

JACC REVIEW TOPIC OF THE WEEK

Socioeconomic Determinants of Health and Cardiovascular Outcomes in Women



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ABSTRACT

Socioeconomic disparities in cardiovascular risk factors and outcomes exist among women, particularly those of minority racial or ethnic backgrounds. Barriers to optimal cardiovascular health begin early in life—with inadequate access to effective contraception, postpartum follow-up, and maternity leave—and result in excess rates of myocardial infarction, stroke, and cardiovascular death in at-risk populations. Contributing factors include reduced access to care, low levels of income and social support, and lack of diversity among cardiology clinicians and within clinical trials. These barriers can be mitigated by optimizing care access via policy change and improving physical access to care in women with geographic or transportation limitations. Addressing structural racism through policy change and bolstering structured community support systems will be key to reducing adverse cardiovascular outcomes among women of racial and ethnic minorities. Diversification of the cardiology workforce to more closely represent the patients we serve will be beneficial to all women. (J Am Coll Cardiol 2021;78:1919-1929) © 2021 the American College of Cardiology Foundation. Published by Elsevier. All rights reserved.

Certain cardiovascular disease (CVD) conditions continue to disproportionately affect women, including stroke (1), heart failure with preserved ejection fraction (1), and myocardial infarction (MI) with normal coronary arteries (2).

Sociodemographic disparities in CVD incidence and outcomes exist among women, and belonging to multiple underrepresented sociodemographic groups is often more than additive regarding its adverse health effects. For example, Black and Native American



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ABBREVIATIONS AND ACRONYMS

ACA = Patient Protection and
Affordable Care Act

CVD = cardiovascular disease

FPL = federal poverty level

LARC = long-acting reversible
contraception

MI = myocardial infarction

SDOH = social determinants of
health

SES = socioeconomic status

women experience higher rates of total CVD, coronary disease, and stroke deaths than their White counterparts, and Latina migrant and seasonal farmworkers experience high rates of uninsurance, obesity, and diabetes (1,3). These differences are likely related to myriad socioeconomic disparities that create sex- and gender-specific barriers to optimal care. Although it is estimated that 80% of CVD is preventable through lifestyle modifications, socioeconomic barriers to optimal care lead to persistent gaps in care independent of biologic differences (1). In this review, we highlight key sociodemographic contributors to disparities in cardiovascular outcomes in women and present potential solutions.

MAJOR SOCIOECONOMIC DETERMINANTS ADVERSELY AFFECTING WOMEN

RACE AND ETHNICITY. The burden of CVD risk factors is disproportionately borne by women of ethnic and racial minorities (4). Black women have the highest rates of obesity of any racial group in the United States and a high prevalence of physical inactivity and unhealthy diet (1). Black women experience a higher incidence of MI or fatal coronary heart disease compared with White women or men in all age groups (1). Despite a lower prevalence of atrial fibrillation compared with White women, Black women have a higher burden of stroke and a higher risk for bleeding (5). Furthermore, Black women are 3.4 times more likely to die of pregnancy complications than White women (6).

The HCHS/SOL (Hispanic Community Health Study/Study of Latinos) showed that the prevalence of ≥ 3 major CVD risk factors was 17.4% in Hispanic/Latina women, with only 29.3% meeting ideal cardiovascular health targets (7). Despite a worse cardiovascular risk profile, Hispanic/Latinx ethnicity is associated with lower cardiovascular and all-cause mortality compared with non-Hispanic Whites, commonly referred to as the Hispanic or Latino mortality paradox (8). However, the perception of a Hispanic paradox was recently refuted, showing that mortality rates may actually be higher within the Hispanic community than for non-Hispanic Whites (9).

