

Medicare Fee-for-Service Spending for Diabetes: Examining Aging and Comorbidities

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Abstract

This research report examines prevalence and spending on diabetes for fee-for-service (FFS) beneficiaries of the Medicare program, the health insurance program that covers the majority of adults age 65 and above in the U.S. To date, most studies of spending on diabetes care in the U.S. have relied on self-reported survey data and estimates of utilization and spending, but do not represent actual spending identified through administrative claims. This report is based on newly available administrative claims data from the Centers for Medicare & Medicaid Services 2010 Chronic Conditions Public Use File. Diabetes was prevalent among approximately 1/4 of Medicare FFS beneficiaries in 2010. Prevalence increased with age initially for the aged population, but dropped for beneficiaries > 85. Only about 1/4 of diabetic beneficiaries had diabetes without a comorbidity. Beneficiaries with diabetes had 2.8 chronic conditions (including diabetes) with average Medicare Part A and Part B spending of \$5,741 and \$5,991, and drug costs of \$3,119, respectively. Spending increased with age for beneficiaries >65. Findings of these analyses consider diabetes in the context of chronic comorbidities and contribute to understand claims-based prevalence and spending for older adults with diabetes in the Medicare FFS population.

Keywords: Diabetes; Comorbidities; Medicare; Fee-for-service; Healthcare spending

Introduction

Diabetes Mellitus is a chronic condition affecting an estimated 25.8 million people, or 8.3% of the population of the United States in 2010, including 10.9 million adults age 65 and above [1]. Type 2 diabetes is responsible for 90-95% of diabetes cases and the majority of health spending, with prevalence increasing with age; Type 1 diabetes, formerly known as juvenile diabetes and gestational diabetes account for most of the remaining cases [2-5]. Diabetes is a leading cause of death and is often associated with comorbidities including kidney failure, lower limb amputations, adult onset blindness, obesity, hypertension, nerve damage, heart disease and stroke. Health care reform legislation in the U.S. under the Affordable Care Act (ACA) of 2010 identifies diabetes as a major population health concern, with provisions that address diabetes prevention, screening, access to wellness and prevention programs, healthcare and prescription drug coverage, enhanced surveillance and quality standards, and demonstration programs for non-institutionalized individuals with diabetes [6,7].

The total economic cost of diagnosed diabetes in the U.S. is estimated at \$245 billion in 2012, including \$176 billion in medical costs and \$69 billion attributed to reduced productivity [3]. This represents a 41% increase over the \$174 billion in total economic costs estimated for 2007 [2]. Diabetes is associated with higher use of health care services, medications, and other supplies, with medical costs per case increasing with age [8].

Individuals 65 years of age and above account for approximately 59% of national spending on diabetes care in the U.S., most of which is paid by Medicare [9], the publicly-funded health insurance program administered by the Centers for Medicare & Medicaid Services (CMS) that covers the majority of adults age 65 and above in the U.S. [3]. Medicare Fee-for-Service (FFS) coverage has multiple parts. Medicare Part A (also known as hospital insurance) covers care in hospitals, skilled nursing facilities and other institutions for the more costly and complex treatment needs. Medicare Part B (also known as medical insurance) covers doctors' services, outpatient services, diagnosis,

examinations, care, equipment and supplies relating to diabetes, as well as some preventive services for individuals at risk for diabetes and self-management training for those newly diagnosed or at risk for complications relating to their diabetes. Medicare Part D (also known as prescription drug insurance) provides prescription drug coverage and covers supplies for injecting or inhaling insulin, and is provided through private insurance companies that contract with CMS.

This report examines Medicare spending on diabetes care for fee-for-service (FFS) beneficiaries, with a focus on individuals age 65 and above (older adult population) to better understand prevalence and spending patterns. Previous studies of spending and resource use on diabetes care in the U.S. have relied on large self-reported survey data such as the Behavioral Risk Factor Surveillance System, National Medical Expenditure Survey or the Medical Expenditure Panel Survey, or from Medicare Part D health plans. These data sources enable estimates of utilization and spending, but do not represent actual hospital, medical and pharmaceutical spending that can be identified through administrative claims. For the Medicare program, funded by public dollars, this information is critical for program policy and management, especially as diabetes accounts for a growing proportion of program expenditures.

