

*Appalachian Mountains*

## **COSTS OF CHRONIC KIDNEY DISEASE**

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Determining the economic impact of CKD on the healthcare system is challenging on several levels. There is, for instance, considerable under-recognition of CKD, as noted in Chapter One. A biochemical definition would be the most quantitative, but health plan datasets rarely contain this information on a large scale. A definition of the CKD cohort using diagnosis codes, however, may represent only the more advanced — and thus most expensive — cases. In addition, CKD is a highly interactive disease, associated with cardiovascular disease, diabetes, stroke, and infectious complications.

Given these limitations, we have developed a method using diagnosis codes to create a point prevalent CKD cohort. In the 2009 and 2010 ADRs, “new” CKD patients were included in order to produce a period prevalent cohort parallel to that created for the ESRD population. These patients, however, accounted for a disproportionate percentage of overall costs, which could not be directly attributed to their CKD status. The reasons for this are numerous, but may include a high rate of acute kidney injury (AKI). This year, we thus continue with the method discussed in the 2011 ADR, including only those patients classified as having CKD on January 1 of a given year. This creates a true point prevalent cohort and reduces the impact of AKI patients, thereby allowing us a more accurate assessment of the chronic disease condition and its associated costs.

When compared to those in the 2009 ADR, costs reported here for CKD patients are thus significantly lower, while those for non-CKD patients are higher. It is unclear which method most accurately depicts true CKD costs. Each has its strengths and weaknesses, and the differences reflect the uncertainty involved in using claims to classify CKD. Additionally, there is emerging data to indicate that AKI patients have a high probability of CKD. These areas will be the subject of ongoing research to be sure the CKD population’s impact on the health care system is addressed.

We begin the chapter by presenting Medicare data on the chronic diseases associated with the greatest population-level expenditures. Congestive heart failure (CHF), for example, affects 9.5 percent of patients in the fee-for-service Medicare population, and accounts for nearly 22 percent of expenditures. Nearly 34 percent of expenditures go toward the 23.4 percent of patients with diabetes. And patients with CKD, who represent 8.4 percent of the point prevalent population, account for 17.0 percent of total expenditures. These assessments do not include ESRD patients on dialysis or with a kidney transplant, who account for another 6.4 percent of fee-for-service expenditures. The combined CKD and ESRD populations thus account for 24 percent of the budget, a number greater than that associated with CHF.

While patients in each of these populations may carry other major diagnoses such as arthritis, cataracts, hip fractures, cancer, and chronic lung disease, on a population level these three groups consume very large portions of the Medicare budget. On this basis alone, targeting the CKD population would have a large impact if improvements in care led to reduced comorbidities and hospitalizations. Overall, CKD patients incur per person per year (PPPY) costs of just over \$23,000, compared to \$8,000 for patients without ESRD, CKD, diabetes, or CHF

How hard to realize that every camp of men or beast has this glorious starry firmament for a roof! In such places standing alone on the mountaintop it is easy to realize that whatever special nests we make — leaves and moss like the marmots and birds, or tents or piled stone — we all dwell in a house of one room — the world with the firmament for its roof — and are sailing the celestial spaces without leaving any track.

JOHN MUIR,  
*John of the Mountains*

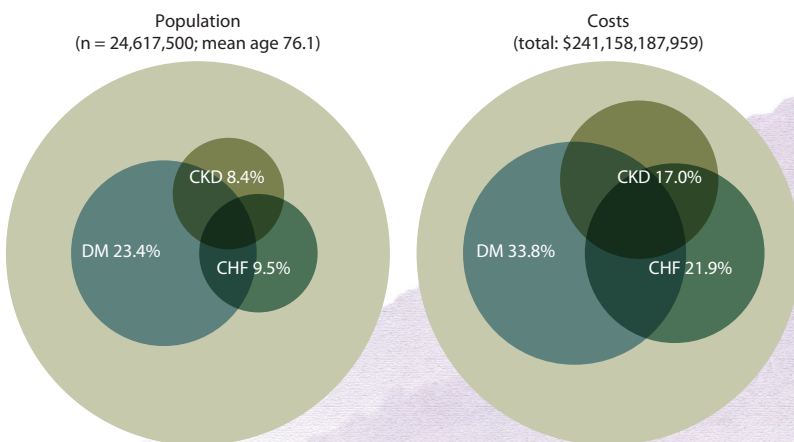
(see Reference Table K.5 in this volume). Patients with CKD of Stages 4–5 have yearly expenditures of \$28,508, demonstrating the impact of more advanced disease and its increasing complications. In patients with both Stage 4–5 CKD and CHF, costs are slightly more than \$38,000 for whites, and approach \$48,000 for blacks/African Americans.

