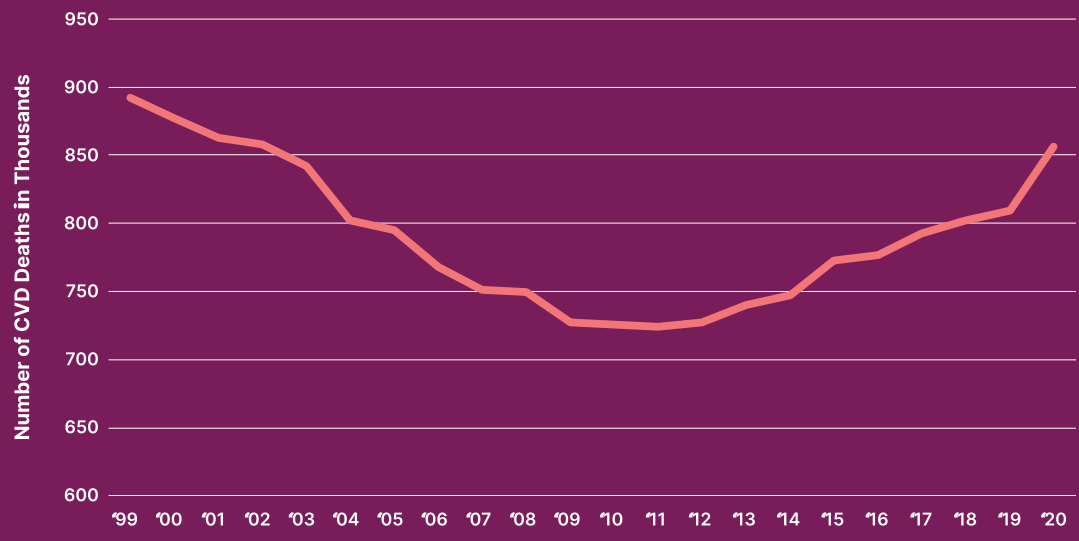
STATE OF THE HEART

Cardiovascular Disease Impact and Outlook in the United States

TAKE HEALTH TO HEART

Cardiovascular Disease Impact and Outlook in the United States

Cardiovascular disease (CVD) is the leading cause of death in the United States, killing more people each year than all forms of cancer and accidents combined.[1] Alarmingly, after a decline in cardiovascular mortality over the past several decades, the number of deaths is rising again.[2]



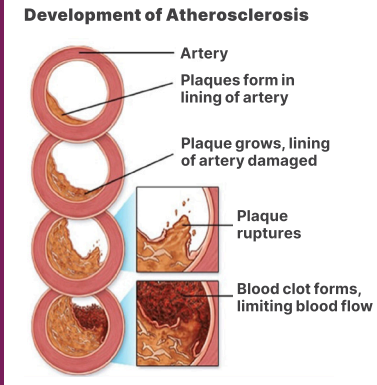
Source: Centers for Disease Control and Prevention. Leading Causes of Death Reports, 1981-2020. https://wisqars.cdc.gov/fatal-leading (Accessed December 2022). (Cardiovascular Deaths estimated as the combined total of all "Heart Disease" deaths and all "Cerebrovascular" deaths for each year between 1999 and 2020).

Most deaths from CVD are a result of atherosclerotic cardiovascular disease (ASCVD),[3] which is caused by high levels of LDL-C, or "bad cholesterol," that builds up in the blood over time. This can temporarily or permanently deprive part of the body of oxygenated blood, leading to severe outcomes.[4] Many people are familiar with these outcomes — myocardial infarction (MI) or heart attack, stable and unstable angina, stroke and transient ischemic attack, and heart disease — rather than the underlying condition of ASCVD itself.

While a multitude of risk factors contribute to the development and progression of ASCVD — including smoking, high blood pressure, obesity, and diabetes[5] — current evidence suggests that elevated LDL-C is the most readily modifiable risk factor through the use of cholesterol-lowering therapies. And yet, **just 1 in 5 ASCVD patients taking a cholesterol-lowering therapy are reaching guideline-recommended LDL-C goals**.[6]

A number of barriers stand in the way of curbing the rise in cardiovascular deaths, many of which are preventable through better risk factor control. These barriers range from insurance practices and clinical guidelines that do not prioritize cholesterol treatment targets to the social and economic factors that contribute to the burden of risk factors on underserved populations. Some medical experts also believe we are facing a coming "tsunami" of death and disability due to unmanaged common chronic diseases during the COVID-19 pandemic, especially CVD, because of disrupted or delayed patient care[7] — meaning this burden will continue escalating if significant changes are not made to address these barriers.

To help policymakers and other critical stakeholders understand the urgency of the problem, Take Health to Heart, an initiative of the Foundation of the National Lipid Association and the National Medical Association, has conducted a first-of-its-kind analysis that compares the current impact of ASCVD mortality on the nation and each state to expert-developed goals. The analysis also examines 17 measures of ASCVD-related outcomes, costs, and contributing risk factors to provide a snapshot of the nation's risk for future severe outcomes — demonstrating that recent troubling trends in cardiovascular deaths are unlikely to reverse without policy interventions to address barriers to treatment and care.



ASCVD Impact Grade

The nation and each state were assigned an ASCVD Impact Grade representing their performance on two measures of cardiovascular mortality — coronary heart disease* (CHD) mortality and stroke mortality — compared to Healthy People 2030 national targets. These measures, both of which are often outcomes of ASCVD, quantify the immediate, deadly impact of ASCVD on the country as a whole and on individual states. Healthy People 2030 is a set of data-driven national objectives to improve health and well-being over the next decade established by the U.S. Department of Health and Human Services Office of Disease Prevention and Health Promotion. The CHD and stroke mortality goals provide aspirational benchmarks against which to assess the performance of states and the nation.

