

[9]We estimate total medical spending on a full set of age dummies, with age topcoded at 100, without adjusting for cohort effects.

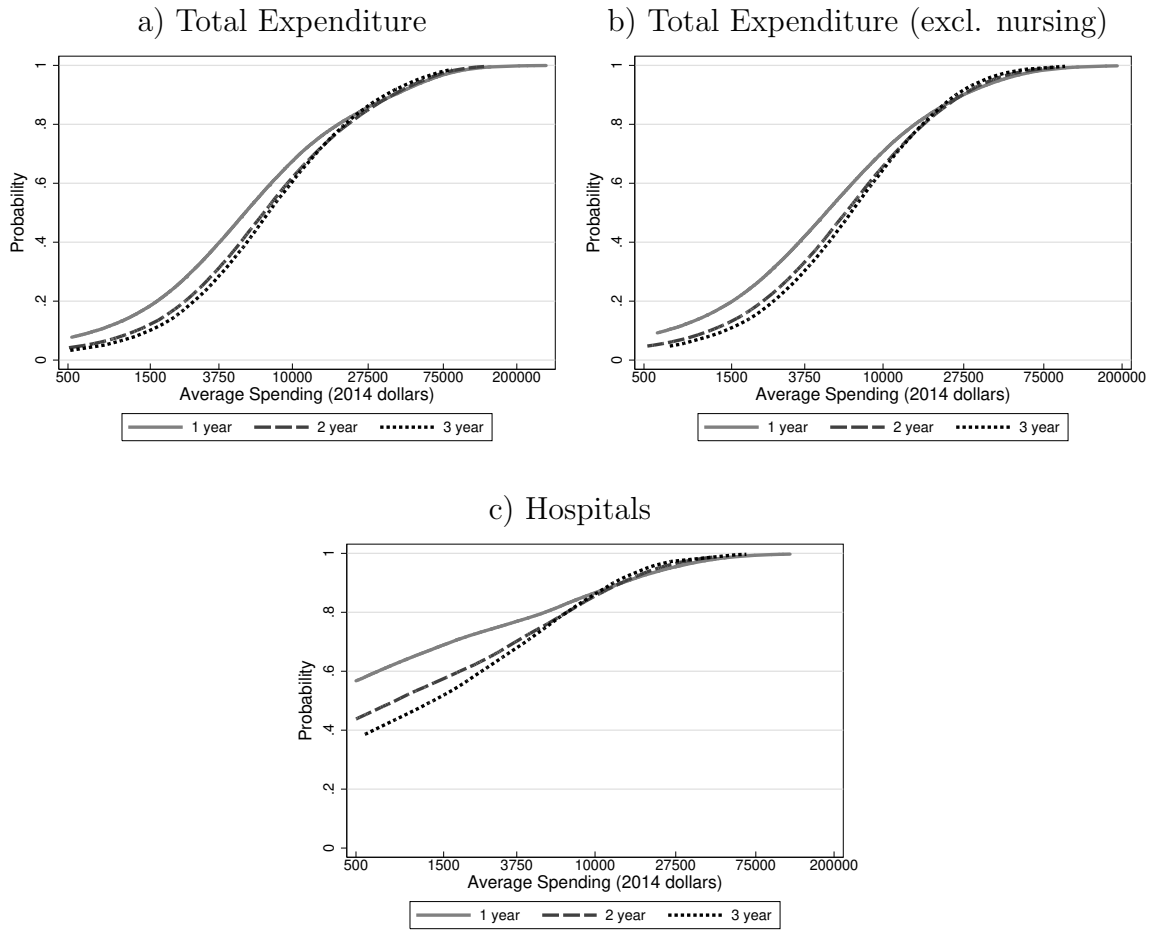


Figure 2: CDFs of Medical Expenditures, Averaged over 1, 2, and 3 Years.

death. Yang et al. (2003) argue that medical spending increases with age primarily because of end-of-life expenditures – mortality rates increase with age. Other papers reach similar conclusions using data from different countries. For instance, Zweifel et al. (1999) use Swiss data, Seshamani and Gray (2004) use data from England, and Polder et al. (2006) use data from the Netherlands. Interestingly, de Meijer (2011) use Dutch data to find that time-to-death predicts long-term care expenditures primarily by capturing the effects of disability. Yang et al. (2003) find that inpatient expenditures incurred near the end of life are higher at younger ages, while long-term care expenditures rise with age. Braun et al. (2015) find that total end-of-life costs rise with age. Scitovsky (1994), Spillman and Lubitz (2000), and Levinsky et al. (2001) have also studied this question.

