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REVIEW

The Role of Social Determinants of Health in Atherosclerotic Cardiovascular Disease

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Abstract

Purpose of review This review seeks to provide important information on each of the major domains of social determinants of health (SDOH) in the context of atherosclerotic cardiovascular disease.

Recent findings SDOH can be classified into five domains: social and community context, health care access and quality, neighborhood and built environment, economic stability, and education access and quality. SDOH are major drivers for cardiovascular health outcomes that exceed the impact from traditional risk factors, and explain inequities in health outcomes observed across different groups of individuals.

Summary SDOH profoundly impacts healthcare's receipt, delivery, and outcomes. Many patients fall within various disenfranchised groups (e.g., identify with minority race, low socioeconomic status, low educational attainment, LGBTQ+), which impact overall health status and care. Learning to understand, recognize, and address SDOH as the driving force of disparities are critical for achieving health equity in the prevention and adequate treatment of ASCVD.

Keywords Social determinants of health · Cardiovascular disease · Atherosclerosis · Disparities · Health equity

Introduction

Social determinants of health (SDOH) encompass the non-medical factors that influence an individual's health, including the place(s) in which they live and work, the political and economic systems that affect their advancement, and the social norms that shape their interactions and development. In recognition of the roles SDOH play in individual and population health, the Office of Disease Prevention and Health Promotion has identified five areas of focus, including social and community context, health care access and quality, neighborhood and built environment, economic stability, and education access and quality (Fig. 1). Addressing individual risk for atherosclerotic cardiovascular disease (ASCVD) and understanding the factors driving disparities in cardiovascular outcomes requires an intentional assessment of these five domains. In this manuscript we first provide an overview of the five domains of SDOH followed by a discussion on paradigms to integrate assessing and addressing SDOH in clinical practice. This article does not contain any studies with human or animal subjects performed by any of the authors.

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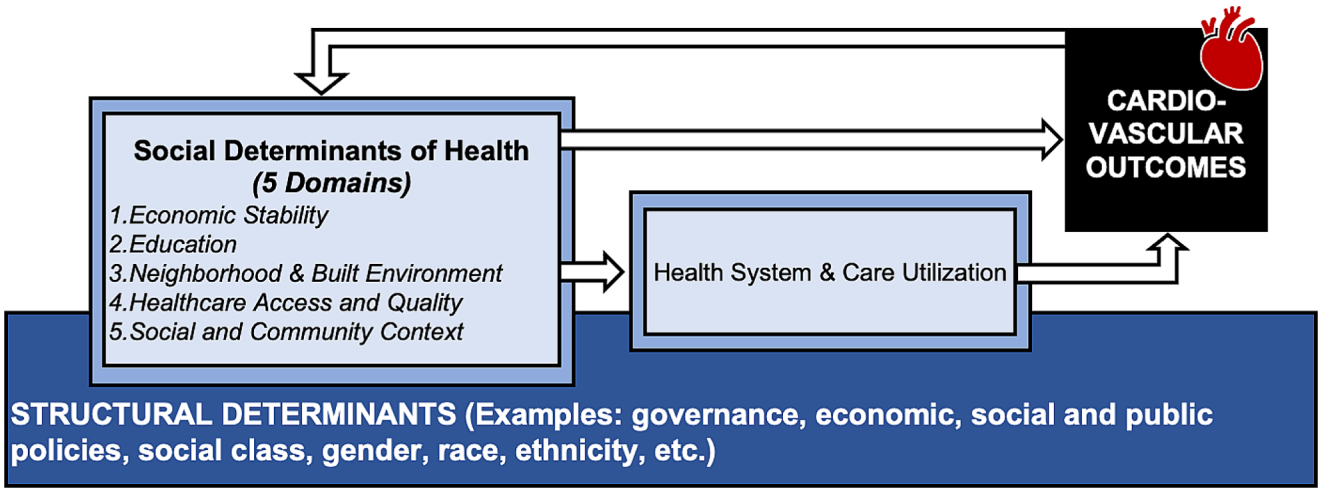

Fig. 1 The bidirectional relationship of social determinants of health with healthcare and cardiovascular outcomes

Social and Community Context

The social and community context includes several potential subdomains, including how individuals' health are impacted in the context of race and gender. Race as a social construct is a concept that underpins the physical differences noted amongst groups of people from varying parts of the world–on the basis of skin color, hair type, and other physical features. Racial ideologies have evolved and have been heavily influenced by historical structures (e.g., slavery, imperialism, and colonialism). [1, 2] Unfortunately, race has been used to justify exploitation, enslavement, and the perpetual unequal treatment and disenfranchisement of many groups. [1] The conflation of race as a biological rather than a social construct has led to numerous injustices and a legacy of mistrust in the medical system among racial and ethnic minorities. [3] Moreover, the fallacy that there are innate biological differences between both White and Black race, was further propagated throughout slavery. It is important to note that the relics of these ideologies continue to permeate society and the medical field. [4] However, there is an effort to move away from using race as a proxy for genetics or biology and instead focus on social and environmental factors that drive health disparities. [5] As a result, more nuanced approaches to medicine and public health are developing that better serve diverse populations and work towards equity in healthcare outcomes.

