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Antihypertensive and Statin Medication Adherence Among Medicare Beneficiaries

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Introduction: Medication adherence is important for optimal management of chronic conditions, including hypertension and hypercholesterolemia. This study describes adherence to antihypertensive and statin medications, individually and collectively, and examines variation in adherence by demographic and geographic characteristics.

Methods: The 2017 prescription drug event data for beneficiaries with Medicare Part D coverage were assessed. Beneficiaries with a proportion of days covered ≥80% were considered adherent. Adjusted prevalence ratios were estimated to quantify the associations between demographic and geographic characteristics and adherence. Adherence estimates were mapped by county of residence using a spatial empirical Bayesian smoothing technique to enhance stability. Analyses were conducted in 2019−2021.

Results: Among the 22.5 million beneficiaries prescribed antihypertensive medications, 77.1% were adherent; among the 16.1 million prescribed statin medications, 81.9% were adherent; and among the 13.5 million prescribed antihypertensive and statin medications, 70.3% were adherent to both. Adherence varied by race/ethnicity: American Indian/Alaska Native (adjusted prevalence ratio=0.83, 95% confidence limit=0.82, 0.842), Hispanic (adjusted prevalence ratio=0.90, 95% confidence limit=0.90, 0.91), and non-Hispanic Black (adjusted prevalence ratio=0.87, 95% confidence limit=0.86, 0.87) beneficiaries were less likely to be adherent than non-Hispanic White beneficiaries. County-level adherence ranged across the U.S. from 25.7% to 88.5% for antihypertensive medications, from 36.0% to 93.8% for statin medications, and from 20.8% to 92.9% for both medications combined and tended to be the lowest in the southern U.S.

Conclusions: This study highlights opportunities for efforts to remove barriers and support medication adherence, especially among racial/ethnic minority groups and within the regions at greatest risk for adverse cardiovascular outcomes.
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INTRODUCTION

Hypertension and hypercholesterolemia are leading chronic disease risk factors that contribute substantially to excess morbidity, mortality, and healthcare expenses in the U.S.[1−3] Poor management of these highly prevalent conditions is associated with increased risk for multiple negative health outcomes—most notably for cardiovascular disease.[2,4−6] Improving blood pressure control and reducing low-density lipoprotein cholesterol levels have been

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identified as 2 of the most important strategies to decrease the burden of death from heart disease and stroke, the first and fifth leading causes of death in the U.S, respectively.[7−9]

Although hypertension and hypercholesterolemia can be improved through modifications in diet and physical activity, pharmacologic therapy is often required to achieve optimal management.[4,5,10] To reduce cardiovascular disease risk, effective management typically involves ongoing tailoring of medications and clinical interactions to support patients in remaining adherent.[11] Many patients have concurrent hypertension and hyperlipidemia,[12] and medication nonadherence is an important factor limiting optimal management.[13−16] Having both hypertension and hyperlipidemia confers greater cardiovascular risk than having either condition alone,[17] and it is important to understand medication adherence for both conditions, individually and collectively.[12,18] Few published studies have assessed adherence levels to both antihypertensive and statin medications when taken concurrently across a large segment of the population, including populations at high risk for cardiovascular events such as Medicare beneficiaries.[19]

The purpose of this paper is to describe the levels of adherence to antihypertensive and statin medication, individually and collectively, among Medicare Part D beneficiaries and assess how levels of adherence vary by demographic and geographic characteristics. Examining the factors related to adherence may help to identify populations in greater need of services supporting adherence.[20−22] We describe adherence to antihypertensive and statin medications, individually and collectively, at the state and county levels and observe the variation in adherence by race−ethnicity and by county of residence urbanicity (metropolitan, micropolitan, or rural). These findings can inform public health, clinical, and health system efforts to improve adherence among those groups with the lowest adherence.

METHODS

Study Sample
Administrative and prescription medication data for all beneficiaries with Medicare Part D coverage in 2017 were accessed using the Centers for Medicare & Medicaid Services Chronic Conditions Data Warehouse through the Centers for Medicare & Medicaid Services Virtual Research Data Center (https://www.ccwdata.org/web/guest/home). There were 33.1 million beneficiaries aged ≥65 years as of January 1, 2017 who were in continuous enrollment in full fee-for-service Medicare (i.e., Part A and Part B coverage within original Medicare) with additional prescription medication plan (PDP) coverage or in a Medicare Advantage PDP

during January 1−December 31, 2017 and were not receiving care in long-term care facilities.[23,24] Of these, 25.1 million had at least 1 antihypertensive or statin prescription filled in 2017, leaving them eligible for analysis (Appendix Figure 1, available online).

