Chapter 6: Medicare Expenditures for Persons With CKD

- Medicare spending for beneficiaries aged 65 and older who have Chronic Kidney Disease (CKD) exceeded $50 billion in 2014, representing 20% of all Medicare spending in this age group (Figure 6.1).
- Medicare spending for beneficiaries with CKD who were younger than age 65 exceeded $8 billion in 2014, representing 44% of spending in this age group (Table 6.2).
- Beneficiaries aged 65 and older with diagnoses of CKD, diabetes, or congestive heart failure accounted for two-thirds of the growth in Medicare spending between 2013 and 2014 ($2 billion of the total $3 billion; Figure 6.1).
- Over 70% of total Medicare spending for beneficiaries with CKD who were aged 65 and older was incurred by those who also had diabetes, congestive heart failure, or both (Table 6.1).
- Spending per patient year was more than twice as high for those with all three chronic conditions of CKD, diabetes, and congestive heart failure ($38,561) than for beneficiaries with only CKD ($15,673; Table 6.1).
- In 2014, spending for Black/African-American beneficiaries with CKD exceeded that for those of White race by 14.6%, an increase from the 12.9% disparity observed in 2013 (Table 6.3).

Introduction

Determining the economic impact of CKD on a health care system is challenging. As noted in this 2016 Annual Data Report (ADR), Volume 1, Chapters 1, 2, and 3, under-recognition of CKD affects estimates of CKD-related expenditures in several ways:

- Biochemical measures of renal function and urine testing for proteinuria support the most definitive criteria, but health plan datasets, including Medicare's, rarely contain this information on a reliable or large scale.
- Even when health care data contain complete laboratory results, CKD is substantially under-identified as many persons with underlying CKD are not tested for the condition.
- Identification of persons with CKD using ICD-9-CM (International Classification of Diseases, 9th Revision, Clinical Modification) diagnosis codes will underestimate total CKD expenditures, as formal diagnoses of CKD are not commonly documented early in the disease process.
- Assuming that under-identification is most common in the earliest and least costly cases, estimates of cost per patient year (PPY) based on diagnoses of CKD found in claims are likely to be biased upwards. To the extent that under-identification is not constant over time, caution needs to be exercised in the interpretation of trend data.

Future efforts to increase CKD identification may also bias estimates of CKD-related health system costs. For example, if the true total number of cases (and therefore true costs) in the population is constant, greater identification of CKD over time might give the appearance of increased total expenditures related to CKD, as the number of identified cases grows.

As alluded to above, greater identification will likely have the opposite effect on trends in PPY expenditures, as the newly identified cases are likely to be less severe. In addition, it is not possible to

accurately attribute health care expenditures solely to kidney disease; the costs of CKD are influenced by its interactive nature and associations with conditions, such as diabetes mellitus (DM), hypertension (HTN), and cardiovascular diseases (CVD) such as coronary artery disease, cerebrovascular disease, peripheral arterial disease, and congestive heart failure (CHF).

The use of Medicare billing data to accurately describe total Medicare expenditures is becoming increasingly problematic. Medicare pays for service to persons in managed care plans ("Medicare Advantage") on a monthly capitated basis, thus specific billing data are not available for all beneficiaries. In recent years, enrollment in Medicare managed care plans has accelerated, possibly due to the enhanced Part D prescription drug coverage in these plans. The percent of Medicare beneficiaries enrolled in managed care increased from 13% in 2004 to 30% in 2014 (Kaiser, 2016), thus, while this chapter's analyses include the majority of Medicare beneficiaries with CKD, data for a significant percentage are potentially missing.

Methods

This chapter uses data from the Medicare 5% sample for fee-for-service beneficiaries aged 66 and older. Roughly 98% of Americans aged 65 and older qualify for Medicare, and as a result, analysis of Medicare data is representative of beneficiaries age 65 and older.

Medicare prescription drug coverage through Part D plans is also included in this chapter. Note that beneficiaries have many options to purchase prescription drugs, so the claims filled through the Part D plan may not represent all medications prescribed to Medicare beneficiaries.

The methodology we employed to calculate costs related to CKD (excluding end-stage renal disease [ESRD]) utilizes ICD-9-CM diagnosis codes to define the point prevalent CKD cohort. We included only those beneficiaries classified as having CKD on January 1 of each given year, to avoid possible association with acute kidney injury (AKI) in 2014. How to best integrate the costs of AKI patients into CKD calculations is a continuing area for research, due to the potential for transition from AKI to CKD.

In this chapter, costs are defined as Medicare expenditures rather than true economic costs, using claims from Medicare Parts A, B, and D as based on the 5% Medicare sample for calendar year 2014. In addition to reporting on the population aged 65 and older, this year we add information on beneficiaries younger than 65 who generally were Medicare-eligible due to disability.

