Hypertension

REVIEW

Social Determinants of Health and Disparities in Hypertension and Cardiovascular Diseases

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ABSTRACT: High blood pressure causes over 10 million preventable deaths annually globally. Populations in low- and middle-income countries suffer the most, experiencing increased uncontrolled blood pressure and cardiovascular disease (CVD) deaths. Despite improvements in high-income countries, disparities persist, notably in the United States, where Black individuals face up to 4× higher CVD mortality than White individuals. Social determinants of health encompass complex, multidimensional factors linked to an individual's birthplace, upbringing, activities, residence, workplaces, socioeconomic and environmental structures, and significantly affect health outcomes, including hypertension and CVD. This review explored how social determinants of health drive disparities in hypertension and related CVD morbidity from a socioecological and life course perspective. We present evidence-based strategies, emphasizing interventions tailored to specific community needs and cross-sector collaboration to address health inequalities rooted in social factors, which are key elements toward achieving the United Nations' Sustainable Development Goal 3.4 for reducing premature CVD mortality by 30% by 2030. ***(Hypertension.* 2024;81:387–399. DOI: 10.1161/HYPERTENSIONAHA.123.21354.)**
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Key Words: blood pressure ■ cardiovascular diseases ■ health equity ■ hypertension ■ social determinants of health

High blood pressure (BP) is the leading preventable risk factor for global mortality, causing over 10 million deaths annually.[1] Low- and middle-income countries (LMICs) suffer the most, with <20% of individuals achieving adequate BP control, and hypertension-related cardiovascular disease (CVD) deaths have been rising over the past 3 decades. In high-income countries (HICs), BP control is ≈50% with decreasing hypertension-related CVD deaths, but disparities persist, particularly among low-income, rural, and racial/ethnic minorities. In the United States, Black individuals experience about 4× the hypertension-related CVD mortality than White individuals.[2,3]

Social determinants of health (SDOH) are a multidimensional measure encompassing factors related to where people are born, raised, engage in activities, reside, and work, which exert a significant influence on health outcomes, including hypertension and CVD. These factors include a wide array of elements that span socioeconomic and environmental structures and have a significant impact on both community- and individual-level health. They encompass issues such as housing and living conditions, neighborhood poverty, food security, access to green spaces, transportation, racial or other forms of disadvantaged minority segregation, structured racism, and various psychosocial stressors. Collectively, these factors

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REVIEW

Nonstandard Abbreviations and Acronyms

BP	blood pressure
CVD	cardiovascular disease
HIC	high-income country
LMIC	low- and middle-income countries
REGARDS	Reasons for Geographic and Racial Differences in Stroke
SDOH	social determinants of health
SEP	socioeconomic position
UPF	ultra-processed foods

shape individuals' health behaviors, fostering unhealthy practices that directly impact stress levels, leading to heightened sympathetic activity, markers of inflammation, and enhanced susceptibility to hypertension and CVD with potential epigenetic transmission to offspring.[4]

Limited access to affordable, high-quality health care compounds these challenges, hindering timely diagnosis and treatment, and leading to accelerated progression of vascular disease with high morbidity and mortality. External factors like climate change, environmental pollution, natural disasters, wars, and conflicts further exacerbate the prevalence of hypertension and CVD. These profound impacts of SDOH on hypertension and CVD are illustrated in Figure 1. Catastrophic health expenses from CVD disproportionately affects low-income communities, perpetuating suffering, and deepening socioeconomic disparities.[5]

This review summarizes how SDOHs contribute to hypertension and related CVD disparities from a global perspective focusing on comparisons between LMICs and HIC, as well as rural-urban and racial/ethnic disparities within HICs. Additionally, we discuss adaptable evidence-based strategies and comprehensive solutions that integrate social and clinical interventions to tackle SDOHs and disparities in hypertension and related CVD. These equity-focused approaches offer a promising path toward achieving United Nation's Sustainable Development Goals 3.4 for reducing premature CVD mortality by 2030 and the Healthy People 2030's goal for equitable health.[6,7]

DISPARITIES IN BURDEN OF HYPERTENSION AND CVD

Over the past 3 decades, the global hypertension prevalence has doubled to 626 million in women and 652 million in men, with disproportionately steeper