Analyses were limited to beneficiaries with 2 or more antihypertensive prescriptions filled within the same pharmacologic therapeutic class or 2 or more statin prescriptions filled with different service dates during a measurement period >90 days (N=25.1 million); the >90-day measurement period helps to ensure that an adequate amount of time is available to assess adherence. The Uniform System of Classification[25] pharmaceutical product classification schema was used to identify the following antihypertensive therapeutic classes: angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers; beta blockers; calcium channel blockers; diuretics; and other antihypertensive medications, which included selective aldosterone receptor inhibitors, peripheral vasodilators, alpha blockers, and centrally acting agents. The schema was also used to identify statin medications. Control of hypertension often requires the use of >1 antihypertensive medication class.[4] Current guidance recommends HMG-CoA reductase inhibitors (statin medications) as the first-line therapy for hypercholesterolemia,[5,26] and these were used as a proxy for cholesterol-lowering therapy in this study.

Measures
Nonadherence was measured using the proportion of days covered (PDC) metric, which represents the percentage of days a beneficiary had access to the prescribed medication from the date of the first fill through the end of 2017 or the beneficiary's death in 2017.[21,27] A PDC was calculated for each class for which a beneficiary met the inclusion criteria. If multiple prescriptions for the same target medication (i.e., same generic ingredient) were dispensed on different days such that the prescriptions overlapped, the start date for the new prescription accounted for the remaining medication from the previous fill. Days' supply that extended beyond the end of the measurement period was not included in the PDC calculation. Beneficiaries with a PDC ≥80% were considered adherent; a standard threshold that has been shown to be associated with improved health outcomes.[28,29] Among beneficiaries taking multiple antihypertensive medications from different classes, an overall PDC was calculated as an average of the PDCs calculated for each therapeutic class.

Adherence among beneficiaries taking both antihypertensive and statin medications was further summarized by describing the percentage with a PDC ≥80% for both medication types. Factors assessed for relationship with adherence were age; sex; race/ethnicity (non-Hispanic White, non-Hispanic Black, Asian/Pacific Islander, American Indian/Alaska Native, Hispanic, Other and Unknown); income status (standard or Low-Income Subsidy [LIS] status, which includes persons eligible for both Medicare and Medicaid)[30]; PDP type (fee for service [fee-for-service-PDP] or Medicare Advantage [Medicare Advantage prescription medication]); and beneficiaries' county of residence urbanicity (metropolitan core−based statistical area [CBSA], micropolitan CBSA, or rural [i.e., non-CBSA]). Additional factors assessed included whether the beneficiary had any fills for fixed-dose combinations, which are medications that contain multiple active ingredients in 1 pill (No, Yes, which includes the following: [1] a single pill containing ≥2 antihypertensive drugs and [2] a single pill containing

≥1 antihypertensive drugs and a statin); whether ≥1 fills were obtained by mail-order pharmacies; the number of prescribers for each medication type, as a proxy for continuity of care for hypertension and hypercholesteremia management, with the number of unique prescribers in 2017 grouped into 3 categories (1, 2, and ≥3 prescribers; the larger the number of unique prescribers may indicate less continuity of care); and out-of-pocket costs for medications (calculated as the mean out-of-pocket cost per 30-day supply [cost per therapy day × 30] of either an antihypertensive medication, a statin medication, or both and categorized as quartiles).

Statistical Analysis

Adherence was stratified by beneficiaries' state or territory of residence and mapped by county of residence using a spatial empirical Bayesian smoothing technique to enhance estimate stability.[31] The minimum and maximum adherence county-level values were calculated for each state as well as the percentage of counties that met the ≥80% adherence threshold. Crude prevalence estimates were calculated for each factor assessed as well as prevalence ratios on the basis of average marginal predictions[32,33] that adjusted for, where appropriate, age, sex, race/ethnicity, income status, PDP type, county urbanicity, any fixed-dose combination use, any mail-order use, and continuity of care level. Analyses used SAS, version 9.4 (SAS Institute Inc, Cary, NC). This study was considered exempt from IRB review under federal regulations covering HHS projects designed to study, evaluate, or examine public benefit or service programs.