Coronary artery disease is the leading cause of death among Native American/Alaskan Native women, with diabetes having the greatest effect on coronary artery disease risk in women (10). Native American/Alaskan Native women have high rates of cardiovascular risk factors, with up to 69% prevalence

HIGHLIGHTS

- In addition to biological differences, socioeconomic factors contribute to disparities in cardiovascular health outcomes in women, and many are potentially modifiable.
- Key factors contributing to health care disparities include poverty, racism, geography, education and access to health care insurance.
- Overcoming disparities that affect the cardiovascular health of women include policy changes, education and training, innovations in health care delivery, and diversification of the cardiology workforce.

of obesity (11). A sedentary lifestyle is magnified by inadequate support for household responsibilities, lack of safe exercise facilities, and sociocultural expectations (12).

RACISM AND DISCRIMINATION. Racism and discrimination have been linked to worse cardiovascular outcomes (13). The adverse effects on health care and health disparities are well described in the Institute of Medicine Report *Unequal Treatment* (14). The Jackson Heart Study showed that lifetime discrimination was associated with incident hypertension in Black women, even after adjusting for hypertension risk factors (15). Discrimination coping behaviors, including unhealthy diet and poor physical activity, may also contribute to the development of hypertension (16). Furthermore, chronic exposure to discrimination may contribute to disparities in observed CVD and access to quality cardiovascular care (17). Within the medical system, racial and gender bias contribute to disparities in diagnosis and treatment, leading to adverse outcomes (18). Finally, institutional or systemic racism leads to minority communities' having differential access to healthy foods and health care, quality education, good housing, and higher wage jobs (19).

INCOME. Low annual income, income volatility, lower lifetime income, and low neighborhood income have all been associated with adverse risk for cardiovascular events (20,21). Although the gender earning gap has narrowed, it persists despite correcting for education, experience, and occupation and is predicted to widen again as a result of the coronavirus disease 2019 pandemic (22). Low-income women often work multiple jobs and work long or

odd hours to support their families and alternative childcare responsibilities, which may lead to increased stress or reduced time to exercise or attend appointments (23,24). Studies have consistently demonstrated increased cardiovascular risk in poor women compared with their wealthier counterparts (25).

PAYER. CVD is the leading cause of maternal mortality, with cardiomyopathy being the leading cause of late maternal deaths (26). Medicaid finances more than 43% of U.S. births (27). Unfortunately, several impediments to implementation of the Medicaid pregnancy coverage mandate persist, including wide state-by-state variability in coverage and income eligibility and delays in access to care in early pregnancy. Of women receiving Medicaid coverage during pregnancy, 50% are uninsured before becoming pregnant, and 55% are uninsured 6 months following delivery (28). Abrupt loss of coverage postpartum leaves many women without health care when they are at risk for postpartum cardiovascular complications, in addition to limiting cardiovascular risk factor optimization between pregnancies (29).

RURALITY. Women living in rural areas have increased mortality due to atrial fibrillation, stroke, ischemic heart disease, and heart failure compared with urban women (30-32). Contributing factors include lower levels of education, lower income, and increased prevalence of mental illness and depression (32,33). Rural women also have higher levels of cardiovascular risk factors, including tobacco use, obesity, and physical inactivity (32).

Access to care is a dire problem in the rural United States because of small numbers of primary care and subspecialty physicians, significant travel distances required to seek obstetric and specialty care, and poor health care insurance coverage (32,34). Rural women have the highest rates of maternal cardiovascular morbidity and mortality, with racial/ethnic minority women living in rural areas experiencing disproportionately poor outcomes (35).

EDUCATION. Lower educational attainment is associated with a higher risk for CVD, including risk for MI and cardiovascular mortality (36,37). Lower educational attainment also predicts worse short- and long-term outcomes from acute MI (38). In patients with acute MI undergoing percutaneous coronary intervention, lower education was the only socioeconomic variable associated with 3-year major CVD events and mortality (39). One potential explanation is that those with lower educational levels tend to have a larger number of CVD risk factors (40). Potential differences in interventional procedures, follow-up care or

medication adherence, and health literacy might also play a role.

