



# US HEALTH AND THE FUTURE OF FOOD



This year marks an amazing milestone for the American Heart Association: a century of science-backed, pioneering work to save and improve lives.

In the same spirit with which our founders committed to understanding and treating heart disease in 1924—a time when it was considered a death sentence—we are boldly forging ahead with new efforts to prevent heart disease and stroke.

The special report I am privileged to share today, in collaboration with Deloitte and Research!America, is a critical example.

In the pages that follow, you'll find a detailed exploration of a complex topic: the future of food and its impact on health.

This report examines how food and nutrition are inextricably linked to health care outcomes and how holistic, systems thinking is required to tackle the complex challenges food and health care industries are facing. It reinforces what we've long known: What we eat can greatly improve—or worsen—our health.

This report is also an example of how the American Heart Association is advancing health and hope for everyone, everywhere. As we begin our second century of impact, we're exploring even more innovative ways to improve health and well-being. And, just like our first 100 years, we're working alongside others who share this vision—collaborators, supporters, volunteers and donors—because transformational change requires teamwork.

And so I would like to urge private entities, public institutions, and individuals alike to engage and invest in integrated solutions that cascade benefits throughout food and health systems, and support those most at need.

We are incredibly grateful for your relentless dedication. Your commitment is fueling our mission and propelling our collective impact into the next century.

A handwritten signature in black ink that reads "Nancy".

Nancy Brown  
Chief Executive Officer  
American Heart Association

# ACKNOWLEDGMENTS

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## American Heart Association

**Selena Ahmed** Global Director, Periodic Table of Food Initiative

**Juliana Crawford** National Executive Vice President, Consumer Health Solutions

**Susan Dance** VP, Total Health and Well-being, Mind-Heart-Body Connection

**Greg Donaldson** National SVP, Corporate & Marketing Communications

**Suzanne Grant** National VP, Media Relations & Issues Management

**Suzette R. Harris** MPH, National Executive Lead, Food Systems

**Lillie Noe** Senior Program Lead, Health Care by Food

**Bernadette Okwu-Gage** PhD, MPH, MBBS, Associate Science and Medicine Advisor

**Radhika Rajgopal Singh** PhD, FAHA, Senior Vice President, Science and Medicine

**Lisa Sanders** National Executive Director, Health Care by Food initiative

**Cheryl Toner** MS, RDN, National Senior Lead, Food & Nutrition

**Kevin Volpp** MD, PhD, FAHA, Scientific Lead, Health Care by Food initiative

**Steve Weiss** National VP, Advocacy Communications

**Sally S. Wong** PhD, RD, CDN, FAHA, National Senior Director, Science & Medicine

**KC Wright** MS, RDN, Senior Advocacy Communications Lead, Health Care by Food

## Deloitte

**Daniel Adugna** Sustainability, Climate, and Equity Manager

**Jay Bhatt** DO, MPH, MPA, Deloitte Center for Health Solutions and Health Equity Institute Leader

**James Cascone** Americas Future of Food Leader and Sustainability, Climate & Equity Consumer Leader

**Surabhi Cholkar** Senior Analyst

**Quan Cung** Sustainability, Climate, and Equity Consultant

**Sheba Ehteshami** Sustainability, Climate & Equity Leader

**Lorenzo Hernandez** Sustainability, Climate, and Equity Senior Consultant

**Neha Kaur** Sustainability, Climate & Equity Research & Insights

**Tiffany Kim** Office of the Future Leader

**Kasey Lobaugh** Future of Consumer Leader

**Kerri Maloney** Lead Client Service Partner

**Jim Mooring** Client & Market Growth Design Leader

**Emily Searle** Client & Market Growth Manager

## Research! America

**Chad Bohnert** Chief Marketing Officer, Zogby Analytics

**Erin Brown** Associate Director of Communications and Marketing, Research!America

**Glenn O'Neal** Senior Director of Communications, Research!America

**Mary Woolley** President and CEO, Research!America

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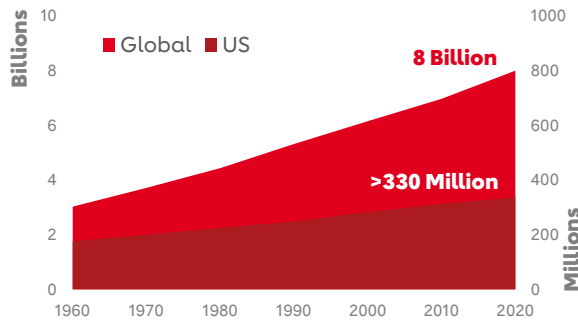
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# 1.0 FOREWORD: US HEALTH AND THE FUTURE OF FOOD



**1.0 FOREWORD**  
**US HEALTH AND**  
**THE FUTURE OF FOOD**

**From 1960–2020, the global population surged to over 8 billion, with the U.S. increasing 85% to over 330 million**



**Increase in U.S. average life expectancy**



**170%**

**Increase in U.S. farm output from 1948–2015**

**1.1 SETTING THE STAGE: CORE OBJECTIVES OF THE PAPER**

Over the past century, efforts and collaborations by organizations from various public and private entities to advance science, health policy, and agriculture have achieved extended life expectancies and improved living standards globally. Since the 1960s, the American Heart Association has promoted healthy eating, evolving to advocate comprehensive health approaches for individuals, health care professionals, and communities to prevent and manage chronic diseases.<sup>i</sup> This includes supporting healthy school meals, food labeling, supporting sugary beverage taxes, nutrition standards in early and elderly care, and healthy food education and outreach campaigns. The American Heart Association is committed to advancing cardiovascular health for all, including identifying and removing barriers to health care access<sup>ii</sup> and catalyzing collective action towards sustainable, health-focused food systems for current and future generations.

