



Food is Medicine: Dietary Priorities and Policy Actions

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Dean

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NOPRENetwork State of the Science Series

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The Global Nutrition Crisis



Health and wellbeing
Hunger, disparities
Health care costs and access
Government budgets
Private business, economic growth
Sustainability and climate change
National security

Our Food: The #1 Cause of Poor Health

Risk Factors

Dietary risks

Tobacco smoking

High blood pressure

High body mass index

Physical inactivity and low physical activity

High fasting plasma glucose

High total cholesterol

Ambient particulate matter pollution

Alcohol use

Drug use

Lead exposure

Occupational risks

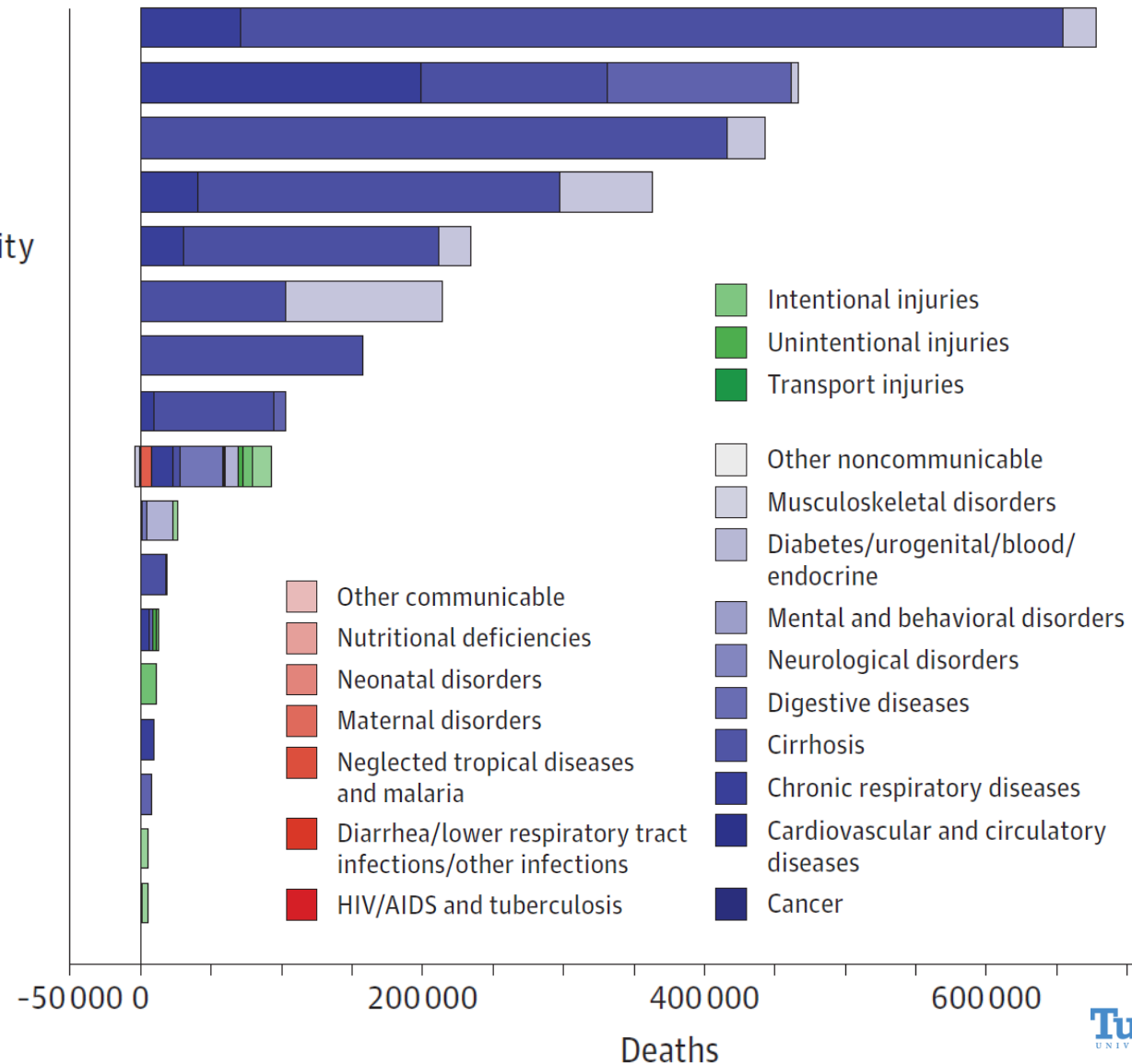
Low bone mineral density

Residential radon

Ambient ozone pollution

Intimate partner violence

Childhood sexual abuse



US Burden of Disease
Collaborators, JAMA 2013

Americans Are Sick – Really Sick

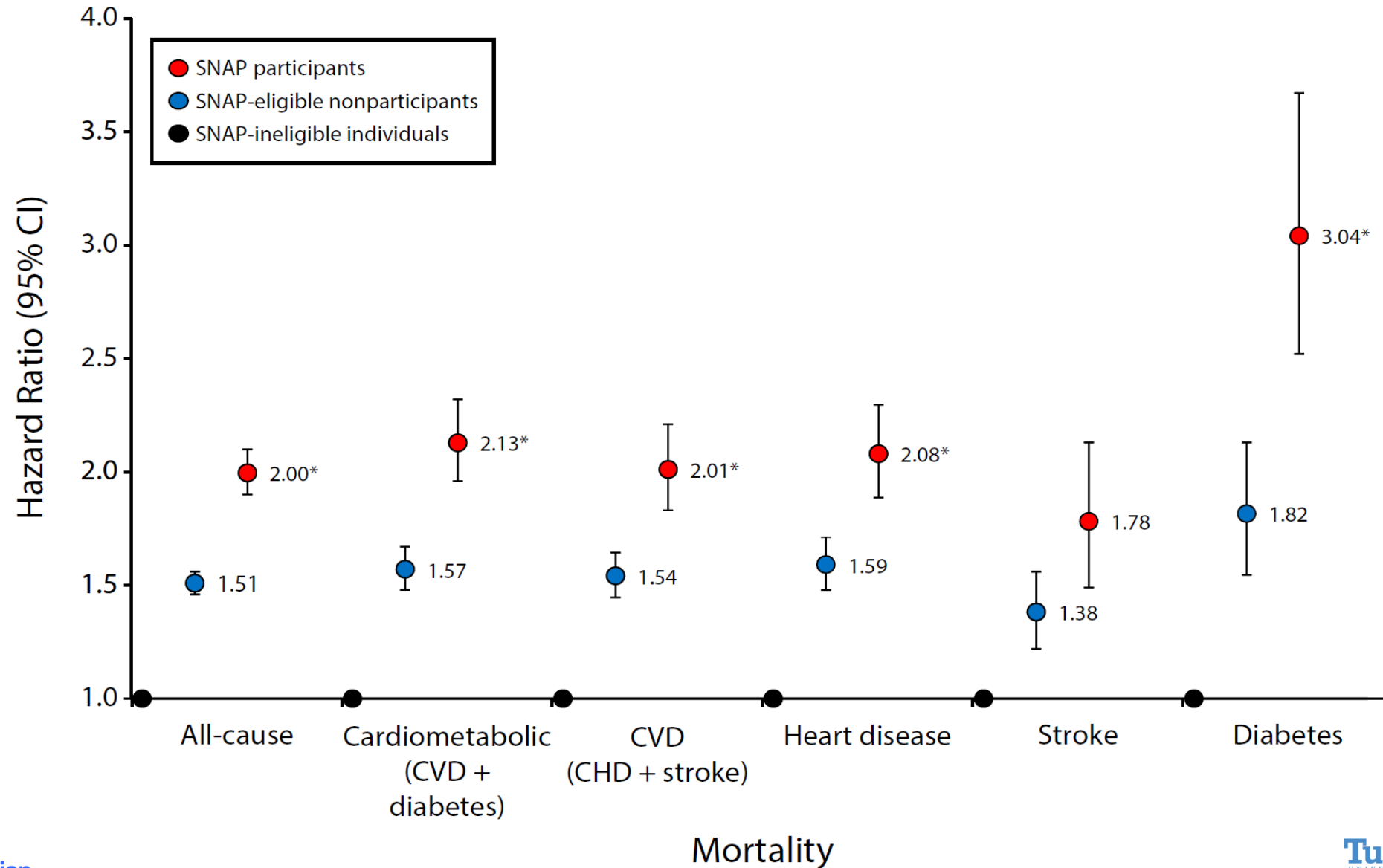
- More Americans are **sick** than are healthy
 - **Half** of adults have **diabetes or prediabetes**.
 - **More than half** have **cardiovascular disease**, causing 841,000 deaths each year – **2,300 deaths each day**.
 - **3 in 4** adults are **overweight or obese**.
- Tremendous economic costs
 - Healthcare costs have skyrocketed **from** :
 - **5%** to **28%** of the total federal budget
 - **5%** to **29%** of total state budgets
 - **\$79 billion** to **\$1.2 trillion** for US businesses
 - **\$11,100** per person in the US