ZIP CODE. In the REGARDS (Reasons for Geographic and Racial Differences in Stroke) study, ZIP code was included in a multivariable social determinants of health (SDOH) risk score to predict incident cardiovascular events. Participants with a greater number of SDOH were more likely to be women, Black, and have multiple cardiovascular risk factors. Higher incidence rates of stroke (41), heart failure (42), and fatal coronary heart disease (43) were seen as the risk score increased. The independent association of cardiovascular events with SDOH could stem from the cumulative effects of allostatic stress responses, including the stimulation of stress hormones, endothelial dysfunction, metabolic disturbances, and inflammation (43).

SOCIAL SUPPORT. Lower level of social support is a recognized psychosocial risk factor for CVD. In the Women's Health Initiative, lower social support showed a modest association with all-cause mortality among women without prior CVD but not in those with CVD histories (44). The greater likelihood that older women are more likely to live alone than older men highlights the importance of low social support as a cardiovascular risk factor in older women.

COMMUNICATION (LANGUAGE/CULTURAL) BARRIERS. Language barriers lead to impaired patient-clinician communication, reduced patient and clinician satisfaction, and more reported adverse outcomes. Language barriers have an impact on the quality and costs of health care provision to women with CVD and diabetes because of unequal access to health care and outcomes, compounded by the global migration of vulnerable people (45). A cross-sectional analysis from London revealed a high prevalence of CVD and diabetes in patients with non-English language preference even after adjustment for age, sex, social deprivation, ethnicity, and practice clustering; the investigators concluded that non-English language preference likely defines a social group with shared cultural and behavioral cardiovascular risk factors (46).

SEXUAL ORIENTATION. Sexual-minority individuals (lesbian, gay, bisexual, transgender) experience chronic stress and disparities in employment, income, education, and access to health care due to discrimination, victimization, and interpersonal rejection, including overt and implicit bias experienced in health care settings (47,48). Sexual-minority women in particular have higher levels of diabetes, hyperlipidemia, hypertension, obesity, CVD, MI, and stroke (47). Lesbians and bisexual women had more

risk factors for CVD, such as smoking, heavy alcohol consumption, and higher body mass index, than heterosexual women in adjusted models, potentially indicating pathways to the increased risk in these women (47).

POTENTIAL SOLUTIONS

Despite the socioeconomic barriers contributing to adverse cardiovascular outcomes in women, many potential promising solutions have been identified (**Central Illustration**). As SDOH represent fundamentally a societal problem, many of the potential resolutions require change at the level of health policy makers, medical societies, and health care institutions. However, each individual clinician and researcher also plays an important role in addressing SDOH within his or her sphere of influence (**Table 1**). The forthcoming proposed solutions may positively affect cardiovascular outcomes in women by modifying multiple socioeconomic risk factors and potentially affecting a broad and diverse population of women.

PHYSICIAN BIAS TRAINING AND DIVERSIFICATION OF THE WORKFORCE. Although often unintentionally, women are less likely to receive advanced diagnostics and treatments or be included in clinical trials (18,49). These disparities are multiplied for women in marginalized racial, ethnic, or social groups (50). Female physicians have been shown to be more likely to intensify treatment for hyperlipidemia and hypertension in female patients, and male physicians with increased exposure to female physicians and female patients had more success in treating female patients (51). Interventions to mitigate bias disproportionately affecting women include training physicians in cultural competence and biases, implicit bias training, diversification of the workforce, inclusion of sex and gender health care disparities education as part of the medical and nursing curricula, and creating a culture of inclusion in cardiology and medicine in general (50,52).

The cardiology workforce is not reflective of the diverse U.S. population it serves; female physicians are underrepresented in adult cardiology (21.5%), despite representing nearly one-half of medical students and internal medicine residents (53). Only 7.8% of internal medicine trainees are Black, and among cardiology trainees, only 5.4% are Black and 6.8% are Hispanic/Latinx (53). Lack of diversity among health care professionals may be even more responsible for disparities in health care access and outcomes than lack of health insurance (54). Pathway and mentoring programs must be implemented at all levels of

education and career (55). Commitment by national societies to diversify the cardiology workforce was led by the 2018 American College of Cardiology Diversity and Inclusion Initiative, but much remains to be done (56).

