

AHA SCIENTIFIC STATEMENT

Cardiovascular Disease Risk Factors in Women: The Impact of Race and Ethnicity: A Scientific Statement From the American Heart Association

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ABSTRACT: Cardiovascular disease is the leading cause of death in women, yet differences exist among certain racial and ethnic groups. Aside from traditional risk factors, behavioral and environmental factors and social determinants of health affect cardiovascular health and risk in women. Language barriers, discrimination, acculturation, and health care access disproportionately affect women of underrepresented races and ethnicities. These factors result in a higher prevalence of cardiovascular disease and significant challenges in the diagnosis and treatment of cardiovascular conditions. Culturally sensitive, peer-led community and health care professional education is a necessary step in the prevention of cardiovascular disease. Equitable access to evidence-based cardiovascular preventive health care should be available for all women regardless of race and ethnicity; however, these guidelines are not equally incorporated into clinical practice. This scientific statement reviews the current evidence on racial and ethnic differences in cardiovascular risk factors and current cardiovascular preventive therapies for women in the United States.

Key Words: AHA Scientific Statements ■ cardiovascular diseases ■ ethnicity ■ primary prevention ■ racial groups ■ risk factors ■ women

Cardiovascular disease (CVD) remains the number one cause of death for women in the United States.¹ The focused research on women at risk for CVD has clarified our understanding of some of the sex-specific factors that are important in the detection of atherosclerosis and reduction in death. The 2010 landmark Institute of Medicine report, *Women's Health Research: Progress, Pitfalls and Promise*, underscored the fact that although major progress was made in reducing cardiovascular death, disparities existed in disease burden among subgroups of women, particularly among those who were socially disenfranchised because of race, ethnicity, educational attainment, and income level.² Women who are at high risk for the development of CVD and its associated risk factors face even greater risk when they are members of certain racial and ethnic groups. Expanding the cardio-

vascular risk assessment to include the social determinants of health (SDOH) and nonbiological variables that affect cardiovascular risk and outcomes is essential for achieving the American Heart Association's (AHA's) 2024 Impact Goal of advancing cardiovascular health for all by identifying and removing barriers to health care access and quality.³

Racial, ethnic, and sex disparities in cardiovascular care are well documented. This scientific statement aims to highlight the need for an expanded approach to risk factors and primary prevention strategies for CVD for women of underrepresented races and ethnicities who are particularly vulnerable to health disparities. It is important to acknowledge that there are gaps in current knowledge and data specific to each race and ethnicity, all of which warrant further investigation and are beyond the scope of this document.

METHODS

The writing group members were nominated by the AHA Manuscript Oversight Committee and have a broad range of expertise on CVD in women and the relationship to race and ethnicity. A general framework outlined by the committee chair was used to conduct a comprehensive literature review to summarize existing evidence and to indicate gaps in current knowledge. Only English-language studies were reviewed, with PubMed/MEDLINE as our primary resource, as well as the Cochrane Library Reviews, Centers for Disease Control and Prevention, and US Census data as secondary resources.

CARDIOVASCULAR RISK FACTORS

Traditional risk factors of CVD are well defined: diabetes, hypertension, dyslipidemia, family history of heart disease, smoking, physical inactivity, poor diet, and obesity.

Clinical risk stratification tools and risk scores have been developed for stratifying risk and tailoring preventive intervention. The Pooled Cohort Risk equations were recommended in the American College of Cardiology/AHA cholesterol and hypertension guidelines, and although they include sex and Black or White race status, limitations remain in risk calibration for other racial and ethnic groups.^{4,5} Given the limited race and ethnicity data available for women living in the United States, we focus our discussion on the traditional CVD risk factors of hypertension, dyslipidemia, diabetes, obesity, and tobacco use among non-Hispanic Black, Hispanic/Latina, American Indian/Alaska Native, and Asian women, as well as the current limitations of using traditional risk factor screening models in these populations.

Limitations of Traditional Risk Factors and Consideration of Nontraditional Risk Factors

There are many limitations to traditional risk factors and their ability to comprehensively estimate a person's risk for CVD. For example, body mass index (BMI) is often used as a means to identify obesity; however, it is not an ideal metric in people of underrepresented races and ethnicities such as Asian individuals.⁶ To date, risk assessment models do not take into account sex-specific biological risk factors: pregnancy-related factors (pre-eclampsia, gestational diabetes or hypertension, miscarriages, preterm delivery), menstrual cycle history (age at start of menarche and menopause), medications (contraception, hormone therapy), and medical conditions (polycystic ovarian syndrome, autoimmune disorders, and history of certain chemotherapy or radiation therapy).

Mental health conditions are an additional nontraditional risk factor that have a significant effect on cardiovascular health. Women have anxiety and depression disproportionately to men and are nearly twice as likely as men to be

diagnosed with depression. Depressed mood can occur as a result of normal hormonal changes associated with puberty, menstruation, pregnancy, perimenopause, and menopause. In addition, environmental and cultural stressors are associated with the higher incidence of depression in women. Psychosocial stressors such as discrimination, poor social support, domestic violence, primary elder and child caregiving roles, and unequal power dynamics in the workplace play a significant role and may increase the risk of depression in women.^{7–14} Incorporating screening for mental health conditions such as depression and posttraumatic stress disorder, which are more common in women and are associated with a higher risk of developing cardiometabolic risk factors and incident CVD, may better serve women and provide a more comprehensive assessment.¹⁵

In addition, SDOH, which include economic stability, neighborhood safety, education, social and community context, and access to quality health care, have a significant role in the development of CVD and vary across racial and ethnic groups.¹⁶ This impact is recognized in the recent AHA scientific statement that has redefined overall cardiovascular health metrics from Life's Simple 7 to now Life's Essential 8.¹⁷ This includes metrics pertaining to health behaviors (diet; physical activity; nicotine exposure, including vaping and exposure to secondhand smoke; and the new inclusion of sleep hygiene) and health factors (BMI, blood lipids, blood glucose, blood pressure), all of which may vary according to racial and ethnic cultural norms and beliefs.^{16,17} Exposure to poor working conditions, poor living conditions, environmental hazards, reduced access to medical care, and other social determinants varies across racial and ethnic groups. Detailed information on the cardiovascular health of non-Hispanic Black, Hispanic/Latina, American Indian/Alaska Native, and Asian women and SDOH can be found in AHA scientific statements focused on these people of underrepresented races and ethnicities.^{16,18–23} However, the influential SDOH have not yet been incorporated into traditional risk factor assessment tools.