Centers for Medicare & Medicaid Services, 2018

American Heart Association, *Heart Disease and Stroke Statistics*, 2018

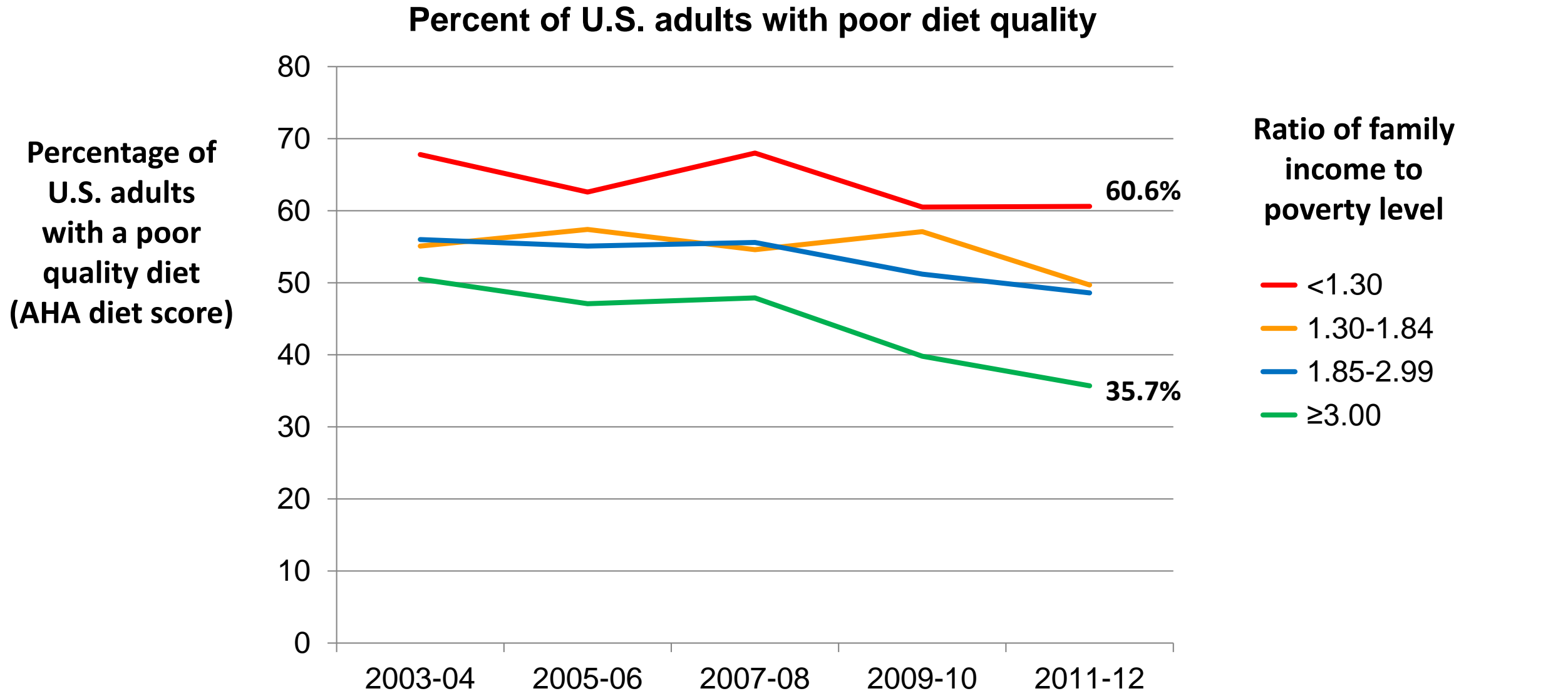
The Milken Institute, *America's Obesity Crisis*, 2018