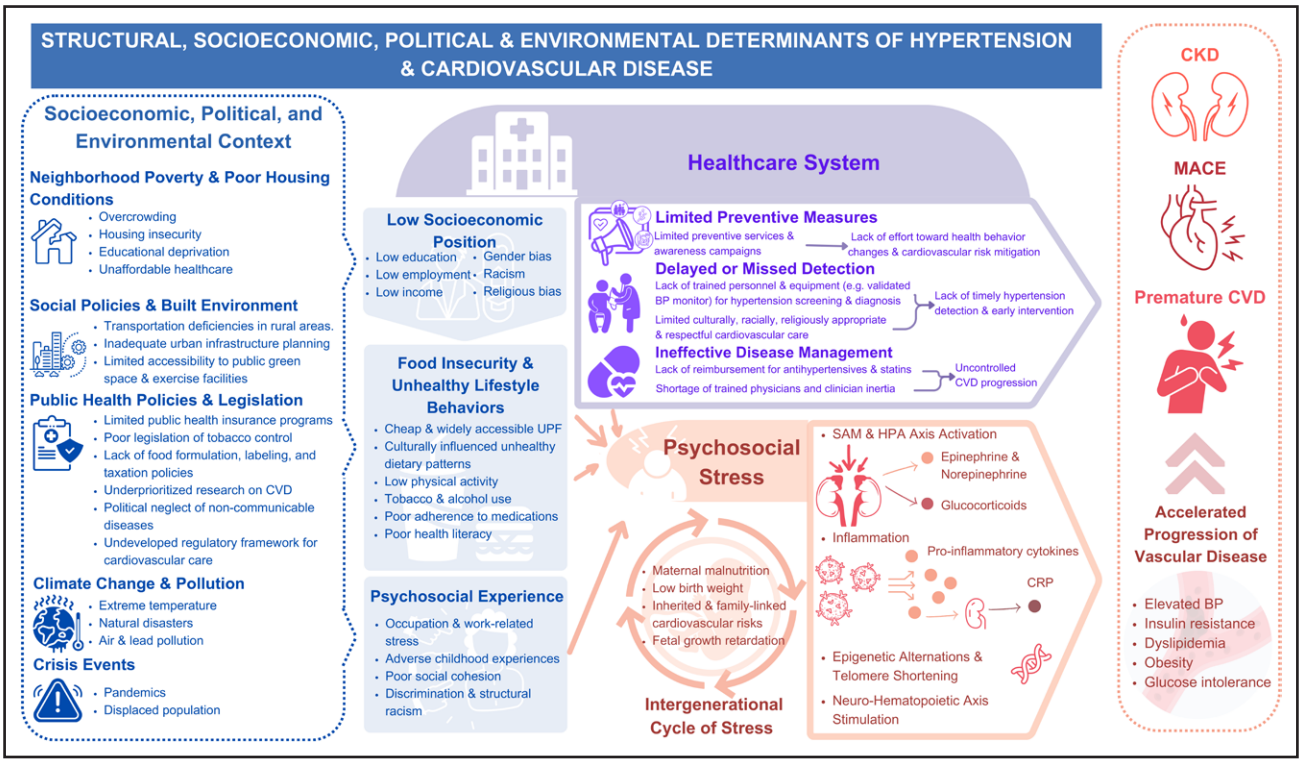

Figure 1. Socioecological and life course approaches of social determinants of health leading to hypertension and cardiovascular disease (CVD).
Social determinants of health (SDOHs) encompass socioeconomic, political, and environmental contexts, including neighborhood poverty and poor housing conditions, social policies and built environment, public health policies and legislation, climate change and pollution, and crisis events. These SDOHs contribute to an increased risk of premature CVD and major adverse cardiac events (MACE) through health care system and psychosocial stress pathway, such as sympathetic-adreno-medullar and hypothalamic-pituitary-adrenal axis activation. BP indicates blood pressure; CKD, chronic kidney disease; CRP, C-reactive protein; and UPF, ultra-processed food.

rise in LMICs (Figure 2).[8,9] In 2019, high systolic BP was linked to 10.9 million deaths and 235.4 million disability-adjusted life years worldwide.[10] Hypertension-related disability-adjusted life years decreased in HICs but increased in LMICs between 1990 and 2019, with HICs reporting significantly lower age-adjusted mortality rates due to high systolic BP (72 per 100 000) than LMICs (187 per 100 000).[11]

Despite favorable trends in HICs, substantial disparities persist, with higher CVD mortality rates in rural areas and racial/ethnic minorities. In the United States, although age-adjusted CVD mortality rates declined for Black and White individuals from 2000 to 2019 with a simultaneous decrease in Black-White disparities, Black individuals consistently demonstrated the highest mortality rates than other ethnicities, especially in rural areas (Figure 3; Figure S1).[12] Moreover, existing racial disparities were exacerbated during the COVID-19 pandemic, as indicated by the widening Black-White disparities in stroke mortality (Figure S2).[13] Non-Hispanic Black individuals have higher hypertension rates, early CVD onset, and increased CVD mortality compared with Whites.[2,14] Although the gap in racial disparities in BP control seemed to be narrowing in some regional studies in the United States, more recent data from a national cohort showed that BP differences and respective control rates have not changed much in the past 20 years.[15,16] Canadian studies also reveal significantly higher hypertension rates among Black and South Asian individuals, particularly women, compared with Whites.[17] In the United Kingdom, Black patients with chronic condition have significantly poorer BP control than White patients.[18] Even in Taiwan, where BP control rates are among the world's highest, indigenous women face substantially worse BP levels.[19]

SOCIOECOLOGICAL AND LIFE COURSE PERSPECTIVES OF SDOH RELATED TO HYPERTENSION AND CVD

SDOH is a multidimensional concept encompassing social, environmental, economic, and psychosocial factors that interact over an individual's lifetime. These factors are closely linked to the life course theory, which examines how early and later life biological, behavioral, social, and psychological exposures affect an individual's health.[20] The Whitehall longitudinal cohort studies led by Sir Michael Marmot, for example, have significantly advanced our understanding of health disparities by emphasizing the impact of both early and later life circumstances on health outcomes, including CVD mortality.[21]

In line with the life course theory, substantial evidence has accumulated that early life stress, especially during the periconceptual and prenatal periods, is linked with