RESULTS

In 2017, 25.1 million Medicare Part D beneficiaries were taking antihypertensive and/or statin medications. Among the 22.5 million who were taking antihypertensive medications, 77.1% were adherent; among the 16.1 million taking statin medications, 81.9% were adherent; and among the 13.5 million taking antihypertensive and statin medications, 70.3% were adherent to both (Table 1). Non-Hispanic White beneficiaries were the racial/ethnic group with the greatest adherence (72.4%) to both medication types (Table 1).

Among beneficiaries taking both an antihypertensive and a statin, American Indian/Alaska Native (adjusted prevalence ratio=0.83, 95% confidence limit=0.82, 0.84), Hispanic (adjusted prevalence ratio=0.90, 95% confidence limit=0.90, 0.91), and non-Hispanic Black (adjusted prevalence ratio=0.87, 95% confidence limit=0.86, 0.87) beneficiaries were less likely to be adherent than non-Hispanic White beneficiaries (Table 2). These disparities persisted when stratified by county urbanicity (Figure 1). For example, in rural counties, adherence to antihypertensive and statin medications combined was lower among American Indian/Alaska Native (adjusted prevalence ratio=0.77, 95% confidence limit=0.74, 0. 79) and non-Hispanic Black (adjusted prevalence ratio=0.84, 95% confidence

limit=0.83−0.85) beneficiaries than among non-Hispanic White beneficiaries. Similarly, in micropolitan counties, adherence to antihypertensive and statin medications combined was lower among American Indian/Alaska Native (adjusted prevalence ratio=0.81, 95% confidence limit=0.78, 0.83) and non-Hispanic Black (adjusted prevalence ratio=0.84, 95% confidence limit=0.83, 0.85) beneficiaries than among non-Hispanic White beneficiaries. These racial/ethnic disparities persisted even after controlling for U.S. region/territory (not shown).

Overall, county urbanicity had a minimal association with adherence to both antihypertensive and statin medications (Table 2). Adherence to both antihypertensive and statin medications was higher among beneficiaries with standard income status (71.5%) than among those with LIS status (65.4%) (Table 1). However, in adjusted models, adherence was nearly equivalent between those with LIS and standard income status (adjusted prevalence ratio=0.98, 95% confidence limit=0.98, 0.98) (Table 2). Adherence to both antihypertensive and statin medications was higher among mail-order pharmacy users (adjusted prevalence ratio=1.07, 95% confidence limit=1.07, 1.07). Beneficiaries who may have lacked continuity of care (i.e., with ≥3 prescribers) were less likely to be adherent to both antihypertensive and statin medications (adjusted prevalence ratio=0.84, 95% confidence limit=0.84, 0.84) than beneficiaries with only 1 prescriber. Beneficiaries with the highest out-of-pocket costs for antihypertensive and statin medications were less likely to be adherent to both (adjusted prevalence ratio=0.89, 95% confidence limit=0.89, 0.89) than beneficiaries with the lowest out-of-pocket costs.

By state/territory, adherence to antihypertensive medications ranged from 52.0% (U.S. Virgin Islands) to 83.8% (North Dakota), adherence to statin medications ranged from 48.5% (U.S. Virgin Islands) to 88.2% (Vermont), and adherence to both medication types ranged from 39.3% (U.S. Virgin Islands) to 78.5% (Vermont) (Appendix Table 1, available online). County-level adherence ranged across the U.S. from 25.7% (Alaska) to 88.5% (North Dakota) for antihypertensives, 36.0%% (Alaska) to 93.8% (Montana) for statin medications, and 20.8% (Alaska) to 92.9% (Colorado) for both medications combined and tended to be the lowest in the southeastern U.S. (Figure 2). A total of 4 states had 100% of counties with antihypertensive adherence ≥80% (Minnesota, New Hampshire, Rhode Island, and Vermont), 11 had 100% of counties with statin medication adherence ≥80%, and none had 100% of counties with adherence ≥80% to both medication types. A total of 15 states/territories had 0% of counties with antihypertensive medication adherence ≥80%, 5 had 0% of counties

Table 1. Adherence to Antihypertensive and Statin Medications by Beneficiary Characteristics, Medicare Part D, 2017