Major Diet-Related Health Disparities

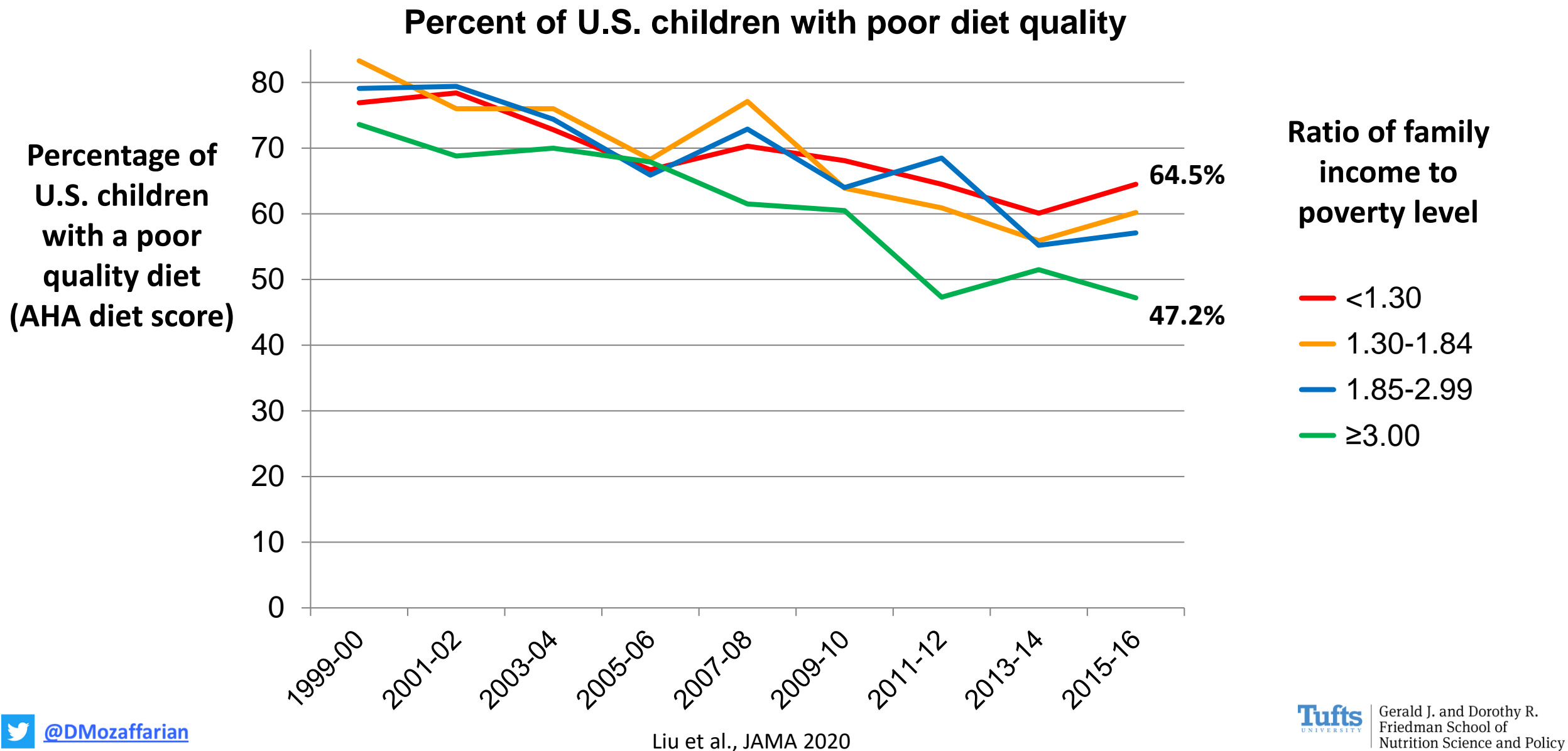


Conrad et al.,
AJPH 2017

Major Dietary Disparities: U.S. Adults

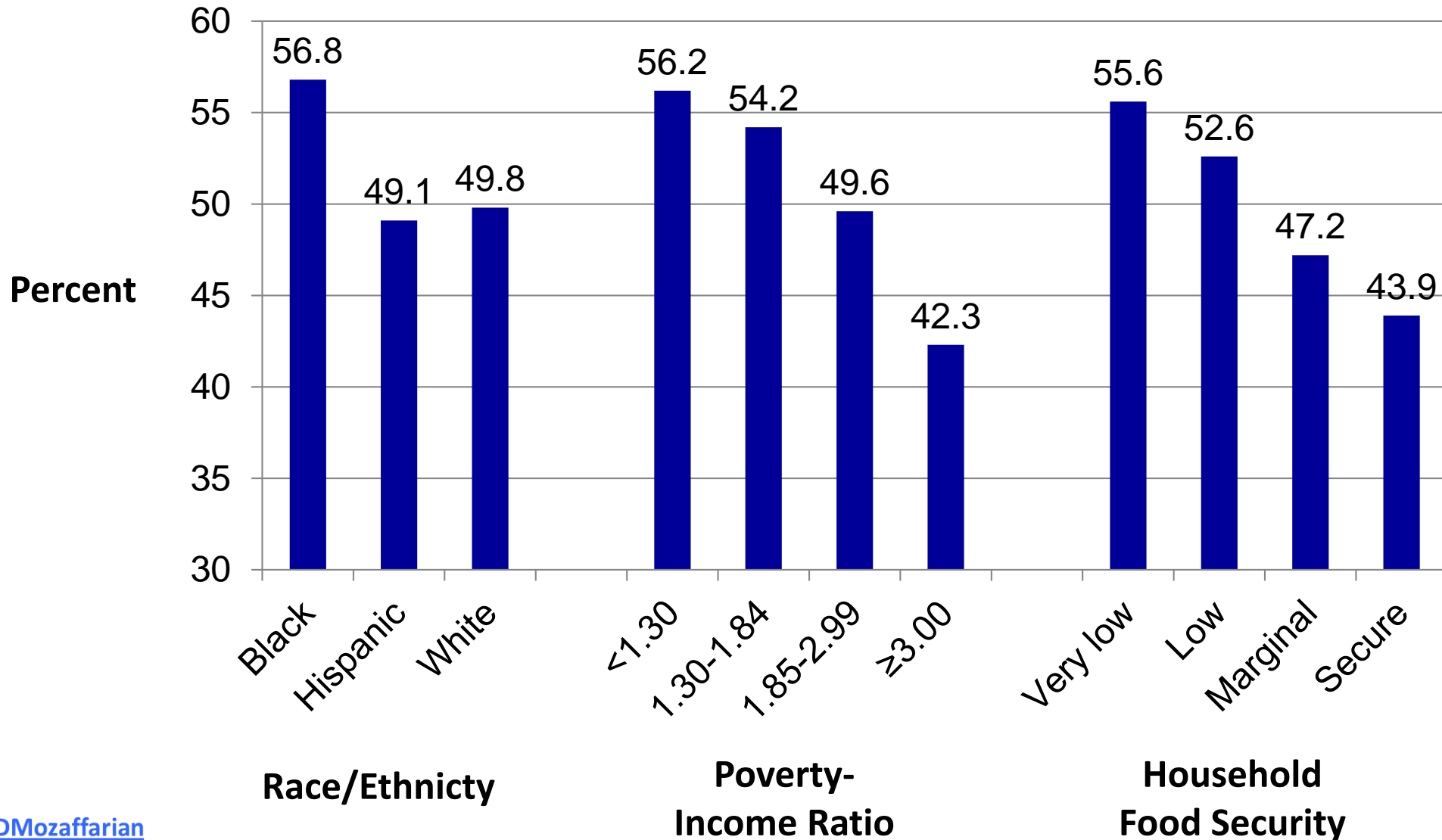


Major Dietary Disparities: U.S. Children



Major Dietary Disparities in the U.S.

Percentage of U.S. children with poor diet quality, 2015-16



Liu et al.,
JAMA 2020

Nutrition and COVID-19

www.cnn.com/2020/03/27/opinions/healthy-diet-immune-system-covid-19-mozaffarian-glickman-nikbin-meydani/index.html

thehill.com/opinion/healthcare/490183-the-fight-against-covid-19-a-need-for-soft-power-in-health-care



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IMMUNITY



Bending the curve, including decreased spread and reduced severity of infection and hospitalization from COVID-19

FOOD INSECURITY



Addressing the tremendous rise in food insecurity from lost jobs and closed schools

CO-MORBID RISKS



Rapidly improving metabolic risks like diabetes and cardiovascular disease, from which the great majority of US adults suffer and major risk factors for poor outcomes from COVID-19

SENIORS



Addressing hidden hunger, poor access, and nutrient deficiencies which predispose older Americans to COVID-19 infection and death

DISPARITIES



Understanding and tackling the intersections of risk among the most vulnerable

SUPPLY CHAINS



Ensuring stable production and supply chains from farm to table of nutritious and affordable foods, while reducing food waste and protecting food system workers

JOBS & THE ECONOMY



Improving the economic resilience of our farmers, rural communities, and restaurants

PUBLIC OUTREACH & ENGAGEMENT



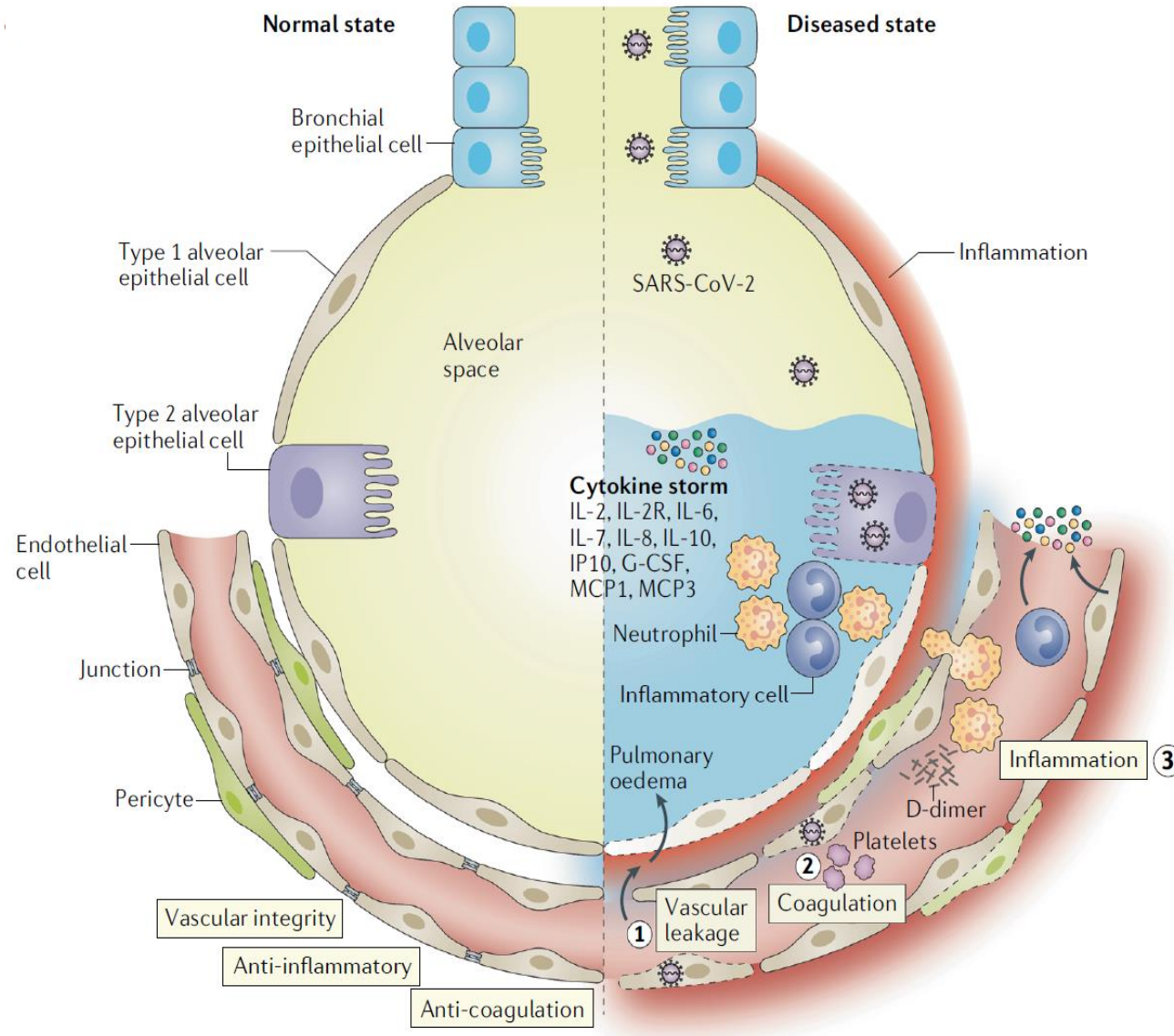
Developing and disseminating timely, accurate information on each of these issues through effective communications and engagement approaches

SCIENCE



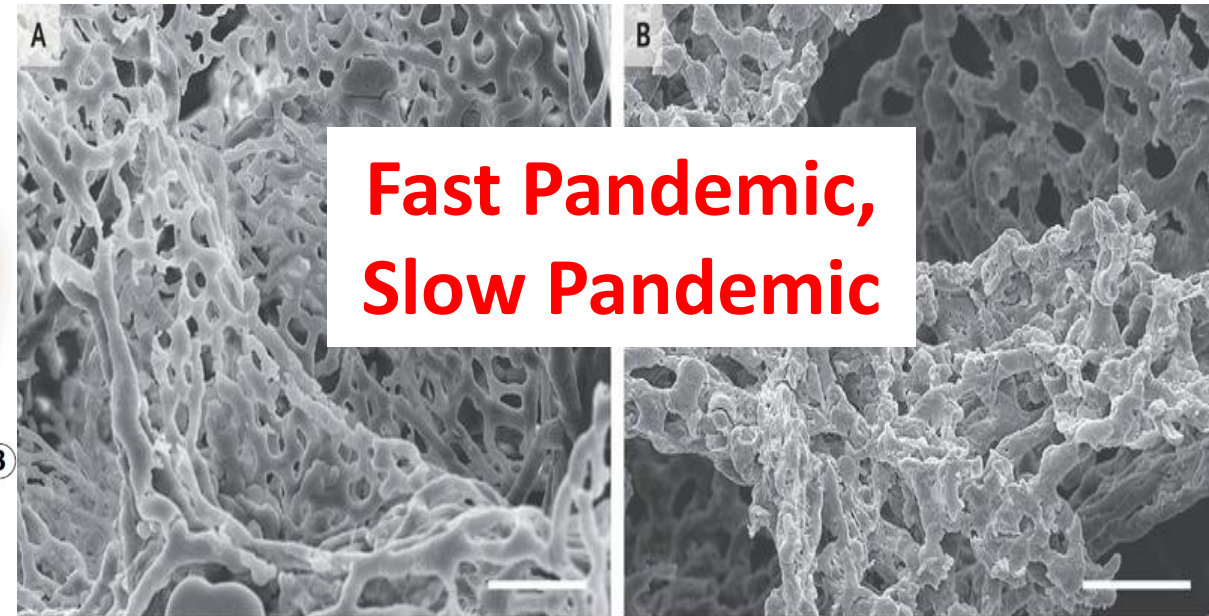
Accelerating discoveries on each of the issues above

