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Authors

Wenger, Nanette K
Lloyd-Jones, Donald M
Elkind, Mitchell SV
[et al.](#)

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Call to Action for Cardiovascular Disease in Women: Epidemiology, Awareness, Access, and Delivery of Equitable Health Care: A Presidential Advisory From the American Heart Association

Nanette K. Wenger, MD, FAHA* [Chair],
Emory University School of Medicine

Donald M. Lloyd-Jones, MD, ScM, FAHA* [Vice Chair],
Northwestern University Feinberg School of Medicine

Mitchell S.V. Elkind, MD, MS, FAHA,
Columbia University

Gregg C. Fonarow, MD, FAHA,
UCLA Medical Center

John J. Warner, MD, FAHA,
University of Texas Southwestern Medical Center

Heather M. Alger, PhD, MPH,
American Heart Association

Susan Cheng, MD, FAHA,
Cedars-Sinai Medical Center

Claire Kinzy,
American Heart Association

Jennifer L. Hall, PhD, FAHA,
American Heart Association

Véronique L. Roger, MD, MPH, FAHA
National Institutes of Health

on behalf of the American Heart Association

Abstract

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*N.K. Wenger and D.M. Lloyd-Jones contributed equally and are co–first authors.

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Addressing the pervasive gaps in knowledge and care delivery to reduce sex-based disparities and achieve equity is fundamental to the American Heart Association's commitment to advancing cardiovascular health for all by 2024. This presidential advisory serves as a call to action for the American Heart Association and other stakeholders around the globe to identify and remove barriers to health care access and quality for women. A concise and current summary of existing data across the areas of risk and prevention, access and delivery of equitable care, and awareness and education provides a framework to consider knowledge gaps and research needs critical toward achieving significant progress for the health and well-being of all women.

Keywords

AHA Scientific Statements; epidemiology; health; heart disease; prevention; women

Cardiovascular disease remains the most common cause of death among US women and men today,¹ as was true 30 years ago.² During the past 5 decades, basic discoveries and clinical research studies have uncovered important biological differences between women and men, and differences in their respective responses to social, environmental, and behavioral stresses, as well. The underrepresentation of women in all aspects of biological research (from bench to population investigations) has delayed the pace of these discoveries and hindered effective translation. Hence, the role of genetic, molecular, cellular, and physiological factors, including sex and gender, social determinants of health (SDOH), behaviors, environment, and policy in women's health are only beginning to be understood.

It is urgent to address these pervasive gaps in knowledge and care delivery to reduce sex-based disparities and achieve equity. As champions for health equity, the American Heart Association (AHA) has committed to advancing cardiovascular health for all by 2024, including charting cardiovascular health and identifying and removing barriers to health care access and quality. Achieving this goal requires driving advances in discovery and translation, raising awareness, empowering and engaging communities, and advocating relentlessly to ensure health care access and quality health for all.

The goal of the present presidential advisory for cardiovascular health and disease in women is to delineate an actionable roadmap to implement this vision for equity for women and their cardiovascular health. To do so, we will review key relevant domains:

- Epidemiology and Prevention
- Awareness
- Access and Delivery of Equitable Health Care
- Call to Action: Provide a clear and urgent call to action across multiple disciplines, including risk and prevention, access to and delivery of equitable health care, and awareness.

In each section, we summarize key data elements and emphasize knowledge gaps that must be addressed to optimize the diagnosis, prevention, and treatment of cardiovascular disease (CVD) in women. In doing so, we strive to foster innovative solutions by engaging

cross-disciplinary expertise and seeking guidance from those most affected. To contextualize our approach, it is important to reflect on 2 seemingly opposite approaches: present data from both men and women, or focus only on women.

This reflection reminds us of the Ancel Keys lecture given by the late Elizabeth Barrett-Connor at the 1995 AHA Epidemiology and Lifestyle meeting. During her characteristically brilliant and thought-provoking lecture, Dr Barrett-Connor advocated against unisex studies, arguing persuasively that “failure to study both sexes limits our understanding of each sex.”³ The counterpoint to this argument is grounded in the observation that, because of decades of structural sex bias in cardiology studies, comparing data from women with data from men inherently leads to position data pertaining to men as the implicit gold standard. For example, the well engrained (although erroneous) belief that women with myocardial infarction present more often with atypical symptoms carries an exculpatory undertone whereby women present the wrong way, not conforming to expectations.⁴ In this example, as in many others, sex-specific data that characterize women without labeling symptoms as atypical could lead to different diagnostic and therapeutic choices. This hypothesis remains to be tested, and we elected herein to strive for a balanced approach whereby the primary focus is data specific to women and data in men presented when useful to make a specific point.

The majority of studies have not made a clear gender versus sex distinction. Most, but not all, studies to date have based the definition on sex defined at birth, and not on gender, that would be comparing female versus male. Thus, we chose to adopt this language throughout much of this presidential advisory.

Although studying the acute and postacute sequelae of infection by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) according to sex and gender is critical, the presentation and evolution of SARS-CoV-2 infections were still very much unfolding when this presidential advisory went to press. Thus, it was determined that dedicated scientific reports/websites were better positioned to define the effect of SARS-CoV-2 on basic, translational, clinical, and population sciences among women and its intersection of specific race and ethnic groups and SDOH.

