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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. This report provides a state and local overview of the prevalence of hypertension 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 updates and expands upon two related state reports that have addressed hypertension as a public health problem in Minnesota. This report provides the first estimates of hypertension prevalence by local communities in Minnesota, allowing the Minnesota Department of Health (MDH), local public health, and other health system partners to identify and address these geographic disparities with tailored interventions. There are many actions that individuals, providers, payers, and communities can undertake to reduce the prevalence of hypertension.

Key Findings

OVERALL

30.5% 

In 2014 in Minnesota, three out of every ten insured Minnesota adults had a diagnosis of hypertension.



Hypertension is more common in older age groups and more common in men than women.

Medicaid **22.0%**
Commercial Insurance **18.6%**

Hypertension is slightly more common in the low-income Medicaid population than the commercial insurance population.

Hypertension is **more common in rural areas** than metropolitan areas.



BY GEOGRAPHY

- The lowest levels of hypertension are in counties along the Twin Cities-Rochester-St. Cloud corridor.
- Hypertension prevalence is highest in northwest Minnesota across all age and insurance groups.
- All but one of Minnesota's 87 counties is home to more than 1,000 adults with hypertension.
- There are 18 counties with an estimated 10,000 adults or more with hypertension, including 11 counties located in Greater Minnesota, outside the 7-county Twin Cities metro.
- For younger adults aged 18 to 44 years, hypertension is most common in a large group of neighboring counties covering much of northern, east central, and west central Minnesota.
- For older adults aged 65 and older, hypertension is most common in parts of northwest and southwest Minnesota.
- In the 7-county Twin Cities metro area, prevalence of hypertension varies widely across short distances.
- Higher hypertension prevalence in the 7-county Twin Cities metro area is largely centered in Minneapolis and adjacent communities to the north, and in St. Paul and adjacent communities to the east.

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 blood vessel walls is too strong. It 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. For many years, hypertension has been defined as a systolic blood pressure of 140 mm Hg or higher OR a diastolic blood pressure of 90 mm Hg or higher. One high blood pressure measurement does not mean someone has hypertension. Blood pressure varies greatly with activity, posture, movement and other factors, so to diagnose a patient with hypertension, a health care provider will take multiple measurements of blood pressure over time while a person is at rest in a sitting position. Hypertension is a major risk factor for a number of serious conditions and events, including heart disease, stroke, diabetes, chronic kidney disease, and vascular dementia, among others. Prevalence of hypertension increases with older age, is associated with low education and low income, non-white race, obesity, inadequate physical activity, tobacco use, and heavy alcohol consumption. Actions to prevent and control hypertension can have lasting impacts on the overall health of a community through improved heart and brain health.



The most frequently cited estimates of hypertension in Minnesota come from the Centers for Disease Control & Prevention (CDC)-sponsored Behavioral Risk Factor Surveillance System (BRFSS), an annual telephone-based survey that asks about a wide range of health risk behaviors, chronic diseases and their risk factors, and utilization of the health care system.¹ Every two years, the survey asks respondents to self-report a diagnosis of hypertension by answering the question “Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?” Minnesota has been consistently significantly lower than the national average and in 2015, Minnesota adults recorded the lowest age-adjusted hypertension prevalence of any state, at 24.2 percent.² Despite this relatively low prevalence compared to other states, this still means more than 1 million Minnesota adults report being diagnosed with hypertension.

While BRFSS survey data are useful as a surveillance tool for states and the nation as whole, there are a number of challenges. First, although this measure has commonly been used to estimate the prevalence of hypertension in the population, it is increasingly understood more as a measure of a person’s awareness of their own high blood pressure status. Many individuals with hypertension may not understand that they have this diagnosis, or their condition may remain undiagnosed.³ Second, the data come from a survey that only samples a small proportion of people in the state, preventing MDH from assessing hypertension prevalence at smaller geographies across the state. Newly available data in the MN APCD allow us to look deeper into differences in hypertension prevalence across the state.

The Minnesota Heart Survey, led by investigators at the University of Minnesota, conducted regular population-based surveys of 25-74 year olds in the

7-county Twin Cities metropolitan area starting in 1980, repeating approximately every five years through 2009.⁴ Participants were interviewed at home about blood pressure awareness, medication use, and other risk factors, followed by clinic-measured blood pressure levels using a standardized measurement protocol. Summary results over three decades have shown overall hypertension prevalence in Minnesota adults to be consistently lower than overall U.S. prevalence as measured in the periodic National Health and Nutrition Examination Survey (NHANES).

