Blood Pressure Medication Non-Adherence in Minnesota

2015

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Executive Summary

Hypertension, also known as high blood pressure, is a common chronic condition that can lead to many more serious health problems, including heart disease, stroke, diabetes, chronic kidney disease, and vascular dementia, among others. Hypertension increases with age and is associated with low education, low income, non-white race, obesity, inadequate physical activity, tobacco use, and heavy alcohol consumption. Lifestyle interventions and medications are typically prescribed to help individuals manage high blood pressure, with the majority of adults able to manage their hypertension and reduce their risk of more serious health problems. Existing blood pressure medications are highly effective if taken in the right dose at the right time. When a person does not take their medications as directed by their health care provider, they are considered *non-adherent*. This report provides a state and local overview of blood pressure medication adherence in Minnesota, utilizing the Minnesota All Payer Claims Database (MN APCD), a large repository of health insurance claims, enrollment information, and costs for services provided to Minnesota residents. It expands upon our recent report estimating hypertension prevalence by local communities in Minnesota, allowing the Minnesota Department of Health (MDH), local public health, pharmacists, and other health system partners to identify and address these geographic disparities with tailored interventions. Individuals, providers, pharmacists, payers, and communities can all play a role in improving adherence to blood pressure medications.

Key Findings

Overall

- In 2015 in Minnesota, almost three of every ten insured Minnesota adults taking blood pressure medications were non-adherent (29.2%).
- Non-adherence to blood pressure medications was more frequent in younger adults, with almost one of every two insured Minnesotans aged 18 to 44 non-adherent.
- Adults insured by Medicare (25.6%) or commercial plans (24.9%) have the lowest non-adherence to their blood pressure medications, whereas individuals in the low-income Medicaid population had the highest non-adherence (51.4%).
- Blood pressure medication non-adherence is higher in metropolitan areas than in smaller cities, towns, and rural communities.

By Geography

- Blood pressure medication non-adherence is lowest in counties in southern Minnesota, south of the Twin Cities.
- Blood pressure medication non-adherence is highest in northern Minnesota and in Hennepin and Ramsey Counties in the 7-county Twin Cities metro.
- All but three of Minnesota's 87 counties are home to more than 250 adults who are non-adherent to their blood pressure medication.
- In the 7-county Twin Cities metro area, the highest blood pressure medication non-adherence is largely centered in Minneapolis, St. Paul, and adjacent communities.

Background

Overview of Hypertension in Minnesota

Hypertension, also known as high blood pressure, is a common chronic condition in which the pressure of the blood against the blood vessel walls is too strong. Hypertension is an important risk factor for many more serious health problems, including heart disease, stroke, diabetes, chronic kidney disease, and vascular dementia, among others. In Fall 2019, MDH published the first report estimating hypertension prevalence by local communities in Minnesota.[1] That report estimated almost 1 million or one out of every four insured Minnesota adults had a hypertension diagnosis in 2014, making it one of the most common chronic conditions in the state. In late 2020, the United States Surgeon General issued a Call to Action to Control Hypertension, emphasizing the disproportionate impact that uncontrolled high blood pressure has on the health of our communities.[2] The COVID-19 pandemic has also revealed an increased risk of severe complications and death due to COVID-19 in individuals with many chronic conditions, including serious heart conditions, and potentially also for those with hypertension.[3] In the first epidemiologic report of hospitalized cases in Minnesota, more than half of COVID-19 patients admitted to the hospital had hypertension, and almost 10 percent had a serious cardiovascular condition, both at rates much higher than the average for Minnesota adults.[4] This lends new urgency to the need for hypertension to be diagnosed and effectively managed.

Blood pressure is measured using two numbers. The first number, called *systolic* blood pressure, is the pressure in the blood vessels when the heart beats. The second number, called *diastolic* blood pressure, is the pressure in the blood vessels when the heart rests between beats. Normal blood pressure is typically defined as a systolic blood pressure of less than 120 mm Hg and a diastolic blood pressure of less than 80 mm Hg. Individual blood pressure control goals are determined by a patient's health care provider and vary depending on the patient's age, health and lifestyle, but most health systems use a threshold of 140/90 mm Hg to assess what percent of their patients with hypertension have their blood pressure under control. Nationally, only about half of people with hypertension have their blood pressure controlled at this level and younger people with hypertension are less likely to be in control than older people.[5] In Minnesota in 2017, health plans reported that approximately one in four adult patients with hypertension were uncontrolled.[6] Actions to prevent and control hypertension can have lasting impacts on the overall health of Minnesota communities through improved heart and brain health.

Controlling Hypertension with Medication

Treatment of hypertension typically consists of lifestyle modifications such as improving diet, increasing physical activity, losing weight, quitting tobacco products, and reducing alcohol intake. In addition, most patients with hypertension are prescribed medication to help control their blood pressure.

There are several types of medications used to control high blood pressure. These are the most prescribed types:

- **Renin-Angiotensin System Antagonists** (RASAs) block or help the body produce less angiotensin, a chemical that causes the arteries to narrow. The most common types of RASAs are Angiotensin Converting Enzyme Inhibitors (ACE) and Angiotensin II receptor blockers (ARB).
- **Diuretics** (Sometimes known as water pills) help the body get rid of excess sodium and water. They are often used in combination with other medications. Thiazide diuretics are the most common type.
- **Beta-blockers** help reduce heart rate.
- **Calcium channel blockers** prevent calcium from entering the smooth muscle cells of the heart and arteries. When calcium enters these cells, it causes a stronger and harder contraction.[7]

Blood pressure medicine (along with a healthy diet and exercise) can protect the heart, brain, and kidneys, but only if patients take it and keep their blood pressure controlled. Following the medication regimen prescribed by a health care provider is called *medication adherence*. People may skip taking their medications for many reasons, such as the costs or side effects. High blood pressure often does not have symptoms, so people may forget or be less motivated to fill their prescription or take their medication if it doesn't change the way they feel. One key to improving hypertension control is improving adherence to blood pressure medications, and this has been an ongoing goal of the U.S. Department of Health and Human Services as a focus of the Million Hearts campaign. A recent analysis of self-reported hypertension and blood pressure medication use from 2017 shows that parts of Minnesota have some of the lowest rates of hypertension in the nation, especially in the Twin Cities, St. Cloud, and Rochester areas, while other rural parts of Minnesota have some of the highest proportions of blood pressure medication use among self-reported hypertensive people.[8] This report uses claims data, rather than self-reported information, to describe the percent of insured Minnesota adults who are adhering to their blood pressure medication regimen.

