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Life's Essential 8: Updating and Enhancing the American Heart Association's Construct of Cardiovascular Health: A Presidential Advisory From the American Heart Association

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ABSTRACT: In 2010, the American Heart Association defined a novel construct of cardiovascular health to promote a paradigm shift from a focus solely on disease treatment to one inclusive of positive health promotion and preservation across the life course in populations and individuals. Extensive subsequent evidence has provided insights into strengths and limitations of the original approach to defining and quantifying cardiovascular health. In response, the American Heart Association convened a writing group to recommend enhancements and updates. The definition and quantification of each of the original metrics (Life's Simple 7) were evaluated for responsiveness to interindividual variation and intraindividual change. New metrics were considered, and the age spectrum was expanded to include the entire life course. The foundational contexts of social determinants of health and psychological health were addressed as crucial factors in optimizing and preserving cardiovascular health. This presidential advisory introduces an enhanced approach to assessing cardiovascular health: Life's Essential 8. The components of Life's Essential 8 include diet (updated), physical activity, nicotine exposure (updated), sleep health (new), body mass index, blood lipids (updated), blood glucose (updated), and blood pressure. Each metric has a new scoring algorithm ranging from 0 to 100 points, allowing generation of a new composite cardiovascular health score (the unweighted average of all components) that also varies from 0 to 100 points. Methods for implementing cardiovascular health assessment and longitudinal monitoring are discussed, as are potential data sources and tools to promote widespread adoption in policy, public health, clinical, institutional, and community settings.

Key Words: AHA Scientific Statements ■ health promotion ■ healthy lifestyle ■ life change events ■ public health ■ social determinants of health

In 2010, after decades of declines in cardiovascular disease (CVD) death rates, the American Heart Association (AHA) expanded its focus from addressing existing CVD and risk factors to adding strategies that would also directly promote the health of the population and individuals. Central to this new approach was the creation of a novel and operational definition for the construct of cardiovascular health (CVH).[1]

THE CONCEPT OF CARDIOVASCULAR HEALTH

In defining CVH, the AHA's 2010 writing group acknowledged that health is a broader, more positive construct than merely the absence of disease. It leveraged relevant existing data and emerging prevention concepts to formulate a definition that was intended to be accessible for all, with ac-

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Figure 1. Life's Essential 8.
Life's Essential 8 includes the 8 components of cardiovascular health: healthy diet, participation in physical activity, avoidance of nicotine, healthy sleep, healthy weight, and healthy levels of blood lipids, blood glucose, and blood pressure.

tionable components for individuals, practitioners, researchers, and policymakers to focus efforts for improvement in CVH for all. Readers are referred to that document for a more detailed discussion of the rationale and genesis of the CVH construct. The initial definition of CVH[1] was based on 7 health behaviors and health factors that, when optimal, were associated with greater CVD-free survival and total longevity and higher quality of life. The 7 components of CVH, subsequently called Life's Simple 7, included indicators of dietary quality, participation in physical activity (PA), exposure to cigarette smoking, and measures of body mass index, fasting blood glucose, total cholesterol, and blood pressure (BP) levels. Each metric was classified as poor, intermediate, or ideal on the basis of accepted clinical thresholds. Overall, ideal CVH was defined as having all 7 metrics at ideal levels. Ideal CVH also formed the basis of a new definition of optimal brain health published in 2017.[2]

The rich experience with and evidence in support of this powerful new health construct over the past 12 years have created an opportunity to update the measurement of CVH in the current context. Now is the time to enhance the approach to quantifying the original metrics and to assess the potential value of additional metrics and data sources to better represent the full range of CVH and to further motivate individual and population health improvement. This advisory presents an updated and enhanced approach to measuring, monitoring, and modifying CVH—now called Life's Essential 8 (Figure 1) after the inclusion of sleep as a new CVH component—to catalyze ongoing efforts to improve CVH in all individuals and the population.

REVIEW OF KNOWLEDGE GAINED SINCE 2010

To date, >2500 scientific articles have cited the original 2010 document describing the AHA's construct of CVH and explored the prevalence, determinants, outcomes, and mechanisms of CVH in diverse populations across the life course. A number of findings are highlighted here.

Prevalence of CVH

In the United States, the prevalence of ideal CVH is exceedingly low (<1%) for all age groups studied, including among individuals as young as 12 years of age.[3] Overall CVH declines with age: The prevalence of having ≥5 metrics at ideal levels is only 45% among US adolescents, 32% among adults 20 to 39 years of age, 11% among adults 40 to 59 years of age, and 4% among adults ≥60 years of age.[3] Thus, although some individuals can preserve higher levels of CVH, most will require some attention to achieve and maintain it into later life. The prevalence of ideal diet (as defined in 2010) is consistently negligible (<1%) across all age groups, driving the overall low prevalence of ideal CVH. Population levels of CVH in the United States have been low and fairly stagnant over the past 15 to 20

years,[4] but this overall observation conceals several important findings. First, although some segments of the population are experiencing modest improvements in CVH, other groups (generally those at a lower socioeconomic position) are experiencing worsening CVH, creating a bimodal distribution.[5] Second, there are persistent differences in the prevalence of CVH levels by self-reported race and ethnicity, and these disparities are larger at younger ages.[3] The prevalence of high CVH also varies geographically[6] and is higher in those who live in urban[7] areas compared with those who live in rural areas. Furthermore, recent data indicate that the prevalence of high CVH is <1 in 10 during pregnancy,[8] and poor CVH in pregnancy is associated with poor CVH in offspring, suggesting that ideal CVH is not universal even at birth.[9]

Outcomes of CVH

Numerous studies have shown strong, stepwise, inverse associations between the number of ideal CVH metrics or overall CVH score and total CVD and CVD mortality, all-cause mortality, and a wide variety of non-CVD outcomes. In all studies, those with higher CVH have markedly lower risks for CVD events. In a meta-analysis of 9 prospective cohort studies, having the highest number of ideal CVH metrics (generally ≥5 versus 0 to 2) was associated with a relative risk of 0.20 for CVD (95% CI, 0.11–0.37), 0.31 for stroke (95% CI, 0.25–0.38), 0.25 for CVD mortality (95% CI, 0.10–0.63), and 0.55 for all-cause mortality (95% CI, 0.37–0.80).[10] Similar associations are observed across all age groups, down to as young as 8 years of age,[11–15] and regardless of race and ethnicity or socioeconomic position.

All 7 original CVH metrics contribute to risks for health outcomes,[12] and the importance of CVH behaviors is underscored by the association of optimal CVH behaviors with nearly 50% lower risk for coronary events among individuals at high genetic risk.[16,17] It is never too late to realize benefits from improvement in CVH.[18–20] However, the earlier that CVH is optimized, the better the outcomes are. Having higher CVH is associated with favorable long-term health outcomes at every age, and improvement in CVH over time is associated with lower risk for CVD.[18–20] A recent analysis estimated that if all US adults maintained high CVH (defined in that article as 12–14 of 14 points on the CVH score), 2.0 million CVD events would be prevented each year.[21] Better CVH has also been associated with lower risks for cancer, dementia, end-stage renal disease, and chronic obstructive pulmonary disease; better cognitive function and quality of life; compression of morbidity (longer health span); and lower health care costs despite a longer life span, among many other positive outcomes.[22,23]

Determinants of CVH

The heritability of overall CVH is low, indicating that behavioral and environmental exposures are paramount in determining CVH.[24] Indeed, pursuing and sustaining a healthier lifestyle from a young age is a successful strategy for maintaining higher CVH into middle age.[25–31] However, one's ability to choose healthy lifestyles across the life course is strongly influenced by psychological health factors[32,33] and social and structural determinants,[34] as addressed later in detail (in the Foundational Factors for CVH: Psychological Health/Well-Being and Social Determinants section).

Mechanisms of CVH

Investigations of mechanisms through which higher CVH is associated with lower CVD risk (or lower CVH with higher risk) have identified several potential pathways involving inflammation, endothelial function, atherosclerosis, cardiac stress and remodeling, hemostatic factors, and epigenetics,[35,36] among others.[13,37,38] Two studies examined multiple potential pathways from low CVH status to clinical CVD events and found only partial statistical attenuation of the relationship after adjustment for a wide array of subclinical disease measures and biomarkers presumed to be in the causal pathway.[13,37] Thus, beyond known CVD risk pathways, the protection conferred by optimal CVH may be "more than the sum of its parts."[39]

Taken together, the substantial body of knowledge gained about CVH indicates that it is uniquely positioned as a health outcome itself related to upstream genetic, social, behavioral, and environmental factors, and as a determinant of major downstream health outcomes. Across the life course, assessment of CVH status has been shown to be an effective means to monitor public and individual health and a strong indicator of the extraordinary potential of primordial prevention strategies to improve and extend countless lives.

LESSONS LEARNED ABOUT CVH AND RATIONALE FOR REDEFINITION

As is evident from the previous review, a number of lessons have been learned about the original construct of CVH through its application and study in diverse settings. The collective experience of the scientific and medical community in using the original CVH construct to measure and improve CVH suggested several important considerations for this update.

First, some features of CVH component definitions may not have allowed appreciation of the full scope of health behaviors and practices in the current environment. For example, the original diet metric assessed intake of only 5 foods or nutrients (fruit and vegetables, fish, whole grains, sugar-sweetened beverages, and sodium). These dietary components were selected to represent an overall healthy eating pattern such as the DASH (Dietary Approaches to Stop Hypertension)

eating pattern from variables available at the time in NHANES (National Health and Nutrition Examination Surveys). However, those 5 components are not the only features of a contemporary healthful eating pattern. The new metrics attempt to allow credit for a broader scope of health in each CVH component.

