



EDITORIAL

Modest Gains Confer Large Impact: Achievement of Optimal Cardiovascular Health in the US Population

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An ounce of prevention is worth a pound of cure.
—Benjamin Franklin, 1736

In 2010, as part of the 2020 Impact Goals, the American Heart Association (AHA) introduced the construct of cardiovascular health (CVH), which integrates 7 modifiable health behaviors and health factors (smoking, total cholesterol, blood pressure, blood glucose, body mass index, physical activity, and diet); each are characterized as being ideal, intermediate, or poor.¹ Favorable CVH is generally considered as having achieved the ideal criteria for at least 5 of these 7 metrics. When each metric is scored 0 to 2 (with 0 for poor, 1 for intermediate, and 2 for ideal), the composite CVH score ranges from 0 to 14, and higher scores reflect better health. Also known as the “Life Simple 7,” the endorsement of the CVH score by the AHA and other stakeholders represented a key shift from focusing on the treatment of disease to the promotion of wellness.

Using the framework of CVH, the AHA’s 2020 Impact Goals were to reduce deaths from cardiovascular disease (CVD) in the United States by 20% and improve the health of all Americans by 20%.¹ Then, in 2020, at the turn of the next decade, the AHA released its 2030 Impact Goals, which stated the desire to increase healthy life expectancy equitably.² As the COVID-19 pandemic illuminated the urgent need for a more near-term goal in health equity, the AHA

subsequently released its 2024 Health Equity Impact Goal, which states “Every person deserves the opportunity for a full, healthy life. As champions for health equity, by 2024, the AHA will advance CVD for all, including identifying and removing barriers to healthcare access and quality.”³

See Article by Bundy et al.

These important AHA goals come on top of the background of worrisome data that have showed that gains in US life expectancy have stalled since 2010 and even declined since 2014,⁴ with further losses anticipated to come in the aftermath of the COVID-19 pandemic. There has been a plateauing of improvement in CVD death rates, and even an increase in heart disease mortality rates among young to middle-aged adults, particularly women.⁵ Dishearteningly, a recent AHA survey indicated there has been a decline in women’s awareness that heart disease was their leading cause of death, from 65% awareness in 2009 to 44% awareness in 2019.⁶ There was less awareness among young women who would arguably benefit the most from primordial prevention interventions, such as the obtainment of optimal CVH.⁶ Concurrently, the CVH status of US adults has worsened from 2006 to 2015,⁷ and hypertension control has also decreased since 2013.⁸

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These sobering statistics suggest we are slipping backwards with CVH promotion. Yet, let us not forget where we came from. We can look back at all the progress we previously made since the original Bethesda Conference in 1978,⁹ with the marked reduction of CVD mortality during the 1980s, 1990s, and early 2000s, and remember that combatting CVD was largely a success story and can be a success story again. CVD is predominantly a preventable disease. Results from the INTERHEART study taught us that 9 modifiable factors (smoking, dyslipidemia, hypertension, diabetes mellitus, abdominal obesity, psychosocial factors, regular physical activity, alcohol, and consumption of fruits and vegetables) can account for 90% of the risk for myocardial infarction.¹⁰ Most CVD globally can be attributed to a relatively small number of modifiable factors.¹¹ The beauty of the CVH score is its simplicity, that it focuses only on modifiable factors and yet tracks with CVD risk well.¹

Exactly how many CVD events could be avoided each year among US adults with even modest improvements in the CVH score was nicely demonstrated in this new study by Bundy et al¹² published in this issue of the *Journal of the American Heart Association (JAHA)*. The authors used CVD event rates from 7 US cohorts (from the Lifetime Risk Pooling Project) spanning from 1985 to 2016 to estimate the hazard ratios of incident CVD associated with CVH scores. The authors then used National Health and Nutrition Examination Survey data from 2011 to 2016 to determine national representative estimates about the prevalence of CVH status. By combining these 2 data sources, the authors were able to determine the population-attributable fractions and number of CVD events that could be prevented if all US adults achieved favorable CVH.

The key findings by Bundy et al were 3-fold. First, the CVH of the US adults is largely unfavorable, with only 7.3% of adults having a high CVH score (score, 12–14) and 59% having a low/unfavorable score (score, 0–8). Second, if adults with low or moderate CVH could achieve high CVH, an estimated 2 million CVD events could be prevented each year. Third, and perhaps most important, even some improvement in CVH across the population is better than none. The authors showed that 42% of CVD events occurred among those with low CVH status, so even if US adults with low CVH were able to move from low to moderate CVH status, \approx 1.2 million CVD events could be prevented each year.¹²