The Pharmacy Quality Alliance (PQA) Medication Therapy Problems Framework describes four primary medication related needs: Indication, Effectiveness, Safety, and Adherence.[9] Any of these medication-related needs can directly influence a patient's adherence to a medication regimen. Focusing solely on adherence can lead to negative outcomes for patients if the medication is unsafe or causes unintended side effects. The experience of three large Minnesota-based health systems shows that other medication-related problems are more common than non-adherence, namely that patients need more drug-related therapy, or that the therapeutic dose is too low. Optimizing medication use is *key* to improving medication adherence, and must take into account the personal situations of patients, their clinical circumstances, expectations, and social situations.[10] While medication adherence is not the only important issue when assessing the quality of medication treatment in an individual or population, it is increasingly being reported as an indicator of the quality of chronic condition management for health plans. It also has the additional benefit of being easily measured in large populations using claims data.

Measuring Medication Non-Adherence

The most accurate ways to measure adherence to medication regimens are direct methods such as observing patients taking their drugs or measuring drug levels in blood. These may be feasible in controlled clinical settings but are not appropriate in large populations. An indirect measure called the Proportion of Days Covered, or PDC, is recommended by the PQA to measure adherence in individuals and populations.[11,12] It is also used by the Centers for Medicare and Medicaid Services (CMS) for their Medicare Part D STAR Ratings, so it is a familiar metric to many pharmacists.[13] PDC is measured during a period of time that a patient is expected to be taking their medication continuously. If pharmacy claims data indicates that the patient had their prescriptions filled for at least 80% of that time, they are considered adherent. For more details on calculating PDC, see the Methodology section at the end of this report.

This report describes the prevalence of Minnesotans with hypertension who are non-adherent to their medication and provides strategies to improve medication adherence. A lower non-adherence value for a group, county, or Zip Code is more desirable.

Summary of Findings

Blood Pressure Medication Non-Adherence by Patient Demographics

In 2015, almost 850,000 insured Minnesota adults aged 18 to 85 (referred to as "Minnesota adults" throughout the remainder of the report) were taking at least one blood pressure medication. Table 1 shows the number of adult Minnesotans taking any blood pressure medication and specific types of medication, along with the proportion of individuals with hypertension taking each type of medication, and the proportion of individuals non-adherent to the medication.

In total, 86 percent of Minnesota adults with hypertension were taking at least one blood pressure medication. The four most common classes of medications were: RASAs, consisting of ACE Inhibitors and ARBs (53.9 percent of people with hypertension); diuretics (40.1 percent of people with hypertension); beta-blockers (39.3 percent of people with hypertension); and calcium channel blockers (20.7 percent of people with hypertension). Finally, 3.7 percent of individuals with hypertension were taking some other type of blood pressure medication, including centrally acting agents and alpha blockers.

For all types of blood pressure medications, almost 3 in 10 Minnesota adults were non-adherent to their medication regimen based on PDC. For this analysis, lower numbers of non-adherence are more desirable, as that means that more patients are following their prescription regimen according to directions. Non-adherence was lowest for RASAs (about 1 in 4 individuals) and highest for Non-thiazide diuretics and other blood pressure medications (more than 1 in 3 individuals). These Minnesota non-adherence values are comparable to those reported by Chang *et al*. (2019)[14] describing blood pressure medication non-adherence at the national level.

Table 1: Non-adherence by type of blood pressure medication and percent taking each type of medication, adults aged 18 to 85, 2015

Medication Type	Number of Adults on Medication	Percent of Adults with Hypertension on Medication	Percent Non-Adherent To Medication
Any Blood Pressure Medication	849,258	86.0%	29.2%*
Renin-Angiotensin System Antagonist (RASA)	513,903	53.9%	24.1%
Angiotensin Converting Enzyme Inhibitor (ACE)	370,569	38.9%	25.0%
Angiotensin II Receptor Blocker (ARB)	148,772	15.6%	23.2%
Diuretics	402,971	40.1%	28.1%
Non-Thiazide Diuretic	156,624	14.2%	35.4%
Thiazide Diuretic	258,861	27.2%	25.1%
Beta-Blocker	377,878	39.3%	26.9%
Calcium Channel Blocker	198,360	20.7%	27.4%
Other Blood Pressure Medication (BPM)	41,241	3.7%	39.7%

*Based on average PDC if on multiple hypertension medications
Source: MDH analysis of data from the MN APCD.

Many patients need more than one type of blood pressure medication to control their high blood pressure. Table 2 shows the ten most frequent blood pressure medication prescribing patterns for Minnesota adults in 2015. The most frequent prescribing pattern was taking only RASAs (ACE Inhibitors/ARBs), at 17.5 percent of individuals. The most frequent prescribing patterns with multiple medication types were RASAs and diuretics together (13.5 percent) and a combination of RASAs, diuretics, and beta-blockers (7.8 percent). More than 84 percent of Minnesota adults taking blood pressure medications followed one of these top ten prescribing patterns. The other blood pressure medication category shown on the last row of Table 1 is not shown in Table 2, as it was not part of any of the ten most frequent prescribing patterns.