Participant characteristics	Total beneficiaries, *n*	Antihypertensive medication adherence Total beneficiaries with PDC, *n* (% adherent)	Statin medication adherence Total beneficiaries with PDC, *n* (% adherent)	Antihypertensive and statin medication adherence (to both) Total beneficiaries with PDC, *n* (% adherent)
Total	25,062,387	22,518,824	16,089,559	13,545,996
n adherent (% adherent)		17,371,021 (77.1)	13,183,785 (81.9)	9,516,062 (70.3)
Sex, by age (years)				
Female				
65−74	7,004,430	77.1	80.2	69.1
75−84	5,127,363	76.9	81.2	69.2
≥85	2,433,298	75.4	81.4	68.3
Male				
65−74	5,524,450	78.5	83.1	72.5
75−84	3,779,908	77.7	83.9	71.5
≥85	1,192,938	74.5	83.1	68.7
Race/ethnicity				
White, non-Hispanic	19,060,049	78.9	83.9	72.4
Black	2,259,943	69.0	73.4	61.0
Asian/Pacific Islander	864,884	77.6	81.6	71.1
American Indian/Alaska Native	64,440	63.5	71.2	56.9
Hispanic	2,295,176	71.4	73.8	62.0
Other	204,509	77.2	81.4	70.3
Unknown	313,386	81.3	84.7	75.1
Income status				
Standard	20,451,812	78.4	82.7	71.5
LIS or Medicaid dual eligible	4,610,575	72.0	78.4	65.4
Prescription medication plan type				
FFS-PDP	13,183,329	77.0	82.0	70.1
MA-PD	11,879,058	77.3	81.9	70.5
Urban/rural classification				
Metro	20,787,808	77.1	81.8	70.2
Micro	2,468,380	77.4	82.7	70.8
Rural	1,806,199	76.8	82.3	70.2
Any fixed-dose combination use				
No	958,782	77.9	77.6	71.5
Yes	24,103,605	77.1[a]	82.8[b]	70.2[c]
Any mail-order use				
No	19,933,072	75.6	80.6	68.6
Yes	51,293,315	83.2	87.0	75.9
Continuity of care for medication management proxy				
1 prescriber	14,044,693	80.5	82.2	74.8
2 prescribers	6,957,169	74.6	80.7	68.7
≥3 prescribers	4,060,525	68.3	82.1	61.9
Out-of-pocket cost (mean cost per 30-day supply)				
Quartile 1 (lowest)	5,630,027	78.9	83.5	72.0
Quartile 2	6,086,063	76.8	82.1	70.5
Quartile 3	5,171,727	77.1	83.3	71.2
Quartile 4 (highest)	5,631,007	75.7	78.9	67.2

Note: Adherence was measured as PDC ≥0.8.
FFS-PDP, Medicare Fee-for-Service prescription medication plan; LIS, Low-Income Subsidy; MA-PD, Medicare Advantage prescription medication; PDC, proportion of days covered.

with statin medication adherence ≥80%, and most 43 had 0% of counties with adherence ≥80% to both medication types (Appendix Table 2, available online).

DISCUSSION

In 2017, 25.1 million Medicare Part D beneficiaries were taking 1 or more antihypertensive medications and/or a statin medication. Among those, 5.1 million beneficiaries were considered nonadherent to their antihypertensive medication therapy, 2.9 million were considered nonadherent to their statin medication therapy, and 4.0 million were considered nonadherent to the combination of antihypertensive and statin medication therapy. This places millions of older U.S. adults at potentially elevated risk for having uncontrolled hypertension and unmanaged hypercholesterolemia and, as a result, at elevated risk for having a cardiovascular event.[28,29] Blood pressure control rates have decreased recently in the U.S., including among older adults,[34] and despite cholesterol levels improving over the past decade with dietary changes and increased use of lipid-lowering medications, high cholesterol continues to contribute significantly to cardiovascular disease−related mortality.[35,36] Therefore, actions to support improved adherence to the medications used to treat these conditions may be necessary because adherence is a crucial component of the overall strategy needed to improve the management of these conditions.

In this study, adherence to statin medications was slightly higher (~82%) among beneficiaries than adherence to antihypertensive medications (~77%). This may be partly because of patient-related factors, such as personal perceptions about the effectiveness of statin medication therapy,[37] self-reported experiences with clinicians,[38] or attitudes and beliefs about taking medications.[39] Physician-related factors, such as disparities in treatment intensification or the role of specialty care, may also influence adherence (e.g., in 1 study, patients under a cardiologist's care were more likely to be adherent to statin medications).[22,40] In addition, medication-related factors, such as the complexity of antihypertensive regimens and the need to take more than once-daily medications[41−45] and the use of home remedies[46] may influence adherence.