Previous work by the Minnesota Department of Health using the MN APCD identified approximately 21 percent of insured Minnesotans with hypertension in 2012, but this included children under the age of 18.⁵ Hypertension is a condition that is much more common in adults, so this study examines prevalence only among Minnesotans aged 18 or older. Another more recent report to the Minnesota legislature used a different methodology to identify individuals with hypertension and the medical costs attributed to the condition, including additional estimates of individuals who are not in the MN APCD, such as the uninsured, and individuals who are insured by TRICARE, Veterans Affairs, or the Indian Health Service. This second report estimated 24.2 percent of Minnesota adults as hypertensive in 2014.⁶

While the survey data discussed above highlight that Minnesota has relatively lower levels of hypertension compared to the rest of the United States, it remains clear that hypertension is a common condition with a high burden across the state. This report will provide the first estimates of hypertension prevalence by local communities in Minnesota, and serve to frame a future report on adherence to hypertension medications.

Summary of Findings

PREVALENCE OF HYPERTENSION BY PATIENT DEMOGRAPHICS

In 2014, almost one million or three out of every ten insured Minnesota adults had a diagnosis of hypertension. The prevalence of hypertension increased with age, with approximately 8 percent of younger adults aged 18-44 with the condition, compared to almost two out of every three adults aged 65 and older (Table 1). As individuals get older, arterial walls tend to become stiffer, which largely explains the increase in hypertension prevalence in older adults.

TABLE 1: HYPERTENSION BY AGE GROUP, ADULTS AGED 18 AND OLDER, 2014

Age Group	Number of Adults with Hypertension	Hypertension Prevalence
All Adults	968,626	30.5%
18-44 years	106,143	7.9%
45-64 years	373,771	34.3%
65 years and older	488,712	65.6%

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 hypertension is 25.4 percent. Overall, the age-adjusted prevalence of hypertension is somewhat higher in men (27.0 percent) than in women (24.0 percent) (Table 2). Analysis of national data has shown that a higher percentage of males than females have hypertension up to 64 years of age, but for those 65 years of age or older the prevalence is higher among females.⁷

TABLE 2: HYPERTENSION BY SEX, ADULTS AGED 18 AND OLDER, 2014

Sex	Number of Adults with Hypertension	Age-Adjusted Hypertension Prevalence
All Adults	968,626	25.4%
Female	516,512	24.0%
Male	452,114	27.0%

Source: MDH analysis of data from the MN APCD.

Analysis by insurance type shows that hypertension is most common in the Medicare and Medicare and Medicaid dually-eligible populations, which is unsurprising since these populations are significantly older (Medicare mean age = 74 years and dually-eligible mean age = 62 years) and often have many chronic or other health conditions. Although Minnesota residents with Medicaid coverage are younger on average (mean age = 39 years) than the commercial insurance population (mean age = 42 years), the prevalence of hypertension in the Medicaid population is higher (22.0 percent vs. 18.6 percent), which is consistent with patterns of higher blood pressure in lower income populations (Table 3).

TABLE 3: HYPERTENSION BY TYPE OF INSURANCE, ADULTS AGED 18 AND OLDER, 2014

Insurance Type	Number of Adults with Hypertension	Hypertension Prevalence
Medicare	429,511	63.7%
Dually-Eligible for Medicare and Medicaid	82,854	59.7%
Medicaid	117,237	22.0%
Commercial	339,024	18.6%

Source: MDH analysis of data from the MN APCD.

Finally, Table 4 highlights the age-adjusted prevalence of hypertension 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.⁸ The prevalence of hypertension increases as you move away from the largest, most densely-populated communities in Minnesota.

TABLE 4: HYPERTENSION BY SIZE OF HOME COMMUNITY, ADULTS AGED 18 AND OLDER, 2014

Urbanicity	Number of Adults with Hypertension	Age-Adjusted Hypertension Prevalence
All Adults	968,626	25.4%
Metropolitan	629,892	24.8%
Micropolitan	137,600	26.3%
Small Town	87,742	27.3%
Rural	111,067	27.5%

Note: Stratified totals do not sum to the total because of missing information
Source: MDH analysis of data from the MN APCD.

