

# The state of US women's heart health: A path to improved health and financial outcomes

Closing the cardiovascular-disease gap between men and women could help women regain 1.6 million years of life lost because of poor health and early death, and boost the US economy by \$28 billion annually by 2040.

*This article is a collaborative effort by Lucy Pérez and Megan Greenfield of the McKinsey Health Institute and leaders of the American Heart Association.*



## At a glance

- Cardiovascular disease (CVD) is the leading cause of death for women. Cardiovascular conditions in the United States make up at least a third of the women's health gap because of inequities between women and men in care delivery, efficacy, and data availability.
- Addressing heart health at every life stage can improve a woman's quality of life and overall health. It could lead to at least 1.6 million years of higher-quality life and boost the US economy by \$28 billion annually by 2040.
- In the United States, Black women have a higher prevalence of and morbidity from CVD than non-Black women do.

**In the United States**, cardiovascular disease (CVD) is the leading cause of death for women. Today, more than 60 million women are living with CVD.<sup>1</sup> They're more likely than men to die from a heart attack and to develop heart failure in the five years after discharge from the hospital.<sup>2</sup>

CVD makes up over a third of the health gap between US men and women, as measured in potential years of healthy life (Exhibit 1). Analysts have quantified this gap in terms of disability-adjusted life years. Building on previous research from the McKinsey Health Institute and the World Economic Forum on the women's health gap,<sup>3</sup> additional insights have found that the United States has the potential to gain an additional \$28 billion in GDP by 2040 by closing the gap in heart health between men and women.<sup>4</sup>

Women constitute half of the population, workforce, and community and are responsible for over 80 percent of a family's medical decision making. Therefore, their well-being plays a pivotal role in shaping the overall health of families and communities. Enabling women to be healthier sets in motion a ripple effect of positive cardiovascular-health choices in the public, private, and social

sectors that can lead to a healthier population, including for caregivers.<sup>5</sup>

Addressing women's heart health and reducing CVD risk factors also has potential financial benefits for employers. One study estimated that the per-year price of employee absenteeism costs a large employer from around \$17,000 for diabetes to more than \$285,000 for physical inactivity.<sup>6</sup>

CVD presents differently in women and men. Yet a pervasive one-size-fits-all mentality for it remains throughout the healthcare delivery ecosystem. Research revealed that only 22 percent of physicians and 42 percent of cardiologists felt extremely well prepared to adequately assess CVD specific to women.<sup>7</sup>

Caring for heart health should be a priority throughout a woman's lifespan, not just at older ages when acute symptoms are most prevalent and most expected by women themselves. It's possible to address modifiable risk factors and focus on prevention before CVD sets in. For example, four out of five maternal deaths are preventable. Considering that CVD remains the leading cause of maternal deaths, this overlap indicates that

<sup>1</sup> "About women and heart disease," US Centers for Disease Control and Prevention (CDC), May 15, 2024.

<sup>2</sup> Justin A. Ezekowitz et al., "Is there a sex gap in surviving an acute coronary syndrome or subsequent development of heart failure?," *Circulation*, December 2020, Volume 142, Number 3.

<sup>3</sup> The women's health gap is the disease burden associated with inequities between women and men in intervention efficacy, care delivery, and data. The women's health burden reflects conditions that affect women disproportionately or differently than they do men.

<sup>4</sup> This number likely underestimates the additional gains from reduced maternal mortality and downstream effects of neonatal morbidity, mortality, and long-term health.

<sup>5</sup> Laura Williamson, "Families often have chief medical officers – and they're almost always women," American Heart Association (AHA), April 17, 2024.

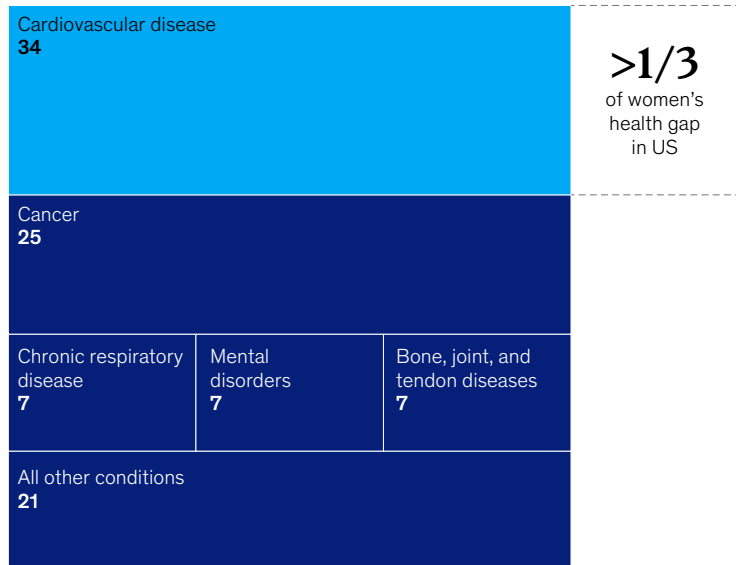
<sup>6</sup> Garrett R. Beeler Asay et al., "Absenteeism and employer costs associated with chronic diseases and health risk factors in the US workforce," *Preventing Chronic Disease*, October 2016, Volume 13.

<sup>7</sup> C. Noel Bairey Merz et al., "Knowledge, attitudes, and beliefs regarding cardiovascular disease in women: The Women's Heart Alliance," *Journal of the American College of Cardiology*, July 2017, Volume 70, Number 2.

Exhibit 1

## Opportunity for cardiovascular health makes up a large part of the US women’s health gap.

Estimated share of US women’s health gap in 2040,<sup>1</sup> by condition, %



Note: Figures do not sum to 100%, because of rounding.  
<sup>1</sup>Based on total disability-adjusted life years.  
 Source: McKinsey Health Institute analysis

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addressing prevention can lower maternal mortality related to CVD.<sup>8</sup> The women’s heart health gap in the United States is addressable by providing sex- and gender-appropriate cardiac care and research. This can be supported by investments, innovation, education, and public-awareness campaigns.

By addressing the CVD gap between men and women in the United States, women could live longer and higher-quality lives, potentially regaining 1.6 million years of life lost because of poor health and early deaths.<sup>9</sup>

### Women are biologically different from men

A woman’s cardiovascular health is influenced by biological factors that are rooted in unique life stages. Women and men share many traditional risk factors for the development of CVD, such as obesity, smoking, and diabetes. But the relative impact of these may vary because of biological differences and behavioral practices. For example, literature suggests that although men have a higher prevalence of diabetes than women do, the presence of diabetes increases cardiovascular risk by three- to sevenfold in women, compared with a two- to threefold increase in men.<sup>10</sup> Men have a higher prevalence

<sup>8</sup> "Four in 5 pregnancy-related deaths in the U.S. are preventable," CDC press release, September 19, 2022.

<sup>9</sup> Anouk Petersen, Lucy Pérez, Brad Herbig, and Pooja Tatwawadi, "Bridging the women's health gap: A country-level exploration," McKinsey, May 23, 2024.

<sup>10</sup> Aardra Rajendran et al., "Sex-specific differences in cardiovascular risk factors and implications for cardiovascular disease prevention in women," *Atherosclerosis*, November 2023, Volume 384.

of CVD, but women are more likely to die after having an acute cardiovascular event.<sup>11</sup>

Estrogen, a sex hormone, is believed to have a protective effect on the heart and may potentially explain some of the differences. Estrogen plays a role in regulating various metabolic functions, such as lipid levels (amounts of fat) in the blood, inflammatory markers (contributing to damage to vessel walls), and the coagulant system (affecting blood clot formation).<sup>12</sup> Additionally, estrogen is believed to help relax and open up blood vessels throughout the body, allowing for better blood flow.