These costs approach 50 percent of the \$88,000 PPPY incurred by a hemodialysis patient (Figure 11.7, Volume Two). In addition, Part D expenditures account for \$3,300 per year. CKD patients overall thus incur nearly half the costs of the hemodialysis population — a group which, with the exception of some populations with rare diseases, is the most expensive in the Medicare system.

We conclude this chapter with data on the Medicare Part D benefit, a program which began in 2006. In 2010, Part D costs accounted for 8 percent of total Medicare expenditures in the CKD population. Costs vary considerably in relation to the low income subsidy (LIS); net Part D costs for CKD patients with the LIS are more than twice those for their non-LIS counterparts, while out-of-pocket Part D costs range from \$133–\$159 in LIS patients to \$1,244–\$1,443 in patients without the LIS.

Part D costs for CKD patients are 74 percent of those for ESRD patients with LIS, and 86 percent of those for non-LIS patients. Given the large costs of Part D covered medications in CKD patients, and the observation that ACEI/ARB use is reduced in patients with advancing CKD despite complications from congestive heart failure, we need to strive for greater understanding of the risk benefit of treatment in patients with CKD. » **Figure 7.1**; see page 146 for analytical methods. *Populations estimated from the 5 percent Medicare sample using a point prevalent model (see appendix for details). Population further restricted to patients age 65 & older, without ESRD. Diabetes, CHF, & CKD determined from claims; costs are for calendar year 2010.*

**vol 1**  
**7.1** Point prevalent distribution & annual costs of Medicare (fee-for-service) patients, age 65 & older, with diagnosed diabetes, CHF, & CKD, 2010



In 2010, overall per person per year (PPPY) costs for patients with CKD reached \$22,323 for Medicare patients age 65 and older, and \$13,395 for patients age 50–64 in the MarketScan database. (These costs include Part D.) Compared to costs for patients with CKD of Stages 1–2, costs for those with Stage 4–5 CKD were 50 percent greater in the Medicare population and 81 percent higher among MarketScan patients.

Among Medicare patients with both CKD and diabetes, PPPY costs for blacks/African Americans reached \$28,651 in 2010, 16.5 percent higher than the \$24,593 incurred by whites. Costs for those with Stage 4–5 CKD were 42 and 50 percent greater, respectively, for blacks/African Americans and whites than costs for their counterparts with CKD of Stages 1–2.

In 2010, costs for black/African American Medicare patients with both CKD and congestive heart failure were 21.3 percent higher than costs for whites with both diagnoses, at \$40,487 and \$33,374, respectively. And for patients with Stage 4–5 CKD, costs were 23 and 21 percent higher among blacks/African Americans and whites, respectively, than costs in those with CKD of Stages 1–2. » **Figures 7.2–4**; see page 146 for analytical methods. *Point prevalent Medicare patients age 65 & older (5 percent Medicare sample, 7.2–4) & MarketScan patients age 50–64 (7.2). Includes Part D.*

