Nutrition Research at NIH

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Senior Nutrition Scientist
NIH Office of Nutrition Research

May 9, 2025

Outline

- NIH research funding
- NIH Office of Nutrition Research
- Precision nutrition
- Nutrition for Precision Health, powered by the *All of Us* Research Program

NIH Nutrition Research Report 2022-2023

Actual Obligations for NIH Nutrition Research and Training in Current and Constant Dollars and as a Percentage of Total NIH Obligations, FY19–FY23 (in thousands of dollars)

Fiscal Year	Nutrition Research & Training Current Dollars[a]	Nutrition Research & Training Constant Dollars[b]	Actual Total NIH Obligations[c]	Constant Nutrition Dollars as a Percentage of Actual Total NIH Obligations
2019	$1,931,268	$1,931,268	$39,420,151	4.90
2020	$2,047,194	$2,012,392	$41,524,839	4.85
2021	$2,065,040	$1,980,373	$42,738,079	4.63
2022	$2,102,819	$1,928,285	$45,327,368	4.25
2023	$2,230,647	$1,967,431	$48,371,641	4.07

[a] Source: NIH RePORT using the Nutrition RCDC category.

[b] Based on the Biomedical Research and Development Price Index, Fiscal Year 2019 equals 100 percent.

[c] Source: NIH Budget Office Actual Total Obligations by Institute and Center FY00–FY23. The amounts for FY22 and FY23 include ARPA-H.

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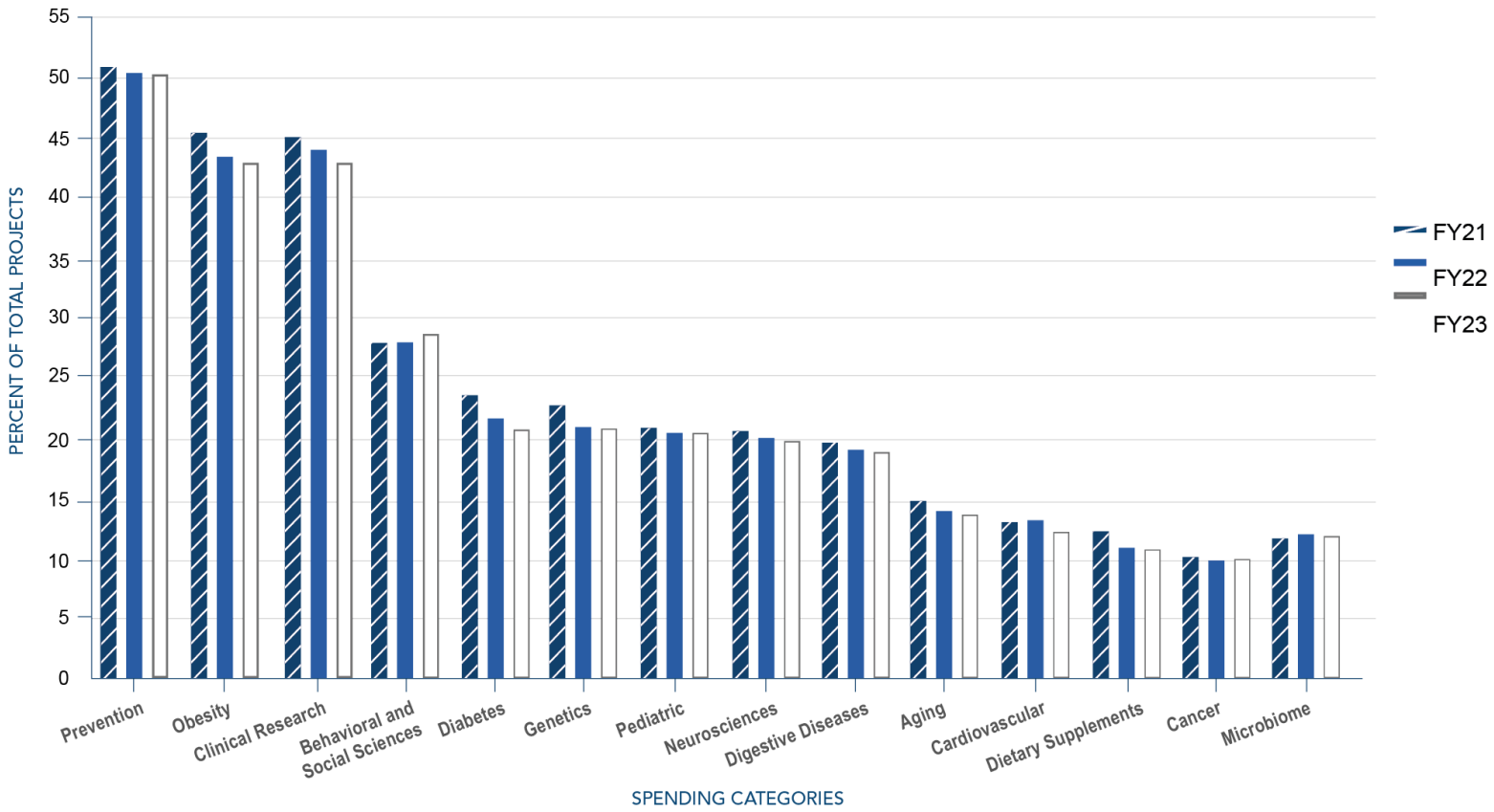
NIH Nutrition Research Report 2022-2023

Overlapping Spending Categories as a Percentage of Total Projects, FY21–FY23



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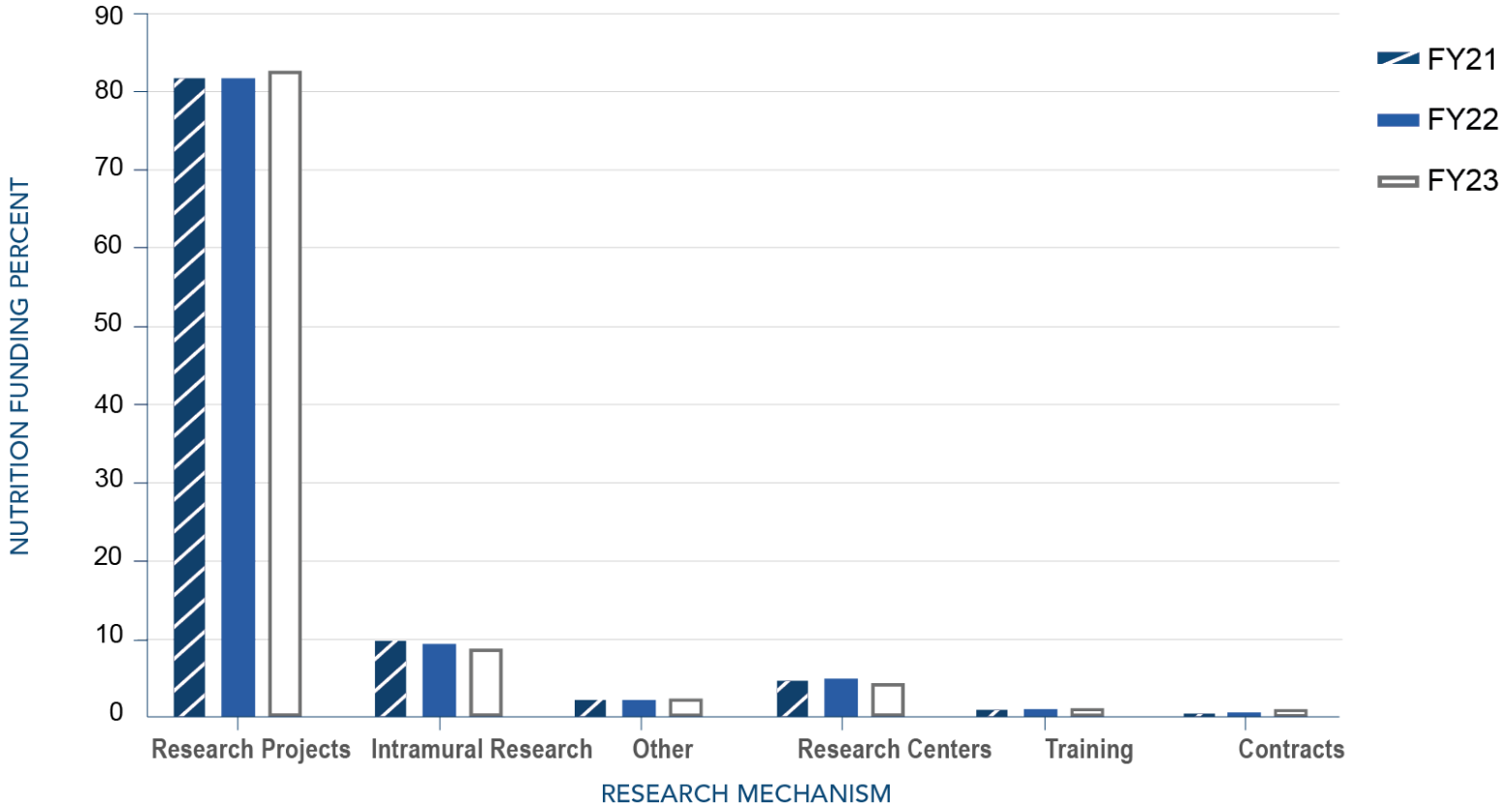
Nutrition Funding Percentages by NIH Research Mechanism, Fiscal Years 2021–2023 (FY21–FY23)