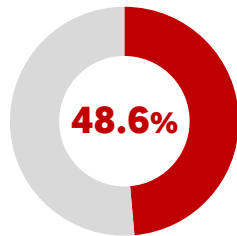
From 1960 to 2020, the global population surged to over 8 billion,<sup>iii</sup> with the U.S. alone increasing by 85 percent to over 330 million.<sup>iv</sup> Despite the anticipated pressures associated with rapid population growth, societies globally have experienced a period of economic growth and innovations that allowed for improvements in health care and quality of life. In the U.S., average life expectancy increased from 59 years in 1925<sup>v</sup> to 77 years in 2022.<sup>vi</sup> Additionally, the evolution of food and agriculture into highly productive and efficient globalized systems from 1948 to 2015 led U.S. farm output to increase by 170 percent, positioning the country as a leading global producer of staple crops like corn, soy, and wheat.<sup>vii</sup> Today’s food supply has the capacity to fulfill the basic caloric requirements for the majority of communities globally.



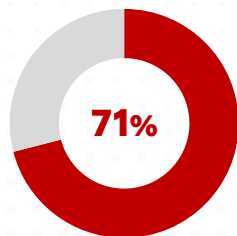
# one in seven

U.S. consumers are food insecure

In the U.S., 48.6 percent of adults over the age of 20 experience cardiovascular disease



71 percent of U.S. adults are overweight or obese



By 2035, over half of the global population will be overweight



Despite profound advancements, a multitude of challenges are compounding negative impacts on food and health care systems. These challenges are being created and/or exacerbated by poor connectivity between health care and food systems,<sup>viii</sup> geopolitical conflicts, increasing weather-related and pest disruptions,<sup>ix</sup> economic uncertainties, nutrition misinformation,<sup>x</sup> and systemic barriers and inequities.<sup>xi</sup> If not addressed, these challenges can lead to adverse health outcomes, given that food and nutrition play significant roles in both the prevention and management of numerous chronic diseases.<sup>xii</sup>

In the U.S., fewer than 10 percent of U.S. consumers choose a diet that promotes cardiovascular health,<sup>xiii</sup> while one in seven are food insecure.<sup>xiv</sup> Heart disease has been the leading cause of death since 1921, and currently 48.6 percent of adults over the age of 20 experience cardiovascular disease (CVD), for example, coronary heart disease, heart failure, stroke, or hypertension.<sup>xv</sup> Other diet-related chronic conditions, such as obesity, have also increased, with more than 71 percent of U.S. adults overweight or obese. By 2035, it is projected that over half of the global population will be overweight, with approximately 2 billion people living with obesity.<sup>xvi</sup> To appropriately manage and adapt health care and food systems to meet the health needs of growing diverse populations by 2050, these multifaceted and interconnected compounding challenges must be considered.<sup>xvii xviii</sup>



## 1.2 ADVOCATING FOR COLLABORATIVE AND COMPREHENSIVE APPROACHES

Recognizing the long-established link between food and health,<sup>xix</sup> it is crucial now more than ever for public entities, private organizations, and individuals from various sectors to act and jointly advocate for health and nutrition solutions that will shape the next century. The call for united action has never been more relevant, especially as communities tackle the intertwined issues within food systems, nutrition security,<sup>xx</sup> and equitable health care.

## 1.3 FRAMING THE FUTURE OF FOOD FOR ACTION AND OPTIMISM

This vision encompasses adapting health care systems to acknowledge and expand the critical role of food in health care while simultaneously adapting food systems to become more resilient, equitable, and health oriented. Resilient food systems that can withstand compounding external pressures (e.g., socio-economic, technological, environmental, and cultural factors) and cater to diverse health priorities are paramount. Adaptive solutions are required to provide simultaneous benefits to food systems and health outcomes. For instance, the transition to plant-forward eating patterns<sup>xxi</sup> may not only help to mitigate chronic disease risks but also has the potential to generate economic savings in the form of more resilient food systems and reduced health care costs.<sup>xxii xxiii</sup> Moreover, fostering a cultural shift towards valuing healthful foods necessitates proactive educational campaigns, food policy support, and innovations that can make healthy options accessible and appealing to all cultural segments of society.

This paper poses a series of critical questions: How can access to nutritious foods across increasingly diverse U.S. communities be secured? Is it possible to ensure equitable nutrition security for current and future generations, considering the complex and compounding pressures on health, environmental, and geopolitical pressures impacting the current food and health care systems? How can the complexity of individual behavior be integrated considering the influences of food, personal differences, and societal factors, while acknowledging structural limitations? Most importantly, how can it be ensured that advancements made today benefit the health and prosperity of tomorrow?





