AMERICAN MEDICAL WRITERS ASSOCIATION AMWA JOURNAL V39 N4 / 2024

SCIENCE SERIES

Cardiovascular Disease in the Americas: Social Determinants, Public Health Policies, and Recommendations (Part 1)

Alan Silburn, MPH, BP, BN, FAWM / Western Sydney University, Campbelltown, Australia

ABSTRACT

The purpose of this article is to examine the influence of social determinants of health on the global health problem of cardiovascular disease (CVD), particularly focused on the Americas region. CVD, which encompasses conditions such as coronary heart disease, heart failure, and cerebral vascular disease, is identified as the leading cause of mortality worldwide, with low- and middle-income countries bearing the brunt of its burden. The article discusses how factors such as economic status, education, environment, food supply, substance addiction, and health care accessibility contribute to the prevalence of CVD. Additionally, it explores current public health policies addressing CVD and provides recommendations for enhancing these policies to alleviate the burden of the disease. The recommendations include implementing tobacco control policies, raising the legal age for purchasing tobacco products, and advocating for comprehensive health care services. The article concludes by emphasizing the importance of tailored interventions, evidence-based policies, and evaluation strategies in combating CVD and improving public health outcomes.

According to the World Health Organization,[1] cardiovascular disease (CVD) is the leading cause of morbidity and mortality that affects the worldwide population. This broad category of diseases encompasses coronary heart disease, heart failure, cardiomyopathy, cerebral vascular disease, and congenital heart disease.[2] Atherosclerosis, characterized by the narrowing of arteries due to plaque formation, is identified as a primary underlying cause of CVD. This condition is exacerbated by chronic stress and elevated serum levels of cholesterol and triglycerides, leading to a build-up of atheroma within the coronary arteries, reducing blood supply to the myocardium, and potentially causing ischemia, myocardial infarction, and angina.[2]

Currently, CVD accounts for 31% of the overall global deaths. However, CVD is not considered to just be a predominant health issue in developed countries; research suggests that low- and middle-income countries have a higher susceptibility to the disease, accounting for 80% of these total deaths.[3] This disparity highlights the significant role that social determinants of health play in influencing CVD outcomes.

Economic status, education, environment, food supply, substance addiction, and accessibility to health care services are pivotal factors that shape the risk and progression of CVD. Poverty and income inequality can limit access to health care services, healthy food, and education, all of which are crucial for preventing and managing CVD. Lower levels of education are linked to poorer health outcomes, increased stress, and lower self-confidence, which can contribute to higher CVD risk. Environmental factors, including climate change and urbanization, influence lifestyle behaviors and access to resources necessary for maintaining cardiovascular health. Diets high in energy-dense, nutrient-poor foods contribute to obesity, diabetes, and other conditions that elevate CVD risk, whereas diets rich in whole grains, fruits, vegetables, and lean proteins are protective against CVD. Tobacco use, excessive alcohol consumption, and illicit drug use are significant risk factors for CVD, leading to conditions such as atherosclerosis, hypertension, and cardiomyopathy. Additionally, limited access to health care services hinders early detection, effective treatment, and ongoing management of CVD, particularly in smaller or economically disadvantaged nations. Addressing these determinants through effective public health policies is crucial for reducing the burden of CVD, particularly in the Americas.

The purpose of this article is to investigate the impact of social determinants of health on the prevalence and burden of CVD in the Americas. It aims to explore how economic status, education, environment, food supply, substance addiction, and health care accessibility contribute to the occurrence of CVD. Additionally, the article evaluates current public health policies addressing CVD and proposes recommendations to enhance these policies to mitigate the disease's impact in the region. Current strategies include tobacco control policies, raising the legal age for purchasing

ISSN 2163-5315

tobacco products, and advocating for comprehensive health care services. These interventions aim to mitigate the risk factors associated with CVD and improve public health outcomes.