An example of race impacting health are the inequities from the utilization of race-based eGRF calculation. The basis of including race into the equation rests on presumptions that non-Hispanic Black individuals release more creatinine into the blood, likely due to increased muscle mass. However, creatinine synthesis is not a constant process and is affected by the daily intake of protein and muscle turnover, not simply based on race. [6] As a result, non-Hispanic Black patients have historically had less access to the kidney transplant list despite the highest rates of advanced renal disease. [7] In the context of ASCVD, the AHA Predicting Risk of CVD Events (PREVENT) equations were developed to be agnostic to race when predicting risk for ASCVD and heart failure. These equations perform similarly to the Pooled Cohort Equations, although require additional validation to ensure they can be applied broadly and equitably across diverse populations. [8, 9]

In regards to ASCVD, these issues permeate health care delivery. One study evaluated the use of secondary prevention treatments amongst US adults with ASCVD. Among 11,033 visits for adults with ASCVD (representing 275.3 million visits), 40.7% were women, 9.2% were Hispanic, 9.9% were non-Hispanic Black, and 90.1% were non-Hispanic White. Non-Hispanic Black patients received statins less frequently than non-Hispanic White patients (41.6% vs. 45.9%; (OR, 0.79; 95% CI, 0.68–0.92)), less aspirin (41.1% vs. 49.8%(OR, 0.82; 95% CI, 0.6–1.11)). [10] Another study of 5,227 patients with hypertension showed that non-Hispanic Black women and men with hypertension were 1.18 (95% CI 1.07–1.30) and 1.20 (95% CI 1.05–1.34) times more likely to have uncontrolled BP values compared with non-Hispanic White women and men, respectively. Non-Hispanic Black women and men with hypertension and a statin therapy indication were 1.23 (95% CI 1.05–1.45) and 1.25 (95% CI 1.03–1.51) times more likely to lack a statin prescription compared with non-Hispanic White women and men. However, there was no evidence of disparities among Hispanic/Latino patients in BP control and statin prescriptions. [11] Moreover, these disparities funnel into the larger bucket of cardiovascular disease (CVD) and associated mortality. *Post et al.* sought to determine the role of various SDOH and lifestyle factors affecting CVD mortality, finding that racial disparities existed, even after

adjusting for age and sex. Non-Hispanic Black participants had a 34% higher mortality (HR, 1.34 (95% CI, 1.19–1.51)) than both their Chinese (21% lower mortality hazard (HR, 0.79 (95% CI, 0.66–0.95)) and non-Hispanic White counterparts. Hispanic participants had similar mortality (HR 0.99 (95% CI 0.86-1.14) to non-Hispanic White participants. Importantly, after adjusting for socioeconomic factors mortality was attenuated (HR 1.16 (95% CI 1.01-1.34)) for non-Hispack Black participants and became lower for Hispanic participants (HR 0.72 (95% CI 0.61-0.85)) compared to non-Hispanic White participants. These results suggest that SDOH are the primary determinant of mortality differences between racial and ethnic groups. [12]

There is broad recognition of inequities such as these impacting health outcomes. In 2003, the National Academy of Medicine reported that despite comparable age, income, insurance, and disease, "racial and ethnic minorities receive lower-quality health care than non-Hispanic White people". They concluded that these disparities in health are contributed to by "bias, stereotyping, prejudice and clinical uncertainty on the part of healthcare providers". [13] Nearly 20 years later, this still proves true. A study by the Commonwealth Fund found that across the US, minority populations receive less effective and timely care than their non-Hispanic White counterparts. [14] A systematic review supports this conclusion and found evidence of pro-White or light-skin/anti-Black, Hispanic, American Indian or dark-skin bias among various health care providers, levels of training, and disciplines. [15] Acknowledging and addressing these systemic issues are essential for achieving health and healthcare equity. The amelioration of these issues calls for the inclusion of adequate training in cultural competency and humility, increasing diversity within the healthcare workforce and research, implementation of community-based interventions, and the creation and expansion of policy aimed at reducing disparities.

