Achieving Ideal Cardiovascular and Brain Health: Opportunity Amid Crisis

Presidential Address at the American Heart Association
2010 Scientific Sessions

Ralph L. Sacco, MS, MD, FAHA, FAAN

Good afternoon, and welcome to Scientific Sessions 2010. I am honored to be here with so many skilled and passionate professionals dedicated to scientific research and the fight against cardiovascular diseases and stroke. I would like to extend a special welcome to those of you who made the journey from any of the >100 nations represented here today. Our community is a global one, so this meeting belongs to all of us.

I stand here today as the first neurologist to serve as president of the American Heart Association (AHA). And that is no accident. We are the AHA/American Stroke Association, and we are committed to conquering all cardiovascular diseases and stroke. I am excited to be part of an organization with members from so many backgrounds, disciplines, and interests, and one that merges the passions of so many clinicians, basic scientists, and population investigators. It is a testament to the diverse and talented membership of the AHA—the real power behind our multidisciplinary fight against cardiovascular diseases and stroke. We each bring a unique perspective, and our collective wisdom is an enormous resource.

Today, my goal is to convince you that we are facing a global crisis that is attacking both our hearts and our brains. We must work together to improve the health of our patients, the public … even ourselves. I will focus on the AHA’s newest weapon in this fight. It is our 10-year goal to improve the cardiovascular health of all Americans by 20% by the year 2020, while reducing cardiovascular and stroke deaths by 20%. To achieve this ambitious goal, we first needed to define “ideal cardiovascular health.” We have done that, and using that definition, we all need to know where we stand in order to move forward. That means understanding the state of public health, racial and ethnic health disparities, and the worldwide magnitude of these diseases. I hope to show you today how our critical and coveted “brain health” is also at stake in the United States—and globally—if we do not aggressively fight this crisis.

We have defined “ideal cardiovascular health” as the presence of 7 factors and behaviors that increase the chance of living free of cardiovascular diseases and stroke. We call them “Life’s Simple 7,” and they are the core elements to building healthier lives free of cardiovascular diseases and stroke (Table 1). These factors are not new, but our approach is. We are not only urging avoidance of risk factors. In fact, we are calling them health factors, not risk factors. It may seem like semantics, but we believe that will motivate people to understand and embrace the benefits of healthy living.

The Life’s Simple 7 health factors define ideal levels for cholesterol, blood pressure, and blood sugar. The health behaviors are nonsmoking, appropriate weight, physical activity, and diet. I believe diet will be the toughest to achieve. In fact, our nutrition and epidemiology experts struggled to identify a realistic approach to an ideal diet (Table 1).

We face many challenges ahead. Not all risk factors and behaviors can be controlled. The aging of the population is a major area of concern. Consider these numbers: The US population >65 years of age is projected to grow from 13% this year to 19% by 2030. Nearly 4.5% of the population will be >85 years of age by 2050. Without a more rigorous focus on prevention now, managing cardiovascular diseases and stroke will be an enormous challenge in this aging society.

The continued shift in the racial and ethnic makeup of the United States also will challenge us to better focus on the needs of the many cultures within our nation. For example, the Hispanic population is expected to make up about 30% of the United States by 2050, and Hispanics already face major health disparities (Figure 1).

Disparities among racial and ethnic groups are among the most important findings in some of my own research. Our Northern Manhattan Study (NOMAS) found disparities in the effects of vascular risk factors among Hispanics, blacks, and whites. We started the NOMAS in 1990 with the goal of studying modifiable risk factors for stroke, myocardial infarction (MI), vascular death, and cognitive decline. I have worked with outstanding colleagues on NOMAS. The National Institute of Neurological Disorders and Stroke–funded project now unites researchers at Columbia University and the Miller School of Medicine at the University of Miami.
We have prospectively followed our very well-characterized population-based community sample of >3200 subjects for a mean of almost 10 years. As in the Framingham Study, we found that many well-defined cardiovascular risk factors increase the likelihood of stroke, MI, and vascular death. We constructed a global vascular risk model that goes beyond Framingham’s traditional predictors of blood pressure, cholesterol, smoking, and diabetes mellitus. We added behavioral factors such as waist circumference, physical activity, and moderate alcohol use.

