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Choosing the Appropriate Method for a Study Design During Early Childhood

Research and Clinical Examples

Linda Van Horn, PhD, RDN
Professor, Chief Nutrition Division
Department of Preventive Medicine
Feinberg School of Medicine
Northwestern University
Chicago, Illinois

Diet Assessment in 2-5 Year Olds: Key Factors

Research:

- Caregiver dependent recall
- Limited food intake/small serving sizes
- Consider life-course implications; maternal intake/human milk?
- Sample size, budget, standardized method with consistent updates

Clinical:

- Limited time/standardized/digital/EHR
- Longitudinal measures/plotting progress

Contexts:

Research versus Clinical Needs

- **Research:**
  - Dietary Guidelines
  - Paucity of Data/Standardized Methods
  - Limitations of Diet Assessment in 2-5 year olds
- **Clinical :**

  Rapid Assessment

  Standardized/Validated Methods

  Prospective/Longitudinal Capacity

Scientific Report of the 2020 Dietary Guidelines Advisory Committee

- The Dietary Guidelines Advisory Committee held 6 public meetings
- The Committee's report to the Secretaries contains its findings and conclusions for use in developing the *2020-2025 Dietary Guidelines for Americans*
- The integration of all the evidence identified two primary themes for the 2020-2025 DGA.
- The Future Directions chapter identifies several important areas for future Dietary Guidelines.

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DGA

Major Themes

- **Life stage**: Healthy eating is important at each stage of life and has a cumulative effect on health over the lifespan.

Dietary patterns: The core elements of a healthy dietary pattern described in the current Dietary Guidelines remain, with some refinements and more evidence supporting the recommendations. **NOTE: Insufficient evidence for most of the childhood data to draw meaningful conclusions.**

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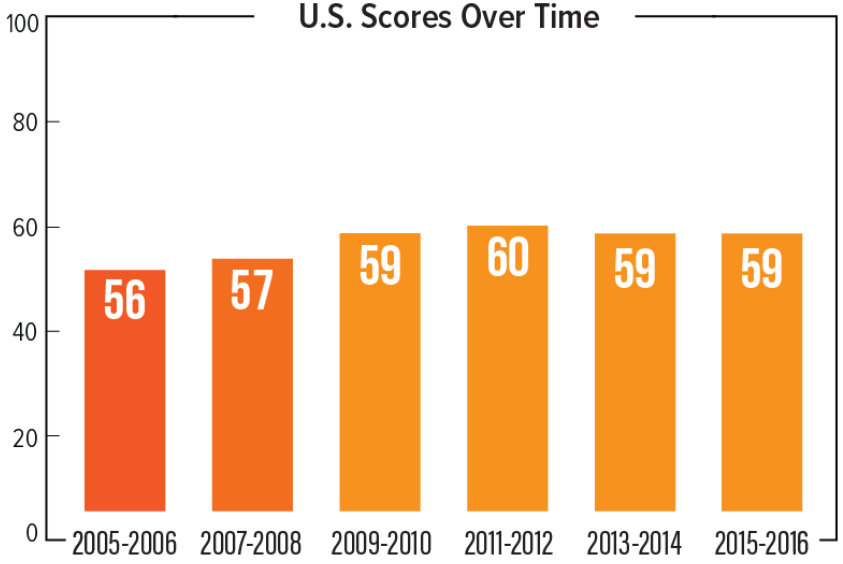
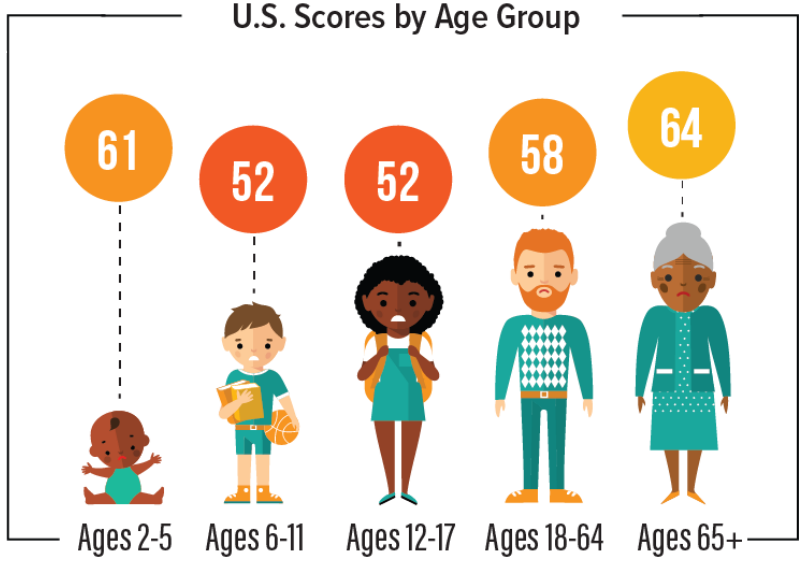
Americans do not follow the DGA

How Healthy Is the American Diet?





Data source for Healthy Eating Index scores: What We Eat in American, National Health and Nutrition Examination Survey. (Undated data are from 2015-2016).

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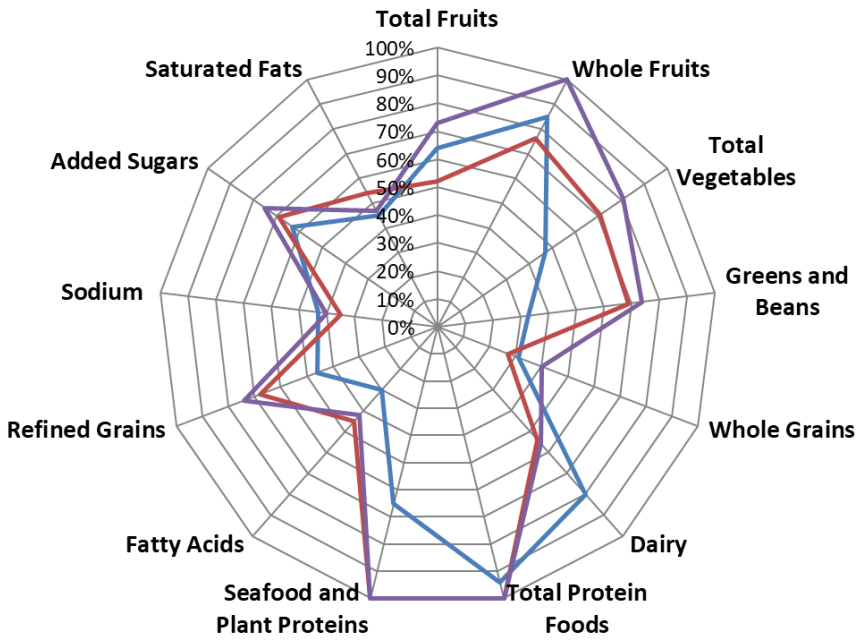
HEI Scores by Age Group