Table 2: Ten most common blood pressure medication prescribing patterns, adults aged 18 to 85, 2015

RASA	Diuretic	Beta-Blocker	Calcium Channel Blocker	Number on Combination	Percent of Adults on Combination
X				148,363	17.5%
X	X			114,892	13.5%
		X		108,689	12.8%
	X			75,175	8.9%
X	X	X		66,096	7.8%
X		X		62,068	7.3%
	X	X		46,086	5.4%
			X	38,022	4.5%
X	X	X	X	29,519	3.5%
X	X		X	28,485	3.4%

Source: MDH analysis of data from the MN APCD.

In 2015, approximately 29 percent of adults taking a blood pressure medication were non-adherent (Table 3). Non-adherence was highest in younger adults aged 18-44 years, with almost half of individuals non-adherent to their blood pressure medications. Adults aged 45-64 years and 65 years and older were less likely to be non-adherent than younger adults at 27.6 percent and 26 percent, respectively.

Table 3: Non-adherence by age group, adults aged 18 to 85, 2015

Age Group	Number of Adults taking Blood Pressure Medication	Percent Non-Adherent
All ages	849,258	29.2%
18-44 years	91,421	49.4%
45-64 years	356,381	27.6%
65-85 years	401,456	26.0%

Source: MDH analysis of data from the MN APCD.

Age-adjusting rates is a way of making fairer comparisons between groups with different age distributions, such as between women and men, or between states, counties, or Zip Codes. For Minnesota, the age-adjusted prevalence of blood pressure medication non-adherence was 29.2 percent. Overall, the age-adjusted prevalence of blood pressure medication non-adherence is

somewhat higher in women (30.1 percent) than in men (28.2 percent) (Table 4). In recent reports looking at national data, there is a similar trend of slightly higher non-adherence among women than men.[14,15]

Table 4: Age-adjusted non-adherence by sex, adults aged 18 to 85, 2015

Sex	Number of Adults taking Blood Pressure Medication	Percent Non-Adherent, Age-Adjusted
All Adults	849,258	29.2%
Female	441,566	30.1%
Male	407,691	28.2%

Source: MDH analysis of data from the MN APCD.

Table 5 highlights differences in medication non-adherence by insurance type. The first two columns describe non-adherence by the type of insurance they had for the largest number of months over the course of 2015, whereas the final two columns describe non-adherence for those adults who were continuously enrolled in each type of insurance for 12 months. Analysis by insurance type shows that medication non-adherence is highest in the Medicaid population (51.4 percent), followed by the Medicare and Medicaid dually-eligible population (36.7 percent). For both the Medicare and commercial insurance population, about 1 in 4 individuals are non-adherent to their blood pressure medication regimens.

However, when looking only at those individuals who have continuous enrollment in the same type of insurance for 12 months, non-adherence decreases to 45.7 percent of the Medicaid population, 34.5 percent of the dually-eligible for Medicare and Medicaid population, and 22.9 percent of the commercial insurance population. The gap of 5.7 percentage points for the Medicaid population highlights the challenges in maintaining a medication regimen when moving between different types of insurance. Approximately 30.2 percent of adults in the Medicaid population in 2015 did not have continuous Medicaid coverage over 12 months, compared to 19.4 percent of the commercial insurance population, 11.8 percent of the dually-eligible for Medicare and Medicaid population, and just 5.5 percent of the Medicare population (data not shown). Individuals who move back and forth between Medicaid and commercial insurance or Medicaid and no insurance had the highest levels of blood pressure medication non-adherence, highlighting a disproportionate impact on the ability to manage hypertension for the lowest income Minnesotans.

Table 5: Non-adherence by type of insurance, adults aged 18 to 85, 2015

Insurance Type	Adults taking Blood Pressure Medication, Any enrollment	Percent Non-Adherent, Any enrollment	Adults taking Blood Pressure Medication, 12 Months Continuous Enrollment	Percent Non-Adherent, 12 Months Continuous Enrollment
Medicare	348,141	25.6%	329,097	25.1%
Dually-Eligible for Medicare and Medicaid	63,659	36.7%	56,156	34.5%
Medicaid*	101,291	51.4%	70,678	45.7%
Commercial	336,164	24.9%	271,009	22.9%

*Includes Medical Assistance (Minnesota's Medicaid program), and MinnesotaCare (Minnesota's Basic Health Program)

Source: MDH analysis of data from the MN APCD.

Finally, Table 6 highlights the age-adjusted prevalence of blood pressure medication non-adherence in insured Minnesota adults by the size of their home communities, from the metropolitan areas of Minneapolis-St. Paul, Duluth, St. Cloud, Rochester, and Mankato, to smaller urban centers called micropolitan areas, to small towns, to entirely rural communities.[16] Medication non-adherence varies little by size of home community, with individuals in Minnesota's metropolitan areas slightly more likely to be non-adherent (29.9 percent), compared to 27.1 percent of Minnesota adults in micropolitan areas, 28.4 percent in small towns, and 28.1 percent in rural communities.

Table 6: Non-adherence by size of home community, adults aged 18 to 85, 2015

Urbanicity	Number of Adults taking Blood Pressure Medication	Percent Non-Adherent, Age-Adjusted
All Adults	849,258	29.2%
Metropolitan	561,107	29.9%
Micropolitan	116,404	27.1%
Small Town	75,098	28.4%
Rural	94,565	28.1%

Note: Stratified totals do not sum to the total because of missing information

Source: MDH analysis of data from the MN APCD.