Methods

We address prevalence and spending associated with diabetes

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(all types combined) among Medicare beneficiaries age 65 and above in calendar year 2010 using the 2010 Chronic Conditions PUF newly available through the CMS. These PUFs contain claims information from 100% of Medicare FFS beneficiaries (complete universe rather than a sample) for Medicare Part A (hospital insurance), Part B (physician and outpatient services) spending, and Part D (prescription drug) spendingⁱ. Information (e.g., utilization, Medicare spending) is summarized in profiles (or groups) of beneficiaries defined by gender, age categories, dual-eligibility status, eleven chronic condition indicators (whether or not the condition exists), and length of enrollment (i.e., full year or less than full year). So, the observations in the data are not beneficiaries or claims, but groups of enrollees that have the same combinations of demographics as well as health status. For each profile, the data provide information on utilization and Medicare payments, such as average Medicare reimbursement per enrollee for inpatient services together with number of beneficiaries enrolled in Medicare Part A which the average is based on. Chronic conditions included in the PUF are: Alzheimer's Disease and Related Disorders or Senile Dementia (ALZ); Cancer including one or more of the following types: breast, colorectal, prostate, or lung (CAN); Congestive Heart Failure (CHF); Chronic Kidney Disease (CKD); Chronic Obstructive Pulmonary Disease (COPD); Depression (DEPR); Diabetes (DIAB); Ischemic Heart Disease (IHD); Osteoporosis (OSTEO); Rheumatoid Arthritis/Osteoarthritis (RA/OA); and Stroke\Transient Ischemic Attack (S/TIA)ⁱⁱⁱ.

The 2010 CMS Chronic Conditions PUF contains eight (8) "segments" distinguished by the type of care (Part A, Part B, Part C: Medicare Advantage, and Part D) and length of enrollment (i.e., full year vs. less than full year)^{iv}. Our analyses focus only on Part A, Part B, and Part D and beneficiaries enrolled for the full year in 2010 who are not dual-eligible (eligible for both Medicare and Medicaid benefits). Dual-eligible beneficiaries are a diverse group of individuals with different health care use patterns compared to those eligible by only Medicare^v. Beneficiaries may be enrolled in one or more of these segments, and thus may be represented in one or more segment analyses in the rest of the study. Also, cost estimates for this study only include Medicare spending and exclude all other costs such as out-of-pocket expenses (e.g., co-insurance, deductible payments) and payments by third parties.

Results

The 2010 Chronic Conditions PUF provides summary information for more than 50 million Medicare FFS beneficiaries in 2010. Average Medicare reimbursements for full-year (i.e., 12 months of continuous enrollment) beneficiaries that are not dual-eligible were \$3,146 and \$4,056 per beneficiary in Part A and Part B, respectively. Average drug spending per beneficiary was an additional \$2,048 per beneficiary.

Table 1 summarizes the most common 15 combinations of chronic conditions among Part A, Part B, and Part D beneficiaries sorted by number of Part A beneficiaries^{vi}. About 38.3% of Medicare Part A beneficiaries 10,245,731 out of 26,751,682) and 31.5% of Medicare Part B beneficiaries (7,468,750) did not have any of the eleven chronic conditions available in the data. Also, these most common combinations of chronic conditions were identical among Part A and Part B beneficiaries. Beneficiaries enrolled in Part D were relatively healthier compared to Part A and Part B: about 57% of Medicare Part D enrollees (10,200,308 out of 17,832,558) did not have any of the eleven

ⁱ. These files are available at: <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/BSAPUFS/index.html>.

ⁱⁱ. CMS does not collect claims data from private insurers for Medicare Advantage (Part C) beneficiaries.

ⁱⁱⁱ. Detailed information chronic conditions indicators is available at the CMS Chronic Condition Warehouse (CCW) website: http://www.ccwdata.org/cs/groups/public/documents/document/ccw_conditioncategories2011.pdf

^{iv}. Utilization and Medicare reimbursement information are not available for the Part C (Medicare Advantage) segment.

^v. These segments are "disjoint" by length of enrollment in the sense that any particular enrollee can only be in the full year (i.e., 12 months) or in the less than year (i.e., 1-11 months) segment. However, even though about 90% of Part A enrollees are also enrolled in Part B, the utilization information for Part A and Part B are provided separately.

^{vi}. Even though patients with end stage renal disease (ESRD) and disabilities, who are covered by Medicare, are also considered to be unique sub-populations, they are included in our study population. This is solely due to the fact that they are not separately available in the data.

