



REPORT TO THE PRESIDENT
A Vision for Advancing Nutrition
Science in the United States

Executive Office of the President
President's Council of Advisors on
Science and Technology

SEPTEMBER 2024



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EXECUTIVE OFFICE OF THE PRESIDENT
PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY
WASHINGTON, D.C. 20502

President Joseph R. Biden, Jr.
The White House
Washington, D.C.

Dear Mr. President,

Good nutrition is a linchpin of overall health and well-being for every American, and federally sponsored research provides the evidence that both the government and private sectors use to determine how to improve health through food. When research identifies a diet-related health problem, the government can develop interventions and implement policies to prevent or manage it, and improve health using one or more strategies. For instance, the Food and Drug Administration's (FDA) guidance to fortify grain products with folic acid starting in 1998 has directly contributed to sparing more than 1,000 babies born each year from devastating birth defects.¹ Using a different approach, changes in food labelling and education campaigns have enabled consumers to make more informed choices and altered which nutrients and ingredients producers include in their products, such as vitamins and minerals, and/or exclude, such as sodium. For example, the consumption of "trans fat" was reduced after it was shown to increase the risk of developing heart disease; FDA has since taken regulatory actions and artificial trans fats have effectively been removed from the U.S. food supply.² About half of the decline in U.S. deaths from coronary heart disease from 1980 to 2000 may be attributed to reductions in risk factors such as lowering cholesterol and high blood pressure, both of which are affected by diet.³ To address today's most significant diet-related health problems and reduce our staggering health care expenditures, new emphasis must be placed on nutrition research that can equitably and effectively help all Americans achieve better health.

We need to build on these prior successes and take action today to create a broad range of nutrition interventions that strategically improve the health of our entire nation, with an equity focus that particularly considers those who are disproportionately affected—racially, ethnically, and socially minoritized groups—due to long-standing and structural inequities which make it hard for many people to eat healthy and be physically active. The challenges are significant. Increasing numbers of Americans are suffering from diet-related diseases including cancer, obesity, diabetes, and hypertension, which are greatly decreasing our quality of life and shortening our overall lifespan,

¹ Williams, J., et al. (2015 January 16). [Updated Estimates of Neural Tube Defects Prevented by Mandatory Folic Acid Fortification—United States, 1995–2011. Centers for Disease Control and Prevention, Vol. 64, Issue 1,1–5](#)

² U.S. Food & Drug Administration. (2023 August 30). [Trans Fat](#).

³ Ford, E.S., et al. (2007 June 7). [Explaining the decrease in U.S. deaths from coronary disease, 1980 – 2000. The New England Journal of Medicine. Vol. 356, Issue 23, 2388-2398.](#)

limiting our national security, as well as costing us billions.^{4, 5, 6} Even more alarming is the dramatic and unanticipated rise in rates of childhood obesity and other conditions not typically seen in adolescence.

For such a highly developed nation, the U.S. has distressingly high rates of food insecurity, imbalanced nutrition, and inequities in food access, all further exacerbated by the pandemic.^{7, 8} With diet-related disease rates increasing, we have responded by focusing resources on costly medical treatments, further widening disparities and directing efforts away from prevention or addressing social determinants of health and a food environment that for too many Americans does not provide or promote good nutrition. The only way to reverse these trends and achieve robust health for our nation is to focus on prevention, which will require significant modifications of our overall food environment and must be informed by improved nutrition research.

Your Administration has acted boldly to mobilize federal agencies as well as issue calls to action for non-federal entities through the [White House Strategy on Hunger, Nutrition, and Health](#), with the goal of ending hunger in America and increasing healthy eating and physical activity by 2030. In support of those efforts, you specifically called on your PCAST to identify opportunities to advance nutrition science and to enable equitable access to the benefits of nutrition research.

PCAST is confident that with commitment and collaboration we can, as we have in the past, address the major diet-related challenges facing the nation. Our recommendations are to:

- Fortify the scientific evidence base for future public and private sector actions to combat diet-related diseases, focusing especially on expanded research on how best to implement interventions and make sure they are effective and equitably accessible.
- Prioritize equity in nutrition science. In developing a coordinated federal vision, current and future research should focus on understanding the unique nutritional needs of population subgroups as well as individuals. This will create a foundation for continued improvements to public health through government and private sector actions.

Preventing diet-related chronic diseases is among the most urgent public health challenges facing the nation. Your support for the recommendations that follow will help empower and prioritize nutrition research, creating the pathway to better health for every American.

Sincerely,

Your President's Council of Advisors on Science and Technology

⁴ Centers for Disease Control and Prevention. (2022 July). [Unfit to Serve: Obesity and Physical Inactivity Are Impacting National Security](#).

⁵ National Center for Chronic Disease Prevention and Health Promotion. (2023 March 23). [Health and Economic Costs of Chronic Diseases](#). *Centers for Disease Control and Prevention*.

⁶ White House. (2022 September). [Biden-Harris Administration National Strategy on Hunger, Nutrition, and Health](#).

⁷ Rabitt, M.P., et al. (2023 October). [Household Food Security in the United Nations in 2022](#). *USDA Economic Research Service*

⁸ White House. (2022 September). [Biden-Harris Administration National Strategy on Hunger, Nutrition, and Health](#).

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Executive Summary

Diet-related chronic diseases have reached an alarming prevalence among Americans. A majority of U.S. adults are not healthy—more than 37 million Americans have diabetes and another 96 million adults have a condition called pre-diabetes, 122 million suffer from high blood pressure, and 42% suffer from obesity.^{9, 10, 11, 12} Additionally, children are now experiencing diseases that previously were almost unheard of before middle age. About 20% of U.S. children have obesity—almost 15 million children whose lives will be shorter and of lower quality—and fatty liver disease afflicts 5-10% of all U.S. children, about the same number of children who have asthma, one of the most common chronic conditions in childhood.^{13, 14} The cost of treating diet-related diseases is enormous. Heart disease, type 2 diabetes, and obesity together are estimated to cost Americans over \$700 billion per year just in health care costs.^{15, 16} If we also consider lost productivity, costs for diet-related diseases exceed \$1 trillion per year, and numbers like these cannot measure the impacts due to lost quality of life.

Recognizing the significant burden of diet-related conditions on our nation’s health and quality of life, the Biden-Harris Administration has catalyzed action to help the millions of Americans struggling with food insecurity and diseases like cardiovascular disorders, diabetes, obesity and cancer. During the [September 2022 White House Conference on Hunger, Nutrition and Health](#), President Biden set an audacious goal to end hunger and reduce diet-related disease by 2030—all while closing disparities among the communities that are most affected. The Administration’s Strategy released during the conference is mobilizing federal government, state, and private sector initiatives toward this end.¹⁷ Efforts are underway across communities, the private sector, and the government, especially as noted in the [February 2024 Fact Sheet New Commitments Cultivated Through the White House Challenge to End Hunger and Build Healthy Communities](#).

⁹ National Center for Chronic Disease Prevention and Health Promotion. (2022 December 13). [Chronic Diseases in America](#). *Centers for Disease Control and Prevention*.

¹⁰ National Center for Chronic Disease Prevention and Health Promotion. (2023 March 23). [Health and Economic Costs of Chronic Diseases](#). *Centers for Disease Control and Prevention*.

¹¹ Tsao, C.W., et al. (2023 January 23). [Heart Disease and Stroke Statistics—2023 Update: A report From the American Heart Association](#). *Circulation*, Vol. 147, Issue 8, e93 – e621.

¹² National Center for Chronic Disease Prevention and Health Promotion. (2022 May 17). [Adult Obesity Facts](#). *Centers for Disease Control and Prevention*.

¹³ Yu, E.L. and Schwimmer, J.B. (2021 April 13). [Epidemiology of Pediatric Nonalcoholic Fatty Liver Disease](#). *PubMed Central*, Vol. 7, Issue 3, 196 – 199.

¹⁴ National Center for Environmental Health. (2023 March 29). [Data, Statistics, and Surveillance](#). *Centers for Disease Control and Prevention*.

¹⁵ National Center for Chronic Disease Prevention and Health Promotion. (2024 July 12) [Fast Facts: Health and Economic Costs of Chronic Conditions](#). *Centers for Disease Control and Prevention*.

¹⁶ National Center for Chronic Disease Prevention and Health Promotion. (2024 May 15) [Health and Economic Benefits of Diabetes Interventions](#). *Centers for Disease Control and Prevention*.

¹⁷ White House. (2022 September). [Biden-Harris Administration National Strategy on Hunger, Nutrition, and Health](#).

The Administration’s Strategy on Hunger, Nutrition, and Health specifically called on PCAST to create a coordinated federal vision for advancing nutrition science and to ensure equitable access to the benefits of that research.

Equity in nutrition science and the research programs administered through federal agencies is important because the epidemic of diet-related diseases disproportionately affects racially, ethnically, and socially minoritized groups. The probability of having a chronic condition increases with increasing food insecurity (see Figure 1) and the rate of food insecurity for racially and economically minoritized households is more than double that for White households.^{18, 19, 20, 21} PCAST praises efforts that are already underway to improve equity in nutrition research and program delivery, for instance the [USDA Equity Commission](#), which is informing change across the U.S. Department of Agriculture, and the [NIH-Wide Strategic Plan for Diversity, Equity, Inclusion, and Accessibility](#).

The emergence of pharmacological treatments for obesity is a promising development to help people achieve a healthier weight and decrease their risk for developing chronic diseases at an early age. However, the high cost of these drugs actually exacerbates the inequity of obesity and related chronic diseases. Because these decades-long disparities will continue to affect every American’s health, it is now more important than ever to revitalize major national prevention efforts.

What Americans eat influences our health in many ways. Creating a more health-promoting food environment and encouraging Americans to adopt health-promoting dietary patterns will have long-term benefits by reducing the occurrence of diet-related diseases and the costs of treating them, and in reducing health disparities. Good nutrition is vital for the individual health of infants, children, and adults, and the U.S. food environment could provide the energy and nutrients needed for good health across the life span through a combination of voluntary changes made by the private sector and science-based government policies to incentivize them. However, people’s food selections are complex, influenced by various factors in a multifaceted U.S. (and global) food ecosystem, with many of these factors beyond an individual’s control, e.g., increased production and availability of ultra-processed foods which are associated with overconsumption and obesity.^{22, 23} In addition to widespread availability of inexpensive ultra-processed foods, the U.S. food environment has undergone huge changes in recent decades, including easy access to low-cost fast food and eating away-from-home becoming much more common. Over an individual’s lifetime, multiple biological,

¹⁸ Gregory, C.A. and Coleman-Jensen, A. (2017 July). [Food Insecurity, Chronic Disease, and Health Among Working-Age Adults](#). *U.S. Department of Agriculture, Economic Research Service Report Number 235*.

¹⁹ Economic Research Service. (2024 January 8). [Predicted prevalence of five chronic diseases increased as household food security worsened](#). *U.S. Department of Agriculture*.

²⁰ Hall, L. (2023 October 26). [Food Insecurity Increased in 2022. With Severe Impact on Households With Children and Ongoing Racial Inequities](#). *Center on Budget and Policy Priorities*.

²¹ Rabbitt, M.P., (2023 October). [Household Food Security in the United States in 2022](#). *U.S. Department of Agriculture, Economic Research Service Report Number 325*.

²² Filgueiras, A.R., et al. (2018 November 12). [Exploring the consumption of ultra-processed foods and its association with food addiction in overweight children](#). *PubMed, Vol. 1, Issue 135, 137 – 145. s*

²³ Harb, A.A., et al. (2022 October 24). [Ultra-processed foods and the development of obesity in adults](#). *European Journal of Clinical Nutrition, Issue 77, 619 – 627*.

behavioral, environmental and cultural factors interact with and are shaped by other interpersonal, community, and societal influences that together determine one’s health and disease experience. Finally, in the era of widespread internet and digital technology access and use, people’s food habits increasingly are influenced by advertising and social media, which are sources of both facts and misinformation. Acknowledging and understanding these factors and their intersections is critical to addressing nutrition-related health disparities.