See the *CKD Analytical Methods* chapter for a further explanation of analytical methods used to generate the figures and tables in this chapter.

Spending for CKD and Related Chronic Comorbidities

Examining Medicare costs reinforces CKD's reputation as a cost multiplier. Beneficiaries with recognized CKD, who represented 10% of the point prevalent aged Medicare population, accounted for 20% of total expenditures (see Tables 6.1 and 6.2 for the aged 65 and older and under-65 populations, respectively). We examined 2014 costs in relation to beneficiaries' CKD stage, age, sex, race, and concurrent disease, focusing on DM and CHF. These conditions, in addition to CKD, represent some of the costliest chronic disease populations for Medicare. CHF, for example, affects 9% of beneficiaries in the fee-for-service Medicare population, but accounts for 21% of expenditures. Thirty-five percent of overall expenditures were directed toward the 24% of beneficiaries with DM.

In those aged 65 and older, per-person per-year costs were 101% higher for those with CKD only versus those with no CKD, DM, or CHF ($15,673 vs $7,812). Costs for those with CKD and DM were 54% higher than those with DM only. Similarly, expenditures for those with CKD and CHF were 47% higher than those with CHF alone. For beneficiaries with CKD, CHF, and DM, costs were 44% higher than for those with only CHF and DM. Overall, people with diagnoses of CKD, DM, and/or CHF accounted for one-third of the Medicare aged 65 and older population, but over half of total programmatic costs.

vol 1 Table 6.1 Prevalent Medicare fee-for-service patient counts and spending for beneficiaries aged 65 and older, by DM, CHF, and/or CKD, 2014

	U.S. Medicare Population	Total Costs (millions, U.S. $)	PPPY Costs (U.S. $)	Population (%)	Costs (%)
All	24,496,020	$254,356	$10,803	100.00	100.00
With CHF or CKD or DM	8,140,540	$130,220	$17,013	33.23	51.20
CKD only (- DM & CHF)	1,023,220	$15,109	$15,673	4.18	5.94
DM only (- CHF & CKD)	4,093,320	$47,846	$12,116	16.71	18.81
CHF only (- DM & CKD)	893,760	$16,955	$20,733	3.65	6.67
CKD and DM only (- CHF)	847,220	$14,856	$18,610	3.46	5.84
CKD and CHF only (- DM)	340,300	$8,829	$30,395	1.39	3.47
DM and CHF only (- CKD)	515,500	$12,599	$26,758	2.10	4.95
CKD and CHF and DM	427,220	$14,025	$38,561	1.74	5.51
No CKD or DM or CHF	16,355,480	$124,136	$7,812	66.77	48.80
All CKD (+/- DM & CHF)	2,637,960	$52,819	$21,857	10.77	20.77
All DM (+/- CKD & CHF)	5,883,260	$89,327	$16,003	24.02	35.12
All CHF (+/- DM & CKD)	2,176,780	$52,409	$26,975	8.89	20.60
CKD and DM (+/- CHF)	1,274,440	$28,882	$24,854	5.20	11.36
CKD and CHF (+/- DM)	767,520	$22,854	$34,935	3.13	8.99
DM and CHF (+/- CKD)	942,720	$26,625	$31,902	3.85	10.47

Data Source: Medicare 5% sample. Abbreviations: CKD, chronic kidney disease; CHF, congestive heart failure; DM, diabetes mellitus; PPPY, per patient per year costs.

For the under age 65 Medicare population, one-fourth had one or more of CKD, DM, and/or CHF, accounting for 44% of spending for this group (Table 6.2).

vol 1 Table 6.2 Prevalent Medicare fee-for-service patient counts and spending for beneficiaries younger than age 65, by DM, CHF, and/or CKD, 2014

