Improving Cardiovascular Health Among Indigenous Communities: Effective Solutions and Interventions

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UW Medicine
CENTER FOR INDIGENOUS HEALTH

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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

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Outline

- Background
- Risk factors (including social drivers of health)
- Solutions and interventions
- Questions

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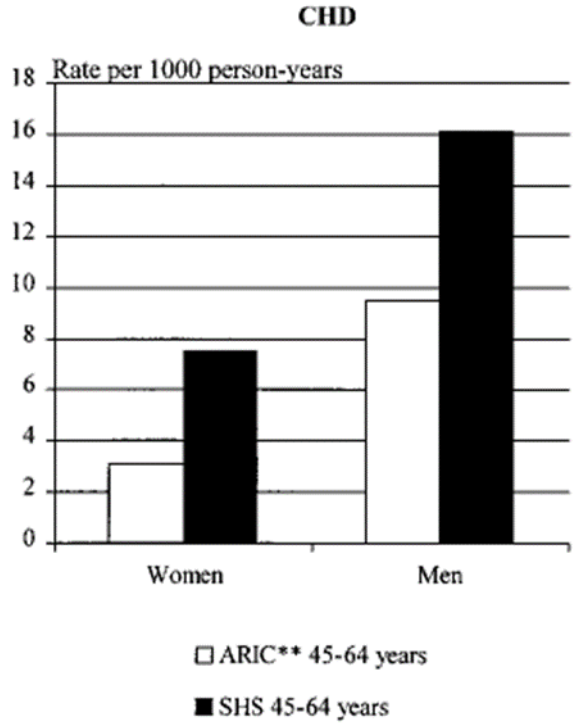
The scope of the problem . . .

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



Circulation. 1999;99:2389-2395

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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

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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

Am J Public Health. 2014;104 Suppl 3:S359-367
MMWR Morb Mortal Wkly Rep. 2004;53:121-125

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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)

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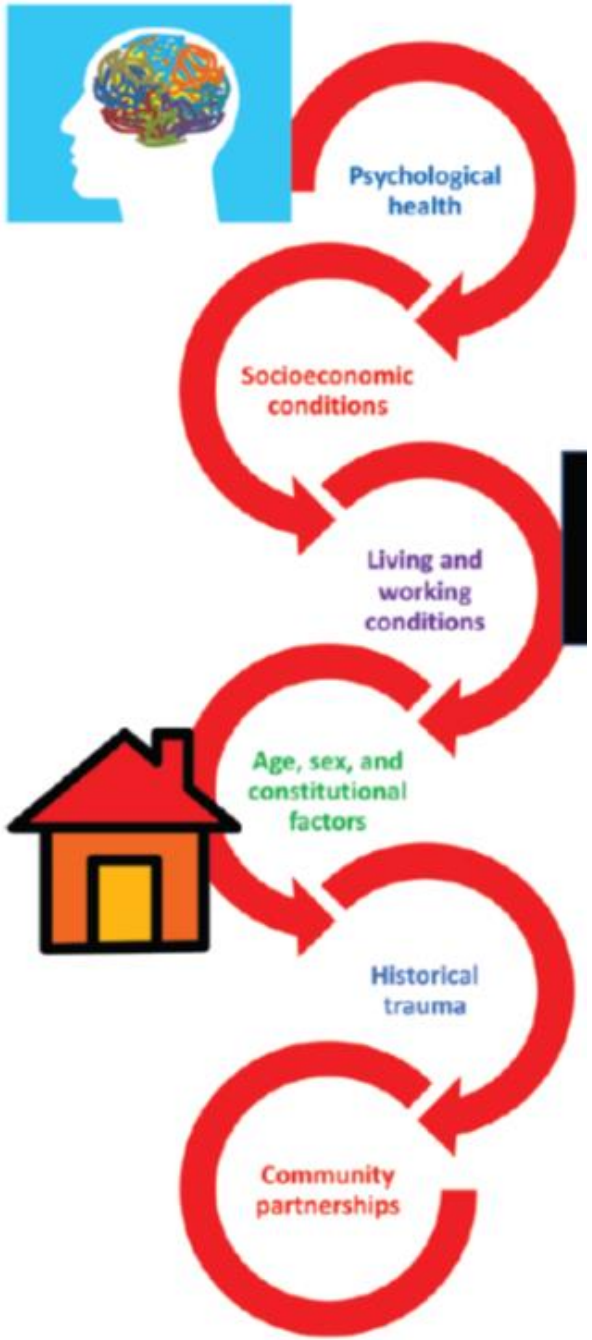
Social Drivers of Health