^{vii}. Sorting by Part B or Part D beneficiaries result in the same order.

Conditions (Part A & Part B)	Conditions (Part D)	Number of Beneficiaries (Part A)	Mean Medicare Payment (Part A)	Number of Beneficiaries (Part B)	Mean Medicare Payment (Part B)	Number of Beneficiaries (Part D)	Mean Total Drug Cost (Part D)
None	None	10,245,731	\$245	7,468,750	\$1,266	10,200,308	\$1,569
DIAB	DIAB	1,457,641	\$537	1,412,250	\$2,146	721,715	\$2,214
IHD	IHD	1,381,884	\$1,228	1,337,306	\$2,870	663,984	\$2,008
RA/OA	RA/OA	1,087,123	\$1,901	1,075,092	\$3,183	506,029	\$1,687
OSTEO	OSTEO	780,153	\$689	771,700	\$2,410	362,094	\$1,520
DIAB & IHD	DIAB & IHD	642,840	\$1,502	626,484	\$3,501	297,262	\$2,847
DEPR	DEPR	506,759	\$1,528	485,388	\$2,885	243,769	\$2,798
CAN	ALZ	364,414	\$1,270	356,644	\$6,138	155,801	\$2,904
IHD & RA/OA	CAN	324,979	\$3,256	323,380	\$4,679	151,442	\$1,707
DIAB & RA/OA	IHD & RA/OA	296,557	\$2,139	294,210	\$3,737	149,652	\$2,187
OSTEO & RA/OA	DIAB & RA/OA	292,620	\$2,639	292,042	\$4,249	139,793	\$2,419
CHF & IHD	OSTEO & RA/OA	282,873	\$3,890	277,055	\$4,610	137,675	\$2,001
CKD	CHF & IHD	278,485	\$2,558	263,884	\$4,795	134,076	\$2,280
ALZ	CKD	263,117	\$2,741	257,461	\$2,160	124,410	\$2,322
COPD	COPD	252,725	\$1,912	245,031	\$3,237	110,731	\$2,587
All other	All other	8,293,781	\$8,305	8,191,094	\$7,435	3,733,817	\$3,246
Total	Total	26,751,682	\$3,146	23,677,771	\$4,056	17,832,558	\$2,048

ALZ: Alzheimer's Disease; CAN: Cancer; CHF: Congestive Heart Failure; CKD: Chronic Kidney Disease; COPD: Chronic Obstructive Pulmonary Disease; DEPR: Depression; DIAB: Diabetes; IHD: Ischemic Heart Disease; OSTEO: Osteoporosis; RA/OA: Rheumatoid Arthritis/Osteoarthritis; S/TIA: Stroke\Transient Ischemic Attack.

Table 1: Most Common Combinations of Chronic Conditions among Medicare FFS Beneficiaries.

chronic conditions. The only striking difference between Part A-B and Part D was that Alzheimer's ranked markedly higher among Part D enrollees than it did among Part A-B enrollees. Beneficiaries with only diabetes were about 5.4 (6.0)% of the Part A (Part B) beneficiaries, but another 2.4 (2.6)% had both diabetes and ischemic heart disease, and 1.1 (1.2)% had both diabetes and arthritis within the most common combinations provided in the table. Also, ischemic heart disease is the most common comorbidity of diabetes among Medicare beneficiaries.

More than 6 million (22.6%) Part A beneficiaries were diagnosed with diabetes making it the most commonly observed chronic condition among non-dual Medicare FFS beneficiaries (Table 2). The share of diabetic beneficiaries was higher (25.0%) among Part B beneficiaries, but lower (15.6%) among Part D beneficiaries. These differences were also consistent for every gender and age category. Male beneficiaries 65 and older suffered more from diabetes compared to female beneficiaries in Part A, Part B, and Part D. For example, in all age categories (except for under 65), the percentage of beneficiaries with diabetes was at least 3-4 percentage points higher for males than females in Part A. The prevalence of diabetes increased with age initially for the aged Medicare

population, but dropped for beneficiaries 85 years of age and older compared to age group 80-84 (e.g., from 28.7% to 24.2% for males and from 24.0% to 19.8% for females in Part A). This may reflect shorter life expectancies identified among individuals with diabetes, and warrants more in-depth investigation.

