veradigm® INSIGHTS REPORT

Selected Metabolic Conditions Prevalence and Control: OBESITY AND DIABETES

INTRODUCTION

The prevalence of both obesity and diabetes have been increasing along with their associated health care costs. Obesity has been a growing health concern in the US for a number of decades where adult obesity rates have almost tripled over the last 30 years from 15% in 1990 to 41.9% during 2017–March 2020.[1,2,3]

The prevalence of diagnosed diabetes has also increased in the last 20 years from 6.2% to 11.3% from 1999-2000 to 2017-2021.[4,5] Along with this increase in prevalence have been corresponding increases in related morbidity and health care costs. Recent estimates of the direct medical cost for obesity in 2019 was $173 billion and of diagnosed diabetes in 2017 was $237 billion.[6,7]

ADULT OBESITY RATES HAVE ALMOST TRIPLED IN THE LAST **30 YEARS.**

THE DIRECT MEDICAL COST FOR DIABETES IN 2019 WAS **$173 BILLION.**

The associated disease burden and costs for both obesity and diabetes underscores the importance of disease management and control for these conditions.

To this end, each condition has an objective measure, body mass index (BMI) for obesity and hemoglobin A1c (HbA1c) for diabetes, that can be used to monitor disease severity and control. Despite limitations in each measure, BMI and HbA1c provide a means to monitor an individual's severity over time and to inform care decisions. When summarized for groups of patients, average BMI and HbA1c can provide a means to characterize disease severity and control at a population level.

The Veradigm Network covers a large portion of the U.S. population providing timely clinical data for surveillance.

This report illustrates the application of Veradigm Network EHR Data to population surveillance. This will be accomplished by comparing population-based prevalence and control measures for obesity and diabetes derived from Veradigm Network electronic health record (EHR) data to comparable values available from public sources. Measures are presented for the United States as a whole and for individual states.

OUR APPROACH

Clinical findings are presented separately for obesity and diabetes and include Veradigm Network prevalence estimates for the years 2021-2023.

As the Veradigm Network serves patients from all 50 states, measures derived for the Veradigm Network patient population were compared to comparable estimates for the United States as a whole. In addition, state level measures are mapped and compared to selected publicly available measures where state is available. Public data included in this report was collected through either the National Health and Nutrition Examination Survey (NHANES) or the Behavioral Risk Factor Surveillance System (BRFSS). Data from both NHANES and BRFSS is for the years 2017-2020, the most recent with full demographic and state data available.