> "Year after year, the statistics show that cardiovascular disease is the leading killer of Americans; deaths continue to rise even as we know more every day about how to prevent cardiovascular deaths. From patients and doctors to state and federal elected officials, all of us must take action if we want to reverse this alarming trend."
>
> **Dr. Ann M. Liebeskind** | Vice President, Foundation of the National Lipid Association

To calculate how the nation and each state are performing on CHD and stroke mortality relative to these aspirational targets, the percent difference between the Healthy People 2030 goal and the value for both measures of mortality for the nation and each state was calculated using the following equation **PD=(-GV - -TV)/-TV**, where **PD** is percent difference, **GV** is the geographic (state or national) value, and **TV** is the Healthy People 2030 target value.

Percent differences less than 0 represent those that have met or exceeded the national target. Differences greater than 0 represent what percent change would be necessary to meet the Health People 2030 target. The mean of the percent difference for the two measures was calculated and used to assign the ASCVD Impact Grade to the nation and each state. Because mortality data were not available for Puerto Rico, the territory was excluded from the grades.

* A type of heart disease where the arteries of the heart cannot deliver enough oxygen-rich blood to the heart, often caused by atherosclerosis.

CORONARY HEART DISEASE DEATH RATE

Per 100,000 population

U.S.	91.8
Healthy People 2030 Target	71.1

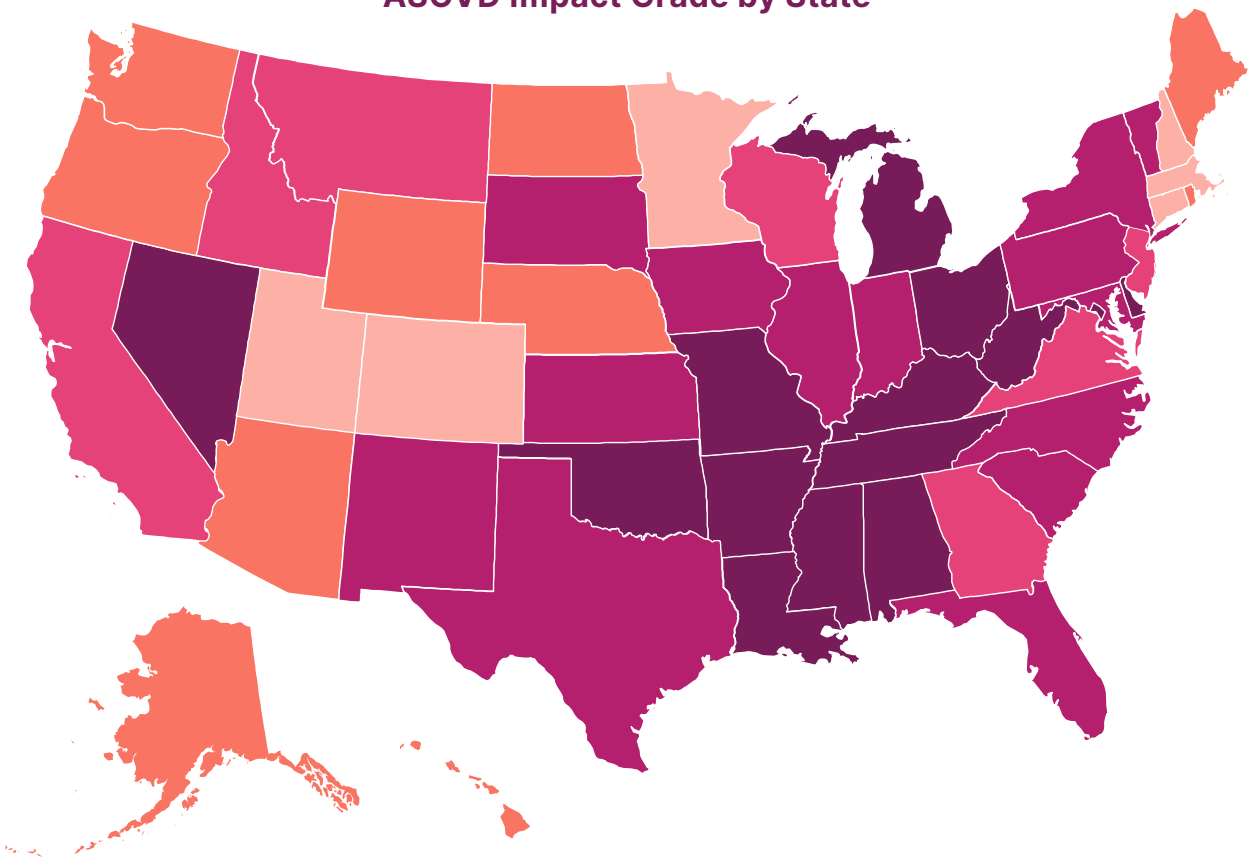
STROKE DEATH RATE

Per 100,000 population

U.S.	38.8
Healthy People 2030 Target	33.4

In mortality from both CHD and stroke, the U.S. received a D compared to the Healthy People 2030 targets: CHD mortality was 91.8 deaths per 100,000 population in 2020 versus the goal of 71.1[8] and stroke mortality was 38.8 per 100,000 versus the goal of 33.4.[9] More than half of states across the U.S. received a D or F, with the highest concentration of states with a failing grade located in the Southern and Midwest regions of the country.