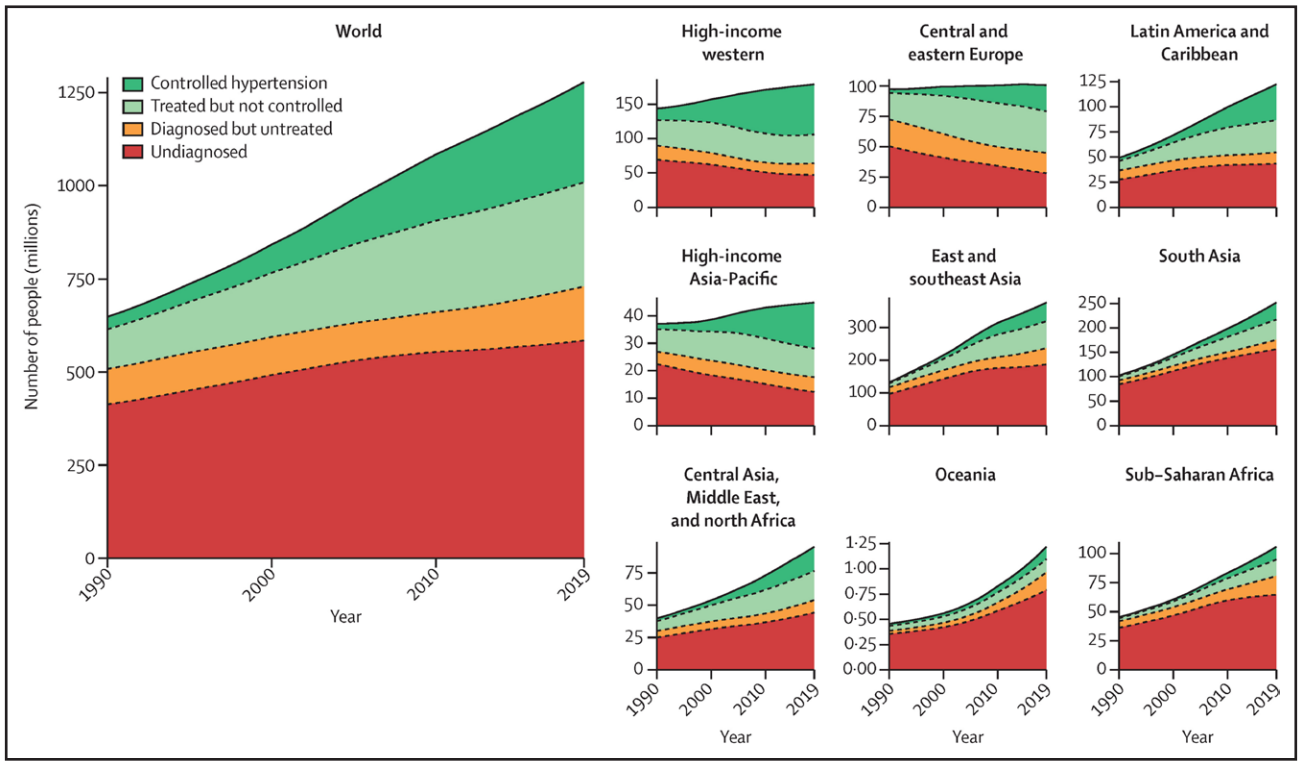

Figure 2. Trends in the number of people with hypertension who reported a diagnosis, who used treatment, and whose blood pressure was effectively controlled, globally and by region, 1990 to 2019.
Data derived from Zhou et al.[8]

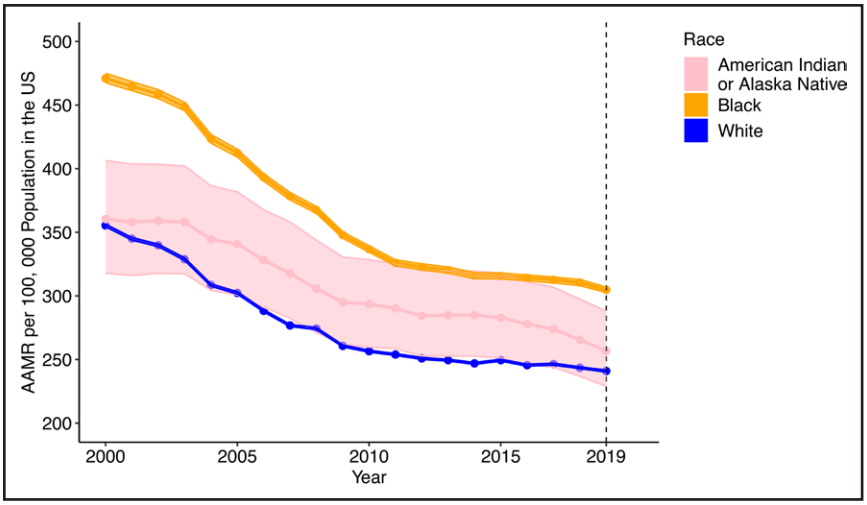

Figure 3. Estimated age-adjusted mortality rates for cardiovascular disease in the United States, 2000 to 2019, by year and racial group. This figure displays age-adjusted mortality rates (AAMRs) for cardiovascular disease in the United States from 2000 to 2019, delineated by racial groups. Shaded areas indicate 95% uncertainty intervals. Data source: the Institute for Health Metrics and Evaluation, 2023.[12]

the subsequent development of hypertension and CVD, primarily through epigenetic alterations.[4] For instance, studies on famine episodes demonstrated associations between maternal undernutrition and an increased risk of hypertension and coronary heart disease in offspring.[22] Additionally, preterm and low birth weight infants have higher systolic BP later in life.[23] Maternal malnutrition and low birth weight are still highly prevalent, especially in low-income countries, where 40% of childbearing-age women are anemic, and 25% of newborns have low birth weights.[24]

Hypertension in childhood, along with other cardiovascular risk factors (body mass index and cholesterol level), can lead to intermediate CVD markers and potentially fatal CVD events in adulthood (Figure S3).[25,26]

Early childhood growth patterns independently impact hypertension and CVD development.[4] For example, in the Helsinki Birth Cohort, adults with coronary events often had low birth weights followed by rapid childhood weight gain, linked to insulin resistance later in life.[27]

Through a life course and socioecological perspective, we explore the impact of key SDOHs on hypertension and CVD. We also provide an overview of widely referenced SDOH frameworks (Table S1).