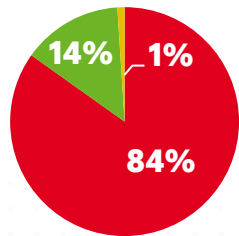
# 2.0 FUTURE OF FOOD AND HEALTH CHALLENGES



**\$1.57 TRILLION**

**Hidden costs incurred by U.S. food systems in 2020**

**Breakdown of U.S. hidden costs**



■ Healthcare ■ Environmental ■ Social

**90%**

**of U.S. annual health care costs stem from burdens linked to chronic diseases and mental health conditions**

In the U.S., food insecurity rose to 44.2 million in 2022, impacting approximately 13 million children, nearly a 45 percent increase compared to 2021.<sup>xxiv</sup> Alarming trends highlight the need to expand understanding of the deeply interconnected food and health care systems and how they are shaped by socio-economic, technological, environmental, and cultural factors, which can significantly compound negative impacts to human health. The Food and Agriculture Organization (F.A.O.) of the United Nations (U.N.) asserts that food security is a fundamental human right and crucial for the overall health and well-being of global communities.<sup>xxv</sup> While food security focuses on the availability of food, nutrition security emphasizes the quality and nutritional value of food.<sup>xxvi</sup> Both food and nutrition insecurity raise the risk of cardiovascular disease and related deaths for U.S. individuals,<sup>xxvii</sup> especially among children and marginalized communities.<sup>xxviii</sup>

In 2020, global food systems, including the interconnected activities of production, processing, distribution, consumption, and disposal of food products,<sup>xxix</sup> incurred approximately \$12.7 trillion in hidden costs.<sup>xxx</sup> Equaling nearly 10 percent of global gross domestic product (GDP), the impact was mostly on high- and upper-middle-income countries.<sup>xxxi</sup> In the U.S., hidden costs amounted to \$1.57 trillion.<sup>xxxii</sup> Health care costs accounted for roughly 85 percent, environmental impact costs made up approximately 14 percent, and social costs amounted to less than one percent.<sup>xxxiii</sup> Globally, social costs of food production are often linked to agrifood system worker poverty and under-nutrition, amounting to \$570 billion, with over half of this burden felt in low-income nations in Africa and Asia.<sup>xxxiv</sup> In the U.S., social costs amounted to \$164 million, stemming from worker poverty within the food system.<sup>xxxv</sup> These costs are attributable to lost productivity due to undernourishment, food insecurity, and the government assistance programs needed to mitigate these impacts.

In the U.S., 90 percent of the \$4.5 trillion in annual health care costs<sup>xxxvi</sup> stem from burdens linked to chronic diseases and mental health conditions, particularly pronounced in marginalized and low-income communities.<sup>xxxvii</sup> Health inequities add approximately \$320 billion to annual health care expenditures, a figure predicted to escalate to \$1 trillion by 2040 if unaddressed.<sup>xxxviii</sup>

# 9.7 BILLION

Projected global population by 2050

The world's population residing in urban areas will increase to 68% by 2050



## 2.1 SOCIAL OBSTACLES TO NUTRITION ACCESS

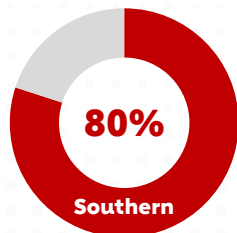
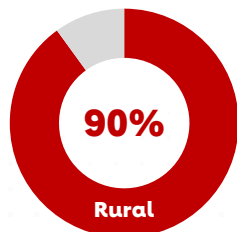
Social barriers linked to population growth, urbanization, geopolitical events, and the increasing impact of climate, significantly shape the landscape of food and nutrition security. The world's population has more than tripled to over 8 billion and the U.N. projects that the global population could reach 9.7 billion by 2050.<sup>xxix</sup> Today, over 55 percent of the world's population resides in urban areas, and it is anticipated to increase to 68 percent by 2050.<sup>xl</sup> The anticipated increase in demand for food and health care will necessitate changes in how health care is provided as well as how food will be produced, processed, distributed, and consumed to ensure sustainable nutrition security. In the U.S., the population is aging and increasingly culturally diverse.<sup>xli</sup> The prevalence of certain cardiovascular diseases and risk factors are projected to increase from 2020 to 2050. Attention to increased availability and affordability of healthy, culturally relevant foods at the neighborhood level is necessary due to the systemic inequities historically prevalent.<sup>xlii</sup>



# 735 MILLION

Estimated number of people  
worldwide facing hunger in 2022

In the U.S., counties with  
high levels of food insecurity  
are disproportionately  
rural and southern



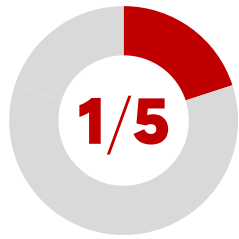
## 2.2 U.S. DIETARY INTAKES, HEALTH AND ITS RELATIONSHIP WITH FOOD SYSTEMS

Factors such as consumer preferences, cultural norms, unhealthy food marketing, and food and nutrition insecurity compounded by social inequities impede positive health care objectives and chronic disease prevention and management.<sup>xliii xliv</sup> Dietary patterns and the prevailing food environment significantly impact cardiovascular and metabolic health and contribute to almost half of U.S. adults suffering from preventable diseases.<sup>xlv</sup> Most people living in the U.S. consume too few whole grains, non-starchy vegetables, fruits, fish, healthy fats, and fiber, and instead consume in excess refined grains, added sugars, sodium, and saturated fats,<sup>xlvi</sup> leading to increased health risks and rising chronic disease rates.<sup>xlvii</sup>

### 2.2.1 State of Food Security

In 2022, an estimated 735 million people worldwide faced hunger, a rise of 122 million from pre-pandemic levels in 2019.<sup>xlviii</sup> In the U.S., approximately one in seven people face food insecurity, impacting over 44 million individuals, including more than 13 million children.<sup>xlix</sup> Rural and southern U.S. counties are disproportionately affected, with 90 percent of counties with high levels of food insecurity being rural and 80 percent located in the South.<sup>l li</sup> Notably, around half of food-insecure individuals do not qualify for federal food assistance programs due to income parameters.<sup>lii liii</sup> The American Heart Association underscores how systemic inequities have limited access to healthier foods.<sup>liv</sup>