The scope of this article encompasses a comprehensive analysis of CVD within the Americas, identifying and evaluating the social determinants of health that impact CVD prevalence. It provides an overview of CVDs and the mechanisms through which they develop. The article examines the disparities in CVD prevalence across different economic, educational, and environmental contexts within the Americas. Furthermore, it reviews existing public health policies targeting CVD and offers evidence-based recommendations to improve these policies. The article concludes with insights for health education specialists and health promotion professionals, emphasizing the importance of tailored interventions, evidence-based policies, and evaluation strategies in combating CVD and enhancing public health outcomes.

CVD OVERVIEW

CVD is a collective term that encompasses the diseases of the heart and blood vessels. It commonly includes a range of conditions such as coronary heart disease, heart failure, cardiomyopathy, cerebral vascular disease, and congenital heart disease.[2] For most CVD presentations, atherosclerosis plays a pivotal role marked by arterial narrowing caused by accumulation of lipids, fibrous elements, and calcification. Chronic stress, either mechanical or oxidative, can damage the inner arterial wall, facilitating the infiltration of macrophages and LDL-containing cholesterol and triglycerides. This process is expedited if serum levels are elevated. Foam cell formation progresses into fatty streaks, and subsequent smooth muscle cell migration and extracellular matrix deposition lead to the formation of a fibrous plaque. If destabilized, the fibrous plaque may rupture, resulting in a thrombus and possibly coronary artery occlusion. This buildup of atheroma within the coronary arteries reduces blood supply to the myocardium, potentially causing ischemia and leading to conditions like myocardial infarction and subsequent angina.[2]

CVD in the Americas

On a global scale, CVD constitutes 31% of total mortality rates. This prevalence is similarly observed across the 21 countries in the Americas, where CVD accounts for 33.7% of annual deaths, maintaining its position as the leading cause of mortality.[4] Broken down into 3 subregions, CVD is responsible for 22.8% of deaths in North America, 38% in Latin America, and 41.8% in the non-Latin Caribbean. Among individual countries, Venezuela, Guyana, and Trinidad and Tobago exhibit the highest CVD mortality rates, whereas Canada and Chile record comparatively lower rates.[4]

SOCIAL DETERMINANTS OF HEALTH AND CVD

Disparities in social determinants of health contribute to variations in health status within a country and across regions. According to the World Health Organization,[5] the social conditions in which people are born, live, and work are shaped by the distribution of money, power, and resources at local, national, and global levels. These factors, collectively known as the social determinants of health, play a crucial role in determining an individual's health status.

Key social determinants such as the environment, education, food supply, substance addiction, and lack of access to appropriate health care services significantly contribute to the burden of CVD in the Americas. These determinants influence modifiable risk factors for CVD, including psychosocial stress, physical inactivity, poor diet, obesity, diabetes, smoking, and alcohol consumption.[6]

Economic Factors

Although CVD affects populations worldwide, significant disparities persist in its prevalence and epidemiology across countries with varying income levels. The World Bank[7] classifies economies based on gross national income (GNI) per capita: low-income economies with a GNI per capita of $995 or less, middle-income economies with a GNI per capita ranging from $996 to $12,055, and high-income economies with a GNI per capita of $12,056 or more.[7] These income classifications delineate the economic landscape within which CVD manifests.

In the Americas, the economic status of a country does not necessarily correlate with the prevalence of CVD. Low-income nations such as Haiti experience a substantial burden, with 24% of annual deaths attributed to CVD.[7-8] Similarly, middle-income countries like Venezuela and Guyana report significant CVD-related mortality, accounting for 30% and 33% of annual deaths, respectively.[7,9,10] Even higher-income countries such as Canada, Chile, and Trinidad and Tobago grapple with CVD, with reported mortality rates of 27%, 27%, and 32%, respectively.[7,11-13] Notably, comparing with a similarly high-income economy, Australia, where CVD constitutes 29% of total annual deaths, underscores the global impact of this disease.[7]

Economic factors significantly influence the burden of CVD. Low-income countries often lack the health care infrastructure necessary for effective prevention, diagnosis, and treatment of CVD, leading to higher mortality rates. Middle-income countries may experience economic instability, which can hinder health care access and affordability,

exacerbating the prevalence of CVD. In high-income countries, although health care systems are more robust, disparities within the population still exist, driven by income inequality, access to health care, and lifestyle choices.