Second, over time, application of the CVH construct has increasingly been used to assess individual- and population-level CVH. This application has revealed limitations in how the metrics are quantified. Specifically, the original definitions of ideal, intermediate, and poor CVH for each component are less sensitive to interindividual differences and intraindividual change than is desirable. For example, the PA metric quantified intermediate CVH as 1 to 149 minutes of moderate to vigorous activity per week. Thus, 2 distinct individuals with widely different amounts (eg, 1 min/wk versus 149 min/wk) would be categorized as having intermediate PA, and an individual who changed their own PA from 1 to 149 min/wk would receive no credit for the substantial improvement in this health behavior. The newer approach to quantification of CVH is designed to be more sensitive and responsive to these considerations. There were also large shifts in some individuals' CVH scores as they transitioned from childhood to adult metrics (some of which is unavoidable) that we have attempted to address.

Third, although CVH was designed to measure and monitor health trajectories over time, a novel contribution of this construct, it has also been used effectively to predict future risk for CVD and other health outcomes across the life course. This has proved to be a useful feature, especially for younger individuals (for whom risk equations are typically unavailable).

Fourth, although the metrics used to measure and monitor CVH are useful for describing health status and trajectories, they should not necessarily be used to promote specific interventions. In the example of the original diet metric, clinicians could recommend and consumers should pursue numerous strategies to improve their eating pattern beyond focusing solely on the 5 original nutrients and food groups. Generally speaking, then, in the promotion of CVH, the specific metrics (eg, the diet components) should not be confused with the health messaging (ie, people should pursue an overall heart-healthy diet such as the DASH- or Mediterranean-style eating patterns).

Fifth, the data on CVH change and its benefits consistently suggest that maintaining the highest possible levels of CVH on all metrics will lead to the best outcomes. Clinicians and consumers should focus on strategies that reinforce success and maintain high levels of overall CVH over time. However, if >1 metric is suboptimal or trending worse, they do not all need to be addressed simultaneously. Picking 1 CVH component at a time to improve, particularly if it is aligned with patient motivation, can lead to successful outcomes (as discussed in Implementation of CVH in Clinical Practice section).

Last, the original writing group contemplated the inclusion of sleep, stress, and other factors as metrics and acknowledged their contributions to overall CVH. However, at the time, the means for reliably measuring these domains in individuals and populations were limited. In the ensuing years, improved assessment techniques and emerging evidence have bolstered the importance of sleep and psychological health/well-being for CVH. In addition, there is increased awareness of the critical importance for CVH of social determinants of health (SDOH) and the underlying societal and structural issues that create them. These factors were of significant importance in the deliberations of the writing group.

In the next sections, we introduce the AHA's new Life's Essential 8, including affirmation of the foundational roles that psychological health/well-being and SDOH play in achieving optimal and equitable CVH in the population (in the Foundational Factors for CVH: Psychological Health/Well-Being and Social Determinants section); a new CVH component metric related to sleep (in the Sleep Health as a New Component of CVH section); and novel, updated methods for defining and quantifying CVH (in the Updated Definitions and Novel Quantitative Assessment of CVH Metrics section).

FOUNDATIONAL FACTORS FOR CVH: PSYCHOLOGICAL HEALTH/WELL-BEING AND SOCIAL DETERMINANTS

Over the past decade, key findings have illuminated the essential, foundational context of psychological health and well-being and SDOH for maintaining or improving CVH (Figure 2). Positive psychological health characteristics such as optimism, purpose in life, environmental mastery, perceived reward from social roles, and resilient coping are associated with more favorable CVH[40–42]; conversely, greater psychosocial stress and depression are associated with poorer CVH.[43–45] SDOH provides the daily context for CVH and often determine the lifelong potential for CVH preservation and success or failure of interventions to improve CVH. A variety of favorable individual-level socioeconomic and social indicators are associated with higher CVH such as higher income, educational attainment, occupational status, and subjective social status and less social isolation, fewer racial discrimination experiences, and less incarceration.[46–50] Likewise, favorable neighborhood-level factors such as greater resources, social cohesion, and built environment are also associated with higher CVH, although fewer neighborhood and community health resources are associated with poorer CVH.[48,51–54] The writing group therefore judged that the context of psychological health/well-being and SDOH must be considered in

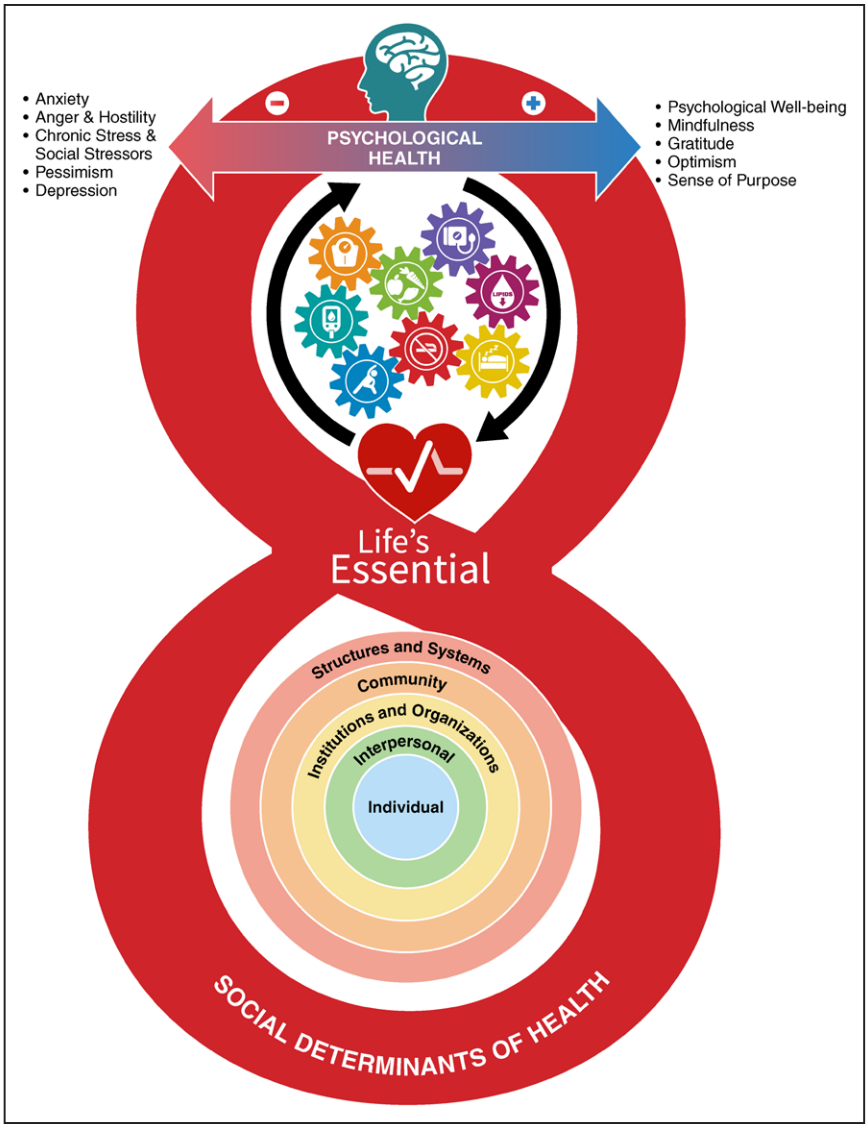

Figure 2. The foundational context of CVH.
As depicted in the social-ecological model in the base of the figure 8, a variety of socioeconomic and structural determinants of health provide the foundational framework that affects an individual's or a community's ability to optimize cardiovascular health (CVH). Several interacting factors provide critical context for CVH, including structures and systems (general socioeconomic, cultural, and environmental conditions), community resources (ie, education, agriculture, food production, employment, water and sanitation, health care, and housing), institutions and organizations (in which people learn, grow, eat, sleep, play, and pray), interpersonal social and community networks, and individual genetic and behavioral factors. These foundational social-ecological factors work through and alongside an individual's psychological health (represented at the top of the 8 in the figure) to provide the context for what is possible in improving or maintaining CVH. There is a continuous interplay of brain-mind-heart-body connections that can positively and negatively affect CVH, which is represented by the 8 component metrics (diet, physical activity, nicotine exposure, sleep, body mass index, blood lipids, blood glucose, and blood pressure) as interacting gears.

attempts to assess and improve CVH in any patient or population. We therefore highlight these 2 critical, foundational factors first.

Psychological Health and Well-Being

A growing body of evidence supports the brain-mind-heart-body connection that can positively or negatively affect CVH, individual CVD risk factors, and cardiovascular outcomes. A recent AHA scientific statement[33] reviewed a large number of studies that address a broad range of positive (eg, optimism, sense of purpose, happiness) and negative (eg, stress, depression, anxiety) psychological health factors and their significant associations with CVH and CVD risk. That statement guided much of the current writing group's deliberations on the interactions of psychological health and well-being with CVH.