Table 3 provides an overview of comorbidities by summarizing the top 15 combinations of chronic conditions for beneficiaries with diabetes in Part A, Part B, and Part D. Ischemic heart disease, arthritis, chronic kidney disease, and congestive heart failure appear as the major comorbidities of diabetes. Stroke/transient ischemic attack (not in the most common comorbidities), Alzheimer's, chronic obstructive pulmonary disease, cancer, and depression are not as significant comorbid chronic conditions for diabetes as the others. Only about 24% of Part A and Part B beneficiaries with diabetes did not have a comorbidity. Hence, 3 out of every 4 beneficiaries dealing with diabetes also deal with at least one more other chronic condition.

Average Medicare spending for a Part A enrollee with diabetes and no chronic conditions was \$537. Average Part B expenditures for a

Sex	Age	Number of Diabetic Beneficiaries (Part A)	Number of Beneficiaries (Part A)	Percent of Diabetic Beneficiaries (Part A)	Number of Diabetic Beneficiaries (Part B)	Number of Beneficiaries (Part B)	Percent of Diabetic Beneficiaries (Part B)	Number of Diabetic Beneficiaries (Part D)	Number of Beneficiaries (Part D)	Percent of Diabetic Beneficiaries (Part D)
Male	Under 65	344,314	1,725,793	20.0%	325,820	1,337,152	24.4%	160,748	857,082	18.8%
	65 - 69	669,752	3,283,386	20.4%	639,698	2,583,428	24.8%	294,165	1,806,708	16.3%
	70 - 74	724,400	2,768,046	26.2%	710,794	2,442,030	29.1%	327,174	1,860,326	17.6%
	75 - 79	572,521	2,007,903	28.5%	565,949	1,861,032	30.4%	224,863	1,328,837	16.9%
	80 - 84	420,795	1,467,095	28.7%	417,790	1,393,865	30.0%	158,825	931,401	17.1%
	85 & over	300,642	1,241,694	24.2%	299,223	1,146,914	26.1%	107,782	686,930	15.7%
Female	Under 65	263,361	1,309,322	20.1%	250,044	1,031,500	24.2%	129,696	782,221	16.6%
	65 - 69	587,972	3,320,661	17.7%	570,296	2,784,123	20.5%	289,823	2,293,537	12.6%
	70 - 74	657,549	2,990,307	22.0%	650,827	2,761,257	23.6%	332,197	2,326,153	14.3%
	75 - 79	568,653	2,363,845	24.1%	565,596	2,259,042	25.0%	281,116	1,864,736	15.1%
	80 - 84	480,022	2,000,004	24.0%	478,716	1,936,706	24.7%	241,969	1,527,556	15.8%
	85 & over	451,254	2,273,626	19.8%	451,327	2,140,722	21.1%	233,621	1,567,071	14.9%
Total		6,041,235	26,751,682	22.6%	5,926,080	23,677,771	25.0%	2,781,979	17,832,558	15.6%

Table 2: Prevalence of Diabetes among Medicare FFS Beneficiaries by Sex and Age.