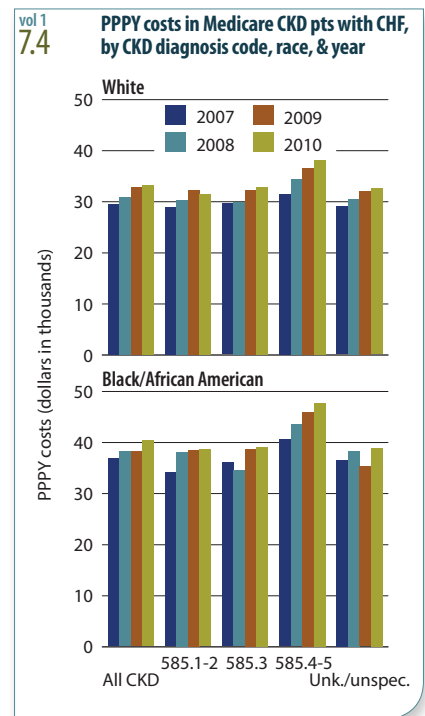
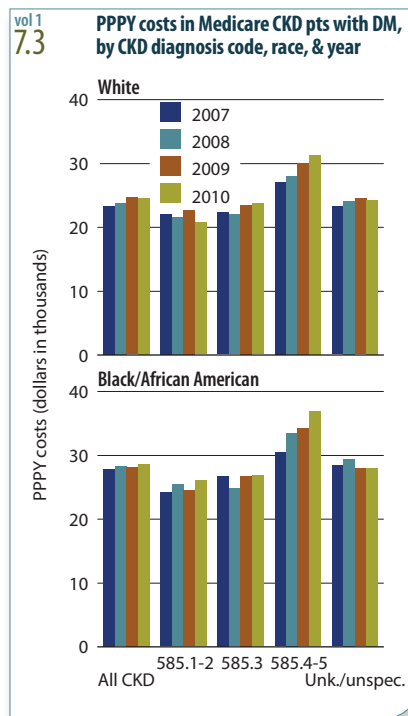
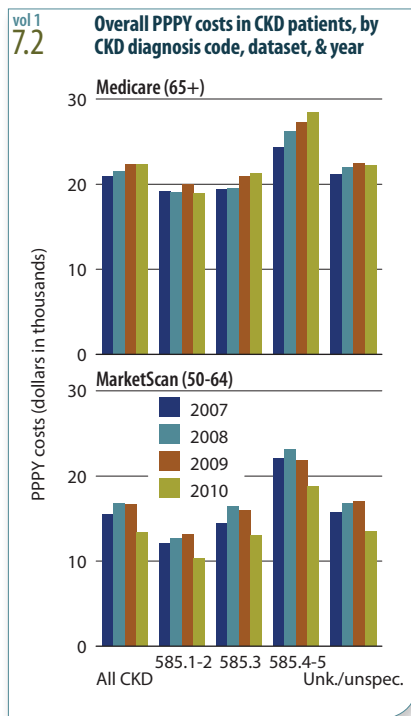
### ICD-9-CM codes

- 585.1 Chronic kidney disease, Stage 1
- 585.2 Chronic kidney disease, Stage 2 (mild)
- 585.3 Chronic kidney disease, Stage 3 (moderate)
- 585.4 Chronic kidney disease, Stage 4 (severe)
- 585.5 Chronic kidney disease, Stage 5 (excludes 585.6: Stage 5, requiring chronic dialysis.)

Chronic kidney disease, unknown/unspecified

*In USRDS analyses, patients with ICD-9-CM code 585.6 & with no ESRD 2728 form or other indication of ESRD are considered to have code 585.5; see Appendix A for details.*

*CKD stage estimates are from a single measurement. For clinical case definition, abnormalities should be present  $\geq$  3 months.*

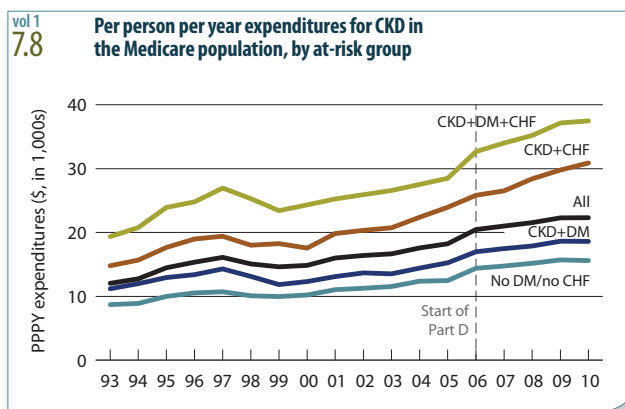
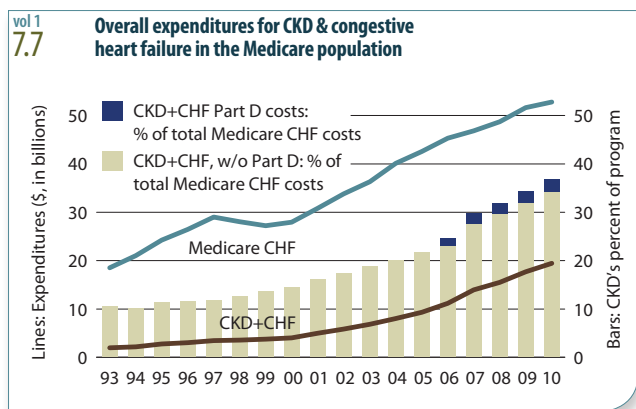
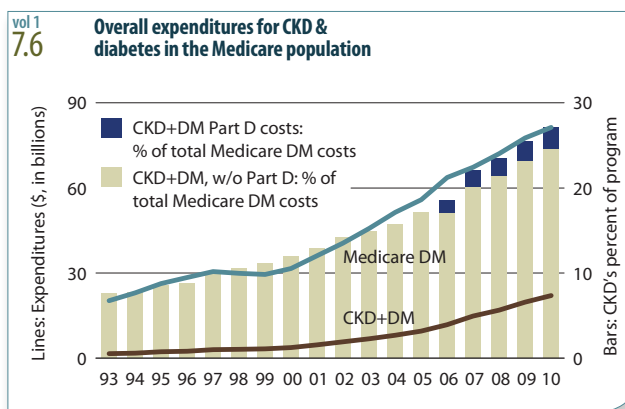
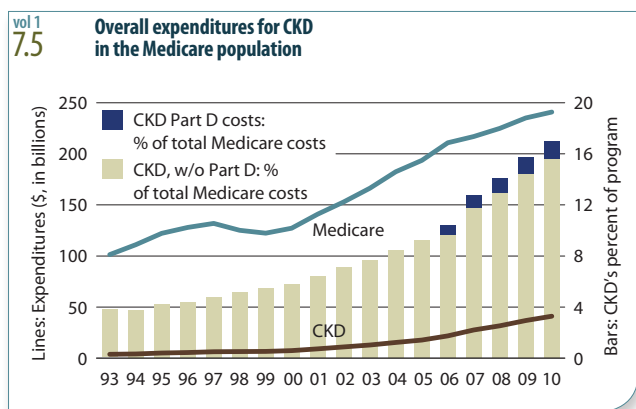