Our cohort illustrates the cardiovascular and brain health crisis we are facing. No one had all 7 of the AHA-defined ideal cardiovascular health factors. Only 13 people (0.5%) from the entire cohort had 6 factors; 82% had ≥4 ideal factors. The most discouraging numbers were for diet and blood pressure. Just 0.6% of our population met the ideal diet criteria, with 4 of our 5 AHA dietary metrics, and 6% had ideal blood pressure. Less than 40% met the definitions for ideal body mass index, physical activity criteria, or cholesterol levels. The news was only slightly better for blood sugar and smoking: 62% had an ideal fasting glucose, and 81% were nonsmokers. We found distinct differences across racial and ethnic groups in ideal cardiovascular health. Hispanics and blacks were less likely to have ≥4 ideal health factors compared with whites in NOMAS. Such disparities will challenge us as we work to shift the population toward ideal cardiovascular health.

Worldwide, vascular disease deaths are projected to rise from 16.7 million in 2002 to 18.1 million this year. Health factors and behaviors in the AHA’s 2020 goal account for most of the world’s cardiovascular diseases and stroke. That is not hard to imagine when you consider an estimated 1.3 billion people in the world smoke, 600 million have hypertension, and 220 million have diabetes mellitus. Those 3 factors alone put >2 billion people in danger of heart diseases, stroke, and untold other health problems.

The INTERHEART Study showed that 9 simple factors are associated with acute MI worldwide and account for >90% of the population-attributable risk in the 52 countries studied. Cardiovascular mortality is predicted to rise in both developed and developing countries, with larger proportionate increases in developing countries by 2020. The INTERSTROKE Study found that similar cardiovascular factors accounted for >80% of the global risk of stroke. Stroke is the second-leading cause of death in the world and the leading cause of acquired disability in adults. Over 5.7 million people die of stroke each year, >85% of them in developing countries. The relative importance of some factors differs for MI and stroke, but most are very similar. Hypertension and physical activity have a greater contribution in stroke, whereas smoking and abnormal lipids confer greater risks for MI. Life’s Simple 7 factors account for a major proportion of the burden of MI and stroke globally. At the AHA, we understand the need for global solutions to this looming epidemic.

Stroke is more heterogeneous than MI. It includes hemorrhagic and ischemic subtypes. Even among the ischemic subgroups, there are distinct entities with a variety of mechanisms, including atherosclerotic larger-artery disease, cardioembolic; lacunar, or small-vessel disease, and cryptogenic

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**Table 1. Ideal Health Factors Defined as Life’s Simple 7**

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<tr>
<th>Ideal health behaviors</th>
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<tr>
<td>Nonsmoking (never smoked or quit ≥ 1 y ago)</td>
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<td>Body mass index &lt; 25 kg/m²</td>
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<tr>
<td>Physical activity of at least 150 min (moderate intensity)</td>
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<td>or 75 min (vigorous) each week</td>
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<td>Four to 5 key components of a healthy diet</td>
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<td>Fish (preferably oily): ≥ 2.35-oz servings/wk</td>
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<tr>
<td>Fiber-rich whole grains (1.1 g fiber per 10 g carbohydrate): ≥ 3</td>
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<tr>
<td>1-oz-equivalent servings/d</td>
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<tr>
<td>Sodium: &lt; 1500 mg/d</td>
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<td>Sugar-sweetened beverages: ≤ 450 kcal (36 oz)/wk</td>
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<th>Ideal health metrics</th>
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<td>Total cholesterol &lt; 200 mg/dL</td>
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<td>Blood pressure &lt; 120/80 mm Hg</td>
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<tr>
<td>Fasting blood glucose &lt; 100 mg/dL</td>
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**Figure 1.** Projected growth in the proportion of the US population classified as Hispanic.
subgroups. Health factors convey a differential risk on the occurrence of these subtypes. Moreover, these strokes can have unique effects on a person’s brain functions and health.

