



## Utilization of antihypertensive drug classes among Medicare beneficiaries with hypertension, 2007 to 2009

# Cardiovascular Issues

## Data Points #8

Hypertension is a chronic medical condition in which systemic arterial blood pressure is elevated. Thus, it is more colloquially referred to as high blood pressure. It typically results in thickening and loss of elasticity in arterial walls, as well as hypertrophy of the left heart ventricle. Hypertension is a risk factor for numerous pathologic conditions, including heart attack, heart failure, and stroke. Hypertension is a serious public health challenge in the United States, as it affects approximately 30 percent of adults.<sup>1</sup> Among adults age 60 and above, prevalence exceeds 60 percent.<sup>2</sup> In all, according to the American Heart Association, more than 74 million American adults have hypertension.<sup>3</sup>

The Seventh Report of the Joint Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommends that treatment of hypertension start with lifestyle modifications. If blood pressure control is not achieved with lifestyle modifications, thiazide diuretics should be used as initial therapy for most patients, either alone or in combination with one of four other antihypertensive drug classes (i.e., angiotensin-converting enzyme inhibitors [ACEIs], angiotensin II receptor antagonists [ARBs], beta-adrenergic blockers [BBs], or calcium channel blockers [CCBs]). Most patients with hypertension will require two or more antihypertensive drugs to control their blood pressure.<sup>4</sup>

Considerable effort has been devoted to increasing awareness and treatment of hypertension among Americans. During 1976-1980, only 51 percent of hypertensive patients ages 18-74 years were aware of their hypertension. This markedly improved during 1999-2000, when 70 percent of people in this age group recognized their hypertension. Between 1976-1980 and 1999-2000, the percentage of patients with hypertension receiving treatment increased from 31 to 58 percent. These changes were associated with reductions in the morbidity and mortality attributed to hypertension during this period.<sup>4</sup> However, the U.S. Department of Health and Human Services' goal for 50 percent of Americans with hypertension to have their blood pressure controlled by the year 2000 was not reached.<sup>5,6</sup>



Between 2007 and 2009, 87 to 88 percent of Medicare beneficiaries with hypertension used at least one prescription for an antihypertensive drug.

Beneficiaries with hypertension used on average  $1.9 \pm 1.3$  antihypertensive drug classes within a calendar year.

The top three dispensed antihypertensive drug classes were beta blockers, diuretics, and angiotensin-converting enzyme inhibitors.

In 2009, the total drug cost for antihypertensive agents was \$4.3 billion and the out-of-pocket expenditure was \$2.2 billion.



Hypertension control rates have been shown to be the lowest among individuals age 60 years and above,<sup>7</sup> despite the availability of public/government-provided health insurance for those age 65 years and older.

In addition, data from the Medicare Current Beneficiary Survey Cost and Utilization files showed that 72 percent of Medicare beneficiaries filled at least one antihypertensive prescription during 1995, while Medicare fee-for-service beneficiaries spent an average of \$508 on medications during the same year.<sup>8</sup>

This *Data Points* brief explores the prevalence of hypertension and utilization of antihypertensive drugs among hypertensive Medicare fee-for-service beneficiaries from 2007 to 2009 (Table 1). Further, it examines costs of antihypertensive drugs.

## FINDINGS

### Prevalence of Hypertension

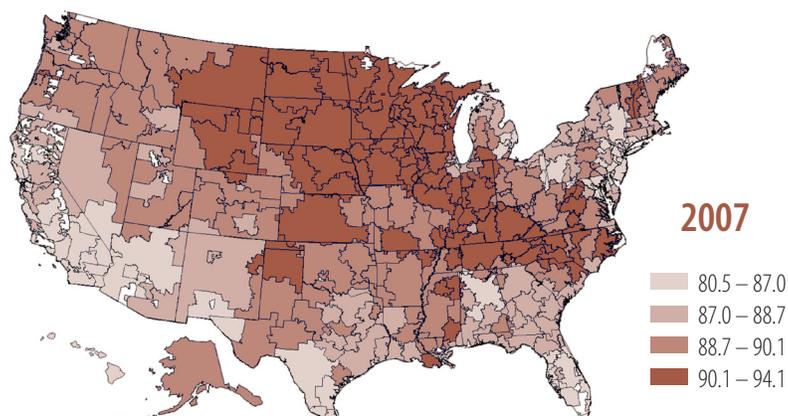
Among continuously enrolled Medicare fee-for-service beneficiaries, the 2009 annual prevalence of hypertension was 60.1 percent (see Data Source and Definitions and Methods sections for definitions of continuous enrollment and hypertension). This number increased significantly when the cohort was restricted to Medicare beneficiaries with diabetes, who had an annual prevalence of hypertension nearly 1.5 times as high (87.6 percent) for 2009.