As evidenced in other studies,[20−22,47] continued demographic disparities and geographic variation in adherence were observed for use of both medication types. These findings likely contribute, in part, to specific groups (e.g., non-Hispanic Black) and regions (e.g., southeastern U.S.) having poorer hypertension and cholesterol management and an elevated risk for cardiovascular events.[2,48]

Previous research has identified multiple barriers that affect adherence.[49] Medication-related barriers include the complexity of the medication regimen as well as side effects.[49] Patient-related factors can include the presence of comorbidities or chronic conditions, perceptions, and medication-taking behaviors.[37,50] Socioeconomic factors include health literacy as well as medication costs and copayments.[49] Healthcare system barriers can include lack of continuity of care, poor access to healthcare or poor quality of the patient−physician relationship,[51] or bureaucratic processes associated with insurance claims.[14]

In this study, low levels of adherence were consistently identified among beneficiaries living in U.S. territories, which aligns with other evidence of gaps in key hospital performance measures and poorer outcomes for Medicare beneficiaries in the territories.[52] Furthermore, within most states, even many that have relatively high rates of adherence, considerable variation was observed at the county level. For example, the median difference between the counties with the lowest and highest adherence to both antihypertensive and statin medications within each state was around 15 percentage points. This level of county variation has also been found for heart disease mortality.[53] Therefore, it is important to note that county-level variation in adherence to antihypertensive and statin medication can be masked when adherence is only assessed at the state level.

There is evidence in the literature about differences in the prevalence of hypertension and in the prevalence of antihypertensive medication use across counties by urbanicity.[54] However, in this study, adherence levels did not vary by county urbanicity among all beneficiaries combined. Racial/ethnic disparities in adherence were observed across all county urbanicity types, with the most pronounced disparities among American Indian/Alaska Native beneficiaries in rural counties. Poor healthcare experiences and difficulties getting needed care in rural counties have been reported by American Indian/Alaska Native beneficiaries.[55] In addition, most (92%) rural

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aPercentage adherent to antihypertensive medication among users taking a fixed-dose combination (i.e., a single pill containing ≥2 antihypertensive drugs with or without a statin).
bPercentage adherent to statin medication among users taking a fixed-dose combination (i.e., a single pill containing ≥1 antihypertensive drugs and a statin).
cPercentage adherent to both antihypertensive and statin medications among users taking a fixed-dose combination (i.e., a single pill containing either ≥2 antihypertensive drugs with or without a statin or a single pill containing ≥1 antihypertensive drugs and a statin).

Table 2. APR for Adherence to Antihypertensive and Statin Medications by Beneficiary Characteristics, Medicare Part D, 2017