ASCVD Impact Grade by State



Grade	Criteria
A	Mean percent differences met or exceeded the Healthy People 2030 target value
B	Mean percent differences need an average decrease of 0-10%
C	Mean percent differences need an average decrease of 11-20%
D	Mean percent differences need an average decrease of 21-30%
F	Mean percent differences need an average decrease of more than 30%

The Current Burden of ASCVD

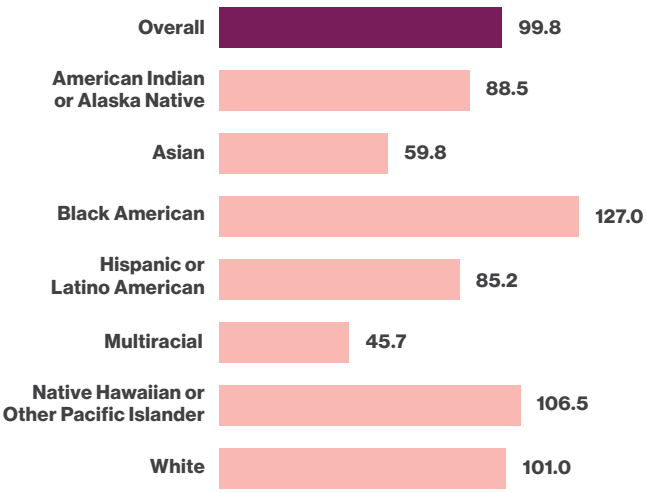
A conservative estimate of the nationwide prevalence of ASCVD in 2021 is 8.0%, or nearly 22.3 million American adults who have reported they've been diagnosed with angina, a stroke, a heart attack, or heart disease, all of which are manifestations of ASCVD.[10] This measure solely represents the adult population with diagnosed ASCVD based on these outcomes and does not include those with other conditions like peripheral artery disease (PAD), transient ischemic attacks (TIA), carotid artery stenosis, aortic atherosclerotic disease, or those with undiagnosed ASCVD — and thus, likely underestimates the total population with ASCVD.

The American Indian/Alaska Native population faces the highest rate of ASCVD prevalence at 12.9%, followed by White (9.4%), Black (9.0%), and multiracial (8.5%) adults. Asian adults (3.3%) had the lowest prevalence, followed by Hispanic (5.0%) and Native Hawaiian (6.0%) adults. Also, males (9.4%) had a higher ASCVD prevalence compared with females (7.2%).

In 2020, ASCVD was an underlying cause of death for 416,096 Americans. Black Americans experienced worse outcomes than other races, with the highest age-adjusted death rates (127.0 per 100,000) across all racial/ethnic groups. Males (134.0 deaths per 100,000) also had a higher age-adjusted ASCVD mortality rate than females (72.1).

Age-Adjusted ASCVD Mortality by Race

Deaths per 100,000 population



> "While cardiovascular disease is a crisis for all Americans, underserved populations, including racial and ethnic minorities, women, and rural Americans, continue to endure profound disparities in cardiovascular outcomes and care — rooted in longstanding inequities in the social and economic conditions that shape us and our communities. To combat the disparities we see in deaths from heart disease, we must not only improve the quality of care but also address the barriers that stand in the way of individuals being able to access care, treatment, and prevention in the first place."
>
> **Dr. Millard D. Collins** | Family Medicine Section Chair, National Medical Association

Millions of Americans have experienced major adverse cardiac events in their lifetime: an estimated **10,850,800 adults reported surviving a heart attack and 8,690,600 reported surviving a stroke** — equivalent to 4.0% and 3.0% of adults, respectively.[11,12] Heart attacks and strokes can have an enormous impact on patients, their families, and the nation as a whole. They often have debilitating long-term effects,[13] and those who survive them are at higher risk for future cardiac events.[14] Regrettably, an estimated **80% of strokes are preventable**,[15] meaning many of these tragedies could have been avoided through better use of medicines and other clinical interventions, as well as preventive measures to help patients improve their diet, increase their exercise, limit their drinking, and reduce their tobacco use.

In addition to the severe health burden on individuals and families, ASCVD takes a massive toll on the economy. **The U.S. spends roughly $126 billion on direct medical expenses for ASCVD care each year** in 2015 dollars, and heart disease and stroke represent the largest medical expenditures in the country.[16] Beyond direct health care costs, heart disease and stroke have been estimated to result in $151.8 billion in lost productivity.[2] Reducing the prevalence of ASCVD and its risk factors has been shown to lower costs for the government, payers, and patients.[17]

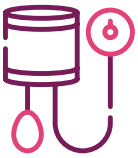
Health Risk Factors

Key health risk factors for ASCVD include high cholesterol, high blood pressure, diabetes, and obesity. While these may be influenced by lifestyle changes such as diet and exercise, the social determinants of health play a key role in shaping an individual's health and well-being.

Genetic factors like family history of heart disease and elevated levels of lipoprotein (a), also referred to as Lp(a), can also contribute to an individual's risk for ASCVD.

The current prevalence of these critical ASCVD risk factors is reported below based on 2021 data.

35.7% of adults reported having high cholesterol. High levels of LDL-C, or "bad cholesterol," contribute to the process of atherosclerosis (the buildup of plaques in the arteries)[4] and raise the risk for heart disease, stroke, and death — especially when exposed to high LDL-C levels over a lifetime.[18,19] Healthy People 2030 has set a population target of a mean total blood cholesterol level of 186.4 milligrams per deciliter (mg/dL), substantially lower than the current level of 190.9 mg/dL.[20]



32.5% of adults reported having high blood pressure, also known as hypertension.[21] Over time, the force from consistent high blood pressure damages arteries, allowing plaque to build up, causing the arteries to narrow, and resulting in more pressure needed to pump blood from the heart — a vicious cycle that can further harm the heart and lead to heart disease and stroke.[22,23]

11.0% of adults reported having diabetes, a key comorbid condition with ASCVD.[24] Over time, high blood sugar caused by diabetes can further impair already-damaged blood vessels and contribute to ASCVD.[25] Among individuals with diabetes, ASCVD is the leading cause of morbidity and mortality.[2,3] Additionally, like for many other cardiovascular outcomes and risk factors, some research has shown that infection from COVID-19 increases an individual's risk of developing diabetes.[26]

33.9% of adults reported living with obesity, based on their reported height and weight — putting them at increased risk for a number of serious health conditions including ASCVD.[27,28] Like many other risk factors, obesity is not determined by individual choices alone; access to healthy food, having leisure time to participate in physical activity, living in an area where exercise is both practical and safe, and education about nutrition and exercise all contribute to obesity, as do a range of biologic and genetic factors.

