Cardiovascular Health, the Cardiovascular Endgame, and 50x50x50

THE RIGHT CARE INITIATIVE
Bay Area University of Best Practices
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Department of Preventive Medicine
Lifetime Risk for ASCVD by RF Strata
Framingham Heart Study, Age 50

In Table 13 all three attributes are considered simultaneously. There is an evident association of these groupings with risk of ASHD ($X^2 = 25$, $n = 4$, $p < 0.001$). Consider first the bottom group which includes the 11 per cent of the men 45–62 who were characterized by low values in all three variables, i.e., blood pressure less than 140/90, FRW less than 100, and cholesterol less than 225 mg per cent. The incidence rate for this group was 10 per 1,000, a rate even lower than that observed among all women of the same age (29 per 1,000). The presence of borderline or medium levels of one or more of the three attributes is associated with progressively increased risk. Deh-
‘Low risk’: Disappearance of CHD deaths in a decade

Coronary heart disease deaths, 2010 compared with 2000 baseline, IMPACT Model, United States.

Source: Capewell et al. WH Bulletin 2010

388,000 → 16,000

= 4%
‘Cardiovascular health’: 2010

Circulation 2010; 121: 586-613
### Cardiovascular Health: Definition

<table>
<thead>
<tr>
<th>Smoking Status</th>
<th>POOR</th>
<th>INTERMEDIATE</th>
<th>IDEAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults &gt;20 years of age</td>
<td>Current smoker</td>
<td>Other ≤ 1 mos</td>
<td>Never quit ≥ 12 mos</td>
</tr>
<tr>
<td>Children 12-19 years of age</td>
<td>Tried prior 30 days</td>
<td>1-149 min/wk mod or 1-74 min/wk vig or 1-149 min/wk mod + vig</td>
<td>150+ min/wk mod or 75+ min/wk vig or 150+ min/wk mod + vig</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Activity</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults &gt; 20 years of age</td>
<td>None</td>
<td>&gt;0 and &lt;60 min of mod or vig every day</td>
<td>60+ min of mod or vig every day</td>
</tr>
<tr>
<td>Children 12-19 years of age</td>
<td>None</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Healthy Diet</th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Adults &gt;20 years of age</td>
<td>0-1 components</td>
<td>2-3 components</td>
<td>4-5 components</td>
</tr>
<tr>
<td>Children 5-19 years of age</td>
<td>0-1 components</td>
<td>2-3 components</td>
<td>4-5 components</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Healthy Weight</th>
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</thead>
<tbody>
<tr>
<td>Adults &gt; 20 years of age</td>
<td>≥30 kg/m² &lt;95th percentile</td>
<td>25-29.9 kg/m² 85th-95th percentile</td>
<td>&lt;25 kg/m² &lt;85th percentile</td>
</tr>
<tr>
<td>Children 2-19 years of age</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Blood Glucose</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Adults &gt;20 years of age</td>
<td>126 mg/dL or more</td>
<td>100-125 mg/dL or treated to goal</td>
<td>Less than 100 mg/dL</td>
</tr>
<tr>
<td>Children 12-19 years of age</td>
<td>126 mg/dL or more</td>
<td>100-125 mg/dL</td>
<td>Less than 100 mg/dL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cholesterol</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults &gt;20 years of age</td>
<td>≥240 mg/dL</td>
<td>200-239 mg/dL or treated to goal</td>
<td>&lt;170 mg/dL</td>
</tr>
<tr>
<td>Children 6-19 years of age</td>
<td>≥200 mg/dL</td>
<td>170-199 mg/dL</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Blood Pressure</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Adults &gt;20 years of age</td>
<td>SBP ≥140 or DBP ≥90 mm Hg</td>
<td>SBP120-139 or DBP 80-89 mm Hg or treated to goal</td>
<td>&lt;120/&lt;80 mm Hg</td>
</tr>
<tr>
<td>Children 8-19 years of age</td>
<td>&gt;95th percentile</td>
<td>90th-95th percentile or SBP ≥120 or DBP ≥80 mm Hg</td>
<td>&lt;90th percentile</td>
</tr>
</tbody>
</table>
AHA 2020 Impact Goal

“By 2020, to improve the cardiovascular health of all Americans by 20%, while reducing deaths from cardiovascular disease and stroke by 20%.”