There are multiple direct and indirect pathways by which psychological health and well-being may influence CVH and CVD risk. These include physiological pathways (such as inflammatory response, glucose and lipid homeostasis, and coagulation) related to chronic stress, indirect effects on health behaviors that influence CVH, and changes in psychosocial resilience factors that promote or impair health or buffer detrimental effects of stressful experiences.[33,55–59] The preponderance of data suggests that interventions to improve psychological health can have a beneficial impact on CVH.[33] However, agreement on which psychological factors are the most robust predictors and correlates of CVH is lacking. Relatively simple questionnaires can be used by clinicians to assess psychological health status in the evaluation and management of patients with or at risk for CVD.[33]

On the basis of the reviewed evidence, the writing group judged that psychological health and well-being form a critical context and interact bidirectionally with the potential for preserving and improving CVH. Psychological health is multidimensional, and at this time, it is not clear how best to combine measures of psychological health or which indicator(s) may be most

important for influencing CVH. When the writing group considered the nature of CVH metrics and improvement strategies, psychological health and well-being were judged to be more foundational, underlying all of the CVH metrics, rather than a distinct metric of CVH per se. For these reasons, the writing group elected to acknowledge the critical importance of psychological health and well-being and to strongly encourage more routine assessment and intervention in the clinical domain but not to include them as formal metrics of CVH at this time.

SDOH and Considerations for Equitably Improving CVH Across Contexts

SDOH is defined as the "structural determinants and conditions in which people are born, grow, live, work, and age" that affect health, functioning, and quality of life.[60] There are 5 key domains of SDOH: economic stability, neighborhood and built environment, education, social and community context, and health and health care.[61,62] Given this context, it is easy to understand how SDOH may directly and importantly affect an individual's ability to optimize their CVH; the availability of healthy food and the ability to pay for it, safe places in which to pursue PA, health literacy, social support structures and networks, and access to and ability to pay for health care all directly influence CVH status.[61]

Disparities in CVH exist across a wide range of social strata, including race and ethnicity, socioeconomic position, geography, and rurality, among others,[63,64] and inequities persist as a result of societal and structural barriers.[34,64] The need to address CVH disparities has recently received considerable attention because persistence of these pervasive issues hinders achievement of health equity.[34,65,66] Prior CVD disparities–focused interventions and initiatives have not proactively incorporated the full spectrum of complex psychosocial influences on CVH.[67–71]

Substantial research activity is currently focused on discovering the best means for representing and measuring SDOH in individuals and neighborhood environments. As with psychological health and well-being, the writing group judged that the best methods for measuring and quantifying SDOH are inadequately understood at this time, and the most important factors for preserving CVH in individuals and populations remain to be elucidated. Likewise, SDOH factors underlie much of the ability to optimize CVH rather than forming a single component of CVH. Accordingly, the writing group encourages further research on SDOH and CVH and urges consideration of SDOH in individual clinical attempts to improve CVH and in the design of community and population policies and interventions (see Implementation of CVH in Clinical Practice and Context and Opportunities for Improving CVH Going Forward).

SLEEP HEALTH AS A NEW COMPONENT OF CVH

Sleep is a foundational element of human biology and a requirement for life.[72] Sleep is defined as "a naturally recurring, reversible state of perceptual disengagement, reduced consciousness, and relative immobility,"[72] although its functions are wide ranging and affect nearly every physiological system.[73] Numerous epidemiological studies have identified poor habitual sleep as a risk factor for all-cause mortality,[74–83] and subsequent research has explored potential mechanisms,[84–86] including implications for cardiometabolic health.

Much of the existing research has focused on sleep duration, although it should be noted that sleep health is a multidimensional construct with overlapping components, including duration, timing, regularity, efficiency, satisfaction, and impact on daytime alertness.[87] Population-level studies have shown that inappropriate sleep duration (either shorter or longer than ideal) is associated with coronary heart disease.[88] Sleep duration is associated with each of the original 7 components of CVH[72,89–107] and with overall CVH score.[108] Recent trends toward decreased sleep health in the population appear to account for some of the variance in changing cardiometabolic risk prevalence.[109] Furthermore, recent evidence suggests that sleep metrics add independent predictive value for CVD events over and above the original 7 CVH metrics.[110] It should be noted that poor sleep health is also known to be associated with poor psychological health[111–114] and SDOH,[84,115–120] important contextual drivers of CVH; therefore, for some individuals, sleep health assessment and intervention may require customized approaches that consider the surrounding context. As with many of the other CVH component metrics, sleep may also serve to integrate and mediate some of the effects of SDOH and psychological health on CVH. Several organizations have adopted sleep duration guidelines, recognizing the population health value of ≈7 to 8 hours of habitual sleep for adults and age-appropriate ranges of sleep duration for children.[91,121–127]

Although there is a paucity of evidence indicating that improving sleep duration or quality reduces CVD incidence, several other lines of evidence support its connection with CVH. For example, laboratory studies show that experimentally manipulated sleep affects BP, inflammation, glucose homeostasis, and other relevant factors. Larger observational studies show that small changes in sleep at the population level are associated with changes in CVD-related risk factors. Research indicates that real-world manipulation of sleep time is possible and that therefore sleep time is modifiable. Last, a limited number of studies demonstrate that real-world sleep manipulation is associated with changes in CVD-related risk factors.[128,129] Nonetheless, overall, this is a research gap for which further investigation is warranted.

As a result of the above evidence, the ease and increasing reliability of measurement, and its comparable and independent contributions to overall and cardiometabolic health and health outcomes, the writing group elected to add sleep duration as an eighth metric to the formal definition of CVH. Its measurement and quantification are described in the next section with the other metrics.

UPDATED DEFINITIONS AND NOVEL QUANTITATIVE ASSESSMENT OF CVH METRICS

Here, we propose updated definitions and rescoring of the original 7 CVH metrics and the new sleep metric on a more continuous scale to better account for interindividual difference and intraindividual change (Table 1). The table should not be used as the sole guide for individuals to shape prevention or health promotion strategies. It is provided for the AHA, researchers, health systems, and policymakers to create standardized tools to measure and monitor CVH in individuals and populations. In the following paragraphs, descriptions of new or updated metric definitions are first presented, followed by a discussion of new measurement and quantification techniques.

Several of the original 7 metrics have been redefined for consistency with newer clinical guidelines, to better represent their biological impact, or for compatibility with new measurement tools, as summarized here:

- Diet: A new method is proposed for assessing dietary quality for both rapid individual assessment in clinical settings and population-level assessment in other settings, along with a suggested means for linking and aligning these assessments, when needed, through the Healthy Eating Index[136] (see Supplemental Material for full details). The writing group supports the overall goal of pursuing DASH- and Mediterranean-style eating patterns as being most consistent with optimal CVH. That said, there is no one such eating pattern, and there are limited tools for assessing alignment with these eating patterns. The DASH-style eating pattern is more easily assessed at the population level for the United States, although it is more difficult at the individual level. Therefore, a rapid dietary assessment tool is suggested for individuals that is a modified Mediterranean Eating Pattern for Americans (MEPA). The writing group selected what we judge to be the best available tools and calls for directed research to advance the field and identify even better standardized and rapid assessment tools. This new approach provides a focus on individuals' eating patterns and intake of whole foods, rather than nutrients, that should promote implementation in clinical and research settings.
- Nicotine exposure: Use of inhaled nicotine-delivery systems (eg, e-cigarettes or vaping devices) has been added to the former metric, which included only combustible cigarette use, to reflect adult and childhood use of these products and their implications for long-term health.[137,138] Secondhand tobacco smoke exposure has also been added to the definition to reflect its adverse impact on health.[135,139]
- Sleep health: As noted, the writing group endorses the systematic assessment and inclusion of sleep duration as the current means for reflecting sleep health within the construct of CVH.
- Blood lipids: The metric for blood lipids has been updated to consider non–high-density lipoprotein cholesterol as the metric of interest rather than total cholesterol because non–high-density lipoprotein cholesterol can be measured in the nonfasting state and reliably calculated in all patients (unlike low-density lipoprotein cholesterol) and because of the lifelong associations demonstrated for different atherogenic lipoprotein fractions, all of which are represented in the non–high-density lipoprotein cholesterol measurement.
- Blood glucose: The metric for blood glucose has been expanded to include hemoglobin A1c measurement (in individuals with or without diabetes) and to better reflect glycemic control among diabetic patients.
- PA, body mass index, and BP: The writing group discussed these metrics and elected to use the same metric definitions (but with updated scoring, as for all the metrics).

Childhood metrics were updated to reflect current pediatric guidelines, to extend to younger ages when appropriate, and to better align with transitions to adulthood. More detailed discussion of the approach to quantifying CVH in children, especially children <6 years of age, is provided in the Supplemental Material Appendix 2.

For ease of reference in clinical or research settings, the 8 metrics making up the new CVH definition have been grouped into the 2 domains of health behaviors (diet, PA, nicotine exposure, sleep) and health factors (body mass index, blood lipids, blood glucose, BP).