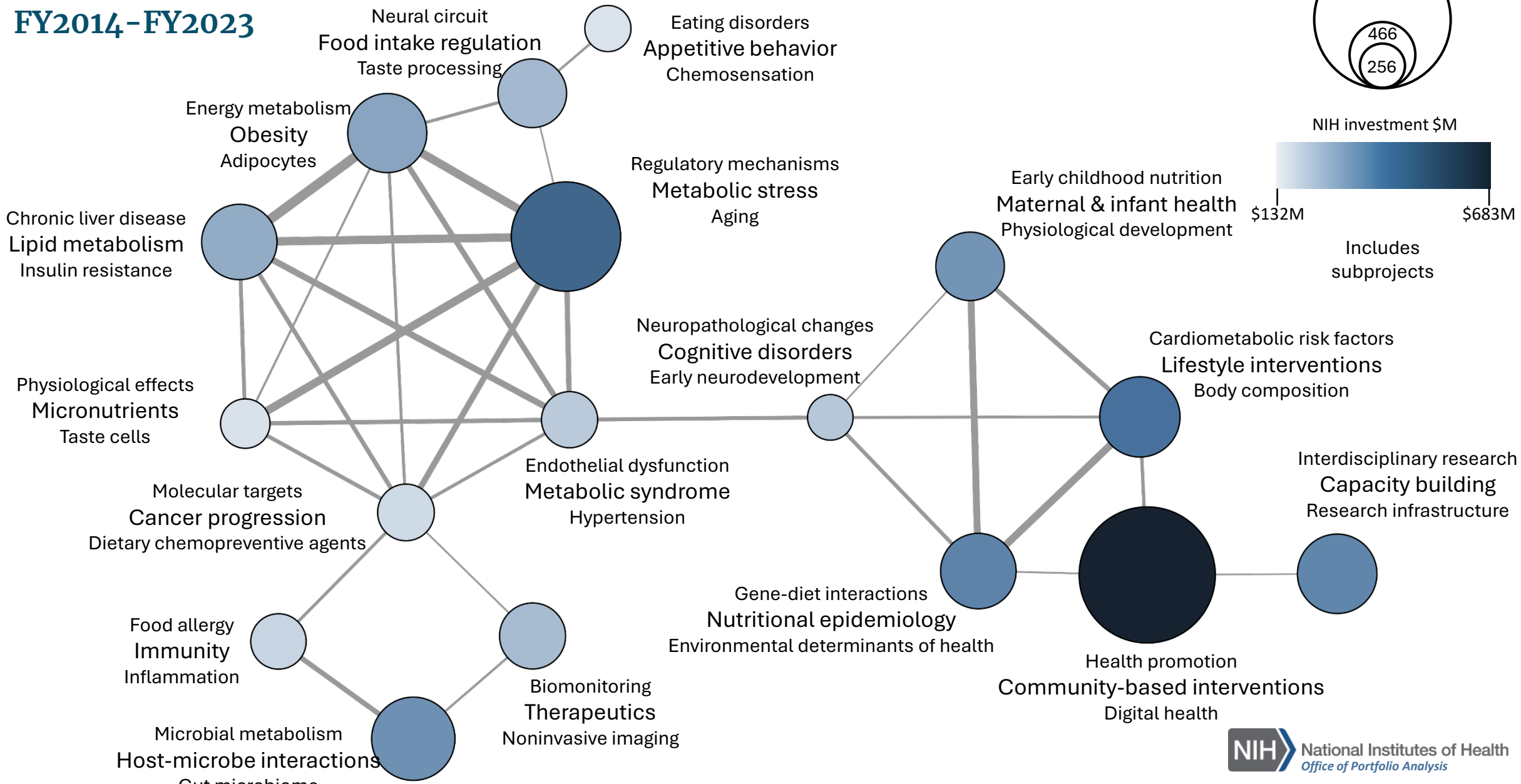


Topics in the NIH Nutrition portfolio

Topics in the NIH Nutrition portfolio

NIH investment

FY2014-FY2023



Award count (Types 1 & 2)

NIH investment $M

$132M — $683M

Includes subprojects

National Institutes of Health
Office of Portfolio Analysis

National Institutes of Health
Office of Nutrition Research

NCI	NEI	NHLBI
NHGRI	NIA	NIAAA
NIAID	NIAMS	NIBIB
NICHD	NIDCD	NIDCR
NIDDK	NIDA	NIEHS

NIH Office of the Director

NIGMS	NIMH	NIMHD
NINDS	NINR	NLM
CC	CIT	CSR
FIC	NCATS	NCCIH

National Institutes of Health
Office of Nutrition Research

So, who are we?

Andrew Bremer, MD, PhD, MAS

ONR Director

Samantha Adas, MS, RDN

Program Analyst

Nicholas Jury, PhD

Health Science Policy Analyst

Emily Levin, MPH, RDN

Program Analyst

Holly Nicastro, PhD, MPH

Senior Nutrition Scientist

Daniel Raiten, PhD

Senior Nutrition Scientist

Why Nutrition Research?

- The US and the whole world are facing an urgent nutrition-related health crisis
- Malnutrition (in all its forms) is the leading cause of morbidity and mortality in the world today
- In the US specifically, suboptimal nutrition is threatening our public health, economy, and national security, and is estimated to lead to the death of ~15,000 Americans each week
- The combined health care spending and lost productivity from suboptimal diets costs the US economy >$1.1 trillion per year
- Suboptimal diets are responsible for more deaths globally than any other risk factor – including tobacco smoking, air pollution, and high blood pressure
- As many Americans die each year from diet-related illnesses as died during the entire American Civil War and World War II combined

- **Vision:** Advance nutrition science for the health of this and future generations.

- **Mission:** Stimulate innovative research to address the complexities of nutrition, its ecology, and its critical role in health promotion and disease prevention across the lifespan for all.

- **Goal:** Reinforce the integral role of nutrition in all aspects of human biology, health, and disease. Achieving this goal will:
  - Improve the precision of assessment and attribution of one's nutritional status to support clinical and public health interventions.
  - Provide the evidence base to develop context-specific, culturally appropriate, resilient, and sustainable solutions to address priority health outcomes across the lifespan.

- **Strategy:** Serve as a synergistic hub across NIH, the government, and non-government multisectoral partners to support the nutrition research agenda.

- **Values:** Integrity, Curiosity, Teamwork, Communication, Transparency, Growth

Our Responsibilities:

- Reinforce the integral role of nutrition in all aspects of human biology, health, and disease
- Coordinate nutrition research across the NIH
- Advise NIH leadership and other key officials on matters related to nutrition research
- Lead interagency committees and working groups on matters related to nutrition research
- Produce the biennial NIH Nutrition Research Report

Our Guiding Principles:

- Food and nutrition are central to the human experience

- Nutrition is more than food
  - Nutrition connects the foods we eat to our overall health (physical and mental)
    - Soil/land/water → food → metabolites → biological function → health

- The biology of nutrition touches every cell and system in our bodies – at every age and stage across the lifespan – and is inextricably linked to all aspects of health and disease

- Nutritional status is a fundamental biological variable – like age and sex – reflecting its intimate and inextricable role in *all* biological systems and is both an *input* and an *outcome* of health and disease

- Nutrition is disease agnostic

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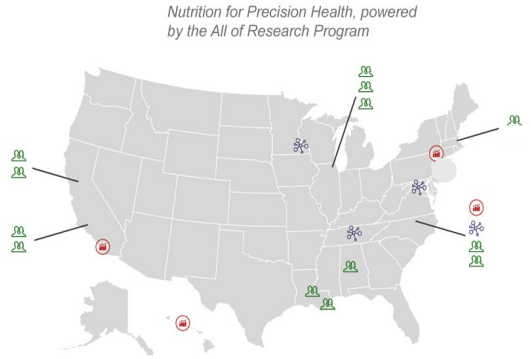
Office of Nutrition Research