COVID-19: A Vascular, Inflammatory Disease



Diet-related diseases with **endothelial dysfunction** and **systemic inflammation** linked to **far worse outcomes** from COVID-19:

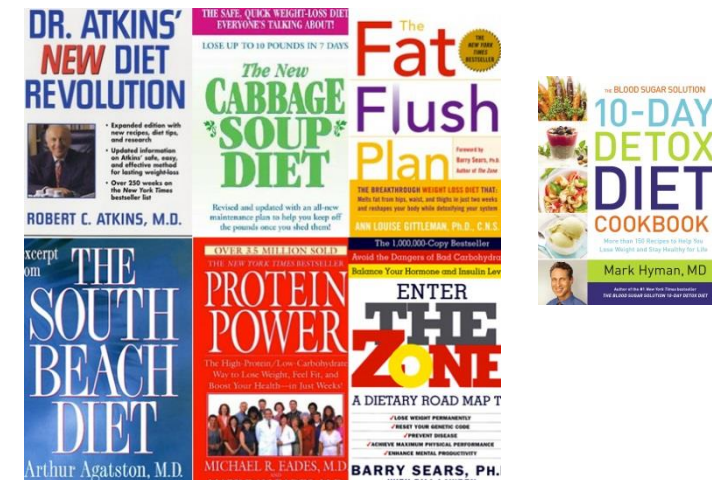
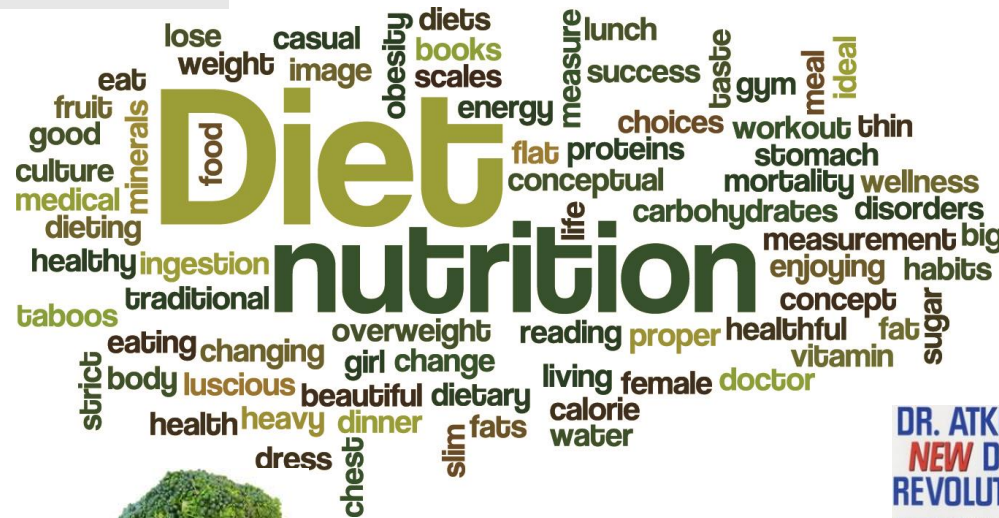
→ diabetes, obesity, hypertension



Teuwen et al., 2020 Nat Rev Immun

Ackermann et al., 2020 NEJM

Real Time with Bill Maher, June 12, 2020



Source: Google images

What is Driving Policy and Public Choices ?

Policy Makers:

- Total fat
- Saturated fat
- Cholesterol
- Total calories
- Added sugar

The Public:

- Clean labels
- Natural
- Gluten-free
- Organic
- Local
- Paleo
- Low-carb
- Plant-based
- Vegetarian

Reductionist Focus Permeates U.S. Nutrition Policy



National School
Lunch Program



Nutrition Facts	
8 servings per container	
Serving size	2/3 cup (55g)
Amount per serving	
Calories	230
% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 160mg	7%
Total Carbohydrate 37g	13%
Dietary Fiber 4g	14%
Total Sugars 12g	
Includes 10g Added Sugars	20%
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%
<small>* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.</small>	

New Nutrition
Facts Panel

1 Chicken Salad



720
calories

3 Hamburgers



660
calories

Restaurant Menu
Calorie Labeling



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Reductionist Focus Permeates International Policy

United Kingdom: Front-of-pack “traffic light” label

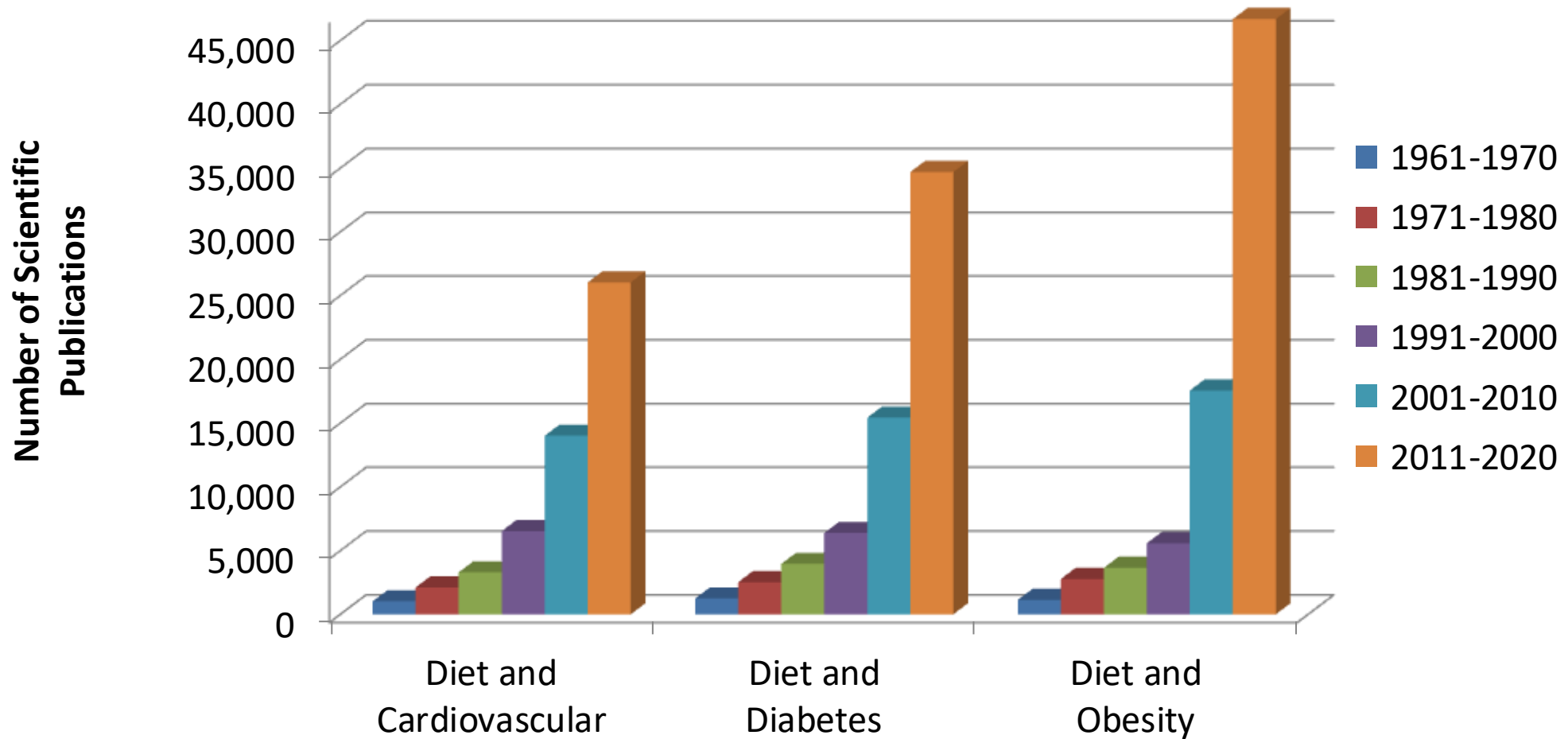


Mexico: “Black box” warning labels



Chile: “Black box” warning labels

Explosion of Nutrition Science

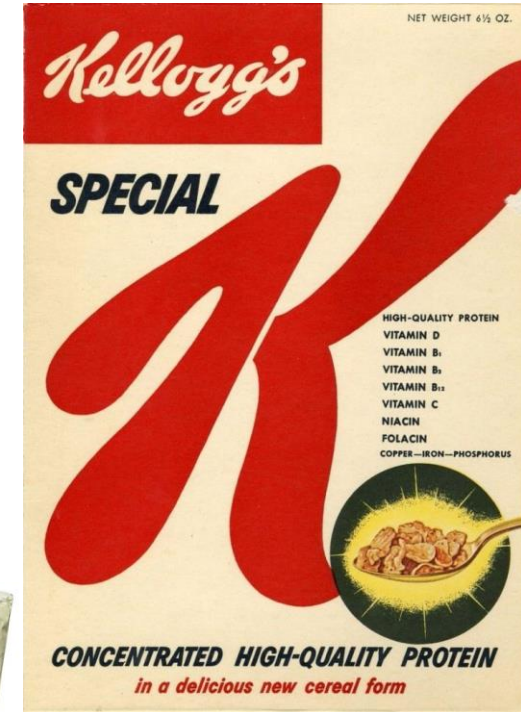


Source: Pubmed/Medline
(through Sep 2020)