	Medical spending averaged over:		
	1 year	2 years	3 years
All			
Gini coefficient on medical spending	0.67	0.61	0.58
Perc. spent by top 1% of spenders	11.9%	9.4%	8.7%
Perc. spent by top 10% of spenders	52.0%	45.5%	42.9%
All (excluding nursing homes)			
Gini coefficient on medical spending	0.64	0.57	0.54
Perc. spent by top 1% of spenders	12.9%	10.0%	8.9%
Perc. spent by top 10% of spenders	49.6%	42.1%	38.7%
Hospitals			
Gini coefficient on medical spending	0.84	0.77	0.72
Perc. spent by top 1% of spenders	21.4%	16.0%	14.0%
Perc. spent by top 10% of spenders	71.8%	59.1%	53.3%

Table 11: Measures of the Concentration of Medical Spending over 1, 2, and 3 Years

7 Medical Spending before Death

It is often argued that people in the U.S. spend too much on health care at the end of their lives. A number of studies have shown that end-of-life spending is significant. For example, Hoover et al. (2002) find that 22% of all medical spending in the MCBS comes from those in the last 12 months of life.[10] Here we revisit and update their estimates. We estimate medical spending in the calendar year of death, and in the two years before death. We also compare medical spending before death to total aggregate medical spending.

Table 12 presents key facts on medical spending in the final three years of life, relative to medical spending of the whole population. Panel A displays aggregate statistics on medical spending and mortality for the U.S. in 2008 that are useful for making these calculations. National statistics for spending come from the aggregate NHEA data. The rightmost column displays corresponding statistics from the MCBS. Data on mortality comes from the National Vital Statistics Reports (Miniño et al., 2011). Panel A shows that the MCBS matches the aggregate spending statis-

[10]Other studies include Lubitz and Riley (1993), Scitovsky (1994), Levinsky et al. (2001), Riley and Lubtiz (2010), and Marshall et al. (2011).

Panel A: Aggregate medical spending and mortality			
	Total population (National Stats)	Age-65+ population (National Stats)	(MCBS)
Personal Health Care Expenditure			
Mean spending per person	7,220	19,110	15,570
Aggregate spending (billions)	2,190	740	600
Mortality			
Deaths (millions)	2.47	1.80	1.71

Panel B: Medical spending in last years of life				
		As a percentage of aggregate spending		
	Mean Spending	Total population (National Stats)	Age-65+ population (National Stats)	(MCBS)
Last years of life from data				
Year of death	**43,030**	**4.9%**	**10.5%**	**12.2%**
Hospitals	21,650	2.4%	5.3%	6.1%
Nursing Home Care	9,150	1.0%	2.2%	2.6%
Next to last year	**42,810**	**4.8%**	**10.4%**	**12.2%**
Hospitals	13,790	1.6%	3.4%	3.9%
Nursing Home Care	14,490	1.6%	3.5%	4.1%
Second to last	**32,860**	**3.7%**	**8.0%**	**9.3%**
Hospitals	8,560	1.0%	2.1%	2.4%
Nursing Home Care	12,290	1.4%	3.0%	3.5%
Sum of last 3 years	**118,690**	**13.4%**	**28.9%**	**33.7%**
Hospitals	44,000	5.0%	10.7%	12.5%
Nursing Home Care	35,920	4.0%	8.7%	10.2%
Hoover et al. method				
Final 12 months	**59,100**	**6.7%**	**14.4%**	**16.8%**
Hospitals	26,870	3.0%	6.5%	7.6%
Nursing Home Care	14,990	1.7%	3.6%	4.3%

Notes: Last year of life spending data from MCBS. Aggregate medical spending data from NHEA, aggregated death data from National Vital Statistics Reports. All data are for 2008, adjusted to 2014 dollars.