Conditions (Part A) [2]	Percent of Beneficiaries (Part A)	Average Medicare Part A Spending	Conditions (Part B) [2]	Percent of Beneficiaries (Part B)	Average Medicare Part B Spending	Conditions (Part D) [2]	Percent of Beneficiaries (Part D)	Average Medicare Part D Spending
DIAB only (1)	24.13%	\$537	DIAB only (1)	23.83%	\$2,146	DIAB only (1)	25.94%	\$2,214
DIAB & IHD (2)	10.64%	\$1,502	DIAB & IHD (2)	10.57%	\$3,501	DIAB & IHD (2)	10.69%	\$2,847
DIAB & RAI/OA (2)	4.91%	\$2,139	DIAB & RAI/OA (2)	4.96%	\$3,737	DIAB & RAI/OA (2)	5.02%	\$2,419
DIAB & CKD (2)	3.46%	\$2,642	DIAB & CKD (2)	3.38%	\$5,534	DIAB & CKD (2)	3.44%	\$3,252
DIAB & CHF & IHD (3)	3.20%	\$4,294	DIAB & CHF & IHD (3)	3.20%	\$5,365	DIAB & CHF & IHD (3)	3.27%	\$3,174
DIAB & CKD & IHD (3)	2.61%	\$4,674	DIAB & RAI/OA & IHD (3)	2.65%	\$5,388	DIAB & RAI/OA & IHD (3)	2.60%	\$2,958
DIAB & RAI/OA & IHD (3)	2.61%	\$3,526	DIAB & CKD & IHD (3)	2.59%	\$7,402	DIAB & CKD & IHD (3)	2.47%	\$3,785
DIAB & CHF & CKD & IHD (4)	2.48%	\$12,792	DIAB & CHF & CKD & IHD (4)	2.48%	\$12,437	DIAB & CHF & CKD & IHD (4)	2.42%	\$4,177
DIAB & OSTEO (2)	2.11%	\$927	DIAB & OSTEO (2)	2.13%	\$3,052	DIAB & DEPR (2)	2.12%	\$3,530
DIAB & DEPR (2)	2.05%	\$2,009	DIAB & DEPR (2)	2.02%	\$3,642	DIAB & OSTEO (2)	2.10%	\$2,307
DIAB & CAN (2)	1.54%	\$1,435	DIAB & CAN (2)	1.55%	\$6,515	DIAB & CAN (2)	1.40%	\$2,459
DIAB & CHF (2)	1.20%	\$1,896	DIAB & CHF (2)	1.18%	\$3,570	DIAB & CHF (2)	1.35%	\$2,795
DIAB & COPD (2)	1.08%	\$2,328	DIAB & COPD (2)	1.07%	\$3,877	DIAB & ALZ (2)	1.14%	\$3,474
DIAB & ALZ (2)	1.05%	\$2,720	DIAB & ALZ (2)	1.05%	\$3,018	DIAB & COPD (2)	1.03%	\$3,200
DIAB & COPD & IHD (3)	0.94%	\$4,296	DIAB & CHF & IHD & RAI/OA (4)	0.96%	\$7,248	DIAB & CHF & IHD & RAI/OA (4)	0.97%	\$3,306
All other combinations (4.4)	36.0%	\$12,183	All other combinations (4.4)	36.4%	\$9,618	All other combinations (4.3)	34.0%	\$3,913
All combinations (2.8)	100.0%	\$5,741	All combinations (2.8)	100.0%	\$5,991	All combinations (2.7)	100.0%	\$3,119

[1] Total number of diabetic beneficiaries in Part A, Part B, and Part D are provided in Table 2.

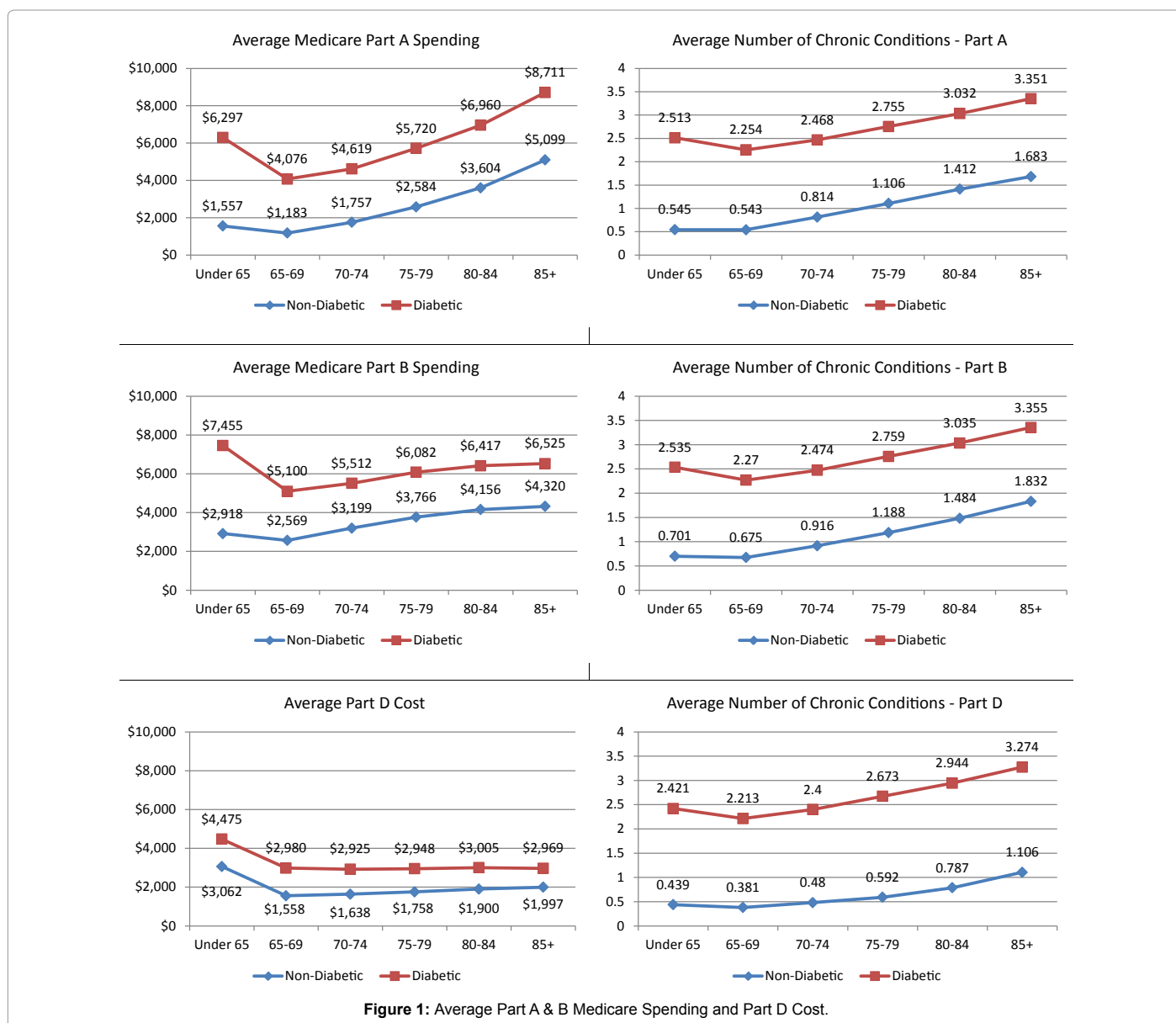
[2] Values in parenthesis denote the number of chronic conditions. For last two rows of the table, they denote the average number of chronic conditions.