Single Nutrients, Fat, Calories – *Misleading*



- Low calorie = “Less weight gain”
- Fat free = “Healthy”
- Low saturated fat = “Healthy”
- Vitamin fortified = “Good for you”



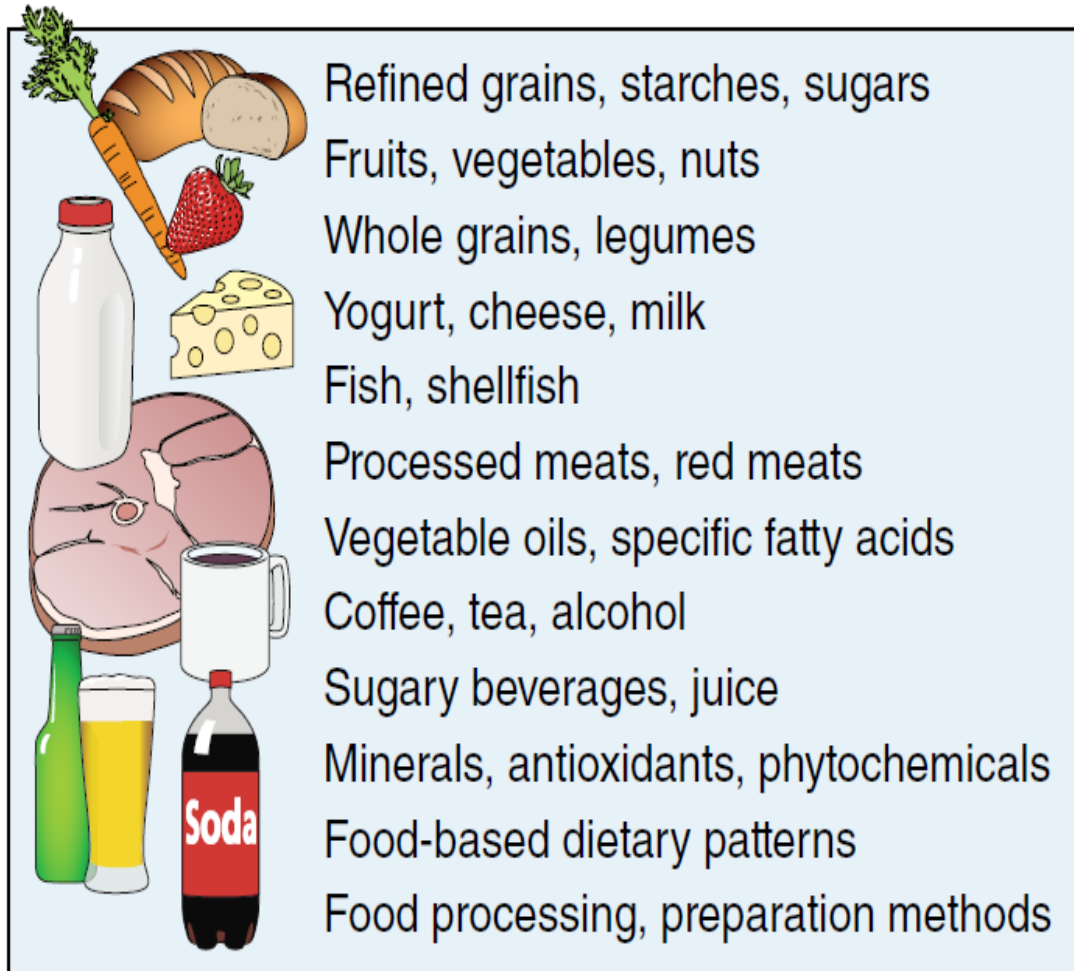
Food and Obesity – More than Calories

- Hunger, fullness
- Glucose, insulin, other hormonal responses
- Liver *de novo* fat synthesis (conversion of starch and sugar to fat)
- Brain reward, craving
- Gut microbiome (bacteria) responses
- Body's metabolic rate (energy *out*)

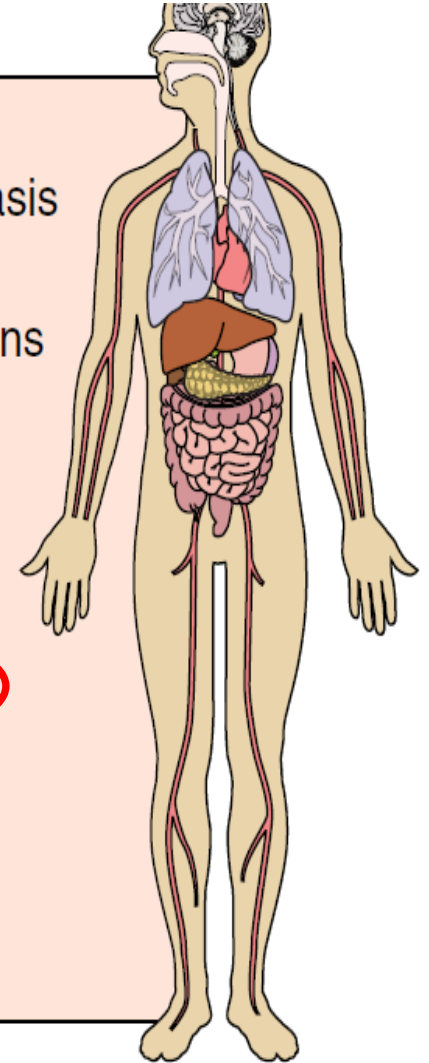
**Cannot judge
a food by its
calorie count
alone**

e.g., Browning AJCN 2011; Ebbeling JAMA 2012; Poutahidis Plos ONE 2013; Lennerz AJCN 2013; Ludwig JAMA 2014; Bazzano Ann Intern Med 2014; Hallberg Diabetes Therapy 2018; Gardner JAMA 2018; Hall Cell Metab 2019; etc.

