Improving Cardiovascular Health Among Indigenous Communities: Effective Solutions and Interventions

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Land Acknowledgement

We acknowledge that the University of Washington is on unceded Coast Salish land, which houses diverse, strong, and enduring communities that uphold a sacred legacy of protecting future generations.
Outline

• Background
• Risk factors (including social drivers of health)
• Solutions and interventions
• Questions
The scope of the problem . . .

Rising Tide of Cardiovascular Disease in American Indians
The Strong Heart Study

Barbara V. Howard, PhD; Elisa T. Lee, PhD; Linda D. Cowan, PhD; Richard B. Devereux, MD; James M. Galloway, MD; Oscar T. Go, PhD; William James Howard, MD; Everett R. Rhoades, MD; David C. Robbins, MD; Maurice L. Sievers, MD; Thomas K. Welty, MD

![Bar Chart]

Circulation. 1999;99:2389-2395
Burden of Cardiometabolic Disease in American Indians

• Cardiovascular diseases (CVD) & diabetes mellitus are leading causes of morbidity & mortality among American Indians (AIs)

• AIs have an exaggerated prevalence of obesity and diabetes mellitus compared to the general population
Burden of Cardiometabolic Disease in American Indians

- AIs have premature CVD mortality and morbidity
  - CVD mortality rate 20% greater among AIs than other US races
  - AIs die of CVD at younger ages
  - 36% will die before age 65 compared to 14.7% of non-Hispanic whites

Burden of Cardiometabolic Disease in American Indians

• Prevalence of diabetes mellitus among Strong Heart Study participants aged 45-74 years in 1989 was 45% (compared to 7.7% in gen. pop)

• High burden of diabetes mellitus in AI communities may be at least partly attributable to changes in lifestyle (as well as other social factors)
Social Drivers of Health

- Social drivers of health and psychological health factors are important CVD risk factors in Al's
Social Drivers of Health

• Systemic racism
• Historical trauma
• Neighborhood safety, food insecurity, lack of access to preventative care, and financial and economic depression
• Anxiety, depression, PTSD, substance abuse, intimate partner violence, sociocultural roles
Adverse Childhood Experiences

Mechanism by which Adverse Childhood Experiences Influence Health and Well-being Throughout the Lifespan
Strong Heart Study

- Largest & longest ongoing multi-tribal study of CVD in AIs
- 12 participating tribes from AZ, OK, ND, SD
Strong Heart Study Objectives

• Quantify prevalent CVD and its risk factors
• Quantify incident CVD events
• Evaluate preclinical CVD
Strong Heart Study Design

• Two AI cohorts:
  – Original cohort (Strong Heart Study)
    • 4,549 participants
    • 45-74 years
    • 59% female
    • Began in 1988
Strong Heart Study Design

• Two AI cohorts:
  – Family cohort (Strong Heart Family Study)
    • 3,665 participants
    • 14-94 years
    • 60% female
    • Began in 1998
    • Extended SHS by including family members and added the identification of genetic risk factors for CVD.
SHS is community-based research

- 30+ year partnership
- Tribal communities guide study goals
- Tribes and participants involved in all aspects of the study (design, data collection, dissemination) and are considered co-PIs
Strong Heart Study Key Findings

• Rates of coronary heart disease higher than other US populations

• Very high rates of insulin resistance and diabetes

Rising Tide of Cardiovascular Disease in American Indians: The Strong Heart Study

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Strong Heart Study Key Findings

- Diabetes is a major risk factor for CVD
- Diabetes in youth and young adults leads to subclinical CVD

Cardiac Geometry and Function in Diabetic or Prediabetic Adolescents and Young Adults

The Strong Heart Study

CONCLUSIONS—In a population of adolescents and young adults, DM is independently associated with early unfavorable cardiovascular phenotype characterized by increased left ventricular mass, concentric geometry, and early preclinical systolic and diastolic dysfunction; early cardiovascular alterations are also present in participants with prediabetes.

