

## Data Analysis Brief:

### National Trends in High-dose Chronic Opioid Utilization among Dually Eligible and Medicare-only Beneficiaries (2006-2015)

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#### OBJECTIVE

The objective of this data brief is to provide a baseline understanding of prescription opioid utilization among (a) those Medicare beneficiaries who are dually eligible for both Medicare and Medicaid, and (b) those who are eligible only for Medicare. To that end, we sought to understand trends in any opioid utilization and high dose chronic (HDC) opioid utilization in these two beneficiary populations and within the demographic subgroups thereof over the ten-year period from 2006 to 2015. This data brief also presents the adjusted risk factors for HDC utilization among dually eligible beneficiaries with one or more filled opioid medication.

#### SUMMARY OF FINDINGS

In the most recent study year, 2015, 43.5 percent of all dually eligible and 30.9 percent of all Medicare-only fee-for-service (FFS) beneficiaries who met the study inclusion criteria received at least one prescription opioid medication. Of these individuals, in the same year, 10.4 percent of all dually eligible and 4.9 percent of all Medicare-only fee-for-service (FFS) beneficiaries received opioid medications at the HDC level. These differences are driven largely by the distribution of people eligible for Medicare by disability status, who are more likely to be dually eligible beneficiaries and had higher rates of HDC opioid utilization.

#### ***Ten-year HDC opioid utilization trends differed by dual eligibility status***

Both study populations experienced similar rates of growth in *any* opioid use (5.0 percent for dually eligible; 5.4 percent for Medicare-only) over the ten-year span from 2006 through 2015. In contrast, for *HDC* opioid use (defined as any calendar quarter during the year with at least 60 days' supply of opioids greater than or equal to 90 mg/day morphine equivalent dose (MED)), we found disparate ten-year growth rates of 17.8 percent and 0.2 percent among dually eligible and Medicare-only opioid-using beneficiaries with one or more opioid fills, respectively. In 2015, 10.4 percent of dually eligible ever-opioid users and 4.9 percent of Medicare-only ever-users filled opioid prescriptions at the HDC level.

#### ***Ten-year HDC opioid utilization trends differed by race/ethnicity***

For both eligibility groups (dually eligible and Medicare-only), the highest proportions of HDC utilization were within the American Indian/Alaska Native, White, and "Other" race/ethnicity classifications. However, for the dually eligible population, the ten-year rates of change in HDC opioid utilization were

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particularly pronounced for the remaining racial/ethnic groups: 54.8 percent (Black/African American), 50.2 percent (Hispanic/Latino(a)), and 44.9 percent (Asian/Pacific Islander). This is compared to 10.3 percent and 1.8 percent rates of change among White and American Indian/Alaska Native, respectively. Among the Medicare-only group, the growth rates were highest for Black/African American, Hispanic/Latino(a), and American Indian/Alaska Native groups at 38.3, 34.9, and 31.1 percent respectively.

### ***HDC opioid utilization differed by age, disability status, and health condition***

Among both the dually eligible and Medicare-only eligibility groups, those qualifying for Medicare based on disability (without co-occurring ESRD) had the highest rates of HDC opioid use, as compared to other entitlement groups. When looking at age groups<sup>4</sup> more granularly, it is apparent that those within the 55-64 year age bracket demonstrated the highest growth rates of HDC opioid utilization, with growth rates of 28.1 and 46.0 percent for both dually eligible and Medicare-only beneficiaries, respectively. For dually eligible as well as Medicare-only beneficiaries, with respect to the specific health conditions included in this analysis, we found substance use disorder (SUD) to be, by far, the condition most associated with HDC opioid utilization. Other top ranking conditions included viral hepatitis, chronic pain, and migraine.

### ***Regression analysis finds multi-pharmacy use, comorbidity, and disability drive HDC opioid utilization***

We performed logistic regression on the dually eligible population with one or more opioid fill to ascertain which characteristics are most predictive of HDC opioid use. We found the strongest predictors of HDC opioid use to be the presence of multiple chronic conditions and the number of dispensing pharmacies that an individual used to fill an opioid prescription. Specifically, in 2015, as demonstrated by an Adjusted Odds Ratio (AOR) of 3.86, dually eligible beneficiaries with four or more pharmacies were nearly four times more likely, and those with two or three pharmacies were nearly twice (AOR=1.99) as likely, to have HDC opioid use as compared to their one-pharmacy counterparts, when controlling for the effects of other variables in the model. In 2015, those with two or more chronic conditions had nearly four times the likelihood of HDC opioid utilization than those with zero or one chronic condition (AOR=3.94). Other results suggest that, with adjustment for other covariates in the model, the likelihood of HDC opioid utilization is also elevated among:

- Those with multiple prescribing providers as compared to only one; for example 2-3 providers (AOR=1.39) and 4 or more providers (AOR=1.59);
- Those ages 45-54 (AOR=1.53) as compared to those ages 65-74; and
- Those for whom the original reason for qualifying for Medicare was disability (AOR=1.46), as compared to turning age 65.

This study presents a baseline understanding of opioid utilization among dually eligible and Medicare-only beneficiaries. It highlights the importance of understanding subgroup differences and changes over time within those groups when discussing and attempting to understand any opioid use and HDC opioid use. It brings to light the need to understand more about subgroup differences and the direction or temporality of the relationship between substance use disorder and opioid utilization. Future research should focus on understanding the role of disability in HDC use in the dually eligible and Medicare-only populations, as well as understanding the rapidly rising rates of HDC opioid use among Black/African American and Hispanic/Latino(a) racial/ethnic groups. Finally, it is critical that future studies aim to clarify the etiology of

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<sup>4</sup> In Medicare, disability and/or ESRD is assumed for individuals under the age of 65, per Medicare eligibility rules.

beneficiaries' progression from HDC opioid use to opioid use disorder to opioid-related overdoses, so that targeted interventions may be designed with the greatest chances of making a positive impact on public health.

All results are displayed graphically in Appendix A. Data tables are also included in Appendix B.

## **STUDY DATA AND METHODS**

This study employed 2006-2015 Medicare data that are housed within the Centers for Medicare & Medicaid Services (CMS) Chronic Conditions Warehouse (CCW). The files included Medicare Parts A, B, and D enrollment and claims information for each year of the 2006 to 2015 study time period.

Beneficiaries with cancer diagnoses in the same year were excluded because analgesic medications are commonly used to treat cancer-related pain. In addition, we excluded individuals who received hospice services during the year to avoid capturing opioid use related to the treatment of pain associated with the end of life. Finally, we excluded beneficiaries with Medicare as a secondary payer with missing values for the characteristics of interest. The HDC analyses further limited the sample by excluding beneficiaries enrolled in Medicare managed care plans during the year because CMS only started requiring encounter data in 2012, so lacks the data necessary to generate the additional key characteristics for the full study period. Only individuals with at least one opioid prescription fill in a given year were included in the HDC analyses.

For both the dually eligible and Medicare-only populations, we analyzed the trends in the rate of any opioid use and HDC opioid use. We used the Dr. Robert Bree Collaborative 2017 Opioid Prescribing Metrics definition of HDC opioid use: any calendar quarter during the year with at least 60 days' supply of opioids greater than or equal to 90 mg/day morphine equivalent dose (MED). Individuals were identified as dually eligible from the CMS Medicare Modernization Act (MMA) data that states submit to CMS for operational purposes on an at-least monthly basis. For more information on defining dually eligible beneficiaries in CMS data, please see the following resource: [https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/Downloads/MMCO\\_DualEligibleDefinition.pdf](https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/Downloads/MMCO_DualEligibleDefinition.pdf).