Total HEI-2015 Score By Age Groups		
2-19Y (53)	20-64Y (59)	65+Y (64)



- Children have lower scores in total vegetables, greens and beans, and seafood and plant protein: **41% are Overweight/Obese**
- Older adults have higher scores in total fruit, refined grains and added sugars
- Adults older than 19 have a lower score in the Dairy component compared to the 2-19 year old group

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Example: ADDED SUGARS AND ACHIEVING FOOD AND NUTRIENT RECOMMENDATIONS

Federal data were reviewed for infancy through older adults

- Reflected the most current NHANES cycle available
- Earlier cycles were used to compare changes in added sugars consumption over time

Main findings:

- In the U.S. population ages 1 and older, **mean usual consumption of added sugars was 13% of daily energy intake in 2013-2016**
- The estimated proportion of the population that met the guidance to consume less than 10% of energy from added sugars has ***increased*** **from 30% in 2007-2010 to 37% in 2013-2016**
- **Nearly 70 percent of added sugars intake comes from 5 food categories:**
  - sweetened beverages
  - desserts and sweet snacks
  - coffee and tea (with their additions)
  - candy and sugars
  - breakfast cereals and bars

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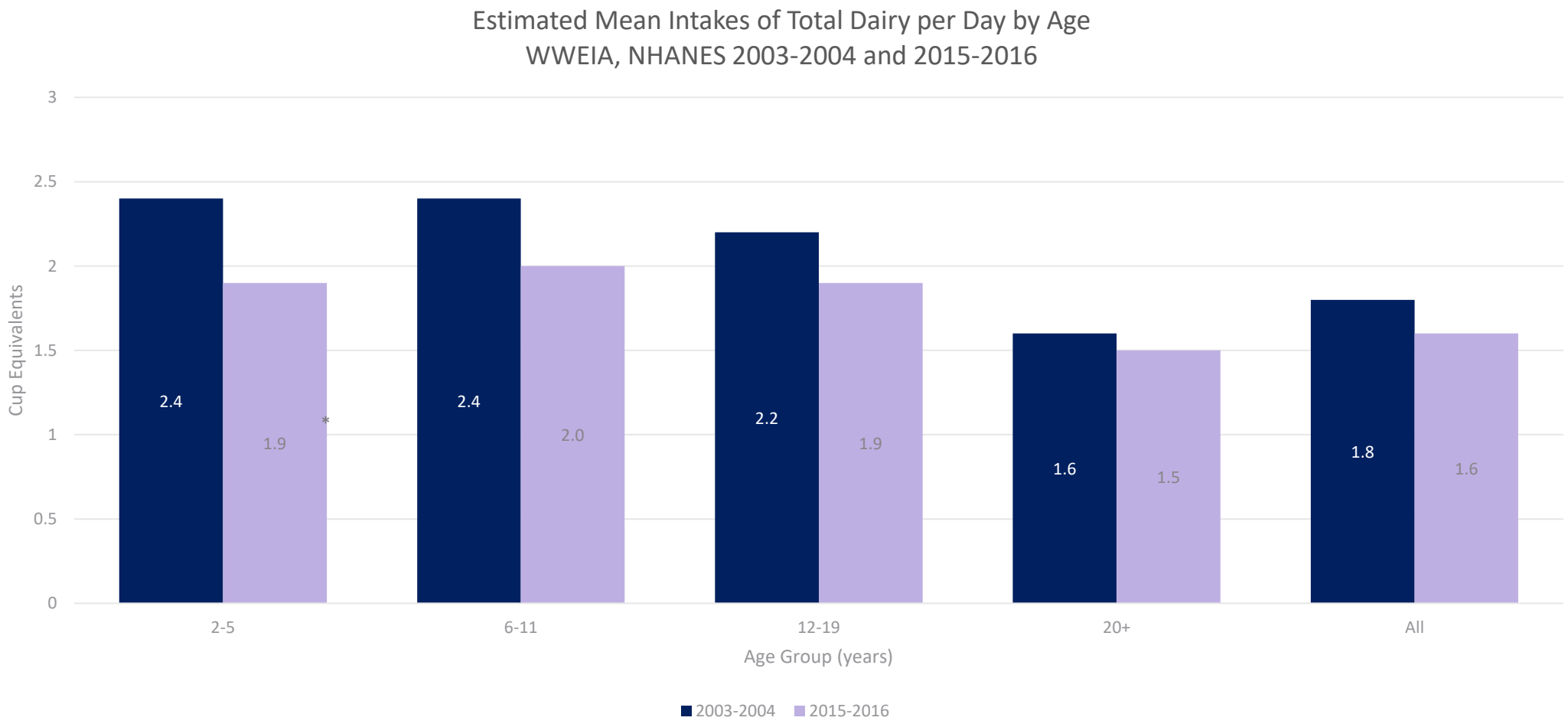
Young Children Significantly Reduced Total Dairy Intakes Between 2003-2004 and 2015-2016



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*Significantly different from 2003-2004 ($p<0.01$)

DATA SOURCE: What We Eat in America, NHANES 2003-2004 and 2015-2016, day 1, individuals 2+ years

Bowman SA, et al. Food Surveys Research Group. Dietary Data Brief No. 20, November 2018.

DGA

USDA

DGA Dietary Guidelines for Americans

2020 - 2025

Make Every Bite Count With the *Dietary Guidelines*

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DietaryGuidelines.gov

DGA 2020-2025:

First time the *Dietary Guidelines* **provided guidance by stage of life**, from birth to older adulthood, including pregnancy and lactation. *The Dietary Guidelines for Americans, 2020-2025* emphasizes that it is **never too early or too late to eat healthy**!