CVD IN WOMEN ACROSS RACE AND ETHNICITY

This scientific statement uses the contemporary views of race and ethnicity not as biological variables but mainly as social, cultural, environmental, systemic, and demographic constructs that are invaluable in the assessment of access to health care, quality of care, and strategies to improve cardiovascular outcomes and to advance cardiovascular equity.^{24–26}

Black Women

CVD is the leading cause of death for non-Hispanic Black women.¹ Black is used as an umbrella term for a heterogeneous population that often encompasses African

American, African (East, West, South), and Afro Caribbean.²⁷ Nearly 60% of non-Hispanic Black women ≥ 20 years of age have CVD (coronary heart disease [CHD], heart failure, cerebrovascular accident [CVA], and hypertension)¹; included within that are CVAs that disproportionately affect non-Hispanic Black women, making CVD prevalence rates the highest among this group.¹⁸ Non-Hispanic Black women account for the greatest number of deaths, with 22.9% of all deaths resulting from heart disease (rheumatic heart disease, hypertensive heart disease, ischemic heart disease, endocarditis, heart failure, other myocardial/pericardial diseases) compared with 22.0% in non-Hispanic White women.²⁸ As a result, they have a persistent life expectancy gap, with non-Hispanic Black women living 75 years on average compared with 80 years for non-Hispanic White women.²⁹ A key contributor to the disparities in care is that non-Hispanic Black women are disproportionately affected in the prevalence and magnitude of effect of traditional risk factors, driven most prominently by SDOH, which leads to this higher prevalence and earlier age at onset of CVD.¹

Hispanic/Latina Women

CVD is the leading cause of death among Hispanic/Latina adults, which refers to individuals of any racial and ethnic background whose ancestry is from Mexico, Central America, South America, the Caribbean, or other Spanish-speaking countries.¹⁹ In 2017, nearly 43% of Hispanic/Latina women had some form of CVD (CHD, heart failure, CVA, hypertension).¹ Paradoxically, despite a higher prevalence of diabetes, obesity, and metabolic syndrome, particularly in women, CVD death rates have remained 15% to 20% lower than in non-Hispanic White women.^{1,30} This poorly characterized epidemiological phenomenon (the Hispanic paradox) may not apply equally to all subgroups, both sexes, and all types of CVD. It is possible that paradoxes in data may be secondary to the underappreciation of the diverse composition of the Hispanic/Latino population, which, in the United States, includes a mixture of races, ethnicities, and socioeconomic and demographic backgrounds. Unfortunately, research has been sparse, consisting mostly of cross-sectional studies focusing on Mexican American individuals or grouping diverse Hispanic/Latino subjects together. This approach to the study of the Hispanic/Latino population has contributed to epidemiological generalizations that do not take into account the possible heterogeneity in CVD risk profiles and may misrepresent their outcomes.¹⁹

American Indian and Alaska Native Women

American Indian and Alaska Native people are a heterogeneous population that includes 574 federally recognized tribes (and many tribes not federally recognized) and make up $\approx 2\%$ of the US population.²⁰ CVD (heart disease and CVA) is the leading cause of death in American

Indian/Alaska Native women,^{31,32} and more than one-third of CVD-related deaths occur among American Indian/Alaska Native men and women < 65 years of age.²⁰ Among American Indian/Alaska Native women, there is substantial variation in CVD-related death rates by geographic region, with the highest rates observed in the Southern and Northern Plains.^{31,33} Most CVD-related deaths are a consequence of underlying CHD.^{31,34}

In the SHS (Strong Heart Study), the largest longitudinal study of CVD among American Indian adults,³⁵ the prevalence of CHD among American Indian/Alaska Native women without and with diabetes was 17.8% and 26.5%, respectively.³⁶ The prevalence of modifiable risk factors in American Indian/Alaska Native women is high, with almost 50% of American Indian/Alaska Native adult women having at least 2 cardiovascular risk factors.³⁷ Unfortunately, understanding the cardiovascular health of American Indian/Alaska Native people remains challenging because many available national data sets underreport the burden of CVD and related deaths in American Indian/Alaska Native people as a result of small sample sizes, racial misclassification, or both.^{38–40}

Asian Women

CVD is the leading cause of death for Asian women in the United States.¹ According to the Office of Management and Budget, federal Asian race and ethnicity classification is defined as having origins in the Far East, Southeast Asia, or the Indian subcontinent, including countries such as Cambodia, China, India, Japan, Korea, Malaysia, Philippines, Thailand, and Vietnam.²⁷ The prevalence of CVD is high in non-Hispanic Asian women (45%); however, there is considerable heterogeneity in both CVD risk factors and outcomes.¹ A report from US national mortality records of the 6 largest Asian subgroups (Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese) from 2003 to 2011 revealed significant differences in cause-specific death, with the highest CVD death rates among Asian Indian women. Although Asian Indian and Filipina women have the highest age-adjusted CVD death rates compared with other Asian subgroups, the rates are still significantly lower than for non-Hispanic White women.⁴¹ Most studies that have examined traditional CVD risk factors in Asian American individuals have found associations similar to those reported for non-Hispanic White people; however, the prevalence varies among Asian subgroups.²¹

CVD RISK FACTORS ACROSS RACE AND ETHNICITY

Hypertension

Non-Hispanic Black women have among the highest prevalence of hypertension in the world at 55.3%.¹ Non-Hispanic Black women are less likely to have controlled

blood pressure compared with non-Hispanic White women and are more likely to have controlled blood pressure compared with Mexican American women. As with other risk factors, there is a lack of consistent data on the prevalence of hypertension among Hispanic/Latina subgroups. According to AHA statistics, 40.8% of Hispanic/Latina women have hypertension.¹ Generally, Mexican American women have a significantly lower prevalence of hypertension compared with all other subgroups, whereas the prevalence is higher in Dominican, Puerto Rican, and Cuban individuals.⁴² Hispanic/Latina Black women have a higher prevalence of hypertension than Hispanic/Latina White women.⁴² The National Heart, Lung, and Blood Institute–sponsored Hispanic Community Health Study (HCHS)/SOL (Study of Latinos) showed that the prevalence of hypertension was higher among Puerto Rican women and lowest in South American women.^{42,43}