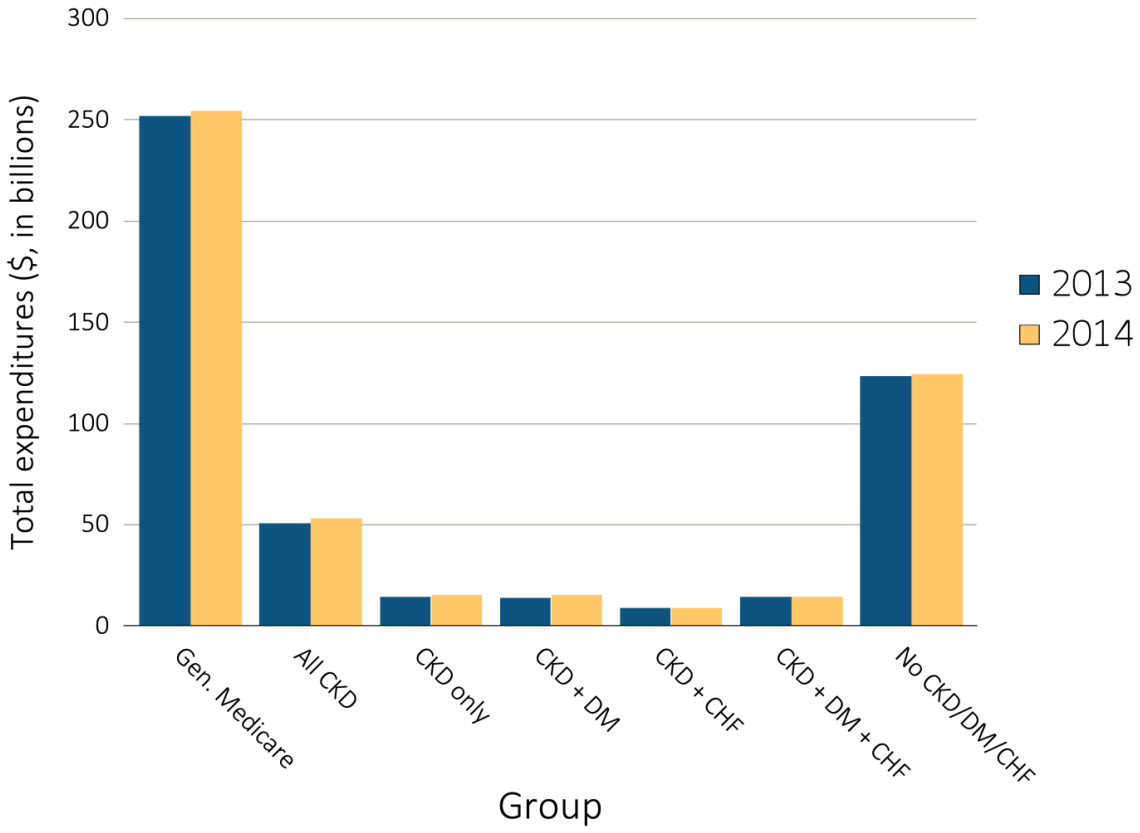
	U.S. Medicare Population	Total Costs (millions, U.S. $)	PPPY Costs (U.S. $)	Population (%)	Costs (%)
All	5,121,280	$61,479	$12,524	100.00	100.00
With CHF or CKD or DM	1,322,060	$26,830	$21,479	25.82	43.64
CKD only (- DM & CHF)	101,280	$2,199	$23,125	1.98	3.58
DM only (- CHF & CKD)	837,480	$13,531	$16,882	16.35	22.01
CHF only (- DM & CKD)	102,740	$2,292	$23,678	2.01	3.73
CKD and DM only (- CHF)	115,440	$3,022	$28,325	2.25	4.92
CKD and CHF only (- DM)	22,120	$743	$37,972	0.43	1.21
DM and CHF only (- CKD)	89,400	$2,774	$33,358	1.75	4.51
CKD and CHF and DM	53,600	$2,269	$49,049	1.05	3.69
No CKD or DM or CHF	3,799,220	$34,649	$9,468	74.19	56.36
All CKD (+/- DM & CHF)	292,440	$8,232	$30,764	5.71	13.39
All DM (+/- CKD & CHF)	1,095,920	$21,596	$20,813	21.40	35.13
All CHF (+/- DM & CKD)	267,860	$8,078	$32,865	5.23	13.14
CKD and DM (+/- CHF)	169,040	$5,291	$34,592	3.30	8.61
CKD and CHF (+/- DM)	75,720	$3,011	$45,757	1.48	4.90
DM and CHF (+/- CKD)	143,000	$5,043	$38,966	2.79	8.20

Data Source: Medicare 5% sample. Abbreviations: CKD, chronic kidney disease; CHF, congestive heart failure; DM, diabetes mellitus; PPPY, per patient per year costs.

Spending for CKD by Stage and Patient Characteristics

Among the general Medicare population aged 65 and older, total spending for Parts A, B, and D rose by $3 billion to $254 billion between 2013 and 2014. Total spending rose by $2.2 billion to $52.8 billion among CKD patients (Figure 6.1). Therefore, spending growth among CKD patients accounted for most of the costs increase in Medicare expenditures during this year. Further, Medicare expenditures were higher for beneficiaries with CKD than beneficiaries with ESRD ($52.8 billion vs. $30.9 billion; see Volume 2, Chapter 11, *Medicare Expenditures for Persons with ESRD*. Costs for beneficiaries with CKD now represent 20.8% of all Medicare Parts A, B, and D non-ESRD spending. Expenditures increased for all covered groups, but the highest growth rates occurred in those with only CKD and CKD with comorbid DM. The spending increase appears to be driven by a rise in the proportion of beneficiaries with recognized CKD (see ADR Volume 1, Figure 2.2 and Table 6.3).

vol 1 Figure 6.1 Overall Medicare Parts A, B, and D fee-for-service spending for beneficiaries aged 65 and older, by CKD, DM, CHF, and year, 2013 & 2014



Data source: Medicare 5% sample. Abbreviations: CKD, chronic kidney disease; CHF, congestive heart failure, DM, diabetes mellitus.