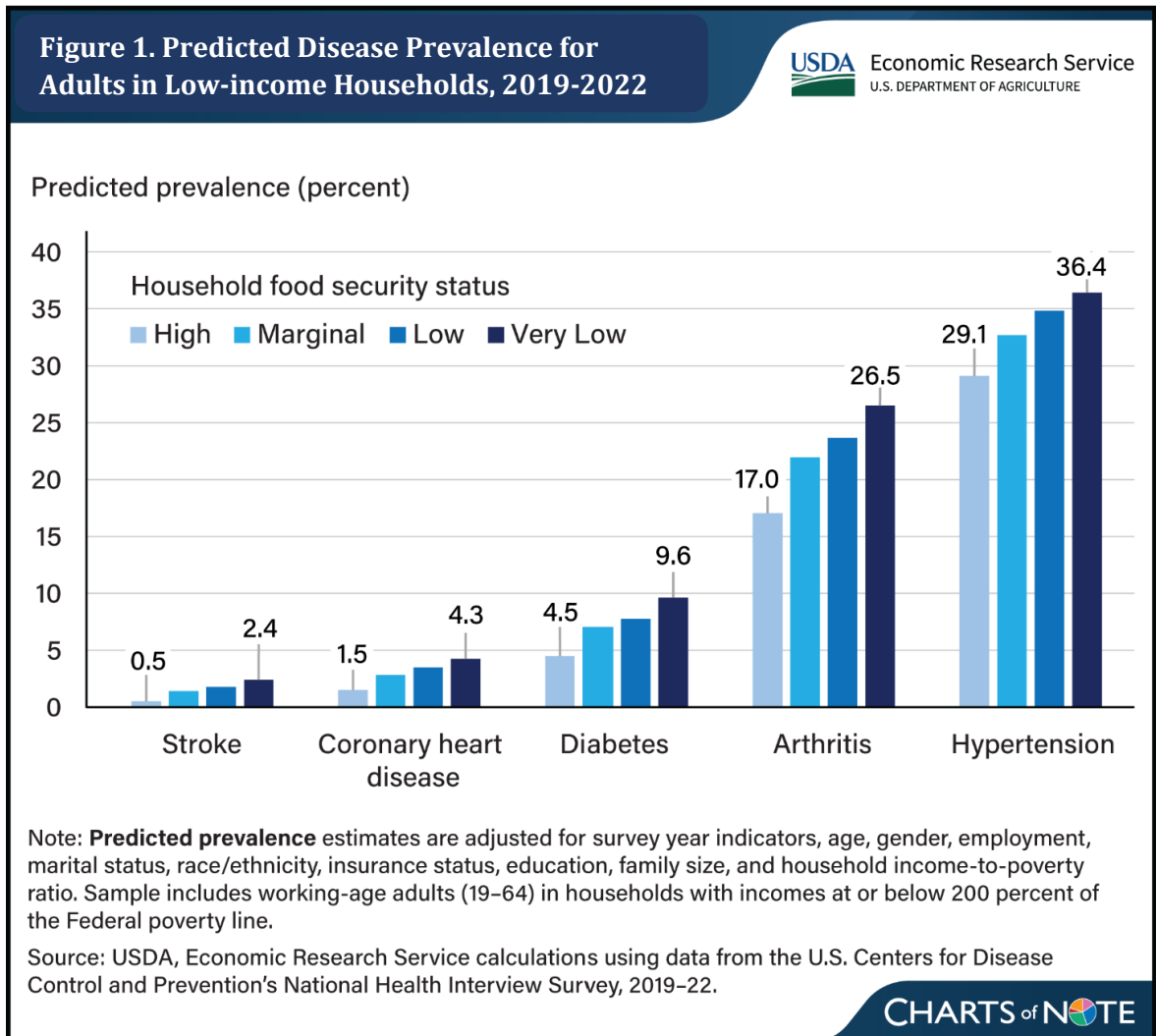


Figure 1: Predicted chronic disease prevalence for adults in low-income households. This graph demonstrates how varying degrees of food insecurity are linked to predictions of chronic diseases, with the lowest degree of food security being associated with the highest prediction prevalence. (USDA Economic Research Service)

PCAST envisions a healthier nation made possible through nutrition science-based multi-sector innovation that provides the American public with a health-promoting food environment and more effective government programs, policies, and public-private initiatives. The biggest opportunity in nutrition science is to focus on the most significant nutrition problem facing Americans: the immense health, economic, and social impact of diet-related chronic diseases. Accomplishing this critical work requires filling gaps in foundational nutrition science knowledge, capitalizing on advances in data science, and incorporating the behavioral and social sciences into the planning and conduct of nutrition research. It will require strengthening the coverage of subpopulations within national nutrition monitoring efforts to provide important data missing in the formulation and evaluation of nutrition programs and introducing more effective risk reduction strategies into these programs. It will require prioritizing equity in the design and conduct of research and an increased level of coordination and cooperation across federal departments and agencies that have not previously been engaged. Finally, success heavily depends on private sector actions to improve the nutritional profile of foods available to the public as occurred with food fortification and the resulting reduction in deficiency diseases and neural tube defects. Accordingly, we discussed with experts from research, federal government and private sectors ways to deliver consistent, uninterrupted progress toward the President's goal of reducing the burden of diet-related chronic diseases in America.

To continue the momentum the Administration has catalyzed through its Strategy for Hunger, Nutrition, and Health, we offer the recommendations below, which are focused on efforts the federal government can undertake now to improve the health of every American. Agencies may need to re-align budgets or identify and request additional resources to fully achieve the goals described below. In addition to the recommendations, this report also discusses some of the key gaps and opportunities in nutrition science that need to be addressed over the long term to provide the foundational research that informs many elements of our food environment.

Recommendation 1. The Administration should implement a coordinated and sustained federal interagency effort, co-led by HHS and USDA, to strengthen the nutrition science base for current and future public and private sector actions to reduce the burden of diet-related chronic disease and maintain momentum toward the President's 2030 goal.

1.1 An interagency committee, co-led by HHS and USDA, should re-evaluate and develop every 5 years, beginning with 2025-2030, a nutrition research roadmap focused on diet-related chronic disease risk reduction and equity, building on the framework provided in the previous roadmap ([2016-03-30- ICHNR NNRR.pdf \(usda.gov\)](#)).

1.2 Federal agencies should strengthen national nutrition monitoring programs to provide necessary data on dietary intake and the nutritional and health status of sociodemographic subgroups used in regulatory and program planning, evaluation, and the formulation of reference standards.

Recommendation 2. To ensure equitable access to the benefits of nutrition research, federal agencies should prioritize equity in nutrition research, focus research on improving program delivery, continue efforts to diversify the nutrition science and dietetics workforce and engage the academic and private sectors in multisector research and intervention initiatives.

2.1 Federal agencies should evaluate nutrition research programs for equity considerations, building on existing health equity frameworks, and identify, share and adopt leading practices.

2.2 Federal agencies should give priority to strategies for effective implementation within the research roadmap and develop an explicit program of research responsive to the needs of programmatic agencies.

2.3 Federal agencies should continue to seek ways to diversify the nutrition workforce, including, for instance, building upon their Agency DEIA Strategic Plans and the Administration's 2021 [Strategic Plan to Advance Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce](#).

2.4 Federal agencies should consult with academic and private sector entities, including non-profits and community organizations, to identify and propose innovative ways to collaborate and remove barriers to public-private research and intervention efforts.

Introduction

We currently have an opportunity to focus efforts across federal programs and engage the private sector to improve health for every American and save the more than \$500B spent annually on treating diseases that could be prevented with improved diet.²⁴ A slowly building epidemic of diet-related chronic diseases has led to today's situation in which 6 in 10 Americans are living with at least one chronic disease.²⁵ America's diet is a major contributor to the heavy social and economic burden stemming from cardiovascular disease, diabetes, obesity, cancer, and other diet-related diseases. Making matters worse, diet-related diseases disproportionately impact racially, ethnically, and socially minoritized groups. By focusing its diverse programmatic and research enterprise on the prevention of these diet-related diseases, along with leadership and thoughtful regulatory action, the federal government could transform the food environment, lessening the escalating costs of treating patients with chronic diseases and providing Americans longer healthier lives. There are already examples of research creating tangible impacts on human health. For example, new authorizations and funding have enabled the translation of nutrition science into [Food Is Medicine](#) programs administered by multiple agencies including [USDA's Gus Schumacher Nutrition Incentive Program \(GusNIP\)](#), and pilot programs in HHS's Medicaid and Medicare, Department of Veterans Affairs, Department of Defense, and [Indian Health Service](#).

The Biden-Harris Administration is already catalyzing action to help the millions of Americans struggling with food insecurity and diet-related conditions like cardiovascular disorders, diabetes, obesity and cancer. During the September 2022 [White House Conference on Hunger, Nutrition and Health](#), President Biden set an audacious goal to end hunger and reduce diet-related disease by 2030—all while closing disparities among the communities that are most affected. Released during the conference, the Administration's Strategy works to mobilize government and private sector initiatives toward this end.²⁶ The actions and commitments by federal and non-federal entities outlined in the Strategy and announced at follow-up events reflect how these organizations are seizing on opportunities to address the devastating impacts of diet-related chronic diseases. The Strategy specifically calls on PCAST to create a coordinated federal vision for advancing nutrition science and to ensure equitable access to the benefits of that research.

What Research Can Accomplish

Thanks to federally sponsored research, the U.S. has developed and implemented successful policies and programs to overcome diet-related diseases of the past. Other federal policies guiding food and health programs including in agriculture (e.g. crop subsidies), trade (e.g. import regulations) and advertising (e.g. TV commercials) in turn influence the myriad facets of our food environment that

²⁴ Centers for Disease Control and Prevention. (2024 May 15). [Health and Economic Costs of Chronic Conditions](#).

²⁵ Centers for Disease Control and Prevention. (2023 November 30). [Advancing Chronic Disease Practice Through the CDC Data Modernization Initiative](#).

²⁶ White House. (2022 September). [Biden-Harris Administration National Strategy on Hunger, Nutrition, and Health](#).

are controlled by the private sector.²⁷ For instance, in the 1930s and 1940s when low intakes of essential nutrients like vitamin D and niacin were found to be the causes of rickets and pellagra, respectively, the Food and Drug Administration encouraged fortification of milk with vitamin D and flour with niacin, effectively eliminating these diseases in America.^{28, 29} More recently, in 2016 FDA updated the [Nutrition Facts](#) label design and information requirements, providing consumers with clearer information such as total calories, salt content, fat content, and added sugars, in hopes of impacting consumer choices and industry practices.^{30, 31}

The existing scientific understanding of how specific nutrients, bioactive ingredients, and patterns of food intake alter the risk of developing a chronic disease, as well as experience with past interventions, provide a sound basis for integrated public and private sector actions to combat the epidemic of diet-related chronic disease. Additionally, a concerted and long-term national effort that spans presidential administrations is needed to continue the momentum launched at the White House Conference and now underway across federal, state, and private sectors. Multi-decadal leadership will be needed to facilitate and coordinate public and private sector actions to reverse our current epidemic of diet-related diseases. Federal leadership would assure that mandated and voluntary programs are evaluated and updated as scientific knowledge and population circumstances evolve, that research priorities reflect the changing food, health, and social environment, and that research is targeted to programmatic agencies' needs. Equitable access to the benefits of food and nutrition research should be the focus of this multi-year commitment to make government programs as effective as possible in risk reduction for those most impacted and to motivate food environment change.

Equity Approach

Ensuring equity in nutrition research and its applications in programs and policies is paramount because the epidemic of diet-related diseases disproportionately affects racially, ethnically, and socially minoritized groups. The probability of having a chronic condition increases with increasing food insecurity, and the rate of food insecurity for American Indian or Alaska Native, Black, Hispanic, or multiracial households is more than double that for White households. And though the percent of Asian, Native Hawaiian or Pacific Islander households with food insecurity was noted as lower than that of White households, data limitations resulting in current grouping can obscure higher rates for

²⁷ This report defines the food environment as the physical, economic, political, and socio-cultural opportunities and conditions that shape people's dietary choices and nutritional status.

²⁸ Rajakumar K. and Thomas S.B. (2005 April). [Reemerging nutritional rickets: a historical perspective](#). *Archives of Pediatric & Adolescent Medicine*, Vol. 159, Issue 4, 335 – 341.

²⁹ Bollet A.J. (1992). [Politics and Pellagra: The Epidemic of Pellagra in the U.S. in the Early Twentieth Century](#). *Yale Journal of Biology and Medicine*. Vol. 65, Issue 3, 211-221.

³⁰ Shangguan, S., et al. (2018 December 17). [A Meta-Analysis of Food Labeling Effects on consumer Diet Behaviors and Industry Practices](#). *American Journal of Preventative Medicine*.

³¹ Cecchini M. and Warin L. (2016 March). [Impact of food labelling systems on food choices and eating behaviors: a systematic review and meta-analysis of randomized studies](#). *Obesity Reviews*.

some subgroups.^{32, 33, 34, 35} Additionally, fast-acting but expensive non-surgical treatments for obesity have emerged, like newer hormone-based diabetes therapies being used as weight loss drugs.³⁶ Although long term effects are not yet known, these therapies appear to be a promising development to help people achieve a healthier weight and decrease risk for developing chronic diseases at an early age. However, the high cost of these drugs, the potential need to stay on them for life, and limited availability will likely exacerbate the unequal distribution of obesity and related chronic diseases. Because these decades-long disparities will continue to affect America's overall health as well as our national security, and economy, it is now more important than ever to revitalize major national prevention efforts while prioritizing equity in nutrition research.^{37, 38}

The Opportunity

The biggest opportunity in nutrition science is to focus on the most significant nutrition problem facing Americans: the immense health, economic, and social impact of diet-related chronic diseases. Accomplishing this critical work requires introducing impactful risk reduction strategies into federal programs, effectively employing regulatory authorities, and building coordination and cooperation beyond past and current levels, as well as expanding into departments and agencies not previously or only minimally engaged. As observed with past interventions, success also depends significantly on private sector actions to implement guidance and improve the nutritional profile of foods available to the public, as is occurring with current efforts to lower sodium consumption to prevent hypertension.^{39, 40} In addition to the current work detailed in the Strategy, ensuring coordination of efforts is central to successfully reducing diet-related chronic disease and will be achieved with a well-resourced coordinating body with appropriate authorities to conduct and oversee this important and challenging work.