CURRENT PERSPECTIVES ON EPIDEMIOLOGY AND PREVENTION OF CVD IN WOMEN

Each year, the AHA, in conjunction with the Centers for Disease Control and Prevention, National Institutes of Health, and other government agencies, compiles statistics on heart disease, stroke, and other vascular diseases in the Heart Disease and Stroke Statistical Update.¹ This authoritative document provides the most comprehensive up-to-date compendium on disease morbidity, mortality, and risks; quality of care; medical procedures and operations; and costs associated with the management of these diseases.¹ Recent excellent and comprehensive reviews provide extensive perspectives on CVD in females.⁵⁻⁸ Readers are directed toward these documents for more details. In the next section, we highlight key elements that ground the call to action, which is the focus of the present presidential advisory.

Traditional cardiovascular risk factors (hypertension, hyperlipidemia, obesity, smoking, sedentary lifestyle, and diabetes) are highly prevalent among US women with notable racial and ethnic differences. Hypertension is highest in non-Hispanic Black women, low-density lipoprotein cholesterol is the highest in non-Hispanic White women, diabetes is highest among Hispanic women, and overweight and obesity are highest in non-Hispanic Black and Hispanic women (Figure 1).¹ Of note, this Hispanic cohort is composed mainly of Mexican American women.

Over time, as shown by the National Health and Nutrition Examination Survey of a nationally representative sample of US adults between 2001 to 2004 and 2013 to 2016, levels, prevalence, treatment, and control of several CVD risk factors followed a generally similar pattern in men and women with some nuances: total cholesterol declined less and body mass index increased more in women. The control of hypertension, diabetes, and dyslipidemia remains suboptimal in both sexes, and, although the prevalence of smoking declined in women and in men, a considerable number of women and men still smoke.⁹ Thus, it should not come as a surprise that, in 2019, similar to 1990, smoking and high systolic blood pressure remained the first and second leading risk factors contributing to years of life lost in the United States.¹ Last, and as illustrated in Figure 1, the prevalence of traditional risk factors is overall similar in women and in men.

SDOH and its association with CVD were reviewed extensively in a 2015 AHA scientific statement.¹⁰ Readers are referred to this statement for data and summaries on individual SDOH metrics like income, education, and health care access, and their associations with specific risk factors and cardiovascular outcomes. Additional social determinants related to gendered roles and how those may affect disease also need to be considered, including sexual violence against women. The complex interplay of all SDOH on cardiovascular health is not well understood. Adverse SDOH adversely affects the prevalence and progression of CVD across all age, sex, race, and ethnicity groups. The lived experience and the magnitude of the effect of SDOH on CVD differs across such groups. To understand and address the root causes of the prominent disparities in CVD outcomes between Black and White women and men in the United States, the intersectional aspects between race, sex, and gender must be considered. For example, studies have shown that, to reduce health disparities related to discrimination, one should first evaluate the dimensions of interpersonal-level discrimination across sociodemographic categories.^{11,12} Although the evaluation of health disparities along sex, racial, and socioeconomic lines is inherently complex, embracing this complexity is critical for designing interventions and providing the resources and modifying policies to reach equity regarding education, economy, health prevention and treatment, and general well-being.¹³

Sex-Specific or Sex-Predominant Risk Factors

Some risk factors for coronary disease are either specific to women or carry a different risk of CVD events in women than in men. An extensive review on pregnancy and reproductive risk factors for CVD in women was published in 2022.⁶ Such risk factors include early menarche (<11 years of age), premature menopause (<40 years of age), polycystic ovarian syndrome, hypothalamic amenorrhea, hypertensive disorders of pregnancy, gestational

diabetes, preterm delivery, low- or high- birth weight fetus, oral contraceptives, and hormone replacement.^{14,15} The cardiovascular health of pregestational women in the United States has declined,¹⁶ and that of pregnant women is suboptimal and lower than among age-matched nonpregnant women. This decline in cardiovascular health of pregestational and pregnant women is particularly critical and specifically noted as a call to action. Decreased cardiovascular health in pregestational and pregnant women increases the risk for adverse pregnancy outcomes, CVD in these women, and worse cardiovascular health in their children.^{17,18}

A presidential advisory from the AHA and the American College of Obstetricians and Gynecologists recommended that cardiologists, obstetricians, and gynecologists collaborate to quantify and reduce the risk of CVD throughout a woman's lifetime.¹⁵ We fully endorse this recommendation, underscoring the importance of interdisciplinary partnerships, and evaluating the best approaches to integrate quantitative measures of risk in women across the life span, as well.

Women are disproportionately affected by systemic inflammatory and autoimmune disorders, including systemic lupus erythematosus, rheumatoid arthritis, and scleroderma.¹⁵ Furthermore, when present, these risk factors greatly augment the risk of CVD events. For example, ≈25% of women with systemic lupus will develop pericarditis. Additional cardiac manifestations in patients with systemic lupus include myocarditis, coronary artery disease, increased risk of myocardial infarction, and valvular disease.¹⁹

Depression and anxiety carry an increased risk of CVD, and adverse cardiovascular outcomes in this context are more frequent in women than in men, in particular, at younger ages.^{20–22} Furthermore, after myocardial infarction and stroke,^{23–25} women experience more frequent depression than men. Therefore, optimizing mental health is particularly important in the care of women with CVD.¹⁵ Additional sex-specific factors to consider include chemotherapies for cancers more prevalent in women (ie, breast cancer).