The annual prevalence of hypertension differed with regard to demographic factors, such as age, gender, and race/ethnicity. For example, in 2009, hypertension was more common among females than males (62.2 percent versus 56.8 percent) and in beneficiaries ages 65-74 (65.7 percent) and 75-84 (67.8 percent) compared with those under 65 (48.1 percent) and 85+ (52.7 percent). Variation in the prevalence of hypertension was also seen between races (white, 59.3 percent; black, 64.4 percent; Asian, 67.5 percent; Hispanic, 60.2 percent; American Indian/Alaska Native, 54.7 percent; and other, 62.1 percent).

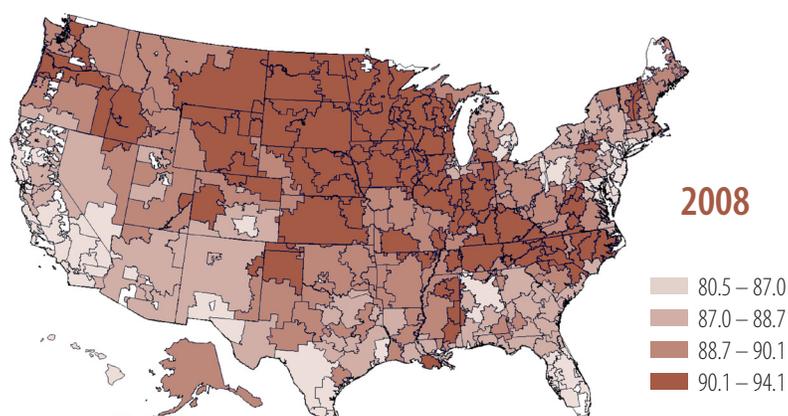
**Table 1:** Yearly prevalence of use of an antihypertensive drug in Medicare fee-for-service beneficiaries (Parts A, B, and D) with hypertension, 2007 to 2009

Variable	Year	Percentage of all hypertensive beneficiaries using an antihypertensive drug	Mean number ± standard deviation of antihypertensive drug classes used by all hypertensive beneficiaries	
<b>Overall</b>	2007	87.9	1.9 ± 1.3	
	2008	88.0	1.9 ± 1.3	
	2009	87.4	1.9 ± 1.3	
<b>Age</b>	Under 65	2007	82.9	1.8 ± 1.3
		2008	83.0	1.8 ± 1.3
		2009	82.6	1.8 ± 1.3
	65 to 74	2007	88.1	1.9 ± 1.2
		2008	88.1	1.9 ± 1.3
		2009	87.1	1.8 ± 1.3
	75 to 84	2007	89.3	2.0 ± 1.3
		2008	89.6	2.0 ± 1.3
		2009	89.2	2.0 ± 1.3
85 and over	2007	89.4	2.0 ± 1.2	
	2008	89.7	2.0 ± 1.2	
	2009	89.6	2.0 ± 1.3	
<b>Gender</b>	Female	2007	89.2	2.0 ± 1.3
		2008	89.3	2.0 ± 1.3
		2009	88.7	2.0 ± 1.3
	Male	2007	85.5	1.9 ± 1.3
		2008	85.8	1.9 ± 1.3
		2009	85.3	1.8 ± 1.3
<b>Race / Ethnicity</b>	White	2007	88.0	1.9 ± 1.2
		2008	88.0	1.9 ± 1.2
		2009	87.3	1.9 ± 1.2
	Black	2007	88.4	2.2 ± 1.4
		2008	88.8	2.2 ± 1.4
		2009	88.7	2.2 ± 1.4
	Asian	2007	87.8	1.9 ± 1.3
		2008	88.0	1.9 ± 1.3
		2009	88.0	1.9 ± 1.3
	Hispanic	2007	85.8	1.9 ± 1.3
		2008	85.9	1.9 ± 1.3
		2009	85.8	1.9 ± 1.3
	American Indian/ Alaska Native	2007	82.6	1.8 ± 1.3
		2008	84.1	1.9 ± 1.3
		2009	84.6	1.9 ± 1.3
Other	2007	85.5	1.8 ± 1.3	
	2008	85.8	1.8 ± 1.3	
	2009	85.8	1.8 ± 1.3	