DIABETES AND OBESITY PREVALANCE

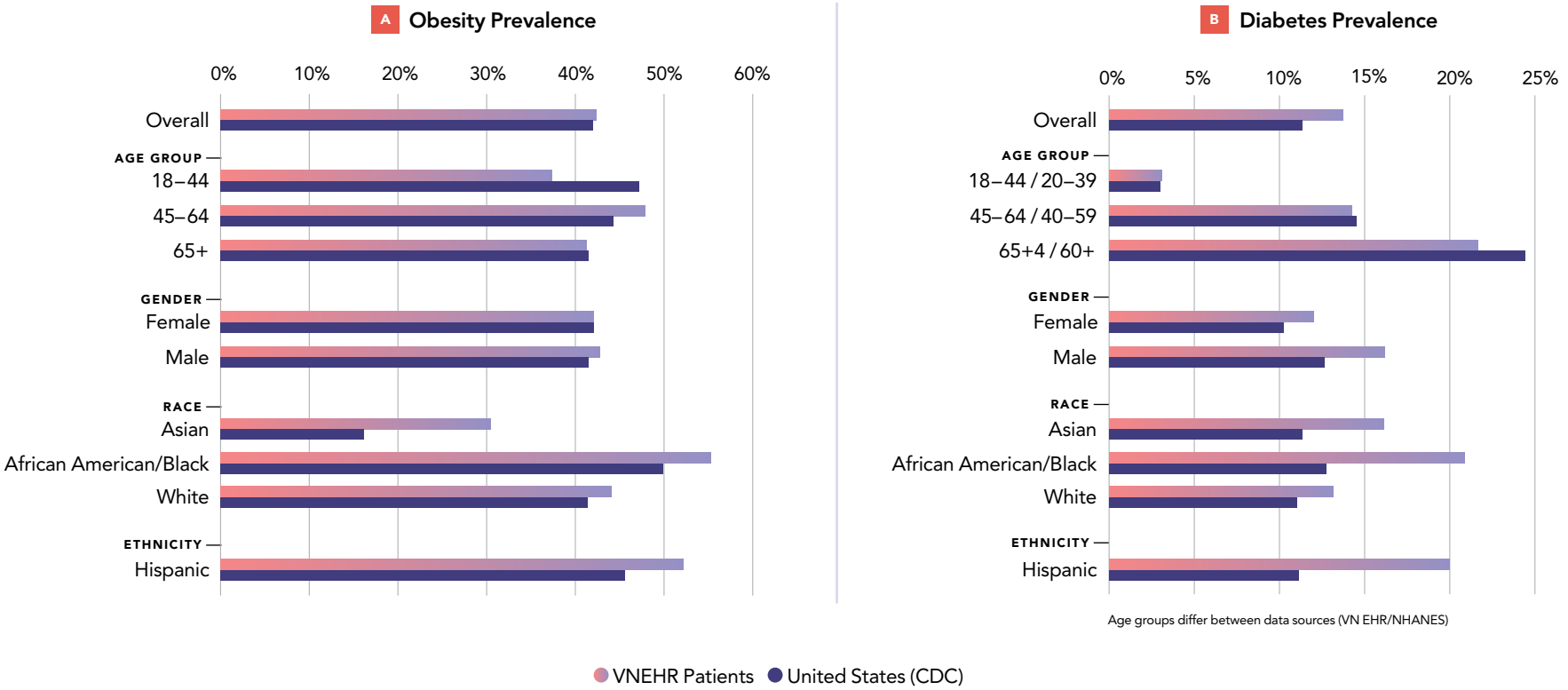
The overall prevalence of obesity, where obesity is defined as having a body mass index (BMI) of 30.0 or higher, in the Veradigm Network (VN) patient population was 42.4% for the period 2021-2023.

This compares closely to the most recent national estimate of 41.9% from NHANES for the period 2017–March 2020. Obesity estimates are available from both sources for age group, gender, and race/ethnicity. The demographic pattern of obesity prevalence was similar between the two sources. In both sources obesity was highest in the 45-64 age group, next highest in the 65+ group, and lowest in the 18-44 age group. The prevalence of obesity was similar by gender in both sources, 42.1% for females in both and 42.9% in VN and 41.6% in NHANES for males. The pattern was also similar comparing VN patients to NHANES for race/ethnicity being highest in African Americans (55.3% and 49.9%), followed by Hispanics (55.2% and 45.6%) and whites (44.1% and 41.4%) and was lowest among Asians (30.5% and 16.1%) **(Figure 1A)**.

Overall diagnosed diabetes prevalence, defined as a diagnosis code for diabetes present in the EHR in the Veradigm Network patient population was 13.7%.

This compares to a national estimate of 11.3% reported in NHANES. Diagnosed diabetes estimates are available from both sources for age group, gender, and race/ethnicity. As with obesity, the demographic pattern of diabetes prevalence was similar between the two sources. However, the prevalence in the VN population was over 20% higher than in the NHANES population. In both sources diabetes increased steadily with age (3.0%, 14.2%, 21.6% in VN and 3.0%, 14.4%, and 24.4% in NHANES). The prevalence of diabetes was lower among females than among males in both data sources, 12.0% vs 16.1% in VN and 10.2% vs 12.6% in NHANES. The pattern was also similar comparing VN patients to NHANES for race/ethnicity being highest in African Americans (20.8% and 12.7%) and lowest among Whites (13.1% and 11.0%) **(Figure 1B)**.

FIGURE 1 | Prevalence by Demographic Characteristics: Veradigm Network Compared to United States NHANES (CDC)