Category	Antihypertensive medication adherences, APR (95% CL)	Statin medication adherence, APR (95% CL)	Antihypertensive and statin medication adherence (to both), APR (95% CL)
Sex, by age (years)			
Female			
65−74	ref	ref	ref
75−84	0.9997 (0.9983, 1.001)	1.0052 (1.0036, 1.0068)	1.001 (0.9991, 1.0029)
≥85	0.9836 (0.9818, 0.9853)	1.0037 (1.0015, 1.006)	0.9903 (0.9877, 0.9928)
Male			
65−74	ref	ref	ref
75−84	0.9912 (0.9896, 0.9928)	1.0046 (1.0029, 1.0063)	0.9888 (0.9868, 0.9908)
≥85	0.9537 (0.9514, 0.9559)	0.9931 (0.9904, 0.9958)	0.9529 (0.9499, 0.956)
Race/ethnicity			
White, non-Hispanic	ref	ref	ref
Black	0.8974 (0.8958, 0.8989)	0.8854 (0.8834, 0.8873)	0.8659 (0.8638, 0.868)
Asian/Pacific Islander	1.0002 (0.9975, 1.0029)	0.985 (0.9818, 0.9882)	0.9856 (0.9821, 0.989)
American Indian/Alaska Native	0.8491 (0.8406, 0.8577)	0.8724 (0.8616, 0.8832)	0.8296 (0.8181, 0.8412)
Hispanic	0.9488 (0.947, 0.9506)	0.9235 (0.9213, 0.9257)	0.9048 (0.9025, 0.9071)
Other	0.9818 (0.9766, 0.9869)	0.9714 (0.9653, 0.9776)	0.9678 (0.9612, 0.9744)
Unknown	1.0129 (1.0086, 1.0173)	1.0058 (1.0004, 1.0111)	1.0129 (1.0071, 1.0187)
Income status			
Standard	ref	ref	ref
LIS or Medicaid dual eligible	0.9656 (0.9643, 0.9669)	0.9867 (0.9851, 0.9882)	0.9781 (0.9763, 0.9799)
Prescription medication plan type			
FFS-PDP	ref	ref	ref
MA-P	1.0156 (1.0146, 1.0166)	1.0178 (1.0167, 1.019)	1.0265 (1.0252, 1.0278)
Urban/rural classification			
Large central metropolitan	ref	ref	ref
Micropolitan	0.9942 (0.9926, 0.9958)	0.9985 (0.9966, 1.0004)	0.9951 (0.9929, 0.9972)
Rural	0.9930 (0.9912, 0.9948)	0.9965 (0.9943, 0.9987)	0.9947 (0.9921, 0.9972)
Region			
Northeast	ref	ref	ref
Midwest	0.9941 (0.9926, 0.9955)	1.0063 (1.0046, 1.0080)	0.9964 (0.9945, 0.9984)
South	0.9535 (0.9523, 0.9548)	0.9818 (0.9803, 0.9833)	0.9450 (0.9433, 0.9467)
West	0.9652 (0.9637, 0.9667)	1.0021 (1.0004, 1.0039)	0.9738 (0.9718, 0.9758)
Territ ries	0.8566 (0.8526, 0.8606)	0.7990 (0.7945, 0.8035)	0.7744 (0.7694, 0.7795)
Any fixed-dose combination use			
No	ref	ref	ref
Yes	1.0070 (1.0052, 1.0088)	1.0769 (1.0752, 1.0785)	1.0005 (0.9977, 1.0033)
Any mail-order use			
No	ref	ref	ref
Yes	1.0756 (1.0743, 1.0769)	1.0611 (1.0597, 1.0625)	1.0711 (1.0695, 1.0727)
Continuity of care for medication management proxy[a]			
1 prescriber	ref	ref	ref
2 prescribers	0.9325 (0.9315, 0.9335)	0.9875 (0.9861, 0.9889)	0.9236 (0.9222, 0.9249)
≥3 prescribers	0.8600 (0.8587, 0.8612)	1.0150 (1.0117, 1.0183)	0.8372 (0.8357, 0.8386)
Out-of-pocket cost (mean cost per 30-day supply)			
Quartile 1 (lowest)	ref	ref	ref
Quarti le 2	0.9642 (0.9630, 0.9655)	0.9905 (0.9890, 0.9920)	0.9564 (0.9546, 0.9581)

(continued on next page)

Table 2. APR for Adherence to Antihypertensive and Statin Medications by Beneficiary Characteristics, Medicare Part D, 2017 (*continued*)

Category	Antihypertensive medication adherences, APR (95% CL)	Statin medication adherence, APR (95% CL)	Antihypertensive and statin medication adherence (to both), APR (95% CL)
Quartile 3	0.9544 (0.9530, 0.9558)	0.9779 (0.9763, 0.9795)	0.9436 (0.9418, 0.9455)
Quartile 4 (highest)	0.9359 (0.9345, 0.9373)	0.9267 (0.9252, 0.9282)	0.8898 (0.8880, 0.8916)

Note: APR was fully adjusted, where appropriate, by age, sex, race/ethnicity, income status, medication plan type, urban/rural classification, fixed-dose use (any), mail-order user (any), and continuity of care.
APR, adjusted prevalence ratio; CL, confidence limit; FFS-PDP, Medicare Fee-for-Service prescription medication plan; LIS, Low-Income Subsidy; MA-PD, Medicare Advantage prescription medication.
[a]Number of unique antihypertensive and/or statin medications prescribers in 2017 as a proxy for continuity of care for medication management.