This edition has a call to action: "Make Every Bite Count with the *Dietary Guidelines***."** The *Dietary Guidelines, 2020-2025* focuses on choosing healthy foods and beverages rich in nutrients, and staying within your calorie limit. Which is why the *Dietary Guidelines* calls on every American to Make Every Bite Count!

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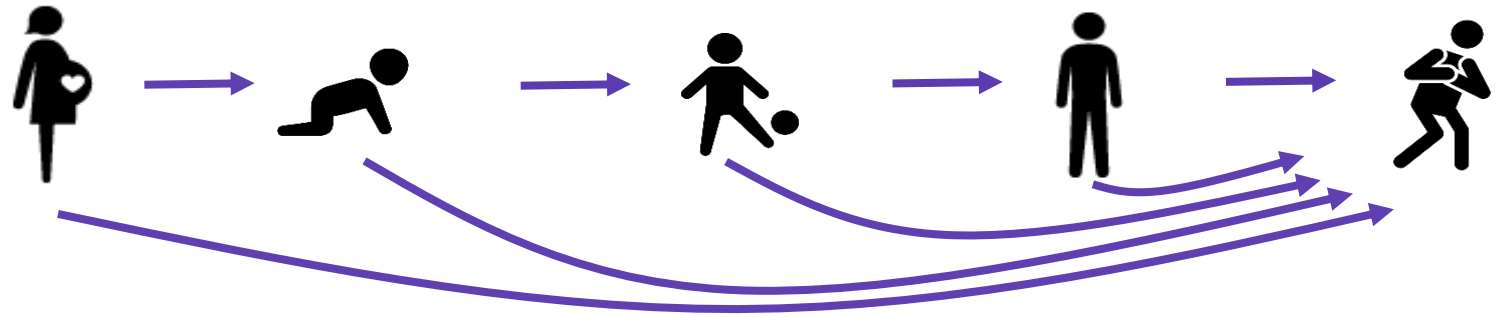
Literature Review: Childhood CVH and Adult CVD

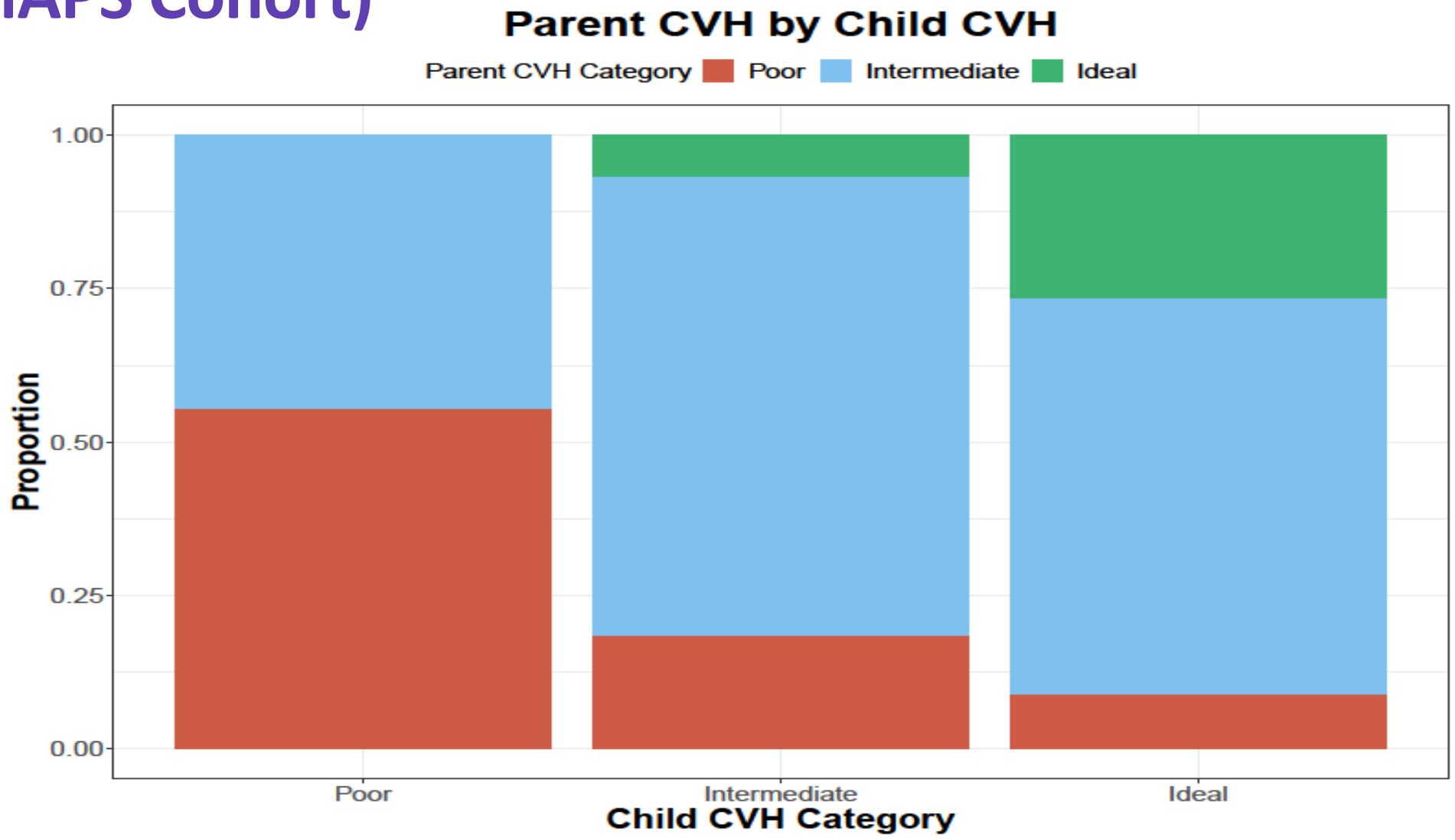
Insight into the life course development of CVD risk:

Example of Adiposity & CHD



- Low birthweight, childhood BMI, and adult BMI all independently associated with CHD
- But, evidence of interactions:
  - higher risk of CHD for childhood BMI with low birthweight
  - higher risk of CHD for childhood BMI and low birthweight with adult obesity
- Rate of weight gain in early childhood better at predicting future CHD than single time point BMI measures

Parent's CVH is the Strongest Predictor of Child's CVH (MAPS Cohort)



Childhood Risk Factors and Adulthood Cardiovascular Disease: A Systematic Review

Lindsay R. Pool, PhD[1], Liliana Aguayo, PhD[1,2], Michal Brzezinski, PhD[3], Amanda M. Perak, MD[1,4,5], Matthew M. Davis, MD[1,2,5,6,7], Philip Greenland, MD[1], Lifang Hou, MD, PhD[1,5], Bradley S. Marino, MD[2,4,5,7], Linda Van Horn, PhD[1], Lauren Wakschlag, PhD[6,7], Darwin Labarthe, MD, PhD[1,6], Donald Lloyd-Jones, MD[1,6], and Norrina B. Allen, PhD[1,6]

Objective To conduct a comprehensive review of the literature on childhood risk factors and their associations with adulthood subclinical and clinical cardiovascular disease (CVD).