Table 6.3 presents overall per person per year (PPPY) costs of Parts A, B, and D services for beneficiaries with CKD (but not ESRD), by stage of CKD (see Table A for definitions). In 2014, PPPY costs reached $21,857 for Medicare CKD patients aged 65 and older, a slight decrease from 2013 ($22,000). This decreased spending was observed in CKD Stages 1-2 and 3, while the costs in Stages 4-5 increased slightly from 2013 to 2014. During this period, the distribution of identified patient years also shifted towards the less severe and less costly stages. In 2014, costs for beneficiaries with Stages 4-5 CKD ($28,541) were 49.6% greater than for beneficiaries with Stages 1-2 CKD ($19,075). Although the number of beneficiaries with unknown/unspecified CKD stage decreased slightly, it still accounted for one-third of all cases of CKD. The PPPY costs for unknown/unspecified were similar to those in the overall CKD population. Spending for Black/African-American beneficiaries with CKD exceeded that for Whites by 14.6%, an increase over the 12.9% disparity observed in 2013.

vol 1 Table 6.3 Per person per year Medicare Parts A, B, and D fee-for-service spending for all CKD beneficiaries aged 65 and older, by CKD stage, age, sex, race, and year, 2013 & 2014

	2013					2014				
	Any CKD	Stages 1-2	Stage 3	Stages 4-5	Unk/ Unspc	Any CKD	Stages 1-2	Stage 3	Stages 4-5	Unk/ Unspc
Patient years at risk	2,300,185	227,240	1,023,212	229,794	819,940	2,416,542	248,264	1,125,979	227,522	814,776
All patients	$22,000	$19,926	$21,339	$27,580	$21,836	$21,857	$19,075	$21,176	$28,541	$21,781
Age										
65-69	$21,054	$17,013	$20,891	$31,048	$20,387	$20,672	$17,301	$20,399	$30,169	$20,085
70-74	$20,374	$17,545	$19,566	$26,823	$20,707	$20,365	$17,440	$19,957	$28,312	$20,172
75-79	$21,537	$20,037	$20,904	$26,564	$21,431	$21,432	$17,389	$20,857	$28,836	$21,647
80-84	$22,464	$21,296	$21,549	$27,563	$22,444	$22,104	$20,458	$21,127	$27,564	$22,344
85+	$23,819	$23,691	$23,167	$27,319	$23,463	$23,874	$23,123	$22,823	$28,472	$23,899
Sex										
Male	$21,638	$19,849	$21,312	$26,960	$21,147	$21,452	$18,868	$20,993	$28,061	$21,143
Female	$22,322	$19,999	$21,363	$28,077	$22,449	$22,223	$19,270	$21,342	$28,932	$22,355
Race										
White	$21,633	$19,686	$21,007	$26,698	$21,573	$21,473	$18,852	$20,855	$27,764	$21,412
Black/African American	$24,413	$20,839	$23,358	$32,551	$23,901	$24,604	$21,039	$23,593	$32,269	$24,415
Other	$22,811	$21,014	$22,578	$28,088	$22,154	$22,370	$18,451	$21,525	$30,563	$22,734

Data source: Medicare 5% sample. Abbreviations: CKD, chronic kidney disease; Unk/unspc, CKD stage unknown or unspecified.

Table A. ICD-9-CM codes for Chronic Kidney Disease (CKD) stages

ICD-9-CM code[a]	Stage
585.1	CKD, Stage 1
585.2	CKD, Stage 2 (mild)
585.3	CKD, Stage 3 (moderate)
585.4	CKD, Stage 4 (severe)
585.5	CKD, Stage 5 (excludes 585.6: Stage 5, requiring chronic dialysis[b])
CKD Stage unspecified	For these analyses, identified by multiple codes including 585.9, 250.4x, 403.9xm & others

[a] *For analyses in this chapter, CKD stage estimates require at least one occurrence of a stage-specific code, and the last available CKD stage in a given year is used.*
[b] *In USRDS analyses, patients with ICD-9-CM code 585.6 & with no ESRD 2728 form or other indication of end-stage renal disease (ESRD) are considered to have code 585.5.*

In Table 6.4, PPPY costs are shown for beneficiaries with both CKD and DM. Among the 2014 Medicare beneficiaries with these two conditions, PPPY costs for Blacks were $27,980—14.9% greater than the $24,347 incurred for Whites.