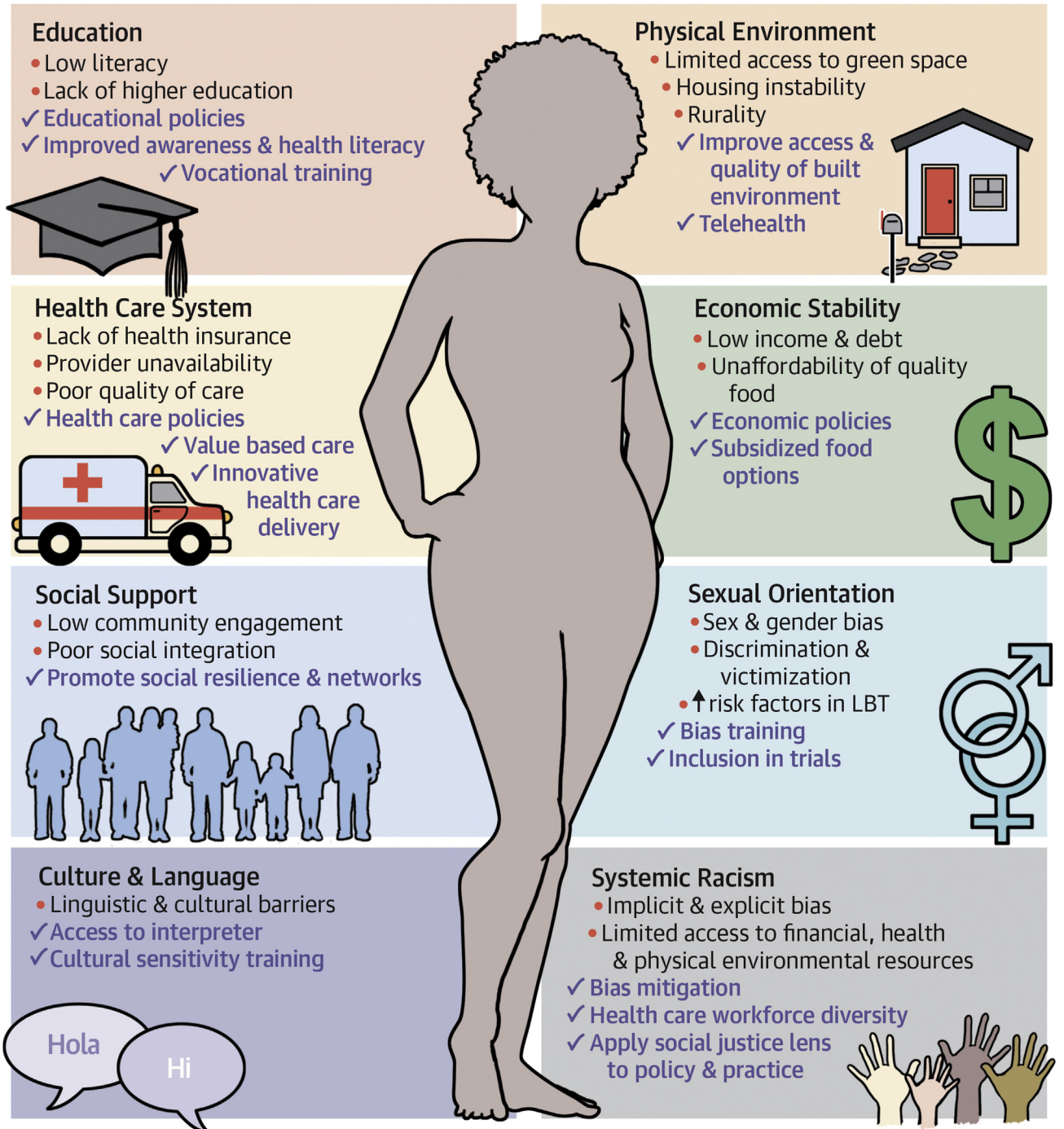
ADDRESSING RACISM AND DISCRIMINATION. Coordinated efforts centered on achieving health equity for all women, irrespective of race/ethnicity, are required to improve cardiovascular outcomes in women. Racial discrimination is a public health problem requiring inclusive and continuous, multi-sector stakeholder engagement and interventions at the individual, community, and government levels. Suggested strategies include working with communities so that they have access to resources essential for healthy living, emphasizing patient-centered health and health promotion rather than treatment of disease, and promoting awareness of and building the political will to prioritize this issue (57). Finally, access to better employment, housing and education, income, and equitable criminal justice systems (19,58,59) will have a significant impact on addressing these disparities.