Sex differences in the absolute prevalence of risk factors and their temporal evolution will yield sex differences in the respective population-attributable fractions (proportion of CVD cases that can be attributed to each modifiable risk factor). Defining this metric is critical to refine and prioritize public health interventions. For example, in White women, obesity and hypertension are the 2 highest population-attributable risk factors for heart failure.²⁶ In Black women, the temporal rise in diabetes as a population-attributable risk factor for heart failure is consistent with the rise in the prevalence of diabetes in Black women.²⁶ In Black women, the highest population-attributable risk factors were hyper-tension (population-attributable fraction, 25.8% [95% CI, 16.3%–34.2%]) and diabetes (population-attributable fraction, 16.4% [95% CI, 12.7%–19.9%]).²⁶

Clinical CVD and Cardiovascular Mortality

Nearly half (44.4%) of US women 20 years of age have some form of clinical CVD, including hypertension (Figure 2).¹ As illustrated in Figure 2, disparities by race and ethnicity are substantial, and the prevalence of coronary disease, heart failure, and stroke are all highest in non-Hispanic Black women. It is important to underscore that

several manifestations of coronary disease are specifically or predominantly seen in women. Although myocardial infarction with epicardial coronary disease is the cardinal manifestation of coronary disease in men, women can experience ischemia with no obstructive coronary arteries that is caused by microvascular dysfunction or vasospastic disorders²⁷ and myocardial infarction with nonobstructive coronary arteries defined as myocardial infarction criteria without coronary disease.²⁸ Other forms of coronary events observed predominantly in women include spontaneous coronary artery dissection.²⁹

The epidemiology of stroke in women was reviewed extensively in 2022 in *Circulation Research*.⁸ As this review underscored, the lifetime risk of stroke is 25.1% in women and 24.7% in men, and women face a disproportionate burden of stroke mortality and disability.

Peripheral artery disease is an important but perhaps less frequently emphasized manifestation of CVD. In 2022, a comprehensive review of the epidemiology of peripheral artery disease emphasized that peripheral artery disease is a highly prevalent condition associated with significant morbidity and mortality and affects women as often or more commonly than men.⁷ Furthermore, once diagnosed, women are less likely to be treated with evidence-based therapies. Increased efforts will be needed to improve awareness and increase the understanding of sex-based differences in peripheral artery disease development, diagnosis, and management.

CVD remains the leading cause of death among both women and men in the United States.³⁰ Recent data emphasized that the favorable decline in CVD mortality (including coronary heart disease and stroke) observed during the past 4 decades was decelerating, and that mortality for heart failure was increasing.^{31,32} These adverse temporal trends are observed in women as in men with persisting disparities by race and ethnicity among women.³³

Risk Prediction and Prevention

The accurate estimation of the risk of atherosclerotic CVD events is the cornerstone of decision-making in prevention, and the effective communication about the magnitude of the risk is critical to judicious person-centric interventions among those at higher risk. Risk estimates have been derived from large epidemiology cohorts, and point-of-care quantitative risk assessment tools have been deployed to support decision-making and counseling. Risk factors included in quantitative risk assessment include age, sex, race, total and high-density lipoprotein cholesterol, systolic blood pressure, antihypertensive therapy, history of diabetes, and smoking. The American College of Cardiology/AHA clinical practice guidelines recommend the use of quantitative risk assessment tools for decision-making for primary prevention of atherosclerotic CVD.³⁴

Although the pooled cohort equations have been well validated, it is recognized, however, that they may underestimate (or overestimate) risk in some racial and ethnic groups or cannot by design account for risk factors not captured within the source populations that enabled generating the pooled cohort equations (adverse social conditions, discrimination, pregnancy-related factors, chronic inflammatory diseases).³⁴ This point is particularly germane to assessing atherosclerotic CVD risk in women. The risk calculators direct clinicians to consider these factors as risk-enhancing factors and incorporate them in the

shared decision-making process. The concern remains, however, that the designation as “risk enhancers” involuntarily carries the suggestion that these somehow matter less. Integrating women-specific risk factors in the quantitative risk assessment across the life span is necessary, and the AHA is currently evaluating approaches to do so. In the interim, in situations when the risk category remains uncertain, clinicians may discuss with women the option to add coronary calcium imaging to further stratify risk and provide additional insight to an agreed-on care plan.³⁴

