

CARDIODIABESITY

PART ONE

Three common conditions.
One extraordinary challenge.





Overview

Over 93%
of the adult
population has
suboptimal
cardiometabolic
health⁹

This is the first in a series of reports on Cardiometabolic, which describes the interrelationship between cardiovascular disease (CVD), type II diabetes (T2D), obesity and other related vascular disease risk factors, such as hypertension and high cholesterol.¹ Though health care experts have been studying this relationship since the 1970s, the term is just now becoming known and understood throughout the industry.

With cardiometabolic, America is currently facing a condition that's on track to become an epidemic of historic proportion. The challenge is that cardiometabolic isn't just one disease, but a complex trifecta of three comorbid diagnoses at once. Recognizing and labeling this challenge as cardiometabolic highlights the combined effect these three conditions have on health outcomes. Overcoming this challenge demands the collective and unrelenting focus of all of us committed to improving health and value.

Why focus on cardiometabolic?

- + **It's deadly.** Cardiometabolic is the leading cause of death in the United States² and the fourth-leading cause of disability.³
- + **It's costly.** Individually, these conditions are significant economic burdens on the U.S health care system. Estimates put the combined cost at \$719 billion annually.⁴ The use of newer, higher-priced medications to treat these conditions and their risk factors is predicted to increase significantly by 2029,⁵ meaning the collective cost of these conditions will continue to rise.
- + **It's a self-fulfilling prophecy.** People with one cardiometabolic-related condition are at risk for developing others.
- + **It's a progressive disease.** Cardiometabolic progresses from identifiable and treatable risk factors like high blood pressure, smoking, excess weight and excess sugar. Addressing these markers in the early stage can slow the development of cardiometabolic.
- + **It's projected to get even worse.** Cardiometabolic conditions are expected to rise exponentially by 2030,⁶ creating even more challenges for members, payers and providers. In the U.S., 50% of adults are estimated to be obese by 2030⁷ and the number of people with diabetes is projected to increase by 39.3% by 2060.⁸

Most of the morbidity and cost come from cardiovascular complications rather than diabetes or obesity alone

The good news? Much of the impact is preventable.

Prevention provides an opportunity to improve health and value. However the current rise of CVD, diabetes and obesity will only increase factors that can't be reversed. That includes severe complications such as stroke and amputation, permanent disabilities and death, as well as high costs. Most of the morbidity and cost come from CVD complications rather than diabetes or obesity alone. That's why studying the trends, factors and outcomes is critical.

In this report, we discuss these trends through three phases: **primary prevention** (i.e., at-risk state), **disease state** (i.e., confirming diagnosis) and **secondary prevention** (i.e., preventing complications or alleviating symptoms of disease in the advanced state). This helps us better understand, develop and tailor health-improving and value-creating intervention strategies for each phase of cardiometabolic disease.



Knowing the phases of cardiometabolic disease

Cardiometabolic disease is a progressive disease. In this analysis we focus particularly on those at risk for developing cardiometabolic disease and on those with cardiometabolic disease, as these represent the best opportunity to avoid severe complications.

Markers exist for early-stage cardiometabolic disease. When caught early enough, these markers can slow its development. For the early-stage cardiometabolic disease group, we identified patients from 2019 to 2021 who had CVD risk factors, such as early hypertension and high cholesterol, any diagnoses of prediabetes or early kidney disease and were overweight (BMI $\geq 25-30$). For the cardiometabolic disease group, we included patients who had comorbid diagnoses of CVD without severe complications, controlled or uncontrolled T2D and obesity (BMI >30) over the same period. In each group, patients were categorized as having one, two or all three condition categories. We followed all patients for one year through 2022.

Defining the Phases of Cardiometabolic Disease

EARLY-STAGE CARDIOMETABOLIC DISEASE	CARDIOMETABOLIC DISEASE
Cardiovascular disease + Hypertension stage 1 + Systolic blood pressure 130–139 + Diastolic blood pressure 80–89 + High cholesterol	Cardiovascular disease + Hypertension stage 2 + Systolic blood pressure >140 + Diastolic blood pressure >90 + Vascular dementia
Prediabetes + Or chronic kidney disease stage 1–2	Controlled or uncontrolled T2D with retinopathy or neuropathy + Or chronic kidney disease stage 3–4
Overweight + BMI 25–30 kg/m ²	Obesity + BMI >30 kg/m ²

Definition of Outcomes for Each Phase Within One Year

EARLY-STAGE CARDIOMETABOLIC DISEASE	CARDIOMETABOLIC DISEASE
Progression to cardiometabolic disease; includes incidence of: + BMI >30 kg/m ² + Diastolic blood pressure >90 + Hypertension stage 2 + Retinopathy or neuropathy + Systolic blood pressure >140 + T2D or chronic kidney disease stage 3–4 + Vascular dementia	Progression to advanced state/complications; includes incidence of: + Amputation + Aneurysm + Bariatric surgery + Diabetes with severe complications + End-stage renal disease + Heart failure exacerbation + Myocardial infarction + Stroke