Hypertension is a significant risk factor for CHD in American Indian/Alaska Native people, particularly among individuals with diabetes.^{44,45} There are regional differences in the prevalence of hypertension in American Indian/Alaska Native women, with estimates ranging from 25% to 41%.^{46–49} In a study of the 6 largest Asian American subgroups, a greater proportion of death from hypertensive disease was observed in all subgroups compared with non-Hispanic White women.⁵⁰ A New York City Health and Nutrition Examination Survey found substantially higher hypertension rates for Asian (38.0%) and Hispanic (33.0%) adults compared with non-Hispanic White adults (27.5%); however, subcategorization by sex was not reported. In addition, East/Southeast Asian adults had much higher odds of hypertension compared with non-Hispanic White adults (adjusted odds ratio, 2.8 [95% CI, 1.6–4.9]).⁵¹ A Northern California study also found heterogeneity in age-adjusted hypertension rates from 30.0% in Chinese to 53.2% in Filipina women. Except for Filipina, Mexican, and non-Hispanic Black women, most women of underrepresented race and ethnicity subgroups had lower or similar rates of hypertension compared with non-Hispanic White women.⁵²

Dyslipidemia

The prevalence of elevated total cholesterol (>200 mg/dL) and low-density lipoprotein (LDL; >130 mg/dL) cholesterol levels is lower among non-Hispanic Black women compared with women of other races and ethnicities (33.4% and 24.3%, respectively).^{1,53} Lipoprotein(a) (Lp[a]), which is an LDL-like particle with an additional apolipoprotein a attached to it, is highest among people of non-Hispanic Black ancestry, followed by those of South Asian, non-Hispanic White, Hispanic/Latino, and East Asian ancestry.⁵⁴ In the ARIC study (Atherosclerosis Risk in Communities), plasma Lp(a) was found to be positively associated with CVD events in Black and White adults;

furthermore, high Lp(a) levels in non-Hispanic Black and non-Hispanic White women were found to be associated with a higher incidence of ischemic strokes.^{55,56}

Dyslipidemia is highly prevalent among Hispanic/Latina women in the United States: 37.3% with total cholesterol levels ≥ 200 mg/dL, 26.3% with LDL ≥ 130 mg/dL, and 12.3% with high-density lipoprotein <40 mg/dL. Among adult American women, the mean triglycerides level is 86.8 mg/dL, whereas non-Hispanic Black and non-Hispanic Asian women have lower mean triglyceride levels, and levels are slightly higher (88.3 mg/dL) among non-Hispanic White women and highest (97.1 mg/dL) among Hispanic/Latina women.¹ Although NHANES (National Health and Nutrition Examination Survey) data demonstrated higher prevalence rates of hypercholesterolemia in Mexican American women,¹ HCHS/SOL showed that Puerto Rican women had the highest prevalence of hypercholesterolemia, followed by Cuban and Central American women. Female sex was one of the factors associated with dyslipidemia in HCHS/SOL.⁵⁷

About 1 in 5 American Indian/Alaska Native women has been diagnosed with hyperlipidemia.¹ The SHS showed that the effect of LDL cholesterol on CHD risk was highest in those with diabetes⁴⁵; thus, optimal management of lipids and glucose is critical to maximize cardiovascular health.⁵⁸ To date, the majority of lipid studies for Asian individuals have been conducted in their country of origin, with Asian Indian and Filipino people having a higher prevalence of low high-density lipoprotein cholesterol and high triglycerides.^{59–61} One study from Northern California explored the variability of lipid profiles among Asian subgroups and found that Asian Indian and Chinese women had greater odds of low high-density lipoprotein cholesterol than non-Hispanic White women. In addition, compared with non-Hispanic White women, Chinese, Filipina, and Japanese women had a greater likelihood of high triglycerides.⁶¹

Furthermore, Lp(a) is an independent risk factor for CVD and is higher in Asian Indian individuals compared with non-Hispanic White individuals.⁶² An analysis from INTERHEART found an association between high Lp(a) and increased CVD risk among Chinese, South Asian, and Southeast Asian adults; however, sex-specific data were not reported. The population-attributable risk of high Lp(a) and myocardial infarction was highest among South Asian adults (9.5%).⁶²

Diabetes

Type 2 diabetes accounts for >95% of diabetes in the United States, and non-Hispanic Black women are more likely to develop it.¹⁸ The prevalence of diagnosed diabetes among non-Hispanic Black US women ≥ 20 years of age is 13.2%.¹ Less is known about the prevalence of gestational diabetes. However, in a nationally representative sample of US women, the prevalence of gestational diabetes was higher in non-Hispanic Black

women at 7.4% compared with 6.7% in non-Hispanic White women.⁶³

Among Hispanic/Latina adults in NHANES, 14.1% of women had diagnosed diabetes compared with 7.3% of non-Hispanic White women.⁶⁴ The prevalence of diabetes differs among individuals with different Hispanic/Latina backgrounds, with a higher incidence seen in Mexican American and Puerto Rican women compared with other Hispanic/Latina women subgroups. In HCHS/SOL, 17% of women had diabetes. The prevalence was lowest in South American women (10.2%) and highest in Puerto Rican women (19.4%), followed by Mexican American women (18.5%), who were less likely to meet hemoglobin A1c and LDL cholesterol goals.⁶⁵

American Indian women have a high prevalence (19%) of diagnosed diabetes, and diabetes is the primary risk factor for CHD in American Indian women.^{34,38,66} However, the prevalence of diabetes varies by region; among SHS participants, the prevalence of diabetes was 72% among American Indian women in Arizona and 40% to 42% among American Indian women from Oklahoma, North Dakota, and South Dakota.⁶⁷ Although most studies report low levels of diabetes (\approx 5%–8%) in Alaska Native women,^{48,68,69} data from the population-based Alaska Native Diabetes Registry demonstrate a recent increasing trend in the prevalence and incidence of diabetes for Alaska Native women.^{46,70}

Type 2 diabetes is highly prevalent among Asian Indian and Filipina women, and several studies have found that Asian Indian people have higher rates of insulin resistance, whereas Filipino people have a higher prevalence of metabolic syndrome.^{61,71,72} Although the associations between BMI and diabetes are strong across racial groups, the BMI cut point for increased risk of type 2 diabetes is lower for Asian people than for other racial groups, including non-Hispanic White and non-Hispanic Black people.⁷³

From 2011 to 2016, the age- and sex-adjusted prevalence of undiagnosed diabetes and total diabetes was highest among non-Hispanic Asian groups compared with non-Hispanic White people. In addition, after adjustment for age, sex, and BMI, Southeast Asian individuals had the highest diabetes prevalence among all Asian subgroups.⁷⁴ The MASALA study (Mediators of Atherosclerosis of South Asians Living in America) found a higher prevalence of type 2 diabetes in South Asian women (22.4%) compared with women of other ethnicities from MESA (Multi-Ethnic Study of Atherosclerosis) even after adjustment for age, sex, and BMI (15.2% in non-Hispanic Black, 11.7% in Hispanic, 12.9% in Chinese American, and 5.6% in non-Hispanic White women).⁷⁵