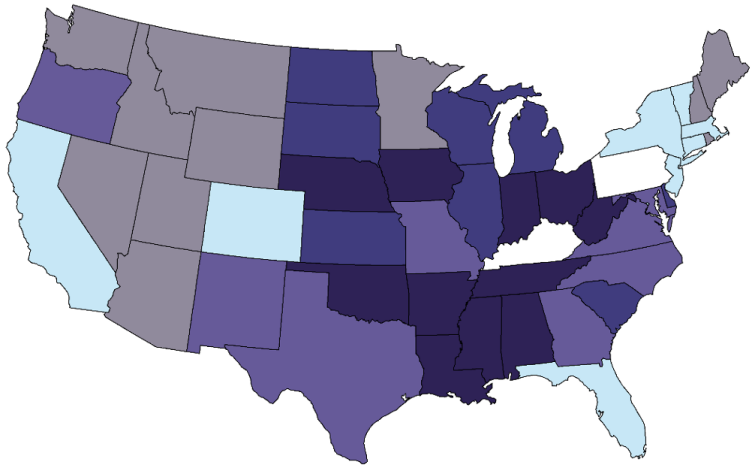


Geographically, there was good correspondence of obesity prevalence by state between the two data sources.

States with higher prevalence in the VN population tended to have higher prevalence and states with lower prevalence tended to have lower prevalence. With higher obesity in the South and Appalachian states and lower in the northeast, west, and mountain states **(Figures 2A and 2B)**.

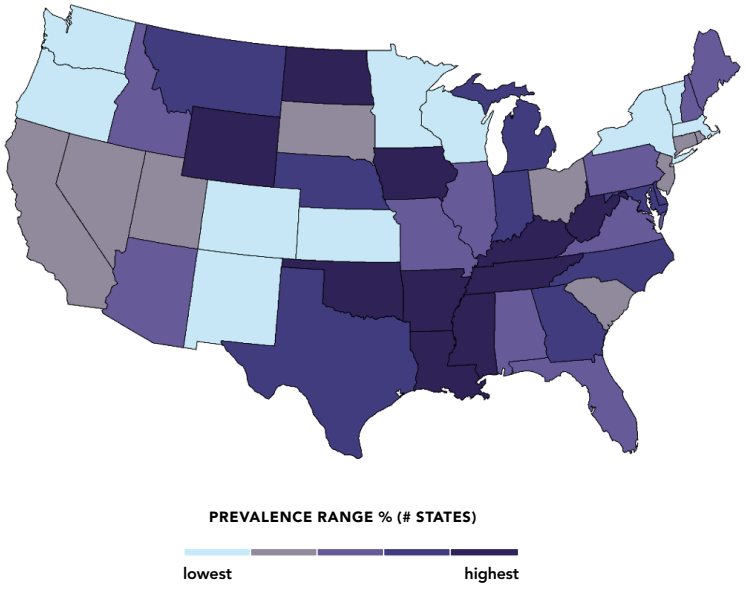
FIGURE 2 | Obesity Prevalence Estimates by State

A 2017-2020 | Behavioral Risk Factor Surveillance System (BRFSS)



No data for Kentucky and Pennsylvania Centers for Disease Control and Prevention

B 2021-2023 | Veradigm Network

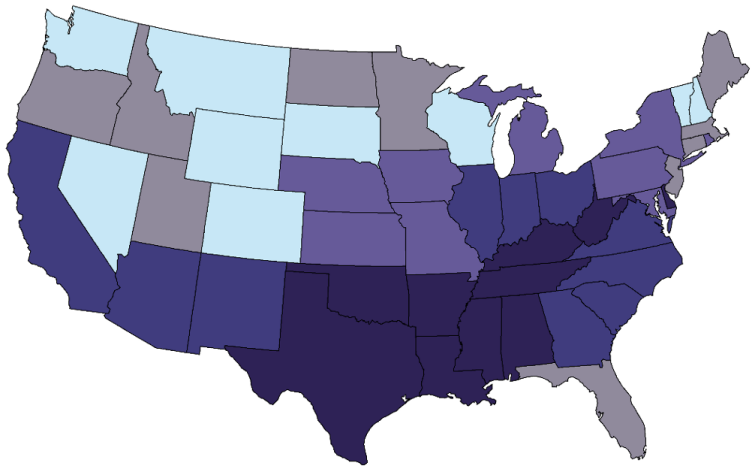


Geographically, as with obesity, there was good correspondence of diabetes prevalence by state between the two data sources.

States with higher prevalence were concentrated in the south and Appalachia and states with lower prevalence were concentrated in the north, north-east, and mountain states in both data sources **(Figures 3A and 3B)**.