The understanding of biological differences such as these has expanded, but major knowledge gaps still exist. Heart health—or lack thereof—affects not only the cardiovascular system but the whole body, including the gastrointestinal, immune, musculoskeletal, neurological, pulmonary, and renal systems. For example, midlife hypertension is associated with an approximately 60 percent increased risk of all-cause dementia, and systolic hypertension (systolic blood pressure greater than 160 millimeters of mercury) is associated with an approximately 25 percent increased risk of Alzheimer's disease.<sup>13</sup>

By 2040, brain health and heart health together could contribute to nearly half of the US women's health burden gap (or two million years of life lost each year because of poor health or early death).<sup>14</sup> Improving brain health and heart health together could add over \$100 billion in annual US GDP by 2040. Addressing CVD throughout a woman's lifespan can have enormous benefits in both cardiovascular health and quality of life at large.

Women go through unique stages of life characterized by fluctuating levels of estrogen (such as puberty and menopause) and additional physiological stress on the body (such as pregnancy). With the increasing prevalence of CVD in women, novel sex-related risk factors should be considered in combination with behavioral, environmental, and social factors to guide its early prevention, diagnosis, and treatment in women across all stages of life (Exhibit 2).

### **Adolescence and puberty mark the first changes**

A woman's first menstrual period (menarche) usually occurs between the ages of 10 and 16, after a yearlong rise in daily estrogen output.<sup>15</sup> Menstrual cycles have been shown to have an impact on a woman's CVD risk later in life.

For one, the age of menarche may play a role in CVD risk. A study found that those who had menarche earlier than the age of 12 had an increased risk of CVD and of some of its associated risk factors, such as metabolic syndrome, obesity, and diabetes. The mechanisms linking early menarche and CVD aren't fully understood but may be explained in part by genetic and lifestyle factors, such as reduced physical activity and excess calorie consumption.<sup>16</sup>

There's an association between irregular menstrual cycles (affecting around 20 percent of women) and elevated body mass index, total cholesterol, and triglycerides, which may increase the overall risk of CVD. Irregular menstrual cycles also independently contribute to the increased risk of CVD.<sup>17</sup> Potential mechanisms by which irregular or prolonged menstrual cycles affect cardiovascular health

<sup>11</sup> Satyam Suman, Jakkula Pravalika, Pulluru Manjula, and Umar Farooq, "Gender and CVD: Does it really matter?," *Current Problems in Cardiology*, May 2023, Volume 48, Number 5.

<sup>12</sup> A.H.E.M. Maas and Y.E.A. Appelman, "Gender differences in coronary heart disease," *Netherlands Heart Journal*, December 2010, Volume 18.

<sup>13</sup> Matthew J. Lennon et al., "Use of antihypertensives, blood pressure, and estimated risk of dementia in late life: An individual participant data meta-analysis," *JAMA Network Open*, September 2023, Volume 6, Number 9; Matthew J. Lennon et al., "Midlife hypertension and Alzheimer's disease: A systematic review and meta-analysis," *Journal of Alzheimer's Disease*, 2019, Volume 71, Number 1.

<sup>14</sup> McKinsey Health Institute (MHI) research.

<sup>15</sup> Amy E. Lacroix et al., *Physiology, Menarche*, Treasure Island, FL: StatPearls Publishing, 2023.

<sup>16</sup> Anna C. O'Kelly et al., "Pregnancy and reproductive risk factors for cardiovascular disease in women," *Circulation Research*, February 2022, Volume 130, Number 4; "Sex-specific differences in cardiovascular risk factors and implications for cardiovascular disease prevention in women," November 2023.

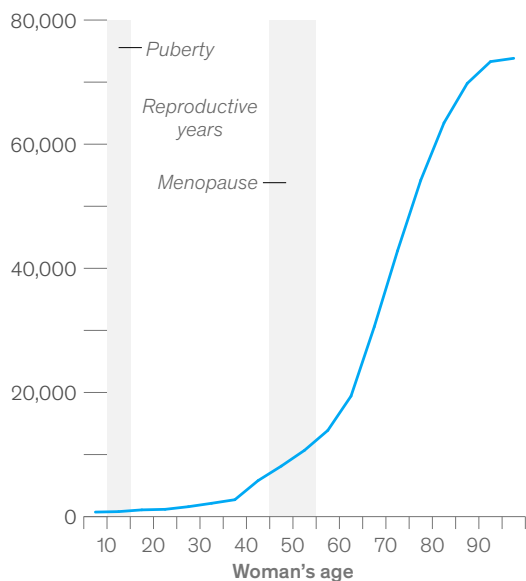
<sup>17</sup> Chensihan Huang et al., "Associations of menstrual cycle regularity and length with cardiovascular diseases: A prospective study from UK Biobank," *Journal of the American Heart Association*, May 2023, Volume 12, Number 11.

Exhibit 2

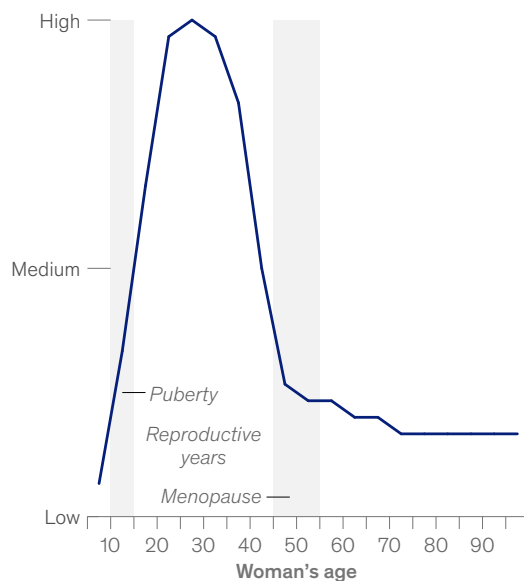
**Estrogen corresponds to cardiovascular risk, and the rate of cardiovascular disease in women rises with age.**

**Global prevalence of cardiovascular disease (CVD) and global average approximate estrogen level in women in 2019, by age**

**Prevalence of CVD in women, rate per 100,000 women**



**Approximate estrogen levels in women, relative to life cycle**



Source: *Global burden of disease: Findings from the GBD 2021 study*, Institute for Health Metrics and Evaluation, May 2024; Edwin D. Lephart and Frederick Naftolin, "Menopause and the skin: Old favorites and new innovations in cosmeceuticals for estrogen-deficient skin," *Dermatology and Therapy*, February 2021, Volume 11, Number 1

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include decreased estrogen exposure and shared risk factors, such as obesity.

There's ample opportunity for research into better understanding the links between menstruation and the overall health of a woman. With greater knowledge and treatment options, women can embark on a lifelong journey to view their heart health more holistically.

**Pregnancy and childbirth can strain a woman's heart**

Pregnancy puts a physiological strain on a woman's body, including on her heart. As early as eight weeks into pregnancy, a woman's body experiences multiple changes, including increased blood volume and increased cardiac output.<sup>18</sup> Beyond normal physiological changes during pregnancy, a number of pregnancy-specific conditions have been associated with adverse cardiovascular outcomes.