## APPENDIX A: FIGURES

Figure 1. Prevalence of Any and High Dose Chronic Opioid Use

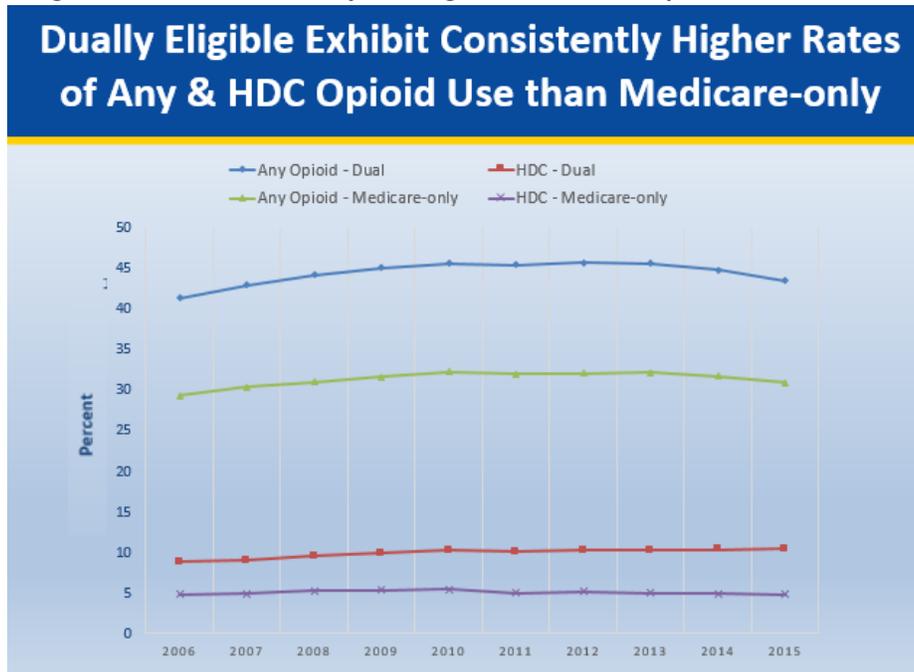
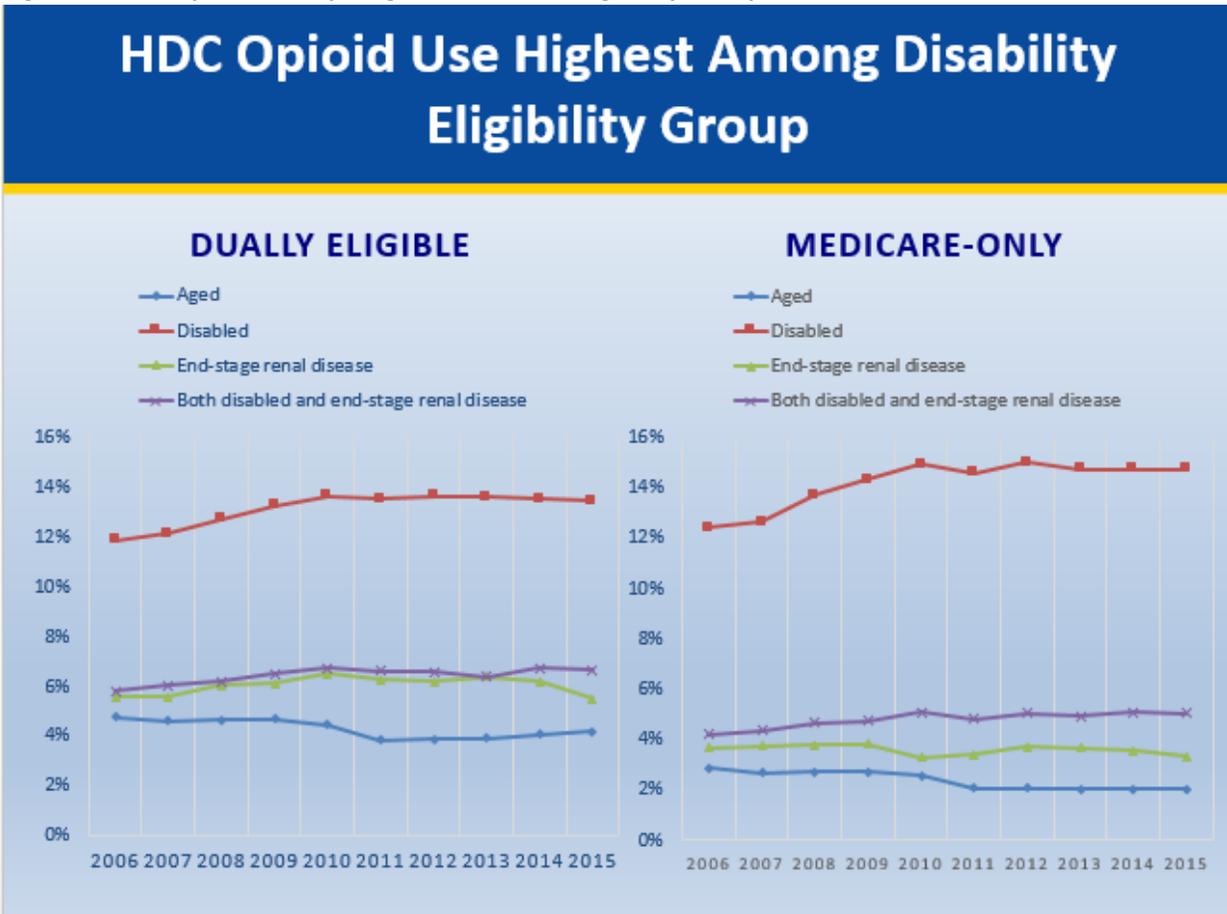


Figure 1 shows the trend lines in any opioid use and HDC opioid use for dually eligible and Medicare-only beneficiaries. Over the ten years, the dually eligible population demonstrated consistently higher rates of any opioid use as compared to the Medicare-only population, but with similar growth rates (5.0 and 5.4 percent, respectively). In the most recent study year, 2015, 43.5 percent of all dually eligible and 30.9 percent of all Medicare-only fee-for-service (FFS) beneficiaries who met the study inclusion criteria received at least one opioid prescription.

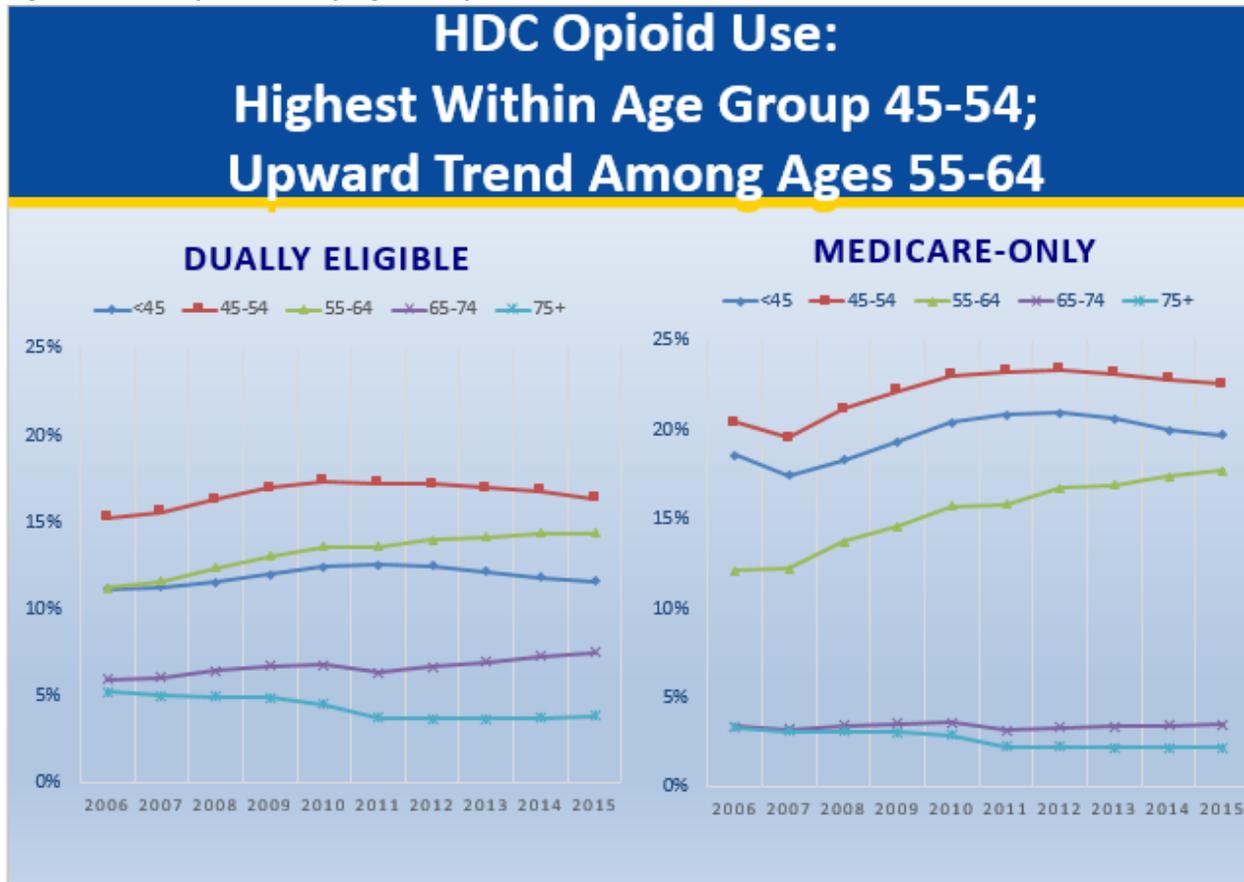
In contrast to any opioid utilization, HDC opioid utilization displayed markedly different rates of change between the dually eligible (17.8 percent) and Medicare-only (0.2 percent) populations. In 2015, 10.4 percent of all dually eligible and 4.9 percent of all Medicare-only fee-for-service (FFS) beneficiaries who met the study inclusion criteria had received opioid prescriptions at the HDC level.

Figure 2. HDC Opioid Use by Original Medicare Eligibility Group



Among the eligibility groups, those qualifying for Medicare based on disability (without co-occurring ESRD) had the highest rates of HDC opioid use: among dually eligible beneficiaries, these rates ranged from 11.4 percent to 13.6 percent; among Medicare-only beneficiaries, rates of HDC use ranged from 12.4 to 15.0 percent.