Income disparities not only shape national CVD prevalence but also reveal variations within countries. For instance, in Canada, regions like the Renfrew and Eastern Counties of the Champlain Region exhibit higher incidences of CVD mortality compared with the City of Ottawa.[14,15] This disparity hints at underlying social determinants influenced by income, potentially affecting access to health care, lifestyle choices, and environmental factors.

Similarly, in the United States, where CVD accounts for nearly 25% of all deaths, specific regions bear a disproportionate burden. States like Kentucky, West Virginia, and Louisiana, situated in the southern Atlantic, report the highest CVD-related deaths per capita.[16] These states typically have lower incomes, higher poverty rates, and limited access to health care, which hinders the prevention and effective management of CVD.[17] These disparities reflect complex interplays between income, access to health care resources, education, and lifestyle factors—all of which contribute to the economic link to CVD.

Education

Likewise, to a country's economic landscape, education is a social determinant of health because low education levels have been linked with poor health status, increased stress, and lower self-confidence.[6] Specifically, education has been inversely associated with CVD.[18] This concept is supported by prior research designs in which individuals with lower education attainment displayed a heightened cardiovascular risk compared with those with higher levels of education.[19,20] This observation may elucidate the higher occurrence of CVD in countries with lower average education attainment, such as Venezuela and Guyana, in contrast to countries like Canada and Chile.[21]

Environment

A nation's environment refers to the natural and physical aspects of the area encompassing the climate, soil, water, and geographical position, all of which significantly influence the health determinants of the respective population. Firstly, the environmental climate plays a pivotal role in daily life and is highly sensitive to changes. Alterations in climate patterns can escalate the severity or frequency of health issues influenced by weather conditions, potentially leading to unforeseen health challenges in previously unaffected regions.[22] The World Health Organization[1] has highlighted the escalating global temperatures, particularly evident near the equator, as a concerning trend. Such temperature rises have been linked to exacerbating preexisting cardiovascular issues like CVD due to intense heat exposure and undernutrition.[23] This connection is particularly worrying because it could contribute to the surge in CVD-related hospitalizations observed in equatorial countries like Brazil from 2007 to 2012.[24]

Likewise, temperature fluctuations, especially rising temperatures, pose complex risks to cardiovascular health and nutritional well-being. Intense heat exposure can strain cardiovascular systems, particularly in individuals already predisposed to cardiovascular issues.[23] Moreover, rising temperatures can exacerbate undernutrition by affecting agricultural productivity, food availability, and nutritional quality, thereby further compromising cardiovascular health. This dual impact underscores the intricate relationship between environmental factors, health outcomes, and the imperative need for comprehensive approaches to address these challenges.

Also, a nation's geographical location can foster psychosocial factors such as social isolation, also known as social disconnectedness. This isolation can profoundly impact an individual's mental well-being and elevate the risk of engaging in unhealthy behaviors.[25] Given that health is defined as a state of complete physical, mental, and social well-being, not merely the absence of disease, mental health directly influences an individual's vulnerability to CVD.[18,26]

Food Supply

Furthermore, the type of food supply and its availability can determine the health of an individual or country. Evidence suggests that a poor-quality diet consisting of excessive energy-rich foods, refined grains, added sugars, high salt content, and unhealthy fats can encourage weight gain, obesity, and diabetes and can have an influence on CVD.[27,28] These diets often include a high volume of processed food products that sacrifice nutrition for convenience. Opposingly, a healthy diet consists of whole grains, fruits, vegetables, legumes, fish, and nuts. Food supply and diets are facilitated by modern food environments that have influenced the prevalence of CVD in the Americas because the food systems that were once dominated by local production and markets containing foods requiring little processing before reaching the household have shifted toward maximizing production efficiency to reduce cost and increase the convenience for the consumer, thus sacrificing the food's nutritional value.[28]