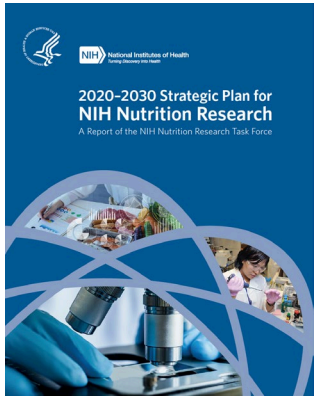
Our Value-Added

National Institutes of Health
Office of Nutrition Research

Our Major Accomplishments:

- Scientific lead and coordinator for the *Nutrition for Precision Health (NPH), powered by the All of Us Research Program*
  - The largest single national investment in nutrition research (~$200M over 5 years; 2022-2027)
- Lead the implementation of the *2020-2030 Strategic Plan for NIH Nutrition Research*
- Concept clearance granted for a Food is Medicine Centers of Excellence Program (2023)
- Lead for the NIH-wide ultra-processed food working group
- Launched the Advanced Training in Artificial Intelligence for Precision Nutrition Science Research (AIPrN) – Institutional Research Training Program





Coming soon: the ONR FY 2026-2030 Strategic Plan

- Overarching strategic goals
  - Advance Science: Rigor, Reproducibility, Precision
  - Support the Generation of Evidence to Address Priority Diet, Nutrition, and Health Outcomes
  - Build Capacity and Strengthen the Field of Nutrition Science
  - Foster Stewardship, Collaboration, Transparency, and Accountability in Nutrition Science Research
- Cross-cutting strategic priorities
  - Training and Development
  - Optimizing Nutrition Across the Lifespan

Other ONR Activities:

- Interagency Committee on Human Nutrition Research (ICHNR)
- President's Council of Advisors on Science and Technology (PCAST)
- United States Domestic Policy Council (DPC)
- White House Nutrition Interagency Policy Council (IPC)
- HHS Food is Medicine (FIM) Working Group
- NIH-FDA Joint Leadership Council's Joint Agency Nutrition Working Group (JAN)
- Intersection of climate/environmental change (CEC), food systems, nutrition, and health
- Cancer Moonshot 2.0
- National Collaborative on Childhood Obesity Research (NCCOR)
- NIH-Gates Foundation Working Group on Nutrition
- Advanced Training in Artificial Intelligence for Precision Nutrition (AIPrN) Science Research – Institutional Research Training Program
- Global Nutrition Coordination Plan 2.0 (2021-2026)
- Nutrition Research Coordination Committee (NRCC)
- Healthy People 2030 Nutrition and Weight Status Working Group
- Multiple USG nutrition-related efforts
- Multiple OD Office Coordinating Committees
- Workshops and partner engagement

And others…

National Institutes of Health
Office of Nutrition Research

Teaching Kitchen Programs at NIH

Launched – Oct 2024

The Children's Inn at NIH

The NIH Clinical Center

National Institutes of Health
Office of Nutrition Research

Teaching Kitchen Programs at NIH

National Institutes of Health
Office of Nutrition Research

Stay Connected to the Office of Nutrition Research

- E-mail updates
  - ONR happenings
  - Upcoming nutrition-related events (i.e., workshops, webinars, seminars, etc.)
  - NIH Notice of Funding Opportunities (NOFOs)
  - Other relevant updates

ONR Listserv

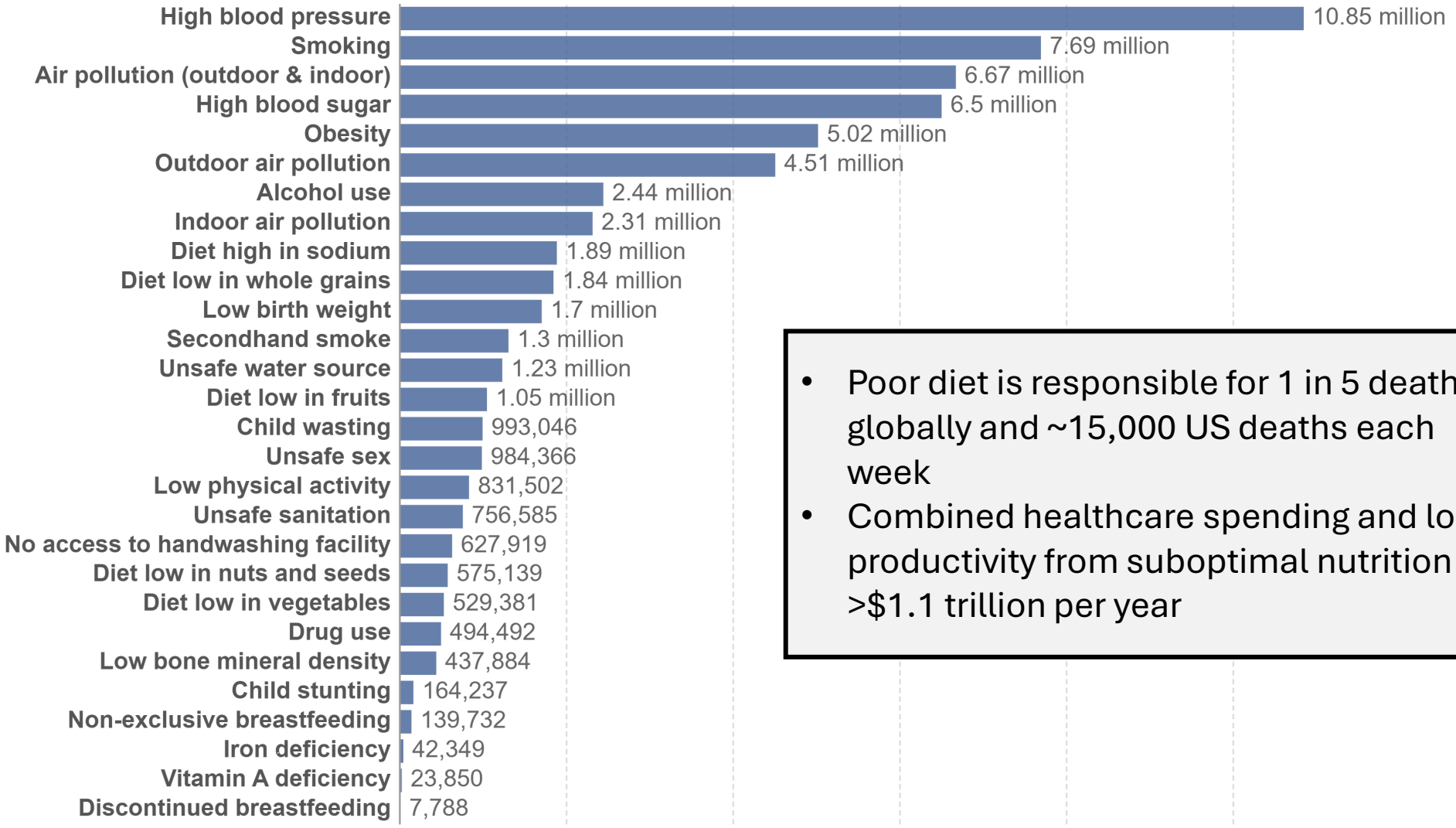
ONR Website

Just go to the ONR Home Page:
https://dpcpsi.nih.gov/onr

And click on the "Get Updates" button!

Precision Nutrition

We are facing an urgent nutrition-related health crisis



- Poor diet is responsible for 1 in 5 deaths globally and ~15,000 US deaths each week
- Combined healthcare spending and lost productivity from suboptimal nutrition >$1.1 trillion per year

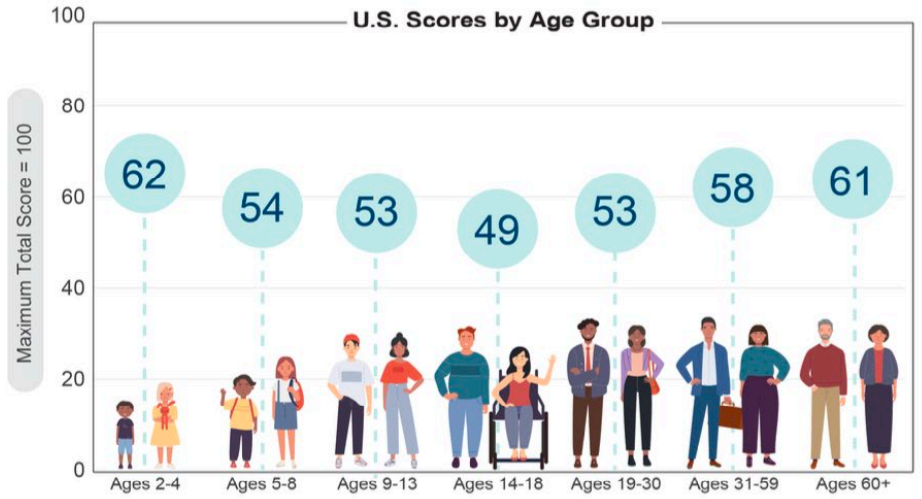
Source: THE INSTITUTE FOR HEALTH METRICS AND EVALUATION, Global Burden of Disease (2019)

Why precision nutrition?