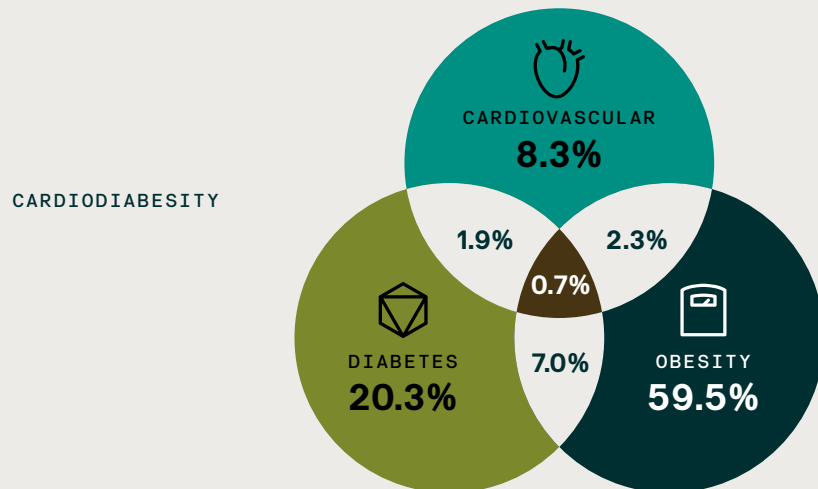
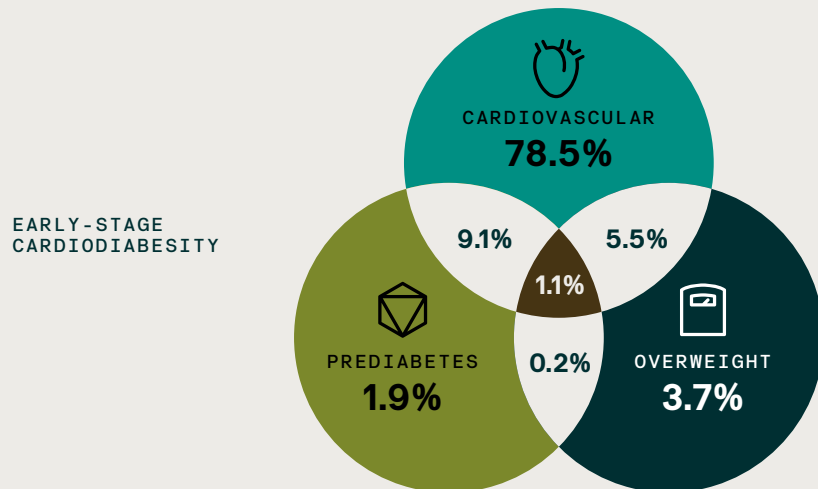
Who is living with cardiometabolic conditions?

Of 127.4 million adults with commercial, Medicare and Medicaid insurance, 3,273,813 patients had at least one comorbid condition for early-stage cardiometabolic conditions and 1,628,407 patients had at least one comorbid condition for cardiometabolic conditions. Among these sub-cohorts, the prevalence of the most-affected patients (i.e., those with all three diagnoses) was 1.1% for early-stage cardiometabolic conditions and 0.7% for cardiometabolic conditions. For patients with early-stage cardiometabolic conditions, CVD conditions such as early hypertension were the most prevalent. For patients already living with cardiometabolic conditions, obesity (59.5%) and diabetes (20.3%) were most prevalent, followed by a combination of both (7.0%).

For patients with early-stage cardiometabolic conditions, **cardiovascular conditions** were the most prevalent

For patients with cardiometabolic conditions, **obesity and diabetes** were the most prevalent