Prevention interventions are grounded in the adoption of a healthy lifestyle, because lifestyle factors are a critical determinant of the great majority of CVD events ($\approx 70\%$ of cases of coronary disease in the Nurses’ Health Study).³⁵ The AHA’s Life’s Simple 7 metrics for cardiovascular health promotion and disease reduction codify ideal health behaviors and factors for primordial (prevention of risk factors) and primary (prevention of disease) prevention: nonsmoking, body mass index $<25 \text{ kg/m}^2$, physical activity at goal levels, pursuit of a diet consistent with current guideline recommendations, untreated total cholesterol $<200 \text{ mg/dL}$, untreated blood pressure $<120/<80 \text{ mm Hg}$, and fasting blood glucose $<100 \text{ mg/dL}$.³⁶ These metrics allow one to define a range of cardiovascular health, which was found to be poor in young (20–44 years) US women overall and particularly during pregnancy. In this domain again, racial disparities were large because cardiovascular health was especially poor in non-Hispanic Black or Mexican women.³⁷ Of particular concern, gestational hypertension was associated with an increased risk of CVD among women, including coronary heart disease, and heart failure.³⁸ Disparities were also notably associated with rurality because maternal mortality is higher for women living in rural areas than for women living in urban areas,³⁹ the increase in maternal mortality being driven largely by an increase in cardiovascular deaths.⁴⁰ Each of the domains of cardiovascular health and Life’s Simple 7 define opportunities for prevention interventions that must be designed with intersectionality in mind. For example, for physical activity recommendations, more women met goals in 2018 (20.9%) than 20 years earlier (11.4%). However, nearly half of all US women did not meet physical activity recommendations for both aerobic activity and muscle-strengthening guidelines in 2018. Disparities were notable because a greater percentage of non-Hispanic White women (54.7%) met aerobic activity guidelines in 2018, compared with 40.5% of non-Hispanic Black women and 43.2% of Hispanic women.¹ The association of income with meeting aerobic and muscle-strengthening guidelines is consistent with the mediation of adherence by SDOH.¹

Knowledge Gaps and Research Needs in Epidemiology and Prevention—A

better understanding of the gaps in knowledge and research needs for CVD in women requires the purposeful adoption of a women-centric approach focused on factors unique to women that affect risk throughout the lifetime. Specific research needs are outlined here.

- Develop and deploy risk calculators that incorporate sex-specific and sex-predominant risk factors.
- Foster cross-disciplinary research on SDOH and design interventions to address determinants.

- Define and implement cross-disciplinary (communities, health systems, businesses, urban developers, and economic researchers) interventions.
- Adopt and implement risk factor interventions that embrace intersectionality and cultural sensitivity.
- Adopt and implement a lifetime approach to risk management and prevention.

AWARENESS

Since 2004, multiple educational and advocacy campaigns have focused on increasing awareness about CVD in women.⁴¹ Awareness among women of CVD as their major health risk increased from 30% to 56% by 2009. Despite these efforts, women surveyed in 2019 compared with women surveyed in 2009 were 74% less likely to identify heart disease as their leading cause of death,^{41,42} with differences most apparent among younger women and women who self-report as Hispanic or non-Hispanic Black. In addition, >10 years of campaign data reported that fewer women recognized some of the common warning signs of heart attack such as chest pain, numbness, pain in jaw, tightness in chest, dizziness, and indigestion. Decreases in recognition of many common warning signs of a heart attack were more pronounced among younger women and across race and ethnicity groups.⁴²

Improvement in awareness must include increased education for health care professionals. Specifically, education must include both intrinsic and extrinsic factors (ie, sex and SDOH as examples) that modify risk factors and the course of CVD for women. As our knowledge of these factors improves, the communication to and education of health care professionals will require ongoing attention.

Nearly 70% of postgraduate medical trainees reported no or minimal training on sex-based medical concepts.¹⁴ Furthermore, the Women's Heart Alliance published results from a nationwide survey showing that only 22% of primary care physicians and 42% of cardiologists feel extremely well prepared to assess CVD risk in women.²³ Thus, health care professionals do not feel prepared to provide adequate risk assessment. For example, translation of how a woman's history of early menopause and gestational diabetes relates to her long-term cardiovascular health is important. Better collaboration between obstetrics and gynecology clinicians and cardiologists would improve care for many women.¹⁴ Lack of awareness about pregnancy-related cardiovascular risk, health, and outcomes is an ongoing concern.

Although the results of these awareness data show that we have lost a decade of progress, these findings also help us to reposition and adapt the awareness approaches to reach the intended audiences. Further attention and funding should be committed to adapt the campaign's approaches and methods to the contemporaneously changing lives and technologies available to target audiences, including reaching younger audiences through social media channels.

With the aid of expert volunteers, AHA leadership conducted a critical assessment of the research and clinical knowledge of CVD across the US population and specifically within women to establish new goals and programs to address persistent gaps. To directly address

the needs of women, the AHA launched the Research Goes Red registry in collaboration with Verily's Project Baseline.⁵ Established in 2019, Research Goes Red is a novel online platform designed to be participant-centric and highly customizable and scalable. It positions women at the center of clinical research to accelerate scientific discovery by fostering active engagement. Research Goes Red and other women's health-focused initiatives are designed to achieve awareness, engagement, and scientific contributions in real-world partnership between women and researchers.⁴³

Knowledge Gaps and Research Needs in Awareness

We must identify and implement effective approaches to mitigate the decline in awareness among women that CVD is their leading cause of death, using methods that are culturally sensitive and appropriate for specific race and ethnic groups. One current knowledge gap is health care professional education about the specific intrinsic and extrinsic age-specific factors that are important for recognizing and treating women at risk for CVD.