Food is at the epicenter of health and disease. But clinical nutrition is still limited to a one-size-fits most approach.

USDA U.S. DEPARTMENT OF AGRICULTURE

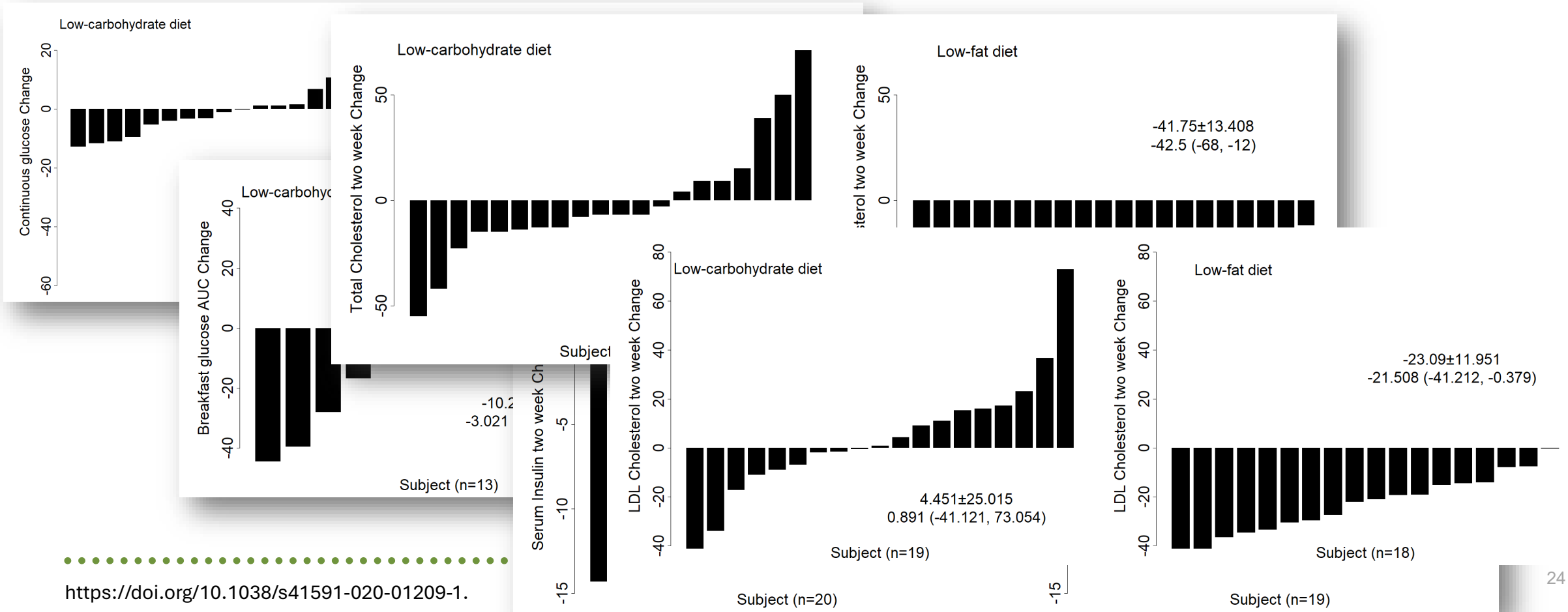
How Healthy Is the American Diet?



This is not an issue with dietary adherence

Effect of a plant-based, low-fat diet versus an animal-based, ketogenic diet on ad libitum energy intake

nature medicine



https://doi.org/10.1038/s41591-020-01209-1.

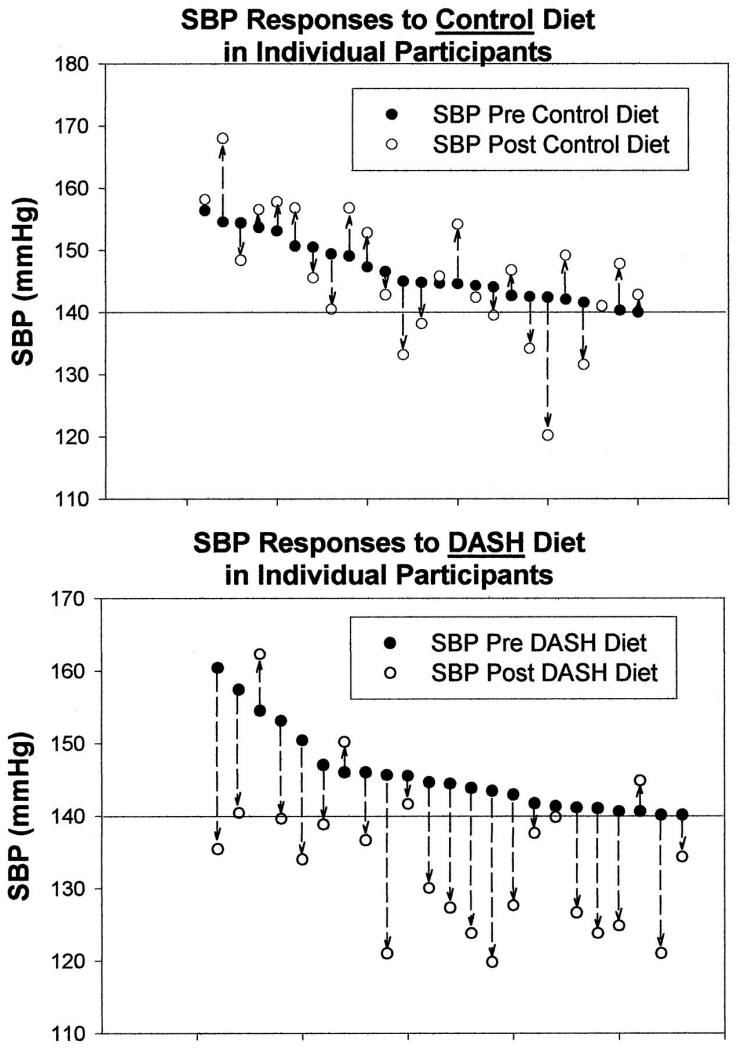
What you should eat on DASH

- Vegetables (fresh or frozen)
  4–5 servings daily
- Fruits (whole fruits)
  4–5 servings daily
- Low fat or nonfat dairy foods
  2–3 servings daily
- Meats, poultry, and fish
  2 or less servings daily
- Grains and grain products
  7–8 servings daily
- Nuts, seeds, and legumes
  4–5 servings per week
- Control sodium intake
  (~2300 mg/day)

Benefits of DASH

- **Lowers blood pressure** more effectively than the other diets
- Drop in blood pressure in people who had hypertension was **equal to that found with medications**
- Effective in **all groups of people studied** (men, women, Black, white, people with normal and high blood pressure)
- **Lowered total cholesterol and LDL cholesterol** (bad cholesterol) compared those on a regular diet
- DASH diet **did not increase triglycerides** even though carbohydrates were increased