This report outlines the priorities, gaps, and opportunities to advance nutrition science and reduce the enormous burden of diet-related chronic diseases now prevalent in the United States, and makes recommendations to build on the foundation the Administration has laid in its Strategy and continue its impact in the future. Admittedly, there are significant scientific challenges and opportunities which are adjacent to or outside the priority of preventing diet-related chronic diseases which are not directly addressed in this report. Although less central to the goal of reducing and/or preventing

³² Gregory, C.A. and Coleman-Jensen, A. (2017 July). [Food Insecurity, Chronic Disease, and Health Among Working-Age Adults. U.S. Department of Agriculture, Economic Research Service Report Number 235.](#)

³³ Economic Research Service. (2024 January 8). [Predicted prevalence of five chronic diseases increased as household food security worsened. U.S. Department of Agriculture.](#)

³⁴ Hall, L. (2023 October 26). [Food Insecurity Increased in 2022, With Severe Impact on Households With Children and Ongoing Racial Inequities. Center on Budget and Policy Priorities.](#)

³⁵ Rabbitt, M.P., (2023 October). [Household Food Security in the United States in 2022. U.S. Department of Agriculture, Economic Research Service Report Number 325.](#)

³⁶ Müller et al. (2019 December). [Glucagon-like peptide 1 \(GLP-1\). Molecular Metabolism.](#)

³⁷ Congressional Research Service (2020 December 22). [Obesity in the United States and Effects on Military Recruiting.](#)

³⁸ Parker, E.D., et al. (2023 November 1). [Economic Costs of Diabetes in the U.S. in 2022. Diabetes Care.](#)

³⁹ U.S. Food & Drug Administration. (2021 November 13). [FDA Issues Sodium Reduction Final Guidance.](#)

⁴⁰ U.S. Food & Drug Administration. (2023 March 24). [FDA Takes Additional Steps to Improve Nutrition, Reduce Disease with Expanded Use of Salt Substitutes to Help Lower Sodium Intake.](#)

diet-related chronic disease, addressing these aspects of nutrition research would also provide evidence for health improvements, for instance nutritional support for post-surgical patients or those in intensive care. Providing healthier food environments and food supply to facilitate healthful selections is a crucial part of the Administration's Strategy, and the specific policy instruments by which to effect these changes are explored further in other pillars detailed in the Strategy and via follow-up efforts, hence they are not the focus of this report.

Focus on Decreasing Disparities and Increasing Prevention

Recent projections of shifts in the U.S. population estimate that the proportion of Black, Latino or Hispanic, Asian-American, and other groups that are currently racial minorities will increase from 41% in 2023 to 52% by 2050.⁴¹ Improving the health of our nation therefore depends heavily on how effectively we improve the health of those currently identified as racially minoritized populations. Accordingly, the greatest return on federal investment in nutrition research will occur if we address scientific gaps particularly as they relate to health disparities and focus on disease prevention in federal research programs by:

- **Developing effective evidence-based solutions for federal agencies and private sector implementation**
- **Engaging and challenging the private sector to improve practices and empowering individuals to take steps within their purview to optimize their personal health**
- **Facilitating equitable implementation throughout federal food and health programs**
- **Supporting high priority research to understand the unfolding and changing nature of nutrition challenges**
- **Coordinating agency efforts to develop, implement, and adapt strategies; and then assessing and reporting on progress and emerging issues to the President and Congress**
- **Seeking Congressional support to fund these programs and take other science-informed actions to change the food environment and ultimately deliver benefits to the nation**

Today's nutrition challenges are far more complex than the elimination of nutrient deficiency diseases and require solutions beyond the simple, single-nutrient interventions like food fortification of the past. Still, there remains much that can be done to make the food environment more health-promoting and to equip people with ways to achieve healthier diets. We clearly have gaps in our knowledge and cannot expect to address the complexities without first tackling the basics, specifically at the individual and subpopulation levels. Additionally, promising areas of research from population health efforts through personalized metabolomics are providing insights to shape future interventions that could prevent the onset of diet-related chronic diseases and/or delay their adverse health effects.

⁴¹ U.S. Census Bureau (2023 November 9). [2023 National Population Projections Tables: Alternative Scenarios](#).

The Administration’s Strategy called on PCAST to create a coordinated federal vision for advancing nutrition science and to ensure equitable access to the benefits of that research. PCAST expects that implementation of the Strategy’s federal programmatic changes and private sector pledges will yield many health benefits. However, long-term improvements to the public’s health will require an evolving base of scientific evidence to further refine and support specific public and private sector actions in the face of an ever-evolving food environment. Increased focus of government research efforts and resources is essential to help the public and private sectors effectively address the enormous challenge of diet-related chronic disease that continues to face our nation.

Vision for Nutrition Science

PCAST envisions a healthier nation made possible through science-based multi-sector innovation providing the American public with a health-promoting food environment and effective government programs, policies, and public-private initiatives that promote good health and prevent disease.

Information from nutrition research and monitoring (see Figure 2) is the foundation for government and private sector decisions that, in turn, can modify social and environmental risk factors for developing one or more diet-related chronic diseases and increase the population’s disease-free lifespan. Science- and equity-informed policies help create consumers’ food environment(s), improve food security (i.e. access to affordable food), and contribute to the long-term sustainability of agricultural systems. Programs and policies can contribute to chronic disease prevention and food security by reducing the levels of known dietary risk factors in consumers’ food environments like saturated fat, added sugar and salt, and increasing access to beneficial dietary components like fiber, fruits and vegetables. Policies and programs can empower consumers by transferring nutrition knowledge to enable healthier food habits and by providing access to preventive health services. Implementing science- and equity-informed policies may require changes to existing statutory and regulatory authorities based on a strong research foundation of nutrition science, data science, and social and behavioral science.

To create the needed changes in food and health policies and programs and reduce the societal burden of diet-related chronic diseases, nutrition research must be embedded in both agricultural and biomedical sciences research which has traditionally been administered mainly by the Departments of Agriculture (USDA) and Health and Human Services (HHS). Nutrition research efforts should be closely coupled to the needs of USDA’s food programs and HHS’s health programs to enhance uptake and implementation of research findings and increase responsiveness of research efforts to the food and health programs’ knowledge needs. Achieving the vision of better health through changes to today’s dysfunctional food environment will require focusing on chronic disease prevention with an equity lens, implementing nutrition knowledge already on hand for the major chronic diseases affecting Americans, continuing research to understand the underlying mechanisms and specific roles that food and dietary patterns play in potentiating or mitigating risk of acquiring a chronic disease, integrating new tools from adjacent areas of science and technology into nutrition research, and reducing silos between different agencies and sectors.

Figure 2. Nutrition Research and Monitoring is Foundational to Lowering Disease Risk Factors and Increasing Disease-Free Lifespan through Interconnected Measures

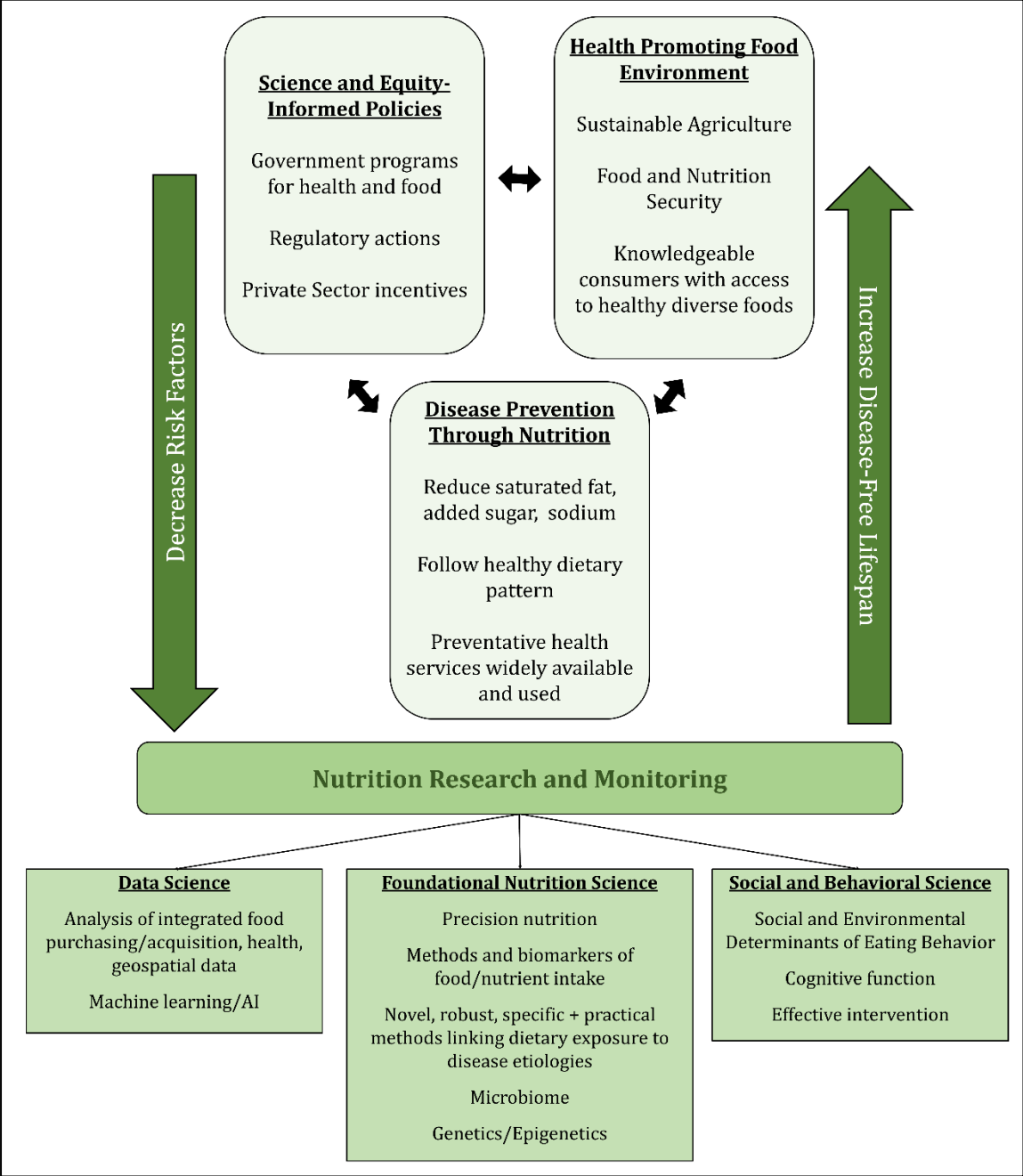


Figure 2: The information from nutrition research and monitoring encompasses key data that are crucial to making beneficial decisions regarding nutrition health including dietary habits, the biology of food intake, food purchasing history, and health data.

Overview of Gaps and Opportunities in Nutrition Science

As knowledge of nutrition's effects on disease risk has grown, emphasis in research and in government policies has shifted from focusing on easily-prevented deficiency diseases and assuring that people have basic calorie security to the Biden Administration's focus on nutrition security where all Americans have consistent and equitable access to healthy, safe, affordable foods essential to optimal health and wellbeing.⁴² We are pleased that federal agencies that sponsor and/or conduct nutrition research have created strategies that prioritize research such as precision nutrition approaches to "convey advances in nutrition science and related fields into meaningful, clinically relevant, and unbiased nutritional solutions for individuals and population subgroups."⁴³

Good nutrition is vital for the individual health of infants, children, and adults of all ages. Growth and development, susceptibility to infectious diseases, maternal health, development of chronic disease, and longevity are all significantly influenced by diet. Malnutrition in all its forms—including overweight and obesity, under-nutrition, and inadequate intake of specific essential nutrients—is a significant public health issue, not just globally but also in the United States.

Dietary risks now top the list of risk factors for the ten leading causes of death in the U.S. (see Figure 3) and the U.S. would benefit from focusing more of its research on how to prevent these diseases.⁴⁴ For instance, reducing the American population's sodium intake to 2,300 mg per day is estimated to reduce cases of high blood pressure by 22% and save 252,000 lives annually and \$37 billion in health care costs over 10 years.⁴⁵ And lifestyle changes like following the Diabetes Prevention Program curriculum that emphasizes maintaining a healthy weight and being physically active have been shown to reduce the risk of developing type 2 diabetes by more than 50% for people at high risk.⁴⁶

Randomized intervention trials provide the strongest evidence for clinical and public health guidelines; yet, the major funder of biomedical research, HHS's National Institutes of Health (NIH), devotes only 8.5% of its portfolio of grants and agreements to *preventing* the leading risk factors or causes of death and disability, and within these studies only a quarter include randomized trials to evaluate interventions to prevent the leading risk factors.^{47, 48} More attention and resources should be given to testing and scaling up community-based dietary interventions to ensure the interventions are appropriate to and accepted by diverse subpopulations.