Burden of Patients by Condition Category, 2019–2021*

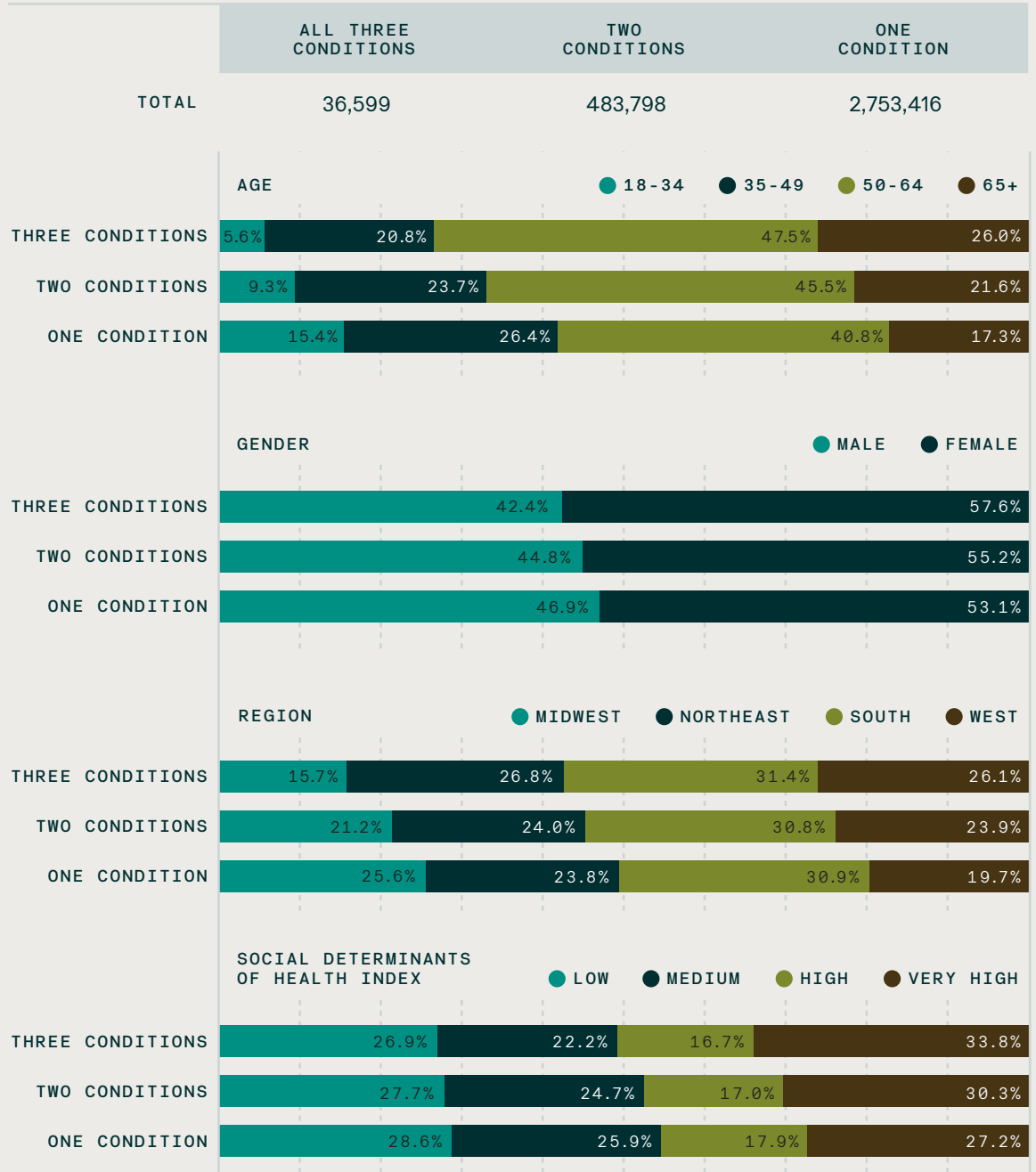


*Prediabetes, overweight and obesity are typically underreported in claims data.

Early-stage cardiometabolic

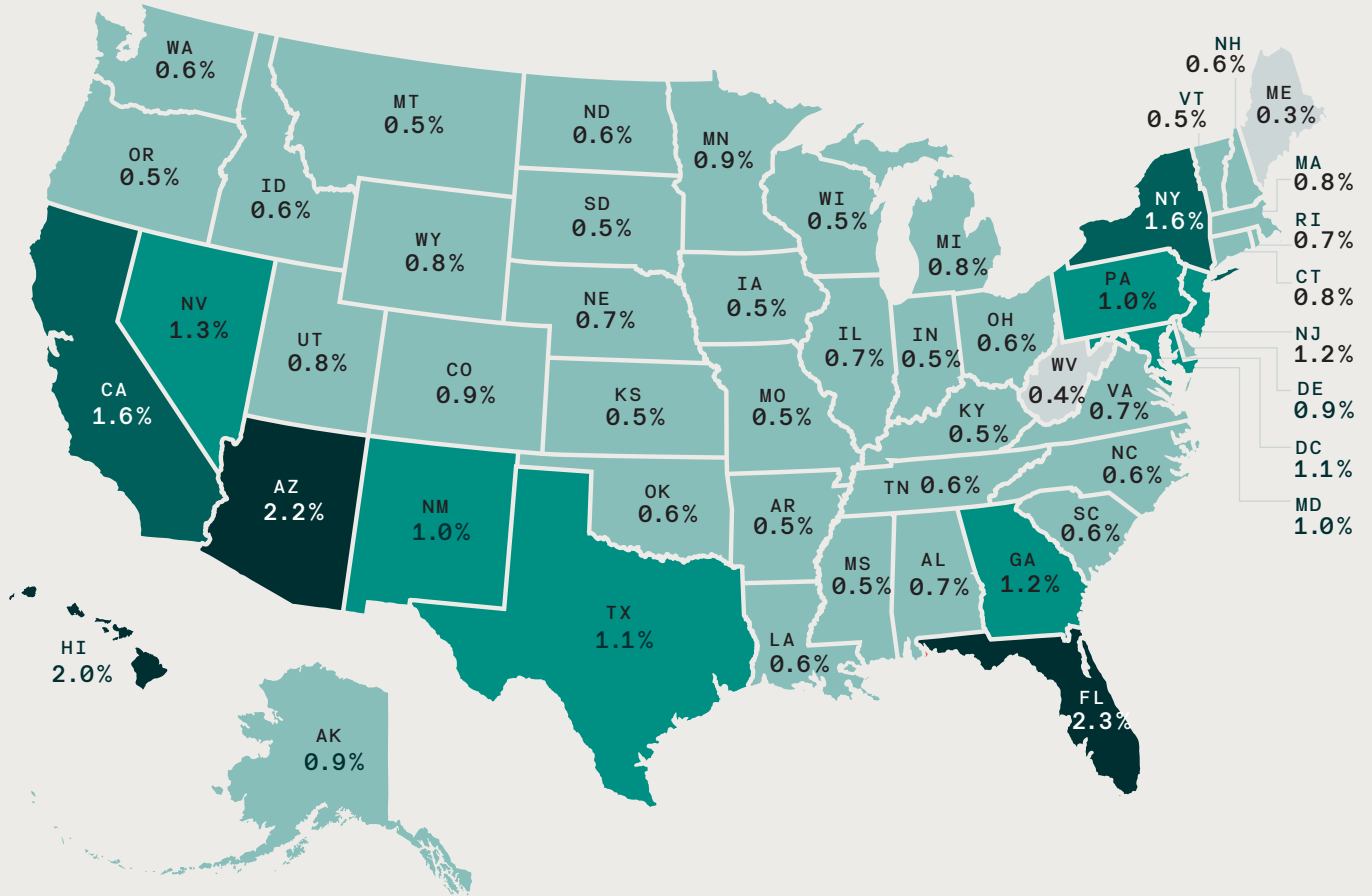
Among patients with all three conditions, 57.6% were female, 50.5% lived in areas with higher social needs, 31.4% lived in the southern U.S. and 73.5% were age 50 and older. The rates of CVD, prediabetes and overweight individuals were highest in Mississippi (97.3%), Hawaii (18.3%) and Arizona (16.1%) respectively. The lowest were in District of Columbia (88.8%), West Virginia (6.7%) and Montana (4.8%) respectively.