Obesity

The prevalence of obesity (BMI >30 kg/m²) has continued to increase among adults in the United States, from

30.5% in 1999 to 39.5% in 2016. The highest age-adjusted obesity (55.3%) and extreme obesity (15.3%) prevalences were in non-Hispanic Black women compared with non-Hispanic White, Hispanic/Latina, or non-Hispanic Asian women.¹ Obesity is highly prevalent in Mexican American⁷⁶ and Puerto Rican^{43,77} women. There is a higher prevalence of obesity in Hispanic/Latina women than in Hispanic/Latino men and a significantly higher prevalence than in non-Hispanic White women (48.4% versus 37.8%, respectively) in prior and current studies. In HCHS/SOL, only 21.2% of women were at a healthy BMI.⁴³

Obesity is 50% more likely in American Indian/Alaska Native adults compared with non-Hispanic White adults, with an age-adjusted percentage of 48.1% of American Indian/Alaska Native individuals ≥ 18 years of age with obesity. However, sex-specific data are not available.⁷⁸ Among Alaska Native women, obesity rates vary between 32.8% and 60%.^{79,80} The mean BMI among American Indian/Alaska Native women is 30 to 34.9 kg/m², but data are limited, and obesity rates vary greatly.^{49,79} In a separate subanalysis of the SHS, obesity was an inverse predictor for CVD in women after adjustment for smoking, which warrants further investigation.³⁴

Although Asian American adults have a lower prevalence of overweight and obesity than adults in other racial groups, they have higher rates of hypertension, CVD, and type 2 diabetes at the same BMI levels.⁸¹ As a result, the World Health Organization and American Diabetes Association have recommended lower BMI cut points for defining overweight (BMI ≥ 23 kg/m²) and obesity (BMI ≥ 27.5 kg/m²) in Asian individuals to increase the identification of cardiometabolic risk in this population.^{73,82,83} In addition to environmental and genetic factors, increased cardiometabolic risk has been attributed to fat composition and distribution. Asian individuals generally have a higher percentage of body fat than non-Hispanic White individuals of the same age, sex, and BMI. Studies have shown a greater proportion of central adiposity and visceral body fat deposition in Chinese, Filipino, and Asian Indian people compared with non-Hispanic White and non-Hispanic Black people.^{21,82} The International Diabetes Federation recommends a waist circumference cutoff of ≥ 88 cm clinically for non-Hispanic White women and ≥ 80 cm for South Asian women.^{84,85} In addition, Asian women carry greater abdominal and visceral fat compared with non-Hispanic White women with similar adiposity and BMI, which may contribute to their elevated cardiometabolic risk.⁸⁶ A cross-sectional cohort study of MESA and MASALA found that South Asian individuals generally have greater intramuscular and visceral fat and less lean mass compared with Chinese American individuals.⁸⁷

Tobacco Use

Data from the 2020 NHIS (National Health Interview Survey) indicate that overall tobacco use among

non-Hispanic Black adults is comparable to that in non-Hispanic White adults, with 14.4% of non-Hispanic Black adults ≥ 18 years of age using cigarettes, followed by 1.6% using cigars, 1.6% reporting electronic cigarette use, and 1% using pipes.⁸⁸ Data show that non-Hispanic Black individuals initiate smoking at an older age and smoke fewer cigarettes per day; however, they die of smoking-related diseases at higher rates than their non-Hispanic White counterparts.⁸⁹ Sex-specific data based on race and ethnicity were not reported, but data from the National Center for Health Statistics showed decreasing rates of current cigarette use in non-Hispanic Black women from 23.1% in 1990 to 1992 to 12.1% in 2016 to 2018.⁹⁰

Data from the 2020 NHIS indicate that overall tobacco product use is lower for US Hispanic/Latino adults than for non-Hispanic White adults and non-Hispanic Black adults, with 8.0% of Hispanic/Latino adults ≥ 18 years of age using cigarettes, followed by 2.8% reporting electronic cigarette use, 2.2% using cigars, and 0.9% using pipes.⁸⁸ Data show that Hispanic/Latino adults born in the United States are more likely to smoke cigarettes than foreign-born Hispanic/Latino adults residing in the United States. In addition, Puerto Rican people were more likely to smoke cigarettes compared with Dominican and Mexican American people living in the United States.⁸⁹ Sex-specific data based on race and ethnicity were not reported, but data from the National Center for Health Statistics showed decreasing rates of current cigarette smoking in Hispanic/Latina women from 15.8% in 1990 to 1992 to 7.0% in 2016 to 2018.⁹⁰

Traditional tobacco is an important part of the culture for many American Indian/Alaska Native people, and it is used for ceremonial and medicinal purposes.⁹¹ However, the use of commercial tobacco (eg, cigarette smoking, vaping, chew) is higher for American Indian/Alaska Native individuals overall than for other racial and ethnic populations in the United States.⁹² Approximately 1 in 3 American Indian/Alaska Native women report current smoking, and $>50\%$ of American Indian/Alaska Native women report being either current or former smokers, with the prevalence of smoking during pregnancy being 15% among American Indian/Alaska Native women.^{88,93–95}

Data from the 2020 NHIS indicate that overall nicotine use among Asian adults is lower than among non-Hispanic White adults, with 8.0% of Asian adults ≥ 18 years of age using cigarettes, followed by 3.4% reporting electronic cigarette use, 0.9% using cigars, and 0.4% using pipes.⁸⁸ Sex-specific data based on race and ethnicity were not reported, but data from the National Center for Health Statistics show decreasing rates of current cigarette smoking in Asian women from 6.3% in 1990 to 1992 to 4.5% in 2016 to 2018.⁹⁰

A summary of the CVD risk factors of hypertension, dyslipidemia, diabetes, obesity, and tobacco use specific to race and ethnicity is provided in Table 1.