Table 12: Medical Spending in the Last Year of Life

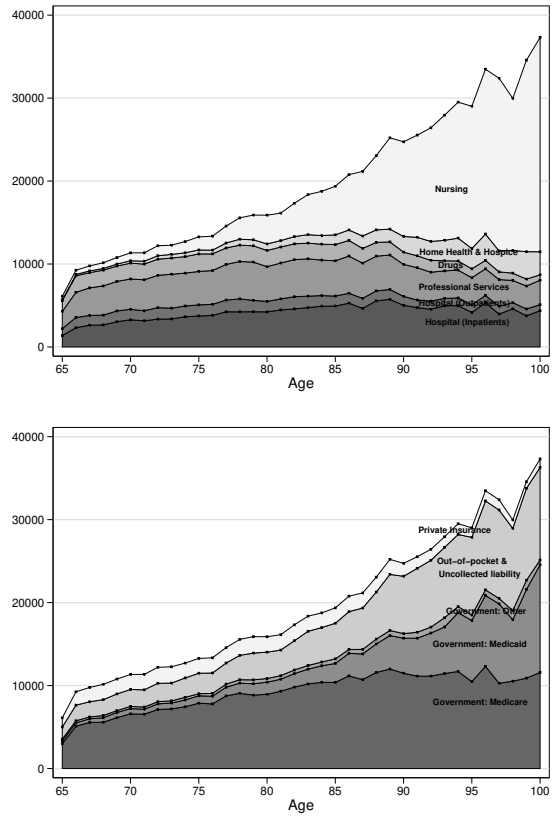


Figure 3: Average Total Medical Expenditures, by Expenditure (top panel) and Payor Type (bottom panel)

tics reasonably well, and matches mortality statistics very well, giving us additional confidence in the data.

Panel B in Table 12 displays medical spending in the last years of life. The leftmost "mean spending" column refers to mean spending in the last 1, 2 and 3 calendar years before death. If an individual dies in March, medical spending in the year of death will refer only to medical spending between January and March. All the data in Table 12 is for 2008, so spending in the "Next to last" and "Second to last" years is by people who go on to die in 2009 and 2010, respectively. Spending in the last calendar year of life is $43,030, or about 6 times average spending for the entire population and over double the average medical spending of the age-65+ population. Medical spending in the previous year is $42,810, again about 6 times average medical spending per person, and spending in the second to last year is $32,860.

The right-hand columns of Panel B present medical spending in the last years of

life as a percentage of medical spending at all ages, as well as a percentage of medical spending for the over-65 population. We calculate these percentages by multiplying the mean spending values in Panel B by the number of deaths in Panel A, and dividing the resulting product by the aggregate spending values reported in Panel A. By way of example, data from the Vital Statistics Reports indicate that 2.47 million individuals died in 2008, of whom 73% were aged 65 or older. Assuming that medical spending on the dead over age 65 is the same as medical spending for the younger-than-65 population, we can infer that aggregate medical spending on all those who died in 2008 was \$43,030 $\times$ 2.4720 = \$106.4 billion, which constitutes 4.9% of aggregate medical spending.

Medical spending for the "year of death" mixes together those who died in January (and so had only one month of spending in the "year of death") with those who died in December (and so had 12 months of spending). To estimate total medical spending in the last 12 months of life, we apply the approach taken in Hoover et al. (2002). We estimate the following regression:

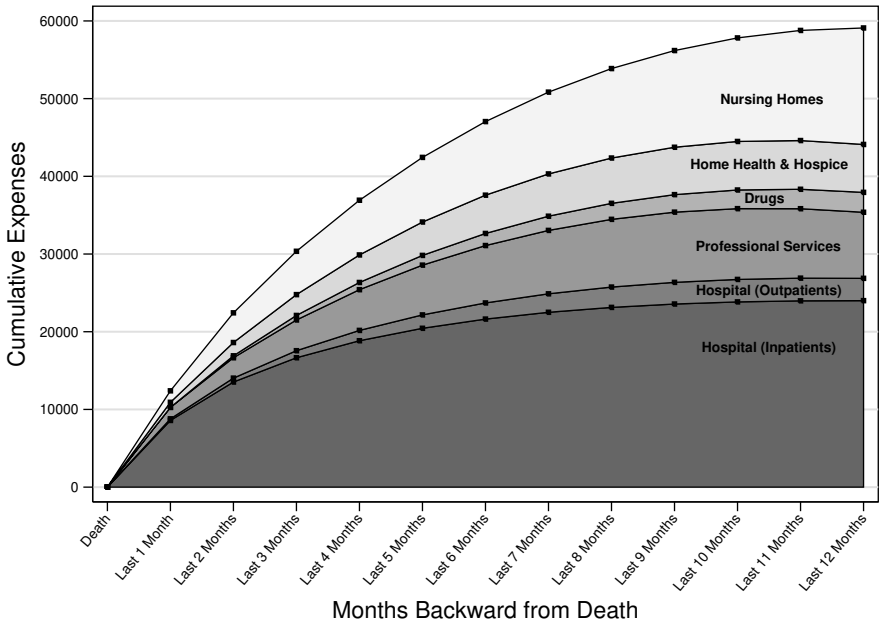
$$E_i = \beta_0 + \beta_1\sqrt{m_i} + \beta_2 m_i + \beta_3 m_i^2 + \epsilon_i, \tag{1}$$

where E_i is total medical spending in the calender year for individual i, and m_i is individual i's exact month of death, where $m_i = 1$ if the month of death is January and $m_i = 12$ if the month of death is December. The bottom row of Panel B presents our results. Using data from 2008, we find that 16.8% of all medical spending for the 65+ population occurs in the last 12 months of life. Using MCBS data for 1992 to 1996, Hoover et al. (2002) find that 22% of all medical spending for the 65+ population occurs in the last 12 months of life. Our lower estimate appears to be the result of using more recent data. For example, if we use data from just 1996, the estimate becomes 20.9%, much closer to Hoover et al's. (2002) estimate.

Because those aged 65 and older are more likely to die, end-of-life spending is far more important for those over 65 than for the population as a whole. The 65+ population accounts for only 34% of all medical spending, but 73% of all deaths. The percentage of medical spending at all ages going towards individuals in the last 12 months of life is only 6.7%. Medical spending in the last 3 years of life represents 13.4% of aggregate medical spending. Thus, while end-of-life spending is high in the United States, it hardly explains all of why medical spending in the U.S. is so much higher than in other countries. For example, Polder et al. (2006) find that 10% of all medical expenditures in the Netherlands are made in the last year of life, a higher percentage than (our estimates) for the U.S.