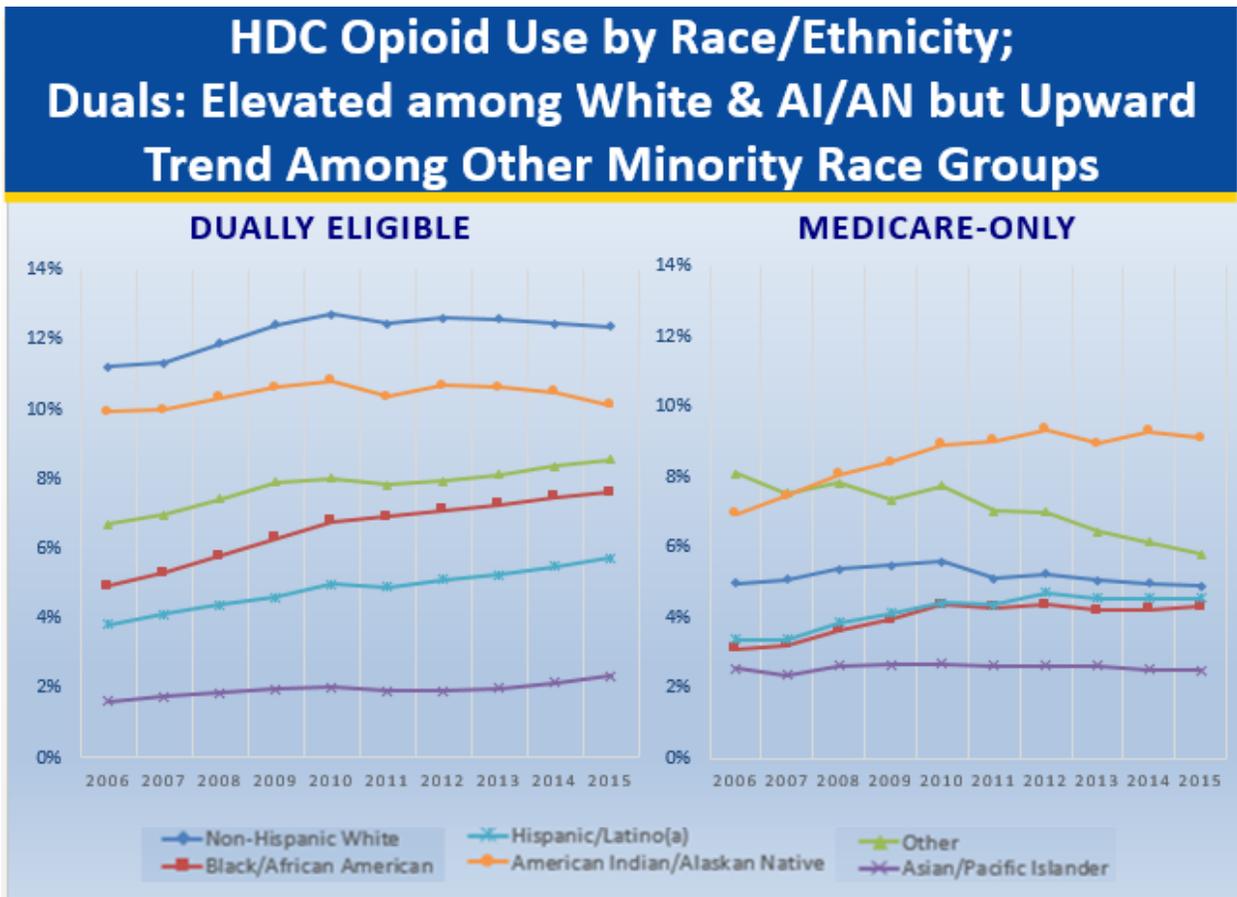
Figure 3. HDC Opioid Use by Age Group



The 45-54 age bracket displayed the highest rates of HDC opioid use, at 15.3 percent of dually eligible beneficiaries using opioids in 2006 and 16.4 percent in 2015. For Medicare-only beneficiaries, the 45-54 age range also ranked highest in HDC opioid use, at 20.4 percent in 2006 and 22.6 percent in 2015. Notably, other Medicare-only age groups under age 65 also had proportions of opioid users who were as high as or higher than their comparable age groups among the dually eligible.

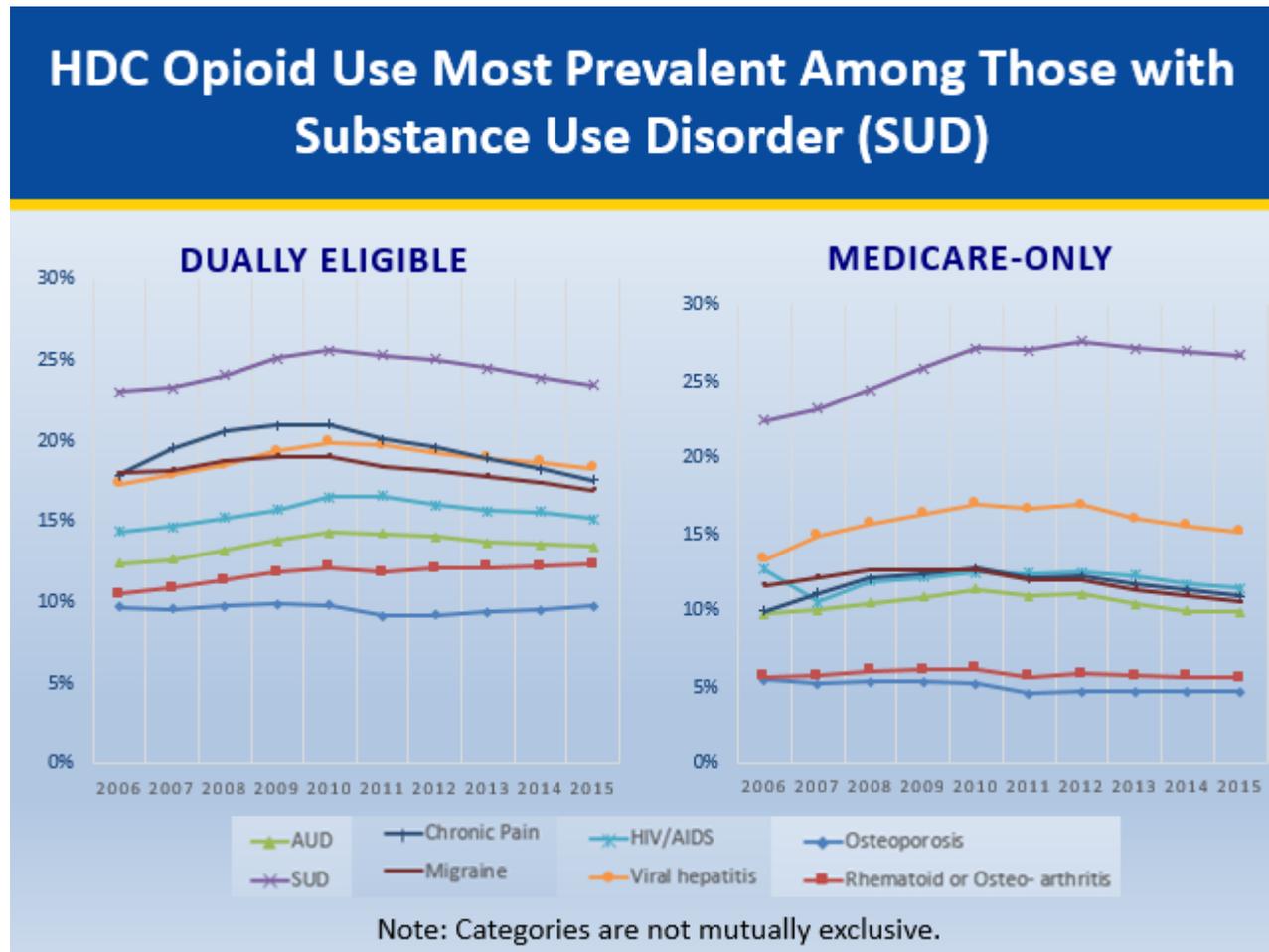
The greatest rates of change in HDC opioid use were in the 55-64 and 65-74 age brackets, which displayed rates of change of 28.1 and 25.6 percent for dually eligible beneficiaries, respectively. For Medicare-only, the age group with the most rapid rate of change was the 55-64 age bracket, demonstrating a 46.0 percent growth rate over the ten years.