A lesser-known independent risk factor for ASCVD is elevated levels of a type of cholesterol called Lp(a), which is structurally similar to LDL-C.[29,30] Elevated Lp(a) is a largely inherited risk factor for ASCVD, regulated mostly by variation in a single gene,[31] and is shown to be causal of heart attacks[32] and strokes.[33] **It is estimated that 20% of Americans, or 60 million people, have elevated levels of Lp(a), which can lead to ASCVD.**[34] Despite its prevalence and associated risks, many people with elevated Lp(a) are unaware of their condition because of low screening rates, driven by a lack of screening guidelines.

Social determinants of health shape prevalence of ASCVD and its risk factors.

A complex set of societal barriers contribute to the development of obesity, diabetes[35,36] and other risk factors, as well as behaviors like diet and exercise. Aspects of the social and physical environment — such as education, income level, availability of healthy food and safe spaces for physical activity, and history of maltreatment during childhood — all shape an individual's likelihood of developing ASCVD risk factors and thus the condition itself.[27,37] Many of these social determinants are rooted in structural inequities that contribute to the wide disparities in ASCVD and other poor health outcomes we see today in underserved communities. Preventing cardiovascular deaths requires understanding and addressing these upstream factors through policy change — beyond just individual lifestyle changes.

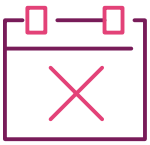
For example, barriers to regular consumption of fruits and vegetables include cost, lack of access to fresh produce, perceived lack of preparation time, and lack of cooking knowledge.[38] Additionally, due in part to historic inequities, some Americans live in areas known as food deserts, where access to fresh, healthy foods is limited.[39]

Health Behaviors

For those diagnosed with ASCVD, the disease's development and progression can often be effectively managed through a healthy lifestyle and appropriate use of medication.[40] However, maintaining healthy habits and adhering to medication regimens can be challenging, including for reasons related to the social determinants of health — putting patients at higher risk for poor cardiovascular outcomes like heart attack, stroke, and death. The prevalence of health behaviors that contribute to ASCVD is reported below based on 2021 data.

15.3% of adults reported engaging in binge drinking during the past 30 days (four or more drinks in one sitting for women; five or more for men), which can contribute to significant health problems including ASCVD.[41,42]

14.4% of adults reported smoking cigarettes daily or some days, greatly increasing the risk of ASCVD.[43] Smoking is also associated with the development of atherosclerosis, or plaque build-up, in adolescents and young adults — and even secondhand smoke exposure has been shown to increase the risk of ASCVD.[43] While cigarette smoking rates are decreasing nationwide, they vary widely by state and by socioeconomic status[44] and rates of e-cigarette use are increasing,[45] with uncertain health consequences.



23.7% of adults reported being physically inactive in the past 30 days. Lack of regular moderate intensity exercise is a key risk factor for ASCVD.[46] While often framed as a lifestyle choice, the safety and accessibility of the built environment plays a large role in shaping an individual's ability to exercise.[47]

Coverage and Preventive Services

The staggering societal and economic burden of ASCVD across the U.S. is exacerbated by barriers to accessing preventive services — including screening for ASCVD risk factors — and accessing medicines to address risk factors before they result in serious cardiac events.

Screening for ASCVD is critical for assessing a patient's risk for the disease and guiding treatment plans for those deemed to be at risk. It often involves calculating a 10-year or lifetime risk of ASCVD based on the following factors: a personal history of diabetes; smoking; treatment for hypertension; age; sex; race; total cholesterol; HDL cholesterol; and systolic blood pressure.[48]

Providers often underestimate the risk of cardiovascular disease risk in women, resulting in suboptimal care.[49]

Women with ASCVD report experiencing significant disparities in care compared to men, such as:

- Poor communication with their health care providers, including that their providers do not explain things in understandable terms, respect what they have to say as a patient, spend sufficient time with them, or listen carefully.
- Poor satisfaction with their health care experience.
- Lower use of aspirin and statins, as doctors are more likely to recommend lifestyle modifications for women with heart disease than lipid-lowering therapies.[50]
- More hospital emergency department visits.[51]

Estimates of coverage and preventive services that can impact cardiovascular health are reported below based on 2021 data.

Unfortunately, **8.6% of the U.S. population — roughly 28.2 million Americans — lacks health insurance**. On top of this, there are tens of millions more Americans that are considered "underinsured," meaning they have a health plan with high out-of-pocket costs relative to their income level.[52] Uninsured and underinsured patients often have limited access to screening for ASCVD and other conditions,[53] hindering early medical interventions that can help avoid costly and potentially deadly ASCVD-related outcomes. Many of these patients also face hurdles accessing treatments like cholesterol-lowering therapies, despite research suggesting that lower out-of-pocket costs for these medicines result in better patient adherence and fewer ASCVD deaths.[54]

> "From a clinical perspective, we've made tremendous progress over the past few decades in how we screen for, treat, and manage ASCVD. However, too often, things outside of a health care provider's and patient's control — from insurance practices and quality measures to the social determinants of health — limit our ability to improve outcomes for patients."
>
> **Dr. Hakeem Ayinde** | Cardiac Electrophysiologist, Co-Chair, Cardiology Subsection, National Medical Association

With high cholesterol considered a key risk factor for ASCVD, expert organizations including the American Heart Association and the American College of Cardiology recommend that all adults undergo regular cholesterol screenings.[55] In 2019, **85.3% of adults reported receiving a cholesterol check in the past five years**.