The US Centers for Disease Control and Prevention found that four out of five maternal deaths in the

<sup>18</sup> Priya Soma-Pillay, Catherine Nelson-Piercy, Heli Tolppanen, and Alexandre Mebazaa, "Physiological changes in pregnancy," *Cardiovascular Journal of Africa*, 2016, Volume 27, Number 2.

United States are preventable. The leading cause of these deaths are CVD (cardiac and coronary conditions) (13 percent), thrombotic embolism (9 percent), cardiomyopathy (9 percent) and hypertensive disorders in pregnancy (HDPs) (7 percent).<sup>19</sup> More than half of pregnancy-related deaths occur in the year after childbirth. Yet up to 40 percent of women don't access postpartum care, and only an estimated 18 to 25 percent of postpartum patients with pregnancy complications are seen by a primary care provider (PCP) within six months of delivery.<sup>20</sup>

Physicians and patients alike must be taught to recognize these issues. Helping pregnant women holistically, beyond reproductive care, creates a vast opportunity to reduce adverse outcomes for mothers and babies. It may also reduce modifiable risk factors for CVD before it's too late.

#### **Pregnancy-related hypertensive disorders**

HDPs affect up to 10 percent of pregnant women in the US and are the cause of 7 percent of maternal deaths.<sup>21</sup> HDPs include gestational hypertension (new-onset hypertension of 140 over 90 millimeters of mercury after 20 weeks' gestation in a previously normotensive woman), chronic hypertension (hypertension before 20 weeks' gestation), and preeclampsia. Women who develop HDPs in their first pregnancy are at an increased risk of recurrence in subsequent pregnancies. They are also at a higher risk of developing hypertension, stroke, and ischemic heart disease in later life.<sup>22</sup>

Preeclampsia is a pregnancy-specific condition characterized by hypertension after 20 weeks of

gestation and the presence of proteinuria (protein in the urine) and/or end-organ dysfunction.<sup>23</sup> The mechanism of preeclampsia isn't fully understood, and the only definitive cure for the condition is the delivery of the fetus and the placenta.<sup>24</sup>

Women with preeclampsia have a fourfold relative risk of developing hypertension later in life, a twofold risk for ischemic heart disease, a twofold relative risk of stroke, and a twofold relative risk for venous thromboembolism (Exhibit 3).<sup>25</sup> Furthermore, the severity of preeclampsia and its earlier onset are correlated with the severity of CVD later in life.

#### **Gestational diabetes**

Gestational diabetes is a pregnancy-specific condition defined as newly diagnosed diabetes mellitus beyond the first trimester of pregnancy. This condition affects up to 14 percent of pregnancies around the world.<sup>26</sup> Gestational diabetes not only increases the risk of developing type 2 diabetes by sevenfold but also independently raises CVD risk (twofold for stroke and fourfold for myocardial infarction) later in life.<sup>27</sup>

#### **Peripartum cardiomyopathy**

Peripartum cardiomyopathy is a pregnancy-specific condition without a reversible cause. It presents near the end of pregnancy or in the postpartum period in a woman without known heart disease.<sup>28</sup> Although relatively rare (incidence of one in 1,000 to 4,000 US live births), it can carry a high mortality of up to 11 percent in the United States, as shown in a longer-term follow-up study of patients in Midwestern academic centers.<sup>29</sup>

<sup>19</sup> "Four in 5 pregnancy-related deaths in the U.S. are preventable," September 19, 2022.

<sup>20</sup> Jennifer Lewey et al., "Opportunities in the postpartum period to reduce cardiovascular disease risk after adverse pregnancy outcomes: A scientific statement from the American Heart Association," *Circulation*, February 2024, Volume 149, Number 7.

<sup>21</sup> National Academies of Sciences, Engineering, and Medicine, *Birth Settings in America: Outcomes, Quality, Access, and Choice*, Washington, DC: National Academies Press, 2020.

<sup>22</sup> Gian Francesco Mureddu, "How much does hypertension in pregnancy affect the risk of future cardiovascular events?," *European Heart Journal Supplements*, April 2023, Volume 25.

<sup>23</sup> Mariana Garcia et al., "Cardiovascular disease in women: Clinical perspectives," *Circulation Research*, April 2016, Volume 118, Number 8.

<sup>24</sup> Lorena M. Amaral et al., "Pathophysiology and current clinical management of preeclampsia," *Current Hypertension Reports*, August 2017, Volume 19, Number 61.

<sup>25</sup> "Cardiovascular disease in women," April 2016.

<sup>26</sup> Oluwasegun A. Akinyemi, "Profiles and outcomes of women with gestational diabetes mellitus in the United States," *Cureus*, July 2023, Volume 15, Number 7.

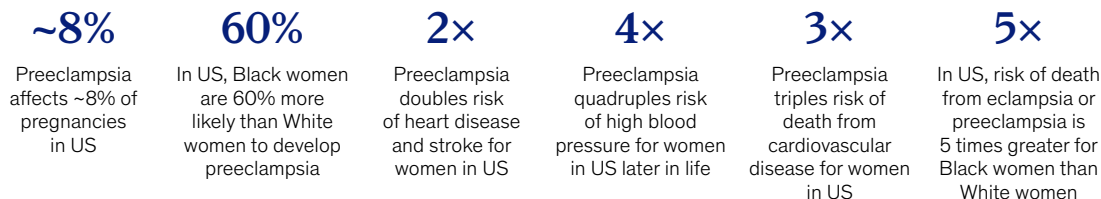
<sup>27</sup> "Cardiovascular disease in women," April 2016.

<sup>28</sup> Laxmi S. Mehta et al., "Cardiovascular considerations in caring for pregnant patients: A scientific statement from the American Heart Association," *Circulation*, June 2020, Volume 141, Number 23.

<sup>29</sup> "Peripartum cardiomyopathy," AHA, updated on May 28, 2024.

Exhibit 3

## Preeclampsia is a common pregnancy condition with lasting effects.



Source: *Genomics and Precision Health Blog*, "Preeclampsia, genomics and public health," blog entry by Erica L. Dawson and Muin J. Khoury, October 25, 2022; Preeclampsia Foundation

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### Menopause symptoms may play a role in hypertension

Menopause is a natural part of a woman's biological aging characterized by the end of the menstrual cycle and reduced estrogen and progesterone. It typically occurs between the ages of 45 and 55. CVD is more common in postmenopausal women than in similarly aged men, though this isn't the case prior to menopause.<sup>30</sup> Women between the ages of 45 and 65 (around menopausal transition) have the greatest rise in the prevalence of hypertension, yet more research is needed to understand why.<sup>31</sup>

Up to 80 percent of women may experience common menopausal symptoms, such as hot flashes and night sweats. These vasomotor symptoms (VMS) may play a role in hypertension and increased CVD risk. A study showed that women with frequent VMS associated with menopause had a 77 percent higher risk of developing CVD than did women with no or less-frequent VMS.<sup>32</sup>

### CVD disproportionately affects women of color

When examining women's cardiovascular health, statistics show how race and ethnicity can also affect women's healthcare experience. From initial diagnosis to treatment outcomes, women of color often face disparities in care. While some progress has been made, substantial opportunities to address these inequities remain.