FIGURE 3 | Diabetes Prevalence Estimates by State

A **Prevalance of Diabetes**
2017-2020 | Behavioral Risk Factor Surveillance System (BRFSS)

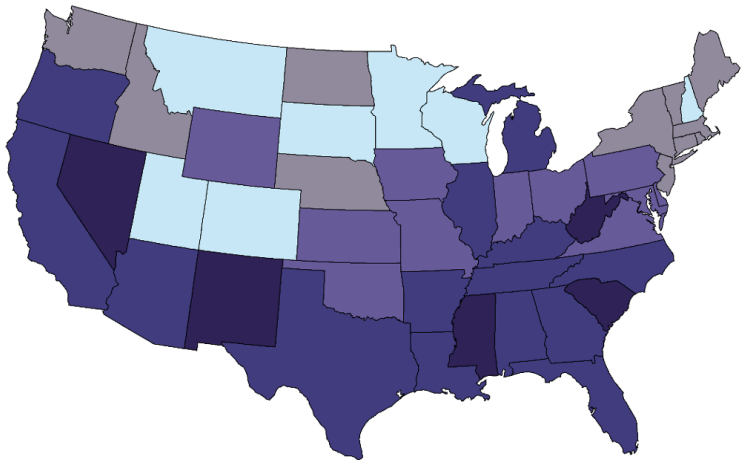


PREVALENCE RANGE % (# STATES)

lowest highest

Centers for Disease Control and Prevention (CDC) United States Diabetes Surveillance System

B **Prevalance of Type 2 Diabetes**
2021-2023 | Veradigm Network



PREVALENCE RANGE % (# STATES)

lowest highest

DISEASE CONTROL IN DIABETES

A hemoglobin A1C (HbA1C) test is a blood test that measures average blood sugar (glucose) level over the past two to three months and is appropriate to be used as an indicator of diabetes control.

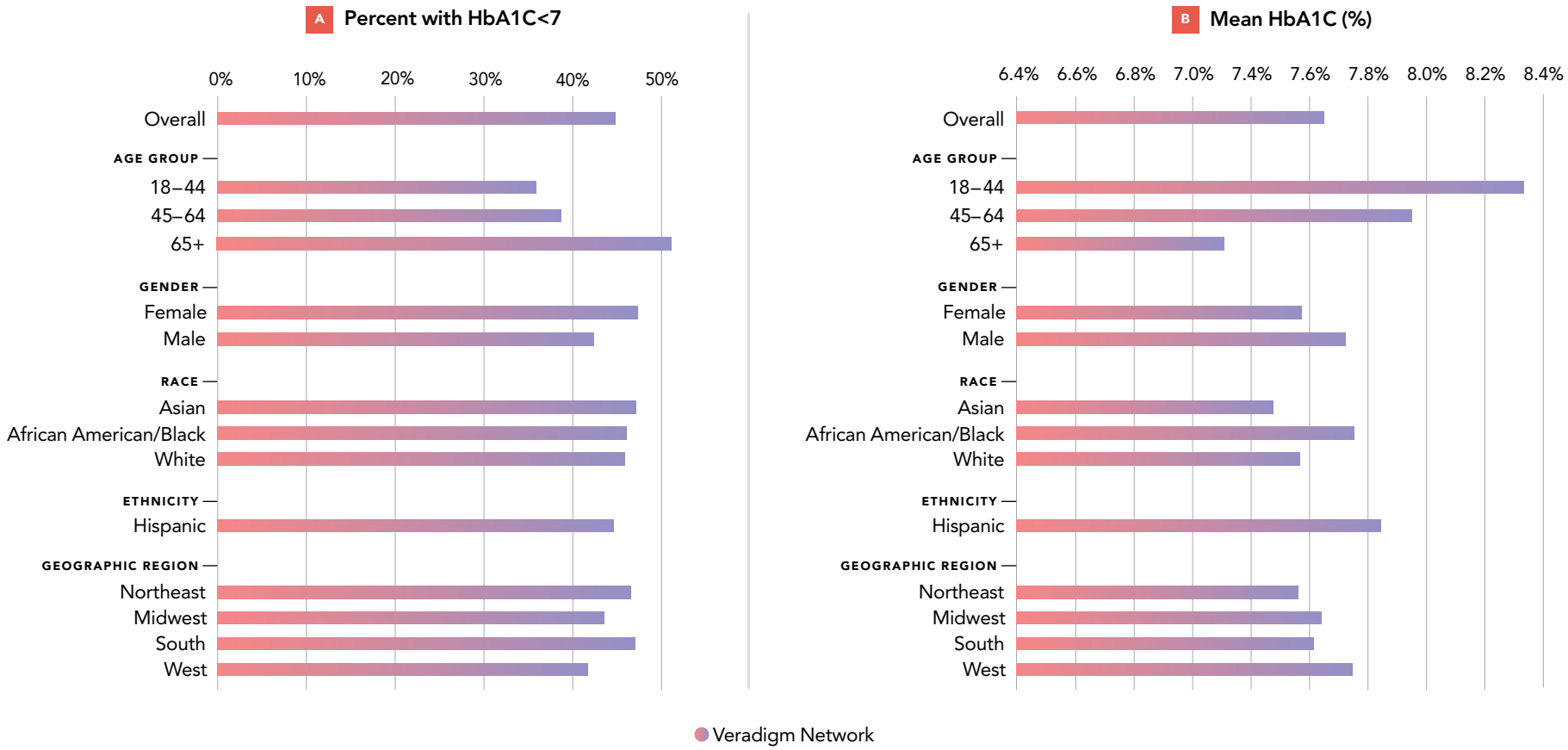
The American Diabetes Association (ADA) in its Standards of Care in Diabetes guidelines recommends an A1C goal for many non-pregnant adults of <7%.[8] HbA1C test results obtained from VNEHR data can be used to describe the level of diabetes control across groups of patients. In this report, HbA1C as both a mean value and as a proportion of patients achieving HbA1C<7 will be used for this purpose.

