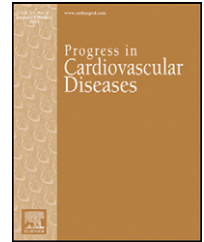


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# Understanding and Improving Cardiovascular Health: An Update on the American Heart Association's Concept of Cardiovascular Health

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## ABSTRACT

The American Heart Association's 2020 Strategic Impact Goal is "By 2020, to improve the cardiovascular health of all Americans by 20% while reducing deaths from cardiovascular diseases and stroke by 20%." To monitor progress towards this goal, a new construct "ideal cardiovascular health" (iCVH) was defined that includes the simultaneous presence of optimal levels of seven health behaviors (physical activity, smoking, dietary intake, and body mass index) and factors (total cholesterol, blood pressure and fasting blood glucose). In this review, we present a summary of major concepts related to the concept of iCVH and an update of the literature in this area since publication of the 2020 Strategic Impact Goal, including trends in iCVH prevalence, new determinants and outcomes related to iCVH, strategies for maintaining or improving iCVH, policy implications of the iCVH model, and the remaining challenges to reaching the 2020 Strategic Impact Goal.

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Cardiovascular (CV) disease (CVD) remains the number one cause of death in the United States (US)<sup>1</sup> despite improvements in awareness and treatment. It is now well established that reaching middle age free of traditional CVD risk factors is associated with longer life expectancy and markedly lower risk of developing CVD later in life compared to age-matched peers that develop one or more risk factors.<sup>2–10</sup> Based on this strong evidence base, the American Heart Association (AHA) declared the 2020 Strategic Impact Goal: "By 2020, to improve the cardiovascular health of all Americans by 20% while reducing deaths from cardiovascular diseases and stroke by 20%." In efforts to monitor attainment of this goal, a new construct "ideal

cardiovascular health" (iCVH) was defined<sup>11</sup>; iCVH is the simultaneous presence of optimal levels of four health behaviors [abstinence from smoking within the past year, normal body mass index (BMI), physical activity (PA) at goal, and consumption of a dietary pattern that promotes iCVH], three health factors [untreated optimal levels of total cholesterol, blood pressure (BP), and fasting glucose], and absence of clinical CVD. In this review, we present a summary of major concepts related to the concept of iCVH and an update of the literature in this area since publication of the AHA 2020 goals, including trends in iCVH prevalence, new determinants and outcomes related to iCVH, strategies for maintaining or

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### Abbreviations and Acronyms

AHA = American Heart Association

BMI = body mass index

BP = blood pressure

CV = cardiovascular

CVD = cardiovascular disease

iCVH = ideal cardiovascular health

PA = physical activity

improving iCVH, policy implications of the iCVH model, and the remaining challenges to reaching the 2020 Strategic Impact Goal.

### Monitoring prevalence and trends in cardiovascular health

The 7 metrics proposed to define and monitor the prevalence of iCVH in the US population are outlined in Table 1 along with the metrics used to categorize individuals according to poor, intermediate and ideal levels. The most comprehensive and nationally representative data source available to monitor iCVH in the US is the National Health and Nutrition Examination Surveys (NHANES), which is a program of the Center for Disease Control's National Center for Health Statistics (<http://www.cdc.gov/nchs/nhanes.htm>). In 2010 when the 2020 Strategic Impact Goal was released, the most current data available from NHANES (2007–2008) were considered the “baseline” prevalence of iCVH to which future improvements in iCVH will be evaluated. The prevalence of US adults and adolescents according to poor, intermediate and ideal levels of the seven iCVH components based on NHANES 2007–2008 exam data are presented in Fig 1. The majority (>75%) of men and women ≥20 years of age reported ideal smoking status (never smoked or quit >1 year prior); this was the CVH component with the highest ideal prevalence in adults. Less than one-third of adults exhibited ideal BMI; approximately two-thirds were overweight or obese. Approximately 50% of men and women reported ideal PA levels and the least prevalent CVH component overall was healthy diet, with less than 1% of adults reporting ideal intakes. Approximately 50% of adults had ideal levels of total cholesterol but less (40%) exhibited ideal levels of BP and fasting blood glucose.