Figure 4. Prevalence of HDC Opioid Use by Race/Ethnicity



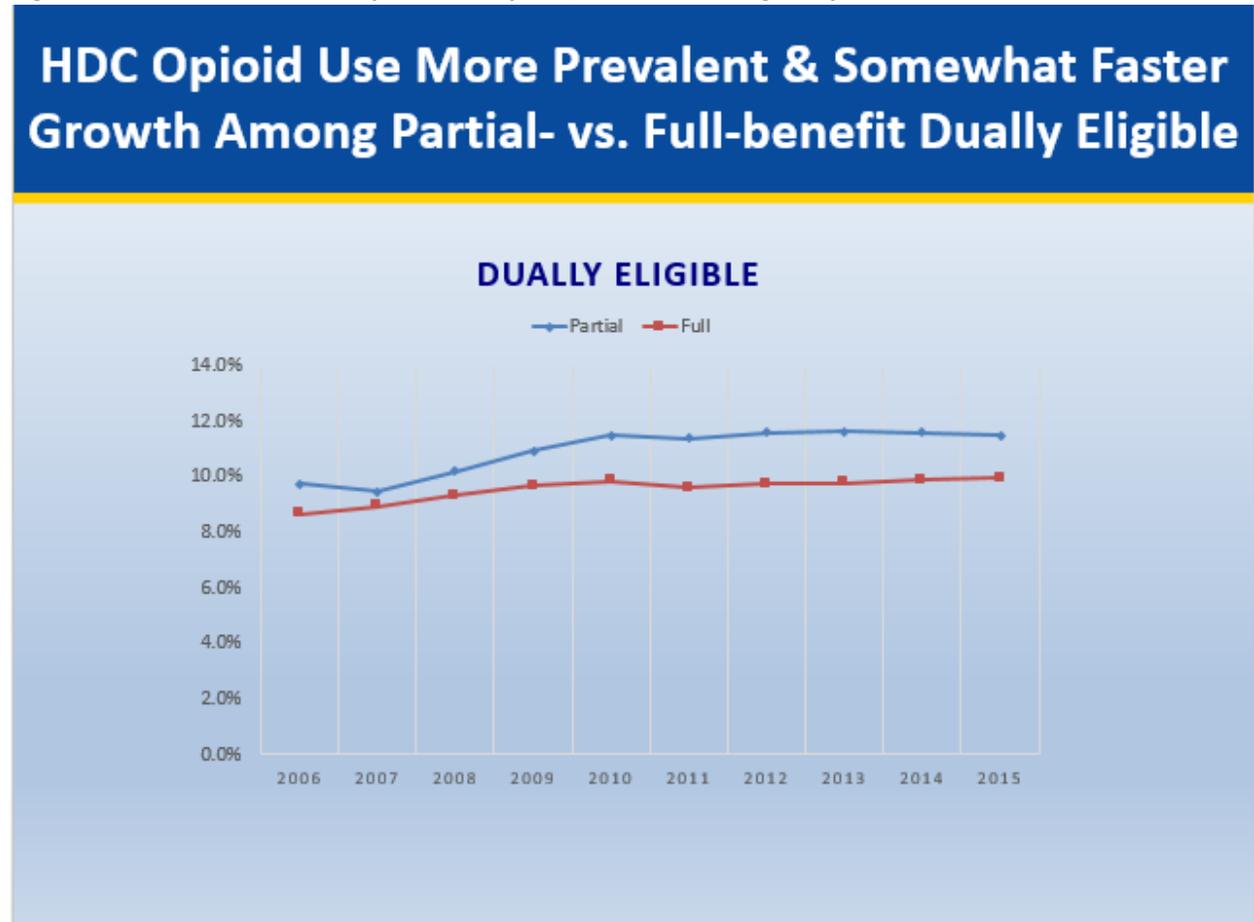
While point-in-time prevalence of HDC opioid use was higher for White than Non-white-classified dually eligible beneficiaries using opioids, the rates of change over the ten years showed stark differences among the other race/ethnicity categories. For dually eligible beneficiaries, ten-year growth rates were 54.8 percent (Black/African American), 50.2 percent (Hispanic/Latino(a)), and 44.9 percent (Asian/Pacific Islander). In contrast, the ten-year growth rates in HDC use for Non-Hispanic White and Native American/Alaska Native dually eligible beneficiaries were 10.3 and 2.8 percent, respectively. Among Medicare-only beneficiaries using opioids, the rates of growth were highest for Black/African American (38.3 percent), Hispanic/Latino(a) (34.9 percent) and American Indian/Alaska Native (31.1 percent), while Non-Hispanic White and Asian/Pacific Islander populations displayed rates of -1.3-and -2.1 percent, respectively.

Figure 5. Prevalence of HDC Opioid Use by Health Conditions Associated with to High Dose Chronic Opioid Utilization



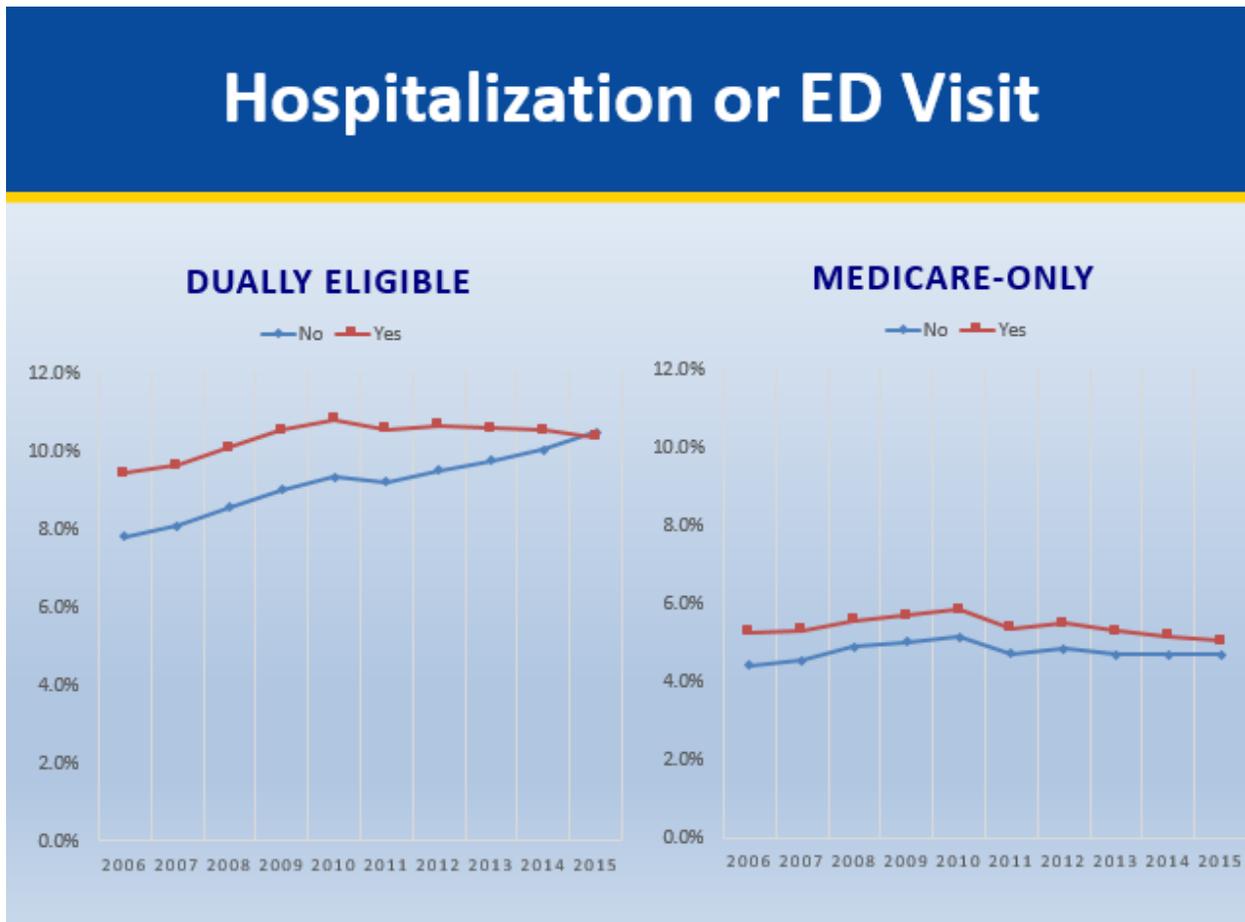
We analyzed the following health conditions that are often associated with to HDC opioid utilization: substance abuse and pain: substance use disorder (SUD), alcohol use disorder (AUD), chronic pain, migraine, rheumatoid arthritis, osteoporosis, HIV/AIDS, and viral hepatitis. All conditions were higher in prevalence for the dually eligible group than the Medicare-only group, with the exception of SUD which ranked highest of all the conditions compared among both groups. For the dually eligible group, chronic pain ranked second highest, followed closely by viral hepatitis and migraine. For the Medicare-only group, viral hepatitis took second place.

Figure 6. Prevalence of HDC Opioid Use by Full/Partial Dual Eligibility



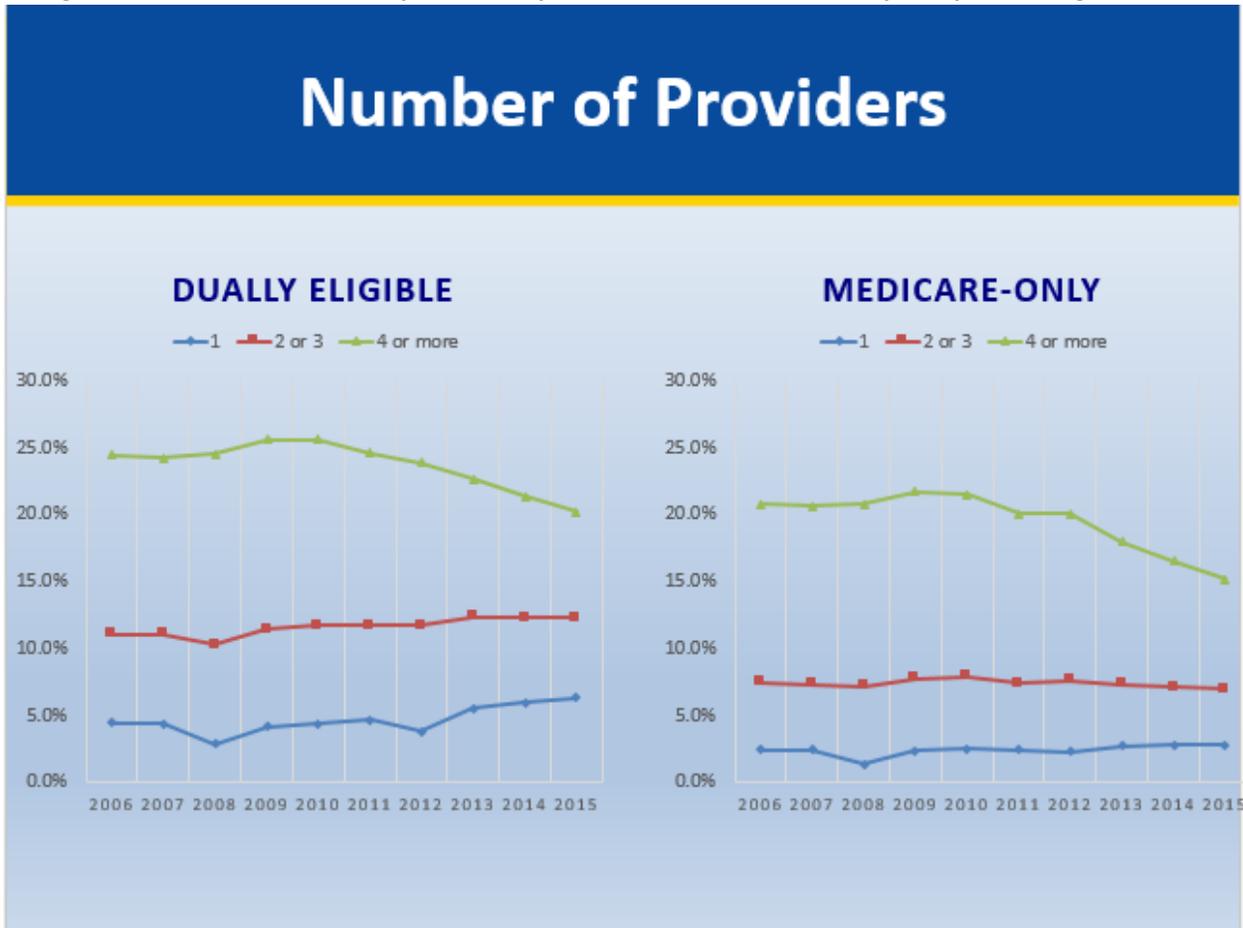
Among this population of dually eligible beneficiaries using opioids, “partial benefit” dually eligible beneficiaries demonstrated slightly higher HDC opioid use than “full benefit” dually eligible beneficiaries.