The overall proportion of patients with a HbA1C test result value <7% was 44.8%. This proportion increases with age going from 35.9% in those age 18-44 to 38.7% in those age 45-64 and reaching 51.0% in patients age 65+. Women had a somewhat higher proportion than men (47.2% vs 42.3%). Differences were relatively minor by race and ethnicity.

The proportion was highest in Asians at 46.9% and lowest in Hispanics at 44.1%. Regional differences show higher proportions in the Northeast and South (46.5% and 47.0%) and lower proportions in the Midwest and West (43.4% and 41.6% **(Figure 4A)**.

The pattern for mean HbA1C is similar to that for the proportion with HbA1C<7 where higher mean values correspond to lower proportions achieving HbA1C<7. The overall mean HbA1C test result was 7.45. This value decreases with age going from 8.13 in those age 18-44 to 7.75 in those age 45-64 and down to 7.11 in patients age 65+. Men had a somewhat higher average value than women (7.53 vs 7.38). Differences were relatively minor by race and ethnicity. Blacks and Hispanics had higher average values (7.55 and 7.65) than Whites or Asians (7.37 and 7.28). Regional differences show lower means in the Northeast and South (7.36 and 7.41) and higher means in the Midwest and West (7.44 and 7.55) **(Figure 4B)**.

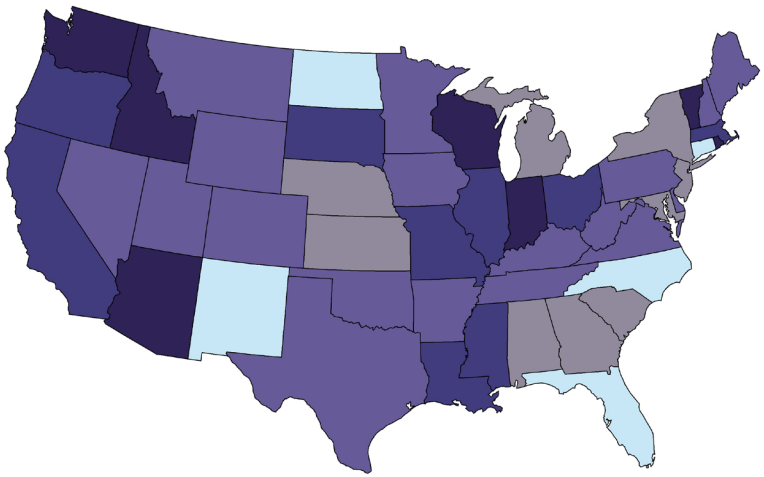
FIGURE 4 | Veradigm Network Adult Patients with Diabetes



For measures related to diabetes control, 6 states had a majority of patients with a HbA1c value < 7 (includes Alaska, not shown). Over half of states (n=33) had a HbA1c average value less than 7.5 indicating a better amount of diabetes control **(Figures 5A and 5B)**.