Among adolescents 12–19 years, ideal healthy diet score was again the least prevalent component of iCVH across all participants, with <1% of boys and girls meeting optimal levels of 4 or 5 components. Approximately two-thirds of adolescents reported ideal smoking status (never smoked a cigarette) and one third were overweight or obese and had fasting blood glucose levels above ideal ranges. Approximately 90% of adolescents had ideal levels of BP, however, over one third exhibited levels of total cholesterol above ideal ranges. For ages younger than 12 years, data are not available to monitor iCVH for all components, however, a recent report from Ning et al.<sup>12</sup> provided prevalence for available iCVH metrics (i.e. diet, BP, BMI, and total cholesterol) in NHANES for children ages 2–11 years. Ideal healthy diet score was least prevalent in children (0.1%), whereas ideal levels of BP was most prevalent (90.5%). Approximately 40% of children exhibited intermediate or poor total cholesterol and ideal

BMI was less frequent at older (6–11 years) than younger (2–5 years) ages (67 vs. 77%, respectively).

Forward projections of the status of CVH to the year 2020 based on the trends observed in 1998–2008 for the components of iCVH in adults was reported by Huffman and colleagues.<sup>13</sup> Declines were observed in current smoking (–4.4%) and physical inactivity (–8.5%). Although decreases in the prevalence of high BP (–4.5%) and high total cholesterol (–5.5%) were observed, these were accompanied by significant increases in the prevalence of individuals with intermediate levels of these iCVH components. Slight improvements in prevalence of ideal healthy diet score were observed (+0.4%) but were accompanied by significant increases in poor (obese) levels of BMI (+12%). These increases in obesity prevalence are consistent with the increasing prevalence of poor fasting blood glucose (type 2 diabetes) (data not provided). If these current trends continue, projected decreases in the prevalence of poor CVH will meet the 20% improvement for smoking, PA, BP, and cholesterol. However, fewer and more modest increases were projected for the prevalence of ideal smoking, diet, and PA. Overall, a 6% relative improvement in the prevalence of overall CVH was estimated by the year 2020, which is well short of the 2020 Strategic Impact Goal.

A similar trends analysis was performed by Yang et al. examining changes in iCVH components among adolescents ages 12–17 years using NHANES data from 1988 to 2010.<sup>14</sup> For these analyses, all components of iCVH were examined, however, variations in the metrics were made to account for data scarcity in some categories. Among adolescents, declines were seen in the prevalence of poor smoking status (tried a cigarette in the past 30 days; –5.8%), lowest levels of the healthy diet score (–4.1%), and poor total cholesterol (–3.0%). However, increases were observed in the prevalence of physical inactivity (+3.8%), poor (obese) BMI (+7.3%), and HbA1c ≥5.7% (+1.2%). Prevalence of poor BP exhibited slight increases over the 10-year time period (+0.3%).

Although NHANES is considered the primary source of data used to monitor iCVH in the general US population,<sup>12,15,16</sup> additional data sources have been used to estimate iCVH prevalence in several US sub-populations, including children and adults with type 1 diabetes,<sup>17,18</sup> all 50 states and the District of Columbia,<sup>19–21</sup> American Indians,<sup>22</sup> and African Americans.<sup>23</sup> The 2020 Strategic Impact Goal is focused on improving CVH in the US population, however, several reports present estimates of iCVH prevalence in a variety of international regions, including China<sup>24–27</sup>; the Mediterranean<sup>28,29</sup>; Finland and Australia<sup>30</sup>; Norway<sup>31</sup>; Korea<sup>32</sup>; Republic of Srpska, Bosnia and Herzegovina<sup>33</sup>; and Luxembourg,<sup>34</sup> among others.

### Outcomes related to maintaining iCVH

Since the concept of iCVH was created in 2010, a number of reports have emerged indicating that having higher numbers of iCVH components are associated with more favorable

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