The population-attributable fraction is an important population-level statistic to help us guide policy by describing the proportional reduction in CVD events if exposure to CVH could be achieved to optimal status. Population-attributable fractions were higher among younger adults than older adults. This emphasizes the critical need to improve CVH health earlier

in the lifespan. Well-being needs to start early in life. Adverse childhood experiences influence CVD risk in adulthood.¹³ Maternal CVH determines the subsequent health of offspring,¹⁴ and CVH during adolescence and young adulthood is associated with subsequent risk of CVD over next 30+ years.¹⁵ Although it is never too late to try to modify CVH, to make the most success of gains in life-years attributed to obtainment of favorable CVH, it is best to start young.¹⁶ In young adults, we are not just thinking the next decade but across decades and across generations. Supporting young women, especially, before, during, and after pregnancy will be critical to optimize maternal and offspring CVH. Healthy lifestyle across the lifespan is the foundation for CVD prevention. Individuals maintaining more favorable CVH for longer periods of time gain greater cardiovascular risk reduction.¹⁷ Although younger people have lower risk on average in the next 10 years, they have more to gain by achieving optimal CVH because of greater potential life-years gained.

Achievement of optimal CVH from in utero to adulthood will require attention beyond the individual to structural and systemic barriers on a societal and population level. Upstream social determinants of health will need to be addressed to avoid the downstream consequences that stem from unfavorable CVH, such as individual morbidity from disease states, like CVD, diabetes mellitus, kidney disease, and cognitive impairment, multimorbidity from combinations of these disease states, years lived with disability, and years of life lost (Figure). In 2020, the AHA issued a powerful call to action that specifically called out and highlighted the role of structural racism as a fundamental driver of health disparities, and the important role that we all play as physicians, scientists, and allies to unequivocally and actively advance antiracism in our commitment to equitably improving CVH.³ Creating healthy environments, improving quality of housing, and ensuring access to health care across the life course are examples of necessary changes before equitable and optimal CVH is possible.

In this new study, Bundy et al determined that the potential impact of gaining even a modest 1-point increase in mean CVH score among US adults would prevent an estimated 559 000 CVD events each year.¹² However, these analyses assume a direct causal association between CVH score and CVD events. Certainly, that is reasonable given what we know about the importance of these risk factors, but people who are in better health overall might be doing other preventive and health-seeking behaviors, such as having better mental and physical health, pursuing more regular medical check-ups, and having better adherence to medical therapy, which may or may not be directly captured in the CVH score. Second, a criticism of the CVH score is that all the 7 factors in the CVH scores

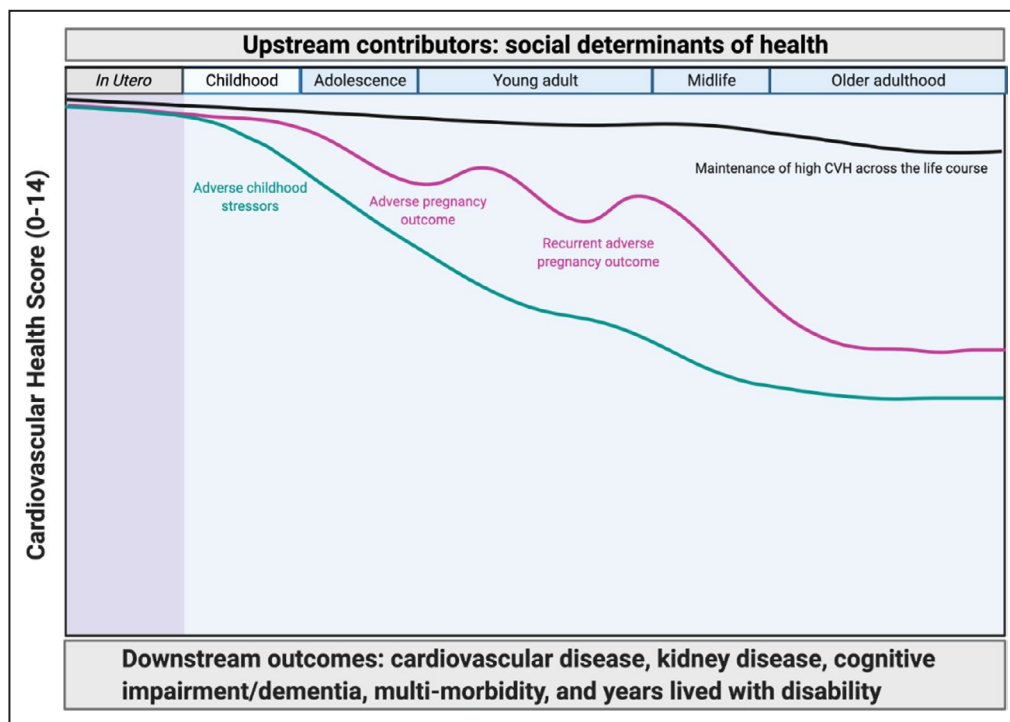


Figure. Upstream social determinants of health need to be addressed to maintain high cardiovascular health (CVH) over the lifespan and avoid the downstream consequences that stem from unfavorable CVH.