Interindividual variability



Hypertension

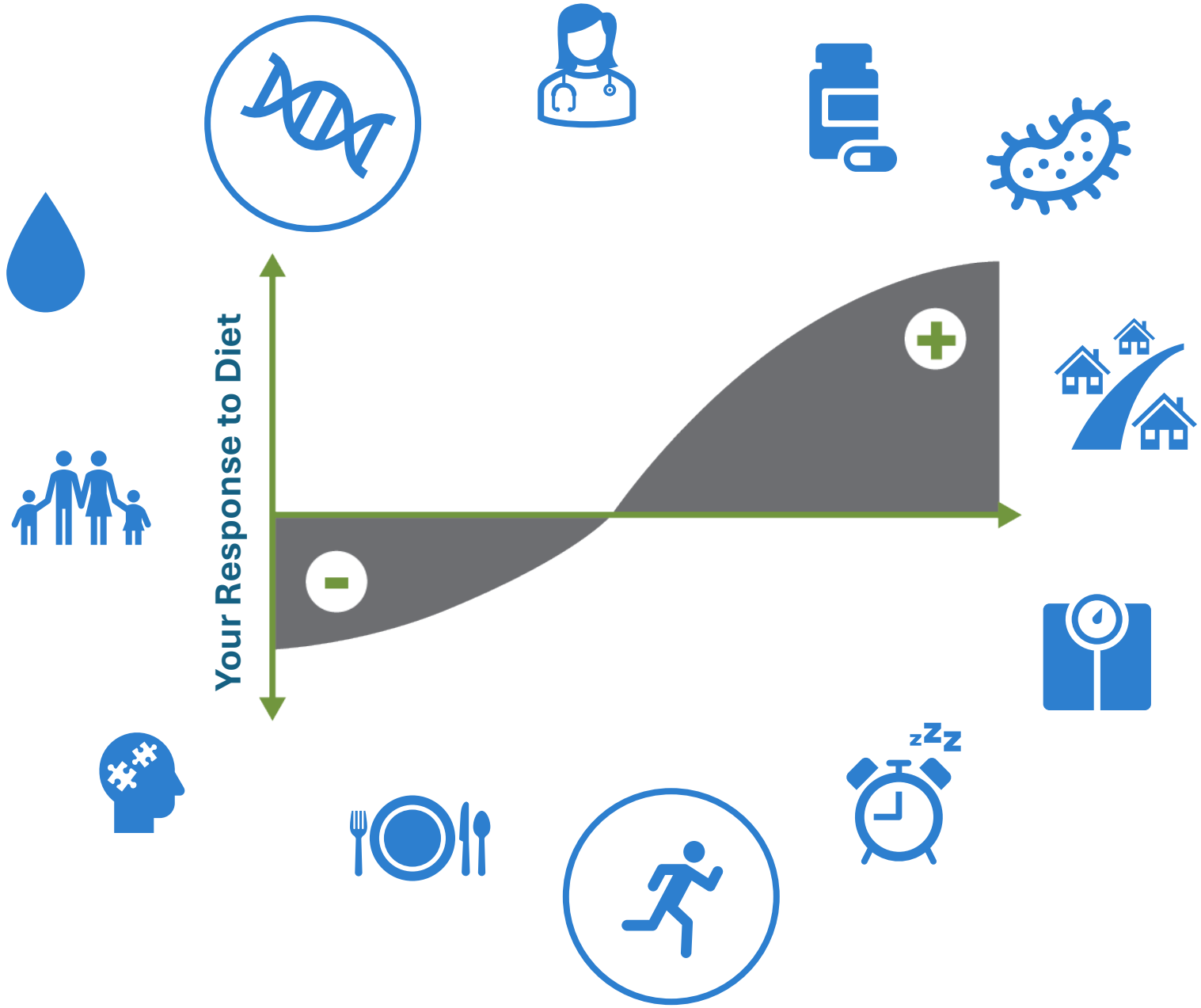
DASH (Dietary Approaches to Stop Hypertension) Diet Is Effective Treatment for Stage 1 Isolated Systolic Hypertension

Thomas J. Moore, Paul R. Conlin, Jamy Ard, Laura P. Svetkey and for the DASH Collaborative Research Group

Originally published 1 Aug 2001 | https://doi.org/10.1161/01.HYP.38.2.155 | Hypertension. 2001;38:155–158

confidence interval, -2.5 to -13.4 mm Hg; P<0.01). Overall, blood pressure in the DASH group fell from 146/85 to 134/82 mm Hg. Similar results were observed with 24-hour ambulatory blood pressure measurements. In the DASH diet group, 18 of 23 participants (78%) reduced their systolic blood pressure to <140 mm Hg, compared with 24% and 50% in the control and fruits/vegetables groups, respectively. Our results indicate that the DASH diet, which is rich in fruits, vegetables, and low-fat dairy foods, is effective as first-line therapy in stage 1 ISH.

Diets do not affect everyone the same



Precision nutrition is possible

Personalized Nutrition by Prediction of Glycemic Responses

David Zeevi,[1,2,8] Tal Korem,[1,2,8]
Orly Ben-Yacov,[1,2] Dar Lador,[1,2]
Elad Matot,[1,2] Gal Malka,[1,2] Noa
Meirav Pevsner-Fischer,[3] Rony

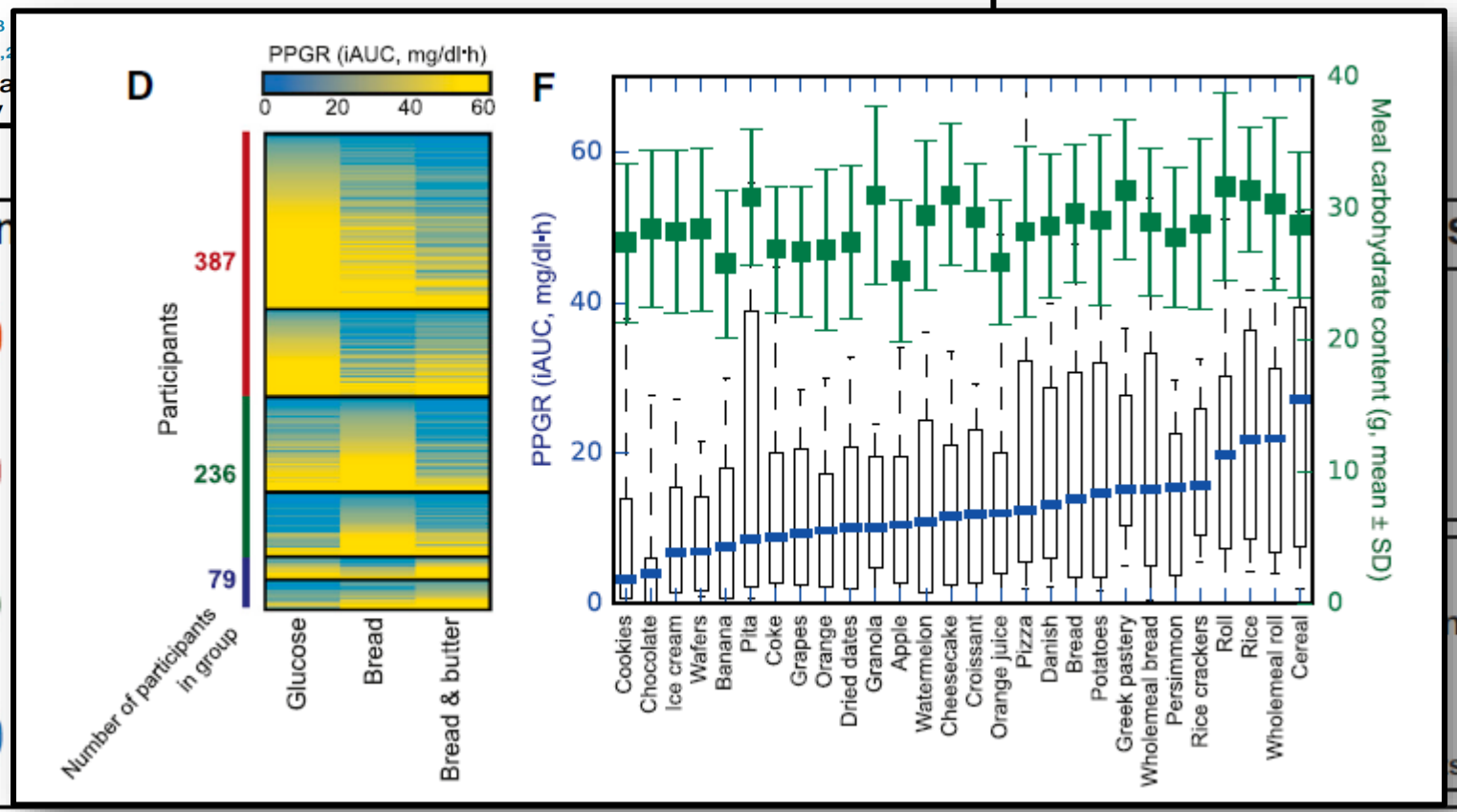
Per person profilin

Gut microbiome
16S rRNA
Metagenomics

Blood tests

Questionnaires
Food frequency
Lifestyle
Medical

Anthropometrics



Source: Zeevi et al., *Cell* 163:1079-1094 **2015**

Precision nutrition is possible

joinzoe.com

Home How It Works Results & Reviews zoe Why ZOE? Our Science Library FAQs

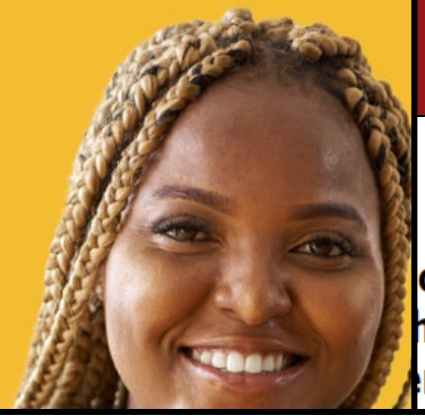
Understand how food affects *your body*.

Get started →

Gut microbiome
Good

Blood fat
Excellent

Blood sugar
Good



nature medicine

M … cale high-resolution studies are lacking. We re … he PREDICT 1 study and assessed postpran- di … r-individual variability (as measured by the po …) an … % of … d 15.4%, respectively); genetic variants had a modest impa… r C-peptide). Findings were independently validated in a U… el that predicted both triglyceride (r = 0.47) and glycemic (r… e for developing personalized diet strategies. The ClinicalTr…

Complete your tests

Easy, at-home tests give us an inside look at your blood fat, blood sugar, and gut microbiome health.