Diabetes Care 34:2300–2305, 2011
Unique CVD risk factors in AIs

• Albuminuria
• Elevated fibrinogen
• Left ventricular hypertrophy
• Prolonged QRSd on resting ECG in women
• Al-specific, sex-stratified coronary heart disease risk calculator
• Designed for >30 years of age
• Estimated 10-year risk of developing CHD
**SHS CHD Risk Calculator**

<table>
<thead>
<tr>
<th>Prediction using (select one)</th>
<th>LDL-C and HDL-C</th>
<th>TC and HDL-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you currently taking hypertension medications for high blood pressure?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Systolic Blood Pressure (SBP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL-C or TC (mg/dL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL-C (mg/dL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have diabetes?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Are you a current smoker?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Do you have microalbuminuria?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Do you have macroalbuminuria?</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Your Estimated Risk:** 0 %

[https://strongheartstudy.org](https://strongheartstudy.org)
• AI-specific tool used to estimate the risk of developing diabetes
• Designed for >35 years of age
• Estimates 4-year risk of developing diabetes
## SHS DMII Risk Calculator

This calculator predicts the risk of developing incident diabetes (DM) defined by either fasting plasma glucose (FPG) or hemoglobin A1c (HbA1c) (denoted as FPG/A1C-DM), or by HbA1c only (denoted as A1C-DM), or by FPG only (denoted as FPG-DM) in the next 4 years for a person who does not currently have FPG/A1C-DM, or A1C-DM, or FPG-DM, respectively (select one).

### Predictors
- **Gender**: Male or Female
- **Age (year)**
- **Waist circumference (cm)**
- **Taking hypertension medications for high blood pressure?** Yes or No
- **Systolic blood pressure (SBP) (mmHg)**
- **Diastolic blood pressure (DBP) (mmHg)**
- **Do you have any of sisters or brothers who had diabetes?** Yes or No
- **Fasting plasma glucose (FPG) (mg/dL)**
- **Hemoglobin A1c (HbA1c) (%)**
- **Triglycerides (TG) (mg/dL)**
- **Urinary albumin and creatinine ratio (UACR) (mg/g)**

### Calculations
- **Your Estimated Risk:** 0%

### URL
- [https://strongheartstudy.org](https://strongheartstudy.org)
• Al-specific tool used to estimate the risk of developing hypertension
• Designed for >35 years of age
• Estimates 4-year risk of developing hypertension
Metric for Cardiovascular Health: Life’s Essential 8

- Modifiable health factors applied to CVD prevention
  - Hypertension, Dyslipidemia, Diabetes, Obesity, Diet, Physical activity, Nicotine exposure, Sleep
## Metric for Cardiovascular Health: Life’s Essential 8 (Range: 0-100 points)

<table>
<thead>
<tr>
<th>Metric</th>
<th>100 Points</th>
<th>0 Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet</td>
<td>≥95&lt;sup&gt;th&lt;/sup&gt; percentile HEI-2015</td>
<td>&lt;25&lt;sup&gt;th&lt;/sup&gt; percentile HEI-2015</td>
</tr>
<tr>
<td>Activity</td>
<td>≥150 min/week or 10,000+steps/day</td>
<td>No activity, &lt;2000 steps/day</td>
</tr>
<tr>
<td>Nicotine</td>
<td>Never smoker; no secondhand exposure</td>
<td>Current smoker</td>
</tr>
<tr>
<td>Sleep</td>
<td>7-9 hours</td>
<td>&lt;4 hours</td>
</tr>
<tr>
<td>BMI</td>
<td>&lt;25</td>
<td>≥40</td>
</tr>
<tr>
<td>Non-HDL cholesterol*</td>
<td>&lt;130 mg/dL</td>
<td>≥220=0</td>
</tr>
<tr>
<td>Glucose</td>
<td>No dm &amp; FBG&lt;100 (or HbA1c&lt;5.7)</td>
<td>dm with HbA1c ≥10</td>
</tr>
<tr>
<td>Blood Pressure*</td>
<td>&lt;120/80</td>
<td>SBP ≥160 or DBP ≥100=0</td>
</tr>
</tbody>
</table>

*subtract 20 points if treated
## Distribution of Ideal Cardiovascular Health Metrics in the Strong Heart Family Study