Globally, poor dietary habits contribute to one in every five deaths

**\$173  
BILLION**

Annual U.S. economic burden of obesity-related medical costs in 2019

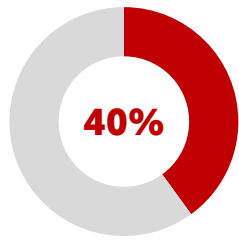
**58/100**

Typical U.S. diet score on the Healthy Eating Index

### 2.2.2 Malnutrition

Malnutrition is a global health concern with substantial developmental and economic implications that encompasses a broad spectrum, including insufficient or excess food intake, as well as poor nutritional quality diets. All forms of malnutrition are associated with higher rates of chronic health conditions such as heart disease, stroke, diabetes, obesity, and mental health disorders.<sup>lv</sup> Globally, poor dietary habits contribute to one in every five deaths.<sup>lvi</sup> The U.S. economic burden is significant, with annual obesity-related medical costs nearing \$173 billion in 2019.<sup>lvii</sup> Diet-related health impacts are largely attributed to the typical U.S. diet, which scores 58 out of 100 on the Healthy Eating Index (based on the Dietary Guidelines for Americans).<sup>lviii lix</sup>





**Up to 40 percent of the planet's land is currently degraded due to human activity**



**Acres of active farmland in the U.S.**



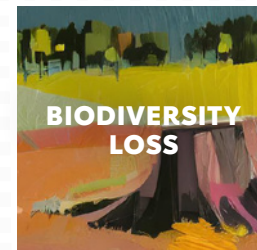
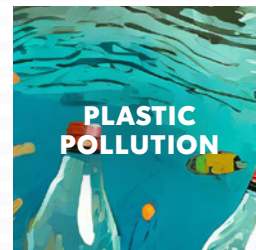
**Annual cost to U.S. Corn Belt farmers due to loss of carbon-rich topsoil**

## 2.3 CONTEMPORARY FOOD SYSTEMS CHALLENGES TO MEET THE NEEDS OF FUTURE POPULATIONS

Current challenges and potential disruptions highlight the need for resilient and adaptive food and agriculture systems, especially in the U.S. Although not an exhaustive list, the three leading human and environmental pressures impacting food systems are Land and Water Ecosystem Degradation, Food Waste, and Greenhouse Gas Emissions (GHGs).<sup>lx, lxi</sup> These issues are not only significant individually; they are connected, span industries, and compound adverse externalities on human health and ecosystems.

### 2.3.1 Land and Water Ecosystem Degradation

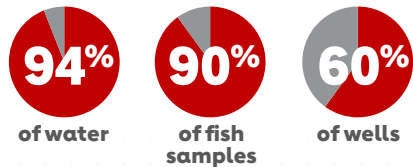
Up to 40 percent of the planet's land is currently degraded due to human activity, affecting half of the global population, and threatening nearly half of the global GDP, valued at U.S. \$40 trillion.<sup>lxii</sup> Land and water degradation jeopardizes food security, increases exposure to zoonotic diseases (e.g., COVID-19), and increases risks of human migration and conflict over diminishing resources.<sup>lxiii</sup> Data from 2023 shows that the U.S. has approximately 879 million acres of active farmland.<sup>lxiv</sup> That land faces significant pressures from land and water ecosystem degradation resulting from intensive agriculture practices. Over a third of the farmland in the U.S. Corn Belt, approximately 100 million acres, has completely lost its carbon-rich topsoil.<sup>lxv</sup> This loss, linked primarily to over-tillage and poor land management, has reduced corn and soybean yields by six percent, costing farmers nearly \$3 billion annually.<sup>lxvi</sup> This paper focuses on four major human induced causes to land and water degradation with impact to human health: Intensive Agricultural Practices, Plastic Pollution, Biodiversity Loss, and Water Scarcity.



# 115 MILLION

Tons of synthetic nitrogen fertilizers applied annually to global croplands

In the U.S., pesticides have been detected in



# 6.9 BILLION

Tons of produced plastic that have become waste since 1950



### Intensive Agricultural Practices

Intensive agricultural practices<sup>lxvii</sup> significantly contribute to soil and water contamination and pollution, degrading the natural resources.<sup>lxviii</sup> Globally, around 115 million tons of synthetic nitrogen fertilizers are applied annually to croplands, with 35 percent entering waterways and the oceans through runoff.<sup>lxix</sup>

This runoff leads to widespread harmful algal blooms and oxygen depletion (hypoxia) affecting over 240,000 km<sup>2</sup> of inland and coastal waters.<sup>lxx</sup> Inadequate agricultural management in the U.S. has led to soil erosion, nutrient loss, and runoff of pesticides and other contaminants in U.S. waterways.<sup>lxxi</sup> Annually, U.S. farms apply about half a million tons of pesticides, 12 million tons of nitrogen, and 4 million tons of phosphorus fertilizers.<sup>lxxii</sup> This intensive use has led to pesticides being detected in approximately 94 percent of water, over 90 percent of fish samples across U.S. streams, and in 60 percent of wells.<sup>lxxiii</sup>



### Plastic Pollution

Additionally, throughout the food value chain, rising plastic pollution from agriculture, fisheries, and food packaging intensifies contamination and pollution of land and water ecosystems. Since 1950, 6.9 billion tons out of 9.2 billion tons of produced plastic have become waste.<sup>lxxiv</sup> Notably, plastic packaging constitutes a significant part of solid waste and accounts for 15.9

percent of oceanic and 74.5 percent of riverine litter.<sup>lxxv</sup> The convergence of increasing plastic waste and its impact to habitats poses severe risks to the environment, human health, and food security, particularly impacting communities most dependent on fisheries and aquaculture, as fish consumption is projected to rise globally by 14 percent by 2032.<sup>lxxvi</sup>