Sex-specific differences in the presentation, treatment, and outcomes of ASCVD have also been recognized in the medical literature. The aforementioned study also showed that women were less likely than men to receive medications for secondary prevention, including less statins (43.3% vs. 52.7% (aOR, 0.69; 95% CI, 0.61–0.77)) and aspirin (39.8% vs. 48.5% (aOR, 0.7, 95% CI, 0.62–0.8)). [10] In another study reporting sex-based outcomes for patients with ASCVD, women with ASCVD were less likely to be on statin therapy compared with men (OR 0.55, 95% CI (0.48–0.62)). Women with ASCVD were more likely to report poorer patient experience, lower health-related quality of life, and poorer perception of their health when compared with men ($p < 0.0100$) [16]. In order to work towards eradication of sex differences in ASCVD, increasing recognition and treatment of ASCVD in women is imperative.

There is also a significant gap in data and overall research outlining disparities among the LGBTQ + population, especially those undergoing gender transitioning. More specifically, gender-affirming hormone therapy, including hormonal administration and suppression, have been found to increase the cardiovascular risk profile in these individuals, including increased risk of hypertension, triglycerides, and LDL cholesterol levels, with decreased HDL cholesterol levels. [17, 18] Moreover, the decreased pursuit of healthcare, secondary to the marginalization of these individuals also precludes the provision of adequate care. [19]

Overall, it is essential that we continue to work towards further addressing the needs of both sexual and gender diverse individuals. Understanding the unique aspects of sex and gender in relation to patient experiences, outcomes, and overall disease processes will allow for a more nuanced healthcare approach.

Healthcare Access and Quality

Despite national efforts to remove barriers to healthcare and insure a greater portion of the population, access remains highly variable. The Affordable Care Act in 2010 expanded insurance coverage in the United States, in large part through the diversification of Medicaid eligibility. However, leaving Medicaid expansion optional for States has left many uninsured. [20] Regardless, insurance attainment alone does not guarantee equal access to healthcare. In fact, low-income patients and their families are more likely to face "catastrophic" expenses because of longitudinal healthcare costs for ASCVD, regardless of whether they have public or private insurance. [21] Prohibitive costs deter individuals from accessing care, contributing to income-based disparities in access and health-based outcomes. [22]

Place of residence in relation to care is another important metric in healthcare quality. Specifically, 15–20% of the US population resides in rural areas, which is a risk factor for worse cardiovascular outcomes than urban residence. [23] Gaps in outcomes between rural and urban populations have been increasing over time. The reasons for this disparity are many but include distance from healthcare centers for those living in rural communities. Since 2010, a disproportionate number of rural hospitals have closed, especially in states that did not expand Medicaid coverage. [24] Even more rural hospitals are at risk for closure due to the relative deficit in occupancy and increased financial strain compared to urban centers (~40% vs. 60–70%) [25].

It is also important to acknowledge the intersection between income and race, as demonstrated by the disparate rates in insurance coverage across self-identified races. Drawing from data in 2021, the US Census Bureau revealed that American Indian and Alaskan Native individuals were

uninsured at higher rates than non-Hispanic White individuals (18.8% vs. 5.7%). Those who identify as Hispanic/Latino were uninsured at similarly high rates (17.7%), as were those identifying as non-Hispanic Black (9.6%).

Quality of care is another important factor to consider when addressing disparities in ASCVD and is influenced by numerous factors, including access to a diverse workforce that mirrors the racial and ethnic diversity of its patient population. Studies have demonstrated that racially concordant physician-patient pairings are associated with greater patient-reported satisfaction regarding the quality of their care, specifically when it comes to patient-provider communication. [26] In a 2019 systematic review, shared racial/ethnic identity between patient and provider was associated with greater patient satisfaction in communication, specifically regarding provider support, respect, commitment to information-giving, and partnership building. [27] However, there are large disparities in racial representation among cardiologists, with recent studies demonstrating 65% of providers identify as non-Hispanic White and only 4.7% identify as non-Hispanic Black and 8.8% Hispanic, despite 12.2% of the general population identifying as non-Hispanic Black and 18.5% as Hispanic. [28] These disparities in racial representation therefore contribute to disparities in perceived quality of care.

A growing body of research also demonstrates the importance of shaping culturally competent healthcare providers. Training in cultural competency has translated to greater provider proficiency in treating patients of diverse socioeconomic and cultural backgrounds. [29] Ongoing efforts to both diversify the workforce and emphasize the importance of cultural competency in clinical training are paramount to promoting more equitable outcomes in patient care.