<table>
<thead>
<tr>
<th>Ideal Cardiovascular Health Metric</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health Behaviors</strong></td>
<td></td>
</tr>
<tr>
<td>Diet (80-100 score of AHEI diet index)</td>
<td>0</td>
</tr>
<tr>
<td>Physical Activity (10,000+ steps per day)</td>
<td>12.8</td>
</tr>
<tr>
<td>Nicotine Exposure (never smoker)</td>
<td>22.2</td>
</tr>
<tr>
<td>Sleep (7-9 hours/night)</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Health Factors</strong></td>
<td></td>
</tr>
<tr>
<td>BMI (&lt;25 kg/m²)</td>
<td>20.1</td>
</tr>
<tr>
<td>Lipids (&lt;130 mg/dl of non-HDL cholesterol)</td>
<td>50.4</td>
</tr>
<tr>
<td>Blood Pressure (&lt;120/80 mmHg)</td>
<td>37.2</td>
</tr>
<tr>
<td>Blood Glucose (no hx dm &amp; FBG&lt;100 mg/dl or HbA1c&lt;5.7%)</td>
<td>61.2</td>
</tr>
</tbody>
</table>

### Hazard Ratios for Association of Life’s Essential 8 Goals with Incident CVD in the Strong Heart Family Study

<table>
<thead>
<tr>
<th></th>
<th>% of population in each CVH strata</th>
<th>CVD cases</th>
<th>Incident rate (per 1000 person-years)</th>
<th>Adjusted Hazard Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td>274</td>
<td>7.43</td>
<td></td>
</tr>
<tr>
<td>Low CVH</td>
<td>28.4%</td>
<td>138</td>
<td>14.5</td>
<td>1 (Ref)</td>
</tr>
<tr>
<td>Moderate CVH</td>
<td>49.8%</td>
<td>120</td>
<td>6.4</td>
<td>0.45 (0.14-0.44)</td>
</tr>
<tr>
<td>High CVH</td>
<td>21.8%</td>
<td>16</td>
<td>1.8</td>
<td>0.25 (0.14-0.44)</td>
</tr>
</tbody>
</table>

Diet Quality in the Strong Heart Family Study

- 4.5+ cups fruits & veg/day: NHANES '05-'06: 3.7%, SHFS '01-'03: 9.4%
- 2+ 3.5 oz srv fish/week: NHANES '05-'06: 0.37%, SHFS '01-'03: 16.5%
- 3+ srv whole grains/day: NHANES '05-'06: 0%, SHFS '01-'03: 5.5%
- <1,500 mg sodium/day: NHANES '05-'06: 13.8%, SHFS '01-'03: 18.8%
- <36 oz sweetened beverage/week: NHANES '05-'06: 29%, SHFS '01-'03: 39.7%
- ≤2 srv processed meats/week: NHANES '05-'06: 34.7%, SHFS '01-'03: 50.9%
- <7% cal from saturated fat: NHANES '05-'06: 2.4%, SHFS '01-'03: 9.6%
- 4+ srv nuts, legumes, seeds: NHANES '05-'06: 17.7%, SHFS '01-'03: 23.3%

# Odds Ratio of Incident Cardiovascular Diseases According to Depressive Symptoms in the Strong Heart Family Study

<table>
<thead>
<tr>
<th>CES-D Quartile</th>
<th>No. Cases/No. at Risk</th>
<th>Adjusted Hazard Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>131/1135</td>
<td>1.0 (Ref)</td>
</tr>
<tr>
<td>II</td>
<td>54/466</td>
<td>1.19 (0.76, 1.85)</td>
</tr>
<tr>
<td>III</td>
<td>54/343</td>
<td>1.60 (1.09, 2.37)</td>
</tr>
<tr>
<td>IV</td>
<td>23/265</td>
<td>1.70 (1.01, 2.88)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depressive Symptoms</th>
<th>% of population in each CES-D Strata</th>
<th>Adjusted Hazard Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>CES-D&lt;16</td>
<td>72.7</td>
<td>1 (Ref)</td>
</tr>
<tr>
<td>CES-D≥16</td>
<td>27.3</td>
<td>1.54 (1.06-2.23)</td>
</tr>
</tbody>
</table>