Figure 7. Prevalence of HDC Opioid Use by Hospitalization or ED Visit



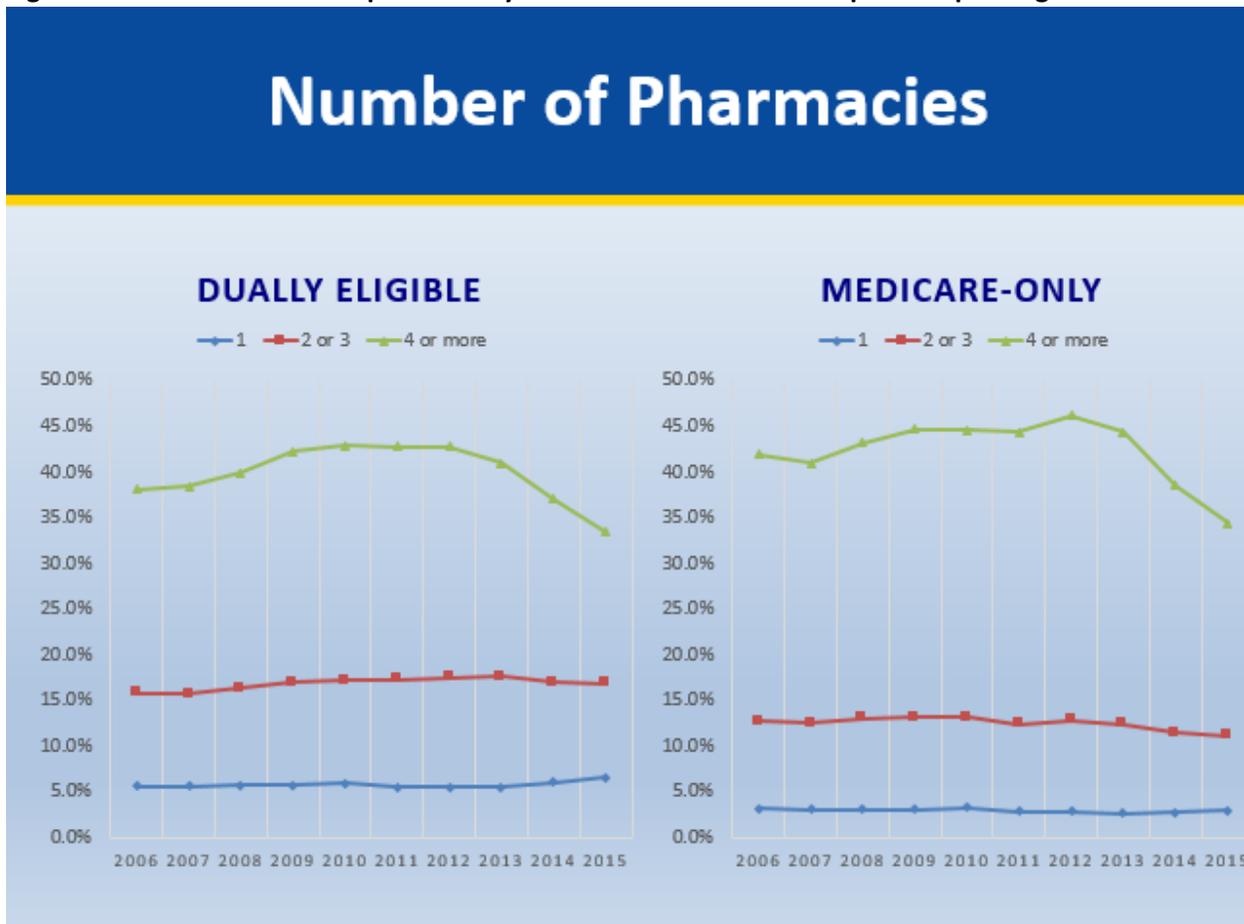
In general, across the two study populations, those individuals with a hospitalization or emergency department (ED) visit had a higher prevalence of HDC opioid use than those with no such hospitalizations or visits. However, for dually eligible beneficiaries, this difference became smaller after 2011.

Figure 8. Prevalence of HDC Opioid Use by Beneficiaries' Number of Opioid-prescribing Providers



For both study populations, prevalence of HDC opioid use was substantially higher for individuals with four or more providers who had prescribed opioids to them, and somewhat higher for those with 2-3 opioid-prescribing providers than those with only one such provider. However, there appears to be a shift over time in which HDC opioid use is gradually rising among those with only one provider and falling among those with four or more providers.

Figure 9. Prevalence of HDC Opioid Use by Beneficiaries' Number of Opioid-dispensing Pharmacies



For both study populations, prevalence of HDC opioid use was substantially higher for those with four or more opioid-dispensing pharmacies, and somewhat higher for those with 2-3 such pharmacies than those with only one such pharmacy. However, it appears that in recent years HDC opioid use is falling among those with four or more pharmacies who had dispensed opioid prescriptions to them in the year.

**APPENDIX B: TABLES**

**Table 1. Percent of Dually Eligible with Any Opioid Utilization, 2006-2015**

	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
N (Total FFS Dually Eligible in millions)	6.0	7.1	7.3	7.6	7.9	8.1	8.4	8.9	9.2	9.5
N (Opioid users in millions)	2.5	3.1	3.2	3.4	3.6	3.7	3.8	4.1	4.1	4.1
Percent	41.4	43.0	44.2	45.2	45.6	45.5	45.7	45.7	44.9	43.5
<b>Age</b>										
<45	39.3	41.6	42.8	43.9	44.3	44.2	44.1	43.1	41.8	40.1
45-54	47.8	50.5	52.2	53.6	54.6	54.8	55.2	55.2	54.4	53.2
55-64	50.3	52.0	53.5	54.7	55.3	55.3	55.7	55.8	55.2	54.2
65-74	39.7	40.8	41.9	42.7	43.0	42.6	42.7	42.8	41.8	40.2
75+	38.0	38.8	39.5	39.8	39.8	39.2	39.4	39.3	38.6	37.2
<b>Sex</b>										
Male	35.5	37.2	38.5	39.5	40.0	40.1	40.3	40.3	39.6	38.3
Female	44.8	46.5	47.7	48.6	49.1	48.9	49.2	49.1	48.3	46.9
<b>Race</b>										
Non-Hispanic White	44.6	46.0	47.3	48.2	48.7	48.5	48.7	48.7	48.1	46.9
Black/African American	41.3	43.3	44.8	46.4	47.3	47.4	47.9	48.1	47.3	46.3
Other	31.7	33.3	34.5	35.5	35.7	35.0	35.2	34.7	33.4	32.7
Asian/Pacific Islander	23.5	24.7	25.3	25.4	25.2	25.3	25.4	25.1	24.0	22.6
Hispanic/Latino(a)	35.0	36.7	37.7	38.6	39.3	39.1	39.4	39.4	38.3	36.4
American Indian/Alaska Native	44.4	47.1	49.0	50.4	51.0	51.4	51.1	51.0	50.0	48.8
<b>Original reason for Medicare entitlement</b>										
Aged	36.5	37.4	38.1	38.4	38.4	37.7	37.8	37.7	36.7	35.0
Disabled	45.5	47.7	49.2	50.5	51.2	51.3	51.6	51.5	50.9	49.7
End-stage renal disease	59.5	61.0	62.1	63.2	62.6	61.8	61.5	60.5	53.9	57.7
Both disabled and end-stage renal disease	62.9	64.0	64.7	65.1	65.6	65.3	64.4	63.8	59.2	62.1
<b>Dual eligibility type</b>										
Partial	45.5	44.9	46.7	48.1	48.8	48.3	48.4	48.5	47.8	46.7
Full	40.7	42.4	43.4	44.2	44.5	44.4	44.6	44.5	43.7	42.1
<b>Type of Part D plan</b>										
Stand-alone prescription drug plan	41.8	43.1	44.2	45.1	45.5	45.3	45.4	45.1	44.4	43.2
Medicare Advantage	39.5	42.5	44.1	45.2	46.0	46.0	46.6	47.0	45.7	43.9