Neighborhood Poverty, Poor Housing Environment, and Living Conditions

While BP was once positively associated with national income and urbanization, this relationship had weakened by 2015, suggesting hypertension is disproportionally affecting the poor population globally.[9] Of note, over 2 billion of the world's poor population live in rural areas or informal urban settlements in LMICs, facing a constant threat of eviction and harsh living conditions.[28] An analysis of 138 LMICs showed that countries with higher gross domestic product, more health investment, and improved multidimensional poverty index have lower hypertension prevalence, highlighting the importance of favorable policies and equitable health care spending for better BP control.[29]

In HICs, residing in underprivileged neighborhoods was associated with an elevated risk of developing coronary heart disease, even after adjusting for individuals' income, educational attainment, and occupation.[30] In the United States, individuals living in rural areas exhibit a higher incidence of hypertension (40%) compared with their urban counterparts (29%).[31] Studies conducted in impoverished neighborhoods in LMICs and rural areas in HICs reveal that individuals in these settings often prioritize basic necessities like stable housing, food, and electricity over health.[32]

Food Insecurity and Unhealthy Lifestyle Behaviors

Social disadvantaged individuals often face limited opportunities for healthy lifestyle choices, leading to adoption of unhealthy behaviors due to structural social and environmental factors.

Food Insecurity

Food insecurity, defined as "limited or uncertain access to sufficient food," is associated with obesity, a known risk factor for hypertension, particularly in women in HICs.[33] This is mainly driven by the consumption of energy-dense ultra-processed foods (UPFs) during scarcity.[34] Moreover, a low-sodium diet rich in fruits, vegetables, grains, and low-fat dairy products is recommended for lowering BP.[35] However, in impoverished neighborhoods, food insecurity is compounded by unfavorable trade policies, making fresh produce unaffordable. For example, in LMICs, the cost of recommended fruit and vegetable servings can account for up to half of household income, while in HICs, it is $< 2\%$.[36]

In 2015, over 42 million people in the United States lived in food-insecure households, including 13 million children.[37] Moreover, roughly 40% individuals with CVD experienced food insecurity, which is twice as high as those without CVD with a disproportionate impact on Black and Hispanic adults.[38]

Cheap and Widely Accessible UPF

A concerning trend is the rising popularity of UPFs, due to their affordability, palatability, convenience, and long shelf life. However, they are nutritionally poor and high in unhealthy fat, sugar, and salt levels.[39] This trend is prominent globally with higher sales in developed regions and increasing consumption in developing countries.[40]

Recent evidence has connected high UPF consumption to a 12% greater risk of CVD, including a 13% higher risk of coronary heart disease and an 11% higher risk of stroke.[41] Low-income neighborhoods, both in HICs and LMICs, often have easier access to cheaper UPFs, overshadowing healthier but pricier options.[42] Food and beverage companies further exacerbate this by targeting marketing at low-income neighborhoods, racial/ethnic minorities, adolescents, and children.[43]

Low Physical Activity, Tobacco, and Alcohol Use

Physical activity is an established protective factor against hypertension and CVD events.[35] However, people with low socioeconomic position (SEP), characterized by lower income, education, and employment, are less physically active due to factors like time constraints, lack of motivation, neighborhood safety, and limited recreational facilities.[44,45] While tobacco may not be a direct hypertension risk factor, it significantly increases the risk for all CVD subtypes, especially in individuals with hypertension.[46] Additionally, data consistently show no safe alcohol limits for incident CVD, especially stroke.[47] Studies in the United States observed higher rates of alcohol and tobacco use in non-Hispanic Blacks compared with Whites, and in rural compared with urban residents.[48]

Low SEP

Marmot's Social Gradient in Health concept illustrates the positive correlation between health status and SEP.[49,50] In HICs, low SEP is directly associated with higher hypertension risk.[51] However, this link was not evident in most LMICs until the 1990s when CVD, previously predominant among affluent individuals, begins to increasingly affect those with low SEP due to epidemiological transition from infectious to chronic disease.[52,53]

Individuals with lower SEP experience elevated risk of CVD and mortality primarily because of the higher prevalence of unhealthy behaviors, increased psychosocial stress, and limited health care access within this population.[54]

Data from both LMICs and HICs consistently highlight the strong association between lower education levels and hypertension/CVD. The INTERHEART study found that individuals with lower education levels had a higher risk for myocardial infarction compared with those with higher education levels.[55] Similarly, the Prospective Urban Rural Epidemiology study showed that low education level was a significant risk factor for incident CVD and associated mortality, especially in LMICs (Figure 4).[56] Moreover, educational opportunities are closely linked with employment rates and economic stability, which, in turn, significantly influence cardiovascular outcomes.[57] In the United States, the REGARDS study (Reasons for Geographic and Racial Differences in Stroke) revealed that socially determined vulnerabilities, such as low education and income levels, living in high-poverty areas, and lacking health insurance, were associated with a higher risk of developing hypertension and mortality.[58]