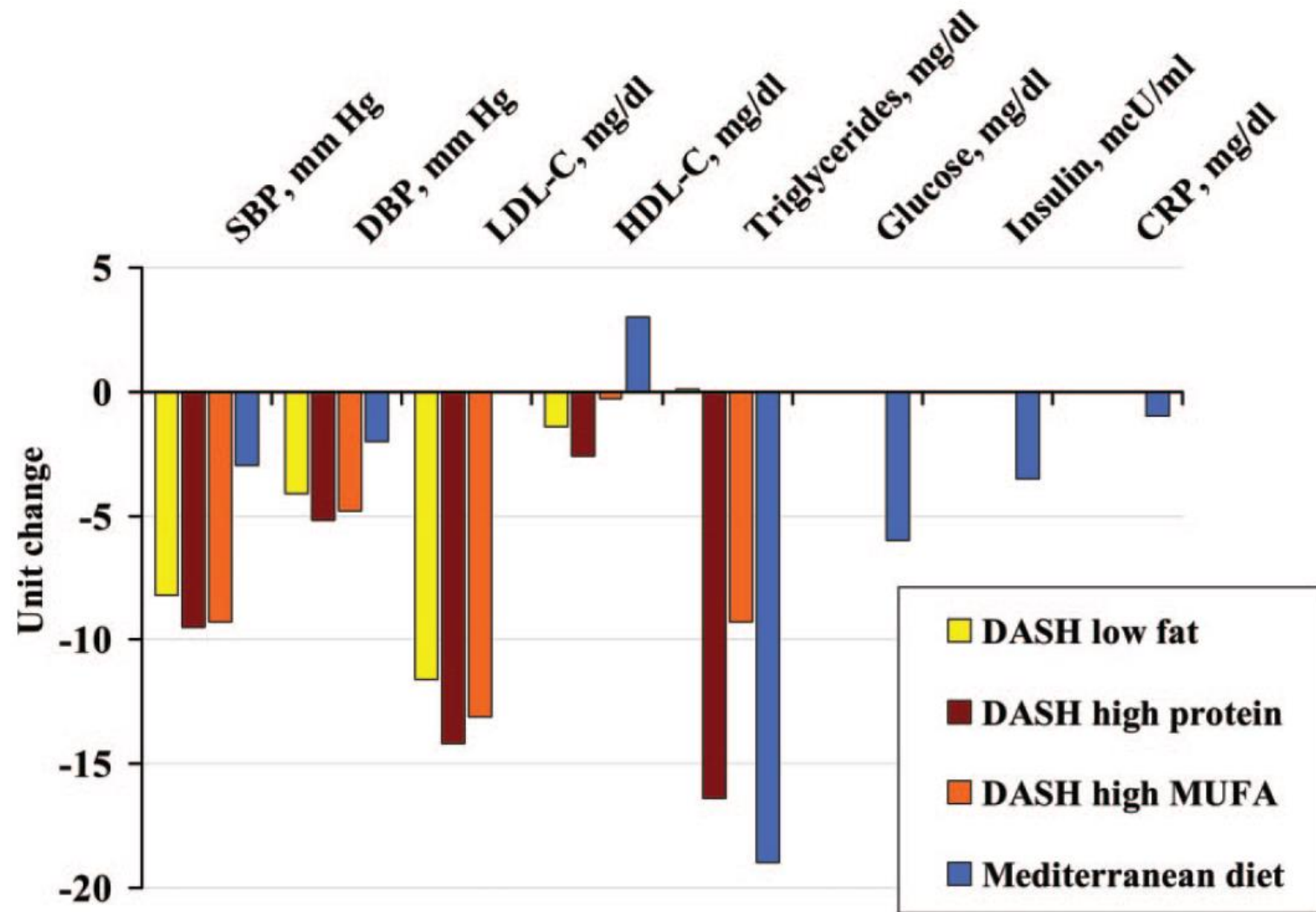
Food and Health – More than Obesity



Blood pressure
Glucose-insulin homeostasis
Liver fat synthesis
Blood lipids, apolipoproteins
Endothelial function
Systemic inflammation
Brain reward, craving
Gut microbiome
Satiety, hunger, obesity
Adipocyte function
Cardiac function
Thrombosis, coagulation
Vasular adhesion

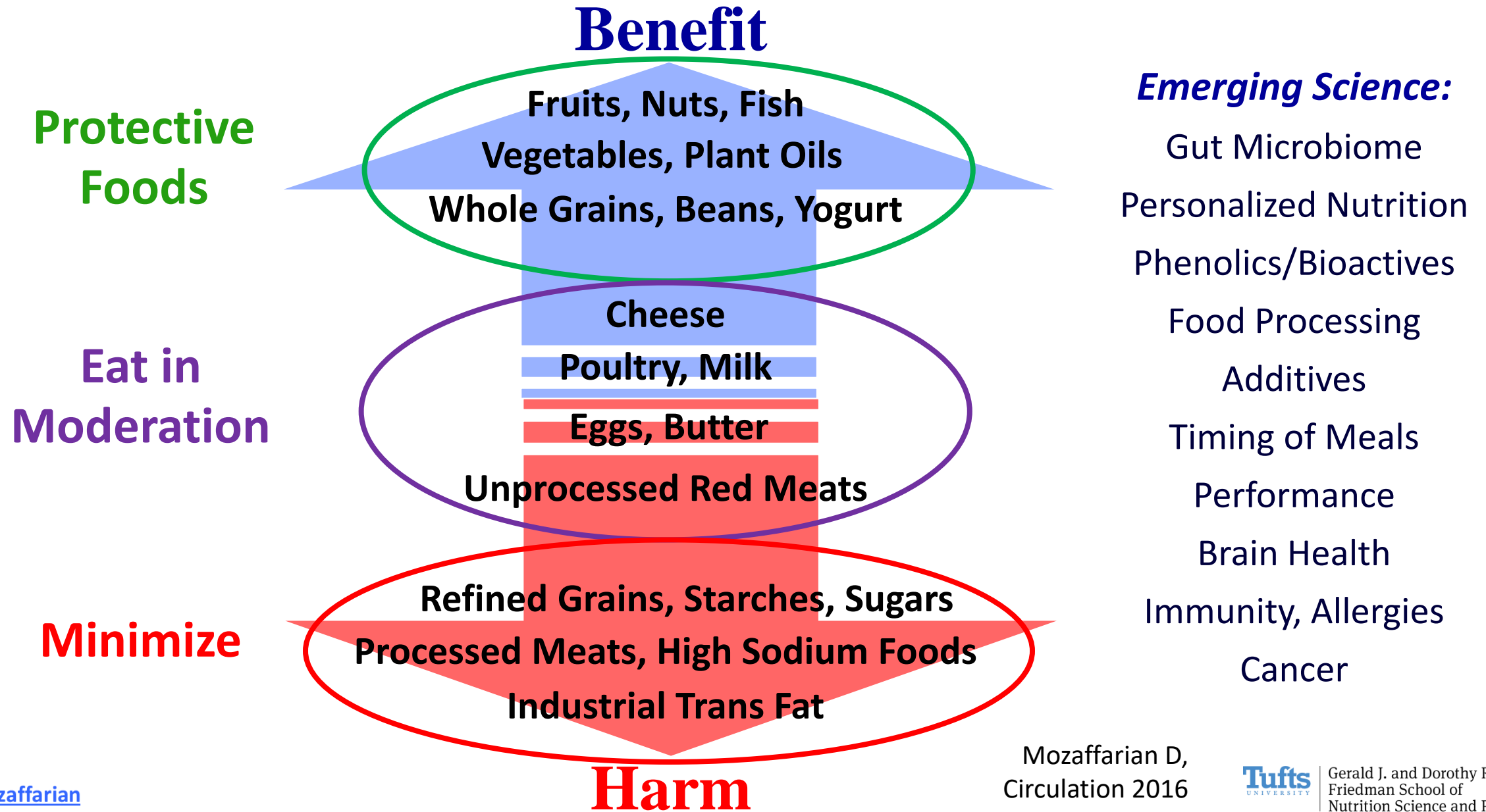


Diet Quality – Rapid Effects



Changing diet quality rapidly improves major risk factors – within 6-8 weeks - and without weight loss

Nutrition Priorities – Healthy Foods



Mozaffarian D,
Circulation 2016



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“Best Buy” Policies & Systems Innovations

Science & Innovation	Healthcare	Economic Incentives	Schools	Worksite Wellness	Standards and Labeling
<ul style="list-style-type: none"> • National Institute of Nutrition (NIN) • Catalyze entrepreneurs • Public-private partnerships • Fundamental discovery • Big data, technology 	<ul style="list-style-type: none"> • Produce Rx programs • Medically tailored meals • Nutrition education • Nutrition in the EHR • Billing & quality metrics 	<ul style="list-style-type: none"> • Govt feeding programs (SNAP, WIC) • Taxes on SSBs, sugar, salt • Retail incentives • ESG metrics • B Corps • Tax policy for food/nutrition innovation 	<ul style="list-style-type: none"> • School meal standards • Competitive food standards • Breakfast in the classroom, summer meals • Fresh F&V programs • School gardens 	<ul style="list-style-type: none"> • Procurement standards • Behavioral economics • Technology wellness platforms • Wellness incentives for healthy food 	<ul style="list-style-type: none"> • Additives (trans fat, salt, sugar) • FOP, menu, and warning labels • Marketing to children • Qualified health claims

Food is Medicine: Medically Tailored Meals (MTMs)



**GOD'S LOVE
WE DELIVER**



Project Open Hand
meals with love



- Providing home MTMs to chronically ill, food insecure patients dramatically reduces hospitalizations, ER visits, nursing home admissions, and **costs**.
- Using the 2011-2015 Massachusetts All Payers Database, MTMs:
 - Reduced hospital admissions by **49%**
 - Reduced nursing facility admissions by **72%**
 - **Net savings: \$9,036** per patient per year
 - Number needed to treat (**NNT**): **2** per saved hospital admission, **1.1** per saved nursing facility admission



<http://www.fimcoalition.org>, Berkowitz et al., JAMA Int Med 2019,
Mozaffarian et al, JAMA Int Med 2019



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Produce Prescription Programs: Systematic Review

26 Produce Rx Programs

- Most targeted specific diseases (e.g., diabetes)
- Only 10 focused on low-income or food insecure patients
- Nearly all quasi-experimental (pre/post)