NONTRADITIONAL RISK FACTORS AND SDOH

Sex-Specific Risk Factors

Much discussion has occurred over the utility of incorporating nontraditional risk factors into standard risk assessment tools. The US Preventive Services Task Force concluded in 2018 that there was insufficient evidence to say whether adding nontraditional risk factors such as high-sensitivity C-reactive protein or coronary artery calcium score to traditional risk assessment tools would benefit patients who do not have CVD symptoms.⁹⁶ However, there is much to consider when examining sex-specific factors and their impact on CVD risk. For example, pregnancy-related risk factors such as preeclampsia and eclampsia demonstrate notable racial and ethnic disparities, with the highest age-adjusted prevalence seen in non-Hispanic Black compared with Hispanic/Latina and non-Hispanic White women. This places the mother at risk for severe morbidity and increases future cardiovascular risk.^{97,98} Asian women may have the highest risk for developing cardiovascular complications from preeclampsia.⁹⁹ In the United States, 2 of 3 women who experience preeclampsia will die of heart disease.¹⁰⁰ Moreover, the impact of pregnancy-related risk factors extends to the offspring born to women with preeclampsia and increases their likelihood of having hypertension and obesity, placing them at higher risk for CVD, particularly heart disease and CVA.¹⁰⁰ Notably, nearly one-third of young adults with hypertension were born to mothers who experienced hypertension during pregnancy.¹⁰⁰

The history of one's menstrual cycle, including the age at the start of menarche and menopause, is another nontraditional, sex-specific risk factor assessment that should be considered when evaluating women for CVD risk. Early menarche is associated with adiposity and metabolic syndrome, suggested to be attributable, in part, to increased lifetime exposure to estrogen.¹⁰¹ In addition, early age at menarche has been associated with increased risk of CVD events and all-cause death.¹⁰² Both early age and late age at menarche have been associated with increased risks of CHD,¹⁰³ with a suggestion that inflammatory biomarkers are at play in the development of angiographic coronary artery disease and could play a role in mediating atherosclerotic plaque destabilization.¹⁰⁴ With regard to menopause, it is imperative to state that menopause is a natural part of a woman's life cycle, and changes that occur during this phase of life can affect heart health. The prevalence of metabolic syndrome increases with menopause.¹⁰⁵ In addition, diminishing levels of estrogen lead to changes in the lipid profile by reducing protective high-density lipoprotein and elevating apolipoprotein B levels and triglycerides, thereby increasing the risk for CVD.¹⁰⁶ Decreasing estrogen levels have also been associated with increased intraarterial cholesterol deposition and increased visceral

Table 1. Cardiovascular Risk Factor Profiles by Race and Ethnicity

	Hypertension	Dyslipidemia	Diabetes	Obesity	Tobacco use
Non-Hispanic Black women	Highest prevalence in world: 55.3% ¹	High Lp(a) levels associated with higher incidence of ischemic strokes ⁵⁴	Prevalence in women >20 y of age: 13.2% ¹	Highest age-adjusted prevalence of obesity and extreme obesity: 55.3% and 15.3%, respectively ¹	Decreasing rates of current smoking ⁹⁰ More attempts to quit smoking, less successful at quitting ⁸⁹ Die of smoking-related diseases at higher rates ⁸⁹
Hispanic/Latina women	High prevalence: 40.8% Wide variation across subgroups: Black Hispanic/Latina women have higher prevalence of hypertension than White Hispanic/Latina women ¹	High prevalence: 37.3% have elevated total cholesterol >200 mg/dL, 26.3% have elevated LDL >130 mg/dL, 12.3% have HDL <40 mg/dL ¹	Heterogeneity across subgroups: highest prevalence in Puerto Rican women (19.4%) and Mexican American women (18.5%) ⁸⁴	Higher prevalence in Hispanic/Latina women compared with Hispanic/Latino men ¹	Decreasing rates of smoking ⁹⁰ US-born Hispanic/Latino people more likely to smoke cigarettes than foreign-born Hispanic/Latino people ⁸⁹
American Indian/Alaska Native women	Prevalence ranges regionally from 25%–41% ^{46–49}	1 in 5 diagnosed with hyperlipidemia	High prevalence: 19% ³⁸ Varies widely by region: 72% among American Indian women in Arizona ⁸⁷	High age-adjusted prevalence: 48.1%* ⁷⁸ Mean BMI ⁴⁹ 30–34.9 kg/m ²	Commercial tobacco use higher than in other racial and ethnic populations ⁹² 1 in 3 currently smoke ⁸⁸ Prevalence of smoking during pregnancy: 15% ⁸⁴
Asian women	Heterogeneity across subgroups: from 30% in Chinese women to 53.2% in Filipina women ⁵²	Heterogeneity across subgroups: Asian Indian and Filipino people have higher prevalence of low HDL cholesterol and high triglycerides ^{59–61} Lp(a) higher in Asian Indian people than non-Hispanic White people ⁸²	Asian Indian people: higher rates of insulin resistance ⁷¹ Filipino people: higher prevalence of metabolic syndrome ⁷² Southeast Asian people: highest prevalence among all Asian subgroups ⁶¹	Have greater proportion of body fat, central adiposity, and visceral fat ^{21,82}	Decreasing rates of smoking ⁹⁰ Overall nicotine use lower than in non-Hispanic White people ⁸⁸

BMI indicates body mass index; HDL, high-density lipoprotein; LDL, low-density lipoprotein; and Lp(a), lipoprotein(a).
*Sex-specific data not available.

fat, which are associated with an increase in triglycerides and insulin resistance.¹⁰⁷

Polycystic ovarian syndrome is a common sex-specific endocrine disorder that affects 5% to 10% of women of reproductive age that also has deleterious effects on the cardiovascular risk profile.¹⁰⁸ Because of the many clinical derangements associated with polycystic ovarian syndrome such as hypertension, altered lipid and glucose metabolism, vascular injury, and systemic inflammation, polycystic ovarian syndrome has previously been recommended to be considered a cardiovascular risk factor.¹⁰⁹ Similarly, those with an autoimmune disorders, of whom an estimated 80% are women, are at greater risk of developing CVD and premature CVD. Autoimmune diseases demonstrate a clear sex bias with a greater prevalence among women, occurring at a rate of 2:1, with some disorders being genetic and some sporadic.¹¹⁰ Regardless of the mechanism of manifestation, patients with autoimmune disease are predisposed to accelerated atherosclerosis, increased CVD risk, and worse outcome from cardiovascular events as a result of inflammatory-mediated endothelial dysfunction and accelerated atherosclerosis.¹¹¹

Social Determinants of Health

SDOH, including barriers to health care access and structural racism, are also primary determinants that

complicate the prevention and management of CVD.¹⁸ There is evidence that SDOH factors experienced in youth such as adverse neighborhood characteristics, poverty, toxic exposures, inability to access health care, or inability to afford care may affect heart health into adulthood and contribute to CVD risk factors and outcomes in adulthood.^{1,16,23}