Characteristics of Patients by Early-Stage Cardiometabolic Condition Categories



Prevalence of Early-Stage Cardiometabolic Conditions by State (N = 36,599)

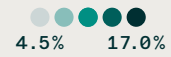
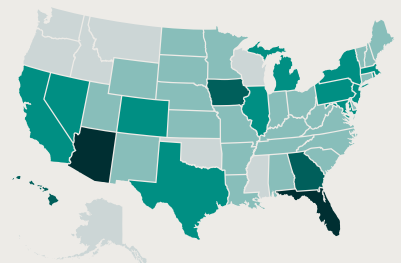
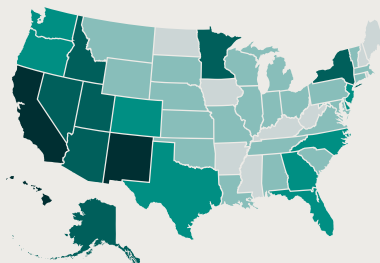
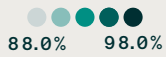
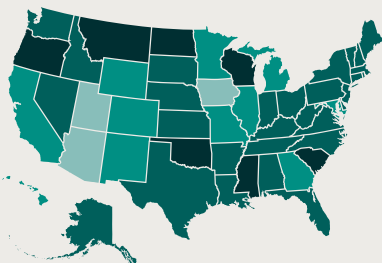
ALL THREE CONDITIONS