**Table 2. Percent of Medicare-only with Any Opioid Utilization, 2006-2015**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N (Total Medicare in millions)	8.3	14.6	15.7	16.5	17.1	17.8	19.5	23.3	24.7	26.1
N (Opioid users in millions)	2.4	4.4	4.9	5.2	5.5	5.7	6.3	7.5	7.8	8.1
Percent	29.3	30.4	31.0	31.6	32.2	32.0	32.1	32.1	31.7	30.9
<b>Age</b>										
<45	39.7	40.8	41.8	43.2	44.1	44.3	44.2	43.6	43.1	41.6
45-54	49.8	50.7	52.2	54.1	55.2	55.2	55.5	55.4	55.0	53.7
55-64	46.2	47.5	49.1	50.8	52.1	52.5	53.1	53.7	53.8	53.1
65-74	26.9	27.7	28.4	29.1	29.7	29.5	29.6	29.7	29.4	28.8
75+	28.9	29.7	30.1	30.4	30.9	30.6	30.6	30.6	30.2	29.4
<b>Sex</b>										
Male	26.4	27.9	28.6	29.3	30.0	30.1	30.3	30.5	30.2	29.6
Female	31.3	32.2	32.7	33.2	33.8	33.4	33.4	33.4	32.8	31.9
<b>Race</b>										
Non-Hispanic White	30.2	31.1	31.6	32.1	32.7	32.4	32.5	32.5	32.2	31.6
Black/African American	28.0	30.2	31.4	32.6	33.8	33.8	33.9	34.1	33.6	32.8
Other	21.5	23.5	24.0	24.9	25.2	24.8	24.6	24.5	24.0	23.1
Asian/Pacific Islander	15.9	16.6	16.7	17.0	17.1	16.9	17.1	17.0	16.5	15.8
Hispanic/Latino(a)	25.5	27.4	28.3	29.2	30.0	30.3	30.8	30.7	29.9	27.1
American Indian/Alaska Native	36.0	37.9	39.1	40.4	41.9	42.3	42.4	42.5	42.5	41.9
<b>Original reason for Medicare entitlement</b>										
Aged	26.9	27.6	28.0	28.4	28.8	28.5	28.5	28.5	28.1	27.4
Disabled	43.9	45.4	46.8	48.3	49.4	49.7	50.1	50.4	50.3	49.4
End-stage renal disease	45.2	44.6	44.6	46.2	46.5	46.5	46.4	45.8	42.7	45.0
Both disabled and end-stage renal disease	50.7	51.6	53.1	52.9	53.3	53.4	52.7	52.3	49.1	51.8
<b>Dual eligibility type</b>										
Partial	-	-	-	-	-	-	-	-	-	-
Full	-	-	-	-	-	-	-	-	-	-
<b>Type of Part D plan</b>										
Stand-alone prescription drug plan	31.6	31.5	32.0	32.5	33.1	32.7	32.7	32.5	32.1	31.4
Medicare Advantage	27.6	29.1	29.9	30.7	31.4	31.3	31.5	31.8	31.3	30.4

**Table 3. High-dose chronic opioid use among dually eligible, 2006-2015**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N (Opioid users in millions)	2.1	2.5	2.5	2.6	2.7	2.8	2.8	2.8	2.7	2.5
N (High-dose chronic users in hundreds of thousands)	1.8	2.2	2.4	2.6	2.8	2.8	2.8	2.9	2.7	2.6
Percent High-dose chronic users	8.8	9.0	9.5	9.9	10.2	10.0	10.2	10.3	10.3	10.4
<b>Age</b>										
<45	11.1	11.2	11.5	11.9	12.4	12.5	12.5	12.1	11.8	11.6
45-54	15.3	15.6	16.3	17.0	17.4	17.2	17.2	17.0	16.8	16.4
55-64	11.2	11.6	12.4	13.0	13.6	13.6	14.0	14.1	14.3	14.3
65-74	6.0	6.0	6.4	6.7	6.7	6.3	6.6	6.9	7.2	7.5
75+	5.2	5.0	4.9	4.9	4.5	3.7	3.7	3.7	3.7	3.8
<b>Sex</b>										
Male	9.7	10.0	10.6	11.1	11.6	11.7	11.9	11.8	11.9	11.9
Female	8.4	8.6	9.0	9.3	9.5	9.2	9.3	9.4	9.5	9.5
<b>Race</b>										
Non-Hispanic White	11.2	11.3	11.9	12.4	12.7	12.4	12.6	12.6	12.4	12.4
Black/African American	4.9	5.3	5.8	6.3	6.8	6.9	7.1	7.2	7.5	7.6
Other	6.7	7.0	7.4	7.9	8.0	7.8	7.9	8.1	8.4	8.5
Asian/Pacific Islander	1.6	1.7	1.9	2.0	2.0	1.9	1.9	2.0	2.2	2.3
Hispanic/Latino(a)	3.8	4.1	4.4	4.6	5.0	4.9	5.1	5.2	5.5	5.7
American Indian/Alaska Native	9.9	10.0	10.3	10.6	10.8	10.4	10.7	10.6	10.5	10.1
<b>Original reason for Medicare entitlement</b>										
Aged	4.7	4.6	4.6	4.7	4.4	3.8	3.9	3.9	4.1	4.2
Disabled	11.8	12.1	12.7	13.2	13.6	13.5	13.6	13.6	13.5	13.4
End-stage renal disease	5.6	5.6	6.0	6.1	6.5	6.2	6.2	6.4	6.2	5.5
Both disabled and end-stage renal disease	5.8	6.0	6.2	6.5	6.7	6.6	6.6	6.4	6.7	6.6
<b>Dual eligibility type</b>										
Partial	9.7	9.4	10.2	10.9	11.5	11.4	11.6	11.6	11.6	11.5
Full	8.7	8.9	9.3	9.7	9.8	9.6	9.7	9.8	9.9	10.0
<b>Number of Providers</b>										
1	4.4	4.3	2.8	4.1	4.3	4.6	3.8	5.5	5.9	6.3
2 or 3	11.0	11.0	10.3	11.4	11.7	11.7	11.6	12.3	12.2	12.3
4 or more	24.4	24.2	24.5	25.5	25.5	24.6	23.9	22.6	21.3	20.2
<b>Number of Pharmacies</b>										
1	5.6	5.6	5.7	5.6	5.9	5.5	5.5	5.4	6.0	6.5
2 or 3	15.8	15.6	16.3	16.9	17.2	17.2	17.5	17.5	16.9	16.8
4 or more	38.0	38.3	39.9	42.2	42.8	42.7	42.8	40.9	37.0	33.4
<b>Hospitalization or ED visit</b>										
No	7.8	8.1	8.6	9.0	9.3	9.2	9.5	9.8	10.0	10.5
Yes	9.4	9.6	10.1	10.5	10.8	10.6	10.6	10.6	10.5	10.4

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N (Opioid users in millions)	2.1	2.5	2.5	2.6	2.7	2.8	2.8	2.8	2.7	2.5
N (High-dose chronic users in hundreds of thousands)	1.8	2.2	2.4	2.6	2.8	2.8	2.8	2.9	2.7	2.6
Percent High-dose chronic users	8.8	9.0	9.5	9.9	10.2	10.0	10.2	10.3	10.3	10.4
<b>Alcohol Use Disorder</b>										
No	8.5	8.7	9.2	9.6	9.8	9.6	9.8	9.9	10.0	10.0
Yes	12.4	12.6	13.2	13.8	14.3	14.2	14.0	13.7	13.5	13.5
<b>Chronic Pain</b>										
No	6.2	5.5	5.0	4.7	4.2	3.5	3.1	2.8	2.6	2.3
Yes	17.8	19.5	20.5	20.9	21.0	20.1	19.6	18.9	18.2	17.6
<b>HIV/AIDS</b>										
No	8.7	9.0	9.4	9.8	10.1	9.9	10.1	10.2	10.3	10.3
Yes	14.4	14.6	15.2	15.7	16.5	16.6	16.0	15.7	15.6	15.2
<b>Migraine</b>										
No	8.1	8.2	8.7	9.0	9.3	9.1	9.2	9.2	9.3	9.3
Yes	18.0	18.2	18.7	19.0	19.0	18.3	18.1	17.8	17.3	17.0
<b>Osteoporosis</b>										
No	8.6	8.9	9.5	10.0	10.4	10.3	10.5	10.5	10.6	10.5
Yes	9.7	9.6	9.7	9.8	9.8	9.1	9.2	9.3	9.5	9.7
<b>Rheumatoid or Osteo- arthritis</b>										
No	6.4	6.4	6.6	6.8	7.0	6.9	6.8	6.6	6.5	6.4
Yes	10.4	10.8	11.4	11.8	12.2	11.8	12.1	12.1	12.2	12.3
<b>Substance Use Disorder</b>										
No	7.3	7.4	7.7	7.8	7.9	7.5	7.5	7.4	7.4	7.1
Yes	23.0	23.2	24.1	25.1	25.6	25.3	25.0	24.5	23.8	23.5
<b>Viral hepatitis</b>										
No	8.3	8.5	9.0	9.4	9.6	9.4	9.6	9.6	9.7	9.8
Yes	17.3	17.9	18.4	19.3	19.9	19.7	19.3	18.9	18.6	18.3