vol 1 Table 6.4 Per person per year Medicare Parts A, B, and D fee-for-service spending for CKD patients with DM, aged 65 and older, by CKD stage, age, sex, race, and year, 2013 & 2014

	2013					2014				
	Any CKD	Stages 1-2	Stage 3	Stages 4-5	Unk/ Unspc	Any CKD	Stages 1-2	Stage 3	Stages 4-5	Unk/ Unspc
Patient years at risk	1,100,789	110,908	499,895	120,672	369,313	1,162,039	120,068	549,905	119,511	372,555
All patients	$25,034	$22,468	$24,557	$31,639	$24,291	$24,854	$21,482	$24,369	$32,330	$24,260
Age										
65-69	$24,665	$19,831	$24,646	$35,220	$23,439	$23,970	$19,346	$24,496	$32,826	$22,667
70-74	$23,240	$20,547	$22,850	$29,726	$22,727	$23,569	$20,210	$23,218	$32,770	$22,743
75-79	$24,517	$22,397	$23,965	$30,320	$24,064	$24,376	$19,584	$24,146	$31,704	$24,090
80-84	$25,544	$25,411	$24,708	$31,886	$24,506	$25,214	$24,877	$24,083	$30,914	$25,039
85+	$27,560	$25,850	$27,130	$32,040	$26,846	$27,346	$25,921	$26,190	$33,411	$26,959
Sex										
Male	$24,105	$21,913	$23,976	$30,246	$23,131	$23,899	$21,157	$23,721	$31,034	$23,008
Female	$25,928	$23,030	$25,133	$32,765	$25,413	$25,790	$21,821	$25,020	$33,379	$25,490
Race										
White	$24,670	$22,102	$24,217	$30,861	$24,093	$24,347	$21,196	$23,886	$31,216	$23,900
Black/African American	$27,073	$23,419	$26,339	$35,701	$25,747	$27,980	$22,991	$27,077	$37,360	$27,201
Other	$25,242	$23,934	$25,170	$30,824	$23,930	$24,832	$21,589	$25,023	$32,828	$23,314

Data source: Medicare 5% sample. Abbreviations: CKD, chronic kidney disease; DM, diabetes mellitus; Unk/unspc, CKD stage unknown or unspecified.

Table 6.5 shows PPPY costs for beneficiaries with CKD and concurrent CHF. In 2014, PPPY costs for Black beneficiaries with both conditions reached $40,381—18.8% higher than the $34,003 PPPY cost for their White counterparts.

vol 1 Table 6.5 Per person per year Medicare Parts A, B, and D fee-for-service spending for CKD patients with CHF, aged 65 and older, by CKD stage, age, sex, race, and year, 2013 & 2014