Substance Addiction

Substance addiction, particularly through smoking and excessive alcohol consumption, significantly exacerbates the risk and progression of CVD. The consumption of addic-

tive substances leads individuals into cycles of dependency, often precipitated by social disintegration and stressors.[29] These dependencies not only perpetuate existing health disparities among different demographic groups but also contribute significantly to the escalation of CVD. This connection is particularly notable as substance abuse can directly exacerbate risk factors associated with CVD, such as hypertension and atherosclerosis, thereby magnifying both the prevalence and severity of cardiovascular health issues within affected populations.

Smoking, for instance, plays a pivotal role in all phases of atherosclerosis development, a primary precursor to CVD. It triggers the release of inflammatory markers and oxidative stress, which collectively contribute to endothelial dysfunction and vascular damage. Nicotine, a key component in cigarettes, further aggravates the situation by constricting blood vessels, thereby increasing blood pressure and heart rate. These physiologic changes foster the formation of arterial plaques and accelerate the progression of atheroma, narrowing crucial blood vessels and compromising blood flow to the heart and other vital organs.[30] In the context of public health, substance addiction significantly adds to the prevalence of CVD. For instance, in Brazil, it is known that 50% of the deaths of smokers, most of which are caused by CVD, could be prevented with smoking cessation.[31]

Similarly, excessive alcohol consumption, defined as 3 or more drinks per day, has been linked to various cardiovascular complications, including hemorrhagic strokes, cardiomyopathy, ischemic heart disease, and hypertension. These conditions not only increase the immediate risk of cardiovascular events but also contribute to the chronic burden of CVD over time.[30] This underscores the critical importance of addressing substance addiction as a key modifiable risk factor in reducing the burden of CVD globally.

Health Care Accessibility

Health care accessibility is not only crucial but fundamentally essential for promoting cardiovascular health across populations. Access to health care services directly influences the prevention, diagnosis, treatment, and management of CVD.[31] It enables widespread adoption of preventive measures such as regular screenings for risk factors like high blood pressure and cholesterol, as well as education on lifestyle changes like diet improvements and smoking cessation. Timely access to health care facilities allows for early detection through diagnostic tests facilitating prompt intervention when abnormalities are identified. Comprehensive treatment options, including medications, surgical interventions, and specialized cardiac rehabilitation programs, can then be implemented to manage cardiovascular conditions effectively.

However, in many countries, especially those with limited health care infrastructure and resources, health care accessibility remains a significant challenge. An example of this can be witnessed in smaller countries such as Saint Kitts and Nevis, which have a total population of 55,000, that experience challenges in providing adequate CVD health care. For instance, less than 25% of the primary health care centers in the country offer CVD risk stratification services.[32] This in turn may justify the disproportionate death rates from CVD in 2021 between Saint Kitts and Nevis when compared with the greater Americas region at 278 per 100,000 and 149.9 respectively.[33]

Access to effective and appropriate CVD health care services is vital for maintaining individual, community, and national health. It serves as a foundation for implementing successful public health policies and strategies. Without sufficient access to health care, efforts to prevent and manage CVDs can be significantly hampered.[29]

Expanding on this, countries can enhance health promotion and prevention by ensuring that health care facilities offer comprehensive CVD services, including risk assessments, early detection, treatment, and ongoing management. Public health campaigns can also raise awareness about the importance of regular check-ups and early intervention for cardiovascular health. Incorporating these strategies into health care systems can improve CVD outcomes and contribute to overall public health.

In Part 2, the impact of public health policies on CVD is explored. Effective public health policies create supportive environments to improve overall health by addressing social determinants like the economy, education, and health care accessibility. This section will cover the historical perspective of CVD policies, the US approach, and the effectiveness of tobacco control measures. In addition, recommendations for future actions and insights for health education specialists on designing, implementing, and evaluating interventions to prevent CVD will be presented.