are weighted equally. Therefore, there should be some caution in the interpretation that if one directly changes the CVH score, such as by improving one factor to increase the score by 1 point, that will equate to the same number of CVD events prevented across all factors. The authors determined that the largest proportion of CVD events prevented could be attributed to improvements in healthy diet score, but diet patterns are much integrated with other socioeconomic and lifestyle factors, which may be harder to change. A third limitation is that CVH score has been mostly used in discussions on primary prevention, but less is understood about how the score should be adapted to capture risk among a secondary prevention population once individuals are already on lipid-lowering and antihypertensive treatment. Nevertheless, despite its limitations, across a broad range of disease states, the CVH is a good surrogate for capturing CVH risk as both a predictor of risk of future events but also as an outcome in and of itself to improve as a goal.

It is long past the time when we need to stop mopping up the floor that is flooded with cardiometabolic diseases and turn off the faucet with primordial prevention. However, our current strategies clearly are not working, and novel approaches need to be undertaken. We need to find disruptive ways to deliver cardiovascular preventive care in a patient-centered way

while eliminating barriers that persist to provide high-quality care for all. Opportunities exist through engagement of community partners, such as the barbershop and faith-based organizations, working together with healthcare professionals. Leveraging new technologies, such as mobile health and smart phones, can help, but we should be cautious not to widen the digital divide. We need all hands on deck to end the pandemic of cardiometabolic diseases, and preventive care is best delivered by using a team-based and community-engaged approach, as endorsed in the 2019 American College of Cardiology/AHA Prevention Guideline.¹⁸ We need to improve diversification of our healthcare teams to be more representative of the patient populations we serve each day.

Unfavorable CVH metrics tend to cluster together; thus, multipronged strategies targeted for comprehensive health promotion are likely to be more effective than targeting any one single factor in isolation.¹⁹ Given the interconnectivity of the heart, mind, and body, there should be a focus on the whole person and improving mental health, as psychological health impacts CVH both indirectly through behaviors and directly through biological processes.²⁰ Changes are needed at both the individual and societal level to move the needle forward with improving the US population's CVH score and achieving health equity. Large changes

are warranted to address racism, poverty, and social determinants, such as access to healthy food sources, safe places for physical activity, housing, transportation, and consistent health care. The AHA 2024 and 2030 Impact Goals seem ambitious but are possible. Bundy et al have shown us that some improvement, even modest, can translate to over a million CVD events avoided each year.¹² Using novel strategies and partnerships, we just need to put in even small ounces of prevention at the individual and society level to gain pounds of cure.