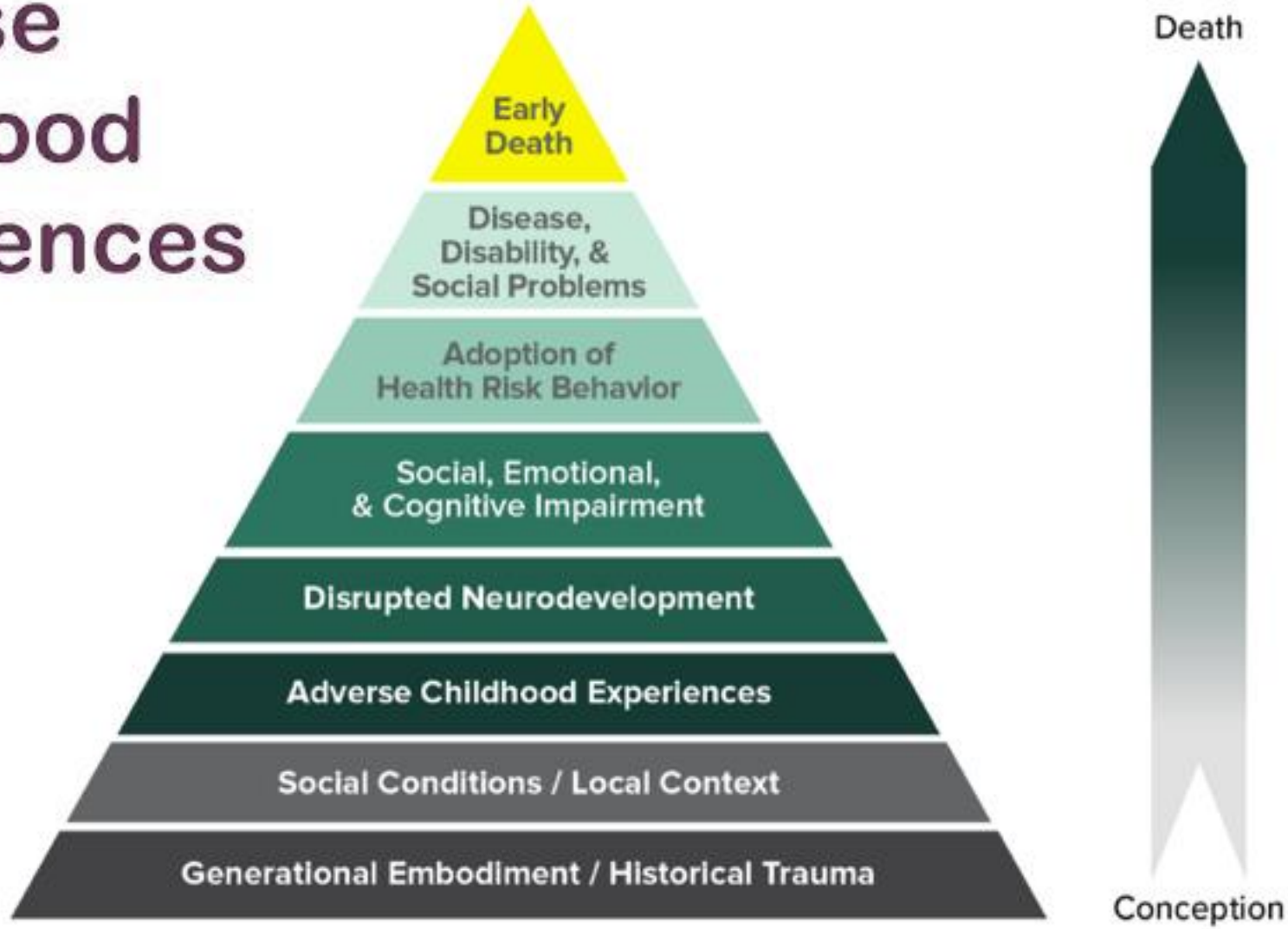
- Social drivers of health and psychological health factors are important CVD risk factors in AIs