Blood Pressure Medication Non-Adherence by Geography

Figure 1 illustrates variation in age-adjusted blood pressure medication non-adherence by county in Minnesota. The highest levels of medication non-adherence are concentrated in the northern half of Minnesota including higher population counties such as St. Louis County (Duluth), Beltrami County (Bemidji), and Becker County (Detroit Lakes). Outside of northern Minnesota, both Hennepin and Ramsey counties in the Twin Cities metropolitan area are among the counties with the highest levels of medication non-adherence. These counties are shown in the darkest color on the map. The counties with the lowest levels of medication non-adherence are primarily located in southern Minnesota, including Olmsted County (Rochester), Blue Earth County (Mankato), and Winona County (Winona). There is great variation across the state, with the lowest level of blood pressure medication non-adherence in Fillmore County at 20.7 percent and the highest non-adherence in Mille Lacs County at 35.4 percent. There is also wide variation within close proximity in northwestern Minnesota: Red Lake County at 29.7 percent and nearby Mahnomen County at 48.4 percent. We estimate that all but three of Minnesota's 87 counties have at least 250 adults who are non-adherent to their blood pressure medications.

Maps included in the supplement to this report present county-level blood pressure medication non-adherence stratified by age group (Figures S2-S4) and type of insurance coverage (Figures S5-S8). Medication non-adherence patterns for adults aged 18-44 (Figure S2) and 45-64 (Figure S3) are similar to patterns observed in the age-adjusted map in Figure 1 (shown as Figure S1 in the supplement), with higher non-adherence seen in Hennepin and Ramsey counties, counties north of the 7-county Twin Cities metropolitan area, and counties scattered primarily in west and northwestern Minnesota. However, for older adults aged 65 to 84 years, the pattern shifts a bit, with Hennepin and Ramsey Counties no longer among the counties with the highest non-adherence. As shown in Figure S4, adults aged 65 to 84 years in a wide swath of counties spanning the three southernmost tiers, plus Red Lake County and Cook County in northern Minnesota have the lowest non-adherence. Although the non-adherence *patterns* are often similar across age groups, the actual medication non-adherence shown on each map is based on the range of non-adherence within each age group, as reflected on each map's legend, and the non-adherence by age group shown in Table 3.

The patterns of blood pressure medication non-adherence by county for Minnesotans with commercial insurance (Figure S5) show both Hennepin and Ramsey Counties in the highest non-adherence category, along with several other counties in or near the 7-county Twin Cities metropolitan area. Other counties in the highest non-adherence category are located along the Iowa and South Dakota borders, or scattered across central and northwestern Minnesota. For Minnesotans with Medicaid coverage (Figure S6), the highest non-adherence counties include all but Carver County in the 7-county Twin Cities metropolitan area, Olmsted County (Rochester), Stearns County (St. Cloud), and Clay County (Moorhead). Additional counties in this highest non-adherence category are scattered throughout the western half of Minnesota. In contrast, higher blood pressure medication non-adherence in the Medicare (Figure S7) population is concentrated from the northern part of the 7-county Twin Cities metropolitan area (Anoka County) through east central Minnesota, up to St. Louis County (Duluth) and several counties along the border with Canada. For Minnesotans dually-eligible for Medicaid and Medicare (Figure S8), Hennepin, Scott, and Carver counties in the 7-county Twin Cities

metro, plus St. Louis County, are among the counties with the highest blood pressure medication non-adherence.

Figure 1: Age-adjusted blood pressure medication non-adherence by county, adults aged 18 to 85, 2015