While this figure is heartening, this does not necessarily translate to effective treatment of ASCVD or good outcomes. In fact, despite similar prevalence of high cholesterol across racial/ethnic populations,[56] compared to White Americans, Black, Hispanic, and Asian Americans were 35%, 32%, and 11% less likely, respectively, to report use of statins, the standard therapy for high cholesterol.[57]

Even for those patients with ASCVD that are able to access treatment, adherence can pose a significant challenge as can the ability to access advanced therapies. **In fact, among patients with ASCVD taking a statin, just 20% actually reach healthy levels of LDL-C**[6] and it is estimated that up to two-thirds of patients stop taking their cholesterol-lowering therapy within one year of starting treatment.[58]

This may be due in part to the nature of quality measures in cardiovascular care. Despite research showing that exposure to unhealthy levels of LDL-C over a person's lifetime increases their risk for ASCVD and outcomes like stroke and heart attack,[59] current quality measures don't orient patient treatment to evidence-based targets.[60] What's more, insurance practices — like prior authorization, in which insurance companies must approve the medication that a patient was prescribed by their provider before covering the therapy — can often stand in the way of patients' access to advanced therapies for more severe forms of ASCVD. These practices can delay care[61] and cause patients to abandon the treatment prescribed by their providers — both of which can contribute to serious cardiovascular events.[62]

Additionally, just **79.2% of adults with high blood pressure reported currently taking medicine to control it** — meaning a large percentage are not adequately controlling their ASCVD risk by addressing the harmful effects of high blood pressure on the circulatory system.[22] Furthermore, just 16.1% of adults with high blood pressure had it under control in 2017-20, compared to the Healthy People 2030 goal of 18.9%.[63]

Finally, from 2015-21, **less than 3.5% of Medicare beneficiaries were screened for elevated levels of Lp(a)** — despite research showing that elevated Lp(a) is an important independent risk factor for ASCVD.[34] Currently, there are no uniform screening guidelines and different scientists suggest different risk thresholds.[64,65]

Take Action to Stop the Rise in Cardiovascular Deaths

The data included in this report paint a grim picture of the nation's cardiovascular health — and make it clear that we must take action to stop the staggering number of preventable deaths from ASCVD. However, a variety of policy barriers stand in the way.

Through our Take Health to Heart initiative, the Foundation of the National Lipid Association and the National Medical Association call on leaders in government to enact policy changes at the state and federal levels to help reverse the alarming trend in cardiovascular deaths, particularly for underserved populations. **Our policy agenda is driven by four key priorities we believe are necessary to lead to lasting change in cardiovascular outcomes**:

Ensure broad, appropriate, and timely access to care and treatment through reforms to prior authorization policies.

Address the socioeconomic barriers that contribute to disparities in cardiovascular outcomes through increased funding and use of programs that improve access to care for underserved populations.

Improve the quality of cardiovascular care through updated quality measures that encourage patients to control modifiable risk factors like LDL-C cholesterol.

Enable collaboration across health care stakeholders to address urgent health challenges through value-based arrangements that improve patient access to innovative therapies.

Sources and Methodology

The ASCVD mortality measure was calculated using Centers for Disease Control and Prevention's (CDC) 2020 Underlying Cause of Death data for primary cause of death International Classification of Diseases (ICD) 10 codes I20-25, I63, and I67.2, which includes ischemic heart disease, cerebral infarction, and cerebral atherosclerosis. Crude and age-adjusted rates were calculated. Age-adjusted mortality rates for coronary heart disease were calculated using ICD-10 codes I20-I25. Age-adjusted mortality rates for stroke were calculated using ICD-10 codes I60-I69. Data are based on death certificates for U.S. residents. Each death certificate contains a single underlying cause of death, up to twenty additional multiple causes, and demographic data. National and state rates were calculated per 100,000 deaths. The 2000 U.S. standard population was used to calculate the age-adjusted rates. Rates for the District of Columbia were also calculated. State estimates were suppressed when the number of deaths in the population group was less than 20. Puerto Rico was not included in the dataset.

Most non-mortality measures were calculated using 2021 survey data from the CDC's Behavioral Risk Factor Surveillance System (BRFSS). Of note, 2021 data were not available for Florida, so 2020 or 2019 data were used instead. State-level estimates were calculated for each measure as well as a 95% confidence interval. Estimates were also calculated for the District of Columbia and Puerto Rico. National estimates were calculated using the median of the 50 states and the District of Columbia. Estimates were suppressed if the sample size was less than 50 or the relative standard error was greater than 30%.

The national level population affected estimation for ASCVD prevalence, heart attack, and stroke were corrected for the absence of Florida in the 2021 BRFSS data. Florida's 2020 BRFSS population affected estimate was added to the national population affected estimate as the closest point of comparison. The result is corrected ASCVD prevalence, heart attack, and stroke population affected estimates which are mixtures of 2021 and 2020 BRFSS data.

Lack of health insurance was sourced from 2021 data from the U.S. Census Bureau's American Community Survey. Estimates for the 50 states, District of Columbia, Puerto Rico, and the nation were obtained from summary tables available at https://data.census.gov/cedsci/. 95% confidence intervals were calculated for each prevalence estimate from the margin of error.

The ASCVD cost measure was calculated using a national level estimate of the cost of ASCVD and the population affected estimate for ASCVD prevalence in each state. The cost estimate was taken from Projections of Cardiovascular Disease Prevalence and Costs: 2015–2035 by Olga Khavjou, Diana Phelps, and Alyssa Leib.

