EDITORIAL COMMENT

Global Paths to Cardiovascular Health Equity Across Risk Spectrum
Unveiling Threads of Social Determinants*

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Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality worldwide.[1] Although traditional CVD risk factors such as hypertension, dyslipidemia, and diabetes are key targets for reducing CVD burden, there is increasing recognition that social determinants of health (SDOH) play a critical role in shaping cardiovascular health (CVH) trajectories and outcomes. The American Heart Association Life Essential 8 has underscored SDOH as foundational factors influencing CVH across the life course and concomitantly advocated for an intensified research focus on quantifying cumulative social risk.[2]

The SDOH framework highlights factors like socioeconomic status, education, social support, access to care, and environmental exposures as potent influencers of health behaviors and CVD risk.[3] A robust body of evidence demonstrates that cumulative social disadvantage is associated with a higher burden of CVD risk factors, lower achievement of ideal CVH metrics, and worse CVD outcomes.[4] Environmental factors including housing, neighborhood conditions, community resources, air quality, and others are also linked to CVD risk.[5] Consequently, the imperative to mitigate adverse SDOH and incorporate integrated environmental assessments into CVD prevention efforts—spanning primordial, primary, and secondary interventions—across both the disease and life trajectory, becomes unequivocally salient.

Notwithstanding, much of the published reports linking SDOH with CVD outcomes, however, has been in Western populations, particularly those in the United States. Therefore, it is crucial to extend research efforts into various geopolitical and sociocultural settings to ensure the developed interventions and strategies are not only applicable but also effective within diverse cultural and contextual frameworks. The paucity of SDOH links with CVD risk in lower-resourced nations highlights an urgent need for the international health community to amplify studies in these regions, bridging the gap in our understanding and enabling the formulation of globally representative and equitable cardiovascular health strategies and policies.

As a result, we applaud Cai et al,[6] who address this key gap in the published reports in this issue of *JACC: Asia* by providing much needed insights on the dynamic interplay among SDOH, CVH, and CVD outcomes, highlighting an important and evolving area of cardiovascular medicine research in Asian populations. This large study was conducted in over 38,000 Chinese adults without established CVD in Guangdong (a coastal province of southeast China) recruited as part of a national survey. The authors explored 5 social risk domains (educational attainment, income level, health insurance status, presence of social support, and urban environment), 4 CVH domains (obesity, cholesterol, glycemia, and blood pressure), and outcomes (major adverse cardiovascular events [MACE]: coronary heart disease/myocardial infarction, stroke, heart failure, cardiovascular death; and all-cause death). Not surprisingly, the study shows that a high burden of unfavorable SDOH was associated with poor CVH and with MACE/all-cause mortality after accounting for CVH. Furthermore, the authors show synergistic

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effects between high burden of unfavorable SDOH and poor CVH on mortality risk.