CARDIOVASCULAR DISEASE

PREDIABETES

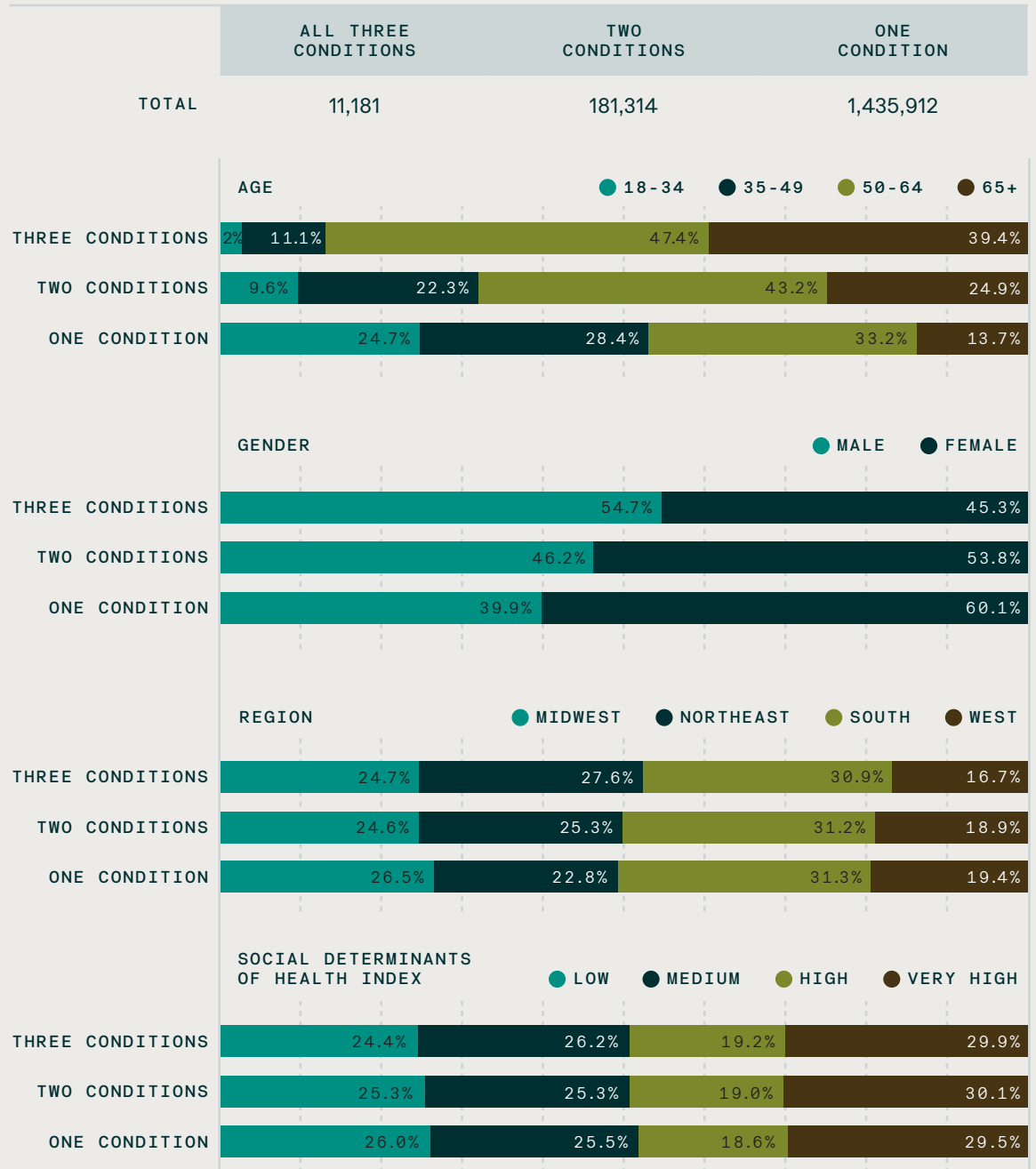
OVERWEIGHT



Cardiodiabetes

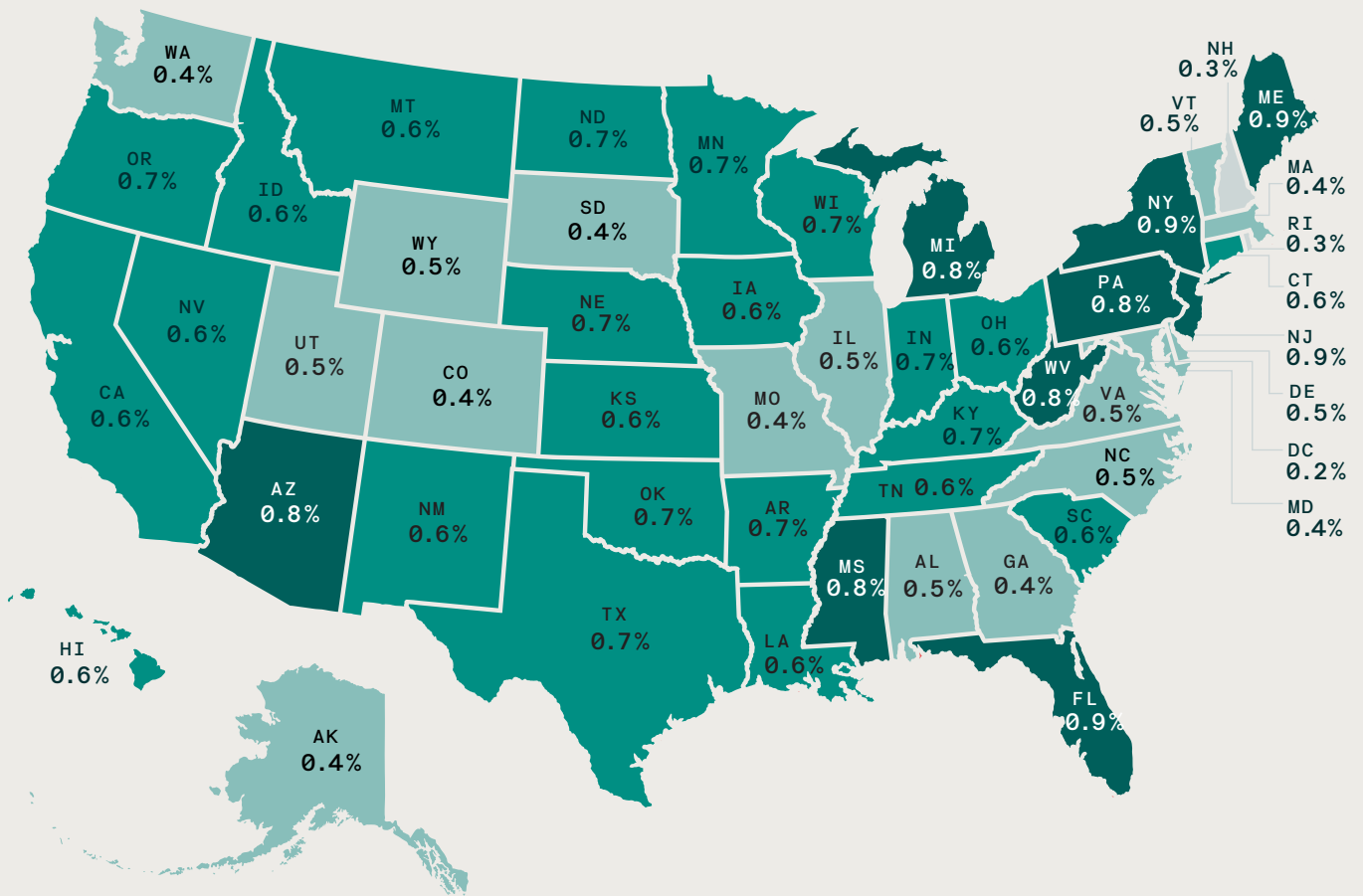
Among patients with all three conditions, 54.7% were male, 49.1% lived in areas with higher social needs, 30.9% lived in the southern U.S. and 86.8% were age 50 years and older. The rates of CVD, T2D and obesity were highest in Oregon (19.2%), Hawaii (41.9%) and Iowa (83.6%) respectively. The lowest were in District of Columbia (4.8%), Iowa (18.7%) and Hawaii (58.5%) respectively.

Characteristics of Patients by Cardiodiabetes Condition Categories



Prevalence of Cardiodiabetes by State (N = 11,181)

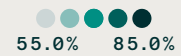
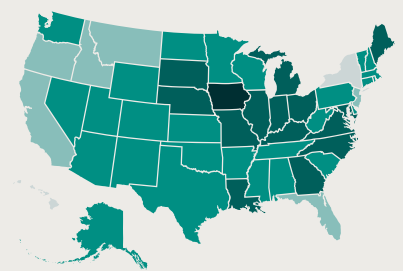
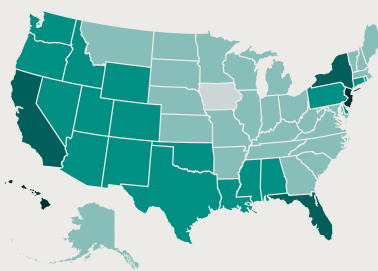
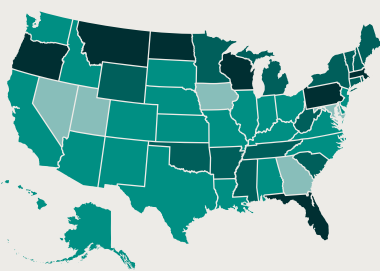
ALL THREE CONDITIONS



CARDIOVASCULAR DISEASE

DIABETES

OBESITY





Three key insights

- 01** Evidence-based prevention can stop progression

- 02** Most patients progress to more-serious conditions within one year

- 03** Disease burden and progression varies by sociodemographic group

INSIGHT
01

Evidence-based prevention can stop progression

The best strategy for combating cardiometabolic disease may be prevention. Prevention can limit the presentation of risk factors such as hypertension, prediabetes and high cholesterol. Prevention also helps at-risk patients control their conditions before they develop into cardiometabolic disease.