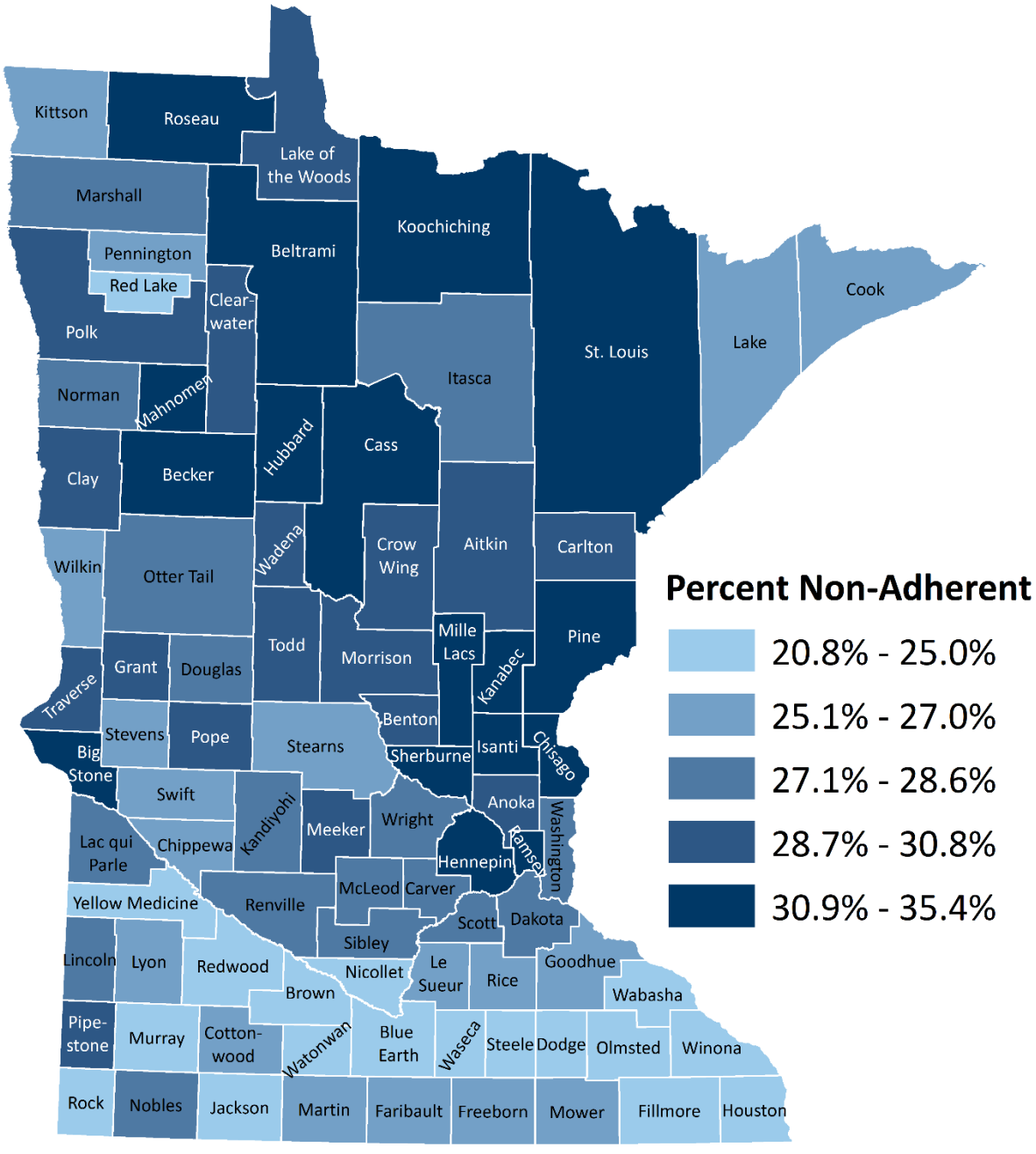
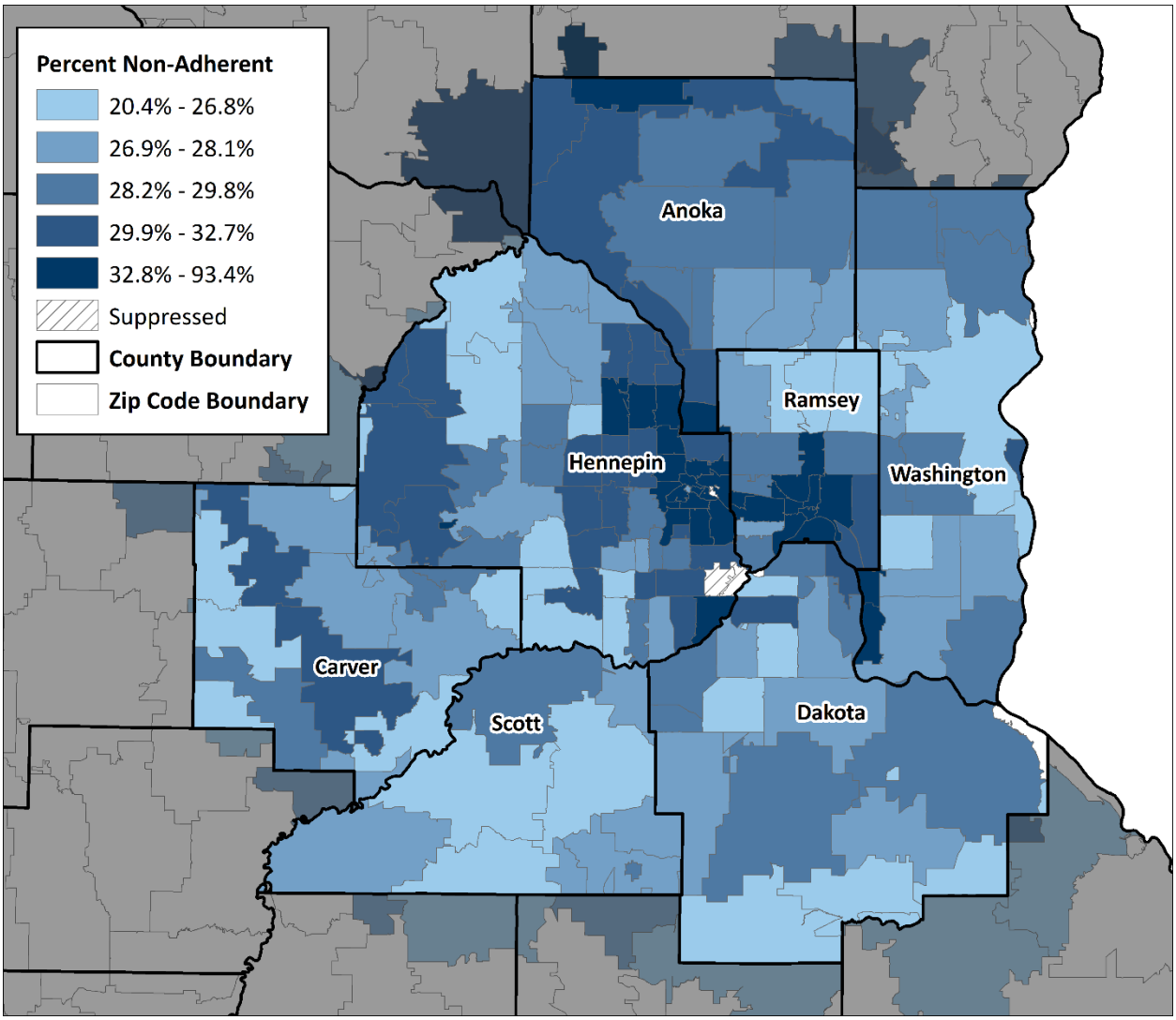


Figure 2 focuses on the 7-county Twin Cities metropolitan area, showing the age-adjusted blood pressure medication non-adherence by Zip Code across Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties. The highest levels of medication non-adherence are concentrated in eastern and northeastern Hennepin County as well as central and southern Ramsey County, represented by the darkest color on the map. These Zip Codes encompass the majority of the cities of Minneapolis and St. Paul, as well as parts of Brooklyn Center, Brooklyn Park, and Little Canada. These communities are among the most diverse in the state with respect to race, ethnicity, income, and education. They are also home to a larger proportion of younger and middle-aged adults than the state as whole. Additional high medication non-adherence Zip Codes include parts of Bloomington, Columbia Heights, St. Paul Park, and Newport. The Zip Code with the highest blood pressure medication non-adherence is 55155, encompassing the sparsely populated Fort Snelling area of Hennepin County at 93.4 percent and is an extreme outlier. Of larger communities, Zip Code 55404 covering the Phillips and Elliot Park areas of Minneapolis has the highest blood pressure medication non-adherence at 48.5 percent.