PREVALENCE OF HYPERTENSION BY GEOGRAPHY

As shown in Figure 1, the age-adjusted prevalence of hypertension varies by county in Minnesota. The lowest levels of hypertension (abbreviated HTN in the legend) are in a corridor of counties from central to southeastern Minnesota, generally encompassing the Twin Cities, Rochester, St. Cloud and many adjacent communities. These counties are all shown in the lightest color on the map, which represents hypertension prevalence lower than the state's age-adjusted prevalence of 25.4 percent. The highest levels are concentrated in east central Minnesota, a group of counties hugging the northwest border of the state with Canada and North Dakota, and two counties in west central Minnesota. In the supplement to this

report, Table S1 summarizes all of the county-level hypertension prevalence information by age group and type of insurance, also shown as maps in Figures S1-S8. It is important to remember that hypertension is a common condition, affecting many people, even in counties with lower prevalence as shown on the statewide map. Data from the MN APCD estimate that all but one of Minnesota's 87 counties are home to more than 1,000 adults with hypertension in 2014. In addition, there are 18 counties with an estimated 10,000 adults or more with hypertension, including 11 counties located in Greater Minnesota, outside the 7-county Twin Cities metro. These counties are highlighted in Figure 2 and number of adults with hypertension for all counties is shown in Table S1.

FIGURE 1: AGE-ADJUSTED HYPERTENSION PREVALENCE BY COUNTY, 2014

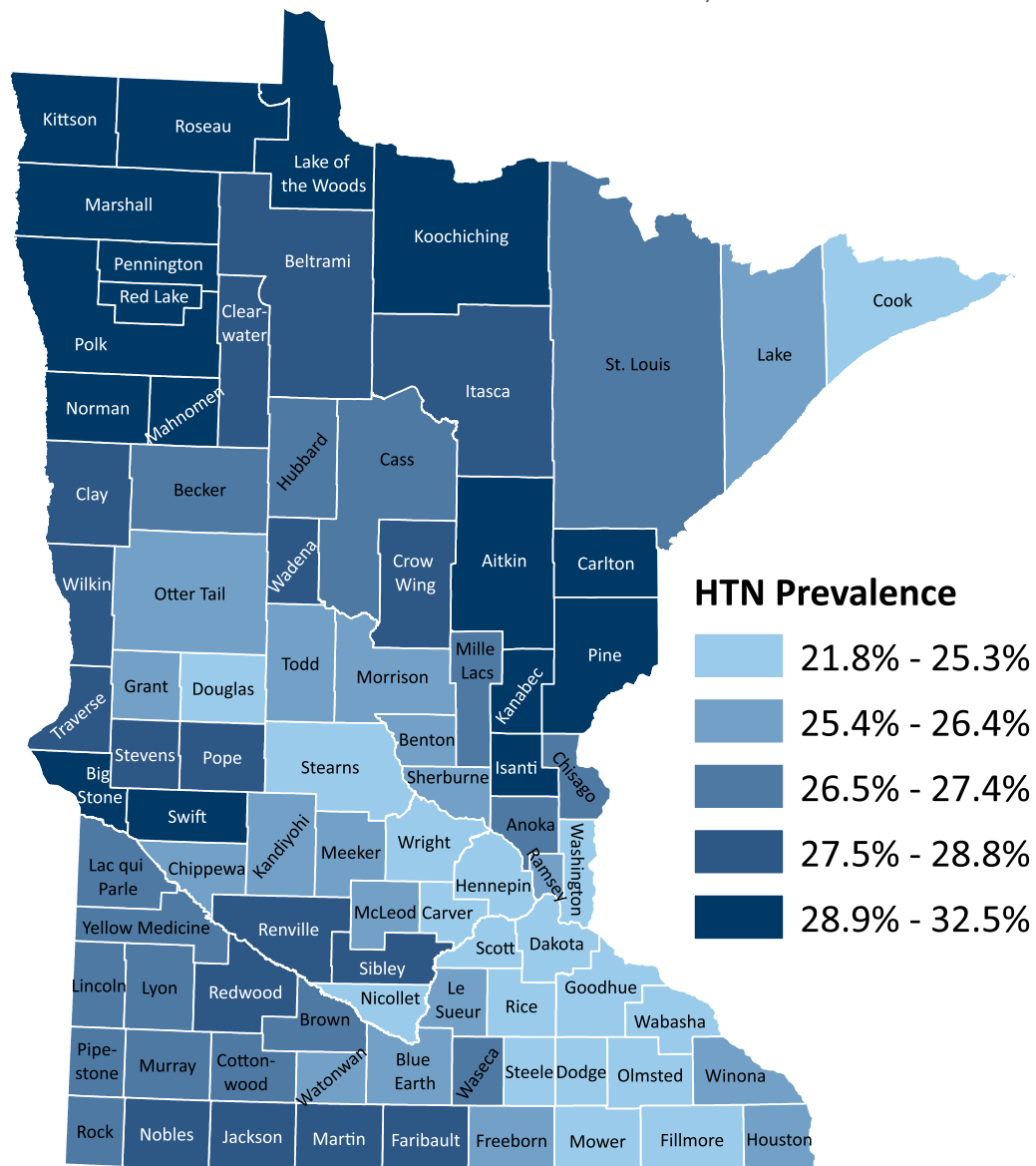
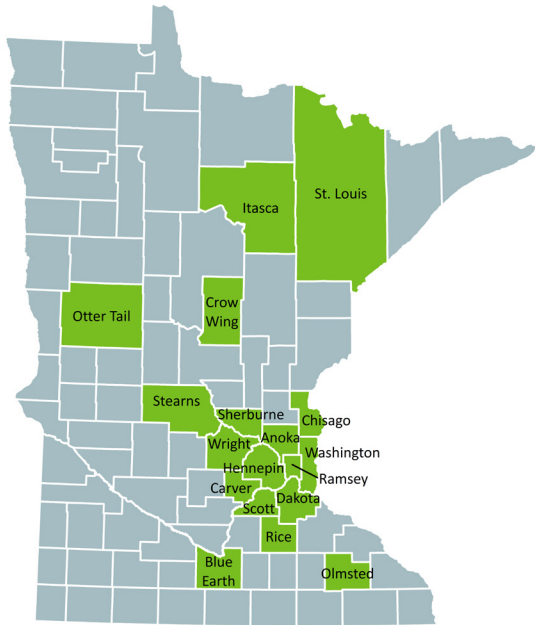