Prevention measures include:

- + Identifying at-risk patients early
- + Understanding the role of micro- and macro-level factors, such as emotional, social, geographic and economic conditions
- + Targeting patient barriers to follow-up and disease control
- + Developing performance quality metrics that improve health outcomes and equity

Strategies should also aim to prevent progression to clinical disease states in susceptible individuals. Examples include:

- + Screening
- + Early identification
- + Helping patients understand how to reduce risk

These practices must be carried out in a health care ecosystem that supports incentivizing preventive behaviors that lower risk. This means providing convenient access to quality evidence-based care and encouraging care providers to be population focused while delivering personalized care to each patient.

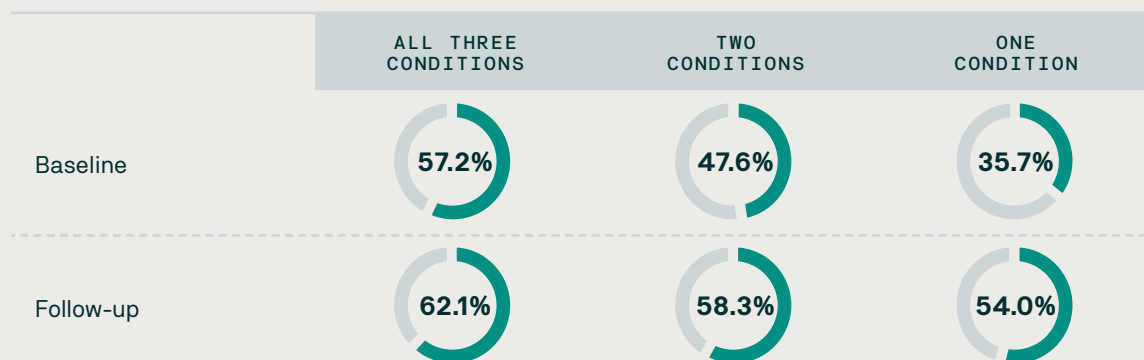
Prevention is a key component, but it must be paired with the right interventions, services and support

Prevention is a key component, but it must be paired with the right interventions, services and support. Only half of patients with two or more early-stage cardiometabolic conditions completed their annual physical. For cardiometabolic patients, fewer than 50% had an annual physical or wellness visit both at baseline and follow-up.

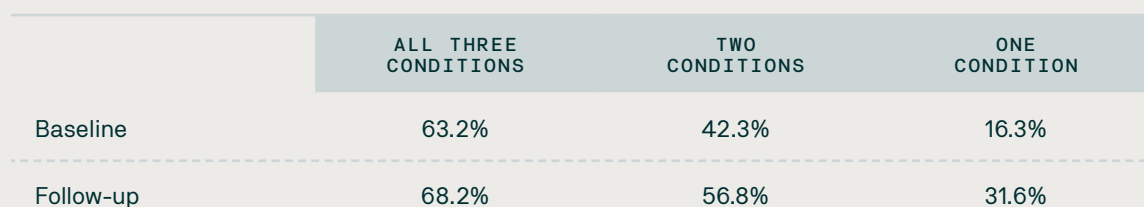
Among those patients with early-stage cardiometabolic disease and all three risk factors, nearly a third had no A1c screening (31.8%) and more than a quarter had no lipid screening (27.3%). Both are necessary measures that could facilitate early detection and management. To stop this trend, we must find the provider models that are more effective at utilizing evidence-based guidelines for risk reduction and control of at-risk conditions since access alone is not enough.

Prevention Practices: Early-Stage Cardiometabolic (Percentage of Patients)

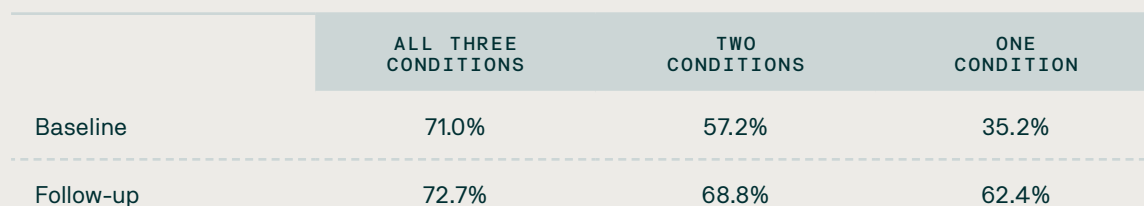
ANNUAL PHYSICAL/WELLNESS VISIT COMPLETED