ACCESS TO AND DELIVERY OF EQUITABLE HEALTH CARE

Access to care is a crucial factor in CVD prevention and overall health. Although many factors influence access to quality cardiovascular care in women, access to affordable insurance coverage and out-of-pocket costs have significant effects on health care access and use. A 2018 Commonwealth Fund report noted more than one-quarter of women in the United States spend \$2000 or more out of pocket on medical costs per year, and more than one-third report skipping needed medical care because of costs.⁴⁴

The introduction of the Patient Protection and Affordable Care Act improved access to affordable health insurance coverage for many women 19 to 64 years of age, the largest coverage gain of any group. The percentage of uninsured women <65 years of age was 31% lower in 2018 (9.9%) than in 1984 (13.8%). Although an improvement, 30 million individuals in the United States were uninsured in 2018. In recent years, Medicaid coverage expansion associated with the Patient Protection and Affordable Care Act has been shown to have a beneficial effect on health care coverage and use in low-income women of reproductive age, which may lead to potential improvements in preconception health, pregnancy, cardiovascular health, and chronic disease management and avoidance.

The recognition that women living in rural America have additional cardiovascular risk compared with women living in urban areas, and that access and health care system delivery differences may be factors in generating this additional risk, is increasing. An AHA presidential advisory published in 2020 summarized health care system delivery factors and failures in rural America,³⁹ including how health care in rural settings is affecting women's health care. Of specific note in the advisory are the increasing life expectancy gaps between rural and urban areas. In 1971, life expectancy was 0.4 years higher in urban than in rural areas, but by 2009, this gap rose to 2 years, and by 2014 it was >2 years (77.6 years versus 74.5 years for men and 82.4 years versus 79.7 years for women).³⁹ Hospital and outpatient facility care, clinician supply, insurance coverage, and public health infrastructure all differ between urban and rural areas, and these differences could contribute to the striking findings

noted in the advisory. These differences have only been exacerbated by the COVID-19 (coronavirus disease 2019) pandemic and its effect on health care systems.

Delaying care can delay diagnosis of conditions and narrow the window when preventive health actions are most effective. Delaying or foregoing care can also affect recovery after an acute event and long-term quality of life. The underlying reasons why women delay care remain poorly understood. The percentage of women reporting delaying medical, prescription, and dental care because of cost has not changed significantly in the past 30 years.⁴⁵ Compared with men, national trends in the past 30 years show a higher percentage of women reporting a delay in care because of costs across all 3 categories.⁴⁵

Despite the prevalence of myocardial infarction being lower overall in women than in men, treatment and delivery of care disparities that existed in the 1990s persist today. Specifically, in 1993, Wenger and colleagues² highlighted sex-based health disparities in early mortality among women after myocardial infarction and in-hospital mortality among women after several coronary interventions, including coronary angioplasty, coronary atherectomy, and coronary bypass surgery.

The AHA gathers data through its Get With The Guidelines Registry, which is built on a quality improvement program, to improve patient care in >2500 hospitals throughout the United States. Among the hospitals, 901 are designated Disproportionate Share Hospitals by the Centers for Medicare & Medicaid Services based on Medicaid and low-income volume, and 166 are Essential Hospitals that provide substantial volume of care to low-income and uninsured patients. Many of the Get With The Guidelines Registry modules collect some indicators of SDOH. These real-world data provide a close look at delivery of treatment, which is summarized briefly in the following text.

Despite decades of advances in medical care, a 2017 analysis from the AHA Get With The Guidelines Registry data of >300 000 patients with myocardial infarction reported that myocardial infarction with nonobstructive coronary arteries occurred more frequently in women than in men (10.5% and 3.4%) and that mortality was significantly higher in women. In addition, among patients with myocardial infarction with obstructive coronary disease, there was significantly higher mortality among women than among men, especially at younger ages.⁴⁶ Udell and colleagues⁴⁷ reported similar differences among patients with acute coronary syndrome stratified by sex and age, including lower rates of achieving door-to-balloon times within 90 minutes for women <65 years of age compared with male counterparts, although this treatment gap was not observed among patients with acute coronary syndrome ≥ 65 years of age. Last, delivery of care for both women and Black patients on the basis of assessment of physician recommendations for cardiac catheterization showed that women and Black patients with the same clinical history were less likely than men and White patients to be referred for cardiac catheterization.⁴⁸

Heart failure achievement measures within hospitals participating in the AHA Get With The Guidelines Heart Failure Registry reported no difference between women and men.¹ The AHA Heart Failure Registry data also showed that women were more likely to be treated for heart failure in hospitals with a higher proportion of Medicare/Medicaid dual eligibility,

which is associated with poorer outcomes.⁴⁹ Last, for reasons unknown, female sex has been associated with a lower likelihood of receiving an implantable cardioverter-defibrillator.⁵⁰

In the specialized area of heart transplant and ventricular assist devices, the 2019 Interagency Registry for Mechanically Assisted Circulatory Support report did not address the influence of sex or race and ethnicity on mortality after placement of a left-ventricular assist device. In 2015, the Interagency Registry for Mechanically Assisted Circulatory Support report of 15 000 patients described a higher mortality in women.⁵¹

Stroke achievement measures within hospitals participating in AHA Get With The Guidelines Stroke Registry showed no difference between women and men.¹ Among patients presenting with ischemic stroke, women had a lower likelihood of being transported to the hospital by emergency medical services,⁵² a lower likelihood of imaging within 25 minutes of arrival at the emergency department,⁵³ and a higher likelihood of failure to receive intravenous tissue-type plasminogen activator within 2 hours.⁵⁴ Conversely, during hospitalization, female sex was associated with earlier use of chemoprophylaxis for venous thromboembolism after an intracerebral hemorrhage.⁵⁵ In a study of older adults hospitalized with stroke, women were more likely to die within 30 days of hospitalization.⁵⁶

Knowledge Gaps and Research Needs in Access to Care

How do we best assist women to overcome the barrier of medical cost as a reason for delaying health care and prescription drugs? Investment in evaluation metrics to better understand the problem from the individuals affected and research to achieve change most effectively in health care policy are needed.