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

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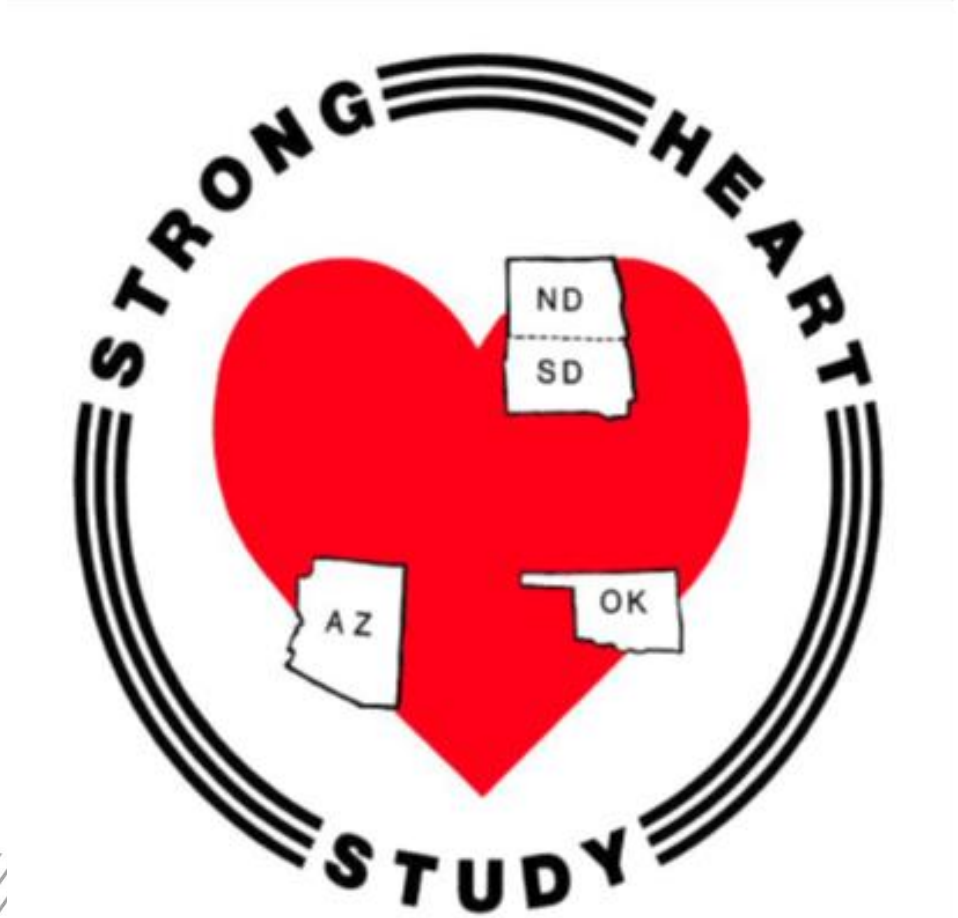
Strong Heart Study



- Largest & longest on-going multi-tribal study of CVD in AIs
- 12 participating tribes from AZ, OK, ND, SD

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Strong Heart Study Objectives

- Quantify prevalent CVD and its risk factors
- Quantify incident CVD events
- Evaluate preclinical CVD

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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.

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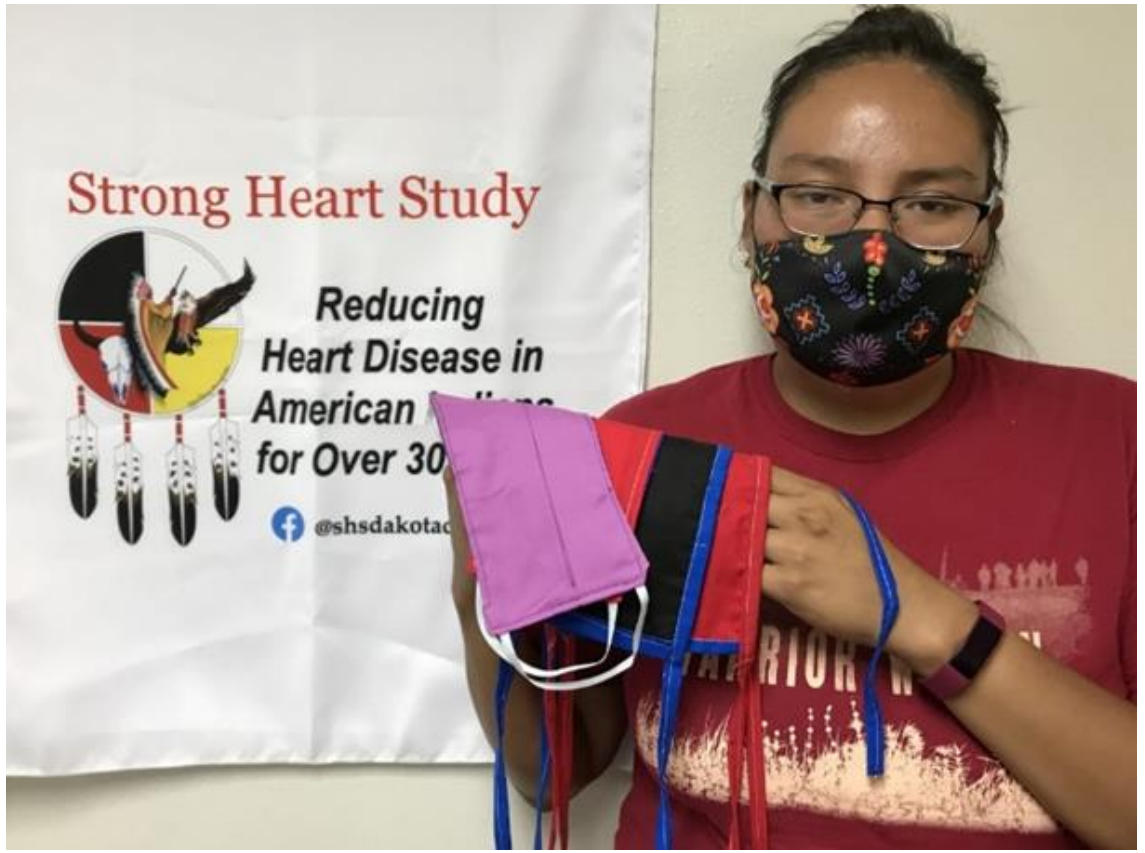
SHS is community-based research

- 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



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Strong Heart Study Key Findings

- Rates of coronary heart disease higher than other US populations
- Very high rates of insulin resistance and diabetes

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association.