F&V Provision

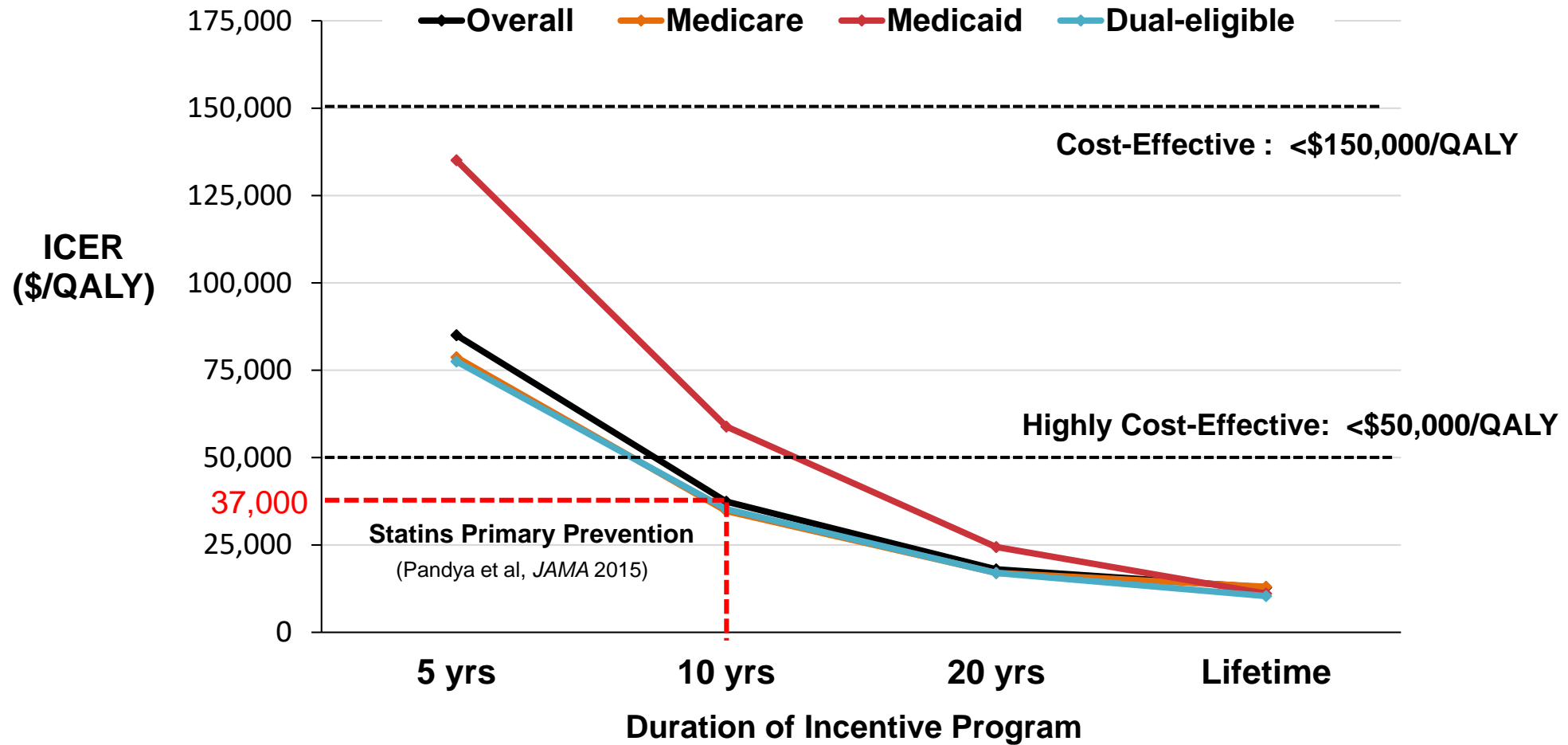
- Vouchers, subsidized food boxes, cash-back rebate
- Only 3 varied incentive for the whole household
- Most brief (4-16 weeks), a few longer (6-12 months)

Outcomes

- **21 of 22** found ↑ F&V intake and/or diet quality
- **3 of 4** found ↓ HbA1c
- **2 of 5** found ↓ weight of BMI

Veldheer et al., J Nutr 2020
Hager et al., J Nutr 2020

Produce Rx in Medicare/Medicaid: Cost-Effectiveness



Lee et al, Plos Med 2019
www.food-price.org

Food is Medicine: Leveraging SNAP

**F&V Incentive
(30% subsidy)**

Prevent **300,000**
lifetime CVD events

ICER:

\$550k/QALY at 5 yrs

\$66k/QALY lifetime

**F&V Incentive
(30% subsidy) +
SSB Restriction**

Prevent **800,000**
lifetime CVD events

ICER:

\$158k/QALY at 5 yrs

\$5k/QALY lifetime

**SNAP Plus
Healthy foods (30% subsidy)
Unhealthy foods (30% disincentive)**

Prevent **940,000**
lifetime CVD events

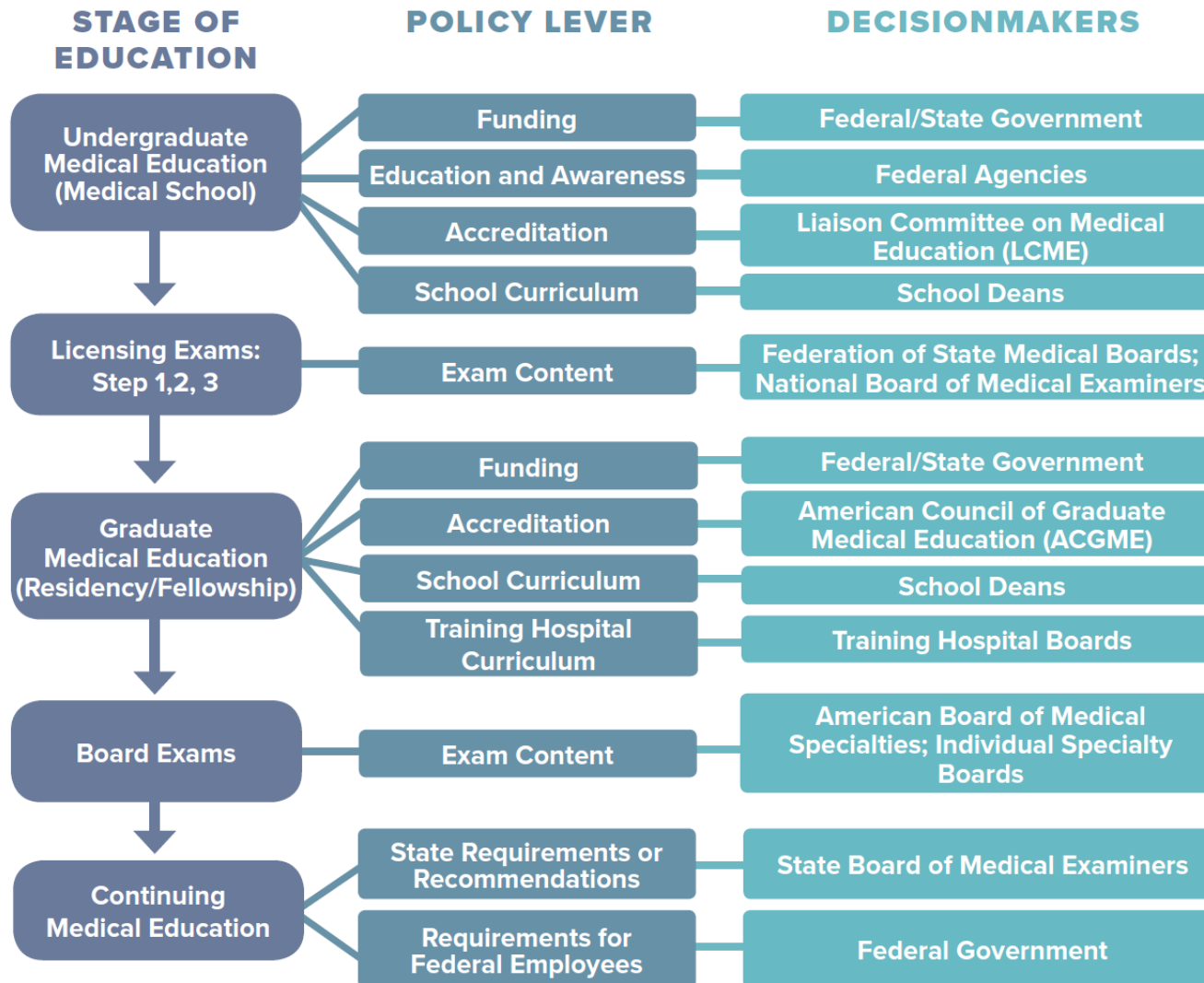
Cost-savings:

\$10B at 5 yrs

\$63B lifetime

Liu et al, Plos Medicine 2018
www.food-price.org

Food is Medicine: Medical Education



Key recommended actions:

1. Update LCME and ACGME accreditation standards to require nutrition education
2. Tie federal funding for medical schools to nutrition education
3. Incorporate nutrition into USMLE, Board, and CME exams
4. Provide technical assistance and resources to support nutrition-curricula development

Strengthening National Nutrition Research & Policy

Sheila Fleischhacker S, Cathie Woteki,
Paul Coates, Van Hubbard, Grace Flaherty,
Dan Glickman, Tom Harkin, David Kessler,
William Li, Joe Loscalzo, Anand Parekh,
Sylvia Rowe, Patrick Stover, Angie Tagtow,
Joon Yun, Dariush Mozaffarian

Fleischhacker et al., AJCN 2020

sites.tufts.edu/nutritionadvisory

Cross-governmental

- A new Office of the National Director of Food and Nutrition (ONDFN)
- A new US Global Nutrition Research Program (USGNRP)
- A new Associate Director for Nutrition Science in the White House Office of Science and Technology Policy (OSTP)
- A new US Task Force on Federal Nutrition Research

Within NIH

- A new National Institute of Nutrition (NIN)
- A new National Center for Nutrition Research (NCNR)
- A return of the Office of Nutrition Research (ONR) into the NIH Office of the Director
- Development of new trans-NIH initiatives in nutrition research

Within USDA

- Increased investment in nutrition research across the USDA Research, Education, and Economics mission area
- Expanded USDA research to improve public guidance and education
- Innovative USDA research to strengthen benefits of nutrition assistance programs



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From the American Society for
Nutrition



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NEW OFFICE OF THE NATIONAL DIRECTOR OF FOOD AND NUTRITION (ONDFN)