Neighborhood and Built Environment

It is well-established that cardiovascular health is influenced by the places in which we live. It is of vital importance to highlight the historical context behind environment-driven health disparities. A prime example is redlining, which was a discriminatory practice adopted by the Homeowners Loan Corporation in the 1930s in which neighborhoods were classified using a color system. "Redlined" districts were considered high lending risk and predominantly occupied by non-Hispanic Black families. Those residing in redlined communities were often denied loans, in effect segregating communities. The long-term effects of redlining remain, as residence in a redlined community has a positive association with chronic illnesses, including coronary artery disease (CAD) and stroke, and known ASCVD risk factors including diabetes and hypertension. [30] While the mechanisms driving this trend are not fully understood, the reasons for these positive associations are likely multifactorial, including: increased risk for CVD risk factors in disadvantaged neighborhoods, [31, 32] trends in hospital closures among redlined communities, [33] poor walkability and resident proximity to greenspace that often translates to individual and population-based fitness, [34, 35] worse air quality, [36, 37] and increased food desert density (low income areas with low access to grocery stores). [38] Studies have also demonstrated that residence in a food desert is independently associated with higher prevalence of cardiovascular risk factors and inflammation among those without known CAD, [36] as well as increase adverse cardiovascular outcomes such as myocardial infarction, [39] overall suggesting causal mechanisms. In total these findings implicate the significance of living circumstances in ASCVD risk.

Additional important consideration for food that is also tied to the social and community contexts are food and nutrition insecurity. Food insecurity is "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways". [39] Nutrition insecurity is "lack of consistent access, availability, and affordability of nourishing foods and beverages". [40] The former refers to access to food in general whereas the latter focuses on access to health-promoting foods. Food insecurity is linked to ASCVD, wherein those with CVD have about double the prevalence of food insecurity. [41] Regarding food quality, poor dietary quality that marks nutrition insecurity is the top contributor to death from CVD, contributing to nearly half of all CVD deaths in the US. [42] Both food and nutrition insecurity are being addressed concurrently by ongoing food is medicine initiatives. [40]

Population-based disparities can also be incorporated into ASCVD risk calculators used at an individual-level. For instance, SCORE2 is a European ASCVD risk calculator that uses country as a risk variable, and the recent US PREVENT equations integrate zip code-based social deprivation index into risk estimation. [8, 43] Area deprivation index (ADI) is another tool used as a proxy for neighborhood-socioeconomic vulnerability and factored into ASCVD risk assessment. In fact, it is considered the most independently validated, scientific tool for US neighborhood-level disadvantage. [44] Studies have demonstrated counties with higher ADI having significantly higher rates of premature ASCVD among non-Hispanic Black and female individuals ($p < 0.001$).[5]

While redlining based on racial grounds is illegal today, eerily similar practices persist, including efforts to re-define voting districts to limit representation. Interfering with communities' voting rights is an egregious violation and has increasingly heavy individual and public health implications. When federal policies shift decisions to states (i.e.,

in the post-Roe era), local elections carry more weight. For example, state-based legislation can place significant limitations on individual access to comprehensive reproductive healthcare. With time, we have come to recognize the intimate connection between obstetric health and cardiovascular health in our patients with uteruses. Some studies have already demonstrated an increase in high-risk pregnancies among states with more restrictive legislation on abortion. [45] This trend may represent immediate and long-term cardiovascular consequences for those affected. Longitudinal studies are needed to better understand the cardiovascular consequences of the changing landscape in reproductive healthcare.

Economic Stability/ Potential for Advancement

Low socioeconomic status is recognized as a significant risk factor for the development of CVD, carrying similar weight to traditional risk factors. [46] In a review of 1.4 billion deidentified tax records in the U.S. from 1999 to 2014 demonstrated a significant association between lower income and shorter lifespan for men (14.6 years; 95% CI 14.4 to 14.8 years) and women (10.1 years; 95% CI 9.9 to 10.3 years). [47] Economic factors further affect cardiovascular health at a community health level. For instance, a 10% reduction in mortality from acute myocardial infarction (AMI) was observed with every $10,000 increase in neighborhood median income. [48]

Job stability is another risk factor for worse cardiovascular outcomes. Unemployment has been associated with a higher burden of CVD, regardless of socioeconomic status. In fact, some studies have demonstrated an increase in AMI within the first year of unemployment, with cumulative number of job losses compounding the risk of AMI. [49]