Delivery of equitable health care for women will depend on improving the knowledge gap, education, and awareness of health care professionals of female-specific and female-predominant risk factors. More research is needed specifically in women to understand the effect of both intrinsic and extrinsic risk factors on cardiovascular risk and cardiovascular outcomes. The role of COVID-19 and other potential infectious diseases, as well as the secondary effects of increasing economic, social, and family demands on women during a pandemic will also have to be studied.

Adopting technology in clinical settings that improves efficiency of operations, predicting patient flow, patient discharge, patient admissions based on elective surgery, prediction of admissions based on COVID-19 data or other infectious diseases including flu, will also be important.

Using the standard nomenclature available (Observational Medical Outcomes Partnership, or OMOP common data model⁵⁷) to standardize and harmonize data across studies will increase the statistical power for the relatively small numbers of studies with women and women within underrepresented groups that exist today. Putting the effort into standardizing and harmonizing studies that have been rigorously conducted in the past may increase the likelihood that data science tools including artificial intelligence and machine learning can be leveraged to accelerate our understanding of the factors regulating risk of CVD in women. Expanding the use of SDOH indicators in electronic health records will

also be critical to understand how external factors, including the environment, social, and structural determinants of health, modify the risk of a person's health over their lifetime. The Veterans Health Administration, for example, has had the foresight to collect indicators of SDOH within the electronic health record.⁵⁸ Last, our traditional approach in science has been to look back at longitudinal data captured to assess trends. Although useful, this approach does not incorporate a look forward mechanism in real time or near real time to sample trends from large data resources. Incorporation of new techniques with distinct and divergent areas of expertise may be critical in addressing awareness.

CALL TO ACTION

This document reviewed persisting challenges and emerging opportunities to achieve cardiovascular health and health equity for all women. The AHA and its partners have had a longstanding engagement in optimizing the cardiovascular health of women across the life course. The intent of this document is to galvanize a call to action and delineate critical components of the journey toward health equity (Figure 3). These include the following:

- Awareness campaigns that are culturally sensitive and appropriate with translations for the appropriate audiences must be synergistically deployed to identify CVD as the largest health threat for women, and education must emphasize the wide-ranging benefits of prevention (80%–90% of CVD is preventable) and lifetime cardiovascular health optimization (eg, Life's Simple 7).
- To optimize prevention and clinical care, interdisciplinary collaboration between cardiologists, vascular neurologists, primary care clinicians, obstetricians-gynecologists, and other relevant health professionals is necessary to improve recognition of women's risk for CVD lifelong and improve implementation of holistic risk-reducing strategies. Clinical education must emphasize the importance of risk factors specific or predominant in women. Risk calculators must integrate quantitative measures of risk in women for life course use (childhood and adolescent well visits, preconception, gestational and postpartum visits, and primary care and gynecologic visits).
- A compendium of research focused on women and CVD was published in 2022.⁵⁹ Resources will be critical to advocate relentlessly in support for basic, translational, clinical, population, and implementation research on CVD and stroke prevention and treatment in women of all ages, with specific focus on under-resourced populations and high-reward opportunities for lifelong improvements in cardiovascular health beginning even at young ages. Ensuring that animal studies include female mice with a strategy and plan to assess and disseminate the outcomes of all of these studies as a whole will be important. Additional attention and priority must be placed on ensuring that basic science and omic-related studies use and compare both female and male single cells, cell lines, stem cells, and organoids. Strategizing approaches to augmenting participation of diverse populations of women in clinical trials will be a key goal,⁶⁰ as will increasing participation of younger and older women.

- Engage communities to optimize cardiovascular health across the life course: examples include, but are not limited to, school-based programs that involve parents and empower families; meeting underrepresented groups where they are within communities; calling on our partnerships with communities of faith, barber shops, and other groups. Departments and schools of public health must be proactively engaged and supported to foster the integration of public health and primary care.
- Advocacy for public policy and legislative interventions must focus on SDOH, including healthy food access and food security, safe spaces for physical activity, clean indoor and outdoor air, and access to high-quality care for prevention and treatment.
- Surveillance systems for CVD are required to assess progress and provide feedback to key stakeholders. Under the auspices of the AHA, the building blocks of effective disease and risk factor surveillance have been outlined.⁶¹ We must leverage innovative digital technologies to capture metrics for prevention, outcomes, and care delivery. National data platforms such as Research Goes Red are uniquely positioned to track life course events independent of geographical location and will be critical in this regard.