Environmental factors such as air pollution, high long-term arsenic exposure, and cadmium and lead exposure have been linked to CVD, including CHD, CVA, and peripheral artery disease.^{112,113} Asian communities in the United States are disproportionately exposed to air pollution compared with predominantly non-Hispanic White communities, although the number of studies is small.¹¹⁴ In MESA, air pollution exposure was associated with carotid intima-media thickness, a predictor of CVD, in Chinese American women.¹¹⁵ Disproportionate lead exposure among non-Hispanic Black women in the United States is of major concern because blood lead levels increase during periods of increased bone metabolism such as pregnancy and menopause and have been related to preeclampsia and increased hypertension risk.^{116–119} Air pollution and arsenic exposures have been associated with increased CVD and diabetes risk in Hispanic/Latino communities.^{50–55} American Indian communities in the Southwest and Midwest are also disproportionately affected by contaminant metal

exposures, with arsenic and cadmium exposures related to increased risk of CVD among American Indian women.^{113,120–122}

Evidence also suggests that perceived discrimination and racism are contributing factors. Such conditions lead to upregulation of the sympathetic nervous system and hypothalamic axis and inflammatory dysregulation, leading to an increased risk for CVD, contributing to cardiovascular health disparities, particularly among women of underrepresented races and ethnicities.¹²³ As a result, non-Hispanic Black women living in socially disenfranchised communities are 3 times more likely to have hypertension, with objective measures of structural racism strongly associated with hypertension and obesity in this population.¹²⁴ Researchers attribute carrying a higher allostatic load, a measure of physiological impact of stress on the body, to the combined weight of racism and sexism, with the terms weathering and superwoman schema used to explain the premature deterioration of health in non-Hispanic Black women exposed to stress, danger, and social disenfranchisement.^{125–127} Additional information on the cardiovascular health of non-Hispanic Black, Hispanic/Latina, American Indian/Alaska Native, and Asian women and a detailed discussion on SDOH can be found in the AHA scientific statements focused on people of underrepresented races and ethnicities.^{16,18–23}

CURRENT GUIDELINES ON CVD PRIMARY PREVENTIVE THERAPIES IN WOMEN

Notable Progress Made

Recent AHA/American College of Cardiology guidelines on the management of hypertension (2017), management of cholesterol (2018), and primary prevention of CVD (2019) have recognized the role of sex-specific risk factors in the evaluation and management of cardiovascular risk factors.^{4,5,128} Current guideline-based recommendations on the management of cardiovascular risk factors and prevention of atherosclerotic CVD are summarized here and in Table 2.^{4,5,128–131} AHA scientific statements on cardiovascular considerations in pregnancy and menopause transition have further highlighted the need for nuanced management of cardiovascular risk in women.^{105,132} In addition, statin treatment groups have been updated in the 2018 cholesterol guidelines, taking into account sex-specific risk factors.⁵ Statin therapy is recommended for primary prevention in patients with a 10-year atherosclerotic CVD risk $\geq 20\%$ or those with borderline or intermediate risk, depending on the presence of risk enhancers, including history of preeclampsia, premature menopause, and inflammatory conditions, that disproportionately affect women.⁴ In

addition, the American Diabetes Association's "Standards of Care in Diabetes—2023" highlights the management of women with prediabetes with a history of gestational diabetes, making recommendations for more frequent screening and more intensive lifestyle and treatment interventions.¹³³

Recently, controversy arose after randomized clinical trials demonstrated no net benefit of low-dose aspirin for the primary prevention of atherosclerotic CVD in patients with diabetes, the elderly, or those with intermediate atherosclerotic CVD risk, regardless of sex.^{134–136} However, for women at high risk of preeclampsia, special consideration is required. The American College of Obstetricians and Gynecologists recommends starting low-dose aspirin (81 mg/d) between 12 and 28 weeks of gestation and continuing it daily until delivery to prevent preeclampsia in women with high-risk features (chronic hypertension, history of preeclampsia, multifetal gestation, diabetes, renal disease, and autoimmune disease) or in women with >1 moderate-risk factors (BMI ≥ 30 kg/m², nulliparity, maternal age ≥ 35 years, family history of preeclampsia, Black race, low socioeconomic status, personal history of previous adverse pregnancy outcomes).^{130,131} The US Preventive Services Task Force has similar recommendations to prescribe low-dose aspirin after 12 weeks of gestation to individuals at high risk of preeclampsia or with a combination of multiple moderate risk factors.¹³⁷

CONSIDERATIONS AND CURRENT GAPS IN KNOWLEDGE

CVD prevention guidance statements have evolved over the decades, with recent emphasis on the consideration of the effects of nontraditional sex-specific risk factors on women's cardiovascular health. Despite this progress, more work needs to be done to refine the understanding we have of biological influencers of health. In addition, racial and ethnic refinements are missing, leaving us to extrapolate from racial and ethnic generalizations. Because of the lack of Hispanic/Latino, American Indian/Alaska Native, and Asian American representation in large registries used for cardiovascular risk assessment, including the American College of Cardiology/AHA Pooled Cohort Equation, specific risk calculators that more broadly incorporate race, ethnicity, and SDOH are currently not available, and the default White risk equation is applied, which may not accurately predict CVD risk.⁴ Inadequate race and ethnicity data hamper optimal management of CVD risk factors and affect outcomes.

Future CVD prevention guidelines would be bolstered by culturally specific lifestyle recommendations tailored to the cultural norms and expectations that influence behaviors, beliefs, and attitudes about diet,

Table 2. Current Guidelines and Considerations on CVD Preventive Therapies in Women^{4,5,128–131}