Table 3: Combinations of Chronic Conditions among Medicare FFS Beneficiaries with Diabetes [1].

diabetic enrollee without other chronic conditions was \$2,146. Average total drug costs were about \$2,214. However, Medicare Part A spending increased drastically with comorbidities – 2.8 fold with ischemic heart disease, 4 fold with arthritis, 5 fold with chronic kidney disease, and 8 fold with ischemic heart disease and congestive heart failure. The increases in Medicare Part B spending were also significant but not as drastic relative to Part A – 1.6 fold with ischemic heart disease, 1.7 fold with arthritis, 2.6 fold with chronic kidney disease, and 2.5 fold with ischemic heart disease and congestive heart failure. Finally, among the comorbidities presented in the table, the increases in total drug costs due to comorbidities were not more than 1.9 fold (90%) which was for beneficiaries with three comorbidities: congestive heart failure, chronic kidney disease, and ischemic heart disease. On average, diabetic beneficiaries in Part A and Part B had 2.8 chronic conditions (including diabetes) with average Medicare spending of \$5,741 and \$5,991. Total drug costs for Part D beneficiaries were \$3,119.

and Part D cost for diabetic and non-diabetic beneficiaries by age (for number of beneficiaries provided in Table 2. Average Medicare Part A and Part B spending increases with age (except for beneficiaries under age 65). However, the increase in Part A spending is relatively steeper than the increase in Part B spending. Part D costs increase slightly with age for non-diabetic beneficiaries, but are flat for diabetic beneficiaries. Average Medicare spending and drug costs for diabetic beneficiaries are higher than for non-diabetic beneficiaries. For example, average Medicare spending for 65-69 year old beneficiaries with diabetes is about 3.5 and 2 times higher than for beneficiaries without diabetes for Part A and Part B, respectively. Some of this increase is explained by the differences in the average number of chronic conditions between diabetic and non-diabetic beneficiaries as shown on the right hand side of Figure 1. Interestingly, the differences in average number of chronic conditions are the largest among Part D beneficiaries, but average Medicare drug spending does not increase by age for diabetic beneficiaries even though they increase slightly for non-diabetic beneficiaries.

Figure 1 shows average Medicare Part A and Part B spending,



Discussion

These analyses show actual treated prevalence and hospital and medical spending (and prescription drug spending) for individuals in the Medicare FFS population using claims information available from newly available CMS public use files. Findings are generally consistent with trends identified in surveys and research that show diabetes as a common chronic condition, especially among older adults, with increases in prevalence and associated spending as the population ages, and shorter life expectancy [1-5]. The findings also show overall increases in the prevalence of chronic conditions with advancing age.