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

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

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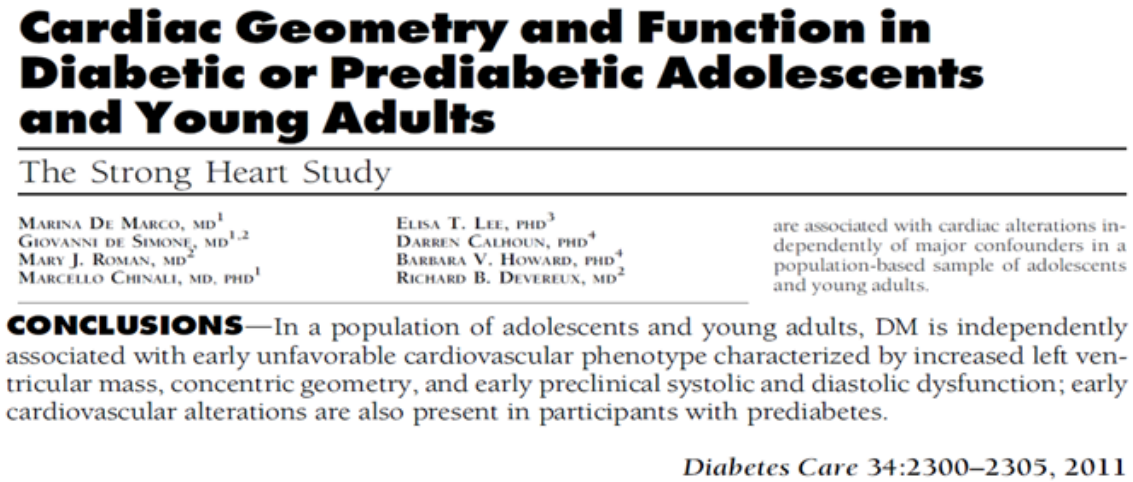
Print ISSN: 0009-7322. Online ISSN: 1524-4539

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

Marina De Marco, MD[1]
Giovanni de Simone, MD[1,2]
Mary J. Roman, MD[2]
Marcello Chinali, MD, PHD[1]
Elisa T. Lee, PHD[3]
Darren Calhoun, PHD[4]
Barbara V. Howard, PHD[4]
Richard B. Devereux, MD[2]

are associated with cardiac alterations independently of major confounders in a population-based sample of adolescents and young adults.

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

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Unique CVD risk factors in AIs

- Albuminuria
- Elevated fibrinogen
- Left ventricular hypertrophy
- Prolonged QRSd on resting ECG in women

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Prediction of Coronary Heart Disease in a Population With High Prevalence of Diabetes and Albuminuria

The Strong Heart Study

Elisa T. Lee, PhD; Barbara V. Howard, PhD; Wenyu Wang, PhD; Thomas K. Welty, MD; James M. Galloway, MD; Lyle G. Best, MD; Richard R. Fabsitz, PhD; Ying Zhang, MD, PhD; Jeunliang Yeh, PhD; Richard B. Devereux, MD

- AI-specific, sex-stratified coronary heart disease risk calculator
- Designed for >30 years of age
- Estimated 10-year risk of developing CHD

Circulation. 2006;113(25):2897-905

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SHS CHD Risk Calculator

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

Reset

Calcualte Your Risk

Your Estimated Risk: 0 %

https://strongheartstudy.org

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Fasting Plasma Glucose and Hemoglobin A_{1c} in Identifying and Predicting Diabetes

The Strong Heart Study

WENYU WANG, PHD[1]
ELISA T. LEE, PHD[1]
BARBARA V. HOWARD, PHD[2]
RICHARD R. FABSITZ, PHD[3]
RICHARD B. DEVEREUX, MD[4]
THOMAS K. WELTY, MD, MPH[5]

Association (ADA) (2) based on fasting plasma glucose (FPG) have been used for a long time. Recently, an International Expert Committee (3) recommended a

- AI-specific tool used to estimate the risk of developing diabetes
- Designed for >35 years of age
- Estimates 4-year risk of developing diabetes