FIGURE 2: MINNESOTA COUNTIES WITH MORE THAN 10,000 HYPERTENSIVE ADULTS



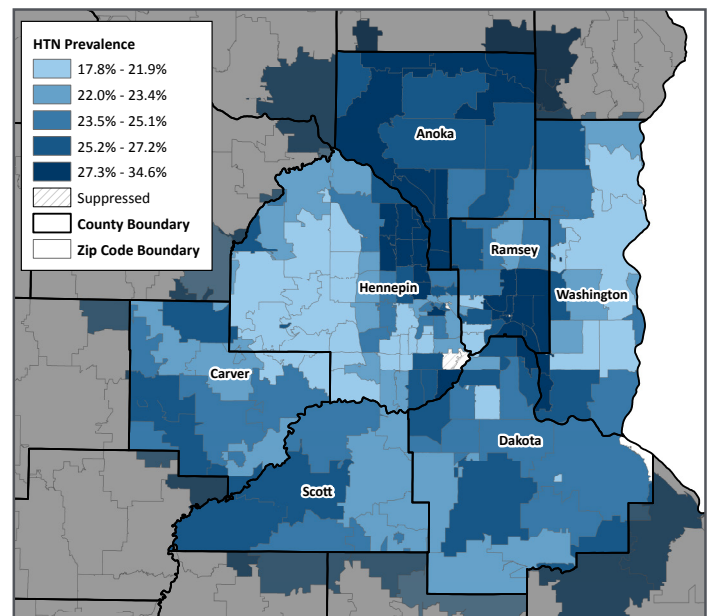
Maps included in the supplement present county-level hypertension prevalence maps stratified by age group (Figures S2-S4) and type of insurance coverage (Figures S5-S8). Prevalence patterns for adults aged 18-44 are similar to the patterns observed in the age-adjusted map in Figure 1 (shown as Figure S1 in the supplement), with higher prevalence in counties north of the 7-county metro and in northwest Minnesota. However, as age increases, the pattern shifts to show higher prevalence in counties in southwest Minnesota among adults aged 65 and older. Prevalence remains high in northwest Minnesota across all age groups, but high levels of hypertension in counties between the Twin Cities metro and Duluth are more prominent in younger age groups. Although the prevalence *patterns* are often similar across age groups, the actual hypertension prevalence shown on each map is based on the range within each age group, as reflected on each map’s legend, and the prevalence by age group shown in Table 2.

The patterns of hypertension prevalence by county for Minnesotans with commercial insurance (Figure S5) or Medicaid coverage (Figure S6) are also similar to those for all Minnesotans shown in Figure 1, with higher prevalence in counties north of the 7-county metro and in northwest Minnesota. In contrast, higher hypertension prevalence

in the Medicare (Figure S7) population and in those who are dually-eligible for Medicaid and Medicare (Figure S8) is concentrated in overlapping parts of northwest and southwest Minnesota (Figure S8).