HEALTH CARE COVERAGE. Medicaid expansion related to the Patient Protection and Affordable Care Act (ACA) has been associated with a substantial decrease in cardiovascular mortality, particularly related to hypertensive heart disease and heart failure (60). There is growing evidence that the ACA state Medicaid expansions have reduced both maternal and infant mortality (61). Extending Medicaid coverage for 12 months after delivery may help reduce late maternal deaths that are due predominantly to cardiomyopathy, facilitate interpregnancy cardiovascular screening and risk factor optimization, and increase access to contraception.

Value-based care has been proposed as a reimbursement strategy that will be an additional strategy to improve maternal health outcomes. Recently, the Health Care Transformation Task Force, a group of providers and payers dedicated to facilitating implementation of value-based payment models, released a report recommending changes in reimbursement to reward high-value care and favorable maternal and newborn health outcomes (62).

INNOVATION IN HEALTH CARE DELIVERY. Telemedicine consultation with cardiology specialists can safely reduce wait times compared with face-to-face encounters in medically underserved patients (63). Digital health technology and mobile health also offer promising mechanisms for expanding patient engagement in health care and improving chronic disease management (64,65). Remote monitoring

CENTRAL ILLUSTRATION Social Determinants of Health and Cardiovascular Disparities in Women



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Social determinants of health contribute to health care disparities in cardiovascular outcomes in women. These factors are modifiable through policy change, education and training, diversification, and innovation in health care delivery. LBT = lesbian, bisexual, and transgender.

TABLE 1 Proposed Levels of Responsibility for Enacting Change in SDOH in Women's Cardiovascular Disease

| Individual | Institution | Professional Societies | Policy Makers |
|--|--|--|--|
| Provide patient-centered care | Provide ample inpatient and outpatient social work resources | Require diversity in clinical study enrollment and leadership | Increase physical and financial access to contraception |
| Ask patients about SDOH | Develop patient transportation partnerships | Prioritize diversification of society leadership | Require diversity in clinical study enrollment and trial leadership |
| Provide individualized patient education | Provide appropriate health literacy level education resources | Facilitate diversification of trainees through education and outreach programs | Increase access to healthy foods and exercise locations |
| Use available interpreters | Provider interpreter support services | Develop and distribute appropriate health literacy level education resources | Increase access to health care innovation via remote monitoring and telemedicine |
| Identify and ameliorate personal bias | Provide bias training for staff | Provide education on racism and discrimination | Increase health care coverage of high-risk women |
| Discuss contraception with women of childbearing age and facilitate referrals for LARC | Partner with community support resources | | Foster community support programs |
| Discuss economical options for healthy diet and exercise | Provide safe exercise locations | | Increase funding for patient education campaigns |
| Diversify clinical and research teams | Provide clinical sites in locations convenient to where patients live | | Improve transportation infrastructure |
| Prioritize diversification of patient enrollment in clinical studies | Prioritize diversification of leadership, faculty, staff, and trainees | | Develop maternity leave policies |
| | Require diversity in clinical study enrollment | | |
| | Provide innovative and flexible health care delivery models | | |
| | Develop cardio-obstetrics programs for multidisciplinary care | | |
| | Develop SDOH EMR dashboard | | |
| | Provide maternity leave for employees | | |

EMR = electronic medical record; LARC = long-acting reversible contraception; SDOH = social determinants of health.

programs have been shown to be effective in reducing heart failure readmissions, improving exercise capacity, and reducing blood pressure, cholesterol levels, and weight (66-68). The implementation of interventions using text messaging (69), wearable devices (70), and web-based technology (71) are feasible and effective for modifying behavior to promote cardiovascular risk reduction in minority and underserved communities. Digital health technology can also allow the integration of SDOH within the electronic medical record to better address the needs of women when formulating comprehensive care plans (64).