Diabetes Care. 2011;34:363–368

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SHS DMII Risk Calculator

Predicting 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).	(●) FPG/A1C-DM ( ) A1C-DM ( ) FPG-DM
Gender	(●) Male ( ) Female
Age (year)	
Waist circumference (cm)	
Taking hypertension medications for high blood pressure?	(●) No ( ) Yes
Systolic blood pressure (SBP) (mmHg)	
Diastolic blood pressure (DBP) (mmHg)	
Do you have any of sisters or brothers who had diabetes?	(●) No ( ) Yes
Fasting plasma glucose (FPG) (mg/dL)	
Hemoglobin A1c (HbA1c) (%)	
Triglycerides (TG) (mg/dL)	
Urinary albumin and creatinine ratio (UACR) (mg/g)	

Reset

Calculate Your Risk

Your Estimated Risk: 0 %

https://strongheartstudy.org

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A Longitudinal Study of Hypertension Risk Factors and Their Relation to Cardiovascular Disease

The Strong Heart Study

Wenyu Wang, Elisa T. Lee, Richard R. Fabsitz, Richard Devereux, Lyle Best, Thomas K. Welty, Barbara V. Howard

- AI-specific tool used to estimate the risk of developing hypertension
- Designed for >35 years of age
- Estimates 4-year risk of developing hypertension

Hypertension. 2006;47:403–409

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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

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Metric for Cardiovascular Health: Life's Essential 8 (Range: 0-100 points)		
	100 Points →	0 Points
Diet	≥95th percentile HEI-2015	<25th percentile HEI-2015
Activity	≥150 min/week or 10,000+steps/day	No activity, <2000 steps/day
Nicotine	Never smoker; no secondhand exposure	Current smoker
Sleep	7-9 hours	<4 hours
BMI	<25	≥40
Non-HDL cholesterol*	<130 mg/dL	≥220=0
Glucose	No dm & FBG<100 (or HbA1c<5.7)	dm with HbA1c ≥10
Blood Pressure*	<120/80	SBP ≥160 or DBP ≥100=0

*subtract 20 points if treated

Distribution of Ideal Cardiovascular Health Metrics in the Strong Heart Family Study

Ideal Cardiovascular Health Metric	%
Health Behaviors	
Diet (80-100 score of AHEI diet index)	0
Physical Activity (10,000+ steps per day)	12.8
Nicotine Exposure (never smoker)	22.2
Sleep (7-9 hours/night)	NA
Health Factors	
BMI (<25 kg/m^2)	20.1
Lipids (<130 mg/dl of non-HDL cholesterol)	50.4
Blood Pressure (<120/80 mmHg)	37.2
Blood Glucose (no hx dm & FBG<100 mg/dl or HbA1c<5.7%)	61.2

Paing PY, Littman A, Reese JA, Sitlani C, Umans JG, Cole SA, Zhang Y, Ali T, Fretts AM. Impact of the American Heart Association's Life's Essential 8 Goals on Incident Cardiovascular Diseases in the Strong Heart Family Study. Under review.

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

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

Paing PY, Littman A, Reese JA, Sitlani C, Umans JG, Cole SA, Zhang Y, Ali T, Fretts AM. Impact of the American Heart Association's Life's Essential 8 Goals on Incident Cardiovascular Diseases in the Strong Heart Family Study. Under review.