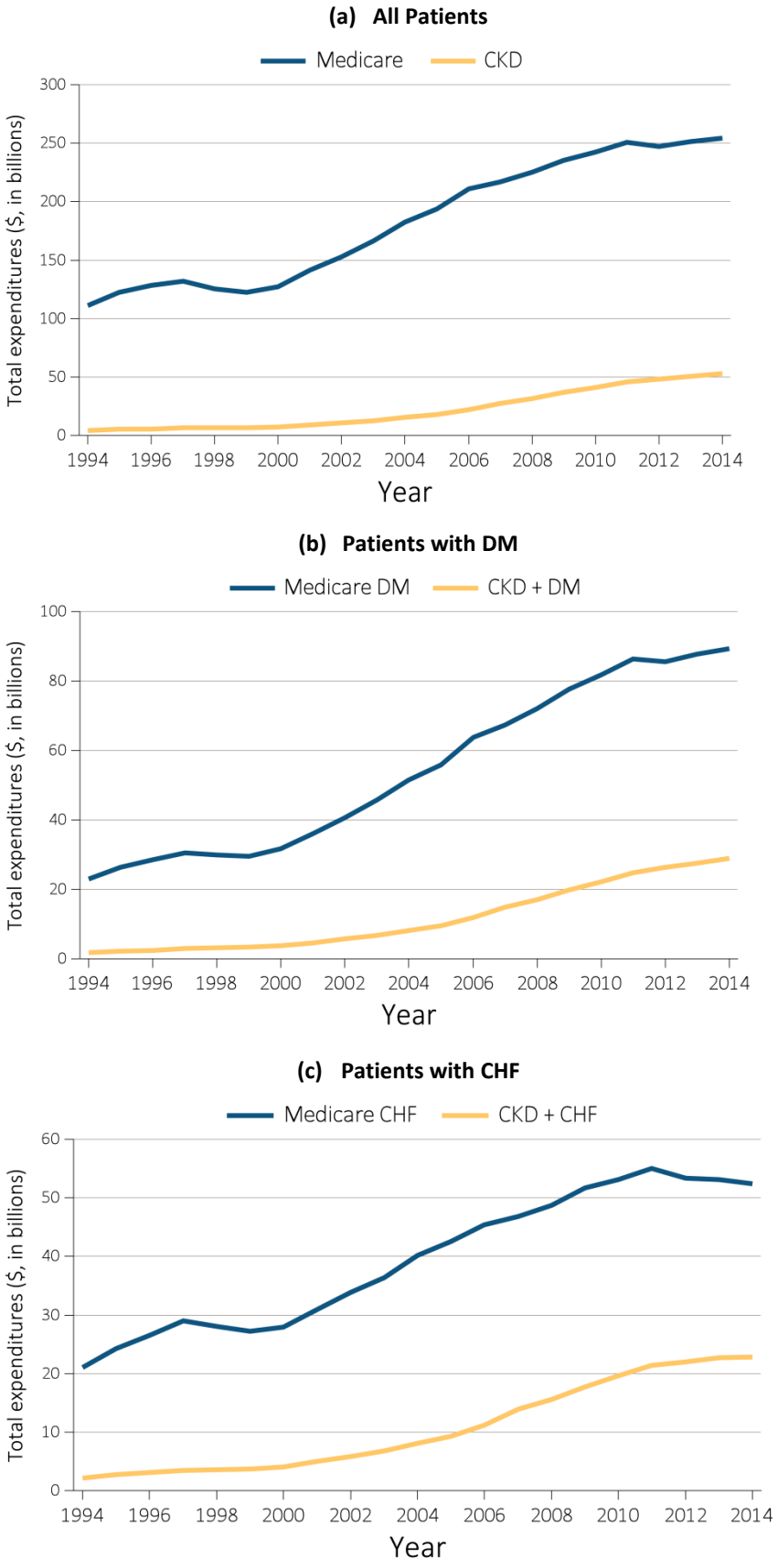
	2013					2014				
	Any CKD	Stages 1-2	Stage 3	Stages 4-5	Unk/ Unspc	Any CKD	Stages 1-2	Stage 3	Stages 4-5	Unk/ Unspc
Patient years at risk	650,103	55,549	289,311	85,624	219,619	654,178	55,376	307,849	83,484	207,469
All patients	$34,876	$34,247	$34,704	$39,045	$33,638	$34,935	$32,433	$34,544	$40,904	$33,783
Age										
65-69	$39,632	$35,199	$39,416	$50,130	$37,742	$38,821	$35,443	$38,226	$48,717	$37,075
70-74	$36,251	$34,125	$36,037	$39,043	$36,113	$35,832	$29,128	$35,852	$42,876	$35,328
75-79	$35,995	$35,625	$35,685	$39,639	$35,082	$36,241	$31,037	$35,947	$43,423	$35,355
80-84	$34,416	$34,794	$33,919	$38,352	$33,374	$34,054	$34,510	$33,344	$39,060	$32,937
85+	$32,255	$32,551	$32,368	$36,069	$30,537	$33,015	$32,744	$32,641	$37,718	$31,589
Sex										
Male	$33,763	$33,639	$34,184	$38,429	$31,491	$34,071	$31,914	$33,843	$39,830	$32,802
Female	$35,875	$34,810	$35,197	$39,531	$35,504	$35,715	$32,932	$35,216	$41,766	$34,616
Race										
White	$34,182	$33,238	$34,148	$37,803	$33,103	$34,003	$31,565	$33,765	$39,763	$32,753
Black/African American	$38,725	$37,758	$37,761	$45,665	$36,847	$40,381	$36,094	$39,766	$46,374	$39,611
Other	$37,325	$40,393	$37,004	$40,186	$35,604	$38,027	$35,999	$36,121	$44,233	$38,915

Data source: Medicare 5% sample. Abbreviations: CHF, congestive heart failure; CKD, chronic kidney disease; Unk/unspc, CKD stage unknown or unspecified.

Over time, the costs for Medicare beneficiaries aged 65 and older with recognized CKD have accounted for an increasing share of Medicare expenditures, expanding from 4.2% in 1995 to 7.7% in 2003, and 20.8% in 2014. Much of this growth was due to the increased ascertainment of CKD as shown in Volume 1, Chapter 2, *Identification and Care of Patients with CKD*. Persons aged 65 and older with CKD accounted for 1.7%, 3.8%, and 11.1% of the Medicare population in 1995, 2003, and 2014.

Figure 6.2 presents total expenditures on Part A, B, and D services for Medicare fee-for-service beneficiaries with CKD and other conditions. In 2014, expenditure for CKD patients was $52.8 billion, accounting for 20.8% of the total spending for all Medicare beneficiaries. Costs for beneficiaries with CKD and concurrent DM amounted to $28.9 billion in 2014, or 32.3% of total Medicare spending on DM. Spending on CHF in the Medicare population was $52.4 billion in 2014. Of this, $22.9 billion (43.6%) was spent on the CKD patient population with CHF.