Education Access and Quality

Differences in education level are a SDOH that underpin many aspects of health. Attaining education can impact a milieu of factors, including but not limited to health literacy, cardiovascular risk factors, and future earning potential. Exemplary of this, *Tremblay et al.* found that participants at greater risk of an ASCVD event were more likely to be older, male, unmarried, insured, have lower education attainment, and lower incomes. More specifically, compared to college graduates, less than a high school education was associated with greater ASCVD risk score by: 3.41% (95% CI: 2.60, 4.22) among non-Hispanic White adults; 3.21% (95% CI: 2.40, 4.02) among non-Hispanic Black adults; and 1.71% (95% CI: 0.91, 2.50) among Hispanic adults. [50] This translates into increased risk for adverse health outcomes among those with already established ASCVD. *Khan et al.*. observed that over a median follow-up of 4.5 years ($n = 210,853$) of the 2006–2014 National Health Interview Survey (NHIS), all-cause age-adjusted mortality rates were higher among those with less than high school vs. college and/or graduate degree for both the overall population participants and participants with ASCVD. In the overall population, less than high school education was associated with a 1.4-fold (HR = 1.39; [95% CI 1.29, 1.50]) and 1.5-fold (HR = 1.51; 95% CI 1.26, 1.81) higher risk of all-cause and CVD mortality, respectively, compared to those with at least college attainment. Within the ASCVD population, less than high school was associated with 1.2-fold (HR = 1.21; 95% CI 1.06, 1.38) and 1.4-fold (HR = 1.38; 95% CI 1.04, 1.82) higher risk of all-cause and CVD mortality, respectively, compared to those with at least college attainment. This reiterates that lower educational attainment associates with worse outcomes and increased mortality risk for those within this vulnerable population.

Educational attainment is also tied to health literacy, which has been described as: "the ability to find, understand, and use information and services to inform health related decisions and actions". [51] Health literacy has been repeatedly demonstrated as an important factor in disease prevention and control. Furthermore, health literacy also is often concomitant with the aforementioned SDOH. Thus, it is important to find novel ways to improve health literacy among the most disenfranchised populations in efforts to improve health equity.

Integration of Social Determinants of Health into Clinical Practice

SDOH contribute to adverse health outcomes both directly (e.g., nutrition insecurity leading to malnutrition then worsening heart failure) and indirectly (e.g., lack of transportation leads to missed appointments and lack of refills for critical medications leading to decompensation) (Fig. 1). The potential scenarios that SDOH can adversely impact health are endless, but what they share are their major impact on health outcomes. The University of Wisconsin's County Health Rankings and Roadmaps estimate that social and economic factors explain 40% of eventual health outcomes, followed by health behaviors (30%), receipt of clinic healthcare (20%) and lastly, physical environment (10%) (see Fig. 2). [52] All told, 80% of health outcomes are driven by things other than clinical care. If we are not addressing SDOH, then we are missing opportunities to curb the impact from the strongest factors driving health outcomes.

These adverse SDOH are not equally distributed. There are differences in the prevalence of adverse SDOH across race and ethnicity, gender, and geography wherein some individuals are more at risk than others for experiencing