# 50%

**Deterioration of natural ecosystems from their original state**

# 68%

**Decline in wildlife populations since 1970 due to intensive and monoculture farming practices**

# 65-48%

**Projected severe reduction of in California's Sierra Nevada snowpack by 2100**

# \$9

**BILLION**  
**Annual cost of droughts in the U.S.**



## Biodiversity Loss

Biodiversity plays an important role in ecosystems and human well-being, but modern agriculture and rising global consumption are significant drivers of biodiversity loss.<sup>lxxvii</sup> Natural ecosystems have deteriorated by about 50 percent from their original states, and a quarter of plant and animal species are threatened with risks of extinction.<sup>lxxviii</sup> Intensive

and monoculture farming practices have contributed to a 68 percent decline in wildlife populations since 1970, and accelerated species extinction rates, now exceeding the average of the last 10 million years.<sup>lxxix</sup> Loss of species weakens agricultural resilience, risks food supplies, and alongside human-driven factors like land-use change and intensive livestock production, raises the risks of zoonotic diseases spreading.<sup>lxxx</sup>

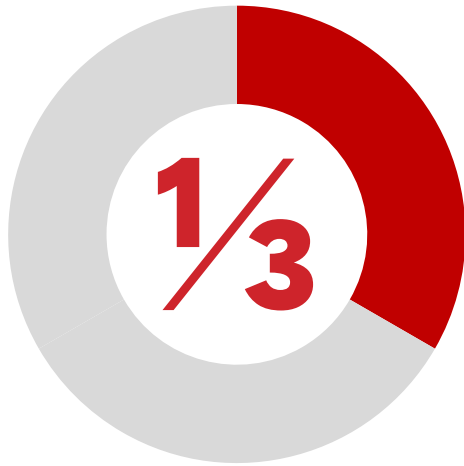


## Water Scarcity

The rapid rate of population growth and unsustainable consumption over the last century has caused for increased water demand globally, limiting freshwater sources.<sup>lxxxii</sup> Agriculture, particularly irrigation, accounts for 70 percent of worldwide freshwater withdrawals, and up to 95 percent in some countries.<sup>lxxxii</sup> In the U.S., the growing demand for water poses significant risks

to agriculture, especially in arid areas like the Southwest where over-pumping surpasses natural replenishment rates.<sup>lxxxiii</sup> Projections indicate a severe reduction of 65 percent to 48 percent in California's Sierra Nevada snowpack by 2100, a crucial water source for agriculture, with significant repercussions expected in the Southwest, Pacific Northwest, and the Midwestern food belt as a result.<sup>lxxxiv</sup> Notably, droughts cost an average of over \$9 billion annually in the U.S. In extreme years, such as in 2012, damage to agricultural lands led to \$14.5 billion in federal crop insurance payouts, and the 2015 California drought resulted in \$1.84 billion in direct agricultural costs and the loss of 10,100 seasonal jobs.<sup>lxxxv</sup>





of the food supply in the U.S. is  
wasted annually, estimated at

**161-335**  
**BILLION POUNDS**  
or 492-1,032 pounds/person

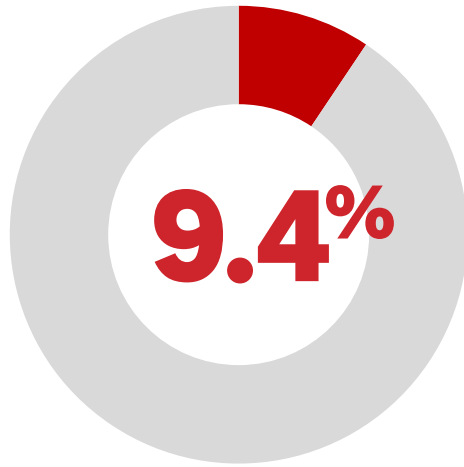
### 2.3.2 Food Waste

Globally, around one-third, or roughly 1.3 billion tons annually, of food produced for human consumption is either lost or wasted.<sup>lxxxvi</sup> Understanding that wasted food can occur across different points of food system value chains is important. Food loss is often used to refer to loss food product from the agricultural sector up to the retail level.<sup>lxxxvii</sup> Food waste often refers to food not consumed and wasted at the retail, food service, and residential levels.<sup>lxxxviii</sup> Approximately 17 percent of food is wasted post-retail.<sup>lxxxix</sup> End consumers contribute to food waste by purchasing or cooking excess foods that are later discarded predominantly ending in landfills and incinerators in the U.S., comprising 24 percent and 22 percent respectively.<sup>xc xci</sup>

In the U.S., more than one-third of the food supply, estimated at 161 to 335 billion pounds, or 492 to 1,032 pounds per person, is wasted annually.<sup>xcii</sup> Approximately half of U.S. food waste occurs at the consumption stage, with fruits, vegetables, dairy, and eggs being the most wasted.<sup>xciii</sup> The uneaten food contains enough calories to feed more than 150 million people each year, exceeding the number of food-insecure individuals in the U.S.<sup>xciv</sup> Food waste also compounds environmental impacts of U.S. agricultural land, water, pesticides, fertilizers, energy, and GHGs.<sup>xcv</sup> According to the EPA, halving food loss and waste in the U.S. can result in environmental savings of:

- Over 75 million acres of agricultural land,
- 3.2 trillion gallons of freshwater,
- 640 million pounds of nitrogen from agricultural fertilizers with potential to reach bodies of water and cause algal blooms and deteriorate water,
- 262 million MWh of energy, and
- 92 million MTCO<sub>2</sub>e of GHG emissions.<sup>xcvi</sup>





In 2022, U.S. agriculture was responsible for 9.4 percent of total U.S. GHGs

**3.26**  
**MILLION CARS**

Equivalent emissions to GHGs produced by the creation of lost or wasted food in the U.S.