General guideline recommendations	Sex-specific considerations
BP	
<p>Encourage optimal BP of <120/80 mm Hg through lifestyle approaches</p> <p>BP categorization</p> <p>Normal: SBP <120 mm Hg and DBP <80 mm Hg</p> <p>Elevated: SBP 120–129 mm Hg and DBP <80 mm Hg</p> <p>Stage 1 hypertension: SBP 130–139 mm Hg or DBP 80–89 mm Hg</p> <p>Stage 2 hypertension: SBP ≥140 mm Hg or DBP ≥90 mm Hg</p> <p>BP treatment thresholds</p> <p>Stage 1 hypertension: clinical CVD, diabetes, or ASCVD risk ≥10%</p> <p>Stage 2 hypertension: no history of CVD and ASCVD risk <10%</p>	<p>Use thiazide diuretic as first-line agent in older women for osteoporosis prevention</p> <p>Avoid atenolol, ACE inhibitors, and ARBs during pregnancy</p> <p>Treat hypertension (≥140/90 mm Hg) during pregnancy</p> <p>Evaluate women with preeclampsia within 3–12 mo of delivery and treat cardiovascular risk factors</p>
Lipids	
<p>Encourage optimal lipid levels through lifestyle approaches:</p> <p>LDL cholesterol <100 mg/dL, HDL cholesterol >50 mg/dL, triglycerides <150 mg/dL, and non-HDL cholesterol <130 mg/dL</p> <p>Statin treatment groups:</p> <p>Clinical ASCVD</p> <p>Severe hypercholesterolemia (LDL ≥190 mg/dL)</p> <p>Diabetes</p> <p>Primary prevention: ASCVD risk ≥20% or 7.5%–<20%, depending on presence of risk enhancers</p>	<p>Stop statins 1–2 mo before attempting pregnancy in women at low to moderate risk. Consider continued use of water-soluble statins in very high-risk pregnant women.</p> <p>Statin use while breastfeeding is not recommended.</p> <p>Risk enhancers: history of preeclampsia, premature menopause (<40 y), inflammatory conditions (eg, rheumatoid arthritis or lupus)</p> <p>Consider other APOs to assess risk and to guide counseling: gestational hypertension, gestational diabetes, preterm delivery, delivering small-for-gestational-age infant</p>
Aspirin	
<p>Aspirin in individuals with CVD unless contraindicated</p> <p>Low-dose aspirin can be considered for primary prevention among select adults at high ASCVD risk and low bleeding risk.</p>	<p>Start aspirin at 12 wk of gestation to prevent preeclampsia in women at high risk of preeclampsia and consider in women at moderate risk of preeclampsia.</p> <p>Obtain and document pregnancy history throughout a woman's life course, and identify APOs as ASCVD risk factors.</p>
Smoking cessation	
<p>Recommend smoking cessation and avoidance of environmental tobacco</p>	<p>More directly address weight gain and anxiety management concerns with female smokers reluctant to quit.</p>
Diet	
<p>Diet emphasizing intake of vegetables, fruits, legumes, nuts, whole grains, and fish</p> <p>Diet limiting consumption of saturated fat, cholesterol, sodium, processed meats, refined carbohydrates, and sweetened beverages</p>	
Exercise	
<p>Engage in 150 min/wk of moderate-intensity or 75 min/wk of vigorous-intensity aerobic exercise</p> <p>Additional cardiovascular benefit with 300 min/wk of moderate-intensity or 150 min/wk of vigorous-intensity aerobic exercise</p>	<p>Engage in muscle-strengthening activities ≥2 d/wk</p>
Weight loss/maintenance	
<p>Maintain or achieve an appropriate body weight through comprehensive lifestyle intervention</p> <p>Higher levels of physical activity recommended (≥300 min/wk) to maintain weight loss</p>	
Environmental exposures	
<p>Assessment of exposure to environmental hazards (eg, living near a highway, unregulated private well for drinking water, house built before 1978).</p> <p>Recommendations based on cardiovascular risk (eg, mask use, air filtration, green spaces)</p> <p>Environmental justice initiatives (eg, renovation of lead water pipes infrastructure, built environment, and green spaces).</p>	<p>Consider lead monitoring during pregnancy and menopause in high-risk populations (eg, child affected at home, old housing)</p>

ACE indicates angiotensin-converting enzyme; APO, adverse pregnancy outcome; ARB, angiotensin receptor blocker; ASCVD, atherosclerotic cardiovascular disease; BMI, body mass index; BP, blood pressure; CVD, cardiovascular disease; DBP, diastolic blood pressure; HDL, high-density lipoprotein; LDL, low-density lipoprotein; and SBP, systolic blood pressure.

physical activity, and healthy weight. Community-based approaches, faith-based community partnerships, and peer support in encouraging a better lifestyle for

chronic disease management among women could play an important role in improving the primary prevention of CVD. For example, the SAHELI study (South Asian

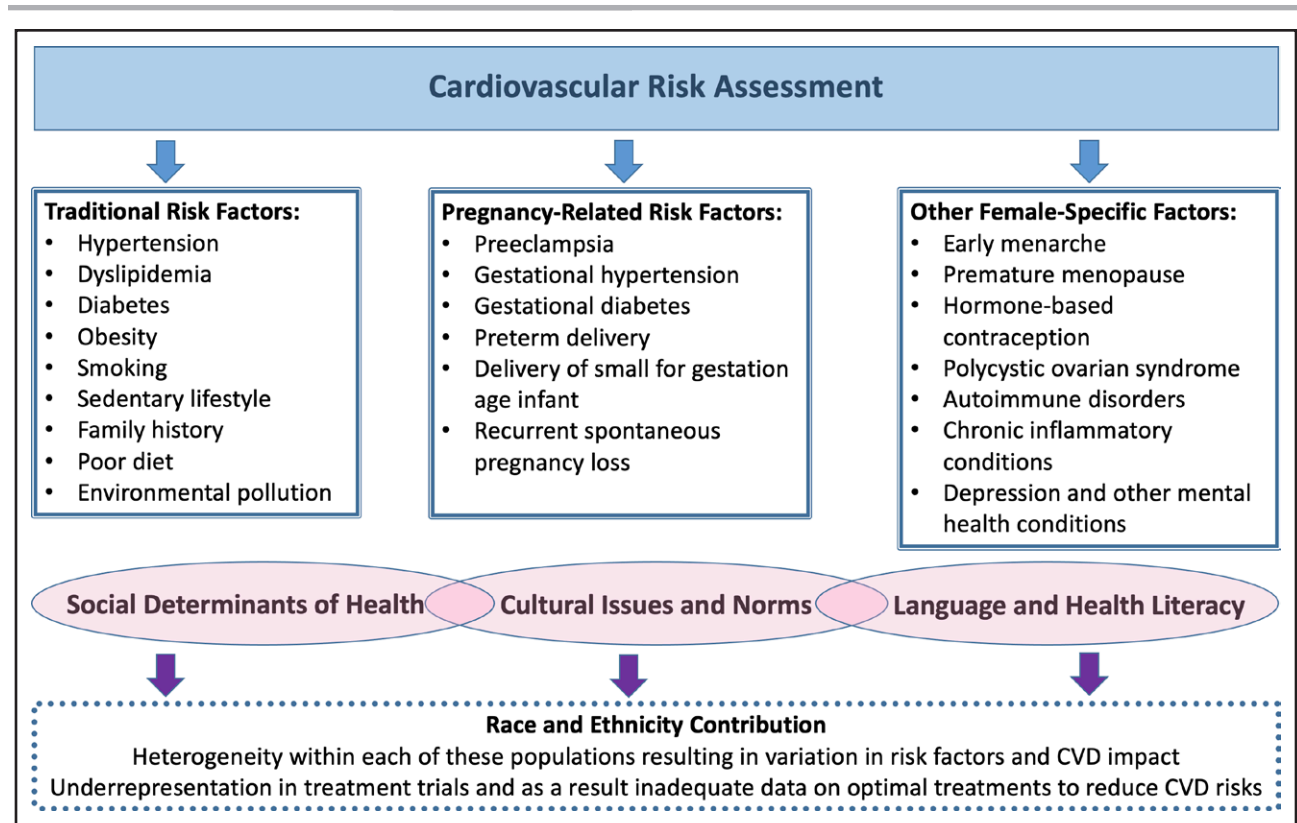


Figure 1. Cardiovascular risk factors in women and the impact of race and ethnicity contribution.