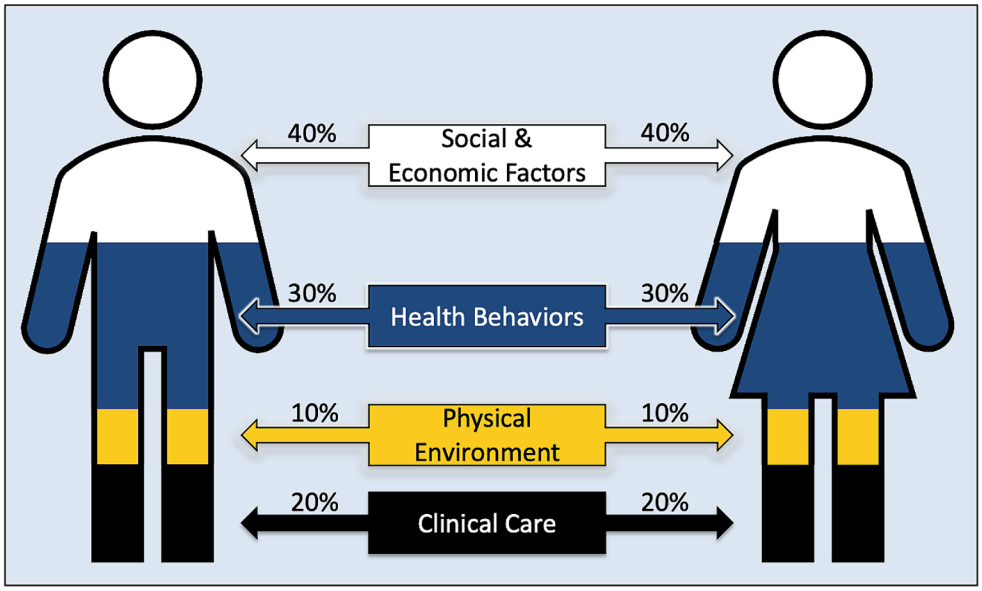

Fig. 2 Proportion of various factors that contribute to health outcomes

these adverse SDOH. [53–55] This unequal distribution of SDOH leads to measurable disparities in health outcomes. A recent study by *Bundy et al.* that explores the relationship between adverse SDOH and race and ethnicity with mortality proves this point. It was found that non-Hispanic Black individuals in the US had both increased premature mortality compared with other racial and ethnic groups (HR 1.59, $p < 0.0001$) and a higher burden of adverse SDOH. [56]

After adjusting for cumulative adverse SDOH, there was no longer an increased risk for premature mortality for non-Hispanic Black individuals (HR 1.00 95% CI (0.91–1.10)). Importantly, adverse SDOH were stronger predictors of mortality – compared to those with no adverse SDOH, those with one had a HR 1.93 (95% CI 1.61–2.31) with a linear trend up to a HR of 7.82 (95% CI 6.60, 9.26) for those with six adverse SDOH. Thus, SDOH are major explanatory variables for inequities in health outcomes. [56, 57] In the broader context, it is essential to recognize that disparities in cardiovascular health outcomes across race and ethnicity are driven by systemic inequities and structural racism rather than biological differences. [1, 58]

Within clinical practice there are opportunities for clinicians to act on SDOH and prevent their adverse impact on health outcomes. This is increasingly recognized within major guidelines. For example, the most recent AHA/ACC/ACCP/ASPC/NLA/PCNA guidelines for the management of chronic CAD recognize that "SDOH have profound influences on the health and well-being of patients," and recommend universal assessments of SDOH as routine parts of clinical care within a collaborative partnership between health care systems and community organizations. [59] The 2023 ACC/AHA/ACCP/HRS guidelines for the Diagnosis and Management of Atrial Fibrillation recognizes that screening and addressing SDOH can improve medication adherence, risk factor control, and health outcomes. [60] Similar recognitions are integrated into guidelines for prevention of ASCVD, [61, 62] heart failure, [63] and stroke. [64]

Beyond guidelines, regulators also recognize the role of SDOH in clinical outcomes. In the Centers for Medicare and Medicaid Services (CMS) Framework for Health Equity, they recognize five priorities - the first is to "Expand the Collection, Reporting, and Analysis of Standardized Data." This includes gathering SDOH data that they hope will allow for the evaluating the prevalence of SDOH, impact on health outcomes, and drive quality improvement. [65] As part of this CMS has developed ICD-10-CM "z-codes" that cover a multitude of areas (Table 1). In addition, as of 2020, CMS and stakeholders now routinely collect information on preferred language, need for interpreters, health literacy, transportation, and social isolation. In 2024, CMS has also moved forward with new billing codes in the physician fee schedule. For clinicians this includes G0136 which is for when SDOH are assessed and addressed during an office visit (RVU = 0.18).[65] Importantly CMS has also introduced billing codes for Community Health Integration (G0019, G0022) and Principal Illness Navigation Services (G0023, G0024, G0140, G0146), which allow for auxiliary personnel to bill under the direction of a physician or other practitioner for time spent addressing SDOH. [65] Allowing for billing by auxiliary personnel provides a cornerstone for health systems and physician practices to build supports to address unmet SDOH needs (note that there may be copay implications for use of these codes).

Clinicians can incorporate SDOH into clinical care in ways that are both efficient and effective. No one is immune

Table 1 Social determinants of health international classificaiton of disease Z-Codes