ARTICLE INFORMATION

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REFERENCES

- Lloyd-Jones DM, Hong Y, Labarthe D, Mozaffarian D, Appel LJ, Van Horn L, Greenlund K, Daniels S, Nichol G, Tomaselli GF, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation*. 2010;121:586–613. DOI: 10.1161/CIRCULATIONAHA.109.192703.
- Angell SY, McConnell MV, Anderson CAM, Bibbins-Domingo K, Boyle DS, Capewell S, Ezzati M, de Ferranti S, Gaskin DJ, Goetzel RZ, et al. The American Heart Association 2030 impact goal: a presidential advisory from the American Heart Association. *Circulation*. 2020;141:e120–e138. DOI: 10.1161/CIR.0000000000000758.
- American Heart Association News. AHA launches 2024 Impact Goal and Presidential Advisory on dismantling structural racism. <http://pages.heartemail.org/Share.aspx?i=29e8e2a9a2fe1dcaa7da7e77127c2afcf9aa40d8f7a196cebe466ee42a5cad93>. Accessed February 27, 2021.
- Woolf SH, Schoemaker H. Life expectancy and mortality rates in the United States, 1959–2017. *JAMA*. 2019;322:1996–2016. DOI: 10.1001/jama.2019.16932.
- Khan SU, Yedlapati SH, Lone AN, Khan MS, Wenger NK, Watson KE, Gulati M, Hays AG, Michos ED. A comparative analysis of premature heart disease- and cancer-related mortality in women in the USA, 1999–2018. *Eur Heart J Qual Care Clin Outcomes*. 2021;:qcaa099. Online ahead of print. DOI: 10.1093/ehjqcco/qcaa099.
- Cushman M, Shay CM, Howard VJ, Jiménez MC, Lewey J, McSweeney JC, Newby LK, Poudel R, Reynolds HR, Rexrode KM, et al. Ten-year differences in women's awareness related to coronary heart disease: results of the 2019 American Heart Association National Survey: a special report from the American Heart Association. *Circulation*. 2021;143:e239–e248. DOI: 10.1161/CIR.0000000000000907.
- Tibuakuu M, Okunrintemi V, Savji N, Stone NJ, Virani SS, Blankstein R, Thamman R, Blumenthal RS, Michos ED. Nondietary cardiovascular health metrics with patient experience and loss of productivity among US adults without cardiovascular disease: the Medical Expenditure Panel Survey 2006 to 2015. *J Am Heart Assoc*. 2020;9:e016744. DOI: 10.1161/JAHA.120.016744.
- Muntner P, Hardy ST, Fine LJ, Jaeger BC, Wozniak G, Levitan EB, Colantonio LD. Trends in blood pressure control among US adults with hypertension, 1999–2000 to 2017–2018. *JAMA*. 2020;324:1190–1200. DOI: 10.1001/jama.2020.14545.
- Goff DC Jr, Khan SS, Lloyd-Jones D, Arnett DK, Carnethon MR, Labarthe DR, Loop MS, Luepker RV, McConnell MV, Mensah GA, et al. Bending the curve in cardiovascular disease mortality: Bethesda + 40 and beyond. *Circulation*. 2021;143:837–851. DOI: 10.1161/CIRCULATIONAHA.120.046501.
- Yusuf S, Hawken S, Ôunpuu S, Dans T, Avezum A, Lanas F, McQueen M, Budaj A, Pais P, Varigos J, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet*. 2004;364:937–952. DOI: 10.1016/S0140-6736(04)17018-9.
- Yusuf S, Joseph P, Rangarajan S, Islam S, Mentz A, Hystad P, Brauer M, Kutty VR, Gupta R, Wielgosz A, et al. Modifiable risk factors, cardiovascular disease, and mortality in 155 722 individuals from 21 high-income, middle-income, and low-income countries (PURE): a prospective cohort study. *Lancet*. 2020;395:795–808. DOI: 10.1016/S0140-6736(19)32008-2.
- Bundy JD, Zhu Z, Ning H, Zhong VW, Paluch AE, Wilkins JT, Lloyd-Jones DM, Whelton PK, He J, Allen NB. Estimated impact of achieving optimal cardiovascular health among US adults on cardiovascular disease events. *J Am Heart Assoc*. 2021;10:e019681. DOI: 10.1161/JAHA.120.019681.
- Pierce JB, Kershaw KN, Kiefe CI, Jacobs DR Jr, Sidney S, Merkin SS, Feinglass J. Association of childhood psychosocial environment with 30-year cardiovascular disease incidence and mortality in middle age. *J Am Heart Assoc*. 2020;9:e015326. DOI: 10.1161/JAHA.119.015326.
- Perak AM, Lancki N, Kuang A, Labarthe DR, Allen NB, Shah SH, Lowe LP, Grobman WA, Lawrence JM, Lloyd-Jones DM, et al. Associations of maternal cardiovascular health in pregnancy with offspring cardiovascular health in early adolescence. *JAMA*. 2021;325:658–668. DOI: 10.1001/jama.2021.0247.
- Perak AM, Ning H, Khan SS, Bundy JD, Allen NB, Lewis CE, Jacobs DR Jr, Van Horn LV, Lloyd-Jones DM. Associations of late adolescent or young adult cardiovascular health with premature cardiovascular disease and mortality. *J Am Coll Cardiol*. 2020;76:2695–2707. DOI: 10.1016/j.jacc.2020.10.002.
- Martin SS, Michos ED. Mapping hyperlipidemia in young adulthood to coronary risk: importance of cumulative exposure and how to stay young. *Circulation*. 2015;131:445–447. DOI: 10.1161/CIRCULATIONAHA.114.014433.
- Corlin L, Short MI, Vasani RS, Xanthakis V. Association of the duration of ideal cardiovascular health through adulthood with cardiometabolic outcomes and mortality in the Framingham Offspring Study. *JAMA Cardiol*. 2020;5:549–556. DOI: 10.1001/jamacardio.2020.0109.
- Arnett DK, Blumenthal RS, Albert MA, Buroker AB, Goldberger ZD, Hahn EJ, Himmelfarb CD, Khera A, Lloyd-Jones D, McEvoy JW, et al. 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2019;140:e563–e595. DOI: 10.1161/CIR.0000000000000677.
- Khan SS, Greenland P. Comprehensive cardiovascular health promotion for successful prevention of cardiovascular disease. *JAMA*. 2020;324:2036–2037. DOI: 10.1001/jama.2020.18731.
- Levine GN, Cohen BE, Commodore-Mensah Y, Fleury J, Huffman JC, Khalid U, Labarthe DR, Lavretsky H, Michos ED, Spatz ES, et al. Psychological health, well-being, and the mind-heart-body connection: a scientific statement from the American Heart Association. *Circulation*. 2021;143:e763–e783. DOI: 10.1161/CIR.0000000000000947.