Psychosocial Experiences

Adverse psychosocial experiences during the life course such as structural racism, poor social cohesion, and work-related stress are associated with adverse cardiovascular outcomes through various plausible pathways,[59] including sympathetic nervous system and inflammation leading to impaired vascular reactivity and endothelial function,[60] and indirect influences from unhealthy coping habits such as poor diet and physical inactivity.[61]

Adverse Childhood Experiences

Adverse childhood experiences, including mistreatment, abuse, or dysfunctional home environments, are associated with increased risk of hypertension and CVD in adulthood. Adverse childhood experiences amplify susceptibility to unhealthy behaviors, epigenetic alterations, and systemic inflammation, thereby increasing vulnerability to CVD.[48,61] Notably, a significant percentage of the world poorest households lack adequate child supervision, with ≈40% of children out of school, and 48% of these households lack anyone with at least 5 years of education.[28]

Structural Racism

In HICs, racial/ethnic disparities in hypertension and CVD burden are evident, which are primarily attributed to inequities and undertreatment experienced by racial/ethnic minority groups (Blacks, Hispanics, and Southeast Asians), resulting in poorer BP control and subsequently increasing CVD risk.[62,63] In the United States, 33% of the Black-White disparity in uncontrolled BP could be explained by SDOHs, including low-income, low education, disadvantaged neighborhoods, and residing in health professional shortage areas.[64]

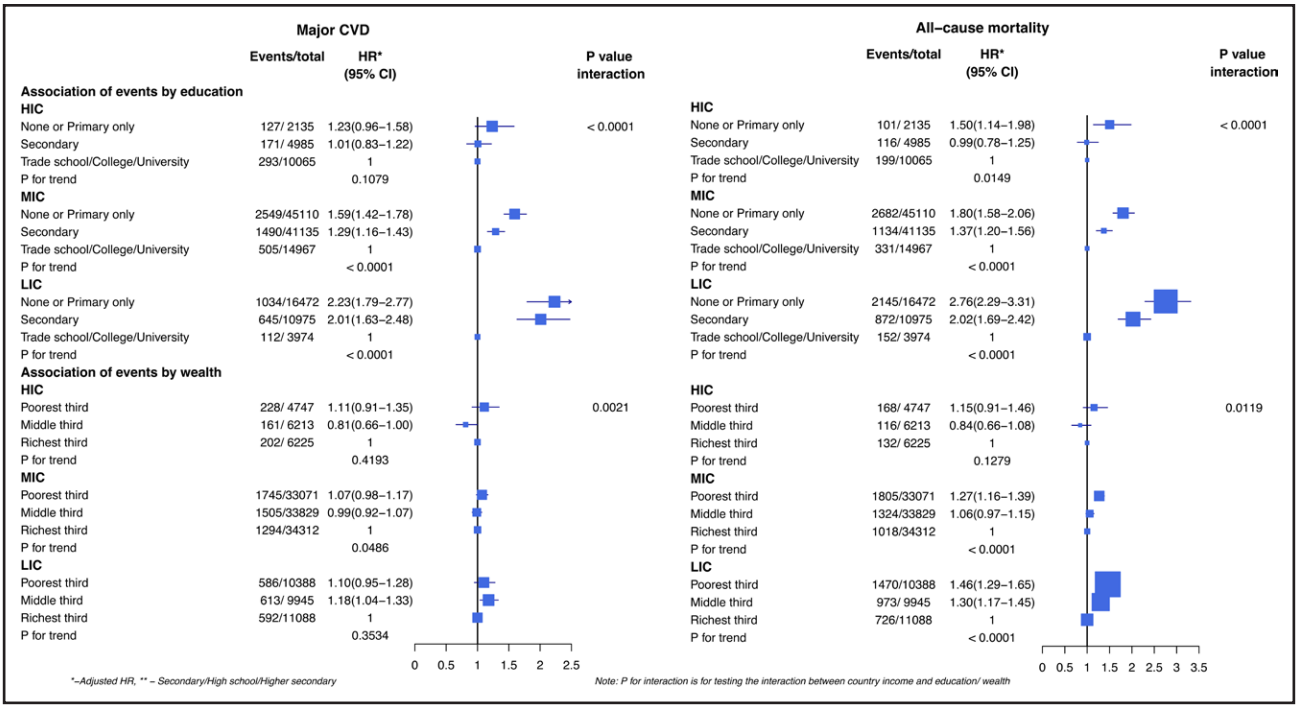

Figure 4. Forest plot of multivariable analysis for all-cause mortality and major cardiovascular disease (CVD) by level of education and wealth across country income strata.