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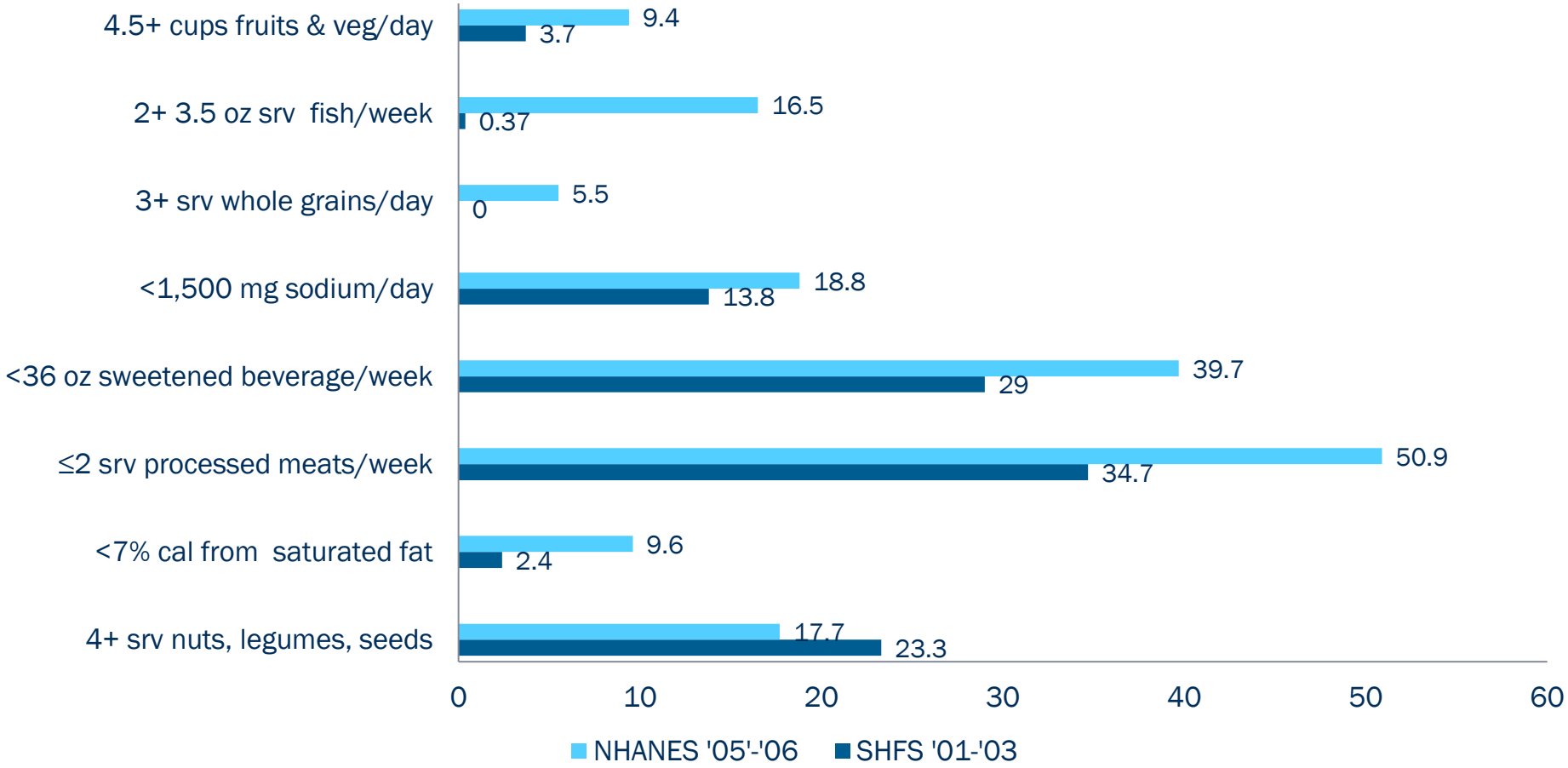
Diet Quality in the Strong Heart Family Study



Fretts AM, Howard BV, McKnight B, Duncan GE, Beresford SAA, Mete M, Zhang Y, Siscovick DS. Life's Simple 7& Incidence of Diabetes in a Population at High Risk for Cardio-Metabolic Diseases: The Strong Heart Family Study. Diabetes Care. 2014 Aug; 37(8): 2240-5.

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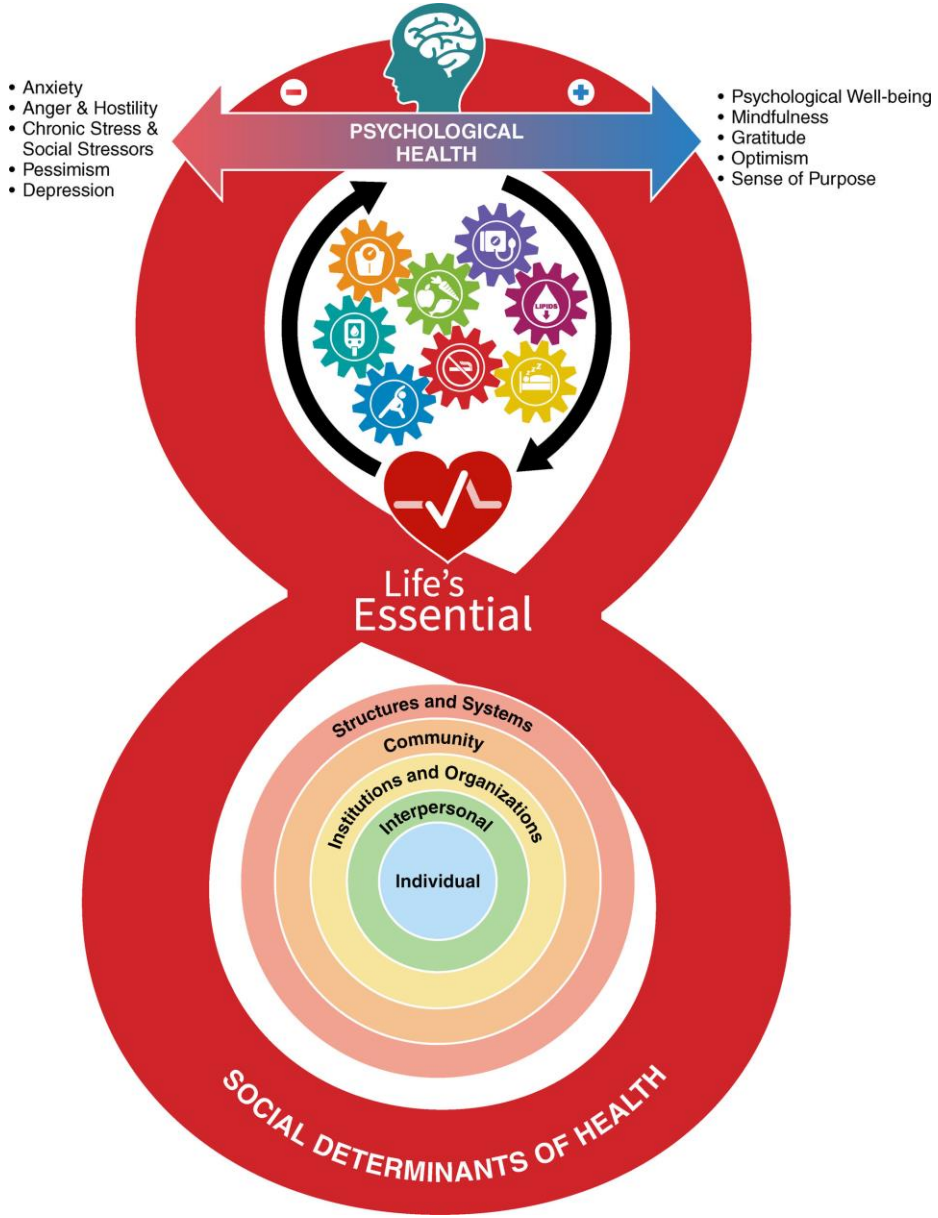