PATIENT EDUCATION AND HEALTH LITERACY. Poor health literacy is associated with increased cardiovascular morbidity, mortality, health care use, and health care costs (72). Interventions incorporating health literacy can improve risk factor control, adherence to therapy, and lifestyle modification and reduce early decompensation and readmission for acute coronary syndromes and heart failure (72,73). To be effective, initiatives and interventions must be culturally tailored and incorporate multilevel community input (74). Digital tools on electronic patient portals and web-based “personal decision assistants”

for cardiovascular testing will be successful only for those who have access to technology (75,76). “Go Red for Women” and “Heart Truth” have had a positive impact on heart disease awareness, but primarily among White women. Overcoming women’s diverse barriers will be important to success of these efforts (77,78).

INTERPRETERS. Foreign-language patients who have access to professional interpreters have improved outcomes, with fewer hospitalizations, better chronic disease outcomes, and lower health care costs (46). Professional medical interpreters influence the quality of acute ischemic stroke care for patients who speak languages other than English (79). Web- or phone-based interpreters can increase access to interpreter services when live interpreters are not available. When professional interpreters are not available or not preferred by patients, family interpreters must be used, especially to facilitate discussions with clinicians (80).

INCLUSION IN TRIALS: OVERCOMING SEX, LANGUAGE, AND RACE BARRIERS. Greater recruitment of women and underrepresented minorities into clinical trials will be a pivotal step in achieving health equity. Presently, women constitute 38% of participants in

clinical trials and 33% of those in cardiovascular device trials, with a median female-to-male ratio of 0.51 for these trials (81,82). Black and Hispanic patients constitute only 5% and 1% of clinical trial participants, respectively, despite representing 12% and 16% of the U.S. population (83). Diverse population recruitment and a priori sex- and race-based analysis and reporting of results should be required by funding sources, review boards, regulatory agencies, and medical journals. Furthermore, expansion of clinical trials and registries, including pilot studies, to include pregnant and lactating women is essential to improve CVD care for both women and their children (84). Recruitment brochures should be translated into common languages. Incorporating community-based participatory research principles in study design and partnering of researchers with underserved communities and their leaders to provide education, raise awareness of sex- and race-based prevalence of disease, and explain the potential side effects of trial arms will increase trust from minority participants. A culturally and linguistically cross-trained research workforce is also more likely to engage with, screen, and enroll minority participants. Targeting marketing efforts at local places of worship and barber and beauty salons and using social media strategies may also improve reach of trial awareness. Leveraging web-based participation may help enroll women with caretaking responsibilities and geographic or transportation barriers.

PATIENT-CENTERED CARE AND COMMUNITY SUPPORT.

Women are often responsible for not only their own health care but also the health care their spouses, children, and elderly parents. The Centers for Disease Control and Prevention estimates that 58% of all caregivers (providing care for family members with chronic illnesses or disabling conditions) in the United States are women (85). Access to basic essential services such as primary care, emergency care, prenatal care, home care, behavioral health services, and navigation of the complex and ever changing health care systems can be daunting (86). To ensure equitable health care access for all women, a collaborative and integrated partnership between health care systems and community organizations is essential—and has previously been proved to reduce cardiovascular risk factors, including lipid levels, blood pressure, and glycated hemoglobin, and to improve mental health indexes among socioeconomically disadvantaged women (87). Suggested strategies include screening patients for SDOH, providing patient navigation services, and fostering community engagement through partnerships with stakeholders,

such as faith-based, public health, and social service organizations, housing and transportation services, and local businesses (86,88).