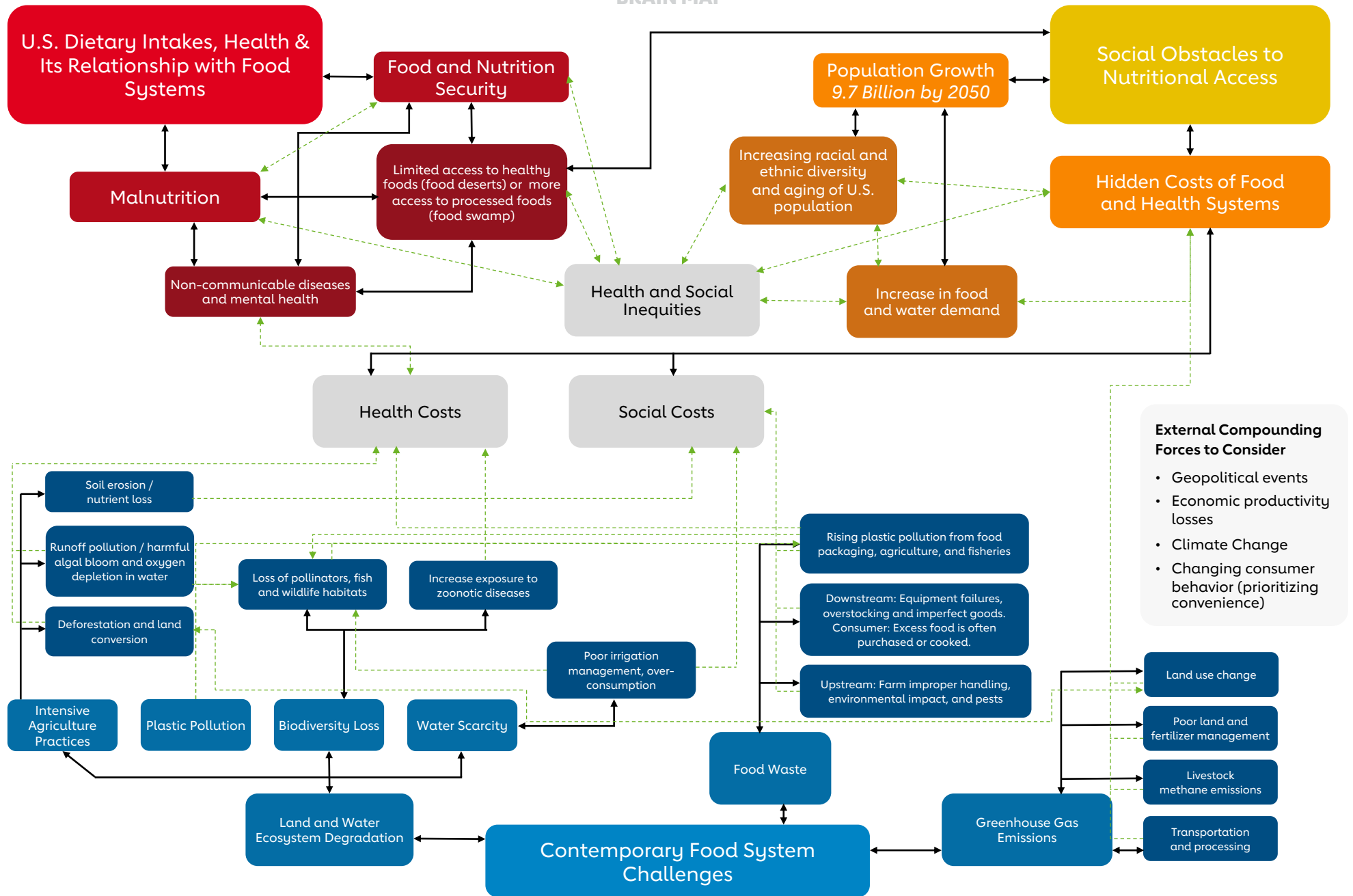
### 2.3.3 Greenhouse Gas Emissions

Food and agriculture systems are a major source of global GHGs, contributing about one-third of all annual human induced GHGs.<sup>xcvii</sup> These GHGs originate from direct agricultural activities, land-use change, transportation and processing, and food waste. In 2022, U.S. agriculture was responsible for 9.4 percent of total U.S. GHGs.<sup>xcviii</sup> Livestock methane emissions contribute over a quarter of agricultural GHGs, and poor land and manure management leads to nitrous oxide (N<sub>2</sub>O) emissions.<sup>xcix</sup> Additionally, food waste and decomposing food in landfills contribute to GHGs, including methane (CH<sub>4</sub>), CO<sub>2</sub>, and chlorofluorocarbons. The GHGs produced by the creation of lost or wasted food in the U.S. are on par with the emissions of 32.6 million cars.<sup>c</sup>