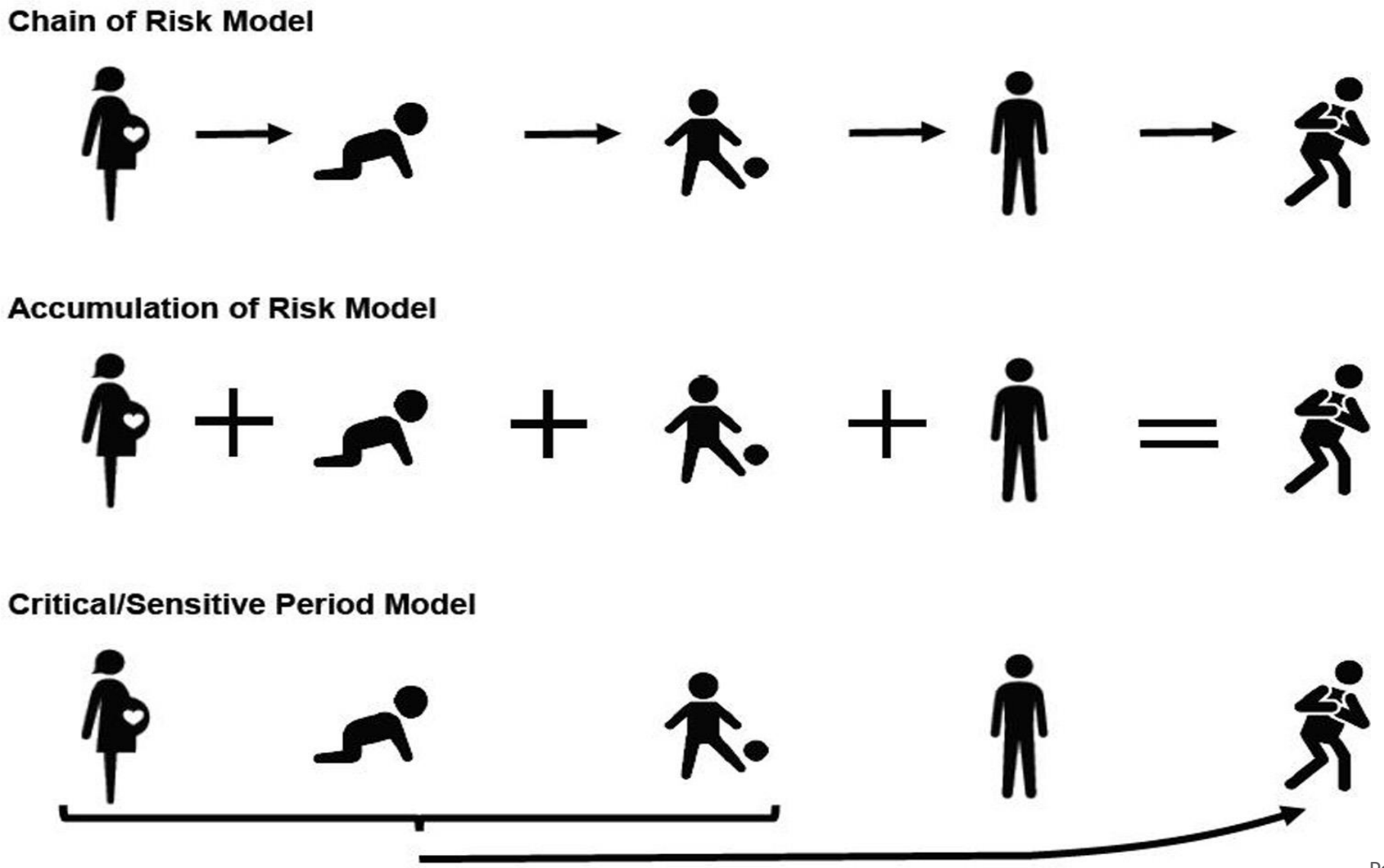
Study design A systematic search was performed using the MEDLINE, EMBASE, PsycINFO, CINAHL, and Web of Science databases to identify English-language articles published through June 2018. Articles were included if they were longitudinal studies in community-based populations, the primary exposure occurred during childhood, and the primary outcome was either a measure of subclinical CVD or a clinical CVD event occurring in adulthood. Two independent reviewers screened determined whether eligibility criteria were met.

Results There were 210 articles that met the predefined criteria. The greatest number of publications examined associations of clinical risk factors, including childhood adiposity, blood pressure, and cholesterol, with the development of adult CVD. Few studies examined childhood lifestyle factors including diet quality, physical activity, and tobacco exposure. Domains of risk beyond "traditional" cardiovascular risk factors, such as childhood psychosocial adversity, seemed to have strong published associations with the development of CVD.

Conclusions Although the evidence was fairly consistent in direction and magnitude for exposures such as childhood adiposity, hypertension, and hyperlipidemia, significant gaps remain in the understanding of how childhood health and behaviors translate to the risk of adulthood CVD, particularly in lesser studied exposures like glycemic indicators, physical activity, diet quality, very early life course exposure, and population subgroups. *(J Pediatr 2021;232:118-26)*.

Pool et. al, *J Pediatr*, 2021

Figure 3. Life course models for CVD development. The 3 hypothesized life course models for the development of CVD: chain of risk, where childhood risk is entirely mediated through adulthood risk; accumulation of risk, where risk factors present at each life stage further increase adulthood risk; and the critical/sensitive period, where exposure at a certain point in the life course confers more risk as compared with other life course stages.