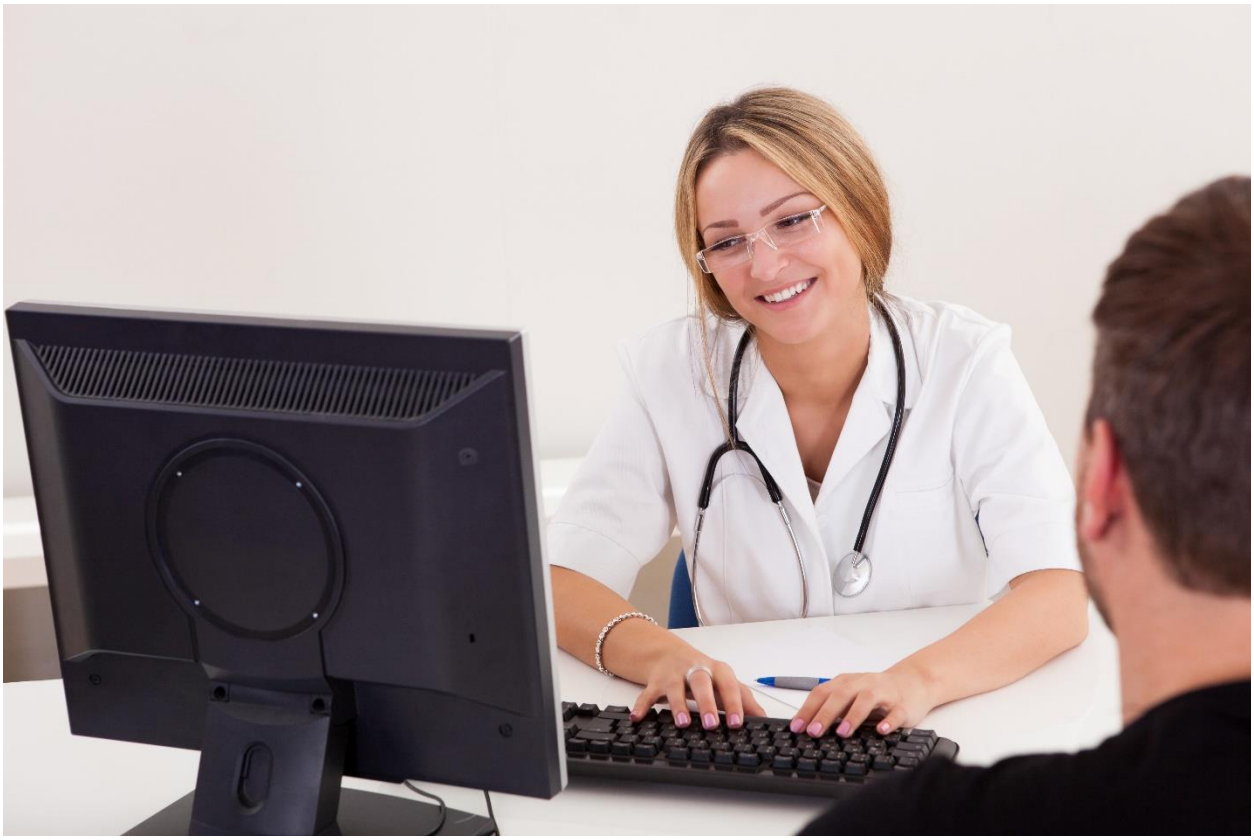
On the other end of the spectrum, blood pressure medication non-adherence is lowest in numerous Zip Codes spread across six of the seven counties, overlapping different communities including high income suburban communities, exurban communities and some of the low-density rural communities farthest from the urban core, notably in Carver and Scott counties.

Figure 2: Age-adjusted blood pressure medication non-adherence by Zip Code in the 7-county Twin Cities metropolitan area, adults aged 18 to 85, 2015



Maps included in the supplement present Zip Code-level blood pressure medication non-adherence for the 7-county Twin Cities metro stratified by age group (Figures S10-S12) and type of insurance (Figures S13-S16). Geographic patterns for adults aged 18-44 are largely similar (Figure S10) to those observed in the age-adjusted map in Figure 2 (shown in as Figure S9 in the supplement), with additional blood pressure medication non-adherence communities in western Hennepin County, near Lake Minnetonka. As shown in Figure S11, geographic patterns for adults aged 45 to 64 years are very similar to those for all ages. Finally, for older adults aged 65 to 85 years, the geographic patterns change again, with some areas of Ramsey County no longer in the highest non-adherence category. Several new communities of high blood pressure medication non-adherence are now apparent in Anoka, western Hennepin, and Carver Counties (Figure S12).

For Minnesotans with commercial insurance (Figure S13), the geographic patterns of blood pressure medication non-adherence by Zip Code in the 7-county Twin Cities metro are largely similar to those for all Minnesotans in Figure 2. Again, the highest non-adherence is largely centered on two clusters, one in Minneapolis and adjacent communities to the north, and the second in St. Paul and adjacent communities to the east. Additional high non-adherence Zip Codes cover parts of Eden Prairie, Minnetonka, St. Louis Park, and Hopkins. For Minnesotans with Medicaid coverage (Figure S14), the pattern is somewhat different, with fewer high non-adherence communities in Minneapolis and St. Paul, but high non-adherence in parts of Inver Grove Heights, Edina, Victoria, and rural sections of Carver and Hennepin counties. All but one of the seven metro counties (Scott) includes at least one Zip Code in the highest non-adherence category for Medicaid patients. Patterns among those who are dually-eligible for Medicaid and Medicare are less clear (Figure S16).