Z55 – Problems related to education and literacy
• Z55.5 – Less than a high school diploma
• Z55.6 – Problems related to health literacy
Z56 – Problems related to employment and unemployment
Z57 – Occupational exposure to risk factors
Z58 – Problems related to physical environment
• Z58.6 – Inadequate drinking-water supply
• Z58.8 – Other problems related to physical environment
• Z58.81 – Basic services unavailable in physical environment
• Z58.89 – Other problems related to physical environment
Z59 – Problems related to housing and economic circumstances
• Z59.0 – Homelessness
• Z59.00 – Homelessness unspecified
• Z59.01 – Sheltered homelessness
• Z59.02 – Unsheltered homelessness
• Z59.1 – Inadequate Housing
• Z59.10 – Inadequate housing, unspecified
• Z59.11 – Inadequate housing environmental temperature
• Z59.12 – Inadequate housing utilities
• Z59.19 – Other inadequate housing
• Z59.4 – Lack of adequate food
• Z59.41 – Food insecurity
• Z59.48 – Other specified lack of adequate food
• Z59.8 – Other problems related to housing and economic circumstances
• Z59.81 – Housing instability, housed
• Z59.811 – Housing instability, housed, with risk of homelessness
• Z59.812 – Housing instability, housed, homelessness in past 12 months
• Z59.819 – Housing instability, housed unspecified
• Z59.82 – Transportation insecurity
• Z59.86 – Financial insecurity
• Z59.87 – Material hardship due to limited financial resources, not elsewhere classified
• Z59.89 – Other problems related to housing and economic circumstances
Z60 – Problems related to social environment
Z62 – Problems related to upbringing
• Z62.2 – Upbringing away from parents
• Z62.23 – Child in custody of non-parental relative
• Z62.24 – Child in custody of non-relative guardian
• Z62.8 – Other specified problems related to upbringing
• Z62.81 – Personal history of abuse in childhood
• Z62.814 – Personal history of child financial abuse
• Z62.815 – Personal history of intimate partner abuse in childhood
• Z62.82 – Parent-child conflict
• Z62.823 – Parent-step child conflict
• Z62.83 – Non-parental relative or guardian-child conflict
• Z62.831 – Non-parental relative-child conflict
• Z62.832 – Non-relative guardian-child conflict
• Z62.833 – Group home staff-child conflict
• Z62.89 – Other specified problems related to upbringing
• Z62.892 – Runaway [from current living environment]
Z63 – Other problems related to primary support group, including family circumstances
Z64 – Problems related to certain psychosocial circumstance
Z65 – Problems related to other psychosocial circumstances

from having an adverse SDOH impact on their life. For example, half of Americans will utilize the food safety net in the US at least once in their lifetime by enrolling in the Supplemental Nutrition Assistance Program (SNAP). [66] It is important to screen broadly for SDOH, of which there are many screeners available. CMS requires they be validated through research and "includes the domains of food insecurity, housing insecurity, transportation needs, and utility difficulties;" Considerations include the "CMS Accountable Health Communities tool, the Protocol for Responding to & Assessing Patients' Assets, Risks & Experiences tool, and instruments identified for Medicare Advantage Special Needs Population Health Risk Assessment". *Brandt et al.* in a 2023 Journal of the American College of Cardiology

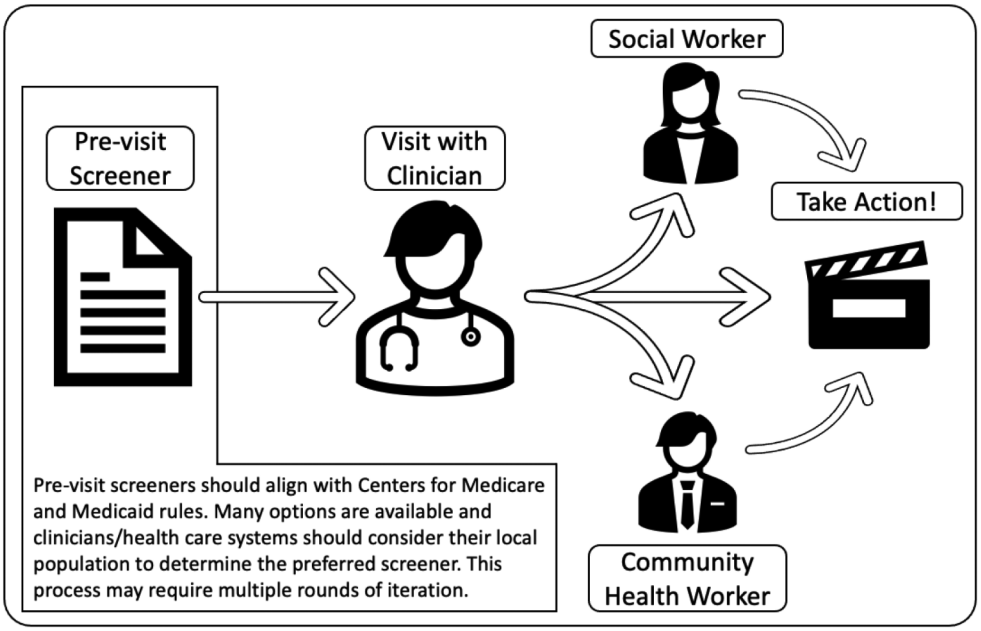

Fig. 3 Integrating social determinants of health screening tools into health care