In 1993, total costs for Medicare patients age 65 and older with CKD accounted for just 3.9 percent of overall Medicare expenditures. In 2010, non-Part D costs for these patients reached \$41 billion, 17 percent of total Medicare dollars, while their Part D expenditures accounted for 1.4 percent of Medicare dollars, up from 0.7 percent in 2006.

Non-Part D expenditures for CKD patients with diabetes accounted for 24.6 percent of total Medicare diabetes costs in 2010, totaling \$22 billion — a fourteen-fold increase since 1993, and one that demonstrates the enormous economic burden that

diabetes imposes on the healthcare system. The percentage of total Medicare diabetes costs attributed to Part D has increased from 1.4 in 2006 to 2.5 in 2010.

Costs for CKD patients with congestive heart failure accounted for 36.8 percent of total Medicare CHF dollars in 2010 — \$19.4 billion of the nearly \$53 billion spent by Medicare on patients with CHF. Part D costs for CKD patients with CHF rose to \$1.4 billion, accounting for 2.7 percent of Medicare CHF costs. » **Figures 7.5–7**; see page 146 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older.*



In 2010, per person per year costs (including Part D) for patients with CKD totaled \$22,323 overall, and were highest in those with diabetes and CHF as well, at \$37,490. Costs for CKD patients with no diabetes or CHF, in contrast, totaled \$15,607. » **Figure 7.8**; see page 146 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older. Includes Part D.*

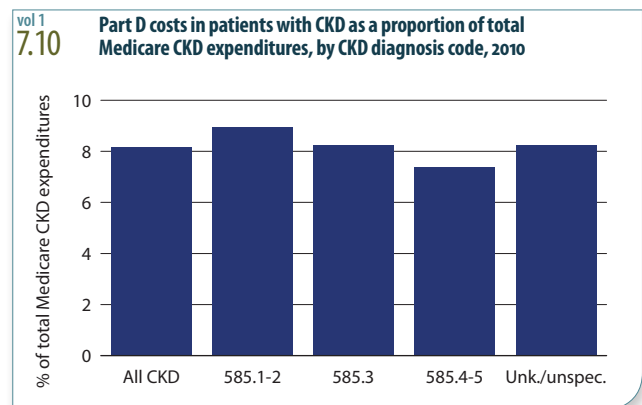
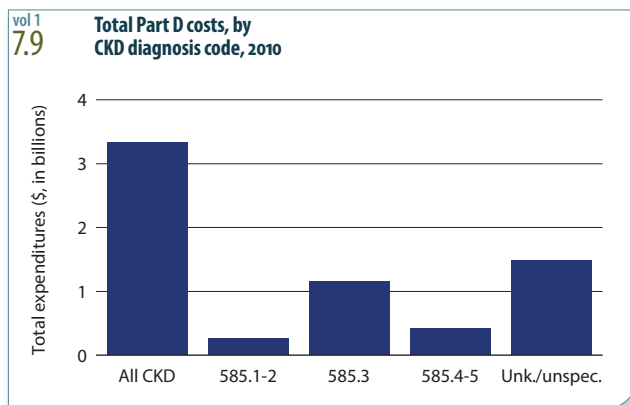
In 2010, total Part D costs for CKD patients reached \$3.35 billion. Eight percent of these costs were incurred by patients with Stage 1–2 CKD, 35 percent by those with CKD of Stage 3, and 13 percent by those in Stages 4–5.