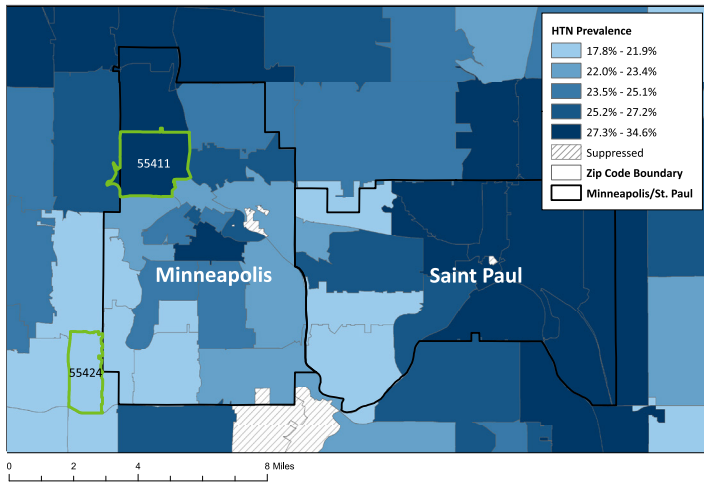
Figure 3 focuses on the 7-county Twin Cities metro area, showing the age-adjusted prevalence of hypertension by Zip Code across Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties. The lowest levels of hypertension are concentrated in central and western Hennepin County, southwestern Ramsey County, and much of Washington County. These communities are among the highest income communities in the state. On the other end of the spectrum, hypertension prevalence is highest in two large contiguous areas. The first group of Zip Codes is in northeastern Hennepin County stretching north into southern, western, and northern sections of Anoka County. The second area of high hypertension prevalence is concentrated in central and southeastern Ramsey County and adjacent areas of Dakota and Washington Counties. Other single Zip Codes with high hypertension prevalence are in southeastern Hennepin County.

FIGURE 3: AGE-ADJUSTED HYPERTENSION PREVALENCE BY ZIP CODE IN THE 7-COUNTY TWIN CITIES METROPOLITAN AREA, 2014



Source: MDH analysis of data from the MN APCD.

FIGURE 4: HIGH VARIATION IN HYPERTENSION PREVALENCE BY ZIP CODE IN THE URBAN CORE OF THE TWIN CITIES METROPOLITAN AREA, 2014



Source: MDH analysis of data from the MN APCD.

The range in hypertension prevalence in Twin Cities Zip Codes is high, even across small distances. The highest prevalence is in 55411, part of the Near North community in Minneapolis, at 34.6 percent of adults, and almost double the lowest prevalence in 55424, the northeast quadrant of Edina, at just 17.8 percent of adults. As shown in Figure 4, these two areas are less than 10 miles apart, with many differences in terms of income, educational level completed, and race and ethnicity, which contribute to widely divergent hypertension prevalence. In the supplement to this report, Table S2 summarizes all of the Zip Code level hypertension prevalence information by age group and type of insurance for most Zip Codes in the state.

Maps included in the supplement present Zip Code-level hypertension prevalence maps for the 7-county Twin Cities metro stratified by age group (Figures S10-S12) and type of insurance coverage (Figures S13-S16). Distribution patterns for adults aged 18-44 and 45-64 are similar to the patterns observed in the age-adjusted map in Figure 3 (shown as Figure S9 in the supplement), with the highest prevalence 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. However, this pattern shifts among adults aged 65 and older to include much of southern Hennepin County (Bloomington and Richfield) as communities with the highest hypertension prevalence.

For Minnesotans with commercial insurance (Figure S13) and Medicare (Figure S15), the patterns of hypertension prevalence by Zip Code in the 7-county Twin Cities metro are largely similar to those for all Minnesotans in Figure 3. Again, the highest prevalence of hypertension 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. For Minnesotans with Medicaid coverage (Figure S14), the pattern is strikingly different, with the highest hypertension prevalence communities largely outside the cities of Minneapolis and St. Paul, with a large contiguous cluster of Zip Codes in northwest and western Hennepin County into Carver County, plus an additional cluster from Scott County into Carver County. Each of the 7 metro counties includes at least one Zip Code in the highest hypertension prevalence category for Medicaid patients. Patterns among those who are dually-eligible for Medicaid and Medicare are less clear (Figure S16).