⁴² United States Department of Agriculture. (July 2023). [Food and Nutrition Security](#)

⁴³ National Institutes of Health. (May 2020). [2020–2030 Strategic Plan for NIH Nutrition Research. A Report of the NIH Nutrition Research Task Force.](#)

⁴⁴ Murray, D.M. (2019 November 8). [ODP Study Suggests the U.S. Could Benefit from More Prevention Research on Leading Risk Factors and Causes of Death and Disability. NIH Office of Disease Prevention.](#)

⁴⁵ Dehmer, S. P., et al. (2020 June 9). [Health and Budgetary Impact of Achieving 10-Year U.S. Sodium Reduction Targets. American Journal of Preventative Medicine.](#)

⁴⁶ Zhou, X., et al. (2020 July). [Cost-effectiveness of Diabetes Prevention Interventions Targeting High-risk Individuals and Whole Populations: A Systematic Review. Diabetes Care.](#)

⁴⁷ Vargas, A.J., et al. (2019 November 8). [Assessment of Prevention Research Measuring Leading Risk Factors and Causes of Mortality and Disability Supported by the U.S. National Institutes of Health. JAMA Network.](#)

⁴⁸ Office of Disease Prevention (2019 November 8) [ODP Study Suggests the U.S. Could Benefit from More Prevention Research on Leading Risk Factors and Causes of Death and Disability.](#) Archived Director's Message.

Over an individual's lifetime, multiple biological, behavioral, environmental and cultural factors interact with and are shaped by other interpersonal, community, and societal influences that together determine one's health and disease experience (see Figure 4). We are beginning to understand these dynamics and how diet interacts with peoples' underlying genetic predisposition, with their gut microbiome, and how mothers' nutritional status before, during, and after pregnancy can alter their children's lifetime risk of developing one or more chronic diseases.⁴⁹ Advances in neuroscience have revealed that numerous signals have evolved to regulate peoples' eating behavior, that the homeostatic and hedonic eating pathways are separate, and that today's food environment with highly palatable foods can trigger addictive-like behavior.⁵⁰ In addition, consuming a health-promoting diet can be challenging in terms of having access to affordable food, whether it can be prepared conveniently, whether it's culturally acceptable, and whether the food preparer has sufficient culinary knowledge and skills. Individuals' ability to access health care or nutrition programs and the quality of those services are also important determinants of their longer-term health outcomes.

⁴⁹ Jensen H. and Larsen L. (2013 July 7). [Dietary Management and Genetic Predisposition. Vol. 2, 159-166. Current Nutrition Reports.](#)

⁵⁰Stover P. J., et al. (2023 July 9). [Neurobiology of eating behavior, nutrition, and health.](#) *Journal of Internal Medicine.*

Figure 3. Leading Risk Factors for Death in the U.S.

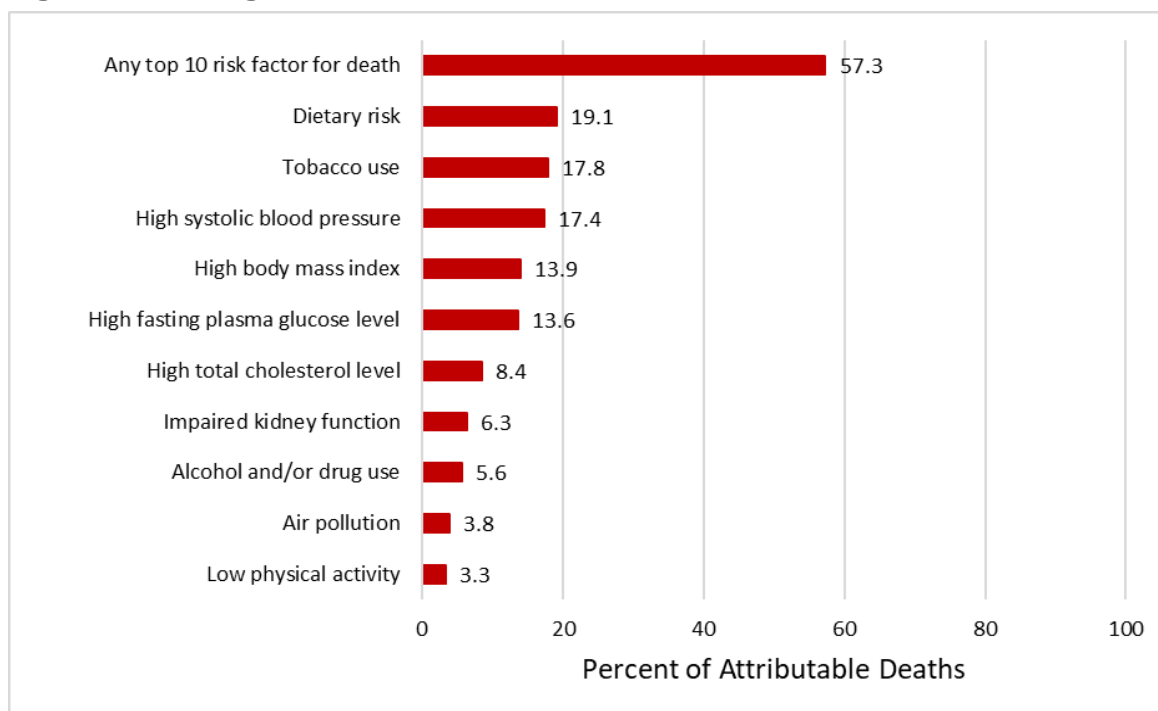


Figure 3: Leading risk factors of death in the U.S. The top 10 risk factors for death account for more than half of the deaths in the United States and dietary risk is at the top of the list. Additionally, diet is a contributor to four (4) of the remaining nine (9) factors: High systolic blood pressure, High body mass index, High fasting plasma glucose level, and High total cholesterol level.

Filling the scientific knowledge gaps for reducing diet-related diseases at the individual, family, community, and population levels will require the involvement of many scientific disciplines in a multi-pronged approach. We need to understand what specifically in food is causative and what the biological mechanisms are by which harm is caused. We need to know to what extent an individual's risk of getting a chronic disease is influenced by genetics and whether other factors like one's intestinal microbiota can modify that risk. We need to know the length of time one must be consuming the specific food or food component or dietary pattern, or at what life stage (e.g. during fetal development, infancy, childhood, or adulthood) the exposure has the most impact. We need to know how and when to change usual food habits to lower risk of acquiring a chronic disease, how to design intervention programs and how to provide information to people in actionable ways that are culturally acceptable. We need to know how to modify food through breeding or processing to reduce or eliminate the causative factors for poor health and how to alter the overall food environment to provide healthier food choices to the public. Before some regulatory actions may be undertaken (like fortification), the characteristics of the target population must be known, whether there are potential safety concerns associated with the changed food and the characteristics of groups at risk of adverse effects, which commonly eaten foods are the optimal delivery methods, and what the possible

Figure 4. Nutrition Health Disparities Research Framework





		Levels of Influence			
		Individual	Interpersonal	Community	Societal
Domains of Influence (Over the Life Course)	Biological	Taste Predispositions, Nutritional Status, Nutrition Metabolism, Nutrigenomics, Metabolomics, Microbiome, Food Allergies and Intolerances	Maternal-Child Interaction, Feeding Practices (e.g., breastfeeding), Family Microbiome	Community Illness Food Contaminant	Sanitation Pathogen Exposure (e.g., E Coli)
	Behavioral	Dietary Intake, Dietary Habits, Eating Patterns, Coping Strategies	Family Dietary Practices (e.g., family meals) School/Work Dietary Behavior	Community Functioning Community engagement (lobbying for full-service grocery stores)	Nutrition Policies and Laws (e.g., food assistance programs and access) State- and City-level Food and Nutrition Policies (e.g., soda taxes)
	Physical/ Built Environment	Personal Food Environment and Access (e.g., exposure to fast food at home)	Household Food Environment School/Work Food Environment	Community Environment Community Resources Neighborhood Food Environment (e.g., food deserts, food marketing)	Societal Structures (e.g., zoning laws) Dept. of Education and School System Workplace Policies and Accommodations, Food Marketing
	Sociocultural Environment	Food Preferences, Sociodemographic (e.g., discretionary income) Food Literacy and Preparation Skills Limited English Cultural Identity/Acculturation Response to Discrimination	Social Networks Family/Peer Norms Interpersonal Discrimination (e.g., dietary practice, body image)	Community Norms Local Structural Discrimination (e.g., dietary practice, body image)	Social Norms Food System (e.g., supply chain, food costs) Societal Structural Discrimination
	Health Care System	Insurance Coverage, Access, Utilization Health Literacy Treatment Preferences Nutrition Medical Therapy	Patient-Clinician Relationship Medical Decision-Making (e.g., referrals to RDs)	Availability of Services Safety Net Nutrition Services (e.g., WIC, SNAP, food pantries)	Quality of Care Health Care Policies for Nutrition Services (e.g., screening & treatment)
Health Outcomes	Individual Health 	Family/ Organizational Health 	Community Health 	Population Health 	

Figure 4: The Nutrition Health Disparities Research Framework shown above highlights examples of multiple factors and their intersection that are relevant to understanding and addressing nutrition-related health disparities. From Agurs-Collins, T., et al. (2024) [Perspective: Nutrition Health Disparities Framework: A Model to Advance Health Equity](#). *Advances in Nutrition* 15, 100194.

unintended consequences of the changes to the food product may be. Lastly, we need to know how to assure that consumers can access the changed food products, whether they will accept them, and what assistance they need to embrace and adopt health-promoting behavioral changes including, for instance, how to incorporate the changed products into culturally-specific and/or preferred foods.

Research to answer these questions is conducted by both the federal government and, to a lesser extent, the private sector. In the federal government, 17 agencies located within 10 different departments as well as independent agencies sponsor research related to the domains shown in Table 1 and work together in an interagency committee – the Interagency Committee on Human Nutrition Research (ICHNR) – to coordinate their efforts.⁵¹ In 2016, the ICHNR published a Nutrition Research Roadmap, the first time the agencies had produced a government-wide set of priorities to guide budget development and reduce the potential for duplicative projects. The plan focused on three questions that covered “the broad spectrum of research likely to yield accelerated progress in nutrition research to improve and sustain health for children, adults, families and communities:”

The multiple federal departments and agencies that conduct or sponsor nutrition research focus on their missions, and that research informs their programs. Altogether, the Government Accountability Office (GAO) identified 200 federal programs related to diet and chronic diseases that range from fundamental research to its applications in food assistance, public health, and medical programs like SNAP or the U.S. Coast Guard’s Weight Management Program. However, no reliable up-to-date accounting is available of the budgets they allocate to this research.⁵² The NIH within HHS is by far the largest funder of nutrition-related research at \$1.9 billion annually, or about 5% of total NIH funding in 2019, and only a quarter of this is for research focusing on diet for the prevention or treatment of disease in people. USDA is the second-largest supporter of nutrition research, with an annual budget of approximately \$0.17 billion in 2019. The ICHNR provides a forum for the research agencies to discuss their plans and priorities and to coordinate their research programs and activities related to crucial outputs such as the Dietary Reference Intakes ([DRI](#)) and Dietary Guidelines for Americans ([DGA](#)). However, the ICHNR does not manage or coordinate budgets nor create an overarching strategy to translate research findings into actionable programs. Although the recent ICHNR National Nutrition Research Roadmap (2016-2021) is now expired, it had value by catalyzing robust interagency input and stimulating sharing of newer data in the dynamic field of nutrition research. Therefore, the Roadmap should be updated and expanded to reflect the 2025-2030 timeframe and provide impetus to achieving the goal of the Hunger, Nutrition and Health Strategy of reducing diet-related chronic diseases for all Americans by 2030.

⁵¹Interagency Committee on Human Nutrition Research. (2016) [National Nutrition Research Roadmap 2016–2021: Advancing Nutrition Research to Improve and Sustain Health](#).

⁵² Fleischhacker, S.E., et al. (2020 September 1). [Strengthening national nutrition research: rationale and options for a new coordinated federal research effort and authority](#). *American Journal of Clinical Nutrition*. Vol. 112, Issue 3, 721 – 769.

Lead agency (and department, if applicable)	Number of efforts	Example of efforts
National Institutes of Health (HHS) ^a	49	Diabetes Prevention Program Outcomes Study
Food and Nutrition Service (USDA)	21	Supplemental Nutrition Assistance Program
Department of Defense	19	Building Healthy Military Communities
Multiple agencies ^b	19	National Collaborative on Childhood Obesity Research
Centers for Disease Control and Prevention (HHS)	13	Community Preventive Services Task Force
Economic Research Service (USDA)	13	Research on Food Access
Agricultural Research Service (USDA)	9	Jean Mayer Human Nutrition Research Center on Aging at Tufts University
Food and Drug Administration (HHS)	7	Nutrition Facts Label
Office of the Assistant Secretary for Health (HHS)	6	Healthy People Nutrition and Weight Status Topic Area
Agency for Healthcare Research and Quality (HHS)	5	Counseling for Healthy Weight and Weight Gain During Pregnancy
Centers for Medicare and Medicaid Services (HHS)	5	National Coverage Determination for Intensive Behavioral Therapy for Obesity
Department of Veterans Affairs	5	Nutrition Screening, Education, Clinical Intervention, Counseling, and Medical Nutrition Therapy
National Institute of Food and Agriculture (USDA)	5	Gus Schumacher Nutrition Incentive Program
National Institute of Standards and Technology (Department of Commerce)	5	Measurements and Standards to Support Nutrition Labeling
Administration for Community Living (HHS)	4	Older Americans Act Nutrition Services Program
Department of Housing and Urban Development	4	Linking Health and Housing Data
Health Resources and Services Administration (HHS)	4	Maternal and Child Health Nutrition Training Program
Indian Health Service (HHS)	3	Special Diabetes Program for Indians
Environmental Protection Agency	2	Air & Energy, Research Area 3 Output 10 (2019–2022); Product Title: Dietary Impacts on Air Pollution Health Effects
U.S. Coast Guard (Department of Homeland Security)	1	Weight Management Program
National Park Service (Department of the Interior)	1	National Park Service Healthy Parks Healthy People
Total	200	

Source: GAO analysis of agency information. | GAO-21-593

Table 1: Reported Federal Diet-Related Efforts by Lead Agency. This table lists current or ongoing federal efforts related to diet and identified by agency officials as playing an important role in reducing Americans’ risk of chronic health conditions. These 200 federal programs are administered by 21 agencies mostly within the departments of HHS and USDA. Source: [GAO analysis of agency information](#). | GAO-21-593

Specific Gaps and Opportunities in Nutrition Science

The following section outlines seven gaps and opportunities in nutrition science that, when filled, would provide the knowledge base and framework to propel progress toward the Administration’s goal of reducing diet-related disease by 2030 and continuing to gain benefits for all Americans in succeeding decades.