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Odds Ratio of Incident Cardiovascular Diseases According to Depressive Symptoms in the Strong Heart Family Study

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

Staff TE, O'Leary M, Fretts AM. Depression, physical activity, and incident cardiovascular disease among American Indians: The strong heart family study. Psychiatry Res Commun. 2023 Jun;3(2):100125.

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Odds Ratio of Incident Hypertension According to Depressive Symptoms in the Strong Heart Family Study

Depressive Symptoms	% of population in each CES-D Strata	Adjusted Hazard Ratios
CES-D<16	72.7	1 (Ref)
CES-D≥16	27.3	1.54 (1.06-2.23)

*Analyses led by Santori S (UW). Manuscript in development

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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

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Table. Policy-Level Framework and Interventions to Optimize Maternal CVH in American Indian/Alaska Native Individuals

Areas of intervention	Suggested solutions	Gaps and challenges
Integrated care delivery models	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.	Data collection, aggregation, and transfer of maternal health outcomes Lack of AI/AN disaggregated data in PMSS Rural landscape, lack of access to housing, particularly in tribal settings, and staffing shortages
Organization of care	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.	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.
Innovative practice categories	Improve health education and health promotion in Life's Essential 8 metrics from childhood throughout childbearing age. Improve preconception, antenatal, and postpartum CVH measures.	High burden of cardiovascular comorbidities and low preventive care services
Values and philosophy	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.	Assess childhood trauma in individuals and population and develop strategies to mitigate it.

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

Availability and Cost of Healthy Foods in a Large American Indian Community in the North-Central United States

Print

ORIGINAL RESEARCH — Volume 15 — January 4, 2018

Amanda M. Fretts, PhD[1]; Corrine Huber, MS[2]; Lyle G. Best, MD[2]; Marcia O'Leary, MS, BSN[2]; Laurel LeBeau[2]; Barbara V. Howard, PhD[3]; David S. Siscovick, MD[4]; Shirley A. Beresford, PhD[1]

(VIEW AUTHOR AFFILIATIONS)

PREVENTING CHRONIC DISEASE
PUBLIC HEALTH RESEARCH, PRACTICE, AND POLICY

-USDA Market Basket Assessment

- Healthy Food, Healthy Families Feasibility Study
- Cooking for Health
- GUSNIP Produce Prescription Program

BMC Public Health

STUDY PROTOCOL Open Access

Cooking for Health: a healthy food budgeting, purchasing, and cooking skills randomized controlled trial to improve diet among American Indians with type 2 diabetes

Caitlin N. Hawley[1], Corrine M. Huber[2], Lyle G. Best[3], Barbara V. Howard[3,4], Jason Umans[3], Shirley A. A. Beresford[5], Barbara McKnight[6], Arlette Hager[7], Marcia O'Leary[7], Anne N. Thorndike[8], India J. Ornelas[9], Meagan C. Brown[10] and Amanda M. Fretts[5*]

Abstract

Background: The prevalence of poor diet quality and type 2 diabetes are exceedingly high in many rural American Indian (AI) communities. Because of limited resources and infrastructure in some communities, implementation of interventions to promote a healthy diet is challenging—which may exacerbate health disparities by region (urban/rural) and ethnicity (AIs/other populations). It is critical to adapt existing evidence-based healthy food budgeting, purchasing, and cooking programs to be relevant to underserved populations with a high burden of diabetes and related complications. The Cooking for Health Study will work in partnership with an AI community in South Dakota to develop a culturally-adapted 12-month distance-learning-based healthy food budgeting, purchasing, and cooking intervention to improve diet among AI adults with type 2 diabetes.