Lloyd-Jones et al. Circulation 2010
## Benefits of favorable CVH in adulthood

<table>
<thead>
<tr>
<th>Domain</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-Cause (total) Mortality</td>
<td>CVD, coronary, stroke mortality</td>
</tr>
<tr>
<td>Nonfatal CVD events</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td>Incident cancer</td>
<td>Stroke</td>
</tr>
<tr>
<td>Venous thromboembolism</td>
<td>CVD indicates cardiovascular disease.</td>
</tr>
<tr>
<td>End-Stage Renal Disease</td>
<td>Atherosclerosis and arterial stiffness in younger adults</td>
</tr>
<tr>
<td>Cognitive function in younger and older adults</td>
<td>Depression</td>
</tr>
<tr>
<td>Quality of life</td>
<td>Compression of morbidity</td>
</tr>
<tr>
<td>Medicare charges</td>
<td></td>
</tr>
</tbody>
</table>

CVD indicates cardiovascular disease.
Status of cardiovascular health

Prevalence in U.S. Adults

- Current Smoking: 24.5%
- Body Mass Index: 33.8%
- Physical Activity: 31.7%
- Healthy Diet: 76.8%
- Total Cholesterol: 38.4%
- Blood Pressure: 41.2%
- Fasting Plasma Glucose: 30.4%

AHA Statistical Update. Circulation 2015
Status of cardiovascular health

Prevalence in U.S. Children

AHA Statistical Update. Circulation 2015
Status and Trajectories of ‘Clinical’ CVH, Ages 8 to 50+

Intermediate-Rapid decline (10.3%)
Intermediate-Stable (17.4%)
High-Slow decline (24.3%)
High-Rapid decline (30.7%)
High-stable (17.3%)

Allen et al., AHA 2016
Early Life Origins of Cardiovascular Health: Healthier, Earlier
Critical Questions about CVH, 2017

• **Population Science**
  – What is the status of CVH from birth to age 8 yrs?
  – How do we practically measure and monitor CVH in order to modify it in early life?

• **Clinical Science**
  – Can we intervene to preserve CVH in early life?
  – Does maternal-fetal environment matter?

• **Basic Science**
  – What are the molecular mechanisms and signals of CVH loss or preservation in early life?

• **Cross-cutting**
  – How do early neurodevelopmental health and the child’s social environment modify CVH trajectories?
Life course of ideal cardiovascular health

100%

0%

Kids

Adults

1

2

Northwestern Medicine

FEINBERG
SCHOOL OF MEDICINE
Life course of ideal cardiovascular health

Favorable change in CVH metrics (health behaviors and factors)

ideal CVH  intermediate CVH  poor CVH

Unfavorable change in CVH metrics (health behaviors and factors)
Primary prevention - Rose 1981

“In the high-risk preventive strategy we go out and identify those at the top end of the distribution and give them some preventive care... [But this strategy offers] only a limited answer to the community problem of heart disease.

“We are therefore driven to consider mass approaches, of which the simplest is to endeavour to lower the whole distribution of the risk variable by some measure in which all participate...

“Potentially far more effective, and ultimately the only acceptable answer, is the mass strategy...”
Primary prevention – A remedial approach
“Real grassroots prevention should start by preserving entire risk-factor-free societies from the penetration of risk factor epidemics. Here lies the possibility of averting one of tomorrow’s world health problems. I wish to propose the term of *protoprophylaxis* or *primordial prevention*.”

Primordial prevention: Promoting ideal CVH
Promoting and preserving ideal cardiovascular health

- **Primordial prevention**
- **Healthy gestation, development, and aging**
- **Favorable change in CVH metrics (health behaviors and factors)**
- **Ideal CVH**
- **Intermediate CVH**
- **Poor CVH**
- **Unfavorable change in CVH metrics (health behaviors and factors)**
- **Primary prevention**
“A moonshot project... to end coronary heart disease and its consequences.”