Screening prevalence of lipoprotein (a) was calculated using Current Procedural Terminology (CPT) code 83695 on health care claims using national Medicare Standard Analytic Files, containing 100% of the claims for institutional settings of care and all non-institutional claims for a 5% statistical sample of Medicare Fee-For-Service (FFS) beneficiaries for calendar years 2015-2021. Beneficiaries had to have Part A and Part B coverage for inclusion in this analysis. National rates for calendar years 2015-2021 were calculated, as well as a pooled rate across years.

References

1 Leading Causes of Death. Centers for Disease Control and Prevention. https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm (Accessed January 24, 2023).

2 Tsao CW, Aday AW, Almarzooq ZI, et al. Heart Disease and Stroke Statistics—2022 Update: A Report From the American Heart Association. Circulation. 2022;(145)8: e153–e639. https://www.ahajournals.org/doi/full/10.1161/CIR.0000000000001052

3 Roth GA, Johnson C, Abajobir A, et al. Global, regional, and national burden of cardiovascular disease for 10 causes, 1990 to 2015. Journal of the American College of Cardiology. 2017;70(1): 1-25. https://doi.org/10.1016/j.jacc.2017.04.052

4 What is Cholesterol? American Heart Association. https://www.heart.org/en/health-topics/cholesterol/about-cholesterol (Accessed January 24, 2023).

5 Atherosclerosis. Johns Hopkins Medicine. https://www.hopkinsmedicine.org/health/conditions-and-diseases/atherosclerosis (Accessed January 24, 2023).

6 Wong ND, Young D, Zhao Y, et al. Prevalence of the American College of Cardiology/American Heart Association statin eligibility groups, statin use, and low-density lipoprotein cholesterol control in US adults using the National Health and Nutrition Examination Survey 2011-2012. Journal of Clinical Lipidology. 2016;10(5): 1109-1118. https://doi.org/10.1016/j.jacl.2016.06.011

7 Califf RM. Avoiding the coming tsunami of common, chronic disease: What the lessons of the COVID-19 pandemic can teach us. Circulation. 2021;143: 1831-1834. https://doi.org/10.1161/circulationaha.121.053461

8 Reduce coronary heart disease deaths. Healthy People 2030. https://health.gov/healthypeople/objectives-and-data/browse-objectives/heart-disease-and-stroke/reduce-coronary-heart-disease-deaths-hds-02 (Accessed January 24, 2023).

9 Reduce stroke deaths. Healthy People 2030. https://health.gov/healthypeople/objectives-and-data/browse-objectives/heart-disease-and-stroke/reduce-stroke-deaths-hds-03 (Accessed January 24, 2023).

10 Fang J, George M, Hong Y, Loustalot F. Use of Aspirin for Prevention of Recurrent Atherosclerotic Cardiovascular Disease Among Adults — 20 States and the District of Columbia, 2013. Morbidity and Mortality Weekly Report. 2015;64(27): 733-737. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4584583/

11 What is a Heart Attack? American Heart Association. https://www.heart.org/en/health-topics/heart-attack/about-heart-attacks (Accessed January 24, 2023).

12 Ischemic Stroke (Clots). American Stroke Association. https://www.stroke.org/en/about-stroke/types-of-stroke/ischemic-stroke-clots (Accessed January 24, 2023).

13 Effects of Stroke. American Stroke Association. https://www.stroke.org/en/about-stroke/effects-of-stroke (Accessed January 24, 2023).

14 Mollon L, Bhattacharjee, S. Health related quality of life among myocardial infarction survivors in the United States: a propensity score matched analysis. Health and Quality of Life Outcomes. 2017;15: 235. https://doi.org/10.1186/s12955-017-0809-3

15 Preventing Stroke Deaths. Centers for Disease Control and Prevention. https://www.cdc.gov/vitalsigns/stroke/index.html (Accessed January 24, 2023).

16 Health and Economic Costs of Chronic Diseases. Centers for Disease Control and Prevention. https://www.cdc.gov/chronicdisease/about/costs/index.htm (Accessed January 24, 2023).

17 Cost-Effectiveness of High Blood Pressure Interventions. Centers for Disease Control and Prevention. https://www.cdc.gov/chronicdisease/programs-impact/pop/high-blood-pressure.htm (Accessed January 24, 2023).

18 Ference BA, Ginsberg HN, Graham I, et al. Low-density lipoproteins cause atherosclerotic cardiovascular disease. 1. Evidence from genetic, epidemiologic, and clinical studies. A consensus statement from the European Atherosclerosis Society Consensus Panel. European Heart Journal. 2017; 38(32): 2459-2472. https://doi.org/10.1093/eurheartj/ehx144

19 Brandts J and Ray K. Low Density Lipoprotein Cholesterol-Lowering Strategies and Population Health: Time to Move to a Cumulative Exposure Model. Circulation. 2020;141(11): 873-876. https://doi.org/10.1161/CIRCULATIONAHA.119.043406

20 Reduce cholesterol in adults. Healthy People 2030. https://health.gov/healthypeople/objectives-and-data/browse-objectives/heart-disease-and-stroke/reduce-cholesterol-adults-hds-06 (Accessed January 24, 2023).

21 Benjamin EJ, Muntner P, Alonso A, et al. Heart Disease and Stroke Statistics-2019 Update: A Report From the American Heart Association. Circulation. 2019;139(10): e56-e528. https://doi.org/10.1161/CIR.0000000000000659

22 Hollander W. Role of hypertension in atherosclerosis and cardiovascular disease. American Journal of Cardiology. 1976;38(6):786-800. https://doi.org/10.1016/0002-9149(76)90357-x

23 What is High Blood Pressure? American Heart Association. https://www.heart.org/en/health-topics/high-blood-pressure/the-facts-about-high-blood-pressure/what-is-high-blood-pressure (Accessed January 24, 2023).