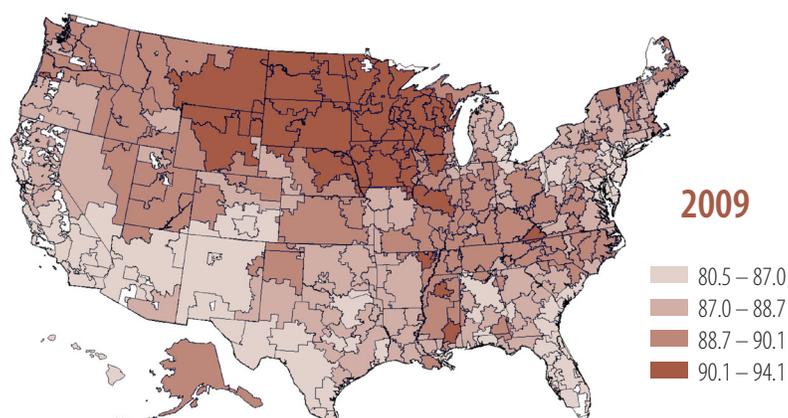
**Figure 1:** Yearly prevalence (%) of use of an antihypertensive drug in Medicare fee-for-service beneficiaries (Parts A, B, and D) with hypertension, 2007



**Figure 2:** Yearly prevalence (%) of use of an antihypertensive drug in Medicare fee-for-service beneficiaries (Parts A, B, and D) with hypertension, 2008



**Figure 3:** Yearly prevalence (%) of use of an antihypertensive drug in Medicare fee-for-service beneficiaries (Parts A, B, and D) with hypertension, 2009



White corresponds to areas that lack a hospital referral region (HRR)

### Utilization of Antihypertensive Drugs Among Those With Hypertension

Between 2007 and 2009, 87 to 88 percent of beneficiaries with hypertension used an antihypertensive drug (Table 1). The use of an antihypertensive drug was slightly higher among hypertensive patients with diabetes and varied between 90.1 and 90.6 percent from 2007 to 2009.

Percentages of antihypertensive drug use among beneficiaries with hypertension varied by age, gender, race/ethnicity, and geographic region (Table 1 and Figures 1-3). For example, in 2009, 88.7 percent of female beneficiaries with hypertension and 85.3 percent of male beneficiaries with hypertension used an antihypertensive drug. Further, the northwestern and midwestern States were among the regions with the highest percentages of hypertensive patients who were dispensed an antihypertensive drug.

In total, 142.4 million prescriptions for antihypertensive agents were dispensed to 10.4 million beneficiaries with hypertension in 2007. The total number of antihypertensive prescriptions dispensed decreased to 141.8 million in 2009, while the total number of beneficiaries increased to almost 11 million. The average annual number of antihypertensive drugs dispensed to a beneficiary with hypertension decreased from 13.7 to 12.8 prescriptions per individual during this period.

Hypertensive patients with diabetes received on average 14.8 prescriptions per individual in 2009. Beneficiaries with hypertension used on average  $1.9 \pm 1.3$  antihypertensive drug classes within a calendar year (Table 1). However, patients age 75 and above, females, and black patients used on average two or more antihypertensive drug classes during a calendar year.

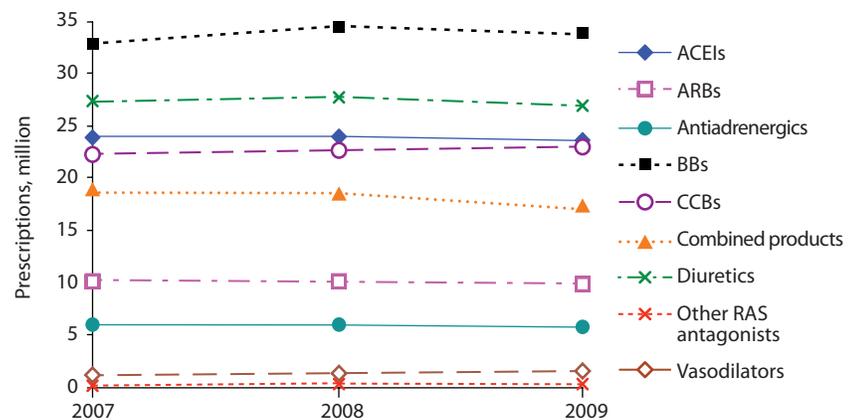
The top three dispensed antihypertensive classes were BBs, diuretics, and ACEIs from 2007 to 2009 (Figure 4). While the number of prescriptions dispensed by antihypertensive drug classes varied little between 2007 and 2009, the use of these different classes varied widely by geographic distribution. For example, ACEIs and diuretics were more commonly dispensed in northern States compared with southern States. In contrast, combination products were less commonly dispensed in northern states compared to southern states. Maps of the use of antihypertensive drug classes can be found online.