KEY CHARACTERISTICS

- ✓ President-appointed, Senate-confirmed Director of National Nutrition, serving as the Principal Nutrition Advisor to the White House, heads of executive branch departments and agencies, senior military, and Congress
- ✓ Modeled after the Office of the Director of National Intelligence, created after September 11 to coordinate fragmented national intelligence efforts
- ✓ Coordinate and harmonize the work of the 10+ US departments and agencies that comprise the federal food and nutrition community, including NIH, USDA, USAID, DoD, VA, CDC, FDA, DoE, CMS, CMMI, NASA, and more
- ✓ Assess and improve effectiveness and synergies of federal food and nutrition research and policy
- ✓ Ensure that timely and objective national nutrition information is provided to the White House, federal agency leaders, military commanders, and Congress

ADVANTAGES

- ✓ Tested, effective model
- ✓ Dedicated leadership, staff, and funding
- ✓ Builds on the ICHNR, with much stronger coordination and synergies across departments and agencies and a stronger dissemination platform
- ✓ Can be mobilized to advise on urgent situations (e.g., COVID-19) which require pre-existing robust leadership and coordination across agencies and departments
- ✓ Broader than solely nutrition research, intersects with food assistance

NEW NATIONAL INSTITUTE OF NUTRITION (NIN)

KEY CHARACTERISTICS

- ✓ Leads research, coordination, training, outreach on foundational and cross-cutting topics in nutrition and health
- ✓ Additive funding and focus areas to existing NIH and other federal nutrition research efforts
- ✓ Harmonizes and leverages other nutrition and related research at NIH and other agencies and departments
- ✓ Strong partner to inform, collaborate on, and help address joint research needs of other agencies and departments
- ✓ Promotes and supports training of a diverse 21st century nutrition research workforce
- ✓ Guides and supports training of healthcare professionals for clinical care and basic and translational science in nutrition
- ✓ Translates and disseminates sound nutrition science findings to the public
- ✓ Fosters innovative external collaborations and partnerships

ADVANTAGES

- ✓ Strong leadership, robust infrastructure, and investment
- ✓ Can better address nutrition science that is cross-cutting rather than disease specific
- ✓ Includes extramural and intramural research, training, and outreach activities
- ✓ Long-term, leading to unforeseeable positive returns and evolving appropriately with changing science and needs of the population
- ✓ Meaningful external advisory mechanism to solicit diverse relevant insights and input
- ✓ Strong return on investment, in line with or exceeding other NIH research investments

Major Advocacy Groups and Businesses Stand in Support

Academy of Nutrition and Dietetics (AND)	Interest (CSPI)	Hunger Free America	PowerPlant Ventures
Acasti Pharma	Community Servings	Institute of Food Technologists (IFT)	Produce for Better Health Foundation
American Academy of Pediatrics (AAP)	DayTwo	January, Inc.	Resnick Center for Food Law and Policy, UCLA School of Law
American Cancer Society (ACS)	Defeat Malnutrition Today	John Hancock	Rhode Island Community Food Bank
American Cancer Society Cancer Action Network (ACS-CAN)	The diaTribe Foundation	Juice Press	The Rockefeller Foundation
American College of Lifestyle Medicine (ACLM)	Elysium Health	KIND Snacks	The Rudd Center for Food Policy & Obesity, University of Connecticut
American Diabetes Association (ADA)	End Allergies Together	Kroger	Sage Mountain Farm
American Public Health Association (APHA)	Feed the Truth	Laurie M. Tisch Center for Food, Education & Policy, Columbia U.	Share Our Strength
American Society for Nutrition (ASN)	Filtricine	Manna Tree Partners	Society of Behavioral Medicine (SBM)
American Society for Parenteral and Enteral Nutrition (ASPEN)	Food & Nutrition Innovation Institute, Tufts University (FNII)	McCormick Science Institute (MSI)	Society for Nutrition Education and Behavior (SNEB)
Angiogenesis Foundation	Food Law and Policy Clinic, Harvard Law School	The Milken Institute	Tangelo
Association of Public and Land-Grant Universities (APLU)	Food Tank	Mission: Readiness	Teens for Food Justice
Association of State Public Health Nutritionists (ASPHN)	Food team @ Google	National Association for the Advancement of Colored People (NAACP)	Trust for America's Health (TFAH)
Azuluna	General Mills Inc.	National Association of Nutrition and Aging Services Programs (NANASP)	2RHealth
Brightseed	The Good Food Institute (GFI)	National WIC Association	Union of Concerned Scientists (UCS)
Center for Health Law and Policy Innovation, Harvard Law School	Good Measures	Novo Nordisk	Urban School Food Alliance
Center for Science in the Public	Gretchen Swanson Center for Nutrition	The Obesity Society	The Well
	The Greater Boston Food Bank	Ocean Spray	Wholesome Wave
	Harkin Institute for Public Policy & Citizen Engagement, Drake U.	Oldways	World Central Kitchen
	Healthy Food America	Partnership for a Healthier America	World Food Policy Center, Duke University
	HumanCo	PepsiCo	



National Nutrition Challenges

sites.tufts.edu/nutritionadvisory

Fleischhacker et al., AJCN 2020

CHRONIC DISEASES



Poor diet is the leading cause of illness in the US, causing half a million deaths per year related to obesity, diabetes, cardiovascular disease, and cancers.

FOOD INSECURITY



1 in 9 households — or 37 million Americans, including 11 million children — were food insecure in 2018; and things are much worse with COVID-19.

HEALTH DISPARITIES



Significant diet-related health disparities are experienced by minority, rural, low-income, and other underserved populations.

PUBLIC CONFUSION



There is a large and growing appetite among Americans for credible, rigorous nutritional science information.

HEALTHCARE COSTS



National healthcare spending has skyrocketed to reach nearly 1 in 5 dollars in the entire US economy, with most of this due to diet-related chronic diseases.

GOVERNMENT BUDGETS



Federal spending on healthcare has risen from 5% to 28% of the total federal budget since 1970. The U.S. government spends \$160 billion annually on direct healthcare for diabetes alone.

US ECONOMIC COMPETITIVENESS



Healthcare expenditures for U.S. businesses have increased 15-fold since 1970 (adjusted for inflation), harming global competitiveness and contributing to stagnating wages.

MILITARY READINESS



71% of young people between the ages of 17 and 24 years do not qualify for military service, with obesity being the leading medical disqualifier.

LINKS TO SUSTAINABILITY



Nutrition security is interrelated with resource scarcity, loss of biodiversity, water shortages, warming climate, and soil degradation from food production.



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How to #FixFood

Food as Medicine

- Medically tailored meals
- Produce Rx programs
- Electronic health record: Food quality and security
- Nutrition education for doctors and other providers

Economic Incentives

- Health insurance, life insurance, worksite wellness support
- Leverage SNAP: Incentives/disincentives for healthier eating
- Taxes on soda, junk food

Science, Innovation, & Entrepreneurship

- National Institute of Nutrition (NIN), new ONDFN
- Reward business innovation: ESG, tax policy, investor vehicles, Opportunity Zones, B corps
- Revitalize rural America, create new jobs and businesses
- 21st century ecosystem for healthy, equitable, sustainable food

Fleischhacker et al., AJCN 2020

50th Anniversary White House
Conference Report 2020

NAIC Rising Health Care Costs:
Drivers, Challenges, Solutions
2018

Report of the 50th Anniversary of the White House Conference on Food, Nutrition, and Health:

Honoring the Past, Taking Actions for our Future

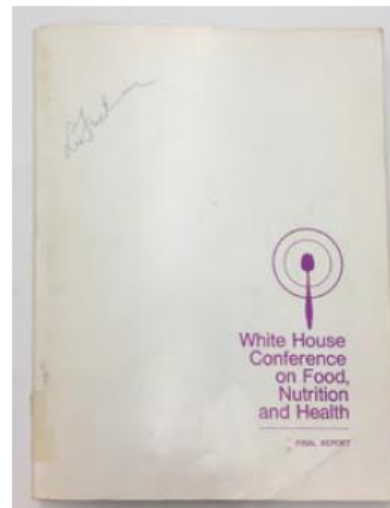
March 2020

In 2021, it's time for the second *White Conference on Food, Nutrition, and Health*

By the time of a follow-up conference two years after the original White House conference, an estimated 1,650 of the original 1,800 recommendations had been implemented in some form. Together, these recommendations established the current national framework for addressing hunger in America.

<https://sites.tufts.edu/foodnutritionandhealth2019/>

Expansion of School Lunch
Expansion of SNAP
Creation of School Breakfast
Creation of WIC
Creation of Nutrition Facts panel



Cover of the final report on the 1969 White House Conference. The report contained 1,800 recommendations addressing nutrition guidelines, nutrition education, nutrition surveillance, consumer issues, food distribution, and special recommendations for vulnerable groups.



Dr. Jean Mayer presents President Nixon with the three volume report on the 1969 White House Conference.



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It's time for a national “moonshot” to fix our food system. We must leverage food as medicine, incentivize and shift to real food, build a strong public health and food infrastructure, and rapidly expand critical nutrition research. “A massive campaign on diet would save lives and change the course of our nation’s health forever.”

NUTRITION.TUFTS.EDU