Pool et. al, *J Pediatr*, 2021

Figure 2. Heat map of identified articles examining childhood exposures and adulthood CVD. Each box lists the number of articles corresponding the exposure and CVD outcome pair. Yellow indicates that only null associations have been observed between the exposure and outcome. Colors deepen from light orange to red with an increasing number of articles indicating the exposure may be associated with higher CVD outcome risk. Colors deepen from light green to dark green with an increasing number of articles indicating the exposure may be associated with lower CVD outcome risk. Gray indicates that no articles examining the exposure and outcome pair were identified in this review. Articles that included multiple subtypes of CVD (eg, CHD and stroke) in the outcome without estimating the association for each subtype of CVD separately were classified as "CVD Mixed Definition".

Childhood Risk Factor	# of papers	Subclinical CVD				Clinical CVD			
		Arterial Stiffness	cIMT	CAC	LV structure and function	CHD	Stroke	Heart failure	CVD Mixed Definition
Increased Adiposity	61	3 papers: higher risk 5 papers: null	19 papers: higher risk 1 papers: null	1 paper: higher risk	11 papers: higher risk	9 papers: higher risk 2 papers: null	6 papers: higher risk 1 papers: null	2 papers: higher risk	10 papers: higher risk
Low Birthweight	28	1 paper: higher risk 1 paper: null	no papers	no papers	1 paper: null	13 papers: higher risk	3 papers: higher risk 1 paper: null	no papers	8 papers: higher risk
Pediatric Hypertension	29	9 papers: higher risk 1 paper: null	10 papers: higher risk 1 paper: null	2 papers: higher risk	7 papers: higher risk 1 paper: null	2 papers: higher risk	no papers	no papers	3 papers: higher risk
Pediatric Hyperlipidemia	16	no papers	10 papers: higher risk	2 papers: higher risk	1 paper: higher risk	1 paper: higher risk	no papers	no papers	3 papers: higher risk
High Glycemic Indicators	2	1 paper: null	1 paper: higher risk	no papers	no papers	no papers	1 paper: higher risk	no papers	no papers

Pool et. al, *J Pediatr*, 2021

Figure 2 Continued

Tobacco Exposure	7	no papers	3 papers: higher risk	1 paper: higher risk	no papers	1 paper: higher risk	1 paper: higher risk	no papers	3 papers: higher risk
Physical Activity	6	4 papers: lower risk	2 papers: lower risk	no papers	no papers	no papers	no papers	no papers	1 paper: null
Dietary Quality	9	3 papers: lower risk 1 paper: null	3 papers: lower risk	no papers	no papers	1 paper: null	2 papers: lower risk	no papers	no papers
Breastfeeding	6	1 paper: null	1 paper: lower risk 1 paper: null	no papers	no papers	1 paper: lower risk 1 paper: null	1 paper: null	no papers	1 paper: null
Low Socioeconomic Status	13	no papers	2 papers: null	no papers	1 paper: higher risk	2 papers: higher risk	2 papers: higher risk	no papers	7 papers: higher risk
Psychosocial Adversity	18	1 paper: higher risk 2 papers: null	4 papers: higher risk	1 paper: higher risk	no papers	3 papers: higher risk	1 paper: higher risk	1 paper: higher risk	5 papers: higher risk 1 paper: null
Metabolic Syndrome	9	1 paper: higher risk	5 papers: higher risk	no papers	no papers	no papers	no papers	no papers	3 papers: higher risk
Other Risk Factor Clustering	7	2 papers: higher risk	6 papers: higher risk	1 paper: higher risk	no papers	no papers	no papers	no papers	no papers

JAMA | Original Investigation

Associations of Maternal Cardiovascular Health in Pregnancy With Offspring Cardiovascular Health in Early Adolescence

Amanda M. Perak, MD, MS; Nicola Lancki, MPH; Alan Kuang, MS; Darwin R. Labarthe, MD, MPH, PhD; Norrina B. Allen, PhD, MPH; Svati H. Shah, MD, MHS; Lynn P. Lowe, PhD; William A. Grobman, MD, MBA; Jean M. Lawrence, ScD, MPH, MSSA; Donald M. Lloyd-Jones, MD, ScM; William L. Lowe Jr, MD; Denise M. Scholtens, PhD; for the HAPO Follow-Up Study Cooperative Research Group

IMPORTANCE Pregnancy may be a key window to optimize cardiovascular health (CVH) for the mother and influence lifelong CVH for her child.

OBJECTIVE To examine associations between maternal gestational CVH and offspring CVH.

DESIGN, SETTING, AND PARTICIPANTS This cohort study used data from the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study (examinations: July 2000-April 2006) and HAPO Follow-Up Study (examinations: February 2013-December 2016). The analyses included 2302 mother-child dyads, comprising 48% of HAPO Follow-Up Study participants, in an ancillary CVH study. Participants were from 9 field centers across the United States, Barbados, United Kingdom, China, Thailand, and Canada.

Editorial page 630

Supplemental content

CME Quiz at jamacmelookup.com

CONCLUSIONS AND RELEVANCE In this multinational cohort, better maternal CVH at 28 weeks' gestation was significantly associated with better offspring CVH at ages 10 to 14 years.