People with diabetes account for approximately a quarter of Medicare FFS beneficiaries in 2010 with a larger share among Part A beneficiaries and a significantly lower share among Part D beneficiaries (Table 2). Most beneficiaries with diabetes had other chronic conditions, which averaged 2.8 conditions (with diabetes). Spending was modest for the 5-6% of Part A and Part B beneficiaries with only diabetes and no other chronic conditions, but increased substantially for the majority of beneficiaries with diabetes who also had other chronic conditions. For example, annual spending associated with hospital care (Part A) increased by about 3 fold (\$1,502 vs. \$537), on average, if a diabetic beneficiary also had ischemic heart disease (Table 3) which is the most common comorbidity for beneficiaries with diabetes.

Not surprisingly, hospitalization accounts for the largest portion of overall resource use and spending for diabetes in this and other studies [2,3,10]. According to the ADA, diabetes contributes to higher rates of hospital admissions and longer average length of stay regardless of the reason for admissions (and controlling for other factors that affect hospital length of stay) [2].

As this study and others have found, health care spending was substantially greater for individuals with diabetes than for individuals without diabetes, and health resource utilization and associated spending increases with age [2,3,11]. This trend is clear for the population 65 years of age and over. However, beneficiaries under age 65 had higher, off-trend spending than the population age 65 and over, likely reflecting their eligibility and enrollment as a result of their disability status.

These analyses also confirm reports showing that diabetes often occurs along with other chronic conditions, and that comorbidities increase with advancing age [10,12]. Some of these conditions, such as ischemic heart disease, are related to diabetes, others are comorbidities independent of diabetes, such as osteoarthritis or Alzheimer's disease. The most common comorbidities identified in this study include: ischemic heart disease, arthritis, chronic kidney disease, osteoporosis and depression. Medicare spending increased across age groups as the number of chronic conditions increased. This finding is consistent with research by Struijs and colleagues who reported that the number of comorbidities is a strong predictor for the volume of medical care utilization for patients with diabetes [10].

The presence of comorbidities such as those in this study can complicate diabetes management, including patients' abilities to manage their self-care, and increase overall costs of care [13,14]. As Piette and Kerr [13] and others [15,16] point out, conditions such as depression and arthritis may impair patient functioning and present barriers to lifestyle change and regimen adherence, while conditions unrelated to diabetes such as emphysema and chronic low back pain can have a more debilitating impact on patients' health status than diabetes, and disabling conditions such as advanced heart failure and dementia may

make diabetes self-care goals impossible to reach. These conditions also compete for patients' time and financial resources.

Complications of diabetes, particularly cardiovascular diseases, neurological diseases, and renal conditions, also lead to increased use of health resources and spending [2,10]. A 2012 ADA study found medical spending increases from 25 percent in emergency departments to 45 percent in hospital inpatient facilities were due to treating complications of diabetes [3]. Other studies have found that people with uncontrolled diabetes or with diabetes complications incur diabetes costs two to eight times more than people with controlled or non-advanced diabetes. [17,18] Diabetes also increases the cost of treating general conditions that are not directly related to diabetes [3,10].

Effective population health tools and interventions—including diabetes education, self-management and self-care programs—are available and are expected to increase availability under the ACA that can improve diabetes management and prevent complications and, potentially, prevent or delay the development of Type 2 diabetes and its frequently occurring comorbid sequelae in persons at high risk. But despite medical and public health advances, it is not clear which interventions work best with which populations.

Limitations

These analyses have several limitations. They profile prevalence and spending for FFS Medicare beneficiaries, but do not examine whether and to what extent these patterns resemble prevalence, spending and chronic conditions in beneficiaries enrolled in non-FFS settings such as Medicare Advantage managed care plans. Data to enable such a comparison are not available, as CMS does not collect or release comparable data from these plans.

The CMS data used for these analyses do not collect information on out-of-pocket spending, although out-of-pocket spending is considerable for individuals with diabetes. These costs can be a barrier to condition management and regimen adherence, especially for those beneficiaries who do not have Medicare Supplemental insurance. Out-of-pocket spending for medication incurred by people with diabetes are higher than for individuals with most other chronic conditions [19]. Other out-of-pocket spending may include co-pays and transportation related to medical care, and purchases of healthy food to maintain diabetic dietary requirements.