In the United States, 59 percent of Black women over the age of 20 have some form of CVD, compared with 43 percent of Hispanic American women, 43 percent of Asian American women, and 42 percent of White women (Exhibit 4).<sup>33</sup> American Indian and Native Alaskan women have a prevalence of type 2 diabetes—up to 72 percent in some communities—that's three times higher than that of White American women.<sup>34</sup>

Despite having a high prevalence of CVD, persons of African, Hispanic, or Indigenous descent are underrepresented and underreported in US clinical trials.<sup>35</sup> Women of color sit at the intersection

<sup>30</sup> Emma Lee et al., "Vasomotor symptoms of menopause, autonomic dysfunction, and cardiovascular disease," *American Journal of Physiology – Heart and Circulatory Physiology*, December 2022, Volume 323, Number 6; Anna E. Stanhewicz, Megan M. Wenner, and Nina S. Stachenfeld, "Sex differences in endothelial function important to vascular health and overall cardiovascular disease risk across the lifespan," *American Journal of Physiology – Heart and Circulatory Physiology*, November 2018, Volume 315, Number 6.

<sup>31</sup> "Vasomotor symptoms of menopause, autonomic dysfunction, and cardiovascular disease," December 6, 2022.

<sup>32</sup> "Vasomotor symptoms of menopause, autonomic dysfunction, and cardiovascular disease," December 6, 2022.

<sup>33</sup> "2022 heart disease & stroke statistical update fact sheet, females & cardiovascular diseases\*," AHA, 2022.

<sup>34</sup> "Diabetes and American Indians/Alaska Natives," US Office of Minority Health, accessed June 2024; Healthy People 2020 Database, CDC, 2021; "Heart health is sub-optimal among American Indian/Alaska Native women, supports needed," AHA press release, May 31, 2023.

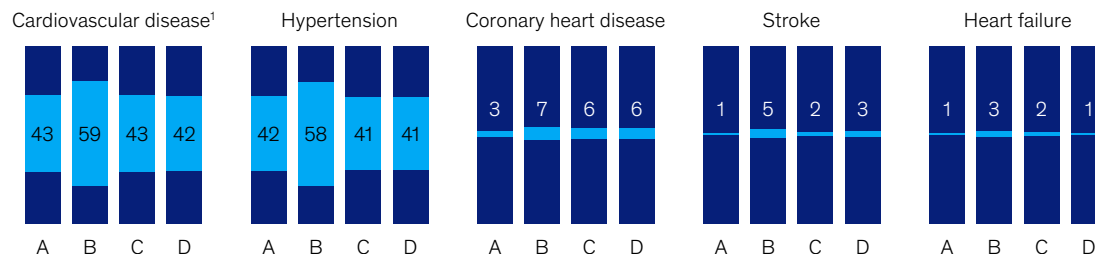
<sup>35</sup> Sujana Balla, Sofia Elena Gomez, and Fatima Rodriguez, "Disparities in cardiovascular care and outcomes for women from racial/ethnic minority backgrounds," *Current Treatment Options in Cardiovascular Medicine*, November 2020, Volume 22, Number 75.

Exhibit 4

## Black women in the United States face the highest burden of cardiovascular conditions relative to other cohorts.

Share of US women aged ≥20 with heart conditions in 2015–18, by race and ethnicity, %

A Asian American B Black C Hispanic American D White



<sup>1</sup>Acute rheumatic fever; cerebrovascular disease; chronic rheumatic fever; diseases of arteries, arterioles, and capillaries; diseases of lymph nodes, lymphatic vessels, and veins not elsewhere classified; hypertensive disease; ischemic heart disease; pulmonary heart disease and diseases of pulmonary circulation; other forms of heart disease; and other and unspecified disorders of the circulatory system.  
Source: "2022 heart disease & stroke statistical update fact sheet: Females & cardiovascular diseases," American Heart Association, January 2022

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of both low representation of women and low representation of non-White races and ethnicities in clinical trials, making their representation in clinical trials even more pertinent.

Black women are at a significantly higher risk than White women of developing CVD during pregnancy, having preterm deliveries, and delivering low-birth-weight infants, and they have the highest postpartum CVD risk, even when adjusted for socioeconomic status.<sup>36</sup> In the United States, the incidence of preeclampsia is 60 percent higher in Black women than in White women.<sup>37</sup> Additionally, Black women face more adverse outcomes related to the condition, including kidney damage and mortality.<sup>38</sup> American Indian and Native Alaskan women have the highest mortality from peripartum cardiomyopathy (14.5 percent) out of all US ethnic and race groups.

The reasons for these discrepancies are multifactorial and include structural inequalities and health-related social needs. Addressing biases, providing differential training for those serving these communities, and offering tailored healthcare delivery models that address specific communities would create more equity in care delivery for women of color.

### Cardiovascular research often underrepresents women, resulting in subpar treatment outcomes

Basic research, including in animal models, often excludes female subjects. One examined compilation of studies published from 2006 to 2016 that focused on preclinical cardiovascular research discovered that the sex of the animals used wasn't disclosed in 20 percent of the studies.<sup>39</sup> Among

<sup>36</sup> Mohamed M. Gad et al., "Disparities in cardiovascular disease outcomes among pregnant and post-partum women," *Journal of the American Heart Association*, December 2020, Volume 10, Number 1; Tracy A. Manuck, "Racial and ethnic differences in preterm birth: A complex, multifactorial problem," *Seminars in Perinatology*, December 2017, Volume 41, Number 8.

<sup>37</sup> Shanshan Sheehy et al., "Hypertensive disorders of pregnancy and risk of stroke in U.S. Black women," *NEJM Evidence*, July 2023, Volume 2, Number 10.

<sup>38</sup> "Disparities in cardiovascular disease outcomes among pregnant and post-partum women," December 2020.

<sup>39</sup> F. Daniel Ramirez et al., "Sex bias is increasingly prevalent in preclinical cardiovascular research: Implications for translational medicine and health equity for women," *Circulation*, February 2017, Volume 135, Number 6.



the studies that did report the sex, only males were used in 72 percent of cases, only females were used in 13 percent of cases, and both sexes were used in 16 percent of cases. Many researchers believe that including females may hamper studies because of the need for larger sample sizes, the increased cost, and the higher variability of female data as a result of the estrous cycle.<sup>40</sup>

Sex should be a consideration as part of initial study design, not only as an afterthought when outcomes differ. For example, between 1997 and 2000, the US Food and Drug Administration removed ten drugs from the market because of adverse events, with one drug noted to have a specific cardiovascular intervention.<sup>41</sup> Eight of those drugs posed greater risks to women than to men, and six correlated with comparatively poorer cardiovascular outcomes in women.

Despite US Congress passing a law in 1993 that required the inclusion of women in clinical research, a gender gap remains. A study looking at 740 trials in cardiovascular health from 2010 to 2017 found that women made up only 38 percent of study participants.<sup>42</sup> Even after adjusting for prevalence, women were underrepresented in trials related to acute coronary syndrome (ACS), coronary heart disease, and heart failure. Additionally, although postmenopausal women are often the ones most affected by CVD, they also had the lowest study participation rates (26 percent).<sup>43</sup> A smaller study, looking at 263 studies as recent as 2016 to 2019, found that women were in slightly less than 42 percent of cardiovascular studies, although 49 percent of the female population had CVD.<sup>44</sup>

The reasons for this are multifactorial, spanning systemic barriers, inadequate trial design, and participant-specific barriers. First and foremost, women need to be asked to participate as routine. Trials need to reflect geographies where a diverse population of women reside or offer alternative means of participation, such as digital engagement.