This forest plot presents the results of multivariable models adjusting for education, wealth, age, sex, urban vs rural settings, baseline CVD, and INTERHEART risk score in low-income, middle-income, and high-income countries. Hazard ratios (HRs) and 95% CIs are displayed for total mortality and major CVD, with the participants with the highest level of education (trade school, college, or university) and the richest third of the participants serving as the reference group. HIC indicates high-income country; LIC, low-income country; and MIC, middle-income country. *Adjusted HR. ** Secondary/High school/ Higher secondary. Note: P for interaction is for testing the interaction between country income and education or wealth. Data derived from Rosengren et al.[56]

Poor Social Cohesion and Work-Related Stress

Social isolation adversely affects health behaviors, cardiovascular risk factors, and mortality.[65,66] Conversely, increased social contact was associated with a 13% lower prevalence of treatment-resistant hypertension among Black people.[67] Furthermore, job strain (characterized by high psychological demands and low decision latitude on the job) and night shift work have been associated with elevated BP and CVD risk.[68]

Mechanistic Insights Into Psychosocial Stress, Hypertension, and CVD

A growing body of evidence links psychosocial stress to cardiovascular health, including hypertension.[69,70] Data suggest that psychosocial stress from perceived adverse neighborhood conditions is associated with hypertension, likely due to abnormal epigenetic alternations including DNA methylation, histone modification, and RNA regulation.[4,71,72] Stress activates both the sympathetic-adrenal-medullary and the hypothalamic-pituitary-adrenal axis, leading to increased catecholamines, glucocorticoids, and inflammatory cytokines.[73,74] Perceived stress, gauged by amygdala activity, predicts future CVD via increased hematopoietic activity and arterial inflammation, suggesting the existence of a neural-hematopoietic-arterial axis.[75,76] A study showed that stress-related neural activity is associated with increased vascular inflammation in individuals from racial/ethnic minority communities and resource-limited neighborhoods, providing further insights into how adverse social conditions can increase hypertension and CVD risk.[60]

Health Systems

A major barrier to implementing proven strategies for chronic disease prevention is the design and functioning of health care systems involving health financing, governance, workforce, information, medical technologies, and health care delivery.[77] In many LMICs, screening services for chronic conditions are frequently lacking, particularly in impoverished and rural areas. Inadequate infrastructure, including poorly maintained roads, long travel distances, and transportation costs, hinder routine and emergency care.

Studies in LMICs indicate that less than half of individuals with hypertension are diagnosed, and less than a third effectively controlled their BP. A recent pooled analysis of 1201 studies showed grossly suboptimal BP control rates (under 25%) in Nepal, Indonesia, and some

sub-Saharan African and Oceanian nations. Even more concerning, certain North African, Central and South Asian, and Eastern European countries exhibit control rates below 10%.[8] Ill-equipped primary care facilities lacking readily available medications add another barrier to optimal hypertension management in these regions.[78]

Underdiagnosis and undertreatment of hypertension in LMICs lead to a higher CVD burden. Patients with acute CVD events often arrive too late for life-saving reperfusion therapy. The situation is worse in rural areas due to limited resources and transportation barriers, causing increased mortality.

In the United States, 1 in 10 individuals lacks affordable health insurance, and these uninsured individuals are more likely to have poorer BP control.[79,80] Similar to LMICs, rural areas in HICs face additional barriers in hypertension care due to physician and equipment shortages, and lack of transportation.[31]

Climate Change and Pollution

Climate change has a detrimental impact on hypertension and CVD. Activities like burning fossil fuels and deforestation release greenhouse gases, leading to extreme temperatures and water-related disasters, contribute to hypertension- and CVD-related morbidity and mortality, partly by disrupting access to medications and health care services for chronic diseases.[81–83] Ambient air pollution is a known risk factor for hypertension and CVD.[84] These adverse effects of climate change and pollution are compounded in socially deprived populations in LMICs.

Crisis Events: Pandemic and Displaced Populations

The COVID-19 pandemic has significantly impacted social, economic, and psychological aspects of lives, impacting individuals and communities alike. It has amplified preexisting disparities in cardiovascular care, underlining accessibility challenges.[13,85,86] Studies showed significantly higher hypertension rates among hospitalized COVID-19 patients, reaching up to 50% to 56%, which were correlated with disease severity, intensive care unit admission likelihood, and mortality risk.[87] Data indicate disproportionately higher mortality in Black, Latino, and South Asian populations in the United States during the pandemic.[88]

POTENTIAL SOLUTIONS AND CALL TO ACTION TO ADDRESS SDOH AND ELIMINATE DISPARITIES IN BP CONTROL AND CARDIOVASCULAR HEALTH

Hypertension is the leading preventable risk factor for CVD mortality on a global scale. The increasing disparities in BP control between LMICs and HICs are fundamentally driven by SDOHs. Among HICs, like the United States, a significant 15-year life expectancy gap persists between privileged and underprivileged individuals, emphasizing the need to view hypertension management strategies through a social equity lens.[89] Therefore, addressing the SDOHs related to hypertension and CVD via community and clinical interventions needs to be a national and global priority.

Achieving this goal necessitates a multifaceted approach, integrating SDOH measures into evidence-based health systems initiatives and policy reforms. These reforms should emphasize BP control while simultaneously targeting reductions in tobacco and alcohol use, promoting healthy lifestyles, reducing obesity, and facilitating referrals to address context-specific SDOHs, such as food subsidies and transportation. Moreover, combating structural racism, climate change, and environmental pollution will be instrumental in achieving these goals.

While eliminating all social and environmental factors may not be entirely feasible, implementing stress management techniques, particularly for the socially disadvantaged, can help mitigate their negative impact on cardiovascular health.[4,90] Furthermore, community engagement and empowerment are essential for the long-term sustainability of these efforts.[91,92] The Sustainable Development Goals 3.4 has set a clear target to reduce premature CVD mortality by 30% by 2030, relative to 2015 levels.[6] Improving BP control in the socially vulnerable populations globally will be key to achieving those targets, and it cannot be possible without addressing SDOHs. The key priorities to achieve these objectives are outlined (Table):

1. Enhance national coordination of hypertension and CVD prevention and mitigate SDOH impact on socially vulnerable populations

National health ministries must prioritize enhancing hypertension care, especially in marginalized communities in low-income neighborhoods, rural areas, and among racial/ethnic minorities. Establishing a dedicated task force is essential to ensure that initiatives related to hypertension care across the health care system work together effectively. In addition to health care services, this task force should foster collaboration with various sectors, including education, housing, food, transportation, and others, to address SDOHs that influence hypertension and CVD within socially disadvantaged populations.