Get your ZOE Scores

Using your results, we score every food (from 0-100), so you can make better choices of what to eat.

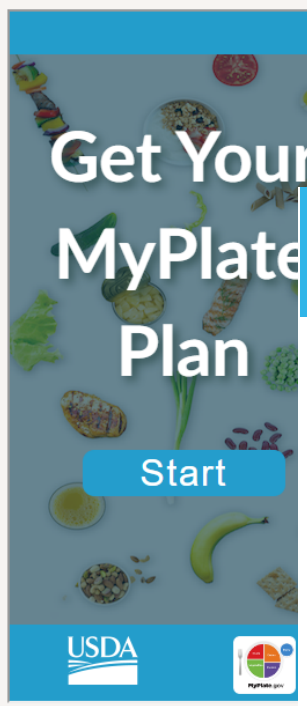
Build new habits

We teach you how to swap, add and combine foods so you can eat in the best way for your body.

Boost your health

Feel more energised and improve your long-term health while eating more of the foods you love.

Precision nutrition is happening



MyPlate Plan

The MyPlate Plan shows your food group targets – what and how much to eat within your calorie allowance.

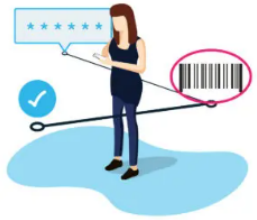
myDNA™

HOW IT WO

The test is simple, quick, and non-

Swab your cheek

Your non-invasive cheek swab can be carried out in the privacy and comfort of your own home.



Activate your barcode

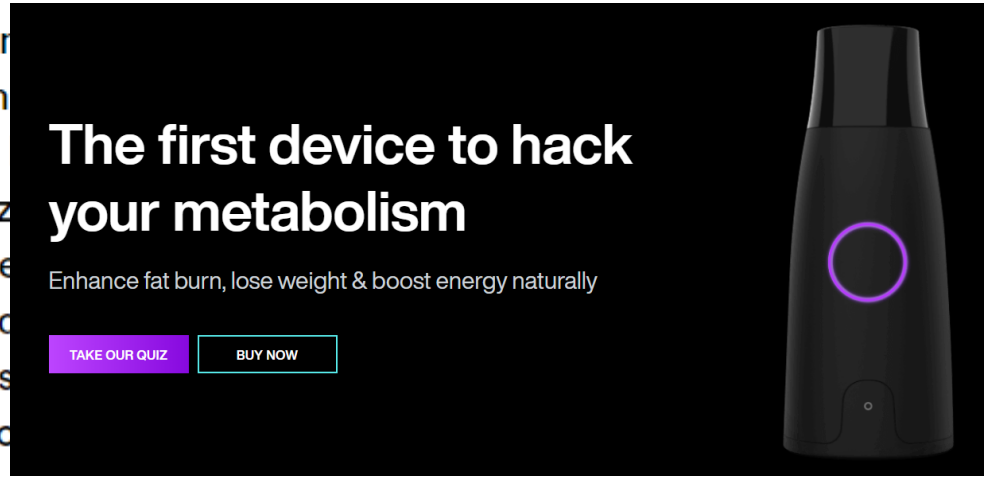
Link your sample to your account by activating your barcode, then mail it back to our lab for analysis.

habit
FOOD, PERSONALIZED®
A VIOME® COMPANY

STEP 1

ANSWER A FEW QUESTIONS ABOUT YOUR HEALTH

When it cor
food recom
Test! Habit
tests analyz
generate pe
recommend
insights bas
and gut mic



Why now? Why NPH?

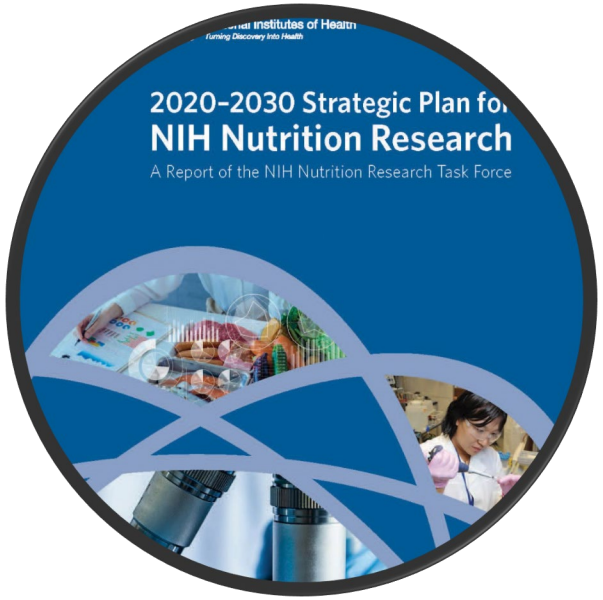
Precision nutrition is **needed**	Nutrition is not one-size-fits-all, and responses vary by individual.
Precision nutrition is **possible**	Past studies demonstrated proof of principle but relied on homogenous populations not reflective of people living in the U.S.
Precision nutrition is **happening**	Precision nutrition companies are operating, though not disclosing their evidence base.

For the science to catch up to the need, we need to:

- uncover the **factors underlying interindividual variability**
- better understand their **interactions**
- study a **large number** of individuals from **all walks of life**

With the end goal of developing more targeted algorithms for individualized dietary guidance to **prevent, manage, and treat diet-related chronic disease**

Nutrition for Precision Health overview



First major initiative to advance the goals of the 2020-2030 Strategic Plan for NIH Nutrition Research

All of Us RESEARCH PROGRAM

First major ancillary study to the *All of Us* Research Program

NIH The Common Fund

First Common Fund program with primary and central focus on nutrition research

15 awards across the United States

All of Us Research Program

Mission: To accelerate health research and medical breakthroughs, enabling individualized prevention, treatment, and care for all of us

Nurture relationships with one million or more participant partners, from all walks of life, for decades

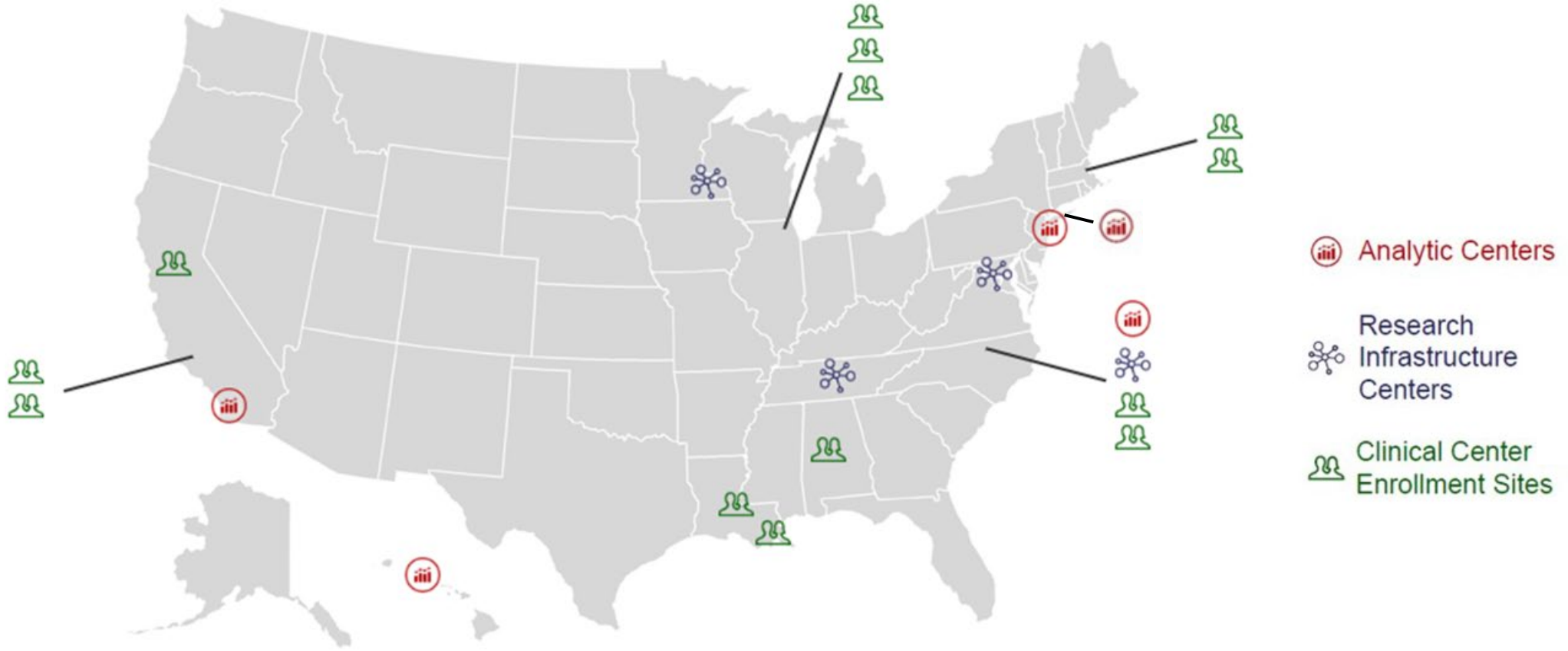
Deliver the largest, richest biomedical dataset ever, making it as easy, safe, and free to use as possible

Catalyze a robust ecosystem of researchers and funders hungry to use and support it

Build and maintain a strong All of Us Team capable of achieving the program's mission

https://allofus.nih.gov/

NPH awardees



Nutrition for Precision Health

Overall goal: To develop **algorithms to predict individual responses** to foods and dietary patterns

- A **comprehensive set** of microbiome, genomic, physiological, metabolic, behavioral, cognitive, contextual, electronic health record, survey, and environmental data will be used.
- A **large and diverse population** of participants (*All of Us* Research Program) will participate.