**Table 4. High-dose chronic opioid use among Medicare-only, 2006-2015**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N (Opioid users in millions)	1.1	2.6	2.7	2.7	2.8	2.9	3.1	3.8	4.0	4.0
N (High-dose chronic users in hundreds of thousands)	0.5	1.3	1.4	1.5	1.5	1.4	1.6	1.9	1.9	2.0
Percent High-dose chronic users	4.8	4.9	5.2	5.3	5.5	5.0	5.2	5.0	4.9	4.9
<b>Age</b>										
<45	18.6	17.4	18.3	19.3	20.4	20.8	20.9	20.6	20.0	19.7
45-54	20.4	19.5	21.2	22.2	23.0	23.2	23.3	23.2	22.8	22.6
55-64	12.1	12.2	13.7	14.6	15.7	15.8	16.8	16.9	17.4	17.7
65-74	3.3	3.2	3.4	3.5	3.6	3.1	3.3	3.3	3.4	3.5
75+	3.3	3.1	3.1	3.0	2.9	2.2	2.2	2.2	2.2	2.2
<b>Sex</b>										
Male	5.2	5.5	5.8	6.0	6.4	6.1	6.2	5.9	5.7	5.6
Female	4.7	4.6	4.9	5.0	5.0	4.4	4.5	4.4	4.4	4.4
<b>Race</b>										
Non-Hispanic White	5.0	5.1	5.4	5.5	5.6	5.1	5.2	5.1	5.0	4.9
Black/African American	3.1	3.2	3.6	3.9	4.3	4.3	4.4	4.2	4.2	4.3
Other	8.1	7.5	7.8	7.3	7.7	7.0	7.0	6.4	6.1	5.8
Asian/Pacific Islander	2.5	2.4	2.6	2.7	2.7	2.6	2.6	2.6	2.5	2.5
Hispanic/Latino(a)	3.4	3.4	3.9	4.1	4.4	4.4	4.7	4.6	4.6	4.5
American Indian/Alaska Native	6.9	7.5	8.1	8.4	8.9	9.0	9.3	8.9	9.3	9.1
<b>Original reason for Medicare entitlement</b>										
Aged	2.9	2.7	2.7	2.7	2.6	2.0	2.1	2.0	2.0	2.0
Disabled	12.4	12.6	13.7	14.3	14.9	14.6	15.0	14.7	14.7	14.7
End-stage renal disease	3.7	3.7	3.8	3.8	3.3	3.4	3.7	3.6	3.5	3.3
Both disabled and end-stage renal disease	4.2	4.4	4.6	4.7	5.1	4.8	5.0	4.9	5.1	5.0
<b>Dual eligibility type</b>										
Partial	-	-	-	-	-	-	-	-	-	-
Full	-	-	-	-	-	-	-	-	-	-
<b>Number of Providers</b>										
1	2.4	2.4	1.3	2.3	2.4	2.4	2.2	2.7	2.7	2.8
2 or 3	7.4	7.3	7.1	7.7	7.9	7.3	7.6	7.3	7.0	6.9
4 or more	20.7	20.6	20.8	21.7	21.5	20.0	20.0	17.9	16.5	15.2
<b>Number of Pharmacies</b>										
1	3.1	3.0	3.1	3.0	3.2	2.8	2.8	2.6	2.7	2.9
2 or 3	12.6	12.5	13.0	13.1	13.1	12.4	12.8	12.4	11.5	11.1
4 or more	41.9	41.0	43.2	44.7	44.5	44.3	46.1	44.3	38.5	34.4
<b>Hospitalization or ED visit</b>										
No	4.4	4.5	4.9	5.0	5.1	4.7	4.8	4.7	4.7	4.7
Yes	5.3	5.3	5.6	5.7	5.8	5.4	5.5	5.3	5.2	5.0

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N (Opioid users in millions)	1.1	2.6	2.7	2.7	2.8	2.9	3.1	3.8	4.0	4.0
N (High-dose chronic users in hundreds of thousands)	0.5	1.3	1.4	1.5	1.5	1.4	1.6	1.9	1.9	2.0
Percent High-dose chronic users	4.8	4.9	5.2	5.3	5.5	5.0	5.2	5.0	4.9	4.9
<b>Alcohol Use Disorder</b>										
No										
Yes	4.7	4.8	5.1	5.2	5.3	4.8	5.0	4.8	4.7	4.6
<b>Chronic Pain</b>	9.7	10.0	10.5	10.8	11.4	10.9	11.0	10.4	9.9	9.9
No										
Yes	3.6	3.2	3.0	2.8	2.5	1.8	1.7	1.4	1.3	1.1
<b>HIV/AIDS</b>	9.9	11.1	12.0	12.4	12.7	12.1	12.2	11.7	11.3	10.9
No										
Yes	4.8	4.9	5.2	5.3	5.4	5.0	5.1	5.0	4.9	4.8
<b>Migraine</b>	12.6	10.5	11.9	12.1	12.5	12.4	12.4	12.3	11.7	11.4
No										
Yes	4.6	4.6	4.9	5.0	5.1	4.6	4.7	4.5	4.5	4.4
<b>Osteoporosis</b>	11.6	12.2	12.6	12.6	12.7	11.9	11.9	11.4	10.9	10.5
No										
Yes	4.7	4.9	5.2	5.4	5.6	5.2	5.3	5.1	5.0	4.9
<b>Rheumatoid or Osteo- arthritis</b>	5.5	5.2	5.3	5.3	5.2	4.5	4.7	4.7	4.7	4.7
No										
Yes	3.5	3.6	3.8	3.8	4.0	3.7	3.7	3.4	3.2	3.0
<b>Substance Use Disorder</b>	5.6	5.7	6.0	6.1	6.2	5.6	5.8	5.7	5.6	5.6
No										
Yes	4.4	4.3	4.5	4.6	4.6	4.0	4.1	3.9	3.7	3.5
<b>Viral hepatitis</b>	22.4	23.2	24.4	25.8	27.2	27.0	27.6	27.1	26.9	26.7
No										
Yes	4.7	4.8	5.1	5.2	5.3	4.8	5.0	4.8	4.7	4.7

**Table 5. Percent Change in high-dose chronic opioid use among dually eligible and Medicare-only, 2006-2015**

	Percent Change in High Dose Chronic Opioid Utilization 2006-2015: Dually Eligible	Percent Change in High Dose Chronic Opioid Utilization 2006-2015: Medicare-Only
<b>Overall</b>	17.9%	0.2%
<b>Age</b>		
<45	3.8%	6.2%
45-54	7.1%	10.8%
55-64	28.1%	46.0%
65-74	25.6%	4.4%
75+	-27.2%	-33.5%
<b>Sex</b>		
Male	23.3%	8.6%
Female	13.3%	-7.0%
<b>Race</b>		
Non-Hispanic White	10.3%	-1.3%
Black/African American	54.8%	38.3%
Other	28.0%	-28.3%
Asian/Pacific Islander	44.9%	-2.1%
Hispanic/Latino(a)	50.2%	34.9%
American Indian/Alaska Native	1.8%	31.1%
<b>Original reason for Medicare entitlement</b>		
Aged	-12.2%	-30.0%
Disabled	13.5%	18.5%
End-stage renal disease	-1.9%	-9.2%
Both disabled and end-stage renal disease	14.1%	20.0%
<b>Dual eligibility type</b>		
Partial	18.2%	N/A
Full	14.9%	N/A
<b>Number of Providers</b>		
1	42.9%	14.6%
2 or 3	11.3%	-6.6%
4 or more	-17.4%	-26.9%
<b>Number of Pharmacies</b>		
1	16.8%	-5.2%
2 or 3	6.4%	-12.3%
4 or more	-12.3%	-17.9%
<b>Hospitalization or ED visit</b>		
No	34.2%	6.4%
Yes	9.9%	-4.6%
<b>Alcohol Use Disorder</b>		
No	17.3%	-1.9%
Yes	8.7%	1.7%

	Percent Change in High Dose Chronic Opioid Utilization 2006-2015: Dually Eligible	Percent Change in High Dose Chronic Opioid Utilization 2006-2015: Medicare-Only
<b>Chronic Pain</b>		
No	-62.4%	-70.1%
Yes	-1.7%	9.9%
<b>HIV/AIDS</b>		
No	18.1%	0.1%
Yes	5.5%	-9.4%
<b>Migraine</b>		
No	15.3%	-4.1%
Yes	-5.7%	-9.5%
<b>Osteoporosis</b>		
No	22.7%	5.2%
Yes	0.5%	-14.1%
<b>Rheumatoid or Osteo- arthritis</b>		
No	-0.3%	-12.5%
Yes	17.8%	-1.2%
<b>Substance Use Disorder</b>		
No	-2.9%	-19.6%
Yes	2.0%	19.3%
<b>Viral hepatitis</b>		
No	17.4%	-1.4%
Yes	5.6%	13.9%