2. Integrate social determinants in hypertension care

Nonconventional, team-based care models with trained nonphysician health workers, like community health workers, show promise in improving hypertension awareness, prevention, and control, particularly in resource-limited settings, as reflected in the recent World Health Organization guidelines.[93] Studies conducted in

Table. Strategies to Address Social Determinants of Health for Hypertension and Cardiovascular Disease Control

Objectives	Strategies
Enhance national coordination of hypertension and CVD prevention and mitigate SDOH impact on socially vulnerable populations	Enhance access to hypertension care in marginalized communities.
	Establish a national dedicated task force for hypertension management and CVD prevention
	Foster multisectoral partnerships to address hypertension and CVD risk.
Integrate social determinants in hypertension care	Incorporate SDOH measures and solutions into hypertension management guidelines and treatment plans.
	Leverage NPHWs and expand existing care teams for priority hypertension interventions.
	Provide counseling on coping strategies and motivation for adopting healthy behavior.
	Partner with nonhealth sector for social services referrals.
Ensure access to essential medications for hypertension and CVD among the socially disadvantaged and expand social insurance schemes	Improve access to essential antihypertensive and CVD medications, particularly for socially disadvantaged populations.
	Promote the availability and affordability of fixed-dose combination antihypertensive pills.
	Develop comprehensive health care financing schemes that ensure affordable access to quality care for all.
Leverage maternal and child health and infectious disease care delivery platforms	Encourage the integration of opportunistic hypertension screening, awareness campaigns, and treatment within existing health care platforms.
	Ensure maternal and childcare programs target socially disadvantaged populations to identify high-risk groups for long-term hypertension and CVD prevention.
	Leverage existing health care infrastructure developed for infectious disease care to enhance the equitable delivery of hypertension care to high-risk populations.
Start hypertension and CVD preventive efforts early in children and adolescents	Initiate preventive efforts early through school-based educational interventions that promote healthy lifestyle.
	Enhance partnerships between primary health care facilities and educational foundations to facilitate school enrollment.
Provide pro-poor healthy food and environmental policies and subsidies	Promote healthy behaviors to reduce hypertension and CVD risk in society.
	Implement national policies to reduce salt and sugar sweetened beverage consumptions and subsidies to make nutritious foods affordable for marginalized groups.
	Leverage existing programs and charitable initiatives to provide nutritious meals to socially disadvantaged groups to improve hypertension and CVD management.
Address racism as a social issue	Tailor hypertension interventions for socially disadvantaged groups to address racial and socioeconomic disparities.
	Provide health care providers with cultural competency training to ensure sensitivity and inclusivity in care.
	Promote diversity in the healthcare workforce to enhance representation and equity in hypertension care.
Leverage digital technology and enhance digital literacy	Use EHR-based surveillance and machine learning to understand how SDOH impact hypertension and CVD risk.
	Investigate wearable BP monitoring devices, along with home and ambulatory BP monitoring, for more accurate and convenient BP measurement.
	Integrating novel technologies like clinical decision support system and mHealth in the existing health care infrastructure.
	Collaborate across sectors to address digital disparities, including expanding digital outreach and enhancing digital literacy.
International agencies and donor support for hypertension care	Programs and initiatives aim to improve global cardiovascular health and reduce disparities in care (eg, WHO Global Action Plan, WHO HEARTS, Resolve to Save Lives organization, Pan American Health Organization, Lancet Commission on Hypertension and NCDI Poverty, Healthy People 2030, CHRONIC Care Act, World Hypertension Day, May Measurement Month campaign, proposed Global Hypertension Care Task Force, World Heart Federation call to African Nations, The American Heart Association's 2024 Health Equity Impact Goal).
	Encourage industry/corporate sector to expand programs such as the Walmart $4 Prescriptions program.
Research and capacity strengthening	Scale up evidence-based interventions for hypertension control.
	Human resource development and capacity-building initiatives to bridge the knowledge gap and improve hypertension management skills of primary care physicians.
	Strengthen national and local data collection and interpretation to monitor CVD risk factors and related SDOH.
	Develop performance metrics measure health care systems performance in managing hypertension.

BP indicates blood pressure; CHRONIC, Creating High-Quality Results and Outcomes Necessary to Improve Chronic; CVD, cardiovascular disease; EHR, electronic health record; NCDI, noncommunicable diseases and injuries; NPHW, nonphysician health workers; SDOH, social determinants of health; and WHO, World Health Organization.

LMICs, such as the Control of Blood Pressure and Risk Attenuation-Bangladesh, Pakistan, Sri Lanka, demonstrate the effectiveness of multicomponent interventions, including the engagement of nonphysician health workers, in BP control.[94] The intervention was cost-effective and acceptable to the stakeholders for scaling up

nationally.[95,96] Trials in Colombia, Malaysia, China, and Nepal with similar intervention components showed consistent results.[97–99] In the United States, the Black Barbershop trial found that the engagement of nonphysician health workers with barbers in Los Angeles County was cost-effective and successful in reducing BP.[100]

Studies suggest that incorporating SDOHs into treatment plans of patients with hypertension and concurrent depression may significantly improve their BP control.[101,102] The Center for Medicare & Medicaid Services in the United States has developed a screening tool for unmet health-related social needs, including housing instability, food insecurity, transportation difficulties, utility assistance needs, and interpersonal safety.[103] To maximize the impact, these measurements should be integrated into hypertension care at every step, such as providing subsidies for healthy food to socially disadvantaged populations.