Part D costs account for 8.2 percent of total Medicare costs for the CKD population as a whole, 9.0 percent of costs in Stage 1–2 patients, 8.2 percent in patients with Stage 3 CKD, and 7.4 percent in those with CKD of the most advanced stages.

Total overall Part D net CKD costs in 2010 were dominated by cost for patients with the low income subsidy (LIS), at \$119

million compared to \$48 million is those with no LIS. Costs are highest in LIS patients with Stage 3 CKD, at \$39 million compared to \$10 and \$16 million, respectively, in patients with CKD of Stages 1–2 and 4–5. » **Figures 7.9–11**; see page 146 for analytical methods.

*Includes Part D claims for all CKD patients, defined from claims on a point prevalent basis, for calendar year 2010. Costs are estimated net pay: sum of plan covered payments & low income subsidy amounts. Counts & costs obtained from 5 percent Medicare sample, & scaled up by a factor of 20 to estimate total Medicare CKD costs.*

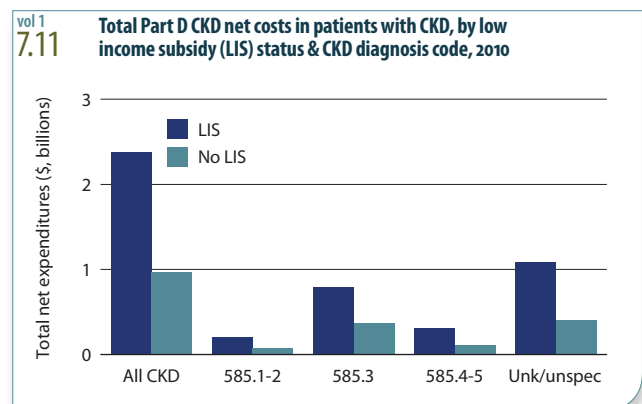


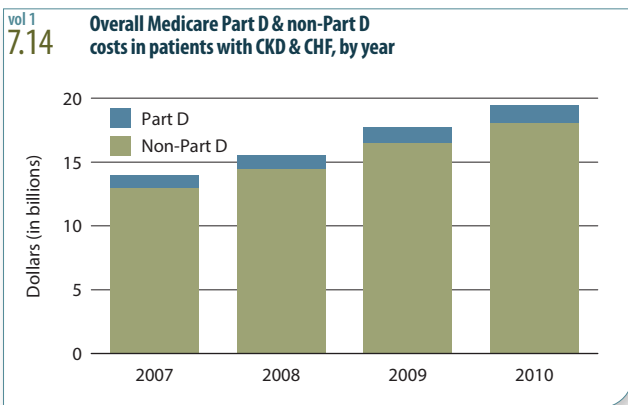
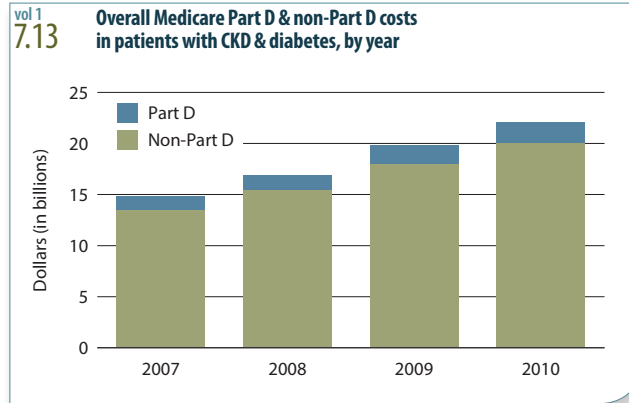
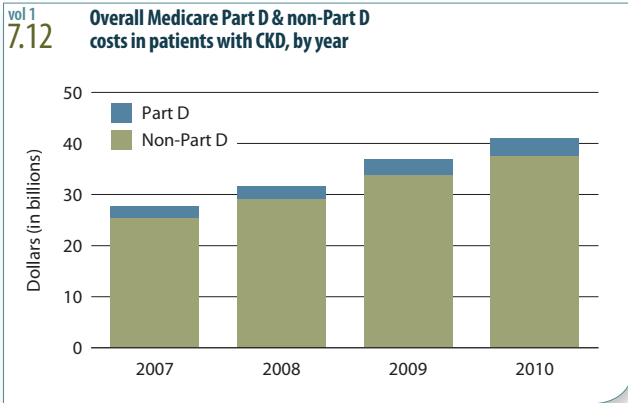
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*†In USRDS analyses, patients with ICD-9-CM code 585.6 & with no ESRD 2728 form or other indication of ESRD are considered to have code 585.5; see Appendix A for details.*