CVD indicates cardiovascular disease.

Heart Lifestyle Intervention) demonstrated that an intervention with culturally targeted, community-based lifestyle interventions designed for medically underserved South Asian individuals was more effective at addressing CVD risk factors than print health education materials.¹³⁸ Key considerations in providing culturally competent care are the patient's preferred language and religion, dietary restrictions, sex identity, cultural norms and practices, health literacy, and cultural differences in communication style.¹³⁹

Potential strategies to use include the following: (1) Provide barrier-free coverage for recommended evidence-based therapies; (2) incorporate screening and treatment for cardiovascular risk factors in all primary health care settings for all patients; (3) develop and increase access to culturally tailored consultations and services such as health education, preconception counseling, weight loss, and nutritional counseling; (4) share health messages through media campaigns in the preferred language of the target population with messaging sensitive to the specific cultural group⁸⁹; (5) increase enrollment of underrepresented populations in clinical trials; (6) mandate and enforce reporting of research participant data by sex and race and ethnicity; (7) create and promote programmatic pipelines for recruiting people who are underrepresented in medicine; and (8) recruit and

retain women of underrepresented races and ethnicities in cardiovascular research.

CONCLUSIONS

CVD risk assessment in women is multifaceted in that it surpasses the traditional risk factors to include sex-specific biological risk factors and incorporates race and ethnicity and nonbiological factors: SDOH and behavioral and environmental factors (Figures 1 and 2). A greater focus on addressing adverse levels of all CVD risk factors among women of underrepresented races and ethnicities is warranted to avert future CVD morbidity and death. Adverse social factors such as health care access, migrant status, language barriers, discrimination, acculturation, and environmental racism (the disproportionate impact of environmental hazards on people of color) are common in communities of underrepresented races and ethnicities and pose a significant challenge in the diagnosis of CVD and the application of treatment modalities. Culturally sensitive, peer-led community and health care professional education is a necessary step in CVD prevention. Equitable access to guideline-approved, evidence-based cardiovascular preventive health care based on available data should be available for all women regardless of race and ethnicity. Despite this knowledge, these guidelines are not equally incorporated into practice, which highlights a call to action.

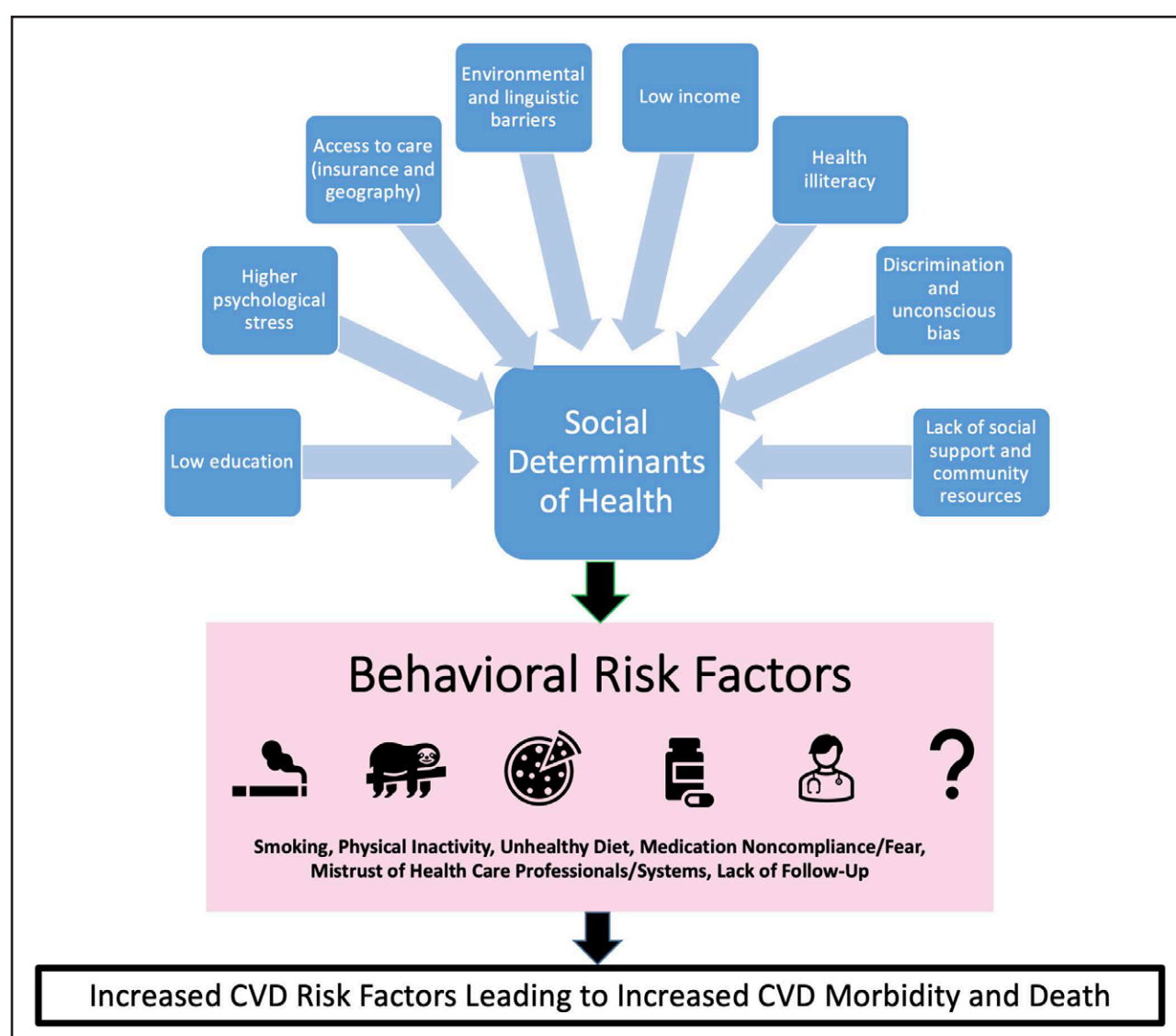


Figure 2. Nonbiological variables to be incorporated into the cardiovascular risk assessment of women.
CVD indicates cardiovascular disease.

ARTICLE INFORMATION

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

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Disclosures

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*Modest.

†Significant.

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