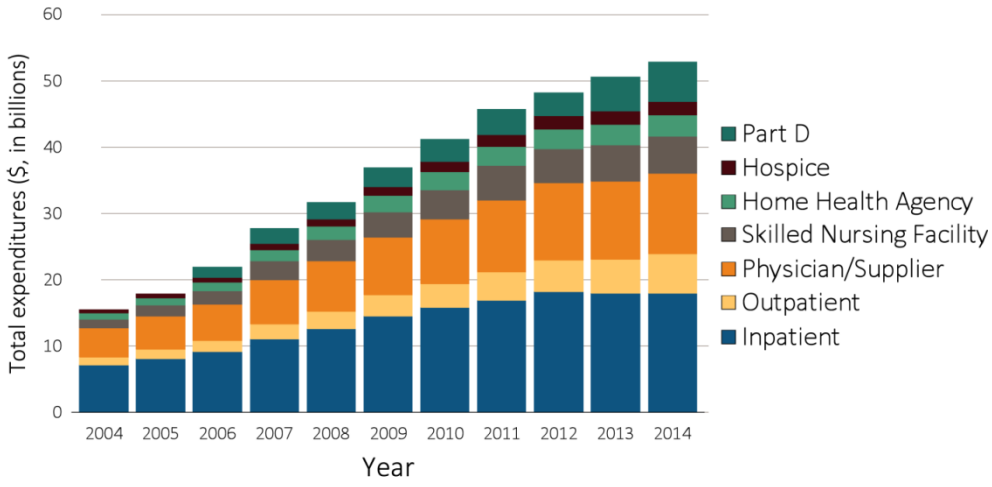
vol 1 Figure 6.2 Overall Medicare Parts A, B, and D fee-for-service spending for general Medicare population aged 65 and older and for those with CKD, by year, 1994-2014



Data Source: Medicare 5% sample. Abbreviations: CKD, chronic kidney disease; CHF, congestive heart failure.

Most spending for CKD patients was incurred for inpatient and outpatient care, physician/supplier services, and care in skilled nursing facilities. The proportion of total Medicare expenditures required to provide inpatient care was 34% in 2014, while outpatient costs were predictably lower at 11%. Physician/supplier service costs amounted to 23% in 2014, while those for skilled nursing facility care reached 11% (Figure 6.3). In the Medicare non-CKD population, these expenditure percentages were 29% to provide inpatient care, 14% for outpatient, 28% for Physician/supplier services, and 8% those for skilled nursing facility care.

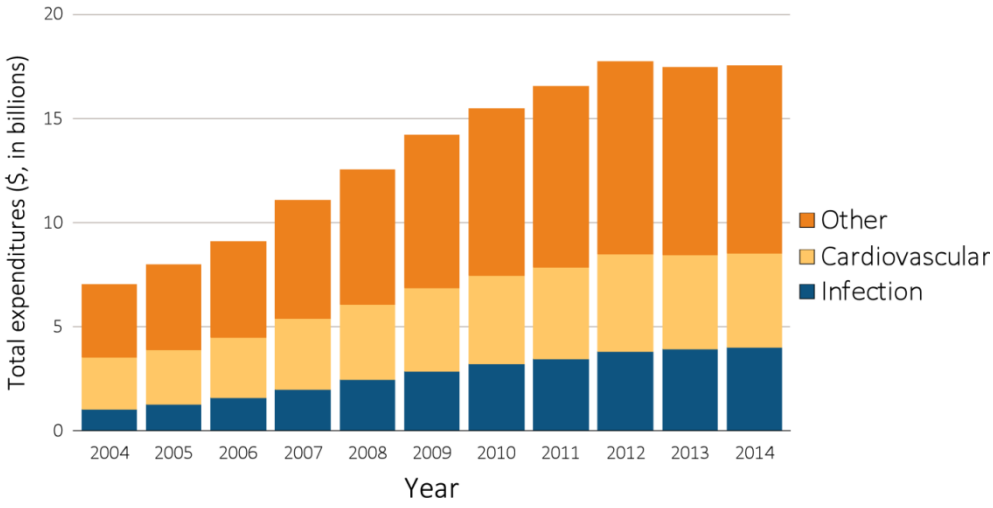
vol 1 Figure 6.3 Trends in total Medicare Parts A, B, and D fee-for-service spending for CKD patients aged 65 and older, by claim type, 2004-2014



Data source: Medicare 5% sample. Part D data was initiated since 2006.

Hospitalization costs accounted for a large proportion of spending for CKD. Of the 2014 inpatient hospitalization spending for those with CKD, 49% resulted from admissions to treat infections (23%) and cardiovascular conditions (26%; Figure 6.4).