AUTHOR STATEMENT

This study did not require ethical approval as it involved a retrospective analysis of publicly available and anonymized data, with no direct involvement of human subjects.

Author declaration and disclosures: *All individuals listed as authors participated sufficiently in the intellectual content, writing, and data analysis of the manuscript to assume public responsibility for the content therein; that all authors reviewed the final version prior to submission; and that any financial or personal relationships that might bias or be seen to bias their contributions to the work have been disclosed.*

Author contact: *alan.silburn@health.nsw.gov.au*

References

1. Cardiovascular diseases. World Health Organization. Accessed October 16, 2023. https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1
2. What we're doing about cardiovascular conditions. Australian Government Department of Health and Aged Care. Updated September 29, 2021. Accessed September 25, 2024. https://www.health.gov.au/topics/chronic-conditions/what-were-doing-about-chronic-conditions/what-were-doing-about-cardiovascular-conditions?utm_source=health.gov.au&utm_medium=callout-auto-custom&utm_campaign=digital_transformation
3. Ordúñez García P, Campillo-Artero C, eds. *Regional Consultation: Priorities for Cardiovascular Health in the Americas. Key Messages for Policymakers*. Pan American Health Organization; 2011. Accessed September 25, 2024. https://iris.paho.org/bitstream/handle/10665.2/50952/9789275132265_eng.pdf?sequence=2&isAllowed=y
4. Ordunez P, Prieto-Lara E, Pinheiro Gawryszewski V, Hennis A, Cooper R. Premature mortality from cardiovascular disease in the Americas – will the goal of a decline of "25% by 2025" be met?. *PLoS One*. 2015;10(10):e0141685.
5. The determinants of health. World Health Organization. Published February 3, 2017. Accessed September 25, 2024. https://www.who.int/news-room/questions-and-answers/item/determinants-of-health
6. Gourgari E, Dabelea D, Rother K. Modifiable risk factors for cardiovascular disease in children with type 1 diabetes: can early intervention prevent future cardiovascular events?. *Curr Diab Rep*. 2017;17(12):134.
7. World Bank country and lending groups. The World Bank. Accessed September 25, 2024. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519
8. *Noncommunicable Diseases (NCD) Country Profiles: Haiti*. World Health Organization; 2018. Accessed September 25, 2024. https://cdn.who.int/media/docs/default-source/country-profiles/ncds/hti_en.pdf
9. *Noncommunicable Diseases (NCD) Country Profiles: Guyan*a. World Health Organization; 2018. Accessed September 25, 2024. https://cdn.who.int/media/docs/default-source/country-profiles/ncds/guy_en.pdf
10. *Noncommunicable Diseases (NCD) Country Profiles: Venezuela (Bolivarian Republic of)*. World Health Organization; 2018. Accessed September 25, 2024. https://cdn.who.int/media/docs/default-source/country-profiles/ncds/ven_en.pdf
11. *Noncommunicable Diseases (NCD) Country Profiles: Canada*. World Health Organization; 2018. Accessed September 25, 2024. https://cdn.who.int/media/docs/default-source/country-profiles/ncds/can_en.pdf
12. *Noncommunicable Diseases (NCD) Country Profiles: Chile*. World Health Orgnization; 2018. Accessed September 25, 2024. https://cdn.who.int/media/docs/default-source/country-profiles/ncds/chl_en.pdf
13. *Noncommunicable Diseases (NCD) Country Profiles: Trinidad and Tobago*. World Health Organization; 2018. Accessed September 25, 2024. https://cdn.who.int/media/docs/default-source/country-profiles/ncds/tto_en.pdf
14. Wielgosz A, Jaffey J, Williams K, et al. *Atlas of Cardiovascular Health in the Champlain Region, 2011*. The Champlain Cardiovascular Disease Prevention Network; 2011. Accessed September 25, 2024. https://haloresearch.ca/wp-content/uploads2/2011/07/ccpn-atlas.pdf