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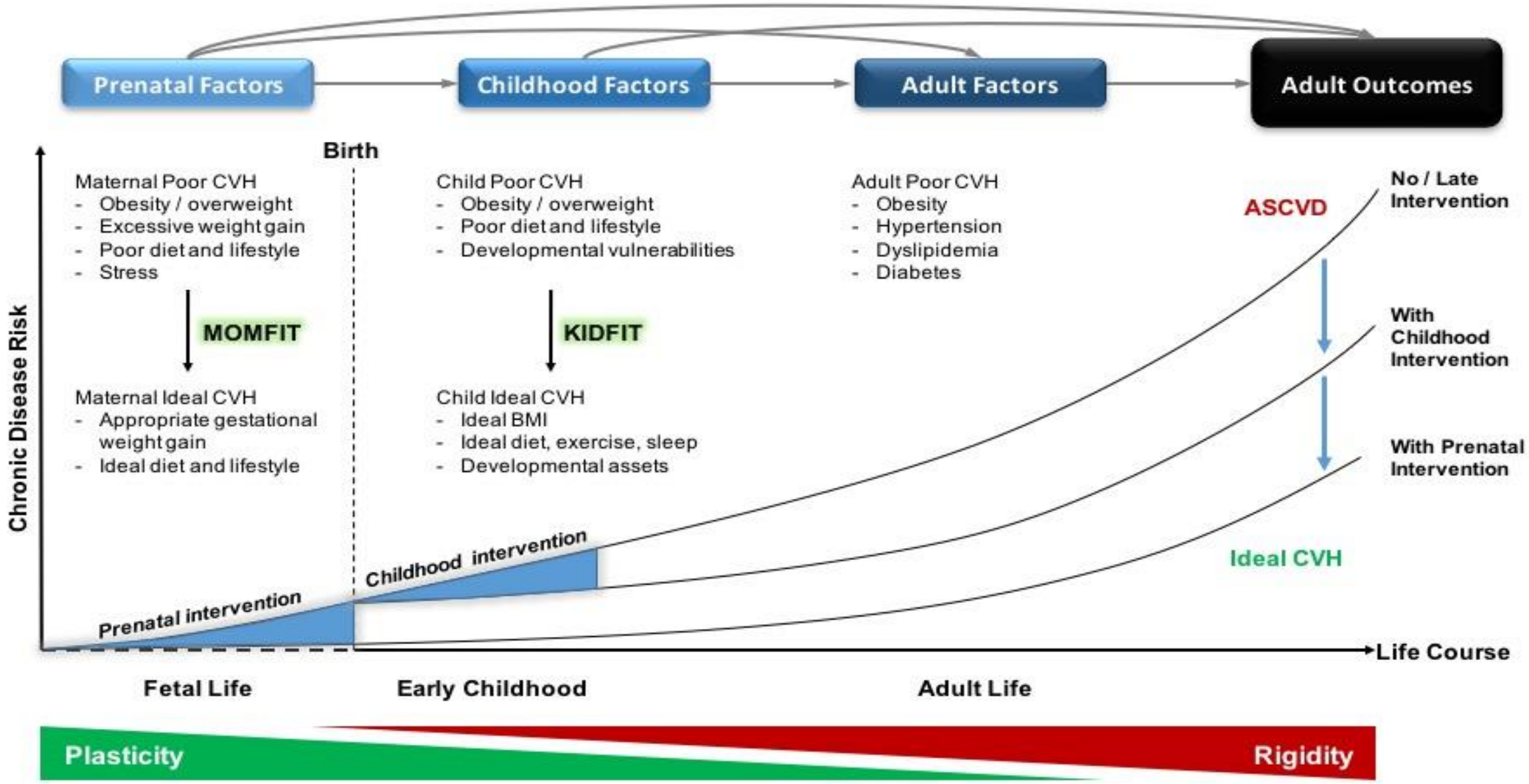
Perak, JAMA,2021;325(7)

KIDFIT Significance/Innovation



KIDFIT Intervention Lifestyle Targets

KIDFIT Intervention: DASH Diet & Activity Tracker

kidfit Daily Food & Activity Tracker

You and your child can work together to earn *KidCash* for toys or other prizes throughout the KIDFIT Study! Track your child's eating & activity habits by checking off the number of servings eaten for each DASH group below as well as activities your child did daily for at least THREE days a week.

	Daily Goal	Serving Size	Day 1	Day 2	Day 3	Day 4
 Fiona Fruit	Fruit 1½ cups	½ cup				
 Reggie Veggie	Vegetables 1½ cups	½ cup				
 Gabby Grain	Whole Grains >2 ounces	1 ounce				
 Payton Protein	Healthy Protein 3-5 ounces	1 ounce				
 Darcy Dairy	Low Fat Dairy 2-2½ cups	½ cup				
 WHOA	WHOA! Foods	Circle items consumed each day	Juice Sugary Drinks Candy Cookies Sweets Chips Fast Food Pizza	Juice Sugary Drinks Candy Cookies Sweets Chips Fast Food Pizza	Juice Sugary Drinks Candy Cookies Sweets Chips Fast Food Pizza	Juice Sugary Drinks Candy Cookies Sweets Chips Fast Food Pizza
 Abby Activity	Activity 60 minutes	Circle activities you did each day	Dancing Running Hopping Kick Ball Walking Park play Jumping Biking Swimming Soccer	Dancing Running Hopping Kick Ball Walking Park play Jumping Biking Swimming Soccer	Dancing Running Hopping Kick Ball Walking Park play Jumping Biking Swimming Soccer	Dancing Running Hopping Kick Ball Walking Park play Jumping Biking Swimming Soccer

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kidfit

DevSci Northwestern

New Initiative/Pilot Funding : KIDFIT – Primary Care

Aim: Dissemination/Implementation Pilot Study : Adapting KIDFIT Clinical Trial Intervention to Primary Care (n=40 randomized)

Methods: Pediatric Practice recruited 3-5 year old patients and care givers with randomization to KIDFIT-PC or Usual Care using a baseline Diet and Lifestyle Questionnaire (DLQ) Assessment Tool

Intervention – "Telenutrition" – 2 coaching calls plus access to a modified KIDFIT Website

Usual Care – Access to USDA Diet and Lifestyle Guidelines

Follow Up Visit: 6 months

Outcome Measures: *Height*

Weight

Diet/Lifestyle Questionnaire

Current status : Completed follow-up visit : n = 26

Well-Child Visits still needed: n = 14 (COVID DELAYED)