A. Strengthen planning, coordination and investment in foundational nutrition science, including implementation research.

More than a century of federally-sponsored nutrition research has established a knowledge base that facilitates action to promote health through consumer education and for public health interventions and dietary treatments for several diet-related chronic diseases. But even a well-studied relationship, like that of dietary sodium to elevated blood pressure or energy intake to obesity, still has many unanswered questions that limit the effectiveness of public health efforts to prevent them. For example, sodium is an essential nutrient and together with potassium is important in maintaining fluid balance within the body, although adverse health effects can occur at high and very low levels of intake. Widespread use of salt (sodium chloride) in processed foods and in cooking is driving the current high level of sodium intake by Americans, more than 3300 milligrams per day and exceeding the recommended level of less than 2,300 mg daily for teens and adults. In people with hypertension, adopting a low sodium diet reduces blood pressure in those who are salt sensitive, but there has been ongoing debate whether reducing sodium levels in the food supply would lower the occurrence of hypertension across the population. The current scientific consensus is that there is a moderate to high strength of evidence of a causal relationship between dietary sodium and the occurrence of hypertension including a level of intake (dose) and response relationship.⁵³

Acting on the basis of this evidence, the Food and Drug Administration (FDA) has taken action to encourage lowering the level of sodium in packaged processed and prepared foods, the greatest source of dietary sodium, and there are indications that food processors are complying.⁵⁴ In addition, the Administration’s Strategy also committed FDA to updating regulations enabling food processors to use safe and suitable salt substitutes in standardized foods, the Veterans’ Administration committed to procuring more lower-sodium foods, HHS’s Administration for Community Living and FDA are working to align adult nutrition programs with FDA’s sodium targets, and USDA committed to reducing sodium in school meals.⁵⁵ Federal employees and visitors to National Parks and VA hospitals will benefit from updating the Federal Food Service Guidelines to promote fruits, vegetables, whole grains, low-fat dairy, and low sodium food options in their food catering facilities. The Administration’s Strategy challenges the food industry to increase availability of and access to

⁵³ National Academies of Sciences, Engineering, and Medicine, et al. (2019 March 5). [Dietary Reference Intakes for Sodium and Potassium](#). *National Academies of Sciences*.

⁵⁴ U.S. Department of Health and Human Services Food and Drug Administration Center for Food Safety and Applied Nutrition. (October 2021). [Voluntary Sodium Reduction Goals: Target Mean and Upper Bound Concentrations for Sodium in Commercially Processed, Packaged, and Prepared Foods: Guidance for Industry](#).

⁵⁵ White House. (2022 September). [Biden-Harris Administration National Strategy on Hunger, Nutrition, and Health](#).

foods that are low in sodium. The Strategy also acknowledges that better data are needed to identify population intake of sodium, especially data on communities and/or populations that may most benefit from interventions.

Even though the evidence on the association of sodium to hypertension is sufficient to launch a public health intervention to lower levels in food, there are still many open questions about sodium replacements in food, the responsiveness of subpopulations to reduced sodium intakes, and evaluating the effectiveness of FDA's sodium reduction program. Ongoing research focusing on strengthening methods to measure sodium intake, continuing to refine knowledge of sodium requirements at different life stages, and using meta-analyses to leverage existing data about the relationship between sodium intake, blood pressure, and the differential chronic disease risk among population subgroups is needed. Food technology research is seeking substitutes for sodium in food processing that enhance flavor and also deliver the preservative and other functions that sodium performs. To guide the next stages of regulatory actions, consumer education, and private sector innovation, better understanding is needed of the different responses of population subgroups to high and reduced sodium diets, technologies for replacing sodium in food, and the most effective and practical strategies that can be incorporated into programs/interventions to lessen the diet-hypertension disparities experienced by people with low income and other access barriers. Beyond these are questions such as: Does the habitual sodium and potassium intake of one's parents affect a child's risk of developing hypertension in a higher sodium food environment? Do the sodium and potassium intakes of both mother and father affect their progeny's risk? To what extent does this risk profile extend into future generations?

Investment in foundational nutrition science will strengthen the evidence base relating dietary patterns to the risk for hypertension and other chronic diseases and lead to more effective interventions. Gaps begin with the determinants of eating behavior and the effects of nutrients and other food components on cognitive performance and regions of the brain that influence behavior, mood, and performance. Filling these gaps is important to inform the design of effective intervention programs at the individual and community levels. But measuring eating behavior – from appetite to sensations of fullness, to measuring patterns of eating -- relies on a wide range of methods including basic neurobiology, behavioral observation, questionnaire construction, and self-report. Current methods are suitable in laboratory settings but cumbersome to implement in epidemiologic studies, surveys and program evaluations. The dietary assessment methods used currently for these purposes rely largely on participants' recall of what they have eaten and are widely recognized to under-estimate true intakes and to be subject to misclassification of individuals and attenuating associations with health outcomes.⁵⁶ New technologies in development enabling more objective assessment of dietary intakes include using photographic images, chatbots rather than a live interviewer to help collect information, sensors to detect chewing and swallowing, using mobile phones cameras to capture the Universal Product Code on food packages, and near-infrared

⁵⁶ Freedman, L.S., et al. (2011 June 8). [Dealing With Dietary Measurement Error in Nutritional Cohort Studies](#). *Journal of the National Cancer Institute*.

spectroscopy in a handheld scanner to detect certain compounds in food.⁵⁷ These approaches with enhanced automation are welcome and will continue to require additional validation and calibration as they are also influenced by the decisions of study participants about when and how to use the tools. Additionally, motivated consumers would benefit from easily accessible and easy-to-use mobile applications to help them track and analyze their own dietary patterns using new technologies.

A second foundational science gap is in biomarkers of intake, nutritional status and metabolomics and biomarkers of nutritional risk factors for chronic diseases. Biomarkers are indicators of recent or long-term dietary intake or a consequence of dietary intake that can be used as reference measures to assess and correct for error (e.g., underreporting) in self-report dietary data.⁵⁸ Two biomarkers of food component intake that have been fully validated are serum carotenoids for fruit and vegetables consumption and omega-3 fatty acids for oily fish consumption.^{59, 60} Progress can be expected to be made through application of techniques that allow identification of several biomarkers simultaneously and provide the opportunity to create combinations of biomarkers to estimate past food intake.⁶¹

Understanding the genetic and epigenetic variation that results in nutritional heterogeneity within and between racial/ethnic groups is a third key gap in foundational nutrition science. The algorithms now in use are limited both by being derived from small datasets not reflective of the general population and the type of dietary data used in their construction. Current needs for genetics and epigenetic methods for application in nutrition research include: cataloging individual gene variants and epigenetic modification that produce functional differences in metabolism, nutrient requirements, and the effects of diet on health outcomes; improved methods for cross-correlating and validating genetic and epigenetic data with nutritionally relevant metabolomic data; and accelerating efforts to integrate individuals' nutritional status data into existing databanks like the Human Genome Project, Human Variome Project and others.⁶²

Understanding the interplay among diet, nutrition and the gut microbiome is the fourth gap in foundational nutrition science and requires establishing standard approaches and strengthened

⁵⁷ Mattes, R.D., et al. (2022 July) [Valuing the Diversity of Research Methods to Advance Nutrition Science](#). *Advances in Nutrition*.

⁵⁸ Gao, Q., et al. (2017 December 12) [A scheme for a flexible classification of dietary and health biomarkers](#). *Genes & Nutrition*.

⁵⁹ Al-Delaimy, W.K., et al. (2005 December). [Plasma carotenoids as biomarkers of intake of fruits and vegetables: individual-level correlations in the European Prospective Investigation into Cancer and Nutrition \(EPIC\)](#) *European Journal of Clinical Nutrition*.

⁶⁰ Trijsburg, L., et al. (2018 May 8). [Validating fatty acid intake as estimated by an FFQ: how does the 24 h recall perform as reference method compared with the duplicate portion?](#) *Advances in Public Health*.

⁶¹ Mattes, R.D., et al. (2022 July) [Valuing the Diversity of Research Methods to Advance Nutrition Science](#). *Advances in Nutrition*.

⁶² Mattes, R.D., et al. (2022 July) [Valuing the Diversity of Research Methods to Advance Nutrition Science](#). *Advances in Nutrition*.

experimental designs for applications in *in vitro* laboratory, animal and human studies.⁶³ Microorganisms in the gut play a substantial role in digesting food and influencing risk for diet-related chronic diseases through a variety of mechanisms. Dietary patterns and macronutrient intakes affect the composition and diversity of the gut microbiome which in turn is associated with cardiometabolic conditions, certain cancers and other disorders.^{64, 65, 66} Because the composition of the gut microbiome can be altered by what is eaten, it offers a very promising area for developing targeted foods and dietary approaches that could improve individual health and public health.⁶⁷

Defining the food’s “dark matter” and its effects on health is another gap in foundational nutrition science. While the macronutrient (i.e. protein, fat, carbohydrate), vitamin, and mineral composition of commonly eaten foods is well known and made available for research and clinical applications through USDA’s Food Data Central, food contains thousands of other chemicals that may have properties affecting chronic disease risk.⁶⁸ These poorly understood bioactive substances are referred to as the “dark matter” in food. This may also include components of ultra-processed foods. An initiative led by the Rockefeller Foundation, known as the Periodic Table of Food Initiative, is currently spearheading efforts to more fully characterize food’s structure and composition, biological interactions and functions and tie the compositional data to environmental, agricultural and cultural variables related to its production.⁶⁹

Finally, in addition to basic nutrition research and efficacy studies, future research should include studies that test the effectiveness of nutrition interventions in real-world settings, especially in communities and populations that are under-resourced. Research gaps in this domain include studies that incorporate community engagement in intervention development, testing, and dissemination; compare multi-level interventions to single level interventions; compare the effectiveness of universal versus tailored approaches; and describe and address challenges to program implementation and sustainability (e.g., cost-effectiveness). This area of implementation research is specifically highlighted in Recommendation 2.2 and is also relevant to Gap/Opportunity E below.

Progress in these six areas of foundational nutrition science can then be brought into the precision nutrition research agenda to deepen our understanding of how food patterns of different population subgroups affect their health and ultimately lead to improved treatments through medical nutrition therapy, improved community-based interventions to address health disparities, and new food technologies to enhance food’s health-promoting properties. That progress can be accelerated

⁶³ Zeisel, S.H. (2019 March 18). [A Conceptual Framework for Studying and Investing in Precision Nutrition](#). *Frontiers in Genetics*.

⁶⁴ Chen, J., et al. (2014 March 12). [Diet effects in gut microbiome and obesity](#). *Journal of Food Science*.

⁶⁵ David, L.A., et al. (2013 December 11). [Diet rapidly and reproducibly alters the human gut microbiome](#). *Nature*.

⁶⁶ Pak H.H., et al. (2019 January 11). [The Metabolic Response to a Low Amino Acid Diet is Independent of Diet-Induced Shifts in the Composition of the Gut Microbiome](#). *Nature*.

⁶⁷ Mattes, R.D., et al. (2022 July) [Valuing the Diversity of Research Methods to Advance Nutrition Science](#). *Advances in Nutrition*.

⁶⁸ United States Department of Agriculture. (2024 April). [FoodData Central](#).

⁶⁹ The Rockefeller Foundation (2024 April 24). [Periodic Table of Food Lays the Ground for a Health Revolution](#).

through improved planning, coordination and investment in foundational research. As previously mentioned, the federal roadmap for nutrition research has lapsed, and a revitalized roadmap giving priority to the foundational science necessary for precision nutrition should be developed giving priority to chronic disease prevention and reduction in health disparities. The interagency coordinating body for research, the ICHNR, should be allocated resources to coordinate the effort and to spearhead the development of multi-agency jointly-funded research initiatives and their associated budget requests.