### Cost of Antihypertensive Drugs Among Those With Hypertension

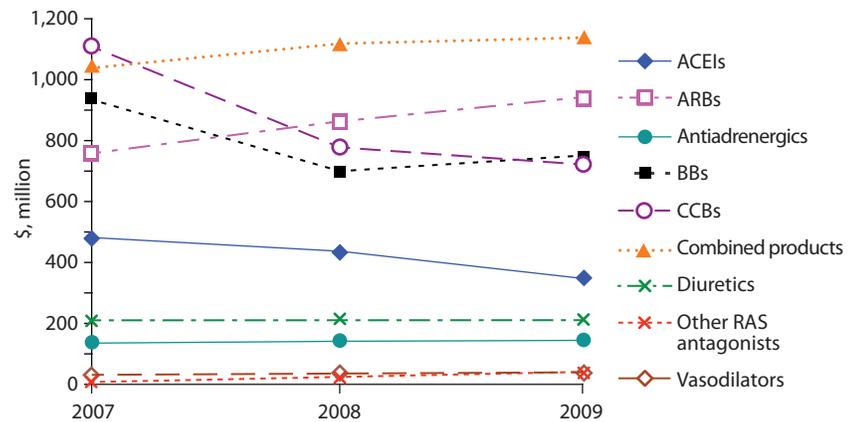
Total drug cost and total out-of-pocket expense were calculated within the Medicare Part D Prescription Drug Event (PDE) file. The PDE file contains summary records of drug dispensing information from prescription plan sponsors. In 2009, the total drug cost for antihypertensive drugs was \$4.3 billion. The average drug cost per Medicare beneficiary with hypertension was \$393. Figure 5 shows the trend of drug cost by antihypertensive drug classes over the study period. The total reimbursement cost of ACEIs, BBs, and CCBs decreased from 2007 to 2009, while the costs of ARBs and combined products increased during this period.

Total out-of-pocket expense for antihypertensive agents in 2009 was \$2.2 billion, which was more than half of the total drug costs. The average out-of-pocket expense per Medicare beneficiary with hypertension was \$195 in 2009. Figure 6 shows the trend of out-of-pocket expense by antihypertensive drug class over the study period. Similar trends were observed for total antihypertensive drug costs.

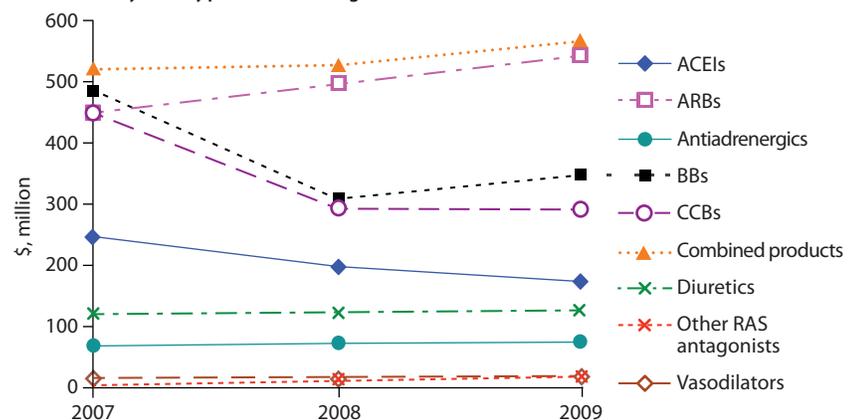
**Figure 4:** Total number of antihypertensive prescriptions dispensed to Medicare beneficiaries with hypertension by antihypertensive drug class, 2007 to 2009



**Figure 5:** Total cost of antihypertensive prescriptions dispensed to Medicare beneficiaries with hypertension, by antihypertensive drug class, 2007 to 2009



**Figure 6:** Total out-of-pocket expenditure of antihypertensive prescriptions dispensed to Medicare beneficiaries with hypertension, by antihypertensive drug class, 2007 to 2009



\* RAS = renin-angiotensin system.