Prevention and Control of Hypertension

The data and maps in this report highlight disparities in hypertension prevalence by community in Minnesota. While it is a common condition with a high burden, there are many actions that can be taken by individuals, providers, payers, and communities to reduce the prevalence and improve control of hypertension. While hypertension is a common condition across the entire state, differences by region, by county, and by Zip Codes can inform the types and intensity of actions that can be undertaken to reduce the burden of hypertension and associated negative health outcomes in Minnesota. The benefits of preventing and controlling hypertension are many, with clear links to lower rates of heart disease, fewer heart attacks and strokes, less chronic kidney disease, and a lower risk of cognitive decline and dementia later in life.



FOR INDIVIDUALS:

- Know your numbers: If you have high blood pressure, your health care provider should check your blood pressure during every visit. If you haven't had your blood pressure checked in the last year, take advantage of a blood pressure screening event or schedule an appointment with your provider.
- 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.
- Take medication as prescribed: Your health care provider may also recommend antihypertensive medications to control high blood pressure. These medications include diuretics, beta blockers, vasodilators, ACE inhibitors, and calcium channel blockers. It can take some time and fine tuning to find the right dose and combination of medications to lower blood pressure effectively.



FOR HEALTH CARE PROVIDERS:

- Develop protocols to identify patients with elevated blood pressure and diagnose patients with undiagnosed hypertension.
- Initiate training and standardize protocols to ensure clinical staff are taking accurate blood pressure measurements.
- Utilize electronic health records to track patients and monitor management.
- Establish protocols to encourage patients to monitor their own blood pressure with clinical support.
- Partner with pharmacists to support medication therapy management for patients experiencing challenges with their blood pressure medications.
- Offer convenient, no cost or low cost blood pressure checks in the clinic.



FOR PAYERS:

- Reduce or eliminate copays for blood pressure checks with health care providers.
- Reduce or eliminate copays for blood pressure control medications.
- Allow 90-day supply or longer medication fill for blood pressure control medications.
- Encourage patients to self-manage their blood pressure through no cost or low cost home blood pressure monitors.
- Enhance price transparency for drugs so providers and patients can understand drug costs and make informed treatment decisions.



FOR COMMUNITIES:

- Increase awareness of high blood pressure by providing screening opportunities at community events or with other partners such as pharmacies, community centers, businesses, public health and other government agencies.
- Participate in the Minnesota Statewide Health Improvement Partnership (SHIP) (www.health.state.mn.us/ship) in your community to support heart healthy policies, including those that encourage healthy eating and active living.
- Develop community-based programs to support patients in managing their blood pressure, and encourage patients and providers to utilize these programs.



Data and Methods Used in the 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.⁹ 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 MN APCD includes claims for approximately 85 percent of Minnesota's population. 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 2009-2017.

This analysis uses data from 2014.

METHODOLOGY

The presence of hypertension was identified using version 10.0 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 guidelines.¹⁰

Overall prevalence of hypertension at the county and Zip Code level was age-adjusted to the 2000 U.S. Standard Population using 10 year age bands. Analyses stratified by age group and insurance were not age-adjusted. Prevalence estimates were suppressed for small geographies following MN APCD suppression criteria; no prevalence estimate is shown if the population group consists of fewer than 30 individuals, or if there are fewer than 11 individuals with hypertension.

Patient residence is available in the MN APCD only at the Zip Code level. To calculate county-level hypertension prevalence, 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 with hypertension 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.¹¹ 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.

Prevalence 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 prevalence of hypertension because in order to be present in the data, individuals must have had health insurance, and must have had a claim over the course of the 2014 calendar year. For patients with hypertension, especially if it is well-controlled, there may not be a claim over the course of the year, so those patients would not be included in the hypertension population. In addition, some health systems have been increasingly providing free blood pressure checks to support patients in self-managing their high blood pressure. Patients utilizing this service to monitor their blood pressure with clinical support, but not generating a medical claim, will also not appear in the MN APCD.

The MN APCD does not include key demographic information that could enable MDH to look at differences between groups known to be disproportionately impacted by high blood pressure. This includes measures of race and ethnicity, level of education completed, 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 (collectively called Medicaid in this report), are income-based and comprise individuals who are lower income.

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.¹² 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 with a diagnosis of high blood pressure have their condition adequately controlled. Those data are typically contained in a patient's electronic health record, and are not part of the medical claim that goes to the insurance company and is subsequently included in the MN APCD.

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MN  APCD

For further information about the MN APCD:
Online: www.health.state.mn.us/data/apcd/index.html
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