*CKD stage estimates are from a single measurement. For clinical case definition, abnormalities should be present ≥ 3 months.*





For prevalent Medicare CKD patients age 65 and older, overall non-Part D costs increased 48 percent between 2007 and 2010, from \$25.5 billion to \$37.7 billion. Part D costs in this population rose 53 percent, from \$2.2 billion to \$3.3 billion, accounting for 8.2 percent of total costs in 2010, up slightly from 7.9 percent in 2007.

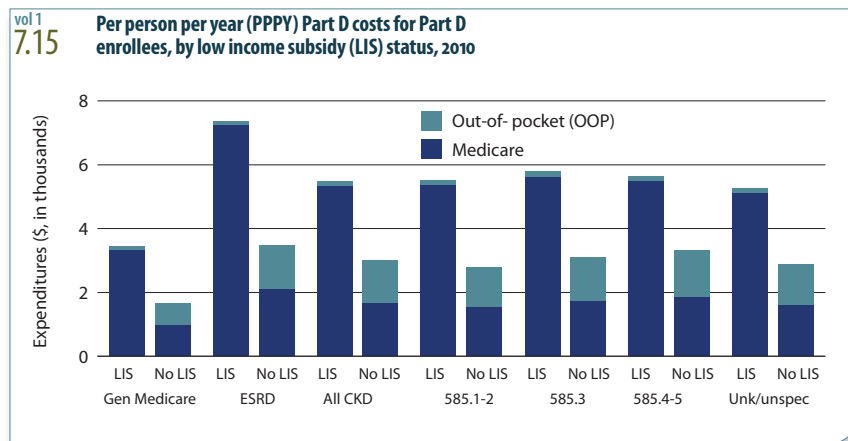
Costs for patients with diabetes in addition to CKD show similar trends. Non-Part D expenditures rose 47 percent, reaching \$20 billion in 2010, while Part D costs, at \$2.1 billion, were nearly 59 percent greater than in 2007, and accounted for 9.3 percent of total costs for the population.

Expenditures for patients with CKD and congestive heart failure have increased at a slower rate. Non-Part D costs reached \$18.1 billion in 2010, 40 percent higher than the \$12.9 billion incurred in 2007. Part D costs rose 36 percent to reach \$1.4 billion — 7.0 percent of overall costs, just under the 7.2 percent seen in 2007. » [Figures 7.12–14](#); see page 146 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older.*

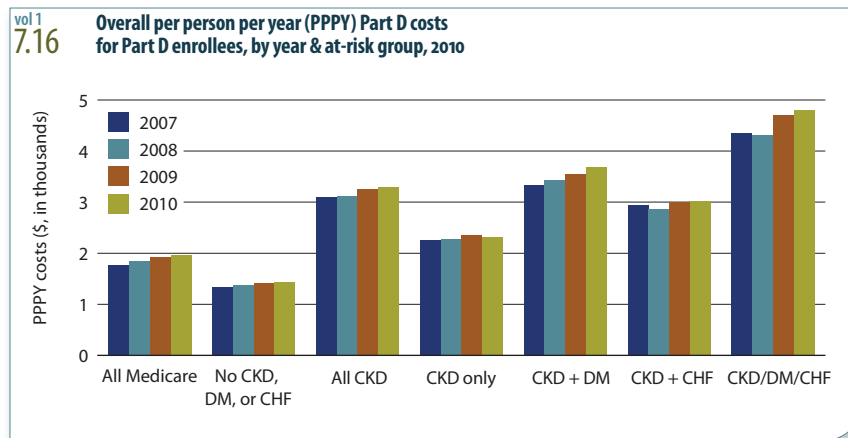
Medicare patients with CKD have higher per person per year (PPPY) Part D costs than general Medicare enrollees regardless of low income subsidy (LIS) status. Overall PPPY costs in 2010 were \$5,350 and \$3,349, respectively, for CKD and general Medicare patients with LIS and \$1,694 and \$979 for those with no LIS. » **Table 7.a;** see page 146 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older, 2010.*