Furthermore, women often must juggle wage earning with more caretaking responsibilities than men have. Therefore, it's important to focus on finding ways to lessen the burden of clinical trial participation and address the challenges. Examples include providing assistance for aspects such as travel, transportation, food, eldercare, childcare, and other related expenses if visits to the trial sites are necessary and advancing the acceptability and ease of distributed clinical trials.<sup>45</sup>

Without enough women participating in trials, researchers have limited data on how treatments and preventative measures affect the female body, especially during transitions that include puberty, pregnancy, and menopause. Consequently, treatment recommendations may not be optimized for women, potentially leading to misdiagnosis and inadequate care.

For example, troponin tests, the gold standard of blood testing for the diagnosis of ACS (conditions characterized by sudden reduced blood supply to the heart), may be underdiagnosing women. Research has demonstrated the upper limits of normal may be twofold higher in men than in women; however, lab standards are based on men, resulting in underdiagnosis of women.<sup>46</sup> One study showed that using sex-differentiated troponin levels

<sup>40</sup> Annaliese K. Beery, "Inclusion of females does not increase variability in rodent research studies," *Current Opinion in Behavioral Sciences*, October 2018, Volume 23.

<sup>41</sup> "Drug safety: Most drugs withdrawn in recent years had greater health risks for women," US Government Accountability Office, January 19, 2001.

<sup>42</sup> Bridget Balch, "Why we know so little about women's health," Association of American Medical Colleges, March 26, 2024; Kardia Tobb, Madison Kocher, and Renée P. Bullock-Palmer, "Underrepresentation of women in cardiovascular trials—it is time to shatter this glass ceiling," *American Heart Journal Plus: Cardiology Research and Practice*, January 2022, Volume 13; Xurui Jin et al., "Women's participation in cardiovascular clinical trials from 2010 to 2017," *Circulation*, February 2020, Volume 141, Number 7.

<sup>43</sup> "Women's participation in cardiovascular clinical trials from 2010 to 2017," February 2020.

<sup>44</sup> Alexandra Z. Sosinsky et al., "Enrollment of female participants in United States drug and device phase 1–3 clinical trials between 2016 and 2019," *Contemporary Clinical Trials*, April 2022, Volume 115.

<sup>45</sup> Barbara E. Bierer et al., "Advancing the inclusion of underrepresented women in clinical research," *Cell Reports Medicine*, March 2022, Volume 3, Number 4.

<sup>46</sup> Haitham Khraishah et al., "Sex, racial, and ethnic disparities in acute coronary syndrome: Novel risk factors and recommendations for earlier diagnosis to improve outcomes," *Arteriosclerosis, Thrombosis, and Vascular Biology*, August 2023, Volume 43, Number 8; Dorien M. Kimenai et al., "Sex-specific versus overall clinical decision limits for cardiac troponin I and T for the diagnosis of acute myocardial infarction: A systematic review," *Clinical Chemistry*, July 2018, Volume 64, Number 7.

in testing increased ACS diagnosis in women by 42 percent and 6 percent in men.<sup>47</sup>

When looking at common interventions for heart failure, women may experience greater risk, side effects, and even worse outcomes than men do. This finding could be the result of a variety of factors, from differences in body composition to drug metabolism to hormone level fluctuations.<sup>48</sup> One study found that standard dosing of common cardiac medications (for example, ACE inhibitors, angiotensin receptor blockers, and beta-blockers) resulted in increased drug effect in women than in men at the same dosage, with a higher frequency of side effects.<sup>49</sup>

### **Women miss out on sex-appropriate cardiac care because of care delivery gaps**

A lack of knowledge, limited availability of sex- and gender-specific medical education, and various implicit and explicit biases contribute to the inequity in CVD care delivery.

The lack of knowledge persists throughout medical training. One study showed that only 22 percent of PCPs and 42 percent of cardiologists felt extremely well prepared to assess CVD risk in women.<sup>50</sup> Indeed, in one survey of over 40 medical schools in Canada and the United States, 70 percent of respondents didn't formally include sex- or gender-specific content in their curriculum.<sup>51</sup> With many women relying on an ob-gyn as their PCP,

sex- and gender-specific cardiovascular training should expand beyond traditional primary care and cardiology training.<sup>52</sup>

Current risk formulas often overlook factors that influence women's CVD risk—especially those related to menstrual cycles, pregnancy, and menopause (Exhibit 5). Additionally, research suggests that including health-related social needs (such as economic stability, neighborhood safety, and access to quality healthcare) in risk assessments for women, particularly women of color, can provide a more comprehensive picture of CVD risk.<sup>53</sup>

Previous research has examined gender disparity in cardiac treatment, particularly in relation to ACS. ACS presentation in men and women often differs. While chest pain is still the most common presentation in both sexes, women often report additional symptoms, such as abdominal pain, jaw pain, nausea, shortness of breath, palpitations, and vomiting.<sup>54</sup> In one study, upon presentation to the hospital with chest pain, women were more likely than men to attribute their symptoms to stress or anxiety (20.9 percent versus 11.8 percent). This may result in diagnostic inaccuracies and delayed treatment.

Furthermore, nonspecific electrocardiogram (EKG) changes are more common in women than in men—for example, estrogen-associated EKG changes mimicking ischemia.<sup>55</sup> This may be exacerbated by incorrect placement of the EKG electrodes because of presumed signal

<sup>47</sup> "Sex, racial, and ethnic disparities in acute coronary syndrome," August 2023.

<sup>48</sup> J. Tamargo et al., "Gender differences in the effects of cardiovascular drugs," *European Heart Journal—Cardiovascular Pharmacotherapy*, July 2017, Volume 3, Number 3.

<sup>49</sup> Giuseppe M. C. Rosano et al., "Gender differences in the effect of cardiovascular drugs: A position document of the Working Group on Pharmacology and Drug Therapy of the ESC," *European Heart Journal*, October 2015, Volume 36, Number 40; Bernadet T. Santema et al., "Identifying optimal doses of heart failure medications in men compared with women: A prospective, observational, cohort study," *Lancet*, October 2019, Volume 394, Number 10, 205.

<sup>50</sup> "Knowledge, attitudes, and beliefs regarding cardiovascular disease in women," July 2017.

<sup>51</sup> Najah Adrea et al., "Integration of women's cardiovascular health content into healthcare provider education: Results of a rapid review and national survey," *CJC Open*, February 2024, Volume 6, Number 2.

<sup>52</sup> Sara Mazzoni et al., "Patient perspectives of obstetrician-gynecologists as primary care providers," *Journal of Reproductive Medicine*, January–February 2017, Volume 62, Number 1–2.

<sup>53</sup> "Non-biological factors and social determinants of health important in women's CVD risk assessment," AHA press release, April 10, 2023; Li Wang et al., "Social determinants of health and hypertension in women compared with men in the United States: An analysis of the NHANES study," *Clinical Cardiology*, August 2023, Volume 46, Number 8.

<sup>54</sup> Judith H. Lichtman et al., "Sex differences in the presentation and perception of symptoms among young patients with myocardial infarction: Evidence from the VIRGO study (Variation in recovery: Role of gender on outcomes of young AMI patients)," *Circulation*, February 2018, Volume 137, Number 8.

<sup>55</sup> Helena Martínez-Sellés, David Martínez-Sellés, and Manuel Martínez-Sellés, "Sex, lies, and coronary artery disease," *Journal of Clinical Medicine*, July 2021, Volume 10, Number 14.