NPH protocol

All of Us RESEARCH PROGRAM

Habitual Intake

Module 1
n >8,000

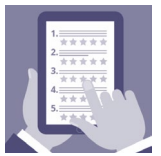
Community Dwelling Controlled Feeding Study

Module 2
n >1,200

Domiciled Controlled Feeding Study

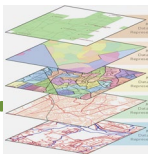
Module 3
n = 150



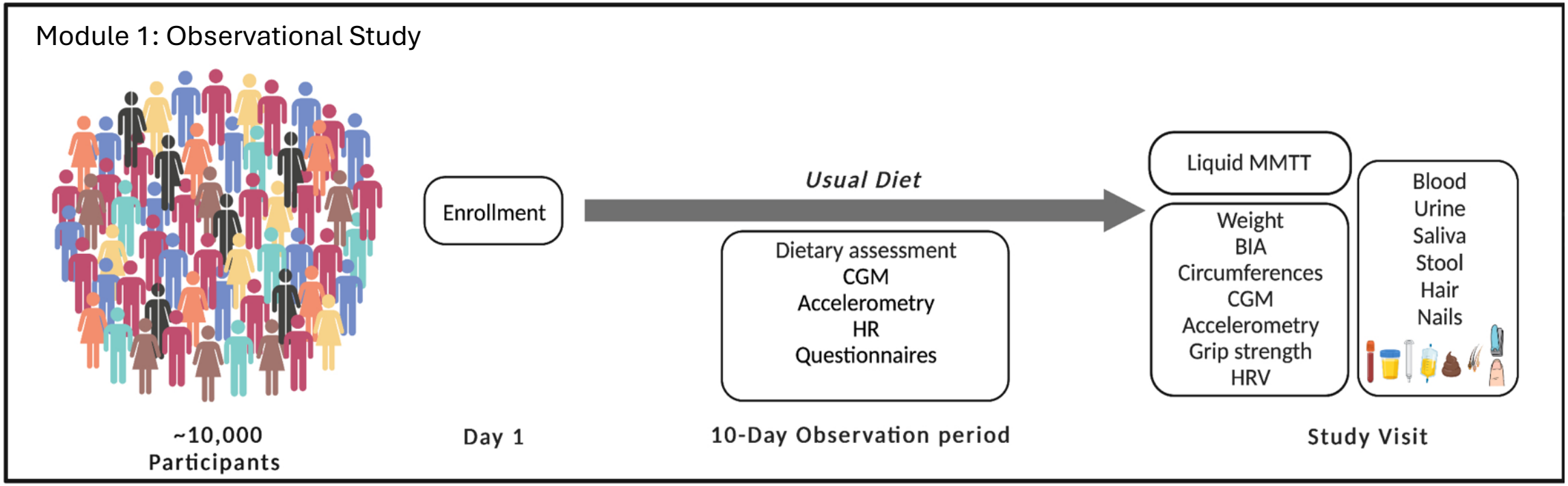







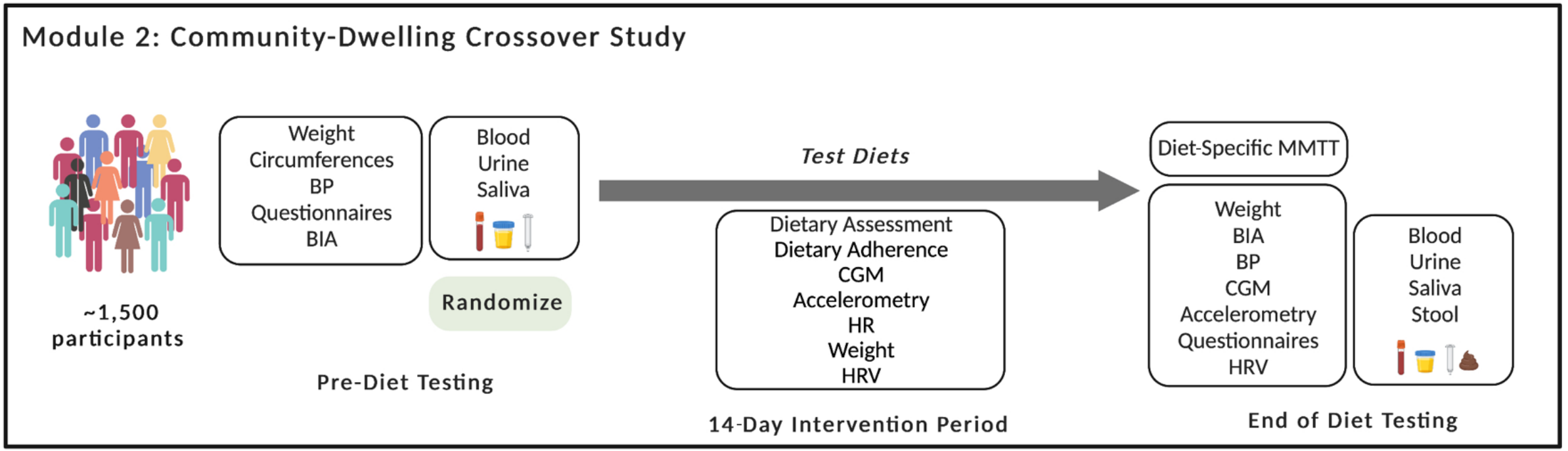
Module 1: Overview of study design



n >≈ 8,000

Participants' dietary intake and accompanying nutritional status, biological measures, and other factors will be observed over 10 days. Physiological responses to a liquid mixed meal tolerance test also will be measured.

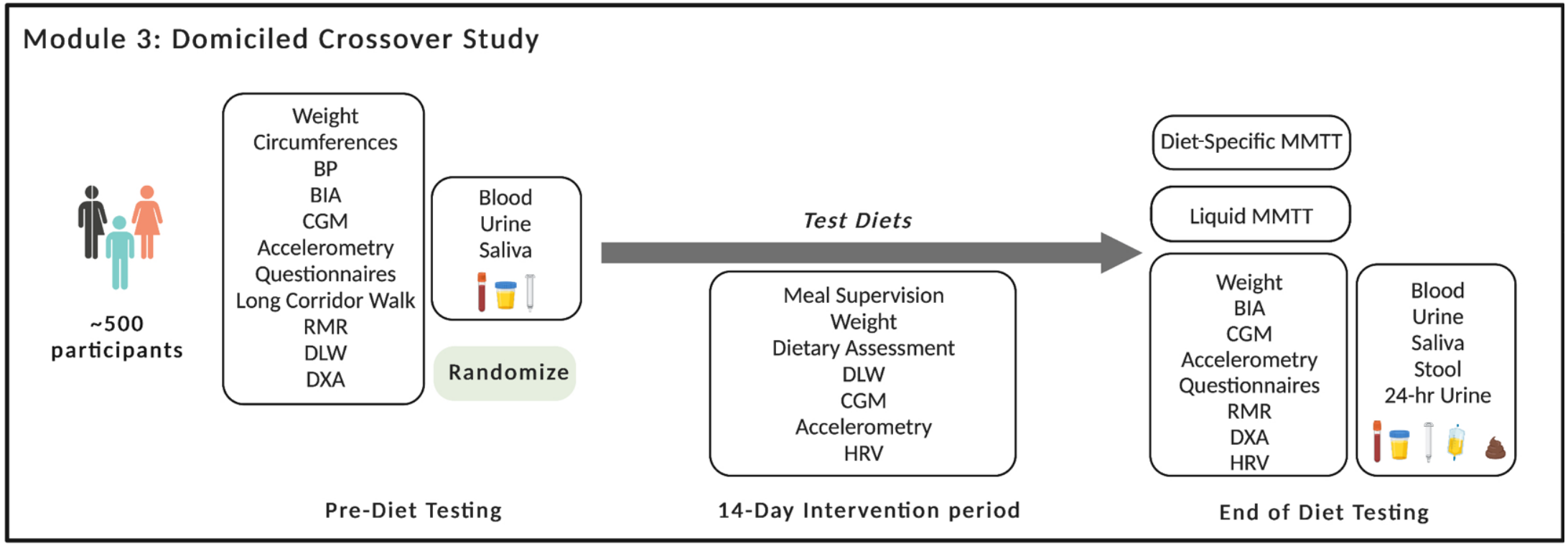
Module 2: Overview of study design



n >≈ 1,200

Participants will undergo **three controlled dietary interventions** for 14 days each, separated by washout periods of at least 14 days. Physiological responses following a **diet-specific meal test** also will be measured.