15. Kreatsoulas C, Anand S. The impact of social determinants on cardiovascular disease. *Can J Cardiol*. 2010;26 (Suppl C):8C-13C.
16. Heart disease facts. Centers for Disease Control and Prevention. Accessed September 25, 2024. https://www.cdc.gov/heart-disease/data-research/facts-stats/index.html
17. Senney GT, Steckel RH. Developmental origins of cardiovascular disease: understanding high mortality rates in the American South. *Int J Environ Res Public Health*. 2021;18(24):13192.
18. *Mental Health Action Plan 2013-2020*. World Health Organization; 2013. Accessed September 25, 2024. https://iris.who.int/bitstream/handle/10665/89966/9789241506021_eng.pdf
19. Strand B, Tverdal A. Can cardiovascular risk factors and lifestyle explain the educational inequalities in mortality from ischaemic heart disease and from other heart diseases? 26 year follow up of 50.000 Norwegian men and women. *J Epidemiol Community Health*. 2004;58(1)705-709.
20. Kubota Y, Heiss G, MacLehose R, Roetker N, Folsom A. Association of educational attainment with lifetime risk of cardiovascular disease. *JAMA Intern Med*. 2017;177(8):1165.
21. *Education for All: Global Monitoring Repor*t. UNESCO; 2012. Accessed September 25, 2024. https://unesdoc.unesco.org/ark:/48223/pf0000217509
22. Crimmins A, Balbus J, Gamble JL, et al. *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. US Global Change Research Program; 2016. Accessed September 25, 2024. http://dx.doi.org/10.7930/J0R49NQX
23. De Blois J, Kjellstrom T, Agewall S, Ezekowitz J, Armstrong P, Atar D. The effects of climate change on cardiac health. *Cardiology*. 2015;131(4):209-217.
24. Ribeiro A, Duncan B, Brant L, Lotufo P, Mill J, Barreto S. Cardiovascular health in Brazil: trends and perspectives. *Circulation*. 2016;133(4):422-433.
25. Cornwell E, Waite L. Social disconnectedness, perceived isolation, and health among older adults. *J Health Soc Behav*. 2009;50(1):31-48.
26. Beyond Blue. *Coronary Heart Disease, Anxiety and Depression*. Heart Foundation; 2011. Accessed September 25, 2024. https://www.heartfoundation.org.au/your-heart/mental-health-and-heart-disease
27. Uauy R, Kumanyika S, Seidell J, et al. WHO/FAO release independent expert report on diet and chronic disease. World Health Organization. Published March 3, 2003. Accessed September 25, 2024. https://www.who.int/news/item/03-03-2003-who-fao-release-independent-expert-report-on-diet-and-chronic-disease
28. Anand SS, Hawkes C, de Souza RJ, et al. Food consumption and its impact on cardiovascular disease: importance of solutions focused on the globalized food system. *J Am Coll Cardiol*. 2015;66(14):1590-1614.
29. Social determinants of health and the prevention of health inequities. Australian Medical Association. March 5, 2007. Accessed September 25, 2024. https://ama.com.au/position-statement/social-determinants-health-and-prevention-health-inequities-2007
30. Mukamal KJ. The effects of smoking and drinking on cardiovascular disease and risk factors. *Alcohol Res Health*. 2006;29(3):199-202.
31. Simão AF, Précoma DB, de Andrade JP, Correa Filho H, Saraiva JFK, de Oliveira GMM; Brazilian Society of Cardiology. Cardiovascular prevention guideline of the Brazilian Society of Cardiology - executive summary. *Arq Bras Cardiol*. 2014;102(5):420-431.
32. *Noncommunicable Diseases (NCD) Country Profiles: Saint Kitts and Nevis*. World Health Organization; 2018. Accessed September 25, 2024. https://cdn.who.int/media/docs/default-source/country-profiles/ncds/kna_en.pdf
33. IHME. Death rate from cardiovascular disease. Our World in Data. Published May 20, 2024. Accessed July 11, 2024. https://cdn.who.int/media/docs/default-source/country-profiles/ncds/kna_en.pdf?sfvrsn=79154496_36&download=true