## The opportunity to assess certain sex-specific risk factors for cardiovascular disease exists at each life stage.

### Risk factors for cardiovascular disease in women, by life stage, nonexhaustive



#### Puberty

- Cycle irregularity
- Early menarche
- Oral-contraceptive use
- Polycystic ovary syndrome
- Primary amenorrhea



#### Reproductive age and pregnancy

- Assisted reproductive technology use or infertility
- Gestational diabetes
- Peripartum cardiomyopathy
- Preeclampsia
- Preterm delivery



#### Menopause

- Hormone-replacement-therapy use
- Premature menopause
- Premature ovarian insufficiency

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reduction by breast tissue.<sup>56</sup> It can potentially be mitigated by ensuring correct positioning using bone landmarks. This can help minimize inaccuracies in the EKG and prevent misdiagnosis.<sup>57</sup>

Women continue to have worse outcomes after ACS compared with men.<sup>58</sup> They're less likely to undergo coronary revascularization and receive essential ACS treatment at admission or discharge, even when adjusted for demographics, patient characteristics, and type of hospital. Women were 2.5 times less likely than men to be referred to a cardiologist after initial presentation with chest pain in an ambulatory care setting, particularly when the initial diagnosis was undertaken by a male physician.<sup>59</sup> In addition, women treated by female physicians may have a better chance of surviving a heart attack.<sup>60</sup>

Similarly, a study has shown that women were less likely than men to receive more aggressive (and appropriate) risk-factor-modification treatment (for example, statins), particularly when they were treated by a male PCP.<sup>61</sup> A large Canadian study focusing on atrial fibrillation found that male physicians were more likely to overestimate the risk of stroke in men but underestimate it in women.<sup>62</sup> In contrast, female physicians could accurately estimate the risk in women but underestimate it in men.

It's worth noting that even though half of medical-school graduates are women, women currently make up only 15 percent of adult cardiologists and 4 percent of interventional cardiologists in the United States.<sup>63</sup> Research conducted by the American College of Cardiology reported

<sup>56</sup> Pentti M. Rautaharju et al., "A standardized procedure for locating and documenting ECG chest electrode positions: Consideration of the effect of breast tissue on ECG amplitudes in women," *Journal of Electrocardiology*, January 1998, Volume 31, Number 1.

<sup>57</sup> "Best practices for ECG lead placement on women," GE HealthCare, February 16, 2022.

<sup>58</sup> "Sex, racial, and ethnic disparities in acute coronary syndrome," August 2023.

<sup>59</sup> Abdullah Al Hamid et al., "Gender bias in diagnosis, prevention, and treatment of cardiovascular diseases: A systematic review," *Cureus*, February 2024, Volume 16, Number 2.

<sup>60</sup> Vera Regitz-Zagrosek and Catherine Gebhard, "Gender medicine: Effects of sex and gender on cardiovascular disease manifestation and outcomes," *Nature Reviews Cardiology*, April 2023, Volume 20, Number 4.

<sup>61</sup> Sonya N. Burgess, "Understudied, under-recognized, underdiagnosed, and undertreated: Sex-based disparities in cardiovascular medicine," *Circulation: Cardiovascular Intervention*, February 2022, Volume 15, Number 2; Emily S. Lau et al., "Does patient-physician gender concordance influence patient perceptions or outcomes?," *Journal of the American College of Cardiology*, March 2021, Volume 77, Number 8; "Women with heart disease are less likely to receive life-saving drugs than men," European Society of Cardiology press release, April 25, 2024.

<sup>62</sup> Hanna Lee et al., "Association between patient and physician sex and physician-estimated stroke and bleeding risks in atrial fibrillation," *Canadian Journal of Cardiology*, February 2019, Volume 35, Number 2.

<sup>63</sup> Parham Eshtehardi et al., "Women leaders: Transforming the culture in cardiology," *Open Heart*, February 2022, Volume 9, Number 1.

that almost two-thirds of female cardiologists consistently experienced discrimination at work, mostly related to gender and childbirth.<sup>64</sup> Less than a quarter of men reported discrimination, which was largely in relation to race and religion rather than gender.

A survey of internal medicine trainees found that having a positive role model was the most important professional development need for both men and women.<sup>65</sup> A significant majority of women felt that the field of cardiology lacked the positive role models they were looking for. This lack of role models, combined with discrimination, may discourage potential candidates from entering the field and perpetuate low rates of women serving as mentors for future trainees.

These biases extend beyond the clinical setting. Women are less likely than men to receive bystander cardiopulmonary resuscitation in case of out-of-hospital cardiac arrest, resulting in lower survival to discharge (the odds ratio for men to women is 1.27).<sup>66</sup>

The use of AI in healthcare has seen a dramatic increase in recent years. Some uses show great promise. In one study, clinical-decision-making accuracy in chest pain evaluation was improved with the assistance of AI, without introducing or exacerbating existing gender biases.<sup>67</sup> Amid busy schedules, clinicians often don't have the time to stay on top of the latest research and clinical guidelines, so using AI tools as prompts to ask pertinent questions in a consultation (for example, assessing a woman's menopausal history as part of a comprehensive CVD risk assessment) could be a viable solution.

However, machine learning models that are trained on data sets containing primarily men can result in suboptimal results, mistakes, and discriminatory outcomes, because they do not consider the sex and gender differences in health and disease.<sup>68</sup>

### **Innovation and investment in women's heart health could make a difference**

All ecosystem stakeholders could play a role in integrating a sex-specific lens at the onset of trial design, incorporating it into innovation design, testing, and launch. To continue discovering the most effective CVD prevention methods and interventions for women, greater investment in both women's heart health and heart health overall is needed. CVD research funding made up less than 6 percent of the US National Institutes of Health (NIH) budget in 2022, with only a fifth of that dedicated to women's heart health.<sup>69</sup> That category includes, for example, conditions that may be unique to women or more prevalent in women than in men for which medical interventions may be different or there has been insufficient clinical data on women.

Women primarily drive 80 percent of healthcare decisions and spending for their families.<sup>70</sup> However, investments continue deprioritizing sex-specific care. As biopharma companies are exploring new mechanisms of action for novel cardiovascular therapies, they can be leaders in developing sex-specific strategies, from R&D to commercialization. For example, they can aim to understand the biological impacts on women of drug metabolism, pharmacodynamics, and pharmacokinetics. Biopharma companies can also embrace a strategy for women's heart health that extends beyond the cardiovascular system. This would require

<sup>64</sup> Marwah Shahid, "Addressing the underrepresentation of women in cardiology through tangible opportunities for mentorship and leadership," *Methodist DeBakey Cardiovascular Journal*, January–March 2019, Volume 15, Number 1.

<sup>65</sup> Meghan York et al., "Professional preferences and perceptions of cardiology among internal medicine residents: Temporal trends over the past decade," *JAMA Cardiology*, December 2022, Volume 7, Number 12.

<sup>66</sup> Audrey L. Blewer et al., "Gender disparities among adult recipients of bystander cardiopulmonary resuscitation in the public," *Circulation: Cardiovascular Quality and Outcomes*, August 2018, Volume 11, Number 8.

<sup>67</sup> Ethan Goh et al., "ChatGPT influence on medical decision-making, bias, and equity: A randomized study of clinicians evaluating clinical vignettes," medRxiv, November 2023, Volume 2023.

<sup>68</sup> Davide Cirillo et al., "Sex and gender differences and biases in artificial intelligence for biomedicine and healthcare," *NPJ Digital Medicine*, June 2020, Volume 3; Agostina J. Larrazabal et al., "Gender imbalance in medical imaging datasets produces biased classifiers for computer-aided diagnosis," *Proceedings of the National Academy of Sciences of the United States of America*, June 2020, Volume 117, Number 23.