B. Improve program effectiveness by integrating and capitalizing on data science and social and behavioral sciences.

Accelerating progress in combatting diet-related chronic diseases will also be enhanced by greater integration of the research approaches and tools of data science and the social and behavioral sciences, including encouraging multidisciplinary teams. As [PCAST recently reported](#), artificial intelligence, machine learning, deep learning, and other data science tools offer new ways to conduct research, do more with data, share models and data, and advance fundamental understanding in life sciences. These methods are critical for microbiome analysis, for example, and informing precision nutrition by providing deeper insights into how dietary exposures mediated through the gut microbiota's metabolism and the individual's and subpopulation's underlying genetic predispositions affect health outcomes.⁷⁰ As PCAST has pointed out, machine learning in social science "promises to provide more detailed, and often individualized, estimates on how medical treatments, education programs, and other interventions or public policies affect different populations."⁷¹ For nutrition science to experience the transformational changes envisioned from artificial intelligence and machine learning approaches, and to transform that knowledge into more effective food-based interventions and programs, those data approaches and tools applied to nutrition should be included in research programs and funding opportunities offered by the federal science agencies. Of note, artificial intelligence / machine language (AI/ML) approaches are only as good as the data they are able to draw on, and again, more nuanced datasets that are fully representative of different U.S. subpopulations are not currently available.

The efficacy of nutrition programs can also be dramatically improved by broader application of behavioral science research methods that evaluate impact and inform improved delivery. A broad range of research efforts could be valuable, for instance, focusing on efficacy studies of social and

⁷⁰ National Academies. (2024). [The Role of Advanced Computation, Predictive Technologies, and Big Data Analytics in Food and Nutrition Research](#). *National Academies of Sciences*.

⁷¹ President's Council of Advisors on Science and Technology. (2024 April). [Supercharging Research: Harnessing Artificial Intelligence to Meet Global Challenges](#)

behavioral interventions such as dietary coaching,⁷² problem-solving,⁷³ social network interventions,⁷⁴ behavior change mediated through digital technology,⁷⁵ and many other approaches.

C. Prioritize equity in research.

In designing and conducting research to fill these gaps in foundational nutrition science, federal agencies should prioritize equity in research to assure that the outcomes are applicable to our diverse population and benefits will be shared. Equity in research can also facilitate a comprehensive understanding of the breadth of nutrition challenges and enable diverse perspectives that can lead to more innovative solutions—from research to policies. Unfortunately, even when research produces clear guidance and interventions have documented efficacy there can be implementation gaps that lead to inequities. Filling the equity gaps in program outcomes requires support for transdisciplinary implementation research (see more detail in Gap/Opportunity section E below), as well as a stronger focus on community-engaged research.⁷⁶

There is currently no standard or widely adopted framework to both evaluate and ensure nutrition research is designed and completed with equity as a priority. There are, however, examples of work currently being undertaken or planned; these include the HHS/NIH [ComPASS Program](#) for community-led, structural interventions, as well as the National Park Service adding equity and access to parks in under-resourced communities as a specific research element, USDA's work to more effectively measure equity within federal nutrition assistance programs, and the NIH [Nutrition Health Disparities Research Framework](#) (also Figure 4 of this report, adapted from the [National Institute on Minority Health and Health Disparities Research Framework](#)).^{77, 78} These isolated ongoing efforts represent an opportunity for federal agencies sponsoring nutrition research to develop a framework that can be used to plan for and evaluate equity within their research programs, including research on effective and equity-focused deployment of interventions.⁷⁹

⁷² Kennel, J. (2018). [Health and Wellness Coaching Improves Weight and Nutrition Behaviors](#). *Am J Lifestyle Med*.

⁷³ Houts, P., et al. (2006). [A problem Solving Approach to Nutrition Education and Counseling](#). *J. Nutr Educ Behav*.

⁷⁴ Kulandaivelu, Y., et al. (2023 July). [Social Media Interventions for Nutrition Education Among Adolescents: Scoping Review](#). *JMIR Pediatr Parent*.

⁷⁵ Chatterjee, A., (2021 November). [Digital Interventions on healthy Lifestyle Management: Systematic Review](#). *J Med Internet Res*.

⁷⁶ Cooper, L. A., et al. (2021). [Using Implementation Science to Move from Knowledge of Disparities to Achievement of Equity](#). Chapter 17 in *The Science of Health Disparities Research*, Editors Dankwa-Mullan, E., et al.

⁷⁷ U.S. Department of Interior. (2018). [National Park Service Comprehensive Survey of the American Public 2018 – Racial and Ethnic Diversity of National Park System Visitors and Non-Visitors](#).

⁷⁸ U.S. Department of Agriculture. (2022 January 20). [USDA Supports Equity, Inclusion in Nutrition Assistance Programs Food and Nutrition Service Highlights from the First Year of the Biden Administration](#).

⁷⁹ Bentley-Edwards, K. L., et al. (2022). [The 5Ws of Racial Equity in Research: A Framework for Applying a Racial Equity Lens Throughout the Research Process](#). *Health Equity*.

D. Improve data on food intake, nutritional status and health outcomes for subpopulations.

Most federal nutrition programs, and many private-sector efforts as well, use two key scientific reviews—the Dietary Reference Intakes ([DRI](#)) and the Dietary Guidelines for Americans ([DGA](#)). Because these two resources provide the core research to support numerous efforts, the survey data upon which they rely is a critical place to focus efforts to assure inclusion of American subpopulations and their nutritional needs and differences. Since World War II, government programs have relied on a set of reference values for essential nutrients for “(a) prescriptive or planning applications, where suitable levels of nutrient intake by individuals and population groups are established, or (b) diagnostic or assessment applications, where determinations are made about the likely nutritional adequacy of the observed intake when considered in relation to appropriate nutrient requirement data.”⁸⁰ Information derived from surveys of what people are eating and their nutritional status and from controlled trials to determine the level of intake required to prevent deficiency and toxicity forms the basis for these reference values called Dietary Reference Intakes (DRI). Though they have not been updated recently, the DRI are intended to reflect new knowledge about essential nutrients required to maintain health and since 2019 to reduce chronic disease risk. Since 1980, USDA and HHS have worked collaboratively to issue the DGA that, together with the DRI, provide guidance to federal food and health programs. Produced on a 5-year schedule, DGA build on the evolving scientific evidence relating dietary patterns to risk of chronic disease and recommend what to eat and drink at different life stages to promote health and lower risk of acquiring a diet-related chronic disease. The DGA expert scientific committees use three complementary methods to review the scientific evidence: systematic reviews, food pattern modeling, and data analysis. Systematic evidence-based reviews evaluate and synthesize the body of food and nutrition-related science, and survey data is the foundation for developing food pattern models and estimating current dietary intakes regarding the State of the American Diet. Federal agencies use the DRI and DGA for multiple purposes that have substantial public health and budgetary implications from planning and procuring food for school meals and military rations, developing the Thrifty Food Plan that is the basis for the SNAP allotment, to create the Nutrition Facts Panel on food labels.^{81, 82}

The National Health and Nutrition Examination Survey ([NHANES](#)) is the primary data source used in the scientific reviews that produce both the DRI and the DGA. Designed to reflect a representative sample of the general American population, the survey interviews respondents about their recent and usual dietary intakes and conducts detailed physical examinations that yield information about their nutritional and health status.⁸³ The annual sample size of 5,000 people is enough to produce reliable estimates for large subgroups but not for all subpopulations at multiple life stages. There is

⁸⁰National Academies Press. (2003). [Dietary Reference Intakes: Guiding Principles for Nutrition Labeling and Fortification](#). *National Academies of Science*.

⁸¹ U.S. Department of Agriculture. (2023 November 3) [SNAP and the Thrifty Food Plan](#).

⁸² Food and Drug Administration. (2024 March 5). [How to Understand and Use the Nutrition Facts Label](#).

⁸³ Zipf, G., et al. (2013 August). [National health and nutrition examination survey: plan and operations, 1999-2010](#). *Vital and Health Statistics Series*.

also concern that declining participation rates may present further challenges.⁸⁴ To meet the agencies' needs for better subpopulation data, a one-time special survey, Hispanic HANES, for Americans of Mexican, Cuban and Puerto Rican descent, was conducted and NHANES regularly oversamples other populations identified as priorities as part of the ongoing survey.

Strengthening the coverage of subpopulations within national nutrition monitoring efforts is needed to provide the data on important subgroups that are now missing in the formulation of the DRI and DGA reference standards. The [NHANES](#) is a critical component of the national monitoring system. Given current limitations of the survey, deliberate and thoughtful consideration is needed to strengthen the survey system to address the changing population composition and health profile.”⁸⁵ For instance, because dietary assessment was hampered during the pandemic, there is not NHANES data available yet to illustrate the impact of the pandemic on usual dietary intake (there is data pre-pandemic, but not yet post-pandemic; and no data during pandemic). Including more nimble diet assessment metrics, such as with ASA24 or another self-administered online tool, in NHANES would allow the government to continue diet assessment during situations such as the pandemic.

E. Focus research on improving program effectiveness.

PCAST heard a consistent message from the agencies with responsibilities for feeding and health programs: they want to know how to more effectively implement the current evidence on reducing risk of diet-related disease into their programs. The range of programs is large and covers interventions as diverse as providing calorie levels on menus, providing fully prepared meals tailored to the medical needs of recipients, and healthy food marketing in grocery stores. Recent evaluations of some representative programs as shown in Table 2 demonstrates that each program has impact, although a gap in our knowledge is how these programs may work in synergy to promote and sustain behavioral changes. Program agencies responsible for food assistance programs and for clinical care desire new approaches to help all they serve obtain and consume health-promoting diets. This is a critical need cited by all the program agencies that requires translation of research into practice. Translating research into practice through successful implementation and dissemination is complicated, encompassing a variety of settings across the diversity of populations participating in programs, and considering the different purposes and designs of programs. As mentioned above, research to improve program impact will require greater integration of the tools, resources, and expertise of data science and the social and behavioral sciences as well as developing entirely new efforts on what is often called implementation science.

⁸⁴ Zipf, G., et al. (2013 August). [National health and nutrition examination survey: plan and operations, 1999-2010](#). *Vital and Health Statistics Series*.

⁸⁵ Zipf, G., et al. (2013 August). [National health and nutrition examination survey: plan and operations, 1999-2010](#). *Vital and Health Statistics Series*.

Table 2. Outcomes and Evidence of Nutrition Related Implementation

Effort	Description	Research Evidence	Outcome
Calorie menu labeling	The mandatory practice for food outlets to display the calorie content of menu offerings.	Calorie labeling was associated with small decreases in mean calorie and nutrient content of fast food meals 2 years after franchise labeling and nearly 1 year after implementation of labeling nationwide. In another study, a supermarket build-your-own sandwich counter found a 7.8% decrease in calories purchased by customers after per-ingredient caloric information was introduced to order slips.	The incorporation of calorie information on menus correlates with a reduction in the number of calories purchased.
Medically tailored meals (MTM)	Fully prepared meals, tailored to the medical needs of the recipient by a registered dietitian nutritionist (RDN).	1 year of MTM coverage for individuals with complex chronic disease plus limited instrumental activities of daily living. Enhanced food security and better disease management result in reduced hospital, emergency room, and nursing home admissions, leading to lower overall healthcare costs.	Improved food security and disease management. Reduced health care expenditures.
Grocery retail interventions	Healthy food marketing strategies in retail stores.	Nutritional scoring and nutritional messaging were found to be the most effective and widely-researched strategies to encourage healthfulness of shoppers' purchases. These two intervention strategies are commonly implemented within SNAP-authorized retail settings.	Encouraged healthfulness of shoppers' purchases.
Produce prescription programs	Discounted or free produce, typically fresh fruits and vegetables.	Improved food security and diet quality.	Enhanced food security and dietary quality, decreased levels of hemoglobin A1c, blood pressure, and body mass index.
Medically tailored groceries	Healthy food items that are preselected, often by an RDN or other qualified professional, and provided to eligible patients.	School meals: Improves diet quality, food security, and academic performance (lunch).	Various programs were found to be effective in reducing food insecurity, improved diet quality, and other areas.
Food assistance programs	Healthy food items that are preselected, often by an RDN or other qualified professional, and provided to eligible patients.	SNAP: Reduces poverty and enhances food security. WIC: Enhances the quality of maternal and child diets, birth outcomes, and child preventive care and cognitive development.	Various programs were found to be effective in reducing food insecurity, improved diet quality, and other areas.