**Table 2:** Antihypertensive drugs examined in this brief

Drug Class	Drugs
<b>Angiotensin-converting enzyme inhibitors (ACEIs)</b>	benazepril, captopril, enalapril, fosinopril, lisinopril, moexipril, perindopril, quinapril, ramipril, andtrandolapril
<b>Angiotensin II receptor antagonists (ARBs)</b>	candesartan, eprosartan, irbesartan, losartan, olmesartan, telmisartan, and valsartan
<b>Antiadrenergics</b>	clonidine, doxazosin, guanabenz, guanadrel, guanethidine, guanfacine, methylodopa, prazosin, reserpine, and terazosin
<b>Beta blockers (BBs)</b>	acebutolol, atenolol, betaxolol, bisoprolol, carteolol, carvedilol, labetalol, metoprolol, nadolol, nebivolol, penbutolol, pindolol, propranolol, and timolol
<b>Calcium channel blockers (CCBs)</b>	amlodipine, diltiazem, felodipine, isradipine, nicardipine, nifedipine, nisoldipine, and verapamil
<b>Combined products</b>	aliskiren-hydrochlorothiazide, aliskiren-valsartan, amiloride-hydrochlorothiazide, amlodipine-atorvastatin, amlodipine-benazepril, amlodipine-olmesartan, amlodipine-telmisartan, amlodipine-valsartan, amlodipine-valsartan-hydrochlorothiazide, atenolol-chlorthalidone, benazepril-hydrochlorothiazide, bisoprolol-hydrochlorothiazide, candesartan-hydrochlorothiazide, captopril-hydrochlorothiazide, clonidine-chlorthalidone, deserpidine-hydrochlorothiazide, deserpidine-methylothiazide, enalapril-diltiazem, enalapril-felodipine, enalapril-hydrochlorothiazide, eprosartan-hydrochlorothiazide, guanethidine-hydrochlorothiazide, hydralazine-hydrochlorothiazide, hydralazine-reserpine-hydrochlorothiazide, irbesartan-hydrochlorothiazide, lisinopril-hydrochlorothiazide, losartan-hydrochlorothiazide, metoprolol-hydrochlorothiazide, methylodopa-chlorothiazide, methylodopa-hydrochlorothiazide, moexipril-hydrochlorothiazide, nadolol-bendroflumethiazide, olmesartan-hydrochlorothiazide, propranolol-hydrochlorothiazide, quinapril-hydrochlorothiazide, reserpine-chlorothiazide, reserpine-chlorthalidone, reserpine-hydrochlorothiazide, reserpine-hydroflumethiazide, reserpine-methylothiazide, reserpine-polythiazide, reserpine-trichlormethiazide, spironolactone-hydrochlorothiazide, telmisartan-hydrochlorothiazide, timolol-hydrochlorothiazide, triamterene-hydrochlorothiazide, and valsartan-hydrochlorothiazide
<b>Diuretics</b>	amiloride, bumetanide, chlorothiazide, chlorthalidone, ethacrynate, furosemide, hydrochlorothiazide, hydroflumethiazide, indapamide, methylothiazide, metolazone, spironolactone, torsemide, and triamterene
<b>Other renin-angiotensin system (RAS) antagonists</b>	aliskiren and eplerenone
<b>Vasodilators</b>	hydralazine and minoxidil

## DATA SOURCE

The Department of Health and Human Services' Medicare data were used for this brief. The use of these data was covered under a project-specific data use agreement with the Centers for Medicare & Medicaid Services. Specifically, the Medicare Enrollment Database (EDB), the Common Working File, and PDE monthly data were used. The data used were current through June 2010. Prevalence of hypertension and utilization of antihypertensive drugs was determined separately for 2007, 2008, and 2009. A Medicare fee-for-service beneficiary was included in the enrollment population for a given year if she or he was continuously enrolled in Medicare Parts A, B, and D during the entire calendar year. Enrollment was determined using the EDB. Gender, race/ethnicity, and age were all extracted from the EDB.

## STUDY PERIOD

The study period over which antihypertensive agents and hypertension were examined included 2006-2009.

## DEFINITIONS AND METHODS

### Eligible Population

Definition of Hypertension: Individuals were determined to have hypertension if they had one or more claims with International Classification of Diseases, 9th revision (ICD-9) codes consistent with hypertension (362.11, 401.x-405.x, 437.2, 997.91) during a calendar year.

Identification of Antihypertensive Drugs and Classes: Oral prescriptions of antihypertensive drugs (see Table 2) were identified using National Drug Codes.