SCREENING COMPLETED: A1C LEVELS

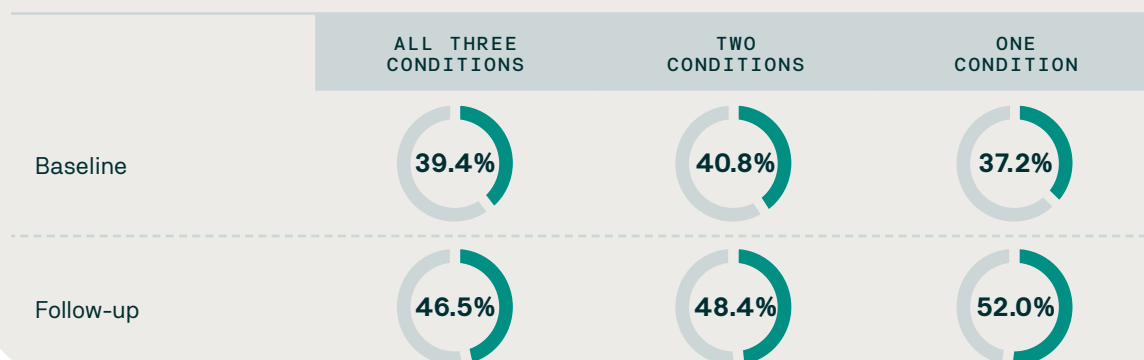


SCREENING COMPLETED: LIPID LEVELS



Prevention Practices: Cardiometabolic

ANNUAL PHYSICAL/WELLNESS VISIT COMPLETED



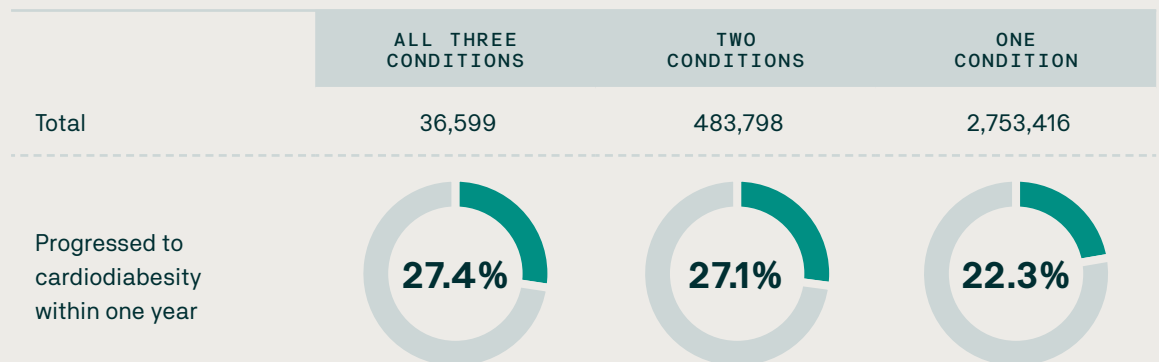
INSIGHT
02

Most patients progress to more-serious conditions within one year

88.4% of patients with cardiometabolic conditions experienced severe complications within one year

While each condition can cause health problems on its own, a combination of the three increases the chance for severe health risks. Many patients have one to two medical diagnoses in various stages of cardiometabolic and high rates of progression. This leads to more suffering, loss of productivity and higher costs. In the year following our initial analysis, 27.4% of patients with all conditions of early-stage cardiometabolic progressed to a more adverse state within one year. Another 22.3% of patients with just one risk factor or condition progressed to cardiometabolic within a year. Similarly, 45.9% and 80.5% of patients with one and two cardiometabolic-related conditions respectively developed severe complications within a year. The most-prevalent complications were more-severe diabetes, hypertension-related complications and obesity. A strong step toward prevention involves raising awareness that these risk factors may cluster in predisposed patients.

Progression of Disease in Early-Stage Cardiometabolic Patients



CARDIOMETABOLIC CONDITIONS DEVELOPED WITHIN ONE YEAR*

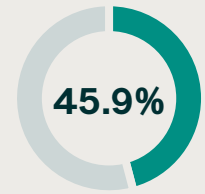
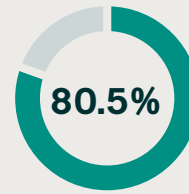
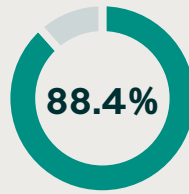
	ALL THREE CONDITIONS	TWO CONDITIONS	ONE CONDITION
Cardiovascular disease	4.3%	4.1%	4.0%
Diabetes	13.1%	11.4%	9.0%
Obesity	14.5%	16.2%	12.7%

*Based on definitions of disease states (see [page four](#)).

Complications Developed Within One Year Among Cardiodiabetes Patients

	ALL THREE CONDITIONS	TWO CONDITIONS	ONE CONDITION
Total	11,181	181,314	1,435,912

Progressed to more adverse state in one year



COMPLICATIONS*

	ALL THREE CONDITIONS	TWO CONDITIONS	ONE CONDITION
Cardiovascular-related	74.4%	33.0%	12.1%
Diabetes-related	69.1%	62.4%	19.7%
Obesity-related	22.8%	21.1%	19.9%

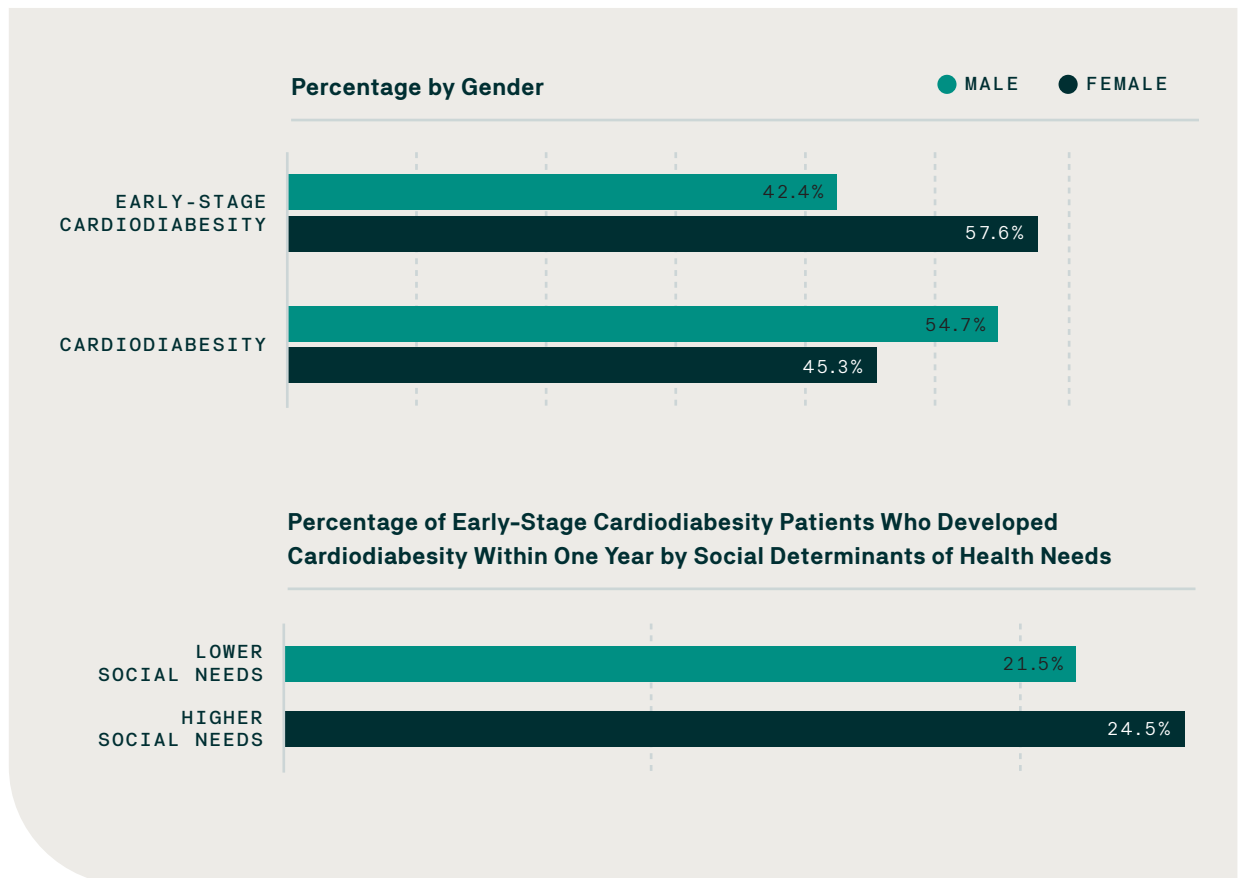
*Based on definitions of disease states (see [page four](#)).