At the AHA, we believe our focus on ideal cardiovascular health will reduce strokes worldwide and improve brain health. As a neurologist, I am all too familiar with the consequences of less-than-ideal cardiovascular health on the brain. More people need to know about the connection between vascular disease and dementia, cognitive depression, and problems with cognitive aging (Table 2). Subclinical vascular brain disease—including white matter hyperintensities, decreased brain volumes, and silent brain infarctions—may explain some of these clinical syndromes. Multiple studies have documented the importance of vascular risk factors as determinants of all of these conditions. A new report by Alzheimer’s Disease International said the global cost of dementia this year will surpass $604 billion. Worldwide, the number of people with Alzheimer’s and other forms of dementia is forecast to nearly triple by 2050, and will change the lives of patients, physicians, caregivers, and family members. The Framingham Study indicates the lifetime risk of stroke or dementia is greater than 1 in 3.

A common problem that may precede dementia is vascular cognitive impairment, which may provide an opportunity for earlier intervention. Many of Life’s Simple 7 health factors are related to the risk of dementia and cognitive decline. Hypertension, dyslipidemia, obesity, and diabetes mellitus increase the risk, while physical activity and dietary factors may help reduce cognitive decline. Mechanisms may include large- and small-vessel disease leading to restricted blood flow to critical brain areas, oxidative stress, inflammation, and subcortical vascular disease (Figure 2).

In NOMAS, we demonstrated associations between vascular risk factors and Modified Mini-Mental State Examination scores and neuropsychological testing scores. Our global vascular risk scores found important relationships with many of these other brain outcomes. Those with more ideal scores fared better on memory tests. Specific deficits in executive function such as psychomotor speed, multitasking, sequencing, and attention may be more sensitive to small-vessel vascular changes. These decrements in cognitive function may occur because of increased white matter hyperintensities, decreased brain volumes, and more silent brain infarcts.

NOMAS subjects with more ideal global vascular risk scores have the least amount of white matter hyperintensities, larger cerebral volumes, and smaller ventricular volumes. In fact, in Framingham, a lower cardiac index was associated with lower brain volumes.

These associations provide other opportunities to intervene and improve not only cardiovascular health, but brain health. There is no doubt that cognitive function impacts quality of life as we age. The concept called “successful cognitive aging” is defined as maintaining 3 key behaviors or characteristics: (1) A low risk of disease and disease-related disability, (2) high mental and physical function, and (3) an active engagement in life. In NOMAS, those with the most ideal global vascular risk scores have the best odds of successful cognitive aging. This shows that we can help others age successfully by promoting ideal cardiovascular health to younger and middle-age adults.

The key to all of this is prevention, which has been proven to reduce coronary and stroke mortality. Expanded efforts in prevention will help us fulfill our mission: Building healthier lives, free of cardiovascular diseases and stroke. Although we know this, the question remains: How will we improve the cardiovascular and brain health of our nations? I believe we need new rules of engagement. We need more emphasis on mass prevention strategies and evidence-based approaches to promoting healthy behaviors. We need more collaboration, partnerships, and innovative multidisciplinary research through team science, and we need advocacy, within the United States and internationally (Table 3).

Table 2. Components of Brain Health Associated With Vascular Risk Factors

<table>
<thead>
<tr>
<th>Stroke</th>
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<tr>
<td>Alzheimer’s disease or dementia</td>
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<td>Vascular cognitive impairment</td>
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<tr>
<td>Depression</td>
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<tr>
<td>Cognitive aging</td>
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<tr>
<td>Subclinical vascular brain disease</td>
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<tr>
<td>White matter hyperintensities</td>
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<tr>
<td>Brain volumes or atrophy</td>
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<td>Silent brain infarctions</td>
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Figure 2. Association of ideal cardiovascular health factors and vascular cognitive aging. Adapted from Middleton et al., with permission of the publisher. Copyright © 2009, American Medical Association. All rights reserved.
Mass prevention strategies
Evidence-based approaches to promoting healthy behaviors
Collaboration and partnerships
Innovative multidisciplinary research—team science
National and international advocacy
Tobacco (clean air, excise taxes, prevention)
Physical education and nutrition policy in schools
Trans fat, sodium, menu labeling
General Assembly of the United Nations summit on noncommunicable diseases

Mass prevention will require us to reach people where they live, work, and play. Prevention must be an integral part of our environment. The food we eat must be healthier. Physical activity should be more accessible. As healthcare professionals and scientists, we need to help others understand the importance of the simple choices: to have the apple instead of the candy bar, to walk down the street instead of taking the cab. But, how do we nudge people and motivate them to change behavior? A recent AHA scientific statement provided a comprehensive review of interventions to promote lifestyle changes.\(^1\) It recommended several evidence-based strategies, such as goal setting, self-monitoring, feedback, and motivational interviewing. All of these must be incorporated into various programs to work on a mass scale.