For the approach to quantification of the metrics and overall CVH, various methods were considered. Also considered was the desire for ease of programming metric scores to create applications (apps) and online CVH assessment tools, as well as for incorporation into electronic health records (EHRs) and other platforms. Because some metrics do not lend themselves to fully continuous quantification scales and because some associations of metrics with health are nonlinear, the writing group judged that an ordinal point scoring system for each metric (ranging from 0 to 100 points) was most

Table 1. New and Updated Metrics for Measurement and Quantitative Assessment of CVH (see Notes for implementation of each metric; See Supplemental Material for additional information on scoring of the Diet Metric, scoring in children at different ages, and examples of overall CVH scores in diverse scenarios)

Domain	CVH metric	Method of measurement	Quantification of CVH metric: adults (≥20 y of age)	Quantification of CVH metric: children (up to 19 y of age)
Health behaviors	Diet	Measurement: Self-reported daily intake of a DASH-style eating pattern Example tools for measurement: DASH diet score[130,131] (populations); MEPA[132] (individuals)	Quantiles of DASH-style diet adherence or HEI-2015 (population) Scoring (population): Points — Quantile 100 — ≥95th percentile (top/ideal diet) 80 — 75th–94th percentile 50 — 50th–74th percentile 25 — 25th–49th percentile 0 — 1st–24th percentile (bottom/least ideal quartile) Scoring (individual): Points — MEPA score (points) 100 — 15–16 80 — 12–14 50 — 8–11 25 — 4–7 0 — 0–3	Quantiles of DASH-style diet adherence or HEI-2015 (population) or MEPA (individuals)*; ages 2–19 y (see Supplemental Material for younger ages) Scoring (population): Points — Quantile 100 — ≥95th percentile (top/ideal diet) 80 — 75th–94th percentile 50 — 50th–74th percentile 25 — 25th–49th percentile 0 — 1st–24th percentile (bottom/least ideal quartile) Scoring (individual): Points — MEPA score (points) 100 — 9–10 80 — 7–8 50 — 5–6 25 — 3–4 0 — 0–2
	PA	Measurement: Self-reported minutes of moderate or vigorous PA per week Example tools for measurement: NHANES PAQ-K questionnaire[133]	Metric: Minutes of moderate- (or greater) intensity activity per week Scoring: Points — Minutes 100 — ≥150 90 — 120–149 80 — 90–119 60 — 60–89 40 — 30–59 20 — 1–29 0 — 0	Metric: Minutes of moderate- (or greater) intensity activity per week; ages 6–19 y (see notes and Supplemental Material for younger ages) Scoring: Points — Minutes 100 — ≥420 90 — 360–419 80 — 300–359 60 — 240–299 40 — 120–239 20 — 1–119 0 — 0
	Nicotine exposure	Measurement: Self-reported use of cigarettes or inhaled NDS Example tools for measurement: NHANES SMQ[134]	Metric: Combustible tobacco use or inhaled NDS use; or secondhand smoke exposure Scoring: Points — Status 100 — Never smoker 75 — Former smoker, quit ≥5 y 50 — Former smoker, quit 1–<5 y 25 — Former smoker, quit <1 y, or currently using inhaled NDS 0 — Current smoker Subtract 20 points (unless score is 0) for living with active indoor smoker in home	Metric: Combustible tobacco use or inhaled NDS use at any age (per clinician discretion); or secondhand smoke exposure Scoring: Points — Status 100 — Never tried 50 — Tried any nicotine product, but >30 d ago 25 — Currently using inhaled NDS 0 — Current combustible use (any within 30 d) Subtract 20 points (unless score is 0) for living with active indoor smoker in home
	Sleep health	Measurement: Self-reported average hours of sleep per night Example tools for measurement: "On average, how many hours of sleep do you get per night?" Consider objective sleep/actigraphy data from wearable technology if available	Metric: Average hours of sleep per night Scoring: Points — Level 100 — 7–<9 90 — 9–<10 70 — 6–<7 40 — 5–<6 or ≥10 20 — 4–<5 0 — <4	Metric: Average hours of sleep per night (or per 24 h for age ≤5 y; see notes for age-appropriate ranges) Scoring: Points — Level 100 — Age-appropriate optimal range 90 — <1 h above optimal range 70 — <1 h below optimal range 40 — 1–<2 h below or ≥1 h above optimal 20 — 2–<3 h below optimal range 0 — ≥3 h below optimal range

(*Continued*)

Table 1. Continued

Domain	CVH metric	Method of measurement	Quantification of CVH metric: adults (≥20 y)	Quantification of CVH metric: children (up to 19 y)
Health factors	BMI	Measurement: Body weight (kilograms) divided by height squared (meters squared) Example tools for measurement: Objective measurement of height and weight	Metric: BMI (kg/m²) Scoring: Points — Level 100 — <25 70 — 25.0–29.9 30 — 30.0–34.9 15 — 35.0–39.9 0 — ≥40.0	Metric: BMI percentiles for age and sex, starting in infancy; see Supplemental Material for suggestions for age <2 y Scoring: Points — Level 100 — 5th–<85th percentile 70 — 85th–<95th percentile 30 — 95th percentile–<120% of the 95th percentile 15 — 120% of the 95th percentile–<140% of the 95th percentile 0 — ≥140% of the 95th percentile
	Blood lipids	Measurement: Plasma total and HDL cholesterol with calculation of non–HDL cholesterol Example tools for measurement: Fasting or nonfasting blood sample	Metric: Non–HDL cholesterol (mg/dL) Scoring: Points — Level 100 — <130 60 — 130–159 40 — 160–189 20 — 190–219 0 — ≥220 If drug-treated level, subtract 20 points	Metric: Non–HDL cholesterol (mg/dL), starting no later than age 9–11 y and earlier per clinician discretion Scoring: Points — Level 100 — <100 60 — 100–119 40 — 120–144 20 — 145–189 0 — ≥190 If drug-treated level, subtract 20 points
	Blood glucose	Measurement: FBG or casual HbA1c Example tools for measurement: Fasting (FBG, HbA1c) or nonfasting (HbA1c) blood sample	Metric: FBG (mg/dL) or HbA1c (%) Scoring: Points — Level 100 — No history of diabetes and FBG <100 (or HbA1c <5.7) 60 — No diabetes and FBG 100–125 (or HbA1c 5.7–6.4) (prediabetes) 40 — Diabetes with HbA1c <7.0 30 — Diabetes with HbA1c 7.0–7.9 20 — Diabetes with HbA1c 8.0–8.9 10 — Diabetes with Hb A1c 9.0–9.9 0 — Diabetes with HbA1c ≥10.0	Metric: FBG (mg/dL) or HbA1c (%), symptom-based screening at any age or risk-based screening starting at age ≥10 y of age or onset of puberty per clinician discretion Scoring: Points — Level 100 — No history of diabetes and FBG <100 (or HbA1c < 5.7) 60 — No diabetes and FBG 100–125 (or HbA1c 5.7–6.4) (prediabetes) 40 — Diabetes with HbA1c <7.0 30 — Diabetes with HbA1c 7.0–7.9 20 — Diabetes with HbA1c 8.0–8.9 10 — Diabetes with Hb A1c 9.0–9.9 0 — Diabetes with HbA1c ≥10.0
	BP	Measurement: Appropriately measured systolic and diastolic BPs Example tools for measurement: Appropriately sized BP cuff	Metric: Systolic and diastolic BPs (mm Hg) Scoring: Points — Level 100 — <120/<80 (optimal) 75 — 120–129/<80 (elevated) 50 — 130–139 or 80–89 (stage 1 hypertension) 25 — 140–159 or 90–99 0 — ≥160 or ≥100 Subtract 20 points if treated level	Metric: Systolic and diastolic BP (mm Hg) percentiles for age through 12 y. For age ≥13 y, use adult scoring. Screening should start no later than age 3 y and earlier per clinician discretion Scoring: Points — Level 100 — Optimal (<90th percentile) 75 — Elevated (≥90th–<95th percentile or ≥120/80 mm Hg to <95th percentile, whichever is lower) 50 — Stage 1 hypertension (≥95th–<95th percentile+12 mm Hg, or 130/80 to 139/89 mm Hg, whichever is lower) 25 — Stage 2 hypertension (≥95th percentile+12 mm Hg, or ≥140/90 mm Hg, whichever is lower) 0 — Systolic BP ≥160 or ≥95th percentile+30 mm Hg systolic BP, whichever is lower; and/or diastolic BP ≥100 or ≥95th percentile+20 mm Hg diastolic BP Subtract 20 points if treated level

(*Continued*)

Table 1. Continued

BMI indicates body mass index; BP, blood pressure; CVH, cardiovascular health; DASH, Dietary Approaches to Stop Hypertension; FBG, fasting blood glucose; HbA1c, hemoglobin A1c; HDL, high-density lipoprotein; HEI, Healthy Eating Index; MEPA, Mediterranean Eating Pattern for Americans; NDS, nicotine-delivery system; NHANES, National Health and Nutrition Examination Surveys; PA, physical activity; PAQ-K, Physical Activity Questionnaire K; and SMQ, smoking assessment.

*Cannot meet these metrics until solid foods are being consumed.

Notes on implementation:

Diet: See Supplemental Material Appendix 1. For adults and children, a score of 100 points for the CVH diet metric should be assigned for the top (95th percentile) or a score of 15 to 16 on the MEPA (for individuals) or for those in the ≥95th percentile on the DASH score or HEI-2015 (for populations). The 75th to 94th percentile should be assigned 80 points, given that improvement likely can be made even among those in this top quartile. For individuals, the MEPA points are stratified for the 100-point scoring system approximately by quantiles. In children, a modified MEPA is suggested that is based on age-appropriate foods. The writing group recognizes that the quantiles may need to be adjusted or recalibrated at intervals with population shifts in eating patterns. In children, the scoring applies only once solid foods are being consumed. For now, the reference population for quantiles of HEI or DASH score should be the NHANES sample from 2015 to 2018. The writing group acknowledges that this may need to change or be updated over time. Clinicians should use judgment in assigning points for culturally contextual healthy diets. For additional notes on scoring in children, see Supplemental Material Appendix 2.

PA: Thresholds are based in part on US Physical Activity Guidelines. For adults, each minute of moderate activity should count as 1 minute and each minute of vigorous activity should count as 2 minutes toward the total for the week. For children, each minute of moderate or vigorous activity should count as 1 minute. The score for PA is not linear, given that there is a greater increase in health benefit for each minute of marginal exercise at the lower end of the range and the association tends to approach an asymptote at the higher end of the range.