counties with American Indian/Alaska Native populations have been identified as health professional shortage areas, compared with 65% of all rural counties nationally.[56] Trends previously observed in rural communities that may possibly undermine medication adherence include decreased access to care,[57,58] not having a primary care provider,[58] and having difficulty in getting to the clinic to get medications.[59] Other factors, such as perceived social standing in the community, specifically among African Americans,[60] and language concordance, particularly among Hispanics,[61] may play a role in medication adherence
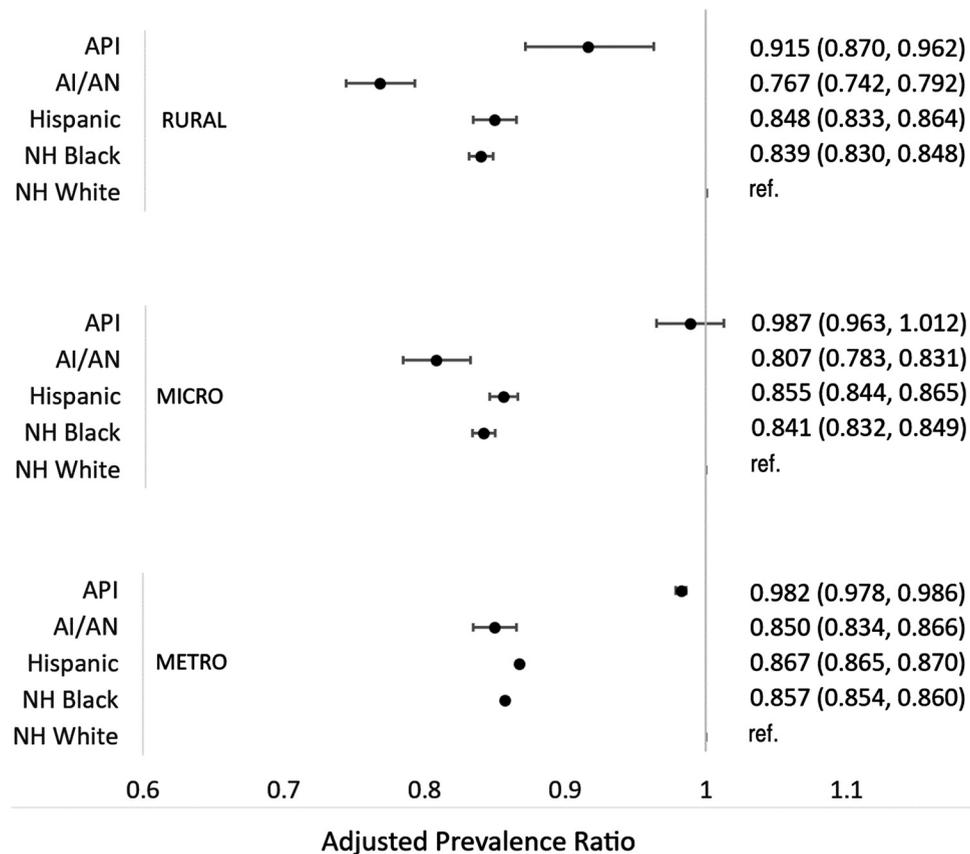

Figure 1. Adjusted[a] prevalence ratio for adherence to antihypertensive and statin medications by county urbanicity and race/ethnicity, Medicare Part D, 2017.
[a]Fully adjusted, where appropriate, by age, sex, income status, medication plan type, urban/rural classification, fixed-dose use (any), mail-order user (any), and continuity of care. The ref group is non-Hispanic White beneficiaries.
API, Asian/Pacific Islander; AI/AN, American Indian/Alaska Native; NH, non-Hispanic.
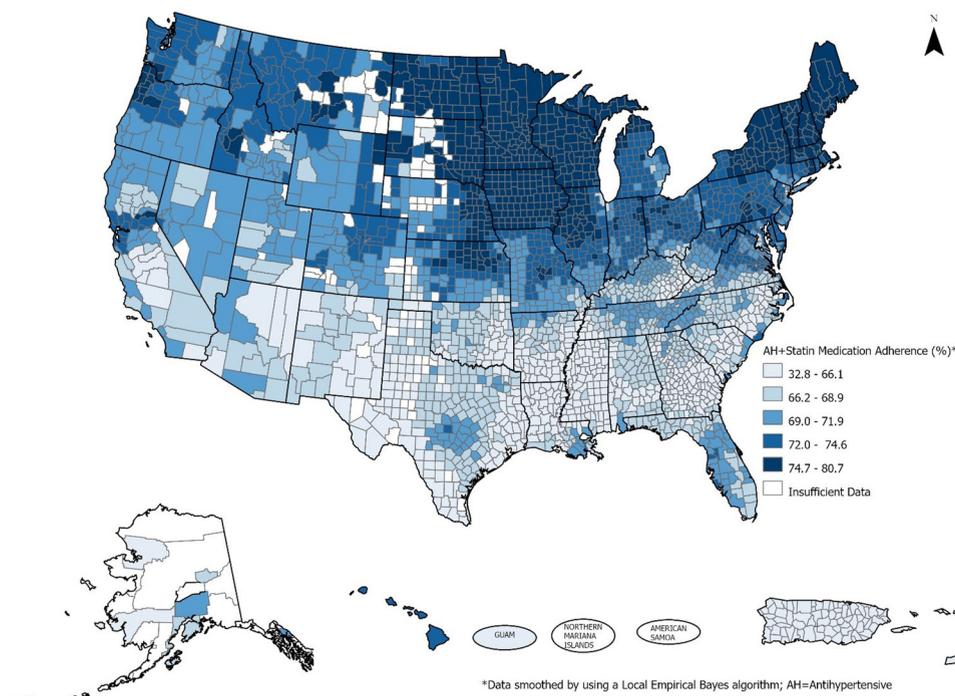
Figure 2. Prevalence of AH and statin medication adherence among Medicare Part D beneficiaries aged ≥65 years by county—U.S., Puerto Rico, and U.S. Virgin Islands, 2017.
AH, antihypertensive.