*Analyses led by Santori S (UW). Manuscript in development*
Addressing CVD in AIs through multi-level interventions

- Intergenerational trauma in AI communities increases ACEs and leads to health inequities
- Mistrust in US government and research community hinders care delivery
- Requires effort to regain trust to identify strength-based health interventions
<table>
<thead>
<tr>
<th>Areas of intervention</th>
<th>Suggested solutions</th>
<th>Gaps and challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated care delivery</td>
<td>Provide appropriate screening and transfer of individuals with high-risk pregnancies to higher levels of care with multidisciplinary team-based care in preventive cardiology, maternal-fetal medicine, cardio-obstetrics, and psychiatry. Provide contraceptive care and shared decision making around termination. Initiate first-line management of complications and adherence to quality bundles and initiatives to reduce death and morbidity.</td>
<td>Data collection, aggregation, and transfer of maternal health outcomes.</td>
</tr>
<tr>
<td>Organization of care</td>
<td>Develop an available, accessible, affordable, and competent workforce that integrates community voices and AI/AN traditions into culturally sensitive care. Ensure shared decision making that includes AI/AN and tribal representation. Incorporate midwives, social workers, mental health counselors, doulas, AI/AN traditional healers, knowledge bearers, birth workers and peers, community health workers, and physician extenders into care. Expand digital and telehealth in resource-limited areas as a supplement to existing care resources but not as a substitute for care and to provide sufficient resources to these areas.</td>
<td>Increase the financial resources currently being deployed, and strategically increase investment in tribes, IHS facilities, and culturally safe community-based programs by earmarking funds for this purpose. Telemedicine may not reach AI/AN community members with severely limited means. Reimbursement structures are not inclusive of necessary collaborators such as AI/AN traditional healers, birth workers, and midwives.</td>
</tr>
<tr>
<td>Innovative practice categories</td>
<td>Improve health education and health promotion in Life’s Essential 8 metrics from childhood throughout childbearing age. Improve preconception, antenatal, and postpartum CVH measures.</td>
<td>High burden of cardiovascular comorbidities and low preventive care services.</td>
</tr>
<tr>
<td>Values and philosophy</td>
<td>Build trust with respect, communication, and community knowledge, and understand the needs of reproductive-aged individuals. Deliver care tailored toward creating understanding historical perspective, childhood trauma, and circumstances unique to maternal needs.</td>
<td>Assess childhood trauma in individuals and population and develop strategies to mitigate it.</td>
</tr>
</tbody>
</table>

AI/AN indicates American Indian/Alaska Native; CVH, cardiovascular health; IHS, Indian Health Service; and PMSS, Pregnancy Mortality Surveillance System.
Example CVH Interventions: Strong Heart Study Communities

- Understand local landscape (barriers, facilitators to health)
- Partner with community leaders & health care organizations

- USDA Market Basket Assessment
  - Healthy Food, Healthy Families Feasibility Study
  - Cooking for Health
  - GUSNIP Produce Prescription Program
Thank you!
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Access the Companion Guide

ACC HEALTH EQUITY WEBINAR COMPANION GUIDE
Improving Cardiovascular Health Among Indigenous Communities: Effective Solutions and Interventions

Jason Deen MD, FAAP, FAAC; Amanda M. Fretts, PhD, MPH

BACKGROUND

The ACC Health Equity Webinar Companion Guides are a complementary resource for the ACC Health Equity Webinar series. The webinar series, produced by the ACC Diversity and Inclusion Committee, offers clinically relevant, evidence-based findings focused on health care disparities as they pertain to minority racial and ethnic groups and under-represented populations in cardiovascular care. This guide provides the background, highlights, and clinical pearls from the "Improving Cardiovascular Health Among Indigenous Communities: Effective Solutions and Interventions" webinar.
THANK YOU

• Webinar Recording Coming Soon
• Complete the evaluation
• Questions?
  – Contact Akua Asare (aasare@acc.org) or Ryan Meyer (rmeyer@acc.org)