**Table 6. Multiple logistic regression on high-dose chronic opioid use among dually eligible beneficiaries, 2006-2015**

	2006 AOR (95% CI)	2007 AOR (95% CI)	2008 AOR (95% CI)	2009 AOR (95% CI)	2010 AOR (95% CI)	2011 AOR (95% CI)	2012 AOR (95% CI)	2013 AOR (95% CI)	2014 AOR (95% CI)	2015 AOR (95% CI)
<b>Age</b>										
<45	1.08 (1.06-1.10)	1.08 (1.06-1.10)	1.07 (1.06-1.09)	1.07 (1.05-1.09)	1.13 (1.11-1.15)	1.26 (1.24-1.28)	1.22 (1.20-1.24)	1.17 (1.15-1.19)	1.18 (1.16-1.20)	1.20 (1.18-1.22)
45-54	1.52 (1.49-1.55)	1.52 (1.50-1.55)	1.50 (1.48-1.53)	1.51 (1.49-1.53)	1.56 (1.54-1.58)	1.69 (1.66-1.72)	1.60 (1.58-1.63)	1.55 (1.53-1.57)	1.55 (1.52-1.57)	1.53 (1.51-1.56)
55-64	1.26 (1.24-1.29)	1.29 (1.27-1.31)	1.29 (1.27-1.31)	1.32 (1.30-1.34)	1.37 (1.35-1.40)	1.47 (1.45-1.50)	1.44 (1.42-1.46)	1.41 (1.39-1.43)	1.40 (1.38-1.42)	1.40 (1.38-1.42)
65-74*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75+	1.03 (1.02-1.05)	0.95 (0.93-0.96)	0.92 (0.91-0.94)	0.84 (0.82-0.85)	0.76 (0.75-0.78)	0.68 (0.67-0.69)	0.64 (0.63-0.65)	0.60 (0.59-0.61)	0.58 (0.57-0.59)	0.55 (0.54-0.56)
χ2	2861.5	3858.2	3979.4	5159.9	6493.8	8495.9	8540.2	9217.5	9611.5	9484.5
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Sex</b>										
Male*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Female	0.89 (0.88-0.90)	0.87 (0.86-0.88)	0.84 (0.83-0.85)	0.84 (0.83-0.85)	0.82 (0.81-0.82)	0.78 (0.77-0.79)	0.78 (0.77-0.79)	0.79 (0.78-0.79)	0.78 (0.77-0.79)	0.77 (0.77-0.78)
χ2	396.39	738.96	1188.4	1353.1	1952.2	2913.3	3052.6	2879.3	3077.7	3131.3
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Race</b>										
Non-Hispanic White*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Black/African American	0.40 (0.40-0.41)	0.43 (0.42-0.43)	0.44 (0.43-0.45)	0.45 (0.44-0.45)	0.46 (0.45-0.46)	0.47 (0.47-0.48)	0.48 (0.48-0.49)	0.49 (0.49-0.50)	0.53 (0.53-0.53)	0.55 (0.55-0.56)
Other	0.67 (0.62-0.72)	0.70 (0.66-0.74)	0.73 (0.69-0.78)	0.74 (0.70-0.78)	0.73 (0.69-0.78)	0.74 (0.69-0.78)	0.75 (0.70-0.79)	0.76 (0.71-0.80)	0.79 (0.74-0.83)	0.81 (0.76-0.86)
Asian/Pacific Islander	0.20 (0.19-0.21)	0.22 (0.21-0.24)	0.25 (0.23-0.26)	0.25 (0.24-0.26)	0.26 (0.25-0.27)	0.27 (0.25-0.28)	0.28 (0.26-0.29)	0.28 (0.27-0.30)	0.31 (0.29-0.32)	0.33 (0.31-0.34)
Hispanic/Latino(a)	0.36 (0.35-0.37)	0.39 (0.38-0.40)	0.41 (0.40-0.42)	0.40 (0.40-0.41)	0.43 (0.42-0.44)	0.44 (0.44-0.45)	0.46 (0.46-0.47)	0.47 (0.47-0.48)	0.50 (0.49-0.51)	0.52 (0.51-0.53)
American Indian/Alaska Native	0.79 (0.75-0.83)	0.77 (0.74-0.81)	0.74 (0.71-0.77)	0.73 (0.70-0.76)	0.74 (0.71-0.76)	0.73 (0.70-0.76)	0.74 (0.71-0.77)	0.75 (0.72-0.78)	0.76 (0.73-0.79)	0.75 (0.72-0.78)
χ2	20338	21726	21463	23528	23522	21799	20951	20389	16680	13918
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

	2006 AOR (95% CI)	2007 AOR (95% CI)	2008 AOR (95% CI)	2009 AOR (95% CI)	2010 AOR (95% CI)	2011 AOR (95% CI)	2012 AOR (95% CI)	2013 AOR (95% CI)	2014 AOR (95% CI)	2015 AOR (95% CI)
<b>Original Reason for Medicare Entitlement</b>										
Aged*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Disabled	1.49 (1.46-1.51)	1.49 (1.46-1.51)	1.43 (1.41-1.46)	1.44 (1.42-1.47)	1.46 (1.43-1.48)	1.47 (1.44-1.49)	1.44 (1.41-1.46)	1.48 (1.45-1.50)	1.47 (1.44-1.49)	1.46 (1.43-1.49)
End-stage renal disease	0.92 (0.86-0.98)	0.91 (0.85-0.96)	0.91 (0.86-0.97)	0.90 (0.85-0.95)	0.93 (0.88-0.99)	0.88 (0.84-0.93)	0.84 (0.80-0.89)	0.91 (0.86-0.96)	0.89 (0.84-0.95)	0.80 (0.76-0.85)
Both disabled and end-stage renal disease	0.87 (0.83-0.92)	0.92 (0.87-0.96)	0.86 (0.82-0.90)	0.87 (0.83-0.91)	0.88 (0.84-0.92)	0.85 (0.82-0.89)	0.83 (0.79-0.86)	0.84 (0.80-0.87)	0.87 (0.83-0.91)	0.85 (0.81-0.88)
χ <sup>2</sup>	2336.1	2606.7	2371.8	2573.4	2729.0	2741.8	2698.4	2998.5	2763.0	2825.9
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Dual Eligibility Type</b>										
Partial*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Full	1.04 (1.03-1.06)	1.11 (1.09-1.12)	1.10 (1.08-1.11)	1.05 (1.04-1.06)	1.01 (1.00-1.02)	1.00 (0.99-1.01)	1.00 (1.00-1.01)	1.00 (0.99-1.01)	0.99 (0.98-1.00)	1.00 (0.99-1.00)
χ <sup>2</sup>	34.52	309.82	276.20	81.64	5.19	0.06	0.95	0.06	1.71	0.90
p-value	<0.001	<0.001	<0.001	<0.001	0.02	0.81	0.33	0.81	0.19	0.34
<b>Rural/Urban</b>										
Metro*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Micro	1.03 (1.01-1.04)	1.01 (1.00-1.03)	1.01 (0.99-1.02)	1.01 (1.00-1.02)	0.99 (0.98-1.00)	0.98 (0.97-0.99)	0.98 (0.97-0.99)	0.99 (0.98-1.00)	0.96 (0.95-0.97)	0.93 (0.92-0.94)
Rural	0.98 (0.96-0.99)	0.94 (0.93-0.95)	0.94 (0.93-0.96)	0.95 (0.94-0.96)	0.91 (0.90-0.92)	0.88 (0.87-0.90)	0.89 (0.88-0.90)	0.91 (0.89-0.92)	0.88 (0.87-0.89)	0.85 (0.84-0.86)
χ <sup>2</sup>	31.21	93.70	75.64	64.87	188.88	321.46	291.09	212.44	363.58	629.40
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Number of Providers</b>										
1*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2 or 3	1.90 (1.88-1.93)	1.90 (1.88-1.93)	2.82 (2.78-2.86)	2.00 (1.97-2.02)	1.93 (1.90-1.95)	1.72 (1.70-1.74)	2.10 (2.07-2.12)	1.46 (1.45-1.48)	1.41 (1.40-1.43)	1.39 (1.37-1.40)
4 or more	3.00 (2.95-3.05)	2.87 (2.83-2.91)	4.90 (4.82-4.98)	2.95 (2.90-2.99)	2.75 (2.72-2.79)	2.22 (2.19-2.25)	2.78 (2.74-2.82)	1.65 (1.63-1.67)	1.60 (1.58-1.62)	1.59 (1.57-1.61)
χ <sup>2</sup>	17793	19947	38981	22270	21526	13945	22350	6856.7	5868.9	5442.7
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

	2006 AOR (95% CI)	2007 AOR (95% CI)	2008 AOR (95% CI)	2009 AOR (95% CI)	2010 AOR (95% CI)	2011 AOR (95% CI)	2012 AOR (95% CI)	2013 AOR (95% CI)	2014 AOR (95% CI)	2015 AOR (95% CI)
<b>Number of Pharmacies</b>										
1*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2 or 3	1.90 (1.87- 1.92)	1.89 (1.87- 1.91)	1.67 (1.65- 1.68)	1.94 (1.92- 1.96)	1.95 (1.93- 1.97)	2.20 (2.18- 2.23)	2.17 (2.14- 2.19)	2.52 (2.49- 2.54)	2.18 (2.16- 2.21)	1.99 (1.97- 2.01)
4 or more	3.92 (3.84- 4.00)	4.06 (3.99- 4.14)	3.59 (3.54- 3.65)	4.67 (4.60- 4.75)	4.83 (4.75- 4.90)	5.63 (5.54- 5.71)	5.56 (5.48- 5.64)	6.41 (6.32- 6.50)	4.92 (4.85- 4.99)	3.86 (3.80- 3.92)
$\chi^2$	20943	27576	24365	38003	42675	53128	56560	70875	50159	34205
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Hospitalizations or ER Visits</b>										
0*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1 or more	0.75 (0.74- 0.75)	0.71 (0.70- 0.72)	0.70 (0.69- 0.70)	0.68 (0.67- 0.68)	0.66 (0.66- 0.67)	0.65 (0.64- 0.65)	0.63 (0.62- 0.63)	0.65 (0.64- 0.65)	0.66 (0.66- 0.67)	0.66 (0.65- 0.66)
$\chi^2$	2606.1	4276.6	4991.7	6284.1	7286.6	8014.9	9410.6	8495.3	7425.8	7651.3
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Two or More Chronic Conditions</b>										
No*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Yes	2.27 (2.24- 2.29)	2.50 (2.47- 2.52)	2.54 (2.52- 2.57)	2.78 (2.75- 2.80)	2.97 (2.94- 3.00)	3.25 (3.21- 3.28)	3.24 (3.21- 3.28)	3.51 (3.47- 3.55)	3.66 (3.62- 3.70)	3.94 (3.89- 3.98)
$\chi^2$	22829	32914	34549	42199	48077	51218	49019	52711	51084	49046
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

\*Indicates Reference group