as well as other health disparities and health inequities.[62]

A metanalysis of medication adherence interventions among adults with hypertension found treatment subjects taking, on average, only 4% more of their prescribed daily doses than control subjects.[63] However, among treatment subjects, the intervention effect was sufficient to show a difference that may lead to meaningful clinical improvement because reductions of as small as 3 mmHg in systolic blood pressure have been found to be associated with 8% reductions in stroke mortality and 5% reductions in mortality from coronary heart disease.[64] One strategy that has been shown to improve adherence is to simplify the treatment regimen, such as limiting pill burden using fixed-dose combinations.[65−67] Other strategies focus on enhancing continuity of care and team-based care,[68] including management of hypertension and cholesterol by pharmacists using a team-care approach as described in the Million Hearts Hypertension Control Change package.[69−71] For healthcare providers, training resources are available on how to discuss medication adherence with patients and how to incorporate such discussions in routine visits.[72] Additional patient-focused strategies can include using education materials in different languages and formats and supporting patient use of self-measured blood pressure monitoring.[73]

Limitations

This study has limitations. First, PDC calculations assess the availability of medication and not the actual compliance with medication, which may lead to the overestimation of adherence, especially among mail-order recipients who can receive automatic refills. Although the use of administrative data to assess nonadherence has previously correlated well with other methods of adherence assessment, including among older adults,[14,74] increasing the use of PDC as a performance measure and expansion of programs that incentivize pharmacies to utilize automated refill programs may have led to overestimation of adherence by PDC.[75,76] Second, because we excluded members with only 1 antihypertensive or statin fill and were unable to include those who were prescribed medication but never initiated treatment, adherence was likely overestimated. About 762,785 beneficiaries in this study had only 1 filled prescription within an antihypertensive class, and 1.24 million beneficiaries had just 1 fill for a statin medication and therefore did not have a PDC calculated. Other studies have found that up to one fourth of prescriptions for newly prescribed antihypertensive are never filled.[77] Third, adherence might be underestimated among beneficiaries who discontinued a medication, switched antihypertensive classes on the basis of their clinician's recommendation, or sometimes directly

purchased low-priced generic medications without the involvement of their PDP but were considered nonadherent. Fourth, the continuity of care proxy measure might not accurately reflect its intended purpose because a higher number of prescribers per patient might indicate better team-based care rather than fractured care. Fifth, diagnostic codes for hypertension or hyperlipidemia were unavailable for Medicare Advantage prescription drug plans. Some patients may have been taking these medications for other conditions; however, among Medicare Fee-for-Service beneficiaries in our analyses, the percentage taking antihypertensive medications without a diagnosis for hypertension was low (3%), and the percentage taking statin medications without a diagnosis of hyperlipidemia was 4%.

CONCLUSIONS

Adherence to antihypertensive and statin medications remain suboptimal among Medicare Part D beneficiaries. Collectively, adherence to concurrent use of both medications is even lower, which is concerning given that millions of beneficiaries are at increased risk for potentially having a life-altering and costly cardiovascular event. Additional public health and clinical efforts can be implemented to address social determinants of health, remove structural barriers to health care, improve access to medications, and address adherence, especially among minority groups and within the regions at greatest risk for adverse cardiovascular outcomes.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2022.02.019.

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