Nancy Brown, CEO
AHA 2016
www.heart.org
## Global targets for the remedial population-wide strategy

<table>
<thead>
<tr>
<th>Organization</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Health Organization</td>
<td>25 x 25</td>
</tr>
<tr>
<td><a href="http://www.who.int">www.who.int</a></td>
<td></td>
</tr>
<tr>
<td>World Heart Federation</td>
<td>25 x 25</td>
</tr>
<tr>
<td><a href="http://www.world-heart-federation.org">www.world-heart-federation.org</a></td>
<td></td>
</tr>
<tr>
<td>United Nations</td>
<td>33 1/3 x 30</td>
</tr>
<tr>
<td><a href="http://www.un.org/sustainabledevelopment">http://www.un.org/sustainabledevelopment</a></td>
<td></td>
</tr>
</tbody>
</table>
The cardiovascular Endgame

Strategic priorities

• Increase prevalence of ideal cardiovascular health to become the societal norm.
• Promote ideal cardiovascular health from the beginning of life and preserve it to middle age and beyond.
• Set an interim target and timeline to catalyze and sustain the needed action.
The cardiovascular Endgame

Strategic priorities

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“50x50x50”
Ideal CVH – Present and Future

A. Today

![Graph showing the prevalence of ideal CVH over age. The prevalence decreases as age increases, with a notable drop from 50x10 to 10x50.]
Ideal CVH – Present and Future

A. Today

B. 2020 – 2050
Ideal CVH – Present and Future

A. Today

B. 2020 – 2050

C. Beyond 2050

Prevalence of Ideal CVH

Age
The RWJF Culture of Health Initiative’s sentinel communities: Live Well San Diego

Mission:
To create a “wellness system” that ensures individuals, families, and communities in San Diego have access to all they need to create a lifetime of health and wellness.

Aim:
As a first step in our journey to divert the focus from disease to wellness, we are starting with the aim of achieving ideal cardiovascular health across the lifespan through prevention, education, and treatment.

“San Diego County is considered a national standard for collaborative community health planning.” - RWJF
Be There San Diego: “Getting to Zero”?

One In Five Fewer Heart Attacks: Impact, Savings, And Sustainability In San Diego County Collaborative

ABSTRACT Before 2011 rates of hospitalization for heart attacks were about the same in San Diego County as they were in the rest of California. In 2011 a multistakeholder population health collaborative consisting of partners at the federal, state, and local levels launched Be There San Diego. The collaborative’s goal was to reduce cardiovascular events through the spread of best practices aimed at improving control of hypertension, lipid levels, and blood sugar and through patient and medical community activation. Using hospital discharge data for the period 2007–16, we compared acute myocardial infarction (AMI) hospitalization rates in San Diego County and the rest of the state before and after the demonstration project started. AMI hospitalization rates decreased by 22 percent in San Diego County versus 8 percent in the rest of the state, with an estimated 3,826 AMI hospitalizations avoided and $86 million in savings in San Diego. Results show that a science-based health collaborative can improve outcomes while lowering costs, and efforts are under way to ensure the collaborative’s sustainability.

Be There San Diego

“...an ‘audacious’ goal of making San Diego the first heart attack- and stroke-free zone in the country...”
50x50x50: The cardiovascular Endgame – next steps

What to do next?

• Continue and expand research, e.g., modeling possible futures

• Continue development of policies, programs, and practices in primordial and primary prevention, e.g., implementation of the ‘CVH growth curve’

• Rapidly deploy and evaluate ongoing advances in technology, e.g., in public health informatics for monitoring of population CVH

• Catalyze communities of all kinds, building on the current momentum, e.g., through a transformed Public Health Action Plan
Who is to do it?

- Researchers across a wide range of disciplines, e.g., modelers and futurists
- Thought leaders, practitioners in health and medicine, and other influential parties, e.g., the Right Care Initiative
- Researchers and practitioners in the health and data systems technology sectors, e.g., Google/Verily
- Community leaders and partners, e.g., the National Forum for Heart Disease and Stroke Prevention
50x50x50: The cardiovascular Endgame – next steps

*When?*

The clock starts...

Now!
Cardiovascular Health, the Cardiovascular Endgame, and 50x50x50

Thank you

D. darwin.labarthe@northwestern.edu
1. Goal of the cardiovascular Endgame = ‘Absence of the cause’ = 100
   (% prevalence of ideal CVH)

2. Goal of the heart attack- /stroke-free zone = ‘Absence of the cause’ = 0
   (# of heart attack and stroke events)

3. $100 = \text{absence of the cause} = 0$

$100 = 0$

QED