**2.0 CHALLENGES**  
**FUTURE OF FOOD**  
**AND HEALTH CHALLENGES**

**FUTURE OF FOOD AND HEALTH CHALLENGES**  
**BRAIN MAP**



# 3.0 MULTIFACETED APPROACHES AND SOLUTIONS



### 3.1 OBJECTIVES FOR THE FUTURE OF FOOD AND HEALTH

The American Heart Association's goals to advance cardiovascular health for all and remove barriers to health care access underscores the critical role that food systems have to reach these greater health objectives.<sup>ci</sup> By recognizing that enhancing cardiovascular health extends beyond health care, the American Heart Association highlights the vital intersection of public health advocacy and stewarding balanced health and food systems for a healthier future for all.<sup>cii</sup> Progress through cross-sector collaborations offers hope in addressing current and future food and health challenges. Engaging public agencies, the private sector, and consumers across industries to create cooperative solutions is essential for a future where nutritional food security supports the achievement of key health care objectives.

A holistic and systems thinking approach is essential to tackle the complex challenges of food systems and health, ensuring solutions yield compounding benefits and acknowledge how food systems interrelate across industries and sectors. This strategy underlines the importance of understanding synergies and trade-offs to enhance food and health care systems. Conservation agriculture, for example, is a farming approach that safeguards and restores arable land, fostering permanent soil cover, minimum soil disturbance, and plant diversity.<sup>ciii</sup> It enhances economic efficiency, boosts soil productivity, and promotes environmental sustainability through improvements in water and air quality, leading to healthier, more nutritious food production and, consequently, improved public health.<sup>civ</sup> Recognizing the interplay between economic viability, health, and environmental sustainability around food and health care systems is crucial, as improvements in one area can amplify benefits in others, necessitating ongoing monitoring to align food systems, health initiatives, and economic performance.





## 3.2 STRATEGIES FOR A SUSTAINABLE AND HEALTHIER POPULATION AND FOOD SYSTEMS

To achieve our food system and health care objectives, integrated efforts from stakeholders across sectors are crucial. These strategies

take a holistic approach to overcome challenges, driving positive outcomes in nutrition security, and ensuring resilient food systems. Two potential strategies that promise immediate and long-term compounding benefits focus on:

**Future Food Systems Technologies and Innovations:** Adopting advanced and sustainable processes and technologies to meet increasing food demands, minimize environmental impacts across food value chains, and enhance resilience.

**Health Care and Consumer-Driven Interventions:** Integrating nutritional health into health care systems and supporting ‘food is medicine’ initiatives including the American Heart Association’s Health Care by Food™ initiative.<sup>cv</sup> This requires collaboration between policymakers and the private sector to ensure consumer access to appropriate healthy foods. Furthermore, innovations targeting consumers can bridge knowledge gaps, transform dietary guidance, empower insightful nutrition-based health care, and drive positive changes within health care and food systems.

Aligned with the American Heart Association’s impact goals, these strategies highlight the crucial intersection of public health and environmental stewardship for equitable health outcomes and resilient food systems. This integrated perspective is vital for advancing health equity and quality of life and public well-being, emphasizing the importance of a holistic and systems thinking approach.

### 3.2.1 Future Food Systems Technologies and Innovations

Enhancing sustainable food systems in the U.S. depends on adopting innovative technologies for regenerating land and water ecosystems. Agriculture, which uses about 50 percent of U.S. land and contributes over \$1 trillion to GDP,<sup>cvi</sup> faces significant environmental sustainability and public health challenges. Land restoration and emissions reduction could yield annual benefits of \$125 trillion to \$140 trillion,<sup>cvi</sup> underlining the importance of food and water security. Consequently, a comprehensive range of solutions across the food value chain are required. One comprehensive solution is the Periodic Table of Food Initiative (PTFI).<sup>cvi</sup> The PTFI integrates different ways of understanding food quality by mapping biomolecular, ecological, cultural, economic, sensory, and health attributes. This approach unravels the complex connection between food, nutrition, and human health. This knowledge, when combined with advanced analytics and global coordination, aids in developing evidence-based strategies to improve diet-related health outcomes, promote sustainable and regenerative agriculture, conserve biodiversity, and foster equity and inclusivity in the food system.



### Upstream Food System Interventions

By concentrating on the upstream aspects of U.S. agriculture, which prominently feature centralized and intensive row crop, pasture, and rangeland practices,<sup>cxix</sup>

technologies and innovations are needed that elevate conservation and restoration while curtailing contamination and pollution, water consumption, and GHGs. Current intensive practices are degrading natural resources essential for nutrition and food security. Adopting practices such as regenerative agriculture can restore and safeguard ecosystems as well as foster healthier relationships between agriculture and the environment.<sup>cx</sup> These practices simultaneously enhance biodiversity and build resilience against climate and weather impacts while offering compounding benefits to both food and health care systems subsequently.<sup>cxii</sup> Moreover, these methods support diversifying food options for healthier diets, decrease zoonotic disease risks, and improve mental well-being by increasing access to natural and biodiverse spaces.<sup>cxiii</sup> Other key solutions to consider would be to improve the cold-chain infrastructure,<sup>cxiii</sup> which can help improve agricultural production, enhance nutrient preservation, and reduce upstream food loss.