TRANSPORTATION. Lack of adequate transportation can limit access to health care and worsen existing health care disparities (86). Potential solutions include the provision of subsidized medical transport and ensuring equitable and affordable access to transportation, especially public transportation services. To address policy and environmental changes, it is important to develop public and private partnerships with communities where the need is the greatest (89).

CONTRACEPTION ACCESS. Unintended pregnancies can derail plans for education or employment or place undue financial pressure at inopportune times. Access to comprehensive contraception is challenging for 2 reasons: 1) financial cost and insurance coverage; and 2) physical access. Black women are more likely than White women to live in regions without reasonable access to a health center that offers comprehensive contraception and pharmacies that facilitate contraceptive purchase (90). Rural health departments also rarely offer prescription contraception, especially long-acting reversible contraception (LARC) (91). Efforts to improve access to clinicians and pharmacies are needed. Immediate postpartum LARC should also be offered, being mindful to avoid coercion, to promote universal availability and reproductive justice (92). Latina women in particular are less likely to have received contraception prior to their first postpartum visits, and although they are more likely than other racial groups to receive contraception at their postpartum visits, they are less likely to receive highly effective methods (93). The reasons for this are not fully known, but possible contributors include increased risk for loss of insurance postpartum and increased distance to the medical center, resulting in hesitancy to schedule follow-up appointments for placement of LARC (93).

The Contraceptive CHOICE Project identified that removal of financial barriers to LARC resulted in women predominantly choosing LARC methods of contraception, leading to substantial reductions in unintended pregnancies, abortions, and teenage pregnancies (94,95). To improve financial access, the American College of Obstetricians and Gynecologists has supported several measures, including full implementation of the ACA requirement that private health insurance cover comprehensive contraception, alternative contraceptive coverage for women with health insurance plans that are exempt from

contraception coverage, and Medicaid expansion to help low-income women gain better access (96). Reducing out-of-pocket costs for contraception is associated with improved patterns of use and fewer births, especially for women with low incomes (97).

ACCESSIBILITY OF HEART-HEALTHY FOOD AND EXERCISE LOCATIONS. Undesirable neighborhood environments are associated with lower odds of exercise, worse diet, and higher body mass index (98). Living in a neighborhood with a recreation center has been associated with more minutes per day spent in moderate to vigorous physical activity in African American adolescent girls living in low-income, urban communities (99). Increased access to recreation centers has been proposed to improve physical activity among urban adolescent girls and women (99). Provision of culturally appropriate and responsive home-based weight-loss programs is another potential solution to increase physical activity and cardiovascular health among women who are unable to access safe and affordable exercise locations (100,101).

Living in a food desert is also associated with pregnancy morbidity, including hypertensive disorders of pregnancy and gestational diabetes, which are linked to short- and long-term cardiovascular morbidity and mortality (102). Providing women access to healthy foods through supermarkets and farmer's markets, through both geographic access and economical access via participation in the U.S. Department of Agriculture Supplemental Nutrition Assistance Program and Special Supplemental Nutrition Program for Women, Infants, and Children, can reduce cardiovascular comorbidities including hypercholesterolemia and diabetes (103).

CONCLUSIONS

SDOH are major contributors to the ongoing sex and race/ethnicity disparities experienced by women with regard to cardiovascular risk factors and outcomes. These contributing factors are often overlapping and, importantly, are modifiable, with actionable solutions. Resolving health care outcomes disparities in women will require both investment in sex-specific science and health policy advocacy and incorporating awareness of the impact of these barriers into our health care delivery (on both personal and systemic levels). Potential solutions to these disparities include improved access to care through greater health care coverage and innovative health care delivery, patient-centered care through community-based solutions and patient empowerment, and reducing structural inequities by addressing systemic bias and diversification of both the health care workforce and participants in clinical trials.

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- KEY WORDS** race, rurality, sociodemographic, socioeconomic, women