FIGURE 5 | Veradigm Network | Adult Patients with Diabetes Measures by State

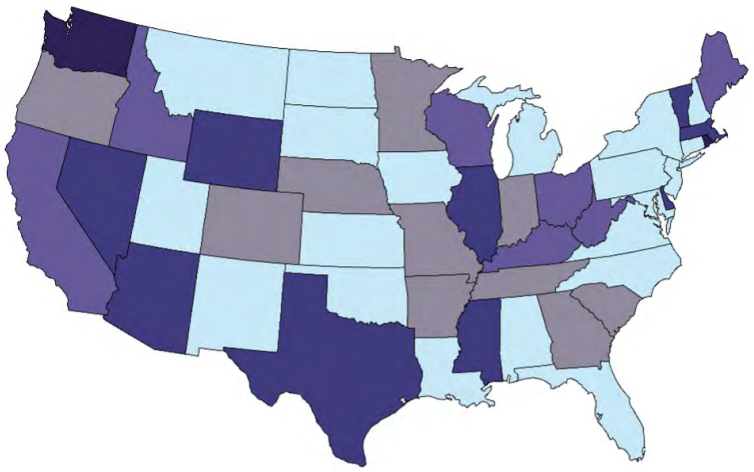
A Percent with HbA1C<7 by State



HBA1C < 7 RANGE % (# STATES)