	Gen. Medicare		All CKD	
	LIS	No LIS	LIS	No LIS
All	3,349	979	5,350	1,694
65-74	3,301	924	6,033	1,830
75+	3,392	1,047	4,990	1,620
Male	3,119	969	5,243	1,707
Female	3,454	986	5,402	1,682
White	3,544	994	5,521	1,711
Black/Af Am	3,021	863	4,685	1,475
Other race	3,003	822	5,576	1,530

In 2010, ESRD patients with the low income subsidy (LIS) had the highest per person per year (PPPY) costs, at \$7,243 compared to \$3,349 and \$5,350, respectively, for the general Medicare and CKD populations. Out-of-pocket costs were lowest for general Medicare and ESRD patients with the LIS, at \$118 and \$125 compared to \$145 in CKD patients. In those without the LIS, out-of-pocket costs were \$686, \$1,376, and \$1,316, respectively, for general Medicare, ESRD, and CKD patients. » **Figure 7.15;** see page 146 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older, 2010.*

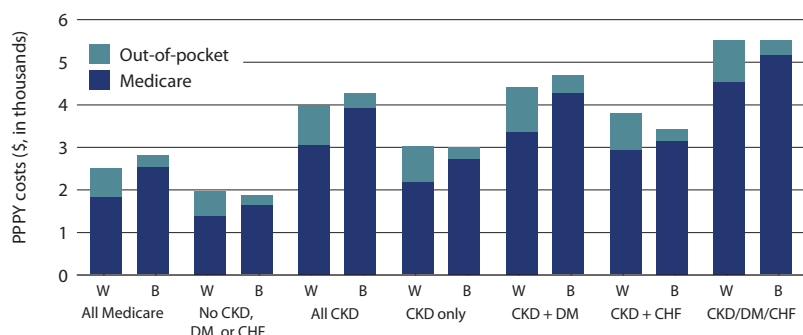


Between 2009 and 2010, Medicare Part D expenditures per person per year (PPPY) rose 2.4 percent overall and 4.7 percent for patients with CKD, to \$1,965 and \$3,298, respectively. Costs rise with patient complexity, reaching \$3,688 for those with CKD and diabetes, and \$4,802 for those with an additional diagnosis of congestive heart failure (CHF). » **Figure 7.16;** see page 146 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older, 2010.*





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7.17 Overall per person per year (PPPY) Part D costs for Part D enrollees, by race & at-risk group, 2010



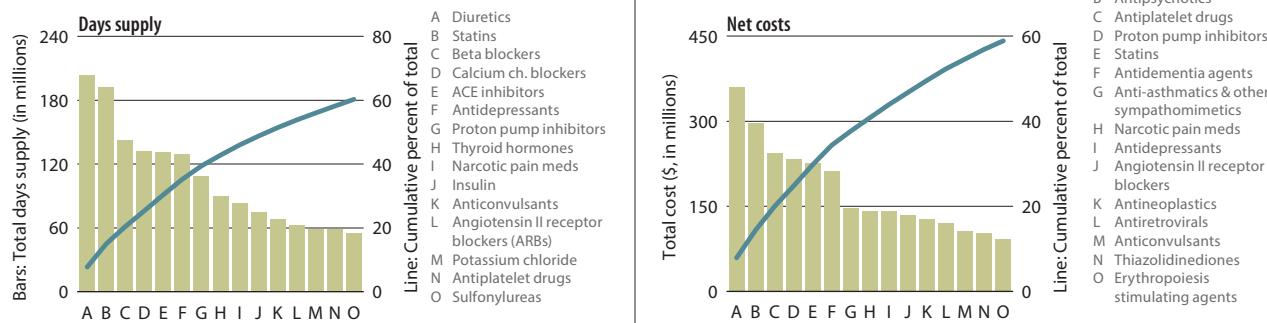
In general, out-of-pocket costs (OOP) for whites in 2010 were 2.5 to 3 times higher than those for blacks/African Americans. And while per person per year costs are higher for patients with CKD compared to those without the condition, the proportion of OOP costs to total costs is actually higher in patients with no CKD. » **Figure 7.17**; see page 146 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older, 2010.*

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7.b Top 15 drugs used in Part D enrollees with CKD, by days supply & net cost, 2010