24 American Diabetes Association. 10. Cardiovascular Disease and Risk Management: Standards of Medical Care in Diabetes-2020 [published correction appears in Diabetes Care. 2020;43(8):1977-1978]. Diabetes Care. 2020;43(Suppl 1): S111-S134. https://doi.org/10.2337/dc20-S010

25 Diabetes and Your Heart. Centers for Disease Control and Prevention. https://www.cdc.gov/diabetes/library/features/diabetes-and-heart.html (Accessed January 24, 2023).

26 Watson C. Diabetes risk rises after COVID, massive study finds. Nature. March 31, 2022. https://www.nature.com/articles/d41586-022-00912-y (Accessed January 24, 2023).

27 Adult Obesity Causes & Consequences. Centers for Disease Control and Prevention. https://www.cdc.gov/obesity/adult/causes.html (Accessed January 24, 2023).

28 Grundy SM. Obesity, metabolic syndrome, and cardiovascular disease. Journal of Clinical Endocrinology and Metabolism. 2004;89(6): 2595-2600. https://doi.org/10.1210/jc.2004-0372

29 McCormick S. Lipoprotein(a): Biology and Clinical Importance. Clinical Biochemist Reviews. 2004;25(1): 69-80. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1853362/.

30 Tada H, Takamura M, Kawashiri M. Lipoprotein(a) as an Old and New Causal Risk Factor for Atherosclerotic Cardiovascular Disease. Journal of Atherosclerosis and Thrombosis. 2019;26(7): 583-591. https://doi.org/10.5551/jat.RV17034

31 Boerwinkle E, Leffert C, Lin J, Lackner C, Chiesa G, Hobbs H. Apolipoprotein(a) gene accounts for greater than 90% of the variation in plasma lipoprotein(a) concentrations. Journal of Clinical Investigation. 1992;90(1): 52-60. https://doi.org/10.1172/JCI115855

32 Cegla J, Neely R, France M, et al. HEART UK consensus statement on Lipoprotein(a): A call to action. Atherosclerosis. 2019;291: 62-70. https://doi.org/10.1016/j.atherosclerosis.2019.10.011

33 The Emerging Risk Factors Collaboration. Lipoprotein(a) Concentration and the Risk of Coronary Heart Disease, Stroke, and Nonvascular Mortality. Journal of the American Medical Association. 2009;302(4): 412-423. https://doi.org/10.1001/jama.2009.1063

34 Lp(a) Screening for Individuals at High ASCVD Risk. National Lipid Association. https://www.lipid.org/sites/default/files/lpa_infographic.pdf (Accessed January 24, 2023).

35 Hamman RF, Wing RR, Edelstein SL, et al. Effect of weight loss with lifestyle intervention on risk of diabetes. Diabetes Care. 2006;29(9): 2102-2107. https://doi.org/10.2337/dc06-0560

36 Schulze MB, Hu FB. Primary prevention of diabetes: what can be done and how much can be prevented? Annual Review of Public Health. 2005;26(1): 445-467. https://10.1146/annurev.publhealth.26.021304.144532

37 Danese A, Tan M. Childhood maltreatment and obesity: systematic review and meta-analysis. Molecular Psychiatry. 2014;19(5): 544-554. https://doi.org/10.1038/mp.2013.54

38 Singleton CR, Fouché S, Deshpande R, et al. Barriers to fruit and vegetable consumption among farmers' market incentive programme users in Illinois, USA. Public Health Nutrition. 2018;21(7): 1345-1349. https://doi.org/10.1017/S1368980018000101

39 Dutko P, Ver Ploeg M, and Farrigan T. Characteristics and Influential Factors of Food Deserts, ERR-140. U.S. Department of Agriculture, Economic Research Service. August 2012. https://www.ers.usda.gov/webdocs/publications/45014/30940_err140.pdf#page=5.

40 Arnett D, Blumenthal R, Albert M, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease. Journal of the American College of Cardiology. 2019;74(10): e177-e232. https://10.1161/CIR.0000000000000678

41 Binge Drinking Fact Sheet. Centers for Disease Control and Prevention. https://www.cdc.gov/alcohol/fact-sheets/binge-drinking.htm. (Accessed January 24, 2023).

42 Binge drinking in college can lead to heart disease later in life. Science Daily. April 23, 2013. https://www.sciencedaily.com/releases/2013/04/130423161905.htm (Accessed January 24, 2023).

43 Gallucci G, Tartarone A, Lerose R, Lalinga A, Capobianco A. Cardiovascular risk of smoking and benefits of smoking cessation. Journal of Thoracic Disease. 2020;12(7): 3866-3876. https://doi.org/10.21037/jtd.2020.02.47

44 Public Health Impact: Smoking. America's Health Rankings. 2022. https://www.americashealthrankings.org/explore/annual/measure/Smoking (Accessed January 24, 2023).

45 Public Health Impact: E-cigarette Use. America's Health Rankings. 2022. https://www.americashealthrankings.org/explore/annual/measure/eciguse (Accessed January 24, 2023).

46 Hsu S, Van-Khue T, Ashen M. A Clinician's Guide to the ABCs of Cardiovascular Disease Prevention: The Johns Hopkins Ciccarone Center for the Prevention of Heart Disease and American College of Cardiology Cardiosource Approach to the Million Hearts Initiative. Clinical Cardiology. 2013;36(7): 383-393. https://doi.org/10.1002%2Fclc.22137

47 Buck C, Eiben G, Lauria F, et al. Urban Moveability and physical activity in children: longitudinal results from the IDEFICS and I.Family cohort. International Journal of Behavioral Nutrition and Physical Activity. 2019;16(1): 128. https://doi.org/10.1186/s12966-019-0886-2

48 ASCVD Risk Estimator. American College of Cardiology. https://tools.acc.org/ldl/ascvd_risk_estimator/index.html#!/calulate/estimator/risk_enhancing_factors (Accessed January 24, 2023).