Strategies to Improve Medication Adherence

The data and maps in this report highlight disparities in blood pressure medication non-adherence by community in Minnesota. The number of Minnesotans on a blood pressure medication is high, approaching 850,000, or about 86 percent of adults with hypertension. There are many actions that individuals, providers, pharmacists, payers, and communities can take to reduce blood pressure medication non-adherence. While blood pressure medication non-adherence is a statewide issue, differences by region, by county, and by Zip Code can inform the types and intensity of actions needed to improve medication non-adherence. Because hypertension is a very common condition among Minnesotans, interventions to improve non-adherence can have a large and positive impact. Adopting strategies to reduce medication non-adherence for a small percentage of patients taking blood pressure medications can have a large impact on thousands of people. Properly adhering to a blood pressure medication regimen can lower risk of heart disease, and help to prevent heart attacks and strokes, reduce the burden of chronic kidney disease, and lower risk of cognitive decline and dementia later in life.

In addition to the strategies listed below, the Division for Heart Disease and Stroke Prevention at the Centers for Disease Control and Prevention has developed many resources designed to help pharmacists improve patient care, not only for high blood pressure, but for many other chronic conditions as well.[17] As part of the Million Hearts campaign, the U.S. Department of Health & Human Services has also developed resources intended for providers to help patients improve their adherence to blood pressure medication regimens.[18]

For Individuals:

- Take medication as prescribed: If your health care provider has prescribed blood pressure medications, make sure to take your medication according to directions. If you experience side effects or challenges taking your medications, have a conversation with your health care provider or pharmacist.
- Know your numbers: If you have high blood pressure and are taking medication, make sure that you monitor your blood pressure. Your health care provider should check your blood pressure during every visit, but it may be appropriate to also measure your blood pressure at home, at your pharmacy, or at another community location.
- Set a goal: You should discuss strategies for reaching your blood pressure goal with your health care provider or pharmacist.
- Talk to your provider about how to monitor your blood pressure at home.
- Make lifestyle changes: Eating a healthier diet, increasing physical activity, maintaining a healthy weight, not using tobacco, and reducing your intake of alcohol are all strategies that may help to reduce blood pressure. Making small improvements in lifestyle can help medications do a better job.
- If you're not reaching your goal, work with your provider and pharmacist on a plan to help you get to goal, which could include medication and lifestyle changes.

For Health Care Providers:

- Utilize a team approach to helping patients manage their blood pressure, including physicians, nurses, pharmacists, dietitians, health coaches, and community health workers.

- Utilize a high blood pressure registry to identify and monitor patients with elevated blood pressure.
- Engage with pharmacists who can help to manage blood pressure medication therapy.
- Consider implementing collaborative practice agreements (CPAs) with pharmacists to allow those pharmacists more autonomy in managing medication regimens for patients with high blood pressure and other chronic conditions.
- Provide pharmacists direct access to electronic health records, allowing them to support the management of patients with high blood pressure.
- Develop protocols to support patients self-measuring their blood pressure.

For Pharmacists:

- Engage with health care providers to form a care team supporting patients with hypertension. Provide recommendations to providers when patients experience adherence challenges or are unable to meet their blood pressure goal.
- Provide self-management support to patients with hypertension, including strategies to adhere to their blood pressure medications, and support healthy lifestyles.
- Offer medication synchronization services, so that patients with multiple prescription medications can efficiently receive those medications.
- Provide Medication Therapy Management services to patients experiencing adherence challenges, side effects, or those struggling to reach their blood pressure goal.
- Develop protocols to support patients self-measuring their blood pressure.
- Optimize medication use by ensuring the prescribed medication is indicated, effective, and safe.

For Payers:

- Provide coverage for Medication Therapy Management (MTM) services, allowing greater access to pharmacist-provided services for patients who are experiencing blood pressure medication challenges.
- Provide adequate reimbursement to pharmacists to support more access to MTM services in both clinical and community pharmacy settings.
- Consider alternative reimbursement mechanisms to pharmacists providing MTM services, including lists of patients needing intervention and per member per month (PMPM) reimbursement arrangements.
- Partner with providers and pharmacists on pay-for-performance contracts to better help patients get to their self-management goal.
- Facilitate efficient credentialing requirements for pharmacists to provide MTM services.
- Provide reimbursement for telemedicine (video) and telephonic (voice only) delivery of MTM services.

For Communities:

- Develop community-based programs to support patients in managing their blood pressure, and encourage patients, providers, and pharmacists to utilize these programs.
- Promote the clinic and pharmacy-based medication adherence and self-management supports, Medication Therapy Management, and clinical services available to the community.

Data and Methods Used in Analysis

Data Source

MDH conducted this study using data from the Minnesota All Payer Claims Database (MN APCD), a large repository of health insurance claims, enrollment information, and costs for services provided to Minnesota residents.[19] Both private and public insurers of Minnesota residents submit information on medical transactions for individuals with insurance coverage. Claims from TRICARE, Veterans Affairs, Indian Health Service, and carriers with less than $3 million in annual medical and/or $300,000 in annual pharmacy claims are not included. The 2015 data from the MN APCD includes claims for over 95 percent of Minnesotans with public health insurance (Medicare and/or Medicaid) and over 85 percent of those with commercial health insurance. Although the data allow MDH to assess care delivered to patients over time and across the spectrum of the health care system (including providers, settings, and payers), it is de-identified, meaning that personal identifying information is removed from the data before it is submitted to MDH. The MN APCD is updated regularly, and currently contains data from 2009-2018.