Figure 4 shows mean cumulative medical spending over the last 12 months of life

By Expenditure type



By Payor type

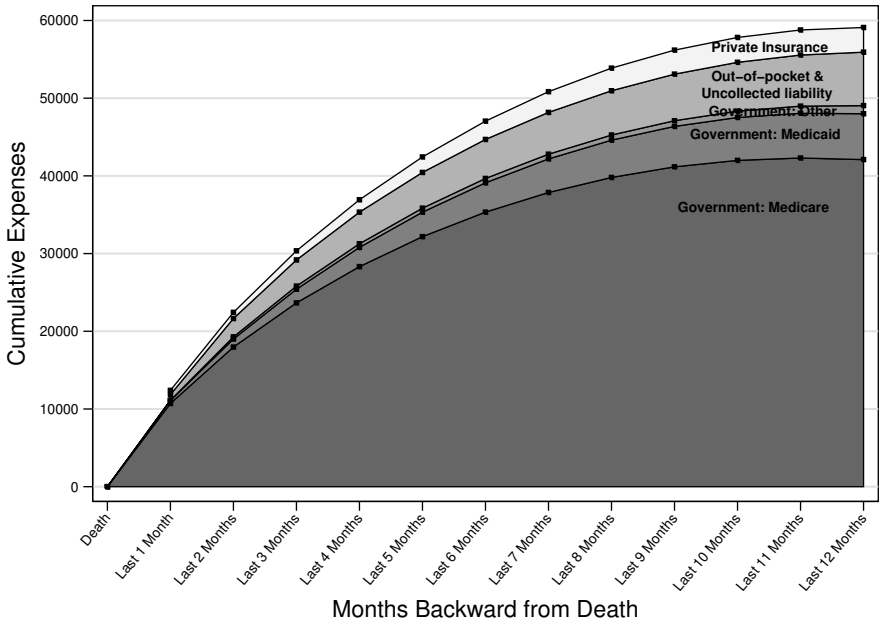


Figure 4: Spending in the Last 12 Months of Life, by Expenditure and Payor Type

as a function of the number of months from death. It decomposes medical spending into spending by expenditure and payor types. Total medical spending in the last month of life averages $12,400, the great majority of which is paid by the government, through Medicare, Medicaid and Veterans programs. Over the final year, total medical spending is $59,100. Of this total, $42,100, or 71%, is covered by Medicare, while $5,900, or 10%, is covered by Medicaid, and $1,040 is covered by other government programs. Relative to medical spending for all the elderly (Table 4), the government picks up a larger share of medical spending amongst those near death, most notably through Medicare. Out-of-pocket expenses in the last year of life are $6,500, somewhat lower than in French et al. (2006) or Marshall et al. (2011). Uncollected liabilities are $380, while $3,180 is covered by private insurance. The greatest expenditure type is hospital inpatients at $24,000, or 41%, followed by nursing home at $14,990, or 25%. Professional services are $8,500, home health and hospice are $6,170, hospital outpatients are $2,870, and drugs are $2,560.

8 Conclusion

We find that medical expenses more than double between ages 70 and 90 and that medical expenses are very concentrated: the top 10% of all spenders are responsible for 52% of medical spending in a given year. In addition, those currently experiencing either very low or very high medical expenses are likely to find themselves in the same position in the future. We also find that the poor consume more medical goods and services than the rich, and have a much larger share of their expenses covered by the government. Overall, the government covers 65% of the elderly's total medical expenses. Despite this, the expenses that remain after government transfers are even more concentrated among a small group of people. Thus, government health insurance, while potentially very valuable, is far from being complete. Finally, while medical expenses before death can be large, on average they constitute only a small fraction of total spending, both in the aggregate and over the life cycle. Hence, medical expenses before death do not appear to be an important driver of the high and increasing medical spending found in the U.S.

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Appendix A: Supplementary Tables

Table A1 shows mean Medicaid payments conditional on payment percentile for both the MCBS and the MSIS (from Young et al., 2012). Our calculations for this table use the subset of the MCBS that receives both Medicare and Medicaid, the subset most similar to the subset of the MSIS data used by Young et al. Table A1 shows that in both datasets the least costly 50% of total Medicaid enrollees account for less than 1% of total Medicaid payments, whereas the most costly 5% are responsible for over 40% of the total. But even though the MCBS Medicaid data match the MSIS expenditure shares, they understate the level of spending at all parts of the distribution.

Spending Percentile	Percentage of Medicaid enrollees	Percentage of Medicaid spending (MSIS)	Average spending per enrollee (MSIS)	Percentage of Medicaid spending (MCBS)	Average spending per enrollee (MCBS)
All	100%	100%	15,880	100%	8,760
95-100%	5%	40.9%	118,490	43.9%	76,880
90-95%	5%	20.4%	59,420	26.8%	46,910
70-90%	20%	32.4%	25,980	26.2%	11,480
50-70%	20%	5.5%	4,370	2.6%	1,140
0-50%	50%	0.9%	280	0.4%	90

Notes: 2008 MSIS data, adjusted to 2014 dollars.

Table A1: Medicaid Enrollment and Expenditures by Enrollee Spending Percentile, MSIS versus MCBS.

Table A2 presents a different measure of expenditure ratios: construct the ratios for each individual, then average over all individuals. This differs from Table 4 and Table 2, where expenditures are averaged across all individuals and then used to calculate ratios. As it turns out, changing the method of calculating ratios has significant effects. For example, the share of aggregate medical expenditures covered by Medicaid is 9.4%, but the average individual Medicaid share is 4.1%. The difference arises because taking the ratio of the means weights more heavily those with high medical spending. Medicaid spending is concentrated amongst a small number of individuals who consume a very large amount of medical resources. Most individuals receive no Medicaid assistance at all. Among expenditure types, nursing home care

represents 15.9% of medical spending in the aggregate, versus 4.1% when averaged across individuals. Again, the key difference is the weighting: the small share of people in nursing homes consume a great deal of medical resources, meaning that nursing home expenditures are responsible for a large share of total resources.