This analysis aligns with prior evidence demonstrating associations between SDOH and CVH. Multiple studies have shown that individuals of lower socioeconomic status or with social/environmental disadvantages have higher prevalence of cardiovascular risk factors and lower CVH.[3,6,7] The current study extends this work geographically to China and to Asian populations, highlighting that SDOH has a global impact on CVD outcomes. In this study population, the burden of unfavorable SDOH was driven mainly by differences in education attainment, income, and urbanization. For example, only 11.8% of individuals with high burden of unfavorable accumulative social risk had an education level of high school or above, compared with 71% in the low-burden group. Similarly, there was a 3-fold difference in proportion with annual household income ≥50,000 RMB and living in urban areas between high- and low-SDOH burden groups.
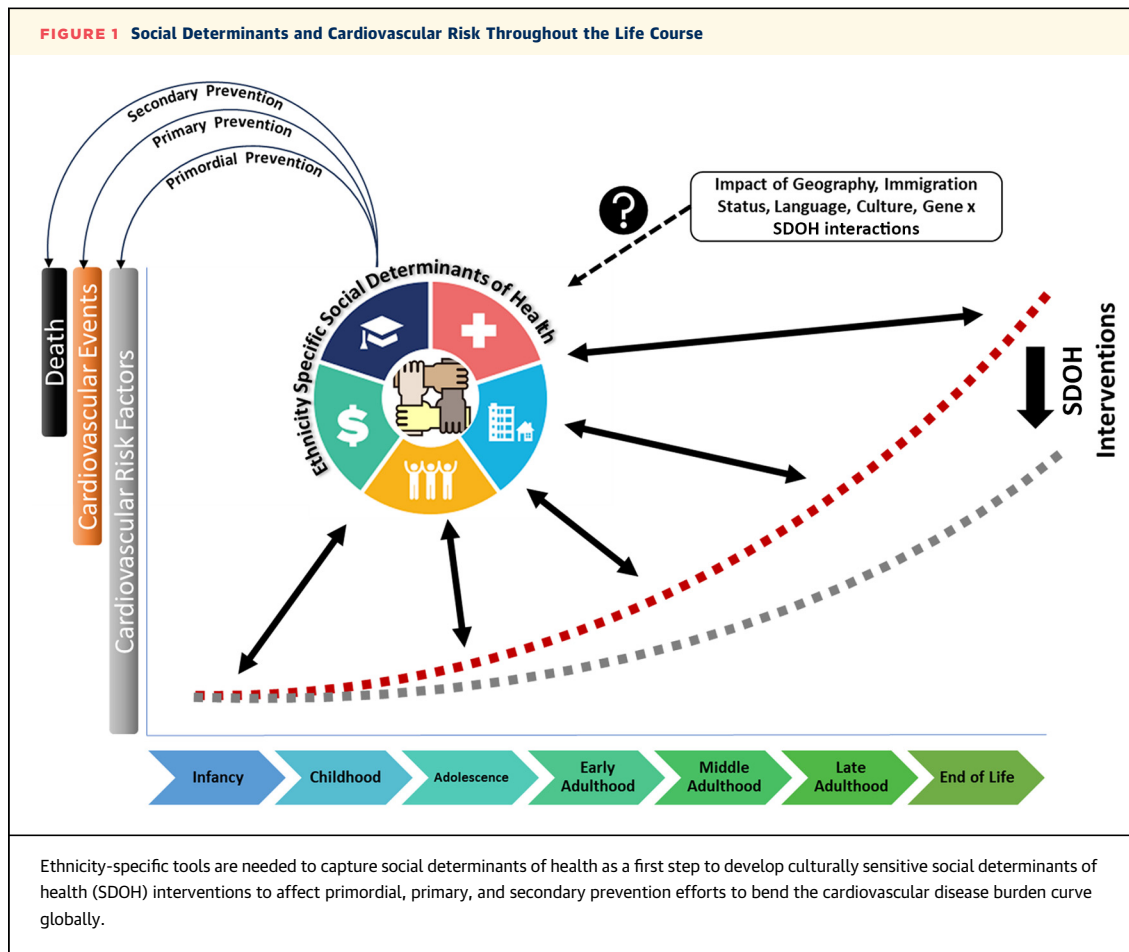
The analysis also highlights the individual association between SDOH components and MACE components. For example, although overall unfavorable social profiles were not independently associated with heart failure risk (HR: 0.98 [95% CI: 0.81-1.18]), poor educational attainment (HR: 1.55 [95% CI: 1.24-1.94]), lack of social support (HR: 1.40 [95% CI: 1.09-1.82]), and rurality (HR: 1.31 [95% CI: 1.11-1.56]) were strongly linked with HF risk, independent of demographics and CVH. These findings highlight the need for disease-specific SDOH fingerprinting to identify factors associated with increased CVD risk and identify personalized SDOH interventions to improve CVD outcomes. Evolving data science approaches may also be needed to untangle the complex interactions between SDOH and biologic factors to identify individual needs.

Although we applaud the authors to focus on these 5 major SDOH factors, attention must also be directed toward expanding the lens aspects of SDOH. Neighborhood environments, access to healthy food, transportation barriers, health and digital literacy, and language proficiency also impact CVD risk and outcomes. Although income and employment are critical, financial toxicity emerges as a pressing concern. The repercussions of being unable to afford medical care are far-reaching, affecting patients' well-being, their mental health, and even their ability to adhere to prescribed treatments. Similarly, education goes beyond degrees; health and digital literacy, language proficiency, and other nuanced factors play pivotal roles. The concept of intersectionality emphasizes how multiple dimensions of disadvantage intersect, magnifying health disparities. Addressing these factors holistically is essential for achieving health equity. To truly comprehend the challenges that individuals face, we must consider these aspects collectively.

Furthermore, aggregating social risks finds its culmination at the individual level; however, we must not forget the significant insights derived from the physical environment where these individuals reside. The infamous "Delmar Divide" in St. Louis, Missouri, symbolizes the socioeconomic gap that translates into stark health disparities. This phenomenon is not limited to one city but resonates across regions and nations, underscoring the intricate link between local environments and health outcomes. We hope that by converging data from multiple sources—ranging from socioeconomic indicators to health care access metrics—we gain a holistic view of the unique challenges and opportunities that these diversified insights present.