By days supply	Total days supply	By net cost	Total days supply	Total cost (dollars)
Furosemide	116,549,920	Insulin	74,735,540	359,843,460
Simvastatin	96,025,260	Clopidogrel bisulfate	53,989,880	227,155,480
Metoprolol	95,041,300	Donepezil	19,567,440	122,565,260
Levothyroxine	88,402,280	Esomeprazole	21,754,600	114,521,000
Amlodipine	84,617,740	Atorvastatin	38,651,260	113,114,980
Lisinopril	76,513,600	Quetiapine	13,461,420	108,079,420
Insulin	74,735,540	Pioglitazone	17,299,760	93,359,820
Omeprazole	64,962,340	Fluticasone/salmeterol	14,054,300	86,148,580
Potassium chloride	58,766,760	Olanzapine	4,762,140	78,968,440
Clopidogrel bisulfate	53,989,880	Memantine	13,856,500	63,059,380
Warfarin	50,785,740	Epoetin alfa	1,938,100	61,496,720
Carvedilol	47,520,840	Tiotropium	11,196,580	58,903,920
Atorvastatin	38,651,260	Sitagliptin	11,133,600	56,650,900
Allopurinol	37,697,680	Valsartan	24,878,640	55,643,200
Hydrocodone/acetaminophen	31,742,560	Rosuvastatin	18,313,300	54,392,300

Furosemide is the most frequently used drug in CKD patients. Simvastatin, the most frequently used drug in the general Medicare population, is also widely used by Part D enrollees with CKD. Drugs such as carvedilol, allopurinol, and hydrocodone are not widely used in the general Medicare population but are frequently used in CKD patients. And potassium chloride is one of the most frequently used medications in the CKD population, which may indicate a more aggressive use of diuretics in these patients. » **Table 7.b & Figure 7.18**; see page 146 for analytical methods. *Point prevalent Medicare CKD patients age 65 & older. Therapeutic classification based on Medi-Span's generic product identifier (GPI) therapeutic classification system.*

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7.18 Top 15 drug classes used by Part D-enrollees with CKD, by days supply & drug class, 2010



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## OVERALL COSTS OF CKD

*per person per year costs in Medicare CKD patients with diabetes, 2010 (Figure 7.3)*

» white · \$24,593 » black/African American · \$28,651

*per person per year costs in Medicare CKD patients with congestive heart failure, 2010 (Figure 7.4)*

» white · \$33,374 » black/African American · \$40,487

*overall Medicare expenditures for CKD, 2010 (Figure 7.5)*

» \$41.0 billion (includes Part D)  
» 17.0% of total Medicare dollars, up from 5.8% in 2000

*Medicare expenditures for patients with CKD & diabetes, 2010 (Figure 7.6)*

» \$22.1 billion (includes Part D)  
» 27.1% of Medicare diabetes dollars, up from 12.0% in 2000

*Medicare expenditures for patients with CKD & congestive heart failure, 2010 (Figure 7.7)*

» \$19.4 billion (includes Part D)  
» 36.8% of Medicare CHF dollars, up from 14.4% in 2000

*per person per year expenditures for CKD in the Medicare population, 2010 (Figure 7.8)*

» all CKD · \$22,323 (includes Part D)  
» no DM or CHF · \$15,607 » CKD + DM · \$18,614 » CKD + CHF · \$30,903 » CKD + DM + CHF · \$37,490

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## MEDICARE PART D COSTS

*total Part D costs, by CKD stage, 2010 (Figure 7.9)*

» all CKD · \$3.35 billion » Stages 1–2 · \$275 million » Stage 3 · \$1.16 billion » Stages 4–5 · \$426 million

*total Part D net costs in CKD patients, by low income subsidy (LIS) status & CKD stage, 2010 (Figure 7.11)*

LIS	» all CKD · \$2.4 billion	» Stages 1–2 · \$200 million	» Stage 3 · \$789 million	» Stages 4–5 · \$311 million
no LIS	· \$965 million	· \$75 million	· \$368 million	· \$114 million

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## PER PERSON PER YEAR MEDICARE PART D COSTS

*PPPY Part D costs for Part D enrollees, by at-risk group, 2010 (Figure 7.16)*

» All Medicare · \$1,965 » no CKD, DM, or CHF · \$1,431 » all CKD · \$3,298 » CKD only · \$2,308  
» CKD + DM · \$3,688 » CKD + CHF · \$3,013 » CKD + DM + CHF · \$4,802