Module 3: Overview



n ≈ 500

While being studied in-residence, **participants will undergo the same three dietary interventions** during the same 14-day periods as Module 2. Physiological responses following a **liquid mixed meal tolerance test** and a **diet-specific meal test** also will be measured.

The NPH provided diets for modules 2 and 3

Blue

High amounts of fruits/vegetables, whole grains, and beans; moderate amounts of dairy, meat/poultry/eggs, fish, nuts/seeds, and vegetable oils; very low amounts of sugar-sweetened drinks and desserts.

Purple

High amounts of refined grains, meat/poultry/eggs, sugar-sweetened drinks, sweets, snacks, desserts, and processed foods; a moderate amount of dairy; low amounts of fruits/vegetables, whole grains, and fish.

Orange

Moderate-high amounts of vegetables, meat/poultry/eggs, fish, nuts/seeds, and fats/oils; low amounts of fruits and dairy; very low amounts of grains and sugars.

Interventions & assessments

Measure	Module		
	1	2	3
Test diet interventions		✓	✓
Liquid mixed meal tolerance test	✓		✓
Diet-specific mixed meal tolerance test		✓	✓
Questionnaires	✓	✓	✓
Dietary assessments	✓	✓	✓

Physical measures

Measure	Module		
	1	2	3
Vital signs	✓	✓	✓
Anthropometrics (height, weight, waist, hip, thigh circumferences)	✓	✓	✓
Activity + sleep + heart rate variability	✓	✓	✓
Continuous glucose monitoring	✓	✓	✓
Bioelectrical impedance analysis (% fat)	✓	✓	✓
DXA (%fat and fat-free mass)			✓
Doubly labeled water analysis			✓
Resting metabolic rate			✓
400m corridor walk			✓
Grip strength	✓		

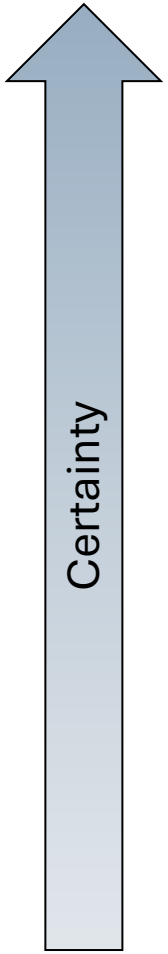
Precision nutrition in practice

Precision nutrition for RDNs

Precision nutrition for public health

Integrating precision nutrition with Food is Medicine paradigm

Potential next steps after NPH



- Broad sharing of NPH findings
- Validation of algorithms
  - Can targeted dietary guidance based on NPH algorithms produce desired health results?
  - Targeted follow up studies
- Consideration of NPH findings for public health dietary guidelines
- Incorporation of NPH findings into clinical practice
  - Additional questions at intake
  - Additional lab tests

Implementation of precision nutrition in the clinic

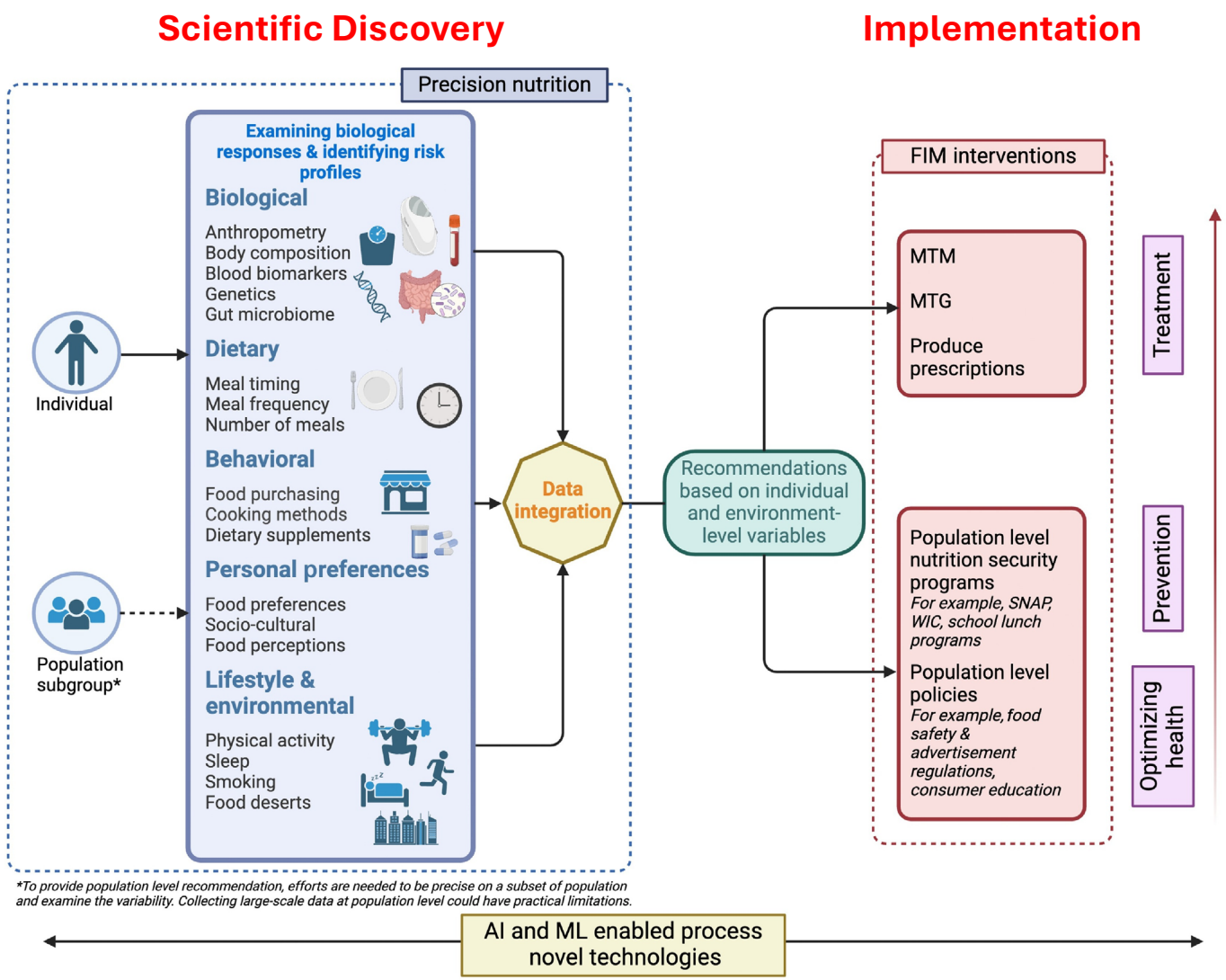
- Currently, RDNs and other professionals consider
  - Patient demographics
  - Medical history
  - Goals
  - Patient preferences and abilities
  - Potential for adherence
  - Much more
- Will addition of more personalized/precision factors:
  - Better help patients get the desired health response?
  - Be more burdensome for the practitioner and/or patient?
  - Help the patient feel more empowered to follow advice/dietary plans?

Implementation of precision nutrition in public health guidance

- Currently, DGAs consider age, sex, weight, dietary preferences, culture, and budget
- If newly identified predictors may account for more interindividual variability, they could be additional factors for personalization

How can precision nutrition benefit everyone?

- Build a strong evidence by studying a broad set of potential predictors in a large and diverse population
  - Demographic
  - Health status
  - Access to care
- Consider predictors that are easy, simple, or inexpensive to measure
  - Questionnaires
  - Point-of care technologies
- Goal to optimize health



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Sinha S et al. Trends Endocrinol Metab 2024 Sep 27:S1043-2760(24)00251-0.

National Institutes of Health
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Questions? Thank you!