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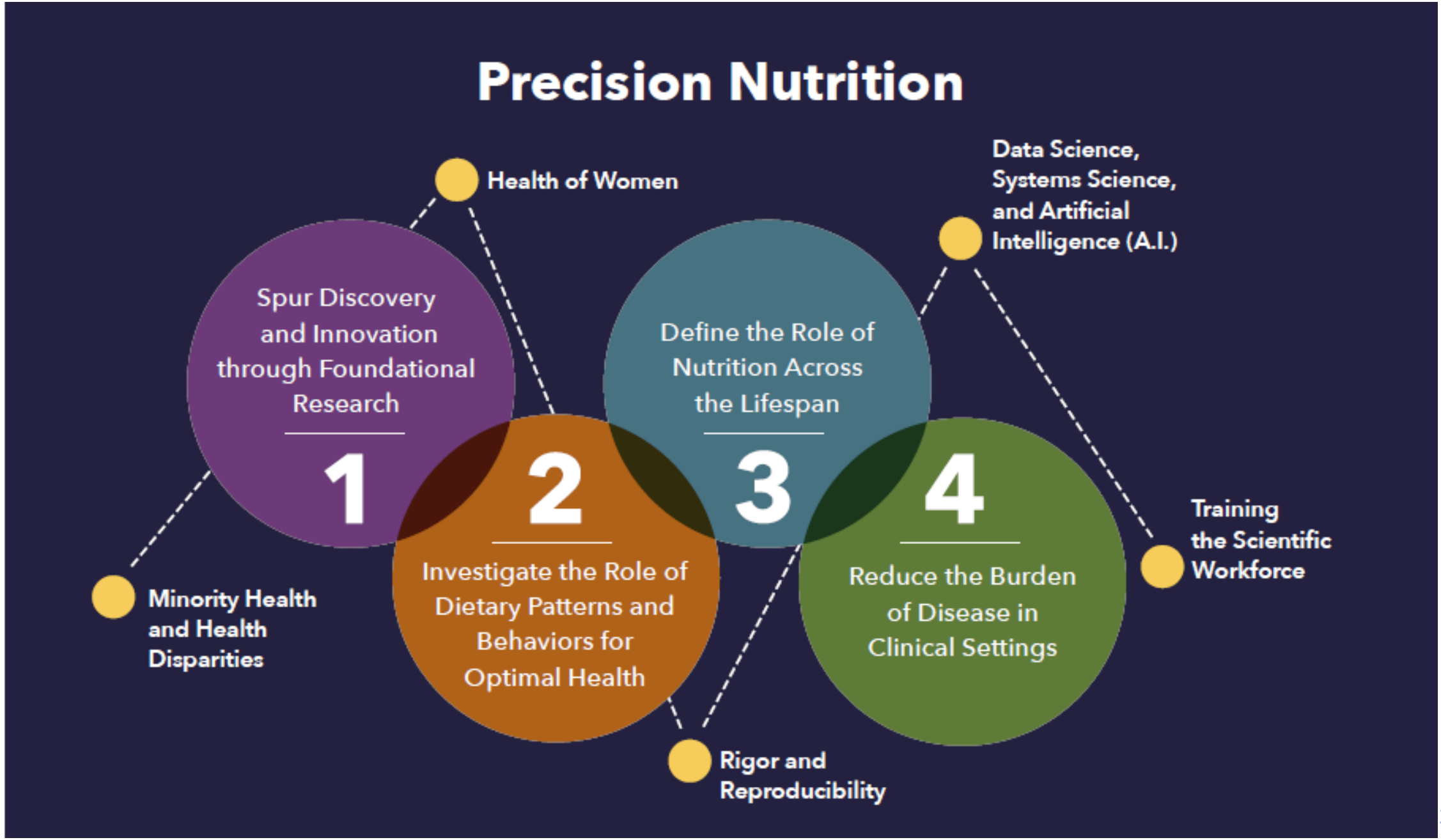
KidfitPC

DevSci Northwestern


Precision Nutrition
Health of Women
Data Science, Systems Science, and Artificial Intelligence (A.I.)
Spur Discovery and Innovation through Foundational Research
1
Define the Role of Nutrition Across the Lifespan
3
2
Investigate the Role of Dietary Patterns and Behaviors for Optimal Health
4
Reduce the Burden of Disease in Clinical Settings
Minority Health and Health Disparities
Training the Scientific Workforce
Rigor and Reproducibility

Circulation: Cardiovascular Quality and Outcomes

AHA SCIENTIFIC STATEMENT

Rapid Diet Assessment Screening Tools for Cardiovascular Disease Risk Reduction Across Healthcare Settings

A Scientific Statement From the American Heart Association

Maya Vadiveloo, PhD, RD, FAHA, Chair, Alice H. Lichtenstein, DSc, FAHA, Vice Chair, Cheryl Anderson, PhD, MPH, FAHA, Karen Aspry, MD, MS, FAHA, Randi Foraker, PhD, FAHA, Skylar Griggs, MS, RD, LDN, Laura L. Hayman, PhD, MSN, FAHA, Emily Johnston, MPH, RDN, CDE, Neil J. Stone, MD, FAHA, Anne N. Thorndike, MD, MPH, FAHA. On behalf of the American Heart Association Council on Lifestyle and Cardiometabolic Health; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; and Stroke Council

ABSTRACT: It is critical that diet quality be assessed and discussed at the point of care with clinicians and other members of the healthcare team to reduce the incidence and improve the management of diet related chronic disease, especially cardiovascular disease. Dietary screening or counseling is not usually a component of routine medical visits. Moreover, numerous barriers exist to the implementation of screening and counseling, including lack of training and knowledge, lack of time, sense of futility, lack of reimbursement, competing demands during the visit, and absence of validated rapid diet screener tools with coupled clinical decision support to identify actionable modifications for improvement. With more widespread use of electronic health records, there is an enormous unmet opportunity to provide evidence-based clinician-delivered dietary guidance using rapid diet screener tools that must be addressed. In this scientific statement from the American Heart Association, we provide rationale for the widespread adoption of rapid diet screener tools in primary care and relevant specialty care prevention settings, discuss the theory and practice-based criteria of a rapid diet screener tool that supports valid and feasible diet assessment and counseling in clinical settings, review existing tools, and discuss opportunities and challenges for integrating a rapid diet screener tool into clinician workflows through the electronic health record.

Vadiveloo et. al, *Circ Cardiovascular Qual Outcomes,* 2020

Table 1: *Practice-based factors*

Optimal Diet Screener Tool Characteristics	Definition
Brief	Diet screener tool can be used in the time-sensitive clinical setting taking <10 min to complete (previously established as no more than 35 items)
Provides CDS	Provides immediate guidance on healthy dietary changes, identifies future goals, or allows clinicians and other members of the healthcare team to quickly identify patients who may need more intensive counseling. Diet screener tool is part of a customizable clinical protocol resulting in a plan of action (ie, guidelines for immediate clinician-initiated dietary counseling or referrals for more intensive nutrition or behavioral therapies).[12]
Sensitive to change over time	The screener will capture changes in a person's diet over time
Able to be completed at administration without special knowledge or software	Screener is easy to learn and use in the clinical setting with diverse populations. Patients, clinicians, and other members of the healthcare team should be able to administer it.
Able to be scored at administration without special knowledge or software	Scoring should be automatic if electronic or easy to calculate. Diet screener tool is accessible and universally implemented by primary care and specialty clinicians and other members of the healthcare team in an EHR to provide consistent delivery of nutritional advice across specialties and to enable dietary adherence monitoring.[44]
Useful for chronic disease management	Clinicians, other members of the healthcare team, and patients should be able to understand the score and ways to improve the score. The diet screener tool should be validated for various populations for both cardiometabolic risk factors and monitoring of dietary changes.