The application of precision nutrition approaches within these different public health, food, and medical programs will require much broader multidisciplinary studies and more granular data about the dietary patterns and the nutritional and health status of subgroups in the population.⁸⁶ Dietary interventions can then be designed to reflect the eating patterns of racially, ethnically, and

⁸⁶ Nicastro, H.L., et al. (2022 November 12). [Opportunities to advance implementation science and nutrition research: a commentary on the Strategic Plan for NIH Nutrition Research](#). *Transl Behav Med*, Volume 13, Issue 1, January 2023, Pages 1–6.

economically minoritized groups and test their feasibility and acceptability among those groups and subgroups. Beyond the cross-sectional national data that [NHANES](#) provides, precision nutrition research will also require conducting epidemiological studies (cohort, case-control, cross-sectional) to expand understanding of the dietary patterns of racially, ethnically, and economically minoritized groups and their association with health outcomes, with emphasis on subgroup differences (*see Appendix B*). The efficacy of culturally sensitive dietary interventions at improving relevant health outcomes can then be tested in robust clinical studies, with strong consideration to contextual variables known to mediate eating behavior in the groups of interest. Comparing and contrasting the adoption, maintenance, and effectiveness of dietary interventions on health outcomes among the various groups will build evidence on approaches to mitigate diet-related health disparities.⁸⁷

F. Diversify the nutrition workforce.

One of the greatest opportunities to increase equity in delivering the benefits from nutrition research to the public may be through diversification of the nutrition workforce and expansion of educational opportunities. Communities need access to diet and nutrition advice and support that reflects their culture, values, and lifestyles. As noted in the Hunger, Nutrition and Health [Strategy](#), dietitians are among the least diverse health care providers. Efforts to promote equitable access to the benefits of nutrition research require a robust and diverse nutrition workforce to be successful. And, although the Bureau of Labor Statistics projects continued growth in the national dietitian and nutrition workforce, as of 2021, only 100 of 2,637 U.S. colleges offer an undergraduate major and 45 offer Ph.D. programs in nutrition and dietetics.⁸⁸ None of the tribal colleges offer undergraduate majors in this area. The end result is limited availability of racially, ethnically, and culturally diverse nutrition scientists and dietitians to design and conduct the research needed for effective intervention programs or deliver effective dietetic advice.

In its Strategy, the Administration committed to strengthening and diversifying the nutrition workforce through a number of steps that HHS, Veterans Affairs (VA), and USDA are undertaking. PCAST endorses these commitments to train future nutrition professionals and notes that nutrition is rarely mentioned among science, technology, engineering, and math (STEM) education initiatives that can interest youths in careers in science. This is a missed opportunity to attract students of diverse backgrounds into a field of science that provides a variety of career settings and opportunities for impact. PCAST also commends the VA's innovative program to train and place individuals who hold both Registered Dietitian Nutritionist registration and doctoral degrees within the VA's clinical settings. The VA is spearheading innovative pilot programs, while USDA is working with Land Grant Universities to develop a [national workforce strategy for the WIC program](#). PCAST believes that there are opportunities to learn from these efforts and apply them more broadly to diversify the nutrition workforce.

⁸⁷ Dhillon, J., et al. (2022 September) [A Systematic Review of Literature on the Representation of Racial and Ethnic Minority Groups in Clinical Nutrition Interventions](#). *Advances in Nutrition*, Vol. 13, Issue 5, 1505 – 1528.

⁸⁸ National Center for Education Statistics. (2022) [Educational Institutions](#).

There are numerous opportunities to increase the robustness and diversity of the nutrition workforce. Removing or lessening barriers to pursuing careers in nutrition and dietetics is a possible area for enrichment. For example, students must pay their own tuition and fees for the required [dietetic internship](#) to become a registered dietitian, which can pose significant socioeconomic barriers to diversifying the workforce. Additionally, starting in 2024, individuals seeking to become registered dietitians will be required to have a master's degree [at minimum](#)—as opposed to the previous bachelor's degree requirement—which may be financially out of reach for many. Workforce inequities are further complicated by the fact that those working in nutrition and dietetics are often ineligible for many health-related tuition reimbursement programs. For example, those working in nutrition and dietetics are not eligible for reimbursement under the [Federal National Health Service Corps Loan Repayment Program](#). This represents a missed opportunity to meaningfully expand our healthcare workforce with nutrition and dietetics professionals.

G. Maintain momentum through leadership.

America finds itself today bearing the burden and cost of diet-related diseases—decreased productivity, increased health care costs, and impaired military readiness—all without a concerted strategy and long-term leadership to focus federal and private sector resources on their prevention. A stronger and more coordinated federal effort is needed to apply nutrition science to the myriad public and private food and health programs, and that effort needs to span presidential administrations and budget cycles to provide leadership for all sectors—government and private—to address the national challenge of diet-related diseases.

Under the Administration's Hunger, Nutrition and Health Strategy, federal agencies have taken many actions to coordinate their relevant diet-related efforts, and many state agencies and private organizations have responded to the Strategy's calls to action. Unfortunately, there are no assurances that these commitments will continue into the future. What is lacking is a mechanism to continue the momentum of the Hunger, Nutrition and Health Strategy, leverage the considerable resources currently devoted to diet- and nutrition-related research efforts, and provide consistent leadership, coordination, and collaboration between agencies and with the private sector for several decades to come. Because two departments house the great majority of food and nutrition research and programs and chair the interagency research coordination mechanism -- the Department of Agriculture and the Department of Health and Human Services -- the ultimate responsibility rests with them for appropriately resourcing and coordinating nutrition research and its translation into actionable programs with benefits for all Americans.

There have been a number of past efforts to catalyze public and private sector efforts to improve health through nutrition initiated in both the Congressional and Executive Branches that were short-term or lapsed at the end of an administration. Because it has taken many decades to reach the point we are at now, where diet-related chronic diseases are shortening lives and impairing productivity, it will take long-term efforts by public and private sectors to achieve health with equity in the American population. Intermittent 4 -10-year prevention efforts have not proven effective -- obesity rates and related chronic disease rates continue to rise. Relevant efforts have included [Healthier U.S.](#)

launched by the Bush Administration in 2002 and the [Let's Move](#) Campaign launched in 2010 and spearheaded by then First Lady Michelle Obama. As GAO notes, the [Patient Protection and Affordable Care Act of 2010](#) required a national strategy for public health that included healthy eating. The 2011 strategy resulted in better coordination in new ways on guidelines for food at federal worksites, housing and health data linkages, and the mass communication of [MyPlate](#). Although a wide-ranging strategy was developed, the full set of planned actions were not implemented and there has been no report on the progress toward meeting 2021 targets.⁸⁹

One exception to the rule of short-run nutrition initiatives is the Healthy People program administered by the Department of Health and Human Services that since 1980 has published 10-year goals for health promotion and disease prevention that include obesity and some key nutrition objectives.⁹⁰ It has been powerful in focusing and coordinating work with states; however, it has a limited focus on food/nutrition issues and has not affected rising obesity rates.

Over the past 50 years, many voices have highlighted the need for high level national leadership for food/nutrition/health. The 1969 White House Conference on Hunger recommended that President Nixon appoint a Special Assistant for Nutrition and that the Department of Health, Education and Welfare establish an Administration for Nutrition Science.⁹¹ The Congressional Office of Technology Assessment in 1978 concluded that the Federal Government had “failed to adjust the emphasis of its human nutrition research activities to deal with the changing health problems of the people” and provided Congress with options for oversight and legislation.⁹² In 1994, the National Academy of Sciences recommended a “Presidential Initiative for the nutrition and food sciences within the Executive Office of the President” in conjunction with a second White House Conference.⁹³ More recently in 2021, the General Accountability Office recommended a national strategy be developed and implemented to coordinate the fragmented activities of 200 federal programs related to diet and chronic disease reduction.⁹⁴

Similar to the climate and weather crisis, the scope of efforts needed to combat the epidemic of diet-related diseases requires high priority research to understand the unfolding and changing nature of the problem, and develop effective solutions and high-level efforts that move research findings into actionable programs. The scope and focus of effort needed will require all federal agencies to assess and report on progress and emerging issues, coordinating agency efforts to develop and implement adaptation and mitigation strategies, engaging and challenging the private sector and individuals to take steps within their purview, and seeking Congressional support to fund the programs that will deliver broad health and security benefits to the nation.

⁸⁹ U.S. Government Accountability Office. (2021 May 12). [2021 Annual Report](#).

⁹⁰ U.S. Department of Health and Human Services. [Healthy People 2030](#).

⁹¹ The White House. (1970). [White House Conference on Food, Nutrition, Health: Final Report](#).

⁹² Office of Technology Assessment. (September 1978). [Nutrition Research Alternatives](#).

⁹³ National Academics Press. (1994). [Opportunities in the Nutrition and Food Sciences](#). *Institute of Medicine*.

⁹⁴ U.S. Government Accountability Office. (2021 August 17). [Chronic Health Conditions: Federal Strategy Needed to Coordinate Diet-Related Efforts](#).

The [U.S. Global Change Research Program](#) (USGCRP) is a tested, successful model for how the U.S. government could effectively engage the multiple departments and agencies involved in a similarly critical area of science to combat the diet-related disease epidemic.⁹⁵ Established by Congress in 1990, the [Global Change Research Act of 1990](#) program, overseen by the Office of Science and Technology Policy, is facilitated by a National Coordination Office. USGCRP has its own budget to support the coordination office and a professional staff. With these resources, the USGCRP has developed multi-stakeholder strategic plans and coordinated efforts through Interagency Working Groups that span a wide range of climate-related topics. The annual reports and scientific assessment have given visibility to monitoring changes in the ozone layer and the effectiveness of policies to reverse its depletion, identified climate change impacts on ecosystems and society along with vulnerabilities and risks, and provided scientific information to enable effective decision making to address corresponding threats and opportunities.

Other models that could be considered for strengthening the linkages between research and delivery of results to the public would require varying levels of executive branch and congressional actions. To strengthen the existing research coordination mechanism, the ICHNR could be delegated some additional authorities such as the authority to initiate multi-agency research programs and budget requests, and the Secretaries of USDA and HHS could delegate additional staff resources to enable its work on a more efficient basis. The ICHNR could be moved into the National Science and Technology Council to raise its visibility within the Office of Science and Technology Policy. An office modeled on the Director of National Intelligence could provide essential planning, coordination and harmonization of the work of the more than 10 U.S. departments and agencies delivering nutrition programs.⁹⁶ Fully addressing the gaps and opportunities will require significant, long-term efforts.

Findings and Recommendations

In this section, we present our findings and recommendations for strengthening the scientific evidence base to drive reductions in the burden of diet-related chronic diseases in America and to assure that the benefits of research will be shared equitably among our diverse population. We build on the Administration’s Hunger, Nutrition, and Health Strategy and on observations from the General Accountability Office regarding the large number of federal research and programmatic activities – 200 in total—that are related to diet and chronic diseases and GAO’s finding that a federal strategy is needed to coordinate these diverse efforts.⁹⁷ These recommendations also address the gaps and opportunities identified above, focusing on actions that can be undertaken now to improve nutrition research that can improve health outcomes for every American. In offering these specific

⁹⁵ Fleischhacker, S.E., et al. (2020 September 1). [Strengthening national nutrition research: rationale and options for a new coordinated federal research effort and authority](#). *American Journal of Clinical Nutrition*. Vol. 112, Issue 3, 721 – 769.

⁹⁶ Fleischhacker, S.E., et al. (2020 September 1). [Strengthening national nutrition research: rationale and options for a new coordinated federal research effort and authority](#). *American Journal of Clinical Nutrition*. Vol. 112, Issue 3, 721 – 769.

⁹⁷ U.S. Government Accountability Office. (2021 May 12). [2021 Annual Report](#).

recommendations, our goal is to speed delivery of evidence-based solutions to achieve a healthier food environment and a healthier America.

Finding 1: High level attention is needed over several decades to deliver continued uninterrupted progress towards the President’s goal of reducing the burden of diet-related chronic diseases in America.

Under the Administration’s Strategy for Hunger, Nutrition and Health, federal agencies have taken many actions to coordinate their relevant diet-related efforts and many state agencies and private organizations have responded to the strategy’s calls to action, but there are no assurances of the continuation of these commitments into the future. The Domestic Policy Council and OSTP have played central roles in coordinating the agencies’ efforts to date. A number of past efforts to catalyze public and private sector efforts to improve health through nutrition initiated in both the Congressional and Executive Branches were short-term or lapsed at the end of an Administration. Because it has taken many decades to reach this point where diet-related chronic diseases are shortening lives and impairing productivity, it will take long-term efforts by public and private sectors to achieve health with equity in the American population. Intermittent 4–10-year prevention efforts have not proven effective – obesity rates and related chronic disease rates continue to rise. What is needed to continue the momentum of the Administration’s Strategy is a mechanism to leverage the considerable resources currently devoted to diet- and nutrition-related research efforts, and provide consistent leadership, coordination and collaboration between agencies and with the private sector for several decades to come.

Recommendation 1. The Administration should implement a coordinated and sustained federal interagency effort, co-led by HHS and USDA, to strengthen the nutrition science base for current and future public and private sector actions to reduce the burden of diet-related chronic disease and maintain momentum toward the President’s 2030 goal.

Because HHS and USDA house the great majority of the 200 food and nutrition research and diet-related programs and chair the interagency research coordination mechanism, the ultimate responsibility should be placed with them for appropriately resourcing and coordinating nutrition, agriculture and health research and its translation into actionable programs with benefits for all Americans. Overcoming the effects of the current food environment and private sector marketing of unhealthy foods requires *significantly greater investment* both in research to inform systematic changes in the food environment and in continued refinement and scale-up of public health intervention programs to combat its detrimental health effects. The HHS and USDA are the two federal agencies in the best position to lead and coordinate interagency efforts to accelerate progress toward reducing the burden of diet-related chronic diseases in America. Their coordinated efforts should focus on reducing health disparities through scaling up effective evidence-based solutions in public and private sectors, strengthening nutrition research oversight and appropriate resourcing the interagency research coordinating committee (i.e., ICHNR). They should periodically assess and report on progress and emerging issues to the President and Congress and seek congressional

support to fund the necessary programs and authorizations to initiate programmatic changes to ultimately deliver benefits to the nation.