If scoring is desired for children ≤5 years of age, see Supplemental Material. For additional notes on scoring in children, see Supplemental Material Appendix 2.

Nicotine exposure: The writing group recommends subtracting 20 points for children and adults exposed to indoor secondhand smoke at home, given its potential for long-term effects on cardiopulmonary health.[135] For additional notes on scoring in children, see Supplemental Material Appendix 2.

Sleep health: Thresholds are based in part on sleep guidelines. Clinicians may consider subtracting 20 points from the sleep score for adults or children with untreated or undertreated sleep apnea if information is available. Note that overall scoring reflects the inverse-U–shaped association of sleep duration with health outcomes, such that excessive sleep duration is also considered to be suboptimal for CVH.

For children, age-appropriate optimal sleep durations are as follows[121]:

Age 4 to 12 months, 12 to 16 hours per 24 hours (includes naps);

Age 1 to 2 years, 11 to 14 hours per 24 hours;

Age 3 to 5 years, 10 to 13 hours per 24 hours;

Age 6 to 12 years, 9 to 12 hours; and

Age 13 to 18 years, 8 to 10 hours.

For additional notes on scoring in children, see Supplemental Material Appendix 2.

BMI: Thresholds are based in part on National Heart, Lung, and Blood Institute (NHLBI) guidelines. The writing group acknowledges that BMI is an imperfect metric for determining healthy body weight and body composition. Nonetheless, it is widely available and routinely calculated in clinical and research settings. BMI ranges may differ for individuals from diverse ancestries. For example, the World Health Organization has recommended different BMI ranges for individuals of Asian or Pacific ancestry. For individuals in these groups, point scores should be aligned as appropriate:

Points	Level (kg/m^2)
100	18.5–22.9
75	23.0–24.9
50	25.0–29.9
25	30.0–34.9
0	≥35.0

Clinicians may want to assign 100 points for overweight individuals (BMI, 25.0–29.9 kg/m^2) who are lean with higher muscle mass. For underweight individuals (<18.5 kg/m^2 in adults or below the fifth percentile in children), the writing group defers to clinician judgment in assigning points on the basis of individual assessment as to whether the underweight BMI is healthy or unhealthy. Conditions that should be considered unhealthy include chronic catabolic illnesses (eg, cancer), eating disorders, and growth failure (for children). For additional notes on scoring in children, see Supplemental Material Appendix 2.

Blood lipids: Thresholds are based in part on 2018 Cholesterol Clinical Practice Guideline.[129a] The levels of non–HDL cholesterol for adults were selected on the basis of current guideline recommendations and in concert with the observation that non–HDL cholesterol levels are generally ≈30 mg/dL higher than low-density lipoprotein cholesterol levels in normative ranges in the population. For children, thresholds for non–HDL cholesterol were chosen on the basis of NHLBI pediatric guidelines, pediatric low-density lipoprotein cholesterol thresholds for diagnosis of familial hypercholesterolemia phenotypes (+30 mg/dL), and current distributions of non–HDL cholesterol to smooth transitions to adult point scales. The writing group recommends subtracting 20 points from the blood lipid score if the level of non–HDL-cholesterol represents a treated value, given the residual risk present in those who require treatment. There may be a modest shift in point scores for this metric as individuals age from pediatric to adult metrics. For additional notes on scoring in children, see Supplemental Material Appendix 2.

Blood glucose: Thresholds are based in part on American Diabetes Association guidelines.[129b] If an individual patient with prediabetes (ie, not yet diagnosed formally with diabetes) is being treated with metformin to prevent the onset of diabetes and has normoglycemic levels, the writing group recommends clinician judgment for assigning point values (ie, consider subtracting 20 points). The maximal point value for patients with well-controlled diabetes was set at 40, given the residual risk present in those with diabetes. For additional notes on scoring in children, see Supplemental Material Appendix 2.

BP: Thresholds are based in part on the 2017 Hypertension Clinical Practice Guidelines and the guidelines for children.[129c] The writing group recommends subtracting 20 points from the BP score if the level of BP represents a treated value, given the residual risk present in those who require treatment. For additional notes on scoring in children, see Supplemental Material Appendix 2.

appropriate. We used a modified Delphi approach among the expert panel members to arrive at point score levels, informed by health outcomes and risk associations. We also examined US population distributions (from recent NHANES) and resulting effects on the metric-specific and overall CVH scores to arrive at the final point assignments for each metric. The group also strove to ensure that, across metrics, similar point value differences were associated with approximately similar impacts on health. Final point scores for each metric are displayed in Table 1. The writing group acknowledges that these point scores are somewhat arbitrary, but we judge that this approach is a substantial improvement to be able to detect interindividual differences and population and individual changes in CVH over time. Further research is warranted to understand all of the implications of the algorithm. The writing group judged that use of categorical descriptors (ideal, intermediate, poor) for each metric

was no longer desirable, electing instead for less pejorative and more supportive presentations of the entire spectrum of each metric, from lower to higher, to encourage intervention and change for improvement.

For overall CVH, the writing group continues to endorse a composite, aggregate score for measuring, monitoring, and assessing change in CVH. The new aggregate score is also scaled from 0 to 100 points, calculated as the unweighted average of all 8 component metric scores. Examples of CVH calculation for different scenarios are shown in the Supplemental Material. The writing group recommends that presentation of CVH score or status for individuals and populations should consider images or icons that reflect the entire spectrum of CVH, including some indication of more and less desirable states (such as red/yellow/green coloration; example shown in Figure 3) across a range of 0 to 100. For some purposes, it may continue to be useful to consider categorical consideration of overall CVH; the writing group recommends that overall CVH scores of 80 to 100 be considered high CVH; 50 to 79, moderate CVH; and 0 to 49 points, low CVH. New research is encouraged in samples from diverse populations, across the life course, and in diverse settings to assess the implications of the new scoring of the metrics and overall CVH. Further discussion of implementation considerations in various contexts is provided below (see Implementation of CVH in Clinical Practice and Context and Opportunities for Improving CVH Going Forward sections).

DATA SOURCES FOR MONITORING CVH

In the original 2010 monograph defining CVH, NHANES data were identified as the best available source with which to monitor population-level CVH. NHANES continues to have a number of advantages, including representative sampling across demographic groups, inclusion of all CVH metrics (including the newly added sleep metric) at most ages, in-person examinations, and sustainability as part of population health monitoring by the Centers for Disease Control and Prevention. NHANES data have limitations, including missing some CVH metrics at the youngest ages, small samples in any given year of some racial and ethnic subgroups, limited generalizability for individuals living in the most deprived conditions, and being limited to the US population. Additional data sources will be needed to fully understand the scope of CVH within these populations and beyond the United States. Alternative data sources such as cohort data, EHRs, national surveys, and registries may be useful in many instances but can have significant limitations that currently prevent their routine use for population monitoring of CVH. For now, it is recommended that NHANES remain the main data source for tracking the US population's CVH over time, although focused efforts to optimize other data sources, as described below, are encouraged.

Major advances in data science and informatics should be harnessed to better understand CVH in individuals and populations going forward. Large health information exchanges such as the National Patient-Centered Clinical Research Network[140] offer comprehensive EHR registries that can be used to track individuals over time. As these health information exchanges have evolved, many now include large swaths of the United States and comprehensively cover most major metropolitan areas, although information on CVH in rural populations may still be limited. Notably, EHRs include only individuals who seek care; they miss individuals who have difficulty accessing or paying for care, particularly well care. EHRs have been shown to provide reliable prevalence rates for some chronic conditions such as diabetes that require routine care, although their validity and reliability for other conditions such as obesity[141] are lower. Although EHR systems have great potential, at present, they typically contain limited behavioral and lifestyle information; thus, they may need dedicated work to generate systematic and standardized inputs that include diet, PA, smoking, and sleep metrics of CVH and to structure these data in useful formats. The AHA can continue to lead in this arena by identifying brief and valid methods of assessing these lifestyle constructs that can then be documented within the medical records. Several are suggested in this document (Table 1). In addition, understanding and tracking the fundamental roles of SDOH and psychological health in CVH through EHRs remain challenging but important (see Implementation of CVH in Clinical Practice section).

Combining EHR data with lifestyle data collected via surveys or wearable technology offers the ability for individuals (or their health care professionals) to monitor their CVH over time and to help preserve high CVH when it exists or intervene early if declines in CVH are detected. A variety of strategies have been proposed to collect lifestyle data and house it within the EHR system,[142] including the use of brief questionnaires on computers or tablets in the waiting room or through patient portals before a visit. Some investigators and companies have created standalone apps to collect self-reported lifestyle data,[143,144] although these have the disadvantage of not being integrated within the EHR. As technology continues to evolve, wearable devices may offer the ability to replace self-reported data on PA, BP, and sleep with objectively measured data. Ultimately, pragmatic—and automated if feasible—data collection is central to simple and effective individual and population monitoring of CVH over time. In turn, the aforementioned health technology platforms can provide motivation to individuals to engage in behavior change to favorably affect CVH. The writing group encourages the AHA to be a leader in the development and dissemination of these technologies to improve CVH.