<sup>69</sup> "Budget," US National Institutes of Health (NIH), October 4, 2023; *Report of the Advisory Committee on Research on Women's Health: Fiscal years 2021–2022*, NIH, 2023.

<sup>70</sup> Sabrina Matoff-Stepp et al., "Women as health care decision-makers: Implications for health care coverage in the United States," *Journal of Health Care for the Poor and Underserved*, November 2014, Volume 25, Number 4.

acknowledging the overlap between therapeutic areas and cross-therapeutic area expansion (for example, into cardiovascular, metabolic, renal, and other areas).

In addition to expanding sex-segregated R&D across emerging clinical interventions that benefit both women and men, increased investment is needed for female-specific heart health conditions (for example, preeclampsia). In 2020, only 1 percent of healthcare research and innovation was invested in female-specific conditions beyond oncology.<sup>71</sup>

Venture capital investment in women's health has increased 314 percent over the past five years; however, investment in FemTech (diagnostic tools, products, services, wearables, and software that use technology to address women's health issues) makes up 2 percent of the overall health sector.<sup>72</sup> Women make up 13 percent of start-up founders overall yet were 24 percent of FemTech founders in 2022—a rate that declined to 22 percent in 2023.<sup>73</sup> Since women only receive 2 percent of total venture capital funding in the United States,<sup>74</sup> this puts FemTech at a potentially greater disadvantage.

In parallel, research suggests that cardiovascular-health-related start-ups and innovations receive less funding than other major therapeutic areas do.<sup>75</sup> And when they do receive funding, it's mostly in digital health or data-driven business models, suggesting that start-ups with a cardiovascular focus outside of these fields may continue to be underfunded.<sup>76</sup>

Female leadership across healthcare research and delivery matters. While women make up the vast majority of the US healthcare workforce, only about a third of US hospitals are led by women, and less than 15 percent of system CEO roles are filled by women.<sup>77</sup> A study across 4,271 medical products

demonstrated that boards with women participating as directors announced recalls about four weeks earlier than boards with all men did.<sup>78</sup> With a lower number of women in decision-making positions, there might be a blind spot regarding the potential and importance of women's health innovations, especially in conditions such as CVD that have been primarily associated with men.

As a note, the investment landscape for FemTech is still nascent, with most companies in that field focused on maternal health, menstrual health, and fertility. Although there's a growing opportunity to address women's health beyond female-specific conditions, such as in cardiovascular health, fewer than 20 early-stage companies focus on women's cardiac health—and the majority of those focus on maternal cardiac health.<sup>79</sup> While FemTech funding has continued to increase, there's still a lag in funding for women's cardiovascular health.

## Recommended actions to close the gap

Improving women's cardiovascular-health outcomes will require prioritization and a strategic investment of resources, leadership, and dedicated time across all areas of health. Despite rising awareness over the past decades about the importance of recognizing women's heart health, an economic opportunity amounting to \$28 billion still exists to prevent the 1.6 million years of life lost because of poor health or premature deaths in women in the United States.

Stakeholders in the public and private sectors, including employers, not-for-profit organizations, and researchers, have an opportunity to embrace the business of better health. By addressing the existing gap and moving closer to achieving a healthier population, with a specific focus on

<sup>71</sup> "Unlocking opportunities in women's healthcare," McKinsey, February 14, 2022.

<sup>72</sup> Phalguni Deswal, "FemTech: The world's largest 'niche' market," Medical Device Network, March 8, 2024.

<sup>73</sup> Kevin Dowd, "A sector-by-sector guide to the gender gap among startup founders," Carta, January 17, 2024.

<sup>74</sup> Sara Silano, "Women founders get 2% of venture capital funding in U.S.," Morningstar, March 6, 2023.

<sup>75</sup> Christopher Colecchi and David Tancredi, "Broadview Ventures: Investing in the future of cardiovascular technology," *JACC: Basic to Translational Science*, February 2016, Volume 1, Number 1–2.

<sup>76</sup> "What drives innovation in cardiovascular health?," AHA, accessed June 2024.

<sup>77</sup> *American Hospital Statistics*, 2017 edition, American Hospital Association, January 2017; Jason N. Mose, "Representation of women in top executive positions in general medical-surgical hospitals in the United States," *Women's Health Reports*, May 2021, Volume 2, Number 1.

<sup>78</sup> Corinne Post et al., "Dangerous products recalled faster when women are on the board," *I by IMD*, March 24, 2022.

<sup>79</sup> PitchBook, accessed February 2024.

women's heart health across all age groups, everyone could benefit.

### **Advance sex-specific research from basic sciences to clinical trials**

Research could be meaningfully improved by shifting from a one-size-fits-all approach to prioritizing sex-specific differences:

- Developing more *knowledge around women and heart disease* relies on a deeper understanding of biological differences. Future research could provide a crucial recognition of the distinctive vulnerabilities that women face across their lives, including during pregnancy.
- Revamping and expanding *clinical research initiatives* may include conducting clinical trials specifically focused on women at all stages of life. Validating women-centric diagnostic tools and investigating the impact of CVD on vulnerable and intersectional populations could also improve care delivery.
- Additional *transparency and disclosure* within research, drugs, and devices could lead to national dashboards on giving evidence on sex-based differences. As the evidence base becomes more robust, it could be built into clinical guidelines.

### **Improve routine health data collection, diagnostics, and treatment algorithms**

Effective guidelines and algorithms rely on a foundation of comprehensive data collection and a balanced representation of women across all age groups and health conditions. Collecting women-specific data in a standardized, easily digestible format should become routine. For example, the NIH has branded menstrual cycle information as the “fifth vital sign.”<sup>80</sup>

Potential avenues to improve routine health data collection and diagnostics include the following:

- *Improved diagnostic criteria for women and separate treatment pathways for men and women.* There also may be applicability for other specialties—for example, one study found that breast arterial calcification, picked up on routine mammograms, may be a useful surrogate for atherosclerotic cardiac disease.<sup>81</sup>
- *Interoperable wearables that deliver information to providers.* Smartphone apps to track heart health, telemedicine, heart health consultations, and wearable devices all empower individuals to keep track of their health. Future efforts may include that data being shared or flagged to a provider if something appears concerning.
- *AI assistance.* As use of AI accelerates in healthcare settings, institutions could consider setting up continuous monitoring and evaluation of these novel technologies. Such efforts are essential to ensure their effectiveness in improving women's cardiovascular-health outcomes, access, and care experience.

In all efforts to improve data collection, patient privacy must be paramount. All US-based companies should follow regulations such as the Health Breach Notification Rule, Health Insurance Portability and Accountability Act of 1996 rules, 21st Century Cures Act, and Code of Federal Regulations on information blocking.

### **Equip healthcare providers across the care continuum**

Healthcare providers across the spectrum, including neurologists, PCPs, and ob-gyns, to name a few, could view women's cardiovascular health as a shared responsibility to improve outcomes. Imagine, for example, creating a standard postpartum health visit that focused on not just the baby or the mom's obstetric needs but also a comprehensive cardiovascular “debrief” from any high-risk events occurring during pregnancy.

<sup>80</sup> “Menstrual cycles as a fifth vital sign,” Eunice Kennedy Shriver National Institute of Child Health and Human Development, September 13, 2021.

<sup>81</sup> Carlos Iribarren et al., “Breast arterial calcification: A novel cardiovascular risk enhancer among postmenopausal women,” *Circulation: Cardiovascular Imaging*, March 2022, Volume 15, Number 3.