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Heather M. Alger	American Heart Association	None	None	None	None	None	None	None
Susan Cheng	Cedars-Sinai Medical Center	NIH (research grant U54 AG065141) [†]	None	None	None	None	None	None
Mitchell S.V. Elkind	Columbia University	None	None	None	None	None	None	None
Gregg C. Fonarow	UCLA Medical Center	Abbott [*] ; Amgen [*] ; AstraZeneca [*]	None	None	None	None	None	None

Writing group member	Employment	Research grant	Other research support	Speakers' bureau/ honoraria	Expert witness	Ownership interest	Consultant/ advisory board	Other
		Bayer [†] ; Cytokinetics [†] ; Janssen [*] ; Medtronic [*] ; Merck [*] ; Novartis [†]						
Jennifer L. Hall	American Heart Association	NIH (coPI on the NIH grant AnVIL Data Ecosystem grant for cloud computing 1U24HG010262) [†] ; NIH (coPI on the NIH funded grant data harmonization R61NS12024) [†]	None	None	None	None	Change Healthcare [*]	None
Claire Kinzy	American Heart Association	None	None	None	None	None	None	None
Véronique L. Roger	National Institutes of Health	None	None	None	None	None	None	None
John J. Warner	University of Texas Southwestern Medical Center	None	None	None	None	None	American Heart Association (Member, National Board of Directors) [*]	None

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be “significant” if (a) the person receives \$5000 or more during any 12-month period, or 5% or more of the person’s gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns \$5000 or more of the fair market value of the entity. A relationship is considered to be “modest” if it is less than “significant” under the preceding definition.

* Modest.

[†] Significant.

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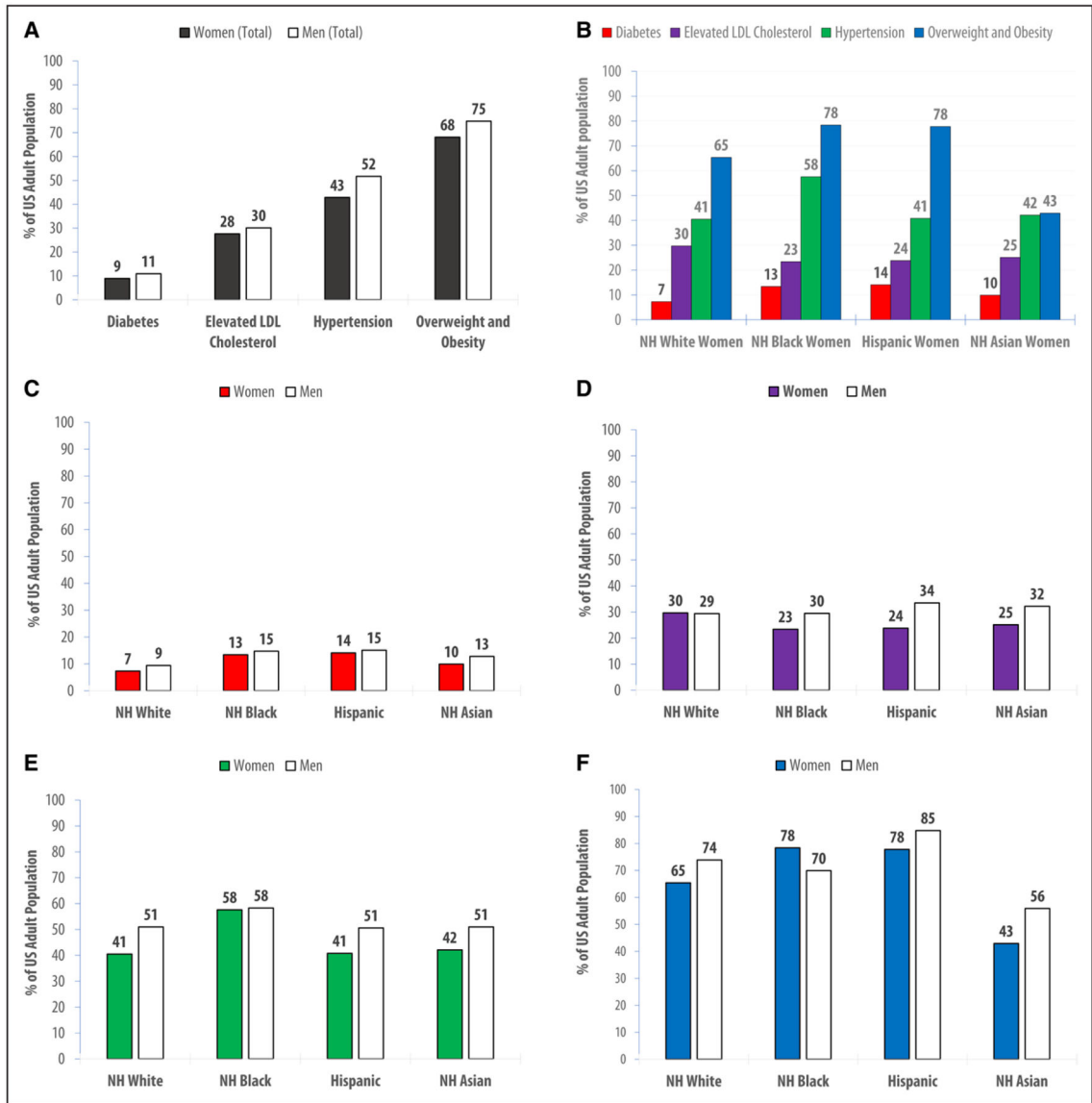


Figure 1. Prevalence of selected cardiovascular risk factors among US adults.