Taken together, these advances offer the possibility of monitoring CVH across an individual's life span and for surveillance within the population in the near future. These more systematically collected and comprehensive

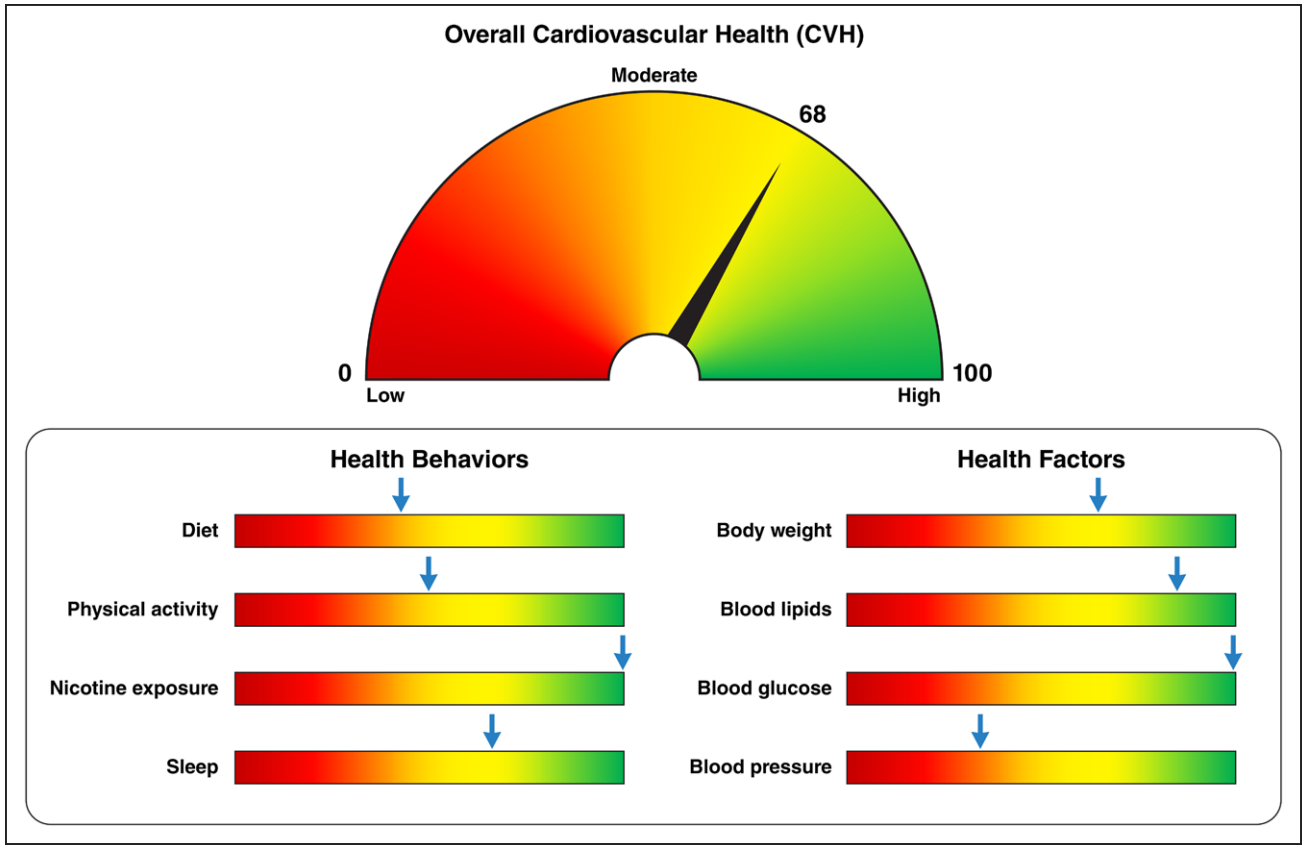

Figure 3. Example presentation of CVH score.
The figure provides an example of how to represent an individual's cardiovascular health (CVH) assessment with the new Life's Essential 8. The gauge at the top corresponds to the individual's overall CVH score (which can range from 0–100 points), with higher scores shown toward the right (a "full tank" of CVH) in green. The individual's status for each of the 8 component metrics is shown below, thus identifying health behaviors and risk factors on which the individual can focus to achieve and maintain a full tank of overall CVH. The overall CVH score is the unweighted average of the 8 component metric scores.

data may ultimately assist the AHA and policymakers in providing insight into population CVH metrics. Other opportunities may arise through existing or new large-scale crowd-sourcing efforts to monitor health (eg, Project Baseline, Health eHeart).

IMPLEMENTATION OF CVH IN CLINICAL PRACTICE

In addition to the social-ecological context for CVH promotion (Figure 2), clinical implementation is crucial. With the proliferation of health technologies noted previously, health systems, individuals, and families can participate in the pragmatic collection of CVH data. In turn, the AHA or health systems need to provide platforms that assist individual patients and their health care teams in assessing their CVH and tracking their progress over time through online websites or apps. These same health technology platforms can serve to aggregate CVH data for population health monitoring and risk prediction or for intervening in CVH by motivating behavior change among diverse populations.[145]

Implementing the CVH Metric in Diverse Populations and Settings and Leveraging Health Technologies for Pragmatic Data Collection and CVH Intervention

Most CVH metrics (body mass index, BP, cholesterol, fasting glucose/hemoglobin A1c, and smoking status) are captured as structured fields in the EHR. Health systems are well positioned to leverage the EHR for population health monitoring, risk prediction, and intervening on CVH in patient populations across the life course.[146] Examples of CVH data visualization tools that have been integrated with the EHR in learning health care systems include Stroke Prevention in Healthcare Delivery Environments and Priorities Wizard, among others.[147] Clinicians have the opportunity to use these tools with patients at the point of care to raise awareness of CVH and use shared decision-making approaches to help patients preserve or achieve optimal CVH.[148] For greater success, it is suggested that clinicians use motivational interviewing strategies to help patients identify those metrics that would benefit from improvement and for which the patient expresses some motivation for change and can envision the

means to do so. Better skills training for clinicians in these areas is critical for success. Likewise, it may be helpful to have the patient focus on a single health behavior or health factor at a time for improvement rather than trying to change too many things at once, which may risk the patient feeling overwhelmed or experiencing a sense of failure.

Universal efforts and tailored, culturally appropriate methods will be needed to direct individuals to resources for improving or maintaining CVH, potentially ameliorating the negative impacts of SDOH and psychological health and promoting positive social and psychological assets.[143,149] Ubiquitous health technology can put important CVH information in the hands of traditionally underserved populations. However, contextual factors (SDOH, access to health care and health technology, health literacy, and psychological health) mediate individuals' access to health technology and information and can affect their ability to maintain or achieve optimal CVH.[145] The AHA and other stakeholders will need to be mindful of these issues in the design of data collection and intervention tools.

Communication of the New CVH Score With Patients

Clinical and general populations alike are accustomed to hearing health status framed as risk (implying negative or bad) for a given disease or condition. When the new CVH, Life's Essential 8, is implemented in diverse settings, it should be presented in a positive manner through a lay-friendly format to ensure accurate interpretation, to indicate its strong associations with favorable health outcomes, and to provide motivation for behavior change as needed. Indeed, high CVH is a positive outcome in and of itself and can bring about immediate health benefits for an individual. Each assessment and reassessment serve as reinforcement of CVH metrics that have remained favorable with an opportunity to arrest decline in others. Tools from the AHA and its partners for clear communication will be needed so that it can be delivered by health care professionals, EHRs, and health technologies and accompanied by suggested steps one can take to improve CVH and monitor progress over time. Health care system and government programs should also be designed to catalyze implementation of CVH improvement strategies in venues beyond the clinic such as through evidence-based individual, family, or group interventions. Newer strategies of patient self-management also show promise for engaging and empowering patients to improve aspects of their CVH.[150]

CONTEXT AND OPPORTUNITIES FOR IMPROVING CVH GOING FORWARD

In this section and Table 2, we highlight selected examples of successful and promising strategies across the spheres of influence of the social-ecological model (Figure 2), aimed at preserving and improving population-wide CVH across the life course. Taken together, these interventions can serve as road maps for policymakers, health systems, institutions, clinicians, researchers, and communities for the future development and translation of SDOH-informed, equitable solutions to ensure attainment of CVH equity for diverse populations.

Policies

Over the past decade, the AHA has partnered with other volunteer science organizations on presidential advisories, clinical practice guidelines, and health policy statements focused on primordial, primary, and secondary prevention and promotion of optimal CVH throughout the life course. These efforts have also increased awareness about the SDOH and their driving influence on CVH disparities and have provided recommendations for addressing them.[2,33,71,147,161,188–192] Although interventions focused on the entire construct of CVH are exceedingly rare, health policy statements have focused on several important structural, contextual, and intergenerational factors that can promote overall optimal CVH (Table 2), including but not limited to access to quality health care, healthy foods, and recreational facilities for leisure-time PA.[193] Ongoing advocacy efforts at the federal, state, and community levels must continue for improvement in population-wide CVH. Indeed, policy-level solutions are often the only ways to address issues such as health care reform (for CVH monitoring and intervention), transformation of PA and healthy meal programs in schools, regulation of tobacco/nicotine products, and accessibility to a healthier food supply.

The writing group particularly acknowledges the emerging evidence on the critical importance of preconception maternal health, gestational health, pregnancy outcomes, and follow-up peripartum care to improve the health of women and children to launch successively healthier generations.[161,194,195] Further research and expanded programs are needed, including better metrics for monitoring progress in addressing disparities in maternal health outcomes. Likewise, a number of successful policies for promoting and sustaining better health from childhood through adolescence have been developed, demonstrated, and supported by the AHA and its partners.[193] Future efforts are needed, given the COVID-19 pandemic and its associated worsening health inequities.