Definition of Antihypertensive Drug Users Among Beneficiaries With Hypertension: Beneficiaries with hypertension were classified as an antihypertensive drug user if they had a claim for one or more antihypertensive drug(s) during a calendar year.

Definition of Diabetes Among Beneficiaries With Hypertension:

Beneficiaries with hypertension were determined to have diabetes if they had one or more claims with ICD-9 codes consistent with diabetes (250.00-03, 250.10-13, 250.20-23, 250.30-33, 250.40-43, 250.50-53, 250.60-63, 250.70-73, 250.80-83, 250.90-93) during a calendar year.

Calculation of Payments for Antihypertensive Drugs:

For each of the study years of interest, we used Part D claims to calculate drug payment for antihypertensive drugs among beneficiaries with hypertension. The annual total drug cost was calculated as the sum of the ingredient cost, dispensing fee, sales tax, and vaccine administration fee (which only became effective in 2008) across all antihypertensive drug claims of interest (defined above). In addition, we calculated the total beneficiary out-of-pocket expense as the sum of patient pay, true out-of-pocket amount, and the low-income subsidy amount across all antihypertensive drug claims.

Generation of Maps: Maps were generated using Dartmouth Atlas of Health Care ([www.dartmouthatlas.org](http://www.dartmouthatlas.org)) hospital referral regions (HRRs). Beneficiary Zip Codes of residence, as of December 31st of the given year, were extracted from the EDB and linked to HRRs. The percentages of beneficiaries with hypertension with use of antihypertensive drugs were grouped into quartiles and mapped accordingly. Geographic regions that did not correspond to an HRR were mapped in white. Regions with fewer than 11 beneficiaries contributing to the proportions presented were mapped in gray.

**ADDITIONAL FINDINGS AVAILABLE ONLINE**

The following additional tables and maps are available online at [www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=509](http://www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=509)

Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension, With Use of One or More Antihypertensive Drugs, With Hypertension and Use of One or More Antihypertensive Drugs, and Average Number of Antihypertensive Drug Classes Prescribed, 2006-2009

Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of One or More Antihypertensive Drugs, by Drug Class, 2006-2009

Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of One or More Antihypertensive Drugs, by HRR; Adjusted by Age Category, Gender, Race, and Comorbid Conditions, 2006-2009

Dartmouth Atlas of Health Care Maps of the Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of One or More Antihypertensive Drugs, by HRR; Adjusted by Age Category, Gender, Race, and Comorbid Conditions, 2006-2009

Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of One or More Antihypertensive Drugs, by HRR and Race; Adjusted by Age Category, Gender, and Comorbid Conditions, 2009

Dartmouth Atlas of Health Care Maps of the Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of One or More Antihypertensive Drugs, by HRR and Race; Adjusted by Age Category, Gender, and Comorbid Conditions, 2009

Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of One or More Antihypertensive Drugs, by Drug Class and HRR; Adjusted by Age Category, Gender, Race, and Comorbid Conditions, 2009

Dartmouth Atlas of Health Care Maps of the Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of One or More Antihypertensive Drugs, by Drug Class and HRR; Adjusted by Age Category, Gender, Race, and Comorbid Conditions, 2009

Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of Combination Drug, by HRR; Adjusted by Age Category, Gender, Race, and Comorbid Conditions, 2006-2009

Dartmouth Atlas of Health Care Maps of the Proportion of Medicare Parts A, B, and D Beneficiaries With Hypertension and Use of Combination Drug, by HRR; Adjusted by Age Category, Gender, Race, and Comorbid Conditions, 2006-2009

Annual Mean Number of Antihypertensive Drug Classes Used by Medicare Parts A, B, and D Beneficiaries With Hypertension, by HRR, 2006-2009

Dartmouth Atlas of Health Care Maps of the Number of Antihypertensive Drug Classes Used by Medicare Parts A, B, and D Beneficiaries With Hypertension, by HRR, 2006-2009

Number of Prescription Claims for Antihypertensive Drugs Among Medicare Parts A, B, and D Beneficiaries With Hypertension, 2006-2009

Total Drug Cost and Out-of-Pocket Cost, by Antihypertensive Drug Class, Among Medicare Parts A, B, and D Beneficiaries With Hypertension, 2006-2009

Total Drug Cost, by Antihypertensive Drug Class, Among Medicare Parts A, B, and D Beneficiaries With Hypertension, by HRR, 2009

Dartmouth Atlas of Health Care Maps of Total Drug Cost by Antihypertensive Drug Class Among Medicare Parts A, B, and D Beneficiaries With Hypertension, by HRR, 2009

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