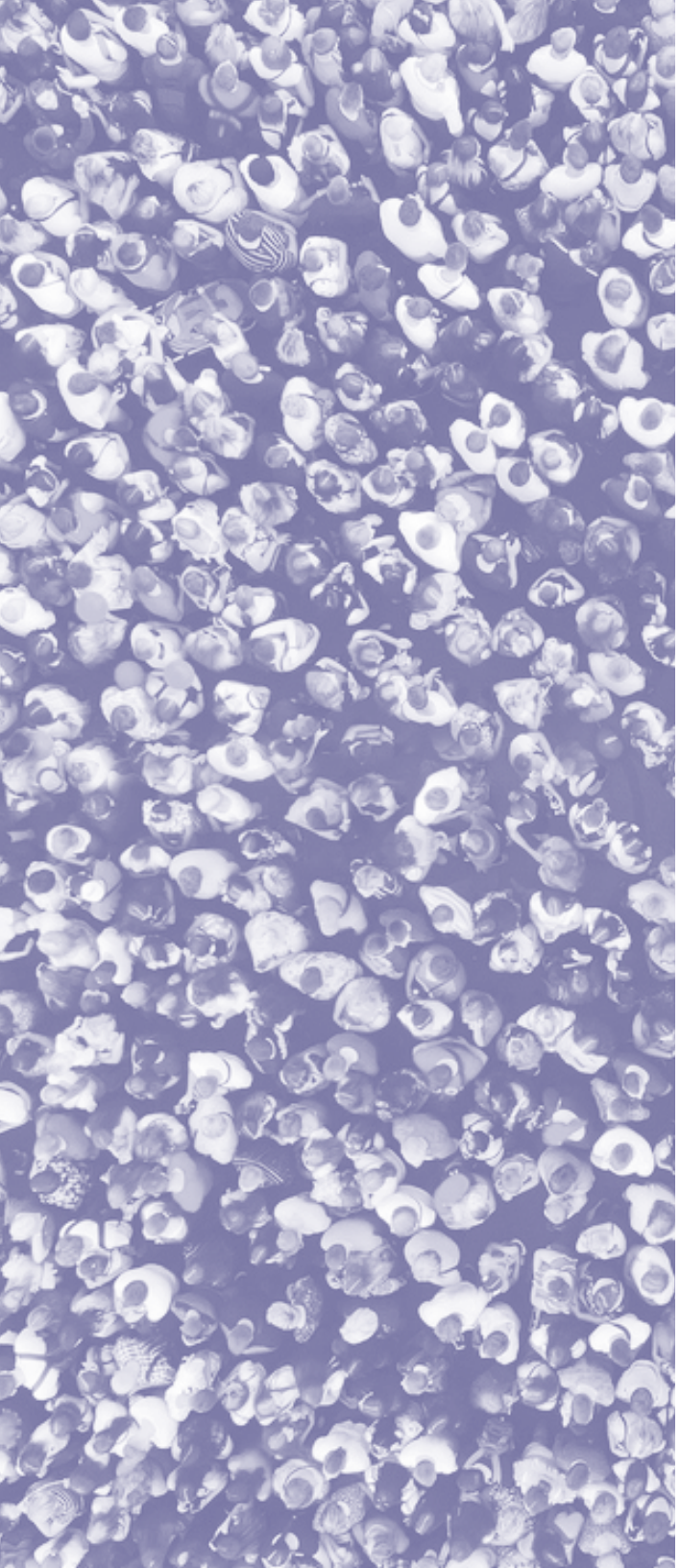
lowest highest

B Mean HbA1C (%) by State



HBA1C (MEAN) RANGE % (# STATES)

lowest highest



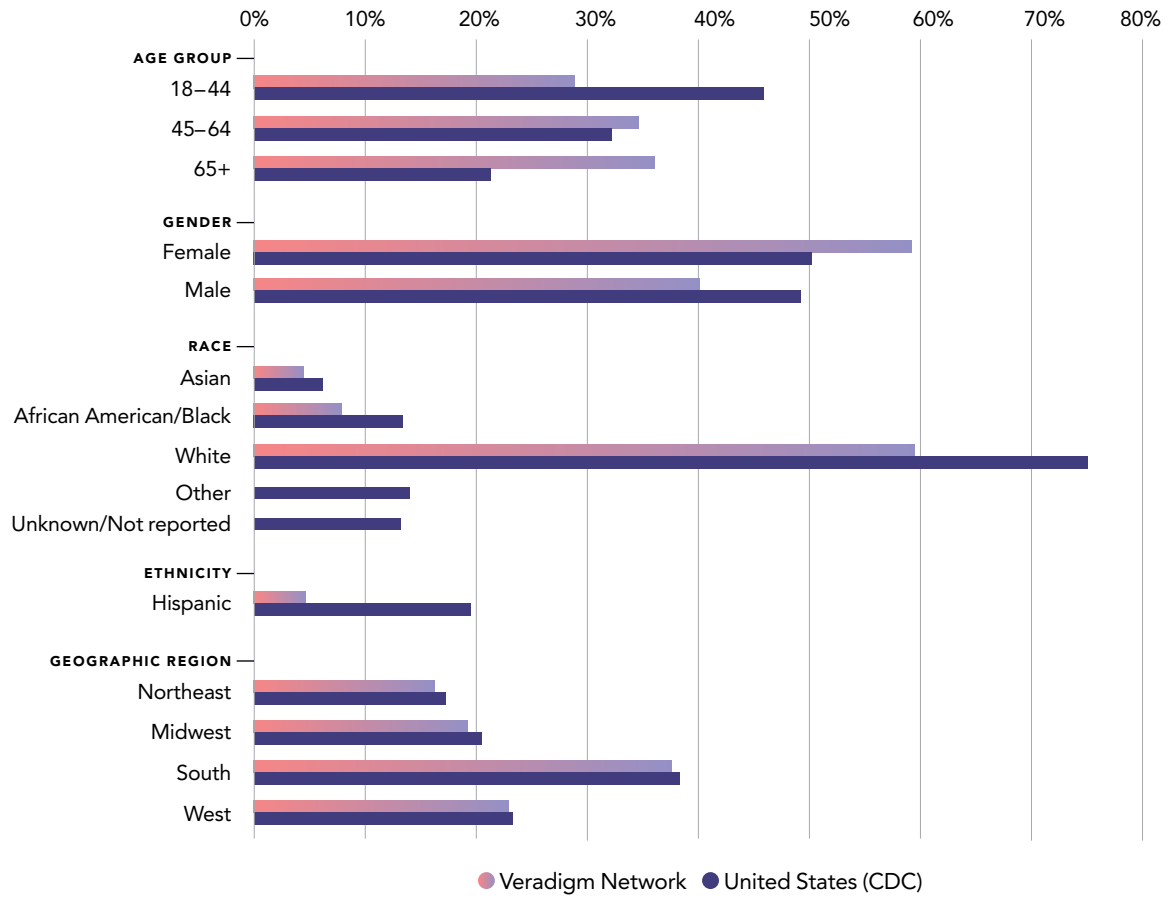
STUDY POPULATION AND CHARACTERISTICS

The population evaluated in this report consists of 38 million adult patients age 18+, active for at least 12 months in the Veradigm Network during the 2021-2023 time period.