One of the first steps in behavior change is awareness. That is why, as part of our 2020 goal, we created the Web site called “My Life Check.”\(^2\) Here, people can easily see how they are doing with Life’s Simple 7 and plan a healthier future. So far, >100 000 people have learned their cardiovascular scores and taken control of their health. My Life Check helps clinicians start the conversation with patients about healthier living.

More research is needed to help us unlock the mysteries surrounding behavior change and the basic mechanisms underlying Life’s Simple 7 factors. In the past 5 years alone, the AHA has provided thousands of awards and hundreds of millions of dollars to investigations into these 7 factors. Such research could lead to novel pathways to combat obesity, lower blood pressure, or decrease insulin resistance. You may know that at this meeting we are celebrating the AHA’s rich history of research funding. Since 1949, we have invested >$3.2 billion in research, and we have funded 11 Nobel Prize winners during their careers; 2500 scientists around the United States currently receive AHA funding.

In the research world, synergy is possible when multiple disciplines attack a problem as a team. I believe such multidisciplinary cooperation is the framework for success against cardiovascular diseases and stroke. For example, our American Stroke Association/Bugher Stroke Prevention Centers are forging alliances that cut across academic boundaries. Together, they are tackling the genetics of stroke or stroke precursors, and they are finding teamwork more rewarding than competition.

At this meeting, the AHA is proud to announce another approach to fostering collaboration and accelerating the progress of science. We are launching the first open-access journal devoted to cardiovascular diseases and stroke. Another great example is our Preventive Health Partnership with the American Cancer Society and the American Diabetes Association. We have found enormous benefits to working together on issues critical to all 3 groups, like reducing smoking, increasing physical activity, and improving diet. We can do so much as a team. I am proud to announce another partnership between our 3 organizations, an upcoming expansion of the Get With The Guidelines–Outpatient program we debuted last year. This program will help us improve cardiovascular health by proactively reaching those at risk, and in our new partnership we will share the goal of improving evidence-based approaches for primary and secondary prevention.

You may have read our Presidential Advisory in *Circulation* regarding hospital certification to optimize quality of care.\(^2\) Stay tuned to learn how we will leverage hospital certification to help accomplish our 2020 goal.

Another way we are improving health is by advocating for better public policies. The AHA advocates for improved quality of care and reduced health disparities. We push for tobacco control and prevention. We work for physical education and nutrition in schools. We are trying to eliminate trans fats, reduce sodium, and ensure menu labeling in restaurants. You can help us with these initiatives in your communities, where your voice as champions is critical.

Internationally, we need strategies and partnerships in countries where an epidemic of cardiovascular diseases and stroke is looming. The United Nations has declared a special session on noncommunicable diseases in September 2011, and the AHA is working with our partners to make sure cardiovascular diseases and stroke are properly represented. The global burden of cardiovascular diseases and stroke is growing. I believe we can improve the cardiovascular health of all Americans, and we also need to collaborate to achieve dramatic improvement worldwide.

In conclusion, working toward ideal cardiovascular health will help prevent stroke, dementia, and other dangers to our brain health, and we must address inequities among racial and ethnic groups. Each of us needs to work toward ideal cardiovascular and brain health. I urge you to get involved, build coalitions, and advocate, personally and professionally. We need to spread the word. Our families, friends, colleagues, patients, and the public must know that the only way to achieve a brighter future is to work toward ideal cardiovascular health. This is crucial, because we truly are facing a crisis.

There are a number of definitions for the word “crisis” in the English language. But, when it comes to the state of our global cardiovascular and brain health, I think we should instead look at the Chinese word for “crisis.” It is composed of 2 characters, one of them representing danger, and the other used to represent opportunity. All of you know the dangers of this crisis. Now it is up to each of us to make the most of our opportunity to change it. Thank you.

### Table 3. Key Strategies Needed to Help Achieve Ideal Cardiovascular and Brain Health

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