Other actions may include the following:

- **Training on how to identify and mitigate potential biases within the healthcare setting.** Hospital systems can further strengthen this approach by creating women's health programs that bring together specialties such as cardiology, obstetrics–gynecology, oncology, and primary care. These specialists could not only serve patients but act as educational hubs for other providers within the hospital setting.
- **Expansion of the role that allied healthcare practitioners play in the management of CVD.** Many people, such as doulas, midwives, and community workers, can be involved in cardiovascular care in women. For example, tailored, patient-centric, nurse-led interventions focused on self-management strategies have been shown to encourage a sense of ownership over a patient's health journey and increase the likelihood of sustained positive behavior.<sup>82</sup>

#### **Raise public awareness on heart health, and tailor prevention strategies across a lifespan**

Public-education campaigns continue to play a valuable role in cardiovascular health. Culturally sensitive, accessible materials that raise awareness about risk factors, prevention strategies, and resources can be tailored to help those at risk of developing CVD. There are several additional ways that outreach could occur:

- **Educational institutions.** This includes teaching sex-based differences, including challenges and opportunities related to women-specific care delivery, in medical-school curricula and throughout medical residency.
- **Direct to consumer.** Engaging women through trusted channels in the moments that matter. Outreach can occur during pregnancy using pregnancy-specific apps. Baby boomers are the most likely to be on certain social media sites, so using those sites to provide resources within

the fields of heart health and menopause may benefit women of that generation.

- **Employers.** Workplace wellness programs can equip employees with the knowledge and tools to prioritize their heart health, potentially improving overall quality of life and removing absenteeism. Additionally, employers have opportunities to improve health through six modifiable drivers: economic security, mindsets and beliefs, productive activity, sleep, social interaction, and stress.<sup>83</sup> Furthermore, employers can examine their boards and C-suites to assess whether they're meeting their vision of a diverse and inclusive workplace.

#### **Invest in furthering women's heart health**

Investing in businesses and initiatives that improve women's cardiovascular health could have benefits for patients, society, and investors. By addressing the unmet needs in women's heart health, businesses can make a substantial impact on the lives of women and potentially tap into a large, underserved market. Here are some items to consider:

- Life science investors that focus on large, underserved markets (such as both heart health and associated conditions) could benefit from the *relative lack of other players* in this area. Most investments in women's health have historically focused on reproductive health.
- Employers that focus on heart health through workplace wellness programs or other initiatives could benefit from *reduced absenteeism* and potentially lower the healthcare costs associated with chronic conditions.

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With 60 million US women living with CVD, the time to act is now. Despite recent advances, a health gap in CVD for women still exists. It's underpinned by limited understanding of the biological differences of women from men and their impact on CVD;

<sup>82</sup> Lemma N. Bulto and Jeroen M. Hendriks, "The role of nurse-led interventions to empower patients in cardiovascular care," *European Journal of Cardiovascular Nursing*, March 2024, Volume 23, Number 2.

<sup>83</sup> Jacqueline Brassey, Lars Hartenstein, Barbara Jeffery, and Patrick Simon, "Working nine to thrive," MHI, March 13, 2024.

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women's underrepresentation in clinical research; lower effectiveness of CVD prevention, diagnosis in women compared with men; and poorer care delivery for women compared with men. Addressing the gap by 2040 could give an annual 1.6 million years of life lost because of poor health or early death back to women. In parallel, it could boost the US economy by \$28 billion and the global economy by at least \$80 billion.

Closing the woman's health gap in CVD can't be done singlehandedly overnight. It will require a consistent and collective effort from various stakeholders, including community leaders, governments, healthcare institutions, individuals, investors, medical and nursing education boards, and workplaces. As women are often the cornerstones of their families, communities, and

workplaces, addressing their health equity could have far-reaching effects on all strata of society. This can begin by reframing women's heart health as a problem for everyone to tackle, not as a "women's problem."

Women's heart health can be improved at every stage of life, and the wide gap reflects tremendous opportunity to improve the quality of life for every woman in the United States. In a new era, the burden of CVD could be erased, and women could better lend their talents, energy, and leadership to every sector of society. By prioritizing accessible healthcare, education, and research related to women's heart health, a future is possible where millions of women not only live longer, healthier lives, but also contribute their full potential to a thriving global society.

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*This report reflects women's health as a market segment. For the purposes of this report, the term "woman" was applied to any individual assigned female at birth and includes those under the age of 18. The authors acknowledge the importance of healthcare to the gender-fluid, nonbinary, and transgender communities and that not all people who identify as women are assigned female at birth.*

*The authors have used the phrase "sex and gender" to reflect inclusive language and recognize the need for future research into health issues that's inclusive of the gender-fluid, nonbinary, and transgender communities. They also acknowledge the profound health differences among women based on factors such as age, disability, ethnicity, race, sexual orientation, and socioeconomic status. Additional work and research should reflect on how to tackle these components alongside the overall women's health gap.*



# Technical appendix

This report presents the results of our investigation of the women's health burden related to cardiovascular disease (CVD), the size of the health gap relative to men, and the potential to close that gap by addressing sources of structural or systematic bias. Building on the report published in 2024 by the McKinsey Health Institute and the World Economic Forum,<sup>1</sup> this appendix outlines the approach and key assumptions for the numbers calculated in this piece. For more information on the methodology of the broader investigation, please see the 2024 report's technical appendix.

## Calculating the burden for CVD

This analysis is based on an assessment of CVD burden, measured in disability-adjusted life years (DALYs), in women in the United States. It uses estimation from the Global Burden of Disease study data set published by the Institute of Health Metrics and Evaluation in 2019.

## Estimating the GDP impact of CVD

To estimate the health gap impact in terms of GDP, we looked at the top conditions contributing to 85 percent of the cardiovascular burden in females in the United States in 2019. These were ischemic heart disease (45 percent), stroke (28 percent), atrial fibrillation and flutter (6 percent), and hypertensive heart disease (6 percent). These conditions were chosen as part of the 64 conditions from the original report based on a ranking of the conditions contributing the most to the female health burden around the world, as measured in DALYs.

To size the economic gap, we estimated the benefits of having a larger, healthier, and more productive female labor force and used it to project the annual potential GDP contribution to 2040. Economic impact was estimated by translating the potential health improvement from eliminating the women's health gap into the associated earnings potential (estimated as the probability of being in work for the affected age group multiplied by the expected earnings).

The economic impact was calculated across four buckets: fewer early deaths, fewer health conditions, increased productivity, and expanded participation. The first three factors expand the number of workers, and the last produces increased economic contribution per worker because of increased productivity.

The category of fewer early deaths covers the economic opportunity from additional women participating in the workforce. The category of fewer health conditions takes into account additional time in the workforce gained from being healthier (for example, lower rates of short-term absenteeism and of longer-term sickness-related absences). The category of increased productivity calculates the number of women affected by conditions associated with presenteeism and their potential for productivity increase, as well as the future earning potential of girls if poor health is avoided during childhood and adolescence. Finally, the category of expanded participation considers the growth of the workforce supply through the increased participation of groups not included in the workforce that require additional measures beyond the gain in healthy life (for example, people with disabilities and informal caregivers).

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<sup>1</sup> Kweilin Ellingrud, Lucy Pérez, Anouk Petersen, and Valentina Sartori, "Closing the women's health gap: A \$1 trillion opportunity to improve lives and economies," McKinsey Health Institute, January 17, 2024.