49 Mosca L, Navar AM, Wenger NK. Reducing Cardiovascular Disease Risk in Women Beyond Statin Therapy: New Insights 2020. Journal of Women's Health. 2020;29(8): 1091–1100. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7476379/.

50 Ries J. Heart Disease: Study Finds Women Get Different Medical Advice Than Men. Healthline. December 5, 2022. https://www.healthline.com/health-news/heart-disease-study-finds-women-get-different-medical-advice-than-men (Accessed January 24, 2023).

51 Okunrintemi V, Valero-Elizondo J, Patrick B, et al. Gender differences in patient-reported outcomes among adults with atherosclerotic cardiovascular disease. Journal of the American Heart Association. 2018;7(24): e010498. https://doi.org/10.1161/JAHA.118.010498

52 The Commonwealth Fund. U.S. Health Insurance Coverage in 2020: A Looming Crisis in Affordability. August 2020. https://www.commonwealthfund.org/sites/default/files/2020-08/Collins_looming_crisis_affordability_biennial_2020_sb.pdf. (Accessed January 24, 2023).

53 Freeman J, Kadiyala S, Bell J, Martin D. The Causal Effects of Health Insurance on Utilization and Outcomes in Adults: A Systematic Review of US Studies. Medical Care. 2008;46(10): 1023-1032. https://doi.org/10.1097/MLR.0b013e318185c913

54 Ngo-Metzger Q, Zuvekas S, Bierman A. Estimated Impact of US Preventive Services Task Force Recommendations on Use and Cost of Statins for Cardiovascular Disease Prevention. Journal of General Internal Medicine. 2018;33: 1317-1323. https://doi.org/10.1007/s11606-018-4497-4

55 What Your Cholesterol Levels Mean. American Heart Association. https://www.heart.org/en/health-topics/cholesterol/about-cholesterol/what-your-cholesterol-levels-mean - .WjFSSt-nGUk (Accessed January 24, 2023).

56 Racial and Ethnic Disparities in Heart Disease. Centers for Disease Control and Prevention. April 2019. https://www.cdc.gov/nchs/hus/spotlight/HeartDiseaseSpotlight_2019_0404.pdf. (Accessed January 24, 2023).

57 Salami JA, Warraich, H, Valero-Elizondo J, et al. National trends in statin use and expenditures in the US adult population from 2002 to 2013. JAMA Cardiology. 2017;2(1):56-65. https://pubmed.ncbi.nlm.nih.gov/27842171/

58 Turin A, Pandit J, Stone N. Statins and Nonadherence: Should We RELATE Better? Journal of Cardiovascular Pharmacology and Therapeutics. 2015;20(5): 447-456. https://doi.org/10.1177/1074248415578170

59 Brandts J, Ray KK. Low Density Lipoprotein Cholesterol-Lowering Strategies and Population Health: Time to Move to a Cumulative Exposure Model. Circulation. 2020;141(11): 873-876. https://doi.org/10.1161/CIRCULATIONAHA.119.043406

60 Flueckiger P, Yeboah J. Implications of the 2013 ACC/AHA Cholesterol Guidelines on Cardiovascular Practice. American College of Cardiology. July 30, 2015. https://www.acc.org/latest-in-cardiology/articles/2015/07/23/07/56/implications-of-the-2013-acc-aha-cholesterol-guidelines-on-cardiovascular-practice (Accessed January 24, 2023).

61 2021 AMA prior authorization (PA) physician survey. American Medical Association. 2022. https://www.ama-assn.org/system/files/prior-authorization-survey.pdf (Accessed January 24, 2023).

62 Myers K, Farboodi N, Mwamburi M, et al. Effect of Access to Prescribed PCSK9 Inhibitors on Cardiovascular Outcomes. Circulation. 2019;12: e005404. https://www.ahajournals.org/doi/10.1161/CIRCOUTCOMES.118.005404

63 Increase control of high blood pressure in adults. Healthy People 2030. https://health.gov/healthypeople/objectives-and-data/browse-objectives/heart-disease-and-stroke/increase-control-high-blood-pressure-adults-hds-05. (Accessed January 24, 2023).

64 Varvel S, McConnell J, Tsimikas S. Prevalence of Elevated Lp(a) Mass Levels and Patient Thresholds in 532 359 Patients in the United States. Arteriosclerosis, Thrombosis, and Vascular Biology. 2016;36: 2239-2245. https://doi.org/10.1161/ATVBAHA.116.308011

65 Nordestgaard B, Chapman M, Ray K, et al. Lipoprotein(a) as a cardiovascular risk factor: current status. European Heart Journal. 2010;31(23): 2844-2853. https://doi.org/10.1093/eurheartj/ehq386

About Take Health to Heart

Take Health to Heart is an education and advocacy initiative of the Foundation of the National Lipid Association and the National Medical Association. Take Health to Heart is made possible through a sponsorship from Novartis Pharmaceuticals Corporation. To learn more about the initiative and its policy agenda, visit **TakeHealthToHeart.org**.

The Foundation of the National Lipid Association is a non-profit organization focused on providing education and resources to help patients and their families manage and overcome lipid-related health problems that may put them at risk for a heart attack or stroke. Learn more here.

The National Medical Association is the largest and oldest national organization representing African American physicians and their patients in the United States, serving as the collective voice of more than 50,000 physicians nationwide. Learn more here.

TAKE HEALTH TO HEART

FOUNDATION of the National Lipid Association
Learn Your Lipids

NMA Since 1895 National Medical Association