This analysis uses data from 2015, as this is the last year in which the MN APCD has nearly all claims from commercial insurers. A subsequent reduction in claims volume resulted because, in 2016, the Supreme Court of the United States ruled that states may no longer require insurers to submit self-insured commercial claims to their all payer claims databases.

Methodology

To be included in this analysis, the following criteria must be met: being insured Minnesota residents enrolled in health plans that report to the MN APCD; being 18-85 years of age in 2015; and having at least two blood pressure medication prescriptions in the same drug class filled within 180 consecutive days during 2015. A small percentage of adults who are prescribed blood pressure medication without an identified hypertension diagnosis were included in the analysis, per guidance for PDC calculation.

Blood pressure medications were identified using the Medi-Span® Generic Product Identifier (GPI) system[20], a database which classifies individual medications into groups based on several factors, including therapeutic use. Medications identified by the "Antihypertensives" *drug group* were included in the analysis and *drug class* and *drug subclass* categories were used to identify the medication types presented in the report.

Proportion of Days Covered, or PDC, is calculated from pharmacy claims data using the following formula: PDC = Number of days in period "covered" by a prescription / Number of days in period. This calculation results in a number from 0 to 1, with 1 meaning that a patient has 100% medication coverage during the period. Any patient with a value of 0.8 (or 80 percent coverage) or higher is considered to be adherent to the medication. For example, an individual who fills a 90 day prescription on June 1st, covering June 1st- August 30th, then doesn't fill their next 90 day prescription until October 20th, covering October 20th-January 18th (a gap of 51 days), would have a PDC of 129 days covered / 180 days in period or a value of 0.72 or 72 percent coverage. This patient is considered non-adherent.

For this report, we present the proportion of patients taking blood pressure medications who are non-adherent, meaning they have a PDC value of less than 0.8 (or 80 percent coverage). It is important to remember that PDC is an estimate calculated from pharmacy claims data and it may not fully represent an individual's actual adherence. The best way to assess medication adherence for an individual patient is to discuss with them directly how they take their medications.

The presence of hypertension was identified using version 12.0 of the Johns Hopkins ACG® System with stringent selection criteria that err on the side of under-identifying chronic conditions. Patients needed to have two or more diagnoses of hypertension during the year or use medication that treats hypertension in order to be classified as having the condition. The diagnosis of hypertension in these claims follows decades-long recommendations as defined in the 2014 Eighth Joint National Committee (JNC) guidelines.[21]

Overall blood pressure medication non-adherence at the county and Zip Code level was age-adjusted to the 2015 Minnesota population taking blood pressure medication using 10 year age bands. Analyses stratified by age group and insurance were not age-adjusted. Medication non-adherence estimates were suppressed for small geographies following MN APCD suppression criteria; no estimate is shown if the population group consists of fewer than 30 individuals, or if there are fewer than 11 individuals taking a blood pressure medication.

Patient residence is available in the MN APCD only at the Zip Code level. To calculate county-level blood pressure medication non-adherence, a Zip Code-based population-weighted attribution method was used. Data were aggregated at the Zip Code level and attributed to counties based on the percent of the population of a Zip Code within each county. For example, if 40 percent of the population of a Zip Code resided in County A and 60 percent resided in County B, then 40 percent of the total number of patients taking a blood pressure medication from that Zip Code were attributed to County A and 60 percent were attributed to County B.

The U.S. Census Bureau publishes boundaries for Zip Code Tabulation Areas (ZCTAs), which are generalized areal representations of United States Postal Service (USPS) Zip Code service areas. USPS Zip Codes are collections of mail delivery routes without specific geographic boundaries.[22] The Zip Code level maps in this report utilize the most recent ZCTA boundaries, created after the 2010 Census. For this report, the term Zip Code is used as the data are aggregated by the patients' home Zip Code.

Medication non-adherence distributions for maps were determined by dividing displayed values into five equal categories. The lowest category includes the 20 percent of geographies (counties or Zip Codes) with the lowest values.

Limitations

The estimates in this report may under report the actual non-adherence to blood pressure medications because in order to be part of this study, individuals must have met all of the inclusion criteria described in the Methodology section. Among these, the most notable finding is that approximately 15 percent of patients with hypertension did not take any prescription blood pressure medications in 2015. This may be due to a number of reasons, such as no prescription being written for patients with hypertension or patients choosing not to fill a

prescription written by their provider. In addition, there may be some instances where a patient was identified as having hypertension through medical claims, but we are unable to identify corresponding pharmacy coverage in the MN APCD, which would result in medication claims being missing for some enrollees.

The MN APCD does not include key demographic information that could enable MDH to look at differences between groups known to disproportionately experience challenges with medication non-adherence. This includes measures of race and ethnicity, level of education completed, and household or personal income. For the purposes of this analysis, type of insurance can serve as a rough proxy for income, as Minnesota Health Care Programs, which include Medical Assistance (the state's Medicaid program) and MinnesotaCare (the state's Basic Health Program), are income-based and comprise individuals with lower income. These programs are referred to as Medicaid throughout this report.

Analyses of the National Health and Nutrition Examination Survey (NHANES) in 2011-2012 show that almost one of every five adults with hypertension is unaware of their status.[23] This is due to a number of factors, but may largely be due to patients having infrequent contacts with the health care system, or a reluctance by providers to diagnose individuals with hypertension. Lack of awareness is much higher in younger adults, which may result in more under reporting of hypertension prevalence in communities with larger young adult populations.

Finally, the MN APCD does not include information on whether patients taking blood pressure medications have their hypertension adequately controlled. Those data are typically contained in a patient's electronic health record, and are not part of the medical or pharmacy claim that goes to the insurance company and is subsequently included in the MN APCD.

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