	Means of Ratios		
	All	Men	Women
Fraction by Payor			
Out-of-Pocket	28.5%	28.0%	28.9%
Private Insurance	18.2%	19.3%	17.4%
Uncollected liabilities	2.2%	2.3%	2.2%
Government	51.1%	50.4%	51.5%
Medicaid	4.1%	2.6%	5.2%
Medicare	43.5%	42.5%	44.2%
Other government	3.5%	5.3%	2.2%
Fraction by Type of Expenditure			
Nursing Home Care	5.3%	3.6%	6.5%
Hospitals	19.6%	20.8%	18.7%
Inpatients	9.7%	10.5%	9.0%
Outpatients	9.9%	10.3%	9.6%
Professional Services	43.0%	44.3%	42.0%
Drugs	30.2%	29.7%	30.6%
Home Help and Hospice	1.9%	1.5%	2.2%

Notes: This table reports expenditure ratios for each individual, averaged over all individuals.

Table A2: Percentage of Total Expenditures, by Payors and Expenditures, MCBS data.

Type of Spending		A: Spending in Levels			B: Spending in Logs	
		t+1	t+2		t+1	t+2
All	All	0.57	0.40	All	0.61	0.53
	Men	0.49	0.33	Men	0.57	0.50
	Women	0.61	0.45	Women	0.64	0.55
		t+1	t+2		t+1	t+2
All (excl. nursing homes)	All	0.45	0.28	All	0.56	0.48
	Men	0.39	0.25	Men	0.54	0.47
	Women	0.49	0.31	Women	0.57	0.49
		t+1	t+2		t+1	t+2
Hospitals	All	0.27	0.19	All	0.30	0.25
	Men	0.28	0.17	Men	0.29	0.24
	Women	0.25	0.20	Women	0.31	0.25

Table A3: Correlation of Medical Spending in Year t with Spending in Year t+1 and Year t+2, by Gender

Panel A: One-year transitions					
Quintile	Next year				
Current Year	Bottom	Fourth	Third	Second	Top
Bottom	61.3	17.8	8.8	6.6	5.5
Fourth	23.4	36.0	19.3	12.1	9.1
Third	9.4	24.5	31.1	21.3	13.6
Second	6.3	13.2	25.4	31.7	23.5
Top	4.8	8.4	14.0	26.6	46.3

Panel B: Two-year transitions					
Quintile	Two years ahead				
Current Year	Bottom	Fourth	Third	Second	Top
Bottom	57.4	18.4	10.2	7.5	6.6
Fourth	25.2	31.4	19.4	12.8	11.2
Third	11.7	24.8	27.8	20.5	15.3
Second	7.6	14.6	24.3	30.1	23.4
Top	6.3	10.4	15.6	26.1	41.7

Table A4: Transition Matrices for Total Medical Expenditures (Excluding Nursing Home Costs)

Panel A: One-year transitions					
Quintile	Next year				
Current Year	Bottom	Fourth	Third	Second	Top
Bottom	39.5	24.8	13.6	11.3	10.9
Fourth	27.1	28.9	17.9	13.7	12.4
Third	13.9	20.9	29.0	20.5	15.7
Second	10.9	14.3	23.1	30.0	21.7
Top	10.0	12.1	16.1	23.9	37.8

Panel B: Two-year transitions					
Quintile	Two years ahead				
Current Year	Bottom	Fourth	Third	Second	Top
Bottom	36.4	23.7	14.2	12.8	12.9
Fourth	28.4	27.3	17.0	13.8	13.5
Third	15.1	21.8	26.9	20.0	16.2
Second	11.0	14.8	23.4	28.7	22.1
Top	11.4	13.7	17.3	23.0	34.6

Table A5: Transition Matrices for Hospital Expenditures