The data contain information on only eleven chronic conditions. Hence, we cannot observe and control for other diseases (e.g., obesity, hypertension) that might affect the health of Medicare beneficiaries. Estimates for total and average number of chronic conditions may underestimate actual values and establish lower bounds. However, if these unknown chronic conditions have a random distribution over Medicare enrollees in the data, then our estimates for Medicare spending and drug costs may not be biased in any direction.

Study data do not include information on Medicare beneficiaries' race and ethnicity, so this study does not address prevalence and spending or profile chronic conditions across racial and ethnic groups. Blacks, Hispanics, and Native Americans have higher reported prevalence of diabetes than White populations [4]. These populations are also more likely to report having chronic conditions and lower incomes and Blacks, in particular, are less likely to report having Medicare supplemental policies to help cover associated care costs [9].

Conclusion

Medicare FFS spending for diabetes-related care for older adults

is substantial, with management and treatment often complicated by comorbid conditions and complications that further fuel spending for patients and the Medicare program. This research report provides prevalence and spending trends from 2010 that represent actual hospital, medical and pharmaceutical spending that can be identified through Medicare administrative claims. This information is critical for program policy and management as Medicare implements new ACA initiatives and continues to focus on prevention and treatment to curb increases in diabetes and related program expenditures for older adults in the FFS population.

Conflict of Interest

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References

- Centers for Disease Control and Prevention (2011a) National Diabetes Fact Sheet.
- American Diabetes Association (2008) Economic costs of diabetes in the U.S. In 2007. *Diabetes Care* 31: 596-615.
- American Diabetes Association. (2013). Economic costs of diabetes in the U.S. in 2012. *Diabetes Care*. [doi: 10.2337/dc12-2625]
- Centers for Disease Control and Prevention (2011b) Diabetes: successes and opportunities for population-based prevention and control at a glance, 2011.
- Narayan KM, Boyle JP, Geiss LS, Saaddine JB, Thompson TJ (2006) Impact of recent increase in incidence on future diabetes burden: U.S., 2005-2050. *Diabetes Care* 29: 2114-2116.
- Centers for Disease Control and Prevention, Diabetes Report Card 2012: National and State Profile of Diabetes and Its Complications.
- Thorpe KE (2012) Analysis & commentary: The Affordable Care Act lays the groundwork for a national diabetes prevention and treatment strategy. *Health Aff (Millwood)* 31: 61-66.
- Dall TM, Zhang Y, Chen YJ, Quick WW, Yang WG, et al. (2010) The economic burden of diabetes. *Health Aff (Millwood)* 29: 297-303.
- Kaiser Family Foundation (2012) Medicare at a Glance.
- Struijs JN, Baan CA, Schellevis FG, Westert GP, van den Bos GA (2006) Comorbidity in patients with diabetes mellitus: impact on medical health care utilization. *BMC Health Serv Res* 6: 84.
- Thorpe KE, Ogden LL, Galactionova K (2010) Chronic conditions account for rise in Medicare spending from 1987 to 2006. *Health Aff (Millwood)* 29: 718-724.
- Weiss CO, Boyd CM, Yu Q, Wolff JL, Leff B (2007) Patterns of prevalent major chronic disease among older adults in the United States. *JAMA* 298: 1160-1162.
- Piette JD, Kerr EA (2006) The impact of comorbid chronic conditions on diabetes care. *Diabetes Care* 29: 725-731.
- Engelgau MM, Geiss LS, Saaddine JB, Boyle JP, Benjamin SM, et al. (2004) The evolving diabetes burden in the United States. *Ann Intern Med* 140: 945-950.
- Ciechanowski PS, Katon WJ, Russo JE (2000) Depression and diabetes: impact of depressive symptoms on adherence, function, and costs. *Arch Intern Med* 160: 3278-3285.
- Krein SL, Heisler M, Piette JD, Makki F, Kerr EA (2005) The effect of chronic pain on diabetes patients' self-management. *Diabetes Care* 28: 65-70.
- Kim S (2007) Burden of hospitalizations primarily due to uncontrolled diabetes: implications of inadequate primary health care in the United States. *Diabetes Care* 30: 1281-1282.
- Brown JB, Pedula KL, Bakst AW (1999) The progressive cost of complications in type 2 diabetes mellitus. *Arch Intern Med* 159: 1873-1880.
- Rogowski J, Lillard LA, Kington R (1997) The financial burden of prescription drug use among elderly persons. *Gerontologist* 37: 475-482.