This represents patients from across the country and includes patients from all 50 states and DC. The adult Veradigm Network patient population is generally representative of the adult U.S. population. The representativeness of the adult Veradigm Network patient population to the U.S. population is evidenced by the alignment of key demographics from the U.S. Census. In addition, the alignment with clinical characteristics from recent reporting from both NHANES and BRFSS data also supports this. Compared to the overall U.S. population the Veradigm Network serves a healthcare seeking population and as such underrepresents younger adults and overrepresents older individuals (Age 65+: 36.4% compared to 16.4%) and has a larger proportion of women (59.5% compared to 50.5%).

The Veradigm Network population, while diverse, is not as diverse as the country as a whole as evidenced by lower proportions of Asians, blacks and Hispanics than the country as a whole. With respect to race, it should be noted that 14.0% of the VNEHR patient population has a race of other and that race is either unknown or not reported for an additional 13.3% of patients. Geographically, on a regional basis the Veradigm Network represents the overall U.S. population closely **(Figure 6)**.

FIGURE 6 | Veradigm Network Adult Population Compared to Adult United States Population



DATA SOURCES

Veradigm Network EHR (VEHR) database

Findings in this report are based on data from the Veradigm Network EHR Database of de-identified real-world data.

This data represents an extensive national population of patients and is drawn from physician practices in the Veradigm Network. The Veradigm Network incorporates structured and unstructured data using NLP and includes over 143 million patients with clinical activity. Veradigm Network EHR Data is one of the largest EHR data products available designed for research purposes, and combines EHR, claims, and NLP data which allows for a more complete picture of the patient journey while allowing researchers to distil down into the details of care. The data were analyzed and mapped by state based on 38 million recent adult patients active in the Veradigm Network.

THE VERADIGM NETWORK INCLUDES OVER **143 MILLION** PATIENTS WITH CLINICAL ACTIVITY.

Public data

Comparison measures for disease prevalence and control measures available from the Centers for Disease Control and Prevention (CDC), will provide reference values.

The CDC makes disease-specific measures available on its web site for both obesity and diabetes. Measures are based on data collected from two different surveys including the National Health and Nutrition Examination Survey (NHANES) and the Behavioral Risk Factor Surveillance System (BRFSS).[9,10] Both surveys collect information on obesity and diabetes including BMI and HbA1C. Most recent available data for each survey was used for comparison, 2017–March 2020 for NHANES and 2023 for BRFSS.

THESE REPORT FINDINGS ARE BASED ON **38 MILLION** RECENT ACTIVE ADULT PATIENTS IN THE VERADIGM NETWORK.

CONCLUSION

With recent increases in the prevalence of metabolic disorders such as obesity and diabetes, as well as increases in the associated healthcare costs for affected patients, patient population surveillance for these conditions has become increasingly important.

Publicly available data, such as the NHANES and BRFSS data used in this case study, can provide a broad overview of these conditions' prevalence and control at a population level. However, publicly available datasets have some limitations. They may be limited in size; for instance, NHANES data is obtained from a nationally representative sample of about 5,000 individuals each year.[11] BRFSS, while not small as it includes over 400,000 interviews per year, has limitations related to telephone and mail surveys where special populations may not be included (e.g., language spoken, living quarters).[12, 13] Additionally, BRFSS data rely on self-reporting, which means respondents may not accurately recall answers or may be biased to provide responses healthier in nature.

In this case study, we compare rates of prevalence and control measures for obesity and diabetes, as determined using publicly available data versus Veradigm Network EHR Data.

Both VNEHR and publicly sourced datasets are collected from geographically diverse, nationally distributed patient populations. Both include data from demographically and socially diverse individuals. Our results support the claim that the VNEHR patient population is generally representative of the adult U.S. population: The overall patterns of prevalence were similar for VNEHR and public data, even when results were broken down for evaluation of specific age groups, genders, race/ethnicities, and geographic locations.

As discussed above, VNEHR data do have some limitations, such as a lower rate of diversity than that seen in the overall U.S. population. However, this case study demonstrates that the Veradigm Network EHR patient population offers clear advantages for monitoring key patient population characteristics, including providing access to near real-time data and access to a dataset far larger than most publicly available sources.

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