Recommendation 1.1 An interagency committee, co-led by HHS and USDA, should re-evaluate and develop every 5 years, beginning with 2025-2030, a nutrition research roadmap focused on diet-related chronic disease risk reduction and equity, building on the framework provided in the previous roadmap.

The initial [Nutrition Research Roadmap](#) that guided and coordinated national research efforts for 5 years expired in 2021. To maintain and accelerate the momentum of the Administration’s Strategy on Hunger, Nutrition and Health, new science-based strategies are needed to address the gaps and opportunities in foundational nutrition science identified in this report and to focus on rapid translation into health, food and agriculture programs and policies. The Interagency Committee on Human Nutrition Research (ICHNR) created the first roadmap and is in the best position to design a multi-agency research agenda.

Recommendation 1.2 Federal agencies should strengthen national nutrition monitoring programs to provide necessary data on dietary intake and the nutritional and health status of sociodemographic subgroups used in regulatory and program planning, evaluation, and the formulation of reference standards.

Strengthening the coverage of subpopulations within national nutrition monitoring efforts is needed to provide data on important subgroups that are now missing or not sufficiently covered and important to program agencies’ focusing initiatives and evaluations. Survey data are essential for the formulation of reference standards (i.e., Dietary Reference Intakes and Dietary Guidelines for Americans) that inform program requirements and have substantial influence on program costs. For example, the Thrifty Food Plan based on these reference standards forms the basis for the cost of SNAP, approximately \$120 billion annually. Efforts should also be undertaken to identify more culturally and linguistically acceptable ways to obtain the needed dietary intake and nutritional status information and to encourage collaboration between federal, state, tribal and local governments and other entities to improve nutritional monitoring programs and provide insights on subpopulations. Targeted coordination and collaboration among federal agencies in three areas would provide methods, databases and metrics important to strengthening nutrition monitoring of subpopulations: innovative data capture methods for dietary assessment, culturally relevant food composition data, and updating and adaptation of metrics used to evaluate dietary status and nutritional status (e.g. Healthy Eating Index).

Finding 2: Equitable access to the benefits of nutrition research has not occurred, and prioritization of efforts to accomplish equitable access is needed. *A national strategy should provide for equity in the planning, conduct and delivery of research results; give high priority to responding to programmatic agencies' needs for improving their program implementation to meet the needs of all Americans; and actively seek new ways to engage the resources of the private sector.*

In 2016, the federal nutrition science agencies working together in the Interagency Committee on Human Nutrition Research developed the first roadmap to guide and better integrate their research plans. At that time, the plan did not consider how to engage with the private sector to access and analyze relevant data from agricultural, food processing, retailing, health care, and insurance sectors. Focusing on programmatic agencies' needs for techniques to translate the existing research base on dietary change into practical programmatic reforms to promote participants' health could potentially have quick payoffs in program effectiveness.

Under the previous plan, equity was not a leading consideration. A number of challenges and barriers exist to developing equitable nutrition research programs. The challenges include lack of a shared understanding and definition of equity, limited social diversity in research teams and funding, limited evidence regarding the efficacy of culturally centered interventions, limited evidence on programmatic and policy interventions, and lack of scale-up approaches to close gaps and reduce population disparities. There are barriers to trust and authentic community/academic relationships, challenges from scientific colonialism, and a need to embrace multiple worldviews (e.g., Indigenous Knowledge). These should be addressed in a new research roadmap.

Recommendation 2. To ensure equitable access to the benefits of nutrition research, federal agencies should prioritize equity in nutrition research, focus research on improving program delivery, continue efforts to diversify the nutrition science and dietetics workforce and engage the academic and private sectors in multisector research and intervention initiatives.

Recommendation 2.1 Federal agencies should evaluate nutrition research programs for equity considerations, building on existing health equity frameworks, and identify, share and adopt leading practices.

For every American to benefit from the federal investment in nutrition science and obtain the health benefits, research must be designed and conducted with equity. As the existing research coordinating body, ICHNR should coordinate a formal review of member agencies' research programs for equity considerations using guidelines derived from existing equity frameworks and support agencies in their efforts to identify, share, and adopt leading practices. PCAST praises effort that are already underway, including the [USDA Equity Commission](#) and the [NIH-Wide Strategic Plan for Diversity, Equity, Inclusion, and Accessibility](#).

Recommendation 2.2 Federal agencies should give priority to implementation science within the research roadmap and develop an explicit program of research responsive to the needs of programmatic agencies.

Focusing on programmatic agencies' needs for how to deliver their programs more effectively could provide a quick payoff in terms of reducing diet-related health disparities through changes to federal programs. Because all the programmatic agencies we consulted asked for more effective ways to deliver their nutrition programs to under-served populations, high priority should be given to developing an interagency coordinated program of implementation science. PCAST believes the need is urgent enough to recommend that the agencies develop a plan for implementation science research as soon as possible and to request funds to support the work.

Recommendation 2.3 Federal agencies should continue to seek ways to diversify the nutrition workforce.

Lack of diversity in the nutrition science workforce contributes to the limited research base necessary for precision nutrition solutions and the community engagement needed to reduce health disparities and the burden of diet-related chronic disease in the United States. In its Strategy, the Administration committed to strengthening and diversifying the nutrition workforce through a number of steps that HHS, Veterans Affairs (VA), and USDA are undertaking and through a government-wide [Strategic Plan for DEIA in the Federal Workforce](#). PCAST endorses the commitments to train future nutrition professionals and notes that nutrition is rarely mentioned within broader STEM initiatives to interest youths in careers in science. This is a missed opportunity to attract students of diverse backgrounds into a field of science that provides a variety of career settings.

Recommendation 2.4 Federal agencies should consult with academic and private sector entities, including non-profits and community organizations, to identify and propose innovative ways to collaborate and remove barriers to public-private research and intervention efforts.

New forms of collaboration are needed to bring the different skill sets and data that reside in academic, government and private sectors together to better understand consumers' food behaviors and health outcomes. Multilevel interventions with involvement from a variety of sectors with multiple intervention levers are needed to affect the kind of food environment and dietary change that will reduce the risk of chronic diseases. The private sector provides the environment where people make their food choices and obtain their health care and therefore has expertise in food marketing and vast amounts of information about consumers' food purchasing.

Conclusion

This report outlines the priorities, gaps and opportunities to advance nutrition science and reduce the enormous burden of diet-related chronic diseases now prevalent in the United States. It offers recommendations that build on the foundation the Administration has laid in its Strategy on Hunger, Nutrition, and Health to continue its impacts into the future. Long-term improvements to the public's health will require an evolving base of scientific evidence to further refine and support specific public and private sector actions in the face of an ever-evolving food environment, and will also require long-term, high-level coordination of federal research and policy. Increased focus of government diet-related chronic disease prevention research efforts and improving program effectiveness is essential to help the public and private sectors address the enormous challenges and reduce the health disparities from these diseases.

Accomplishing this critical work requires introducing impactful risk reduction strategies into federal programs, effectively employing regulatory authorities in both agricultural and health care domains, building coordination and cooperation beyond past and current levels, as well as expanding into departments and agencies not previously or only minimally engaged. Success also depends significantly on private sector actions to implement guidance and improve the nutritional profile of foods available to the public, as is occurring with current efforts to lower sodium consumption to prevent hypertension.^{98, 99}

We as a country have overcome diet-related diseases in the past by applying knowledge from federally sponsored research to guide food and health policies and programs. We are already building on existing scientific information to expand public and private sector actions to combat the epidemic of diet-related chronic disease. By investing in foundational nutrition science and building on advances in data and behavioral sciences, we can make crucially needed progress toward a healthier food environment and healthier people.

⁹⁸ U.S. Food & Drug Administration. (2021 November 13). [FDA Issues Sodium Reduction Final Guidance.](#)

⁹⁹ U.S. Food & Drug Administration. (2023 March 24). [FDA Takes Additional Steps to Improve Nutrition. Reduce Disease with Expanded Use of Salt Substitutes to Help Lower Sodium Intake.](#)

Appendix A: The Interagency Committee on Human Nutrition Research (ICHNR)

ICHNR aims to increase the overall effectiveness and productivity of federally supported or conducted human nutrition research. Its membership includes representatives from agencies within USDA, HHS, DoD, EPA, Commerce, FTC, NASA, NSF, USAID, EPA, VA, and OSTP. Its current work agenda is conducted through subcommittees. The current ICHNR Subcommittees include:

1. **The Subcommittee on Dietary Reference Intakes (DRI)** and its working group, the U.S. and Canada DRI working group, support systematic reviews to inform updates to the DRIs for macronutrients (carbohydrates, fats, and proteins) and energy. USDA and HHS each requested \$1 million a year for this effort over 5 years.

Traditionally, nutrient standards were based on adequacy and toxicity. There is a need to explore whether specific levels of nutrients or other food substances can reduce the risk of chronic diseases and the potential roles of nutrients in the causal pathways leading to chronic diseases. The process to update all DRIs will now consider chronic disease as endpoints where applicable.

Pending a regular source of funding, the working group will develop a continuous process to update DRIs and support systematic reviews. The availability of updated nutrient values is critical to informing high priority nutrition programs.

2. **The Subcommittee on Dietary Guidance** strives to enhance federal implementation of the Dietary Guidelines for Americans and other nutrition and lifestyle-related recommendations by developing policies and programs that promote healthy dietary patterns and the food environment. Members from HHS and USDA will contribute to the planning efforts and may also act as subject matter experts throughout the scientific process and policy development.
3. **The Subcommittee on Nutrition Security** is a newly established subcommittee that will foster communication across federal departments and agencies about research activities in the emerging area of nutrition security.
4. **The Subcommittee on Global Nutrition** is a newly established subcommittee that will foster communication across federal departments and agencies to identify opportunities for interagency collaboration and partnerships to leverage U.S. government resources and capabilities to address nutrition-related evidence gaps at a global scale.

Appendix B: The National Health and Nutrition Examination Survey ([NHANES](#))

NHANES data are used in the formulation of the [DRI](#) and [DGA](#) which are the basis for nutritional requirements for federal programs like the SNAP and WIC, school meals, military rations, and even astronauts’ diets. The NHANES data about food consumption and nutritional status are also often used to evaluate program effectiveness and identify changing nutritional needs of program participants.

NHANES is a series of surveys designed to assess the health and nutritional status of national adults and children in the United States. The survey consists of interviews and physical examinations of a sample of 5,000 people per year in their households and at NHANES mobile examination centers (MEC). NHANES evaluates risk factors to better understand the occurrence of:

Health Conditions	Health Indicators
<ul style="list-style-type: none"> • Anemia • Cardiovascular disease • Diabetes • Cancers • Eye diseases • Hearing loss • Infectious diseases • Kidney disease • Obesity • Osteoporosis • Respiratory disease (asthma, chronic bronchitis, emphysema) • Sexually transmitted diseases 	<ul style="list-style-type: none"> • Environmental exposures • Nutrition • Food security • Oral health • Physical fitness and physical functioning • Reproductive history and sexual behavior • Vision

NHANES data is easily accessible to federal agencies, local governments, research organizations, universities, health care professionals, and educators. NHANES enables public health efforts for national monitoring and surveillance in order to assess burden, trends, and differences/disparities to help sectors prioritize subgroups that may need additional programs/supports. The survey data is essential for the analysis and implementation of new and existing nutrition programs. Source: NHANES - About the National Health and Nutrition Examination Survey (cdc.gov)

Appendix C: External Experts Consulted

PCAST sought input from a diverse group of additional experts and stakeholders. PCAST expresses its gratitude to those listed here who shared their expertise. They did not review drafts of the report, and their willingness to engage with PCAST on specific points does not imply endorsement of the views expressed herein. Responsibility for the opinions, findings, and recommendations in this report and for any errors of fact or interpretation rests solely with PCAST.

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Appendix D: Workshop Participants

PCAST convened a nutrition workshop this past fall with relevant government agencies/ departments and other key stakeholders from the private and academic sectors to identify scientific opportunities, gaps, and priorities to continue to advance nutrition science, with a particular emphasis on ensuring equitable access to the benefits of research. This event's purpose was to specifically provide an opportunity for PCAST Working Group members and stakeholders to discuss possible strategies and recommendations that PCAST could make it to the President.

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Appendix E: Acronyms

CDC	Centers for Disease Control and Prevention
CHD	Coronary Heart Disease
DGA	Dietary Guidelines for Americans
DHS	Department of Homeland Security
DoD	Department of Defense
DRI	Dietary Reference Intake
EPA	Environmental Protection Agency
FDA	Food & Drug Administration
FTC	Federal Trade Commission
GAO	Government Accountability Office
HHS	Department of Health and Human Services
ICHNR	Interagency Committee on Human Nutrition Research
IDA	Institute for Defense Analyses
NASA	National Aeronautics and Space Administration
NHANES	National Health and Nutrition Examination Survey
NIH	National Institutes of Health
NSF	National Science Foundation
OMB	Office of Management and Budget
SNAP	Supplemental Nutrition Assistance Program
STLT	State, tribal, local, and territorial
STPI	Science and Technology Policy Institute
RDNs	Registered dietitian nutritionists
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
VA	Department of Veterans Affairs
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

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