What are the implications of these considerations? First, this report expands our understanding of residual social risk across the life course.[8] As shown in **Figure 1**, SDOH has important and complex interactions with cardiovascular risk factors, incident CVD, and CVD outcomes across the life span. The relationships observed in this context are nonlinear in nature, resembling a matrixed framework. This suggests that individual determinants do not operate alone, but rather typically interact synergistically with one another, leading to an amplified effect on health outcomes. Second, additional factors may also play a role as risk enhancers or modifiers of the relationship between SDOH and CVD risk, such as immigration status, culture, and genetics, but these require further investigations. As such, an accurate understanding and social phenotyping is crucial to understanding population and individual social needs. Understanding ideal methods to capture and measure SDOH requires a cultural understanding of the issues affecting the community. Third, this study also highlights the importance of studying determinants of CVD in ethnic groups both globally and within the United States. For example, there is a growing interest in investigating proximate determinants of CVD in South Asian populations, East Asian populations, African populations, and Arab populations in the

FIGURE 1 Social Determinants and Cardiovascular Risk Throughout the Life Course

Ethnicity-specific tools are needed to capture social determinants of health as a first step to develop culturally sensitive social determinants of health (SDOH) interventions to affect primordial, primary, and secondary prevention efforts to bend the cardiovascular disease burden curve globally.

United States. Individualized understanding of proximate CVH determinants requires unique understanding of the cultural and geographic factors impacting health.

Finally, it is evident that there is a pressing need to develop tools sensitive to the cultural variations in SDOH across different populations. Complex and targeted SDOH interventions are essential to facilitate primordial, primary, and secondary CVD prevention efforts and to bend the CVD curve. These interventions should be culturally sensitive and built within the ethnic boundaries to enhance effectiveness and acceptability. They should also start early and be implemented throughout the life course. This demands a "systems thinking" approach to comprehend the cultural context and to thoroughly pinpoint targeted strategies that span from policy, community, health care, and individual

perspectives, such as deploying community health worker-led care models that holistically address both SDOH and medical risk.

In conclusion, moving toward equitable health care requires not just identifying the individual elements of SDOH, but synthesizing them into a coherent understanding while also recognizing their potential variations across different ethnic groups, cultures, and nations. Adopting a comprehensive approach that contemplates the complex impact of social risks is a logical step in our pursuit of equitable health care. A crucial next step is developing standardized SDOH data collection tools to systematically capture these elements across health care settings, which can facilitate SDOH screening in clinical practice. Aggregating culturally sensitive social risks magnifies the influence of these factors on health outcomes, enabling us to make informed policy decisions, allocate resources

effectively, and provide patient-centered care. Moving forward, implementing evidence-based and culturally-tailored programs that simultaneously target SDOH and CVH metrics specifically in at-risk communities will be key to reducing disparities.

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REFERENCES

1. Tsao CW, Aday AW, Almarzooq ZI, et al. Heart disease and stroke statistics—2023 update: a report from the American Heart Association. *Circulation*. 2023;147:e93–e621.

2. Lloyd-Jones DM, Allen NB, Anderson CAM, et al. Life's essential 8: updating and enhancing the American Heart Association's construct of cardiovascular health: a presidential advisory from the American Heart Association. *Circulation*. 2022;146:e18–e43.

3. Javed Z, Haisum Maqsood M, Yahya T, et al. Race, racism, and cardiovascular health: applying a social determinants of health framework to racial/ethnic disparities in cardiovascular disease. *Circ Cardiovasc Qual Outcomes*. 2022;15: e007917.

4. Powell-Wiley TM, Baumer Y, Baah FO, et al. Social determinants of cardiovascular disease. *Circ Res*. 2022;130:782–799.

5. Motairek I, Makhlouf MH, Rajagopalan S, Al-Kindi S. The exposome and cardiovascular health. *Can J Cardiol*. 2023;39:1191–1203.

6. Cai A, Chen C, Wang J, Ou Y, Nie Z, Feng Y. Social determinants of health, cardiovascular health, and outcomes in community-dwelling adults without cardiovascular disease. *JACC: Asia*. 2023;4(1):44–54.

7. Havranek EP, Mujahid MS, Barr DA, et al. Social determinants of risk and outcomes for cardiovascular disease: a scientific statement from the American Heart Association. *Circulation*. 2015;132:873–898.

8. Al-Kindi SG, Brook RD, Biswal S, Rajagopalan S. Environmental determinants of cardiovascular disease: lessons learned from air pollution. *Nat Rev Cardiol*. 2020;17:656–672.

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