Prevalence of cardiovascular risk factors for women and men (A) and women by race and ethnicity (B). C, Prevalence of diabetes in women and men. D, Prevalence of elevated LDL cholesterol (> 130 mg/dL) in women and men. E, Prevalence of hypertension in women and men. F, Prevalence of overweight and obesity in women and men. Solid bars indicate prevalence data for US women; open bars indicate prevalence for US men. LDL indicates low-density lipoprotein; and NH, non-Hispanic. Adapted from Virani et al.¹ Copyright © 2021 American Heart Association, Inc. *Note: The Hispanic cohort described in this figure is composed mostly of Mexican American individuals.

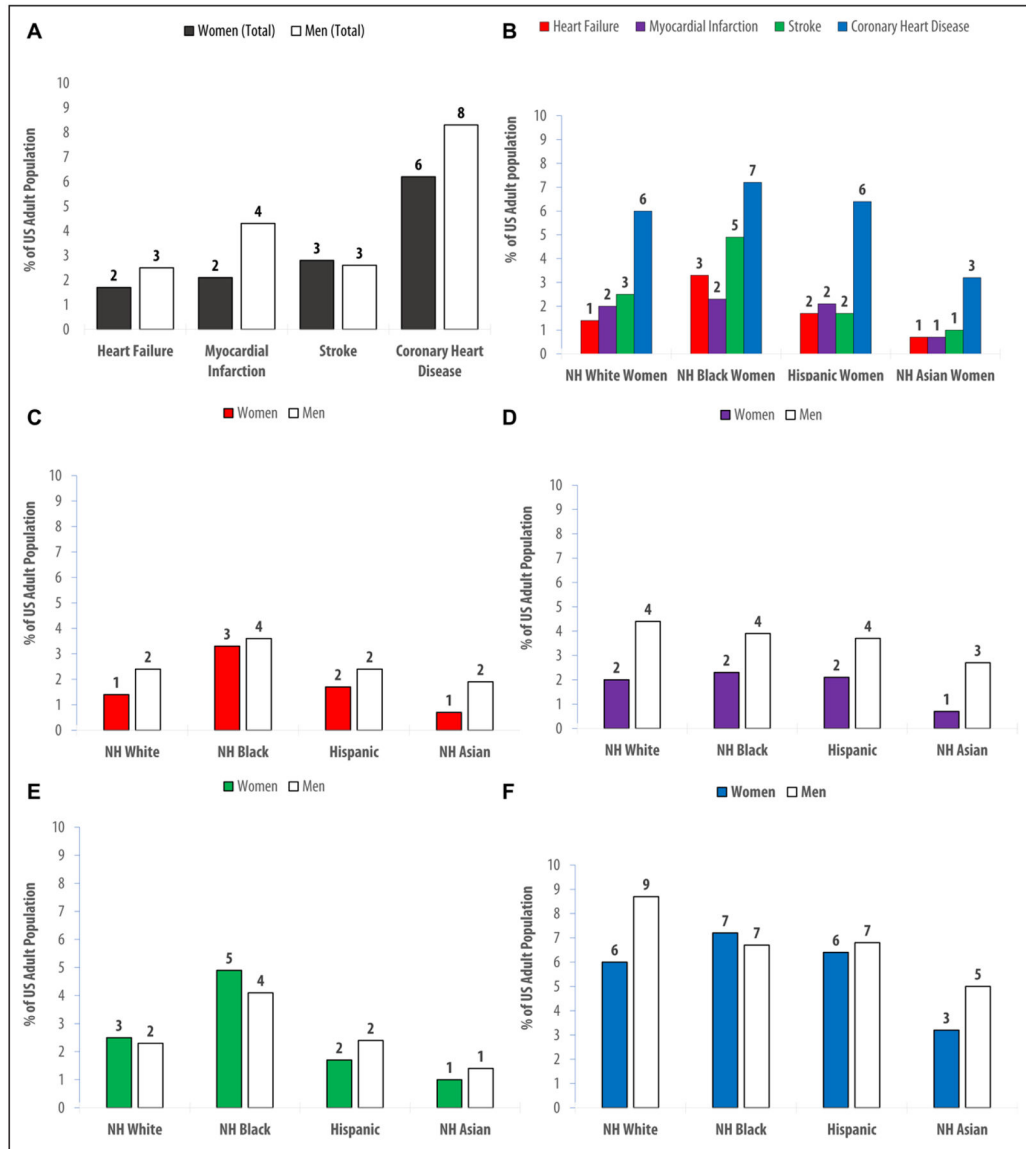


Figure 2. Prevalence of selected cardiovascular and cerebrovascular conditions among US adults. Prevalence of selected cardiovascular and cerebrovascular conditions for women and men (A) and for women by race and ethnicity (B). C, Prevalence of heart failure in women and men. D, Prevalence of myocardial infarction in women and men. E, Prevalence of stroke in women and men. F, Prevalence of coronary heart disease in women and men. Solid bars indicate prevalence data for US women; open bars indicate prevalence for US men. NH indicates non-Hispanic. Adapted from Virani et al.¹ Copyright © 2021 American Heart Association, Inc. *Note: The Hispanic cohort described in this figure is composed mostly of Mexican American individuals.



Figure 3. Call to action for reducing the risks and burden of cardiovascular disease (CVD) in women.