Disease burden and progression varies by sociodemographic group

Health disparities remain a major problem in disease prevalence and health care. These disparities are evident in cardiometabolic disease among certain groups. Similar to previous research findings,¹⁰ the burden of this condition was highest among those with very high social determinant of health needs (33.8% and 29.9% for early-stage cardiometabolic disease and cardiometabolic disease respectively).

Interestingly, early-stage cardiometabolic disease is more prevalent in women (57.6%), while cardiometabolic disease and the risk of complications are more prevalent in men (54.7%). Although this might be due to biological differences, more research would need to be done on possible diagnostic delays or inaccuracies in women.¹¹ Among patients with early-stage cardiometabolic disease living in areas with lower social needs, 21.5% developed cardiometabolic disease within one year versus 24.5% in higher-needs areas.

These findings show the need for clinical and/or population health interventions to address health equity in the management of cardiometabolic disease. They also show the need to tailor interventions according to the needs of the different affected segments within the patient population.⁹





Where we go from here

The exorbitant cost in terms of both money and resources brought about by serious health conditions remains a major concern and threat to the U.S. health care system. **Our study shows that cardiometabolic disease has substantial rates of progression over a year.** Further, the early-stage cardiometabolic cohort is receiving some primary care and laboratory testing but likely not the evidence-based interventions that would halt condition progression.

Our study also shows the importance of prevention, as having all three conditions related to cardiometabolic disease instead of just one is substantially detrimental. Several U.S.-based studies have shown the impact of diabetes on health care resources.¹² A recent study of adult patients with a diagnosis of T2D reported that without proper treatment, 0.9% suffered a stroke in the following year.¹³ These studies and our findings reinforce the need for interventions that lower the risk of progression from early-stage to active disease.

It is imperative to proactively lower the prevalence of these conditions and decrease the toll they take on society and the health care system. **The right interventions need to consider both micro and macro factors that include the patient, provider and payer.** We need innovative approaches to early intervention or disease management, and we need new ways to better understand the holistic impact of these diseases on the total cost of care. This is the only way we can halt disease progression and promote equity, as well as decrease the excessive costs and resources that are weighing on our health care system.

Methodology

Data

Data came from the Komodo Healthcare Map, a nationally representative, open-source, longitudinal and de-identified claims database of more than 320 million insured individuals from all demographic and socioeconomic groups throughout the U.S. in 2019 through 2021. Drawing open and complete data from both providers and payers, the Komodo Healthcare Map provides a near real-time view of the entire patient journey, including medical and pharmacy services delivered in-network, out-of-network, and through a specialist, hospital or retail clinic, among others.

Population

We identified adult patients (≥ 18 years) across the U.S. from 2019 to 2021 and categorized them in two mutually exclusive cohorts: “early stage” and “active disease” states. Patients were followed for one year through 2022. The database is representative across various age groups and geographic locations of the insured U.S. population derived directly from payer sources, including 100% fully integrated fee-for-service Medicare, Medicare Advantage, Commercial and Medicaid claims.

Limitations

While this study has several strengths—such as the use of a large and nationally representative sample of U.S. adults, there are a few limitations to consider.

- + First, our analysis is limited to the insured adult population, and there is reason to be concerned about the growing cardiometabolic trend among the uninsured as well as in pediatric populations.
- + Second, this analysis might have underestimated the actual number of adults with these conditions and any associated outcomes because it relied on medical claims data.
- + Third, causal inference could not be drawn due to the cross-sectional nature of the analysis.
- + Fourth, no information on race/ethnicity or education level was included; thus, we were unable to assess prevalence and disparities by these factors.
- + Fifth, some conditions or variables were identified using “E” ICD-10 codes (for diagnosis), which may have resulted in an underestimation of counts in instances where additional “Z” or historical ICD-10 codes could be used.

Nonetheless, the insights derived from this analysis are important and could drive future research in better understanding cardiometabolic.

Statistical Analysis

Descriptive statistics were used to estimate means, medians, standard deviations, range for continuous measurements, and frequencies and percentages for categorical variables. A Chi-square test was used to compare categorical variables across patient groups with one, two or three condition categories, and a Kruskal-Wallis ranked test was used for continuous variables. Following convention, statistical significance was set at $p < 0.05$. Analyses were conducted using RStudio (now known as Posit), version 1.4.1564.¹⁴

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