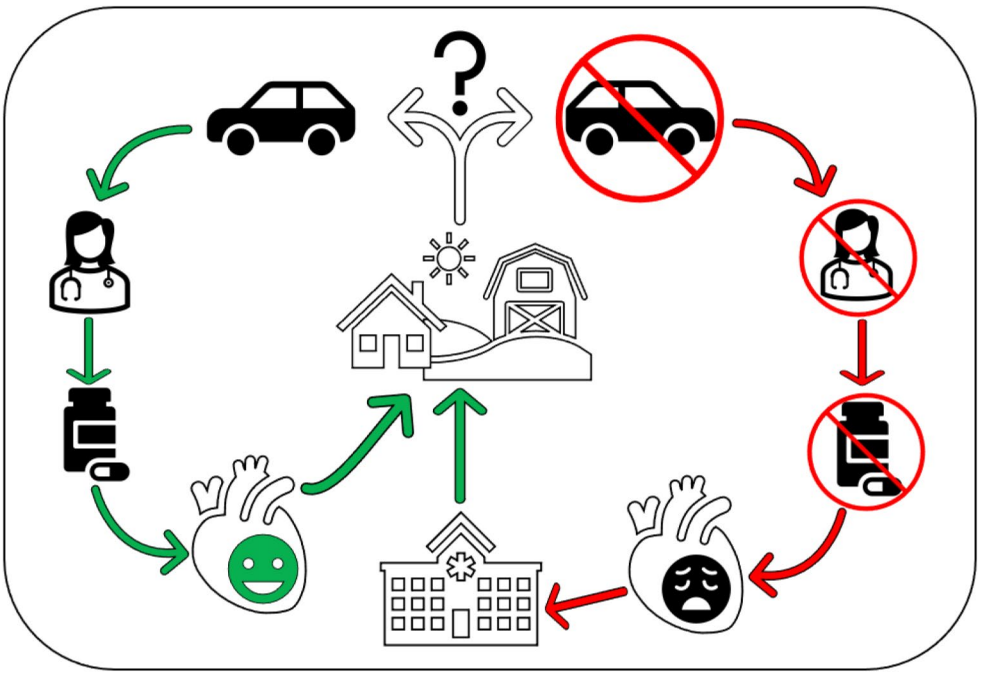

Fig. 4 Case example of integrating SDOH into clinic and health systems

State of the Art Review provides individual assessments in this area that can also be utilized. [67] If assessments are done ahead of the appointment, they can be reviewed and addressed at the time of the visit. Addressment can include providing resources within the physician's knowledge or integrating additional team members from health system resources. For example, a referral can be placed to a social worker or community health worker to contact the patient, assess the SDOH, and provide appropriate additional referral or resources to address the SDOH (Fig. 3). Systems that can identify barriers to health can have a dramatic impact on health outcomes (See Fig. 4 for a case example illustrating how heart failure exacerbations relate to SDOH).

Conclusion

Altogether, SDOH profoundly impacts healthcare's receipt, delivery, and outcomes. The aforementioned information highlights the inequities that exist in ASCVD in relation to the five domains of SDOH. Many patients fall within various disenfranchised groups (e.g., identify with minority

race, low socioeconomic status, low educational attainment, LGBTQ+), which impact overall health status and care. Learning to understand, recognize, and address SDOH as the driving force of disparities are critical for achieving health equity in the prevention and adequate treatment of ASCVD.

Caption: Social determinants of health can act directly on cardiovascular outcomes or indirectly through interactions with the health system and care utilization. These complex relationships are also impacted by structural determinants, including government, economic policies, social policies, public policies, social class, gender, race, and ethnicities, among others. This figure is adapted from the World Health Organization framework of social determinants of health.

Caption: Several factors are thought to relate to health outcomes. The greatest contributor is thought to be social and economic factors (40%), followed by health behaviors (30%), clinical care (20%), and physical environment (10%). This figure is adapted from the University of Wisconsin's County Health Rankings and Roadmaps.

Caption: A predetermined pre-visit screener that aligns with Centers for Medicare and Medicaid Services' rules can help to guide clinical care. If a screen is positive then the physician can refer to a social worker or community health worker or directly take action.

Caption: As a case example from my (EJB) own clinical practice, a patient presented three years in a row in the same month for heart failure exacerbation. The underlying cause for recurrence was lack of transportation. They had no car and could not make any outpatient visit from a rural community. Once prescriptions expired the heart failure symptoms returned, resulting in emergent need for hospitalization. A social worker was contacted to help address the transportation barrier. The patient was referred to a state sponsored transportation service and the patient was able to make the follow up visits and maintain access to prescription medications needed to treat heart failure.

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Data Availability No datasets were generated or analysed during the current study.

Declarations

Competing Interests The authors declare no competing interests.

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