3. Ensure access to essential medications for hypertension and CVD among the socially disadvantaged populations and expand social insurance schemes.

Inadequate access to antihypertensive and CVD medications poses a significant barrier to effective BP control. Addressing this challenge entails fostering public-private partnerships to ensure consistent supply of essential medications and reducing co-payment costs to improve outcomes.[104,105]

Additionally, health care financing schemes must encompass transportation options for socially disadvantaged individuals. These efforts also align closely with the Sustainable Development Goals, which advocate for equitable and affordable access to high-quality care for all.[6]

4. Leverage maternal and child health and infectious disease care delivery platforms.

Opportunistic screening, awareness, and treatment of hypertension should be encouraged by leveraging the existing outreach infrastructure established for maternal and child health services and infectious diseases (eg, COVID-19, tuberculosis, HIV) in LMICs.[106] Such approaches ensure equitable care delivery while keeping the marginal cost of scaling up the intervention low.

5. Start hypertension and CVD preventive efforts early in children and adolescents.

Initiating prevention efforts early in childhood and adolescence through school-based interventions promoting physical activity and healthy eating, while encouraging parental involvement can significantly reduce body mass index and BP.[107] Unfortunately, in the world's poorest communities, as many as 40% of children do not attend school.[28] To address this issue, primary health care facilities can partner with educational foundations to enroll children in school.

6. Provide pro-poor healthy food and environmental policies and subsidies.

Societies should prioritize healthier lifestyles by reducing salt, sugar, tobacco, and alcohol consumption, while promoting increased intake of fruit and vegetable, and physical activity. National policies and interventions should ensure affordable seasonal produce and offer subsidies for marginalized groups to promote health equity.[2,36]

7. Address racism as a social issue.

Efforts to ensure health equity in hypertension care require proactive antiracism measures, encompassing advocacy, policy development, and practical implementation strategies. These measures must include adapting interventions to the specific needs of the socially disadvantaged, equipping health care providers with the cultural competencies necessary for unbiased and shared decision-making, promoting diversity within the health care workforce, and enforcing anti-discriminatory policies.[108] Findings from ongoing REGARDS study suggest that racial disparities in cardiovascular health can partly be attenuated by interventions targeting neighborhood physical environment, neighborhood safety, social cohesion, and discrimination.[109]

8. Leverage digital technology and enhance digital literacy.

Digital health initiatives, such as mobile-based health (mHealth) applications, have shown effectiveness in improving BP control by improving medication adherence in both HICs and LMICs.[110,111] Additionally, wearable BP monitoring devices can be integrated into a virtual-first hypertension care model; however, their accuracy validation remains a challenge.[112] Concerns also exist regarding the accessibility of digital services in remote areas and a lack of digital literacy. Addressing these challenges requires collaborative efforts involving both the health and nonhealth sectors.

9. International agencies and donor support for hypertension care.

World Health Organization Global Action Plan targets a 25% reduction in hypertension prevalence by 2025 relative to 2010.[113] This goal is achievable through effective collaboration between governmental and nongovernmental entities.[11,90] Key global and regional initiatives aiming to eliminate dipartites in BP control and cardiovascular health are listed in the Table.

10. Research and capacity strengthening.

Efforts are needed to scale up the evidence-based interventions for hypertension care for socially disadvantaged populations. National data on hypertension, along with other CVD risk factors and related SDOHs, should be systematically collected and reported on a regular basis. Equally important is the generation and interpretation of local data, health system performance monitoring, and the establishment of mechanisms for continuous quality improvement in hypertension care. This requires investing in professionals with expertise spanning quantitative, qualitative, and social sciences, along with skills

in implementation research. Similarly, human resource development and capacity-building initiatives, focused on-the-job training programs, can improve hypertension care by bridging the knowledge gap among primary care physicians and strengthening the referral system in a sustained manner.[114,115]

CONCLUSIONS

Despite numerous clinical practice guidelines for hypertension management, uncontrolled BP remains the leading cause of preventable deaths, especially among socially disadvantaged groups. In this review, we have provided a comprehensive overview of the SDOHs significantly influencing the burden of hypertension and CVD. Our examination took a socioecological and life course perspective, emphasizing the interconnected behavioral, biological, and psychological pathways at play. It is crucial to underscore that addressing the SDOHs related to hypertension and CVD demands concerted efforts on both national and global levels complemented by robust community engagement, social financing, and strategic partnerships with nonhealth sector entities, including municipal organizations, faith-based institutions, schools, small businesses, and psychosocial support systems. Creating an enabling environment conducive to healthy behaviors, such as promoting a nutritious diet and providing accessible green spaces for physical activity, along with tobacco control measures, is essential. Additionally, ensuring access through efficient transportation and digital technology is vital. When implemented collectively, these measures hold great promise for achieving equitable BP control, preventing CVD, and ultimately eliminating related disparities in line with the Sustainable Development Goals 3.4 and Healthy People 2030 mission.

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Supplemental Material

Table S1
Figures S1–S3

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