Public Health Programs

Several successful public health programs have been developed to address CVH disparities in recent decades. In alignment with the AHA, the US Department of Health and Human Services–led Healthy People 2020 and 2030

Table 2. Multilevel Efforts to Improve CVH Across Social-Ecological Contexts

Ecological level	Selected examples	Examples of key gaps and needed directions
Policies		
Federal	FDA regulation of tobacco products Robust school nutrition standards and healthy school meals for all Active transportation infrastructure investment Ensuring affordable, equitable, adequate access to health insurance for all[151] Public health infrastructure investment, data modernization, and surveillance systems upgrade[152,153]	Premarket approval of newer tobacco products[154] Regulating synthetic nicotine[155] Removing all characterizing flavors from all tobacco products[156] Continued support for implementation and increasing sodium reduction, promotion of whole grains; developing an added sugars standard Ensuring that federal appropriations flow effectively to the state and local levels for biking, walking, and rolling, reaching all people equitably, particularly those in the most underserved and underinvested communities[157] Preserving and building on the Affordable Care Act Optimizing value-based insurance design[158,159] Continued federal investment of the data modernization and surveillance systems upgrade to ensure seamless integration across all levels of government and health systems Protecting and expanding the public health workforce
State	Tobacco end game strategies (eg, comprehensive smoke-free air laws, tobacco excise taxes, comprehensive coverage and access to tobacco cessation services, tobacco retail strategies, and removing all characterizing flavors from all tobacco products)[138] Medicaid expansion and Medicaid coverage of extended postpartum coverage, self-measured BP, telehealth[160–162]	Effective coordination and engagement across public health, social justice, and equity partners Need for robust public and private investment in the tobacco end game, overcoming industry product innovation, targeted marketing, and positioning Housing, income, and transportation issues for the Medicaid population Ensuring that states can use all means at their disposal to offset costs of expansion[163] and to increase access to services
Local	Sugar-sweetened beverage taxes[164,165] Increasing access to early care and education[166]	Combatting industry opposition and preemption efforts Significant commitment to funding for advocacy campaigns and ground softening efforts State preemption of local efforts Inadequate workforce compensation[167,168] Disruption caused by the COVID-19 pandemic[169]
Advocacy groups	AHA Voices for Healthy Kids grantees policy work	
Public health programs		
Federal	Healthy People 2020 and 2030 Million Hearts WISEWOMAN NHLBI ENRICH/home visiting program partnership Head Start	Tailored sociocultural messaging for diverse populations in partnership with relevant stakeholders
State/national	AHA's Go Red for Women	Tailored sociocultural messaging for diverse populations in partnership with relevant stakeholders
Local	Mass media campaigns to promote healthy behaviors and risk factor control[170,171]	
Institutions		
Early childcare/education	Chicago Child-Parent Center Education Program Longitudinal Study[172]	Broader implementation
Schools and colleges	AHA/NFL Play60 AHA/Clinton Foundation Alliance for a Healthier Generation AHA Kids Heart Challenge School-based tobacco prevention,[171,173] PA promotion, sugar-sweetened beverage reduction	Delineate specific intervention components most effective in promoting CVH and best approaches to implementation[174]
Workplaces	AHA Workforce Well-Being Playbook and Corporate Recognition Program[175] NIOSH Total Worker Health Centers of Excellence	Implementation, particularly including workplaces more likely to employ individuals who may be socioeconomically impacted
Health care systems (eg, insurance/payers, hospitals, practitioners)	AHA Get With The Guidelines SPHERE[176]	Broader implementation

(*Continued*)

Table 2. Continued

Ecological level	Selected examples	Examples of key gaps and needed directions
Neighborhoods and communities		
Community-serving programs	Strong Hearts, Healthy Communities intervention[177,178] AHA SFRN-funded Hearts & Parks/Bull City Fit intervention[179] CDC Prevention Research Centers	Outreach to broader rural communities with geographic barriers to access
Private community settings	Faith-based interventions (FAITH trial, FAITH!) Barbershop interventions	Evaluation of design elements sufficient for large-scale dissemination and implementation in community settings and broad population health impact[180] Expansion of rigorously tested CVH promotion interventions to other community venues (eg, hair salons,[181] community centers) in partnership with civic organizations[182] (eg, sororities, fraternities)
Neighborhood environments	Green space, corner store interventions[183,184]	Development of methods to increase consumer demand and to foster sustainability of corner store interventions in various neighborhood/environmental contexts (eg, urban vs rural)[185] Specific assessment of impacts of green space interventions on health equity and potential adverse effects (eg, gentrification and reduced access)[186]
Virtual communities	Interactive, group social media interventions[187]	Culturally responsive interventions to promote CVH
Families and individuals		
Parents/children	AHA Simple Cooking With Heart for Kids AHA/Aramark Health for Life nutrition education curriculum INSIGHT intervention STRIP intervention	
Adults	Health-partner intervention Mobile technology for stroke prevention	

AHA indicates American Heart Association; BP, blood pressure; CDC, Centers for Disease Control and Prevention; CVH, cardiovascular health; ENRICH, Early Intervention to Promote Cardiovascular Health of Mothers and Children; FAITH, Faith-Based Approaches in the Treatment of Hypertension; FAITH!, Fostering African-American Improvement in Total Health; FDA, US Food and Drug Administration; INSIGHT, Intervention Nurses Start Infants Growing on Healthy Trajectories; NFL, National Football League; NHLBI, National Heart, Lung, and Blood Institute; NIOSH, National Institute for Occupational Safety and Health; PA, physical activity; SFRN, Strategically-Focused Research Network; SPHERE, Stroke Prevention in Healthcare Delivery Environments; STRIP, Special Turku Coronary Risk Factor Intervention Project; and WISEWOMAN, Well-Integrated Screening and Evaluation for Women Across the Nation.

public health initiatives have identified identical indicators for overall CVH for nationwide health improvement goals, including CVD prevention.[196] The systematic, evidence-based approach encourages cross-sector community collaborations for health promotion, including state-specific benchmarks, with an overarching mission to achieve health equity for all population groups. Nonetheless, disparities by race and ethnicity and geographic regions have persisted, indicating the complexity of SDOH and psychological health as key barriers and facilitators to optimal CVH.[197,198] Additional broad-based initiatives focused on risk factor control in individuals (eg, the Million Hearts and Well-Integrated Screening and Evaluation for Women Across the Nation programs) complement these efforts.[199–201] The AHA's Go Red for Women and similar programs have been instrumental in raising heart disease awareness to promote CVH among women.[125,127,202–204] Room for optimization of these initiatives exists through enhanced cross-fertilization efforts across key stakeholder groups for tailored sociocultural messaging among high-priority populations.[205–208] The writing group urges the AHA to engage all of its partners in new broad-based communication strategies to raise awareness and to enhance engagement with the new CVH construct across all sectors to improve population CVH.

Institutions

Institutions such as early childhood care or education centers, schools, and workplaces have unique opportunities to preserve and promote optimal CVH through engagement of their large, captive populations. For example, preschool programs providing comprehensive educational and family support[172] can improve multigenerational CVH and positively affect numerous life course outcomes other than CVH such as socioeconomic position, justice-system involvement, and addiction.[209] School-based programs such as health education and screenings retain their influence through adolescence and young adulthood, including at colleges and universities, to promote positive CVH behaviors among youth,[171,173] although widespread implementation remains a challenge.[174] Starting in adolescence and extending through most of adulthood, workplace wellness programs gain importance. Workplace programs align employee and employer incentives; they can generate savings not only from reduced health care costs but also reduced absenteeism and improved employee engagement.[210] The AHA Workplace Wellness Playbook offers recognition for workplaces with high-quality programs.[210,211] Implementation of such programs across all

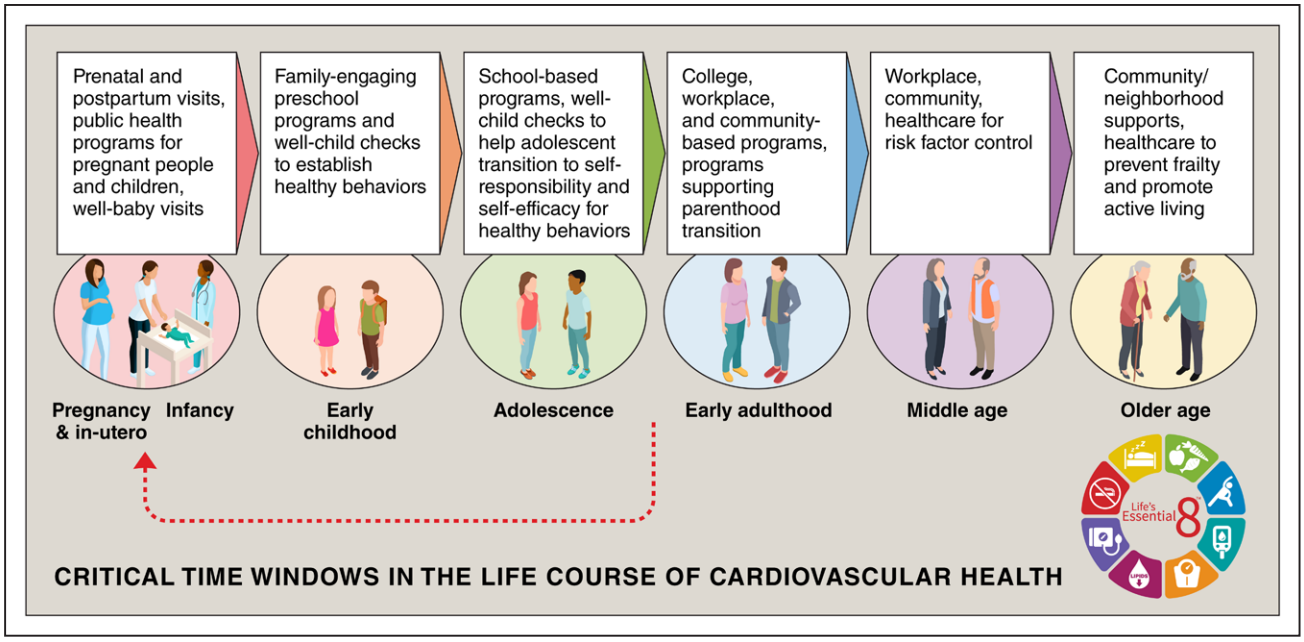

Figure 4. Life course of CVH.
The figure describes sensitive periods and transitions for cardiovascular health (CVH) across the life span, along with example opportunities for intervention to preserve or promote CVH at each age or stage. Opportunities to improve CVH occur across public health and policy, institutional, neighborhood- and community-level, and clinical contexts. Red arrow indicates the feedback loop of primordial prevention strategies that can maintain CVH through early life, leading to healthier parents before conception and a subsequent generation of healthier children.

types of workplaces, including those most relevant to individuals who may be socioeconomically impacted, needs focused attention.