Vadiveloo et. al, *Circ Cardiovascular Qual Outcomes,* 2020

Table 2. Rapid Diet Screener Tool Options for Clinical Settings

Least time-intensive: expert opinion	Nutrition screening protocol	Powell and Greenberg Screening Tool[44]
		1. How often per week do you eat ≥5 fruits and vegetables?
		2. How often do you consume sugary food/drinks (juice, sweeteners in coffee or tea, sugary sodas)?
	Starting the Conversation*	Ask about the frequency of these dietary intakes occurring over the previous few months[43,56]
		1. Fast food meals or snacks per month
		2. Servings of fruit per day
		3. Servings of vegetables per day
		4. Regular sodas, juices, or other sugary beverages per day
		5. Servings of beans, nuts, chicken, or fish per week
		6. Regular snack chips or crackers per week*
		7. Desserts and other sweets per week*
		8. Use of butter or meat fat*

MEDAS indicates Mediterranean Diet Adherence Screener; and REAP-S, Rapid Eating Assessment for Participants–Shortened.
*These questions were modified to reflect current nutrition recommendations for dietary fat. The modified questions have not been validated.

Vadiveloo et. al, *Circ Cardiovascular Qual Outcomes,* 2020

Table 2. Rapid Diet Screener Tool Options for Clinical Settings

REAP-S[54,55,57]	In an average week, how often do you:	
	1. Skip breakfast	9. Eat fried foods such as fried chicken, fried fish, French fries, fried plantains, tostones, or fried yuca?
	2. Eat ≥4 meals from sit-down or take-out restaurants?	10. Eat regular potato chips, nacho chips, corn chips, crackers, or regular popcorn instead of unsalted nuts, or air-popped popcorn?*
	3. Eat <2 servings of whole-grain products or high-fiber starches a day?	11. Add butter or margarine to bread, potatoes, rice, or vegetables at the table?*
	4. Eat <2 servings of fruit a day?	12. Eat sweets such as cake, cookies, pastries, donuts, muffins, chocolate, and candies >2 times per day?
	5. Eat <2 servings of vegetables a day?	13. Drink ≥16 oz of nondiet soda, fruit drink/ punch, or Kool-Aid a day?
	6. Eat or drink <2 servings of milk, yogurt, or cheese a day?	14. Usually shop and cook (you or a family member) rather than eating sit-down or take-out restaurant food?
	7. Eat >8 oz of meat, chicken, turkey, or fish per day?	15. Usually feel well enough to shop or cook?
	8. Eat regular processed meats (bologna, salami, corned beef, hot dogs, sausage, or bacon) instead of low-fat processed meats (roast beef, turkey, lean ham, low-fat cold cuts/hot dogs)?	How willing are you to make changes in your eating habits to be healthier?

MEDAS indicates Mediterranean Diet Adherence Screener; and REAP-S, Rapid Eating Assessment for Participants–Shortened.
*These questions were modified to reflect current nutrition recommendations for dietary fat. The modified questions have not been validated.

Vadiveloo et. al, *Circ Cardiovascular Qual Outcomes,* 2020

Table 2. Rapid Diet Screener Tool Options for Clinical Settings

Most time-intensive: validated short diet screeners

MEDAS[50,51]	1. Do you use olive oil as the principal source of fat for cooking?
	2. How much olive oil do you consume per day (including that used in frying, meals eaten away from home, salads, etc)?
	3. How many servings of vegetables do you consume per day?
	4. How many pieces of fruit (including fresh-squeezed fruit juice) do you consume per day?
	5. How many servings of red meat, hamburger, or meat products (ham, sausage, etc) do you consume per day?
	6. How many servings of butter, margarine, or cream do you consume per day?
	7. How many sugar-sweetened beverages do you drink per day?
	8. How much wine do you drink per week?
	9. How many servings of pulses do you consume per week?
	10. How many servings of fish or shellfish/seafood do you consume per week?
	11. How many times per week do you consume commercial sweets or pastries (not homemade) such as cakes, cookies, biscuits, or custard?
	12. How many servings of nuts (including peanuts) do you consume per week?
	13. Do you prefer to eat chicken, turkey, or rabbit meat instead of beef, pork, hamburgers, or sausages?
	14. How many times per week do you consume cooked vegetables, pasta, rice, or other dishes prepared with a sauce of tomato, garlic, onions, or leeks sautéed in olive oil (sofrito)?

MEDAS indicates Mediterranean Diet Adherence Screener; and REAP-S, Rapid Eating Assessment for Participants–Shortened.
*These questions were modified to reflect current nutrition recommendations for dietary fat. The modified questions have not been validated.

Vadiveloo et. al, *Circ Cardiovascular Qual Outcomes,* 2020

Table 4. Strengths and Limitations of 2 Approaches to EHR Data Collection

	Strengths	Limitations
Rapid diet screener tools completed by patients via EHR portal	Lower perceived risk of judgement by clinicians and other members of the healthcare team for responses	Limited reach into underserved populations
	Completed at patients' convenience	Potentially less reliable than clinician-administered diet screener tools
	Perceived as important if request to complete comes from clinician	Ineffective if dietary data are not reviewed by clinicians and other members of the healthcare team
Rapid diet screener tools completed by clinicians and other members of the healthcare team in the EHR template	Collected in real time and used in shared decision making during encounter	Lack of ownership of task by clinicians and other members of the healthcare team
	Perceived as more reliable by clinicians because completed by a professional	Healthcare system referral resources may not exist to address diet
	Framed as a vital sign for clinicians	Low prioritization by clinician during short clinical encounter

EHR indicates electronic health record.

Vadiveloo et. al, *Circ Cardiovascular Qual Outcomes,* 2020

Preservation of Ideal Cardiovascular Health