Methods: The study will enroll 165 AIs with physician-diagnosed type 2 diabetes who reside on the reservation. Participants will be randomized to an intervention or control arm. The intervention arm will receive a 12-month distance-learning curriculum adapted from Cooking Matters® that focuses on healthy food budgeting, purchasing, and cooking skills. In-person assessments at baseline, month 6 and month 12 will include completion of the Nutrition Assessment Shared Resources Food Frequency Questionnaire and a survey to assess frequency of healthy and unhealthy food purchases. Primary outcomes of interest are: (1) change in self-reported intake of sugar-sweetened beverages (SSBs); and (2) change in the frequency of healthy and unhealthy food purchases. Secondary outcomes include: (1) change in self-reported food budgeting skills; (2) change in self-reported cooking skills; and (3) a mixed-methods process evaluation to assess intervention reach, fidelity, satisfaction, and dose delivered/received.

(Continued on next page)

Public Health Nutrition: 22(14), 2653–2661 doi:10.1017/S1368980019001095

Characterizing the local food environment and grocery-store decision making among a large American Indian community in the north-central USA: qualitative results from the Healthy Foods Healthy Families Feasibility Study

Meagan C Brown[1], Umit Shrestha[2], Corrine Huber[3], Lyle G Best[3], Marcia O'Leary[3], Barbara Howard[4], Shirley Beresford[5] and Amanda M Fretts[5,*]

[1]Department of Health Services, School of Public Health, University of Washington, Seattle, WA, USA: [2]Sanford Research, Sioux Falls, SD, USA: [3]Missouri Breaks Industries Research Inc., Eagle Butte, SD, USA: [4]MedStar Health Research Institute and Georgetown and Howard Universities Center for Translational Sciences, Hyattsville, MD, USA: [5]Department of Epidemiology, Cardiovascular Health Research Unit, School of Public Health, University of Washington, 1959 NE Pacific Street, Box 357236, Seattle, WA 98195, USA

Submitted 23 June 2018: Final revision received 3 January 2019: Accepted 28 February 2019: First published online 24 May 2019

Abstract

Objective: Perceptions of social-contextual food environments and associated factors that influence food purchases are understudied in American Indian (AI) communities. The purpose of the present study was to (i) understand the perceived local food environment; (ii) investigate social-contextual factors that influence family food-purchasing choices; and (iii) identify diet intervention strategies.

Design: This qualitative study consisted of focus groups with primary household shoppers and key-informant interviews with food retailers, local government food

ith Nutrition

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Thank you!

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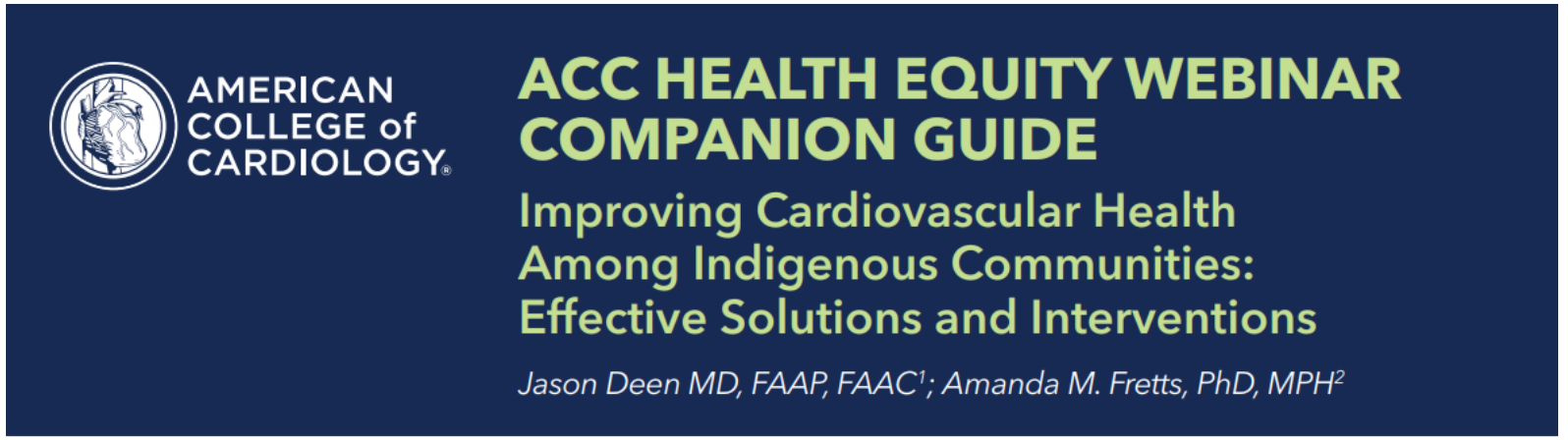
Access the Companion Guide



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THANK YOU

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