Neighborhoods and Communities

Promising interventions to promote CVH have demonstrated the importance of going beyond traditional venues (outside of the clinical setting or academia) to places where individuals actually live, learn, work, play, and pray within neighborhoods and communities.[212] This paradigm of "meeting people where they are" while considering the sociocultural context of individuals and their families is at the heart of several community-based interventions. These programs have successfully leveraged social capital and trust building with individuals belonging to traditionally underserved and marginalized groups, especially for underrepresented racial and ethnic populations.[213–218] Successful examples of multidisciplinary hypertension interventions for Black men based in barbershops and other community venues are justifiably celebrated. In addition, culturally tailored interventions incorporating faith-based tenets and delivered in partnership with churches have resulted in significant improvements in CVH.[219–226] Other community-serving programs with a clinic-to-community link by way of municipal parks and recreation centers[179,227,228] have aimed to build a culture of health for youth by providing community-centered support for a lifelong commitment to healthy lifestyle.[177,178] Furthermore, there is evidence to support multicomponent corner store interventions in addressing food insecurity in food deserts/swamps in both rural and urban areas.[183,184,229–236]

Of utmost importance are collaborative, equitable community health needs assessments to allow a better understanding of community priorities/needs, socioeconomic constraints/barriers, and strengths/assets to ensure that deployed interventions within underserved communities are relevant, meaningful, scalable, and sustainable.[237–246] Through its Empowered to Serve initiative and significant investments through its Social Impact Funds, the AHA has galvanized a movement to reduce CVH disparities in underresourced communities by supporting community advocates, social justice leaders, social entrepreneurs, and locally owned businesses in implementing community-led models to improve SDOH.[247]

Life Course and Intergenerational Perspectives on CVH Promotion Across Ecological Levels

Figure 4 depicts key windows and transitions in the life course of CVH, along with examples of opportunities to preserve or improve CVH at every stage. Pregnancy and the periods around it (preconception, postpartum) set the stage for the offspring's CVH potential and represent an important transition period and physiologic stressor for mothers. It is at once a period of great opportunity given universal coverage of (although not necessarily access to) health care during pregnancy but also a taxing and vulnerable time for mothers and families. Early childhood is key for establishing healthy CVH behaviors, with preschool age thought to be a particularly important window. Adolescence through very early adulthood is a period of rapid development physically, mentally, emotionally, and

Table 3. Example Research Needs and Future Directions

Enhanced definition and scoring and potentially different metrics for CVH in pregnancy, at birth, and during the earliest years of life (especially <2 y of age); enhanced data collection at individual and population levels during these life stages
Assessment of the new CVH scoring algorithm across the life course and in diverse populations to understand its utility for describing individual and population health, strengths and limitations, and trends in CVH over time
Focused research to tie classification of existing metrics at the youngest ages based on guidelines (eg, PA) to meaningful outcomes, eg, CVH or BMI at older ages in childhood or subclinical CVD in midlife
Investigation of novel measures or biomarkers to represent overall CVH at young age
Development and validation of short, clinically feasible surveys for each age group/developmental stage in children
Utility of new CVH score for predicting diverse health outcomes, including total mortality, healthy longevity (compression of morbidity), cardiovascular events, and other chronic disease outcomes, especially in younger people
Research driving to consensus on best tools for assessment of health behaviors in clinical settings
Greater routine and standardized assessment of diet, PA, nicotine exposure, and sleep health in clinical and population settings to facilitate CVH measurement and monitoring
Greater routine and standardized assessment of psychological health and well-being and SDOH, as well as their associations with CVH in clinical and population settings
Discovery, demonstration, and dissemination of successful strategies (eg, policies, clinical strategies, community interventions, individual behavioral changes) to preserve or improve overall CVH in individuals and in diverse settings and populations
Research on other metrics of sleep related to CVH and interventions to improve CVH through improved sleep health
Enhanced medical education and training to equip clinicians with the tools to assess CVH, to implement motivational interviewing, to assist patients with behavioral change or maintenance, to promote wellness strategies, and to avoid bias and stigma around adverse health behaviors and factors (eg, nicotine exposure or obesity)
Deployment of apps, online tools, and code for implementation of CVH scoring in consumer-facing, clinical, population, and research settings
Optimization of broad-based communication strategies to promote and preserve CVH and tailored communication strategies for diverse cultural settings and demographic groups

Apps indicates applications; BMI, body mass index; CVD, cardiovascular disease; CVH, cardiovascular health; PA, physical activity; and SDOH, social determinants of health.

socially. The transition to full responsibility for self comes with competing priorities for limited resources of attention, often including parenthood, and appears to be a sensitive period for CVH loss.[248] Contexts outside of the young adult's own health care such as college, workplace, community, and family-based/child health care settings gain importance. Middle age may offer new perspectives and changing roles that can be leveraged by workplace, community, and health care contexts to control risk factors, improve CVH, and prevent CVD events. In older age, access to well-being supports through communities, neighborhoods, and health care systems can help prevent frailty, promote active living, extend healthy longevity, and improve quality of life through CVH promotion.

RESEARCH GAPS AND FUTURE DIRECTIONS

The extensive knowledge gained about the construct of CVH since 2010 provided the basis for the current update and enhancement. Nonetheless, numerous knowledge gaps and research opportunities remain to ensure that the utility, implementation, and impact of CVH can be optimized. In addition, there is now need for study of this new approach to measuring and monitoring CVH in diverse settings. Some research gaps and proposed future directions identified by the writing group are presented in Table 3.

CONCLUSIONS AND VISION FOR LIFE'S ESSENTIAL 8

The formal definition of CVH in 2010 represented the culmination of decades of evolution in epidemiology, public health, clinical care, and prevention concepts. Supported by the AHA, the rapid uptake of the CVH concept by researchers, policymakers, funding agencies, communities, and, to a certain extent, patients and clinicians has provided a road map for reenergizing individual and population health promotion strategies and reducing the ongoing substantial burden of CVD and other chronic health conditions. The CVH construct provided the means for positive, actionable steps that could be taken to measure, monitor, and modify CVH through primordial, primary, and secondary prevention approaches. The knowledge gained over the past 12 years has reinforced the need for addressing limitations and enhancing utility to advance this construct even further. The goal is to unite efforts around improving a wide array of health outcomes and quality of life through a positively framed, responsive health construct of CVH used consistently across the life course and in diverse settings. Greater insight into the foundational aspects of SDOH and psychological health in which CVH occurs will likely lead to further refinements of CVH definitions in the future.

The present document presents a substantial update of and enhancement to the means for measuring and monitoring CVH to address the current context of public health and to assist the AHA and its partners in efforts to achieve greater health equity by promoting better CVH for all. The new means for defining and measuring CVH, Life's Essential 8, in individuals and populations represents a major step forward in our ability to intervene by promoting and reinforcing healthy metrics while averting decline of those with potential for unfavorable trajectories. It should help re-energize efforts to develop, test, and disseminate interventions to maintain or improve CVH at every stage across the life course, in diverse settings, and for all people. Primordial prevention efforts focused on early life are likely to have particularly beneficial effects in initiating healthier

trajectories of lifelong CVH and creating healthier parents of healthier babies in future generations.

In business management, it is often said that "if you cannot measure it, you cannot improve it." With this enhanced measurement tool for CVH, the AHA and its numerous multisector partners in schools, communities, government, health care, business, and beyond have new opportunities to catalyze CVH improvement by raising awareness of its importance, promoting platforms for its measurement, funding research on interventions, and disseminating successful strategies. Capitalizing on these opportunities will be a critical step toward ensuring that every person has the opportunity for optimal CVH and a full, healthy life.

ARTICLE INFORMATION

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

This advisory was approved by the American Heart Association Science Advisory and Coordinating Committee on May 9, 2022, and the American Heart Association Executive Committee on May 16, 2022. A copy of the document is available at https://professional.heart.org/statements by using either "Search for Guidelines & Statements" or the "Browse by Topic" area. To purchase additional reprints, call 215-356-2721 or email Meredith.Edelman@wolterskluwer.com.

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Disclosures

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This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (a) the person receives $5000 or more during any 12-month period, or 5% or more of the person's gross income; or (b) the person owns 5% or more of the voting stock or share of the entity, or owns $5000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

†Significant.

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*Modest.

†Significant.

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