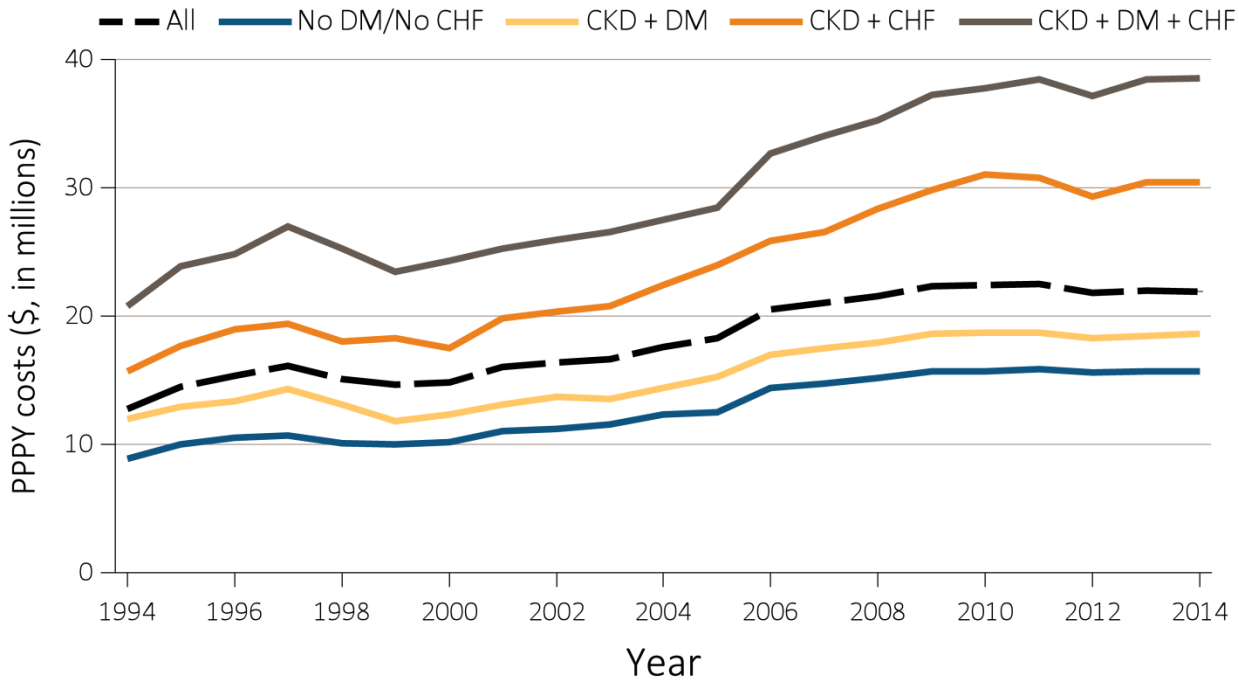
vol 1 Figure 6.4 Total Medicare fee-for-service inpatient spending for CKD patients aged 65 and older, by cause of hospitalization, 2004-2014



Data source: Medicare 5% sample. Part D data was initiated since 2006.

Figure 6.5 illustrates PPPY costs for Medicare CKD patients aged 65 and older by the presence of DM and CHF. In 2014, PPPY costs for CKD patients varied greatly by the presence of these comorbidities. CKD patients without DM and CHF cost $15,672 per person per year. Those with DM in addition to CKD averaged $18,609 PPPY, and beneficiaries with CKD and CHF cost $30,395; expenditures for those with all three conditions reached $38,561 PPPY in 2014.

vol 1 Figure 6.5 Per person per year Medicare Parts A, B, and D fee-for-service spending for the CKD patients aged 65and older, by DM, CHF, and year, 1994-2014



Data Source: Medicare 5% sample. Abbreviations: CKD, chronic kidney disease; CHF, congestive heart failure, DM, diabetes mellitus; PPPY, per person per year.

Conclusion

The analysis of Medicare expenses for beneficiaries with CKD indicates avenues for potential cost savings, enduring racial cost disparities, and the effect of cost containment efforts in this population. Potential savings could be achieved through the prevention of disease progression to later stages of CKD, and prevention of the development of concurrent chronic conditions such as DM and CHF. Beneficiaries with CKD, DM, and CHF, alone or in combination, account for the vast majority of spending growth in the entire aged 65 or older Medicare non-ESRD population. In the Medicare CKD population, Black beneficiaries continue to exhibit higher costs in all disease categories as compared to Whites and those of other races. Finally, a large portion of CKD hospitalization costs occur for infection or cardiovascular causes.

Growth in total CKD spending has primarily been driven by growth in the number of identified cases, particularly in the earlier stages (CKD 1-3).

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Notes