### Downstream Food System Interventions

Downstream stakeholders, including processors, distributors, retailers, and consumers, are pivotal in converting raw agricultural products into market-ready

goods and managing waste. Strategies include augmenting traceability with the Internet of Things (IoT) sensors and big data analytics, creating circular supply chains and processes, reducing food miles, and implementing innovations in food packaging. These innovations may incorporate biodegradable materials, reusable solutions, or intelligent packaging and transportation that monitors the condition and environment of the packaged food.<sup>cxiv</sup> These efforts cut GHGs reduce food waste, improve operational and resource efficiency, and reduce plastic waste in landfills and waterways. Additionally, policies and incentives to promote food product reformulation, such as disallowing partially hydrogenated vegetable oils in foods and introducing maximum limits for sodium, are improving the nutritional quality of the food supply with the aim of improving dietary quality.<sup>cxv</sup> Engaging a wide array of stakeholders is crucial as food and agriculture products commonly involve diverse industries.

### 3.2.2 Health care and Consumer-Driven Interventions

Food is medicine<sup>cxvi</sup> initiatives can integrate nutritional health into health care systems. The American Heart Association's Health Care by Food™ research, education and advocacy approach could promote cost-effective solutions to improve health care outcomes in the U.S., as 90 percent of the \$4.3 trillion annual U.S. health care costs stem from chronic, often diet-related, diseases.<sup>cxvii</sup> Food is medicine interventions can support the prevention and treatment of type 2 diabetes, maintenance of cognitive and kidney functions, and sustain a healthy gut microbiome.<sup>cxix</sup> Implementation requires a unified effort from policymakers, the private sector, and consumers to emphasize nutrition security as a cost-effective strategy for maintaining health and preventing and managing health conditions.<sup>cxx</sup>

'Food is medicine' programs represent a transformative pivot within preventive health care, where dietary interventions are integrated into the treatment and management of clinical conditions to improve health outcomes, minimize health care costs, and address disparities and food insecurity.<sup>cxxi</sup> This evolving health care model garners increasing investment and interest, building support for sustainable, accessible nutritional programs like Medically Tailored Meals (MTMs) and Groceries (MTGs) for those with specific conditions, as well as Healthy Food Prescription Programs that enable clinicians to provide patients with redeemable food vouchers, combined with nutrition education.<sup>cxxi</sup>

The Periodic Table of Food marks a pivotal evolution in health care towards personalized nutrition and well-being.<sup>cxviii</sup> However, future grocery retail models must demonstrate improvements in transparency and earn trust amongst consumers. The integration of advanced data analytics and artificial intelligence (AI) through initiatives like the PTFI may enhance traceability, sustainability, and health and safety factors, shaping consumer decisions on fresh food purchases.<sup>cxviii</sup> This approach emphasizes the need of grocers to build a digital layer of service to scale the hyper-customization required for 'food is medicine' efforts and pave the way for a future where custom dietary plans and preemptive health and food system measures are closely aligned.<sup>cxviii cxv</sup> This integrated approach to nutrition signifies a future where healthy food is a foundational element in health care strategy, shaped by opportunities to involve trust and transparency.







### Consumer-Driven Solutions and Technology Enablement

The consumer industry<sup>cxxvi</sup> is undergoing a transformation influenced by six forces of change, primarily promoting a shift from mass marketing to micro-targeted approaches.<sup>cxxvii</sup>

Price, personal health and wellness, and convenience lead purchasing habits, of which 68 percent of consumers are willing to pay a premium for fresh food.<sup>cxxviii</sup> Scientific advances related to nutrition and genomics<sup>cxxix</sup>, the gut microbiome, and diet-gene- environment interactions are concepts of personalized and precision nutrition.<sup>cxxx</sup> By leveraging AI and big data related to food composition, nutrition, eating behaviors, and social determinants of health, researchers can better understand food and the health impacts of how food is produced and consumed, enabling health care providers to prescribe more precise dietary recommendations and enhance treatment protocols, improving overall health outcomes.<sup>cxxxi</sup>

Clear, relevant, and actionable information and resources delivered through health care professionals, food labels, restaurants, retail stores, homes, schools, workplaces, online grocery shopping platforms or social media are essential. Technology, such as telehealth, mobile apps, and wearable devices, can be leveraged to connect more consistently with consumers and enable informed dietary choices that support healthier lifestyles. Social needs referral technology can help health care providers to connect patients with food assistance. Companies can partner with government, health care providers, universities, employers, and non-profits to deliver tailored food benefits, promoting access to nutritious food through simple app-based interfaces.<sup>cxxxii</sup> Such innovative approaches can also inspire enhancements to the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) programs, guiding consumer behavior towards healthier options across various platforms. These advancements, together with programs like the American Heart Association's Heart-Check,<sup>cxxxiii</sup> are poised for expansion to partner with consumers along the continuum of planning, shopping, preparing, and consuming a healthy diet. These advancements collectively support chronic disease prevention and management, incentivize the development of nutrient-rich food products, and public health policies informed by accurate data.

### 3.3 Strengthening Policy and Consumer Engagement

The push for stronger food policies and active consumer engagement is vital for building a resilient food system focusing on health and sustainability. It is important to consider policies that support nutrition security, shifting from solely securing food availability to ensuring nutritional quality, affordability, accessibility, and stability—thereby fostering health and lowering disease risks.<sup>cxxxiv</sup> Public initiatives should drive private sector innovation across the food and health care systems.

Individual consumers are pivotal in shaping the future of food systems and improving their health outcomes through conscious lifestyle and consumption choices. By utilizing digital tools for informed decisions, they can champion a balanced diet and lifestyle changes—such as increasing physical activity, improving better sleep habits, or not smoking—which not only benefit personal health<sup>cxxxv</sup> but can also lead to positive outcomes for collective food systems. By prioritizing their health and the environment in their daily choices, consumers create demand for healthier products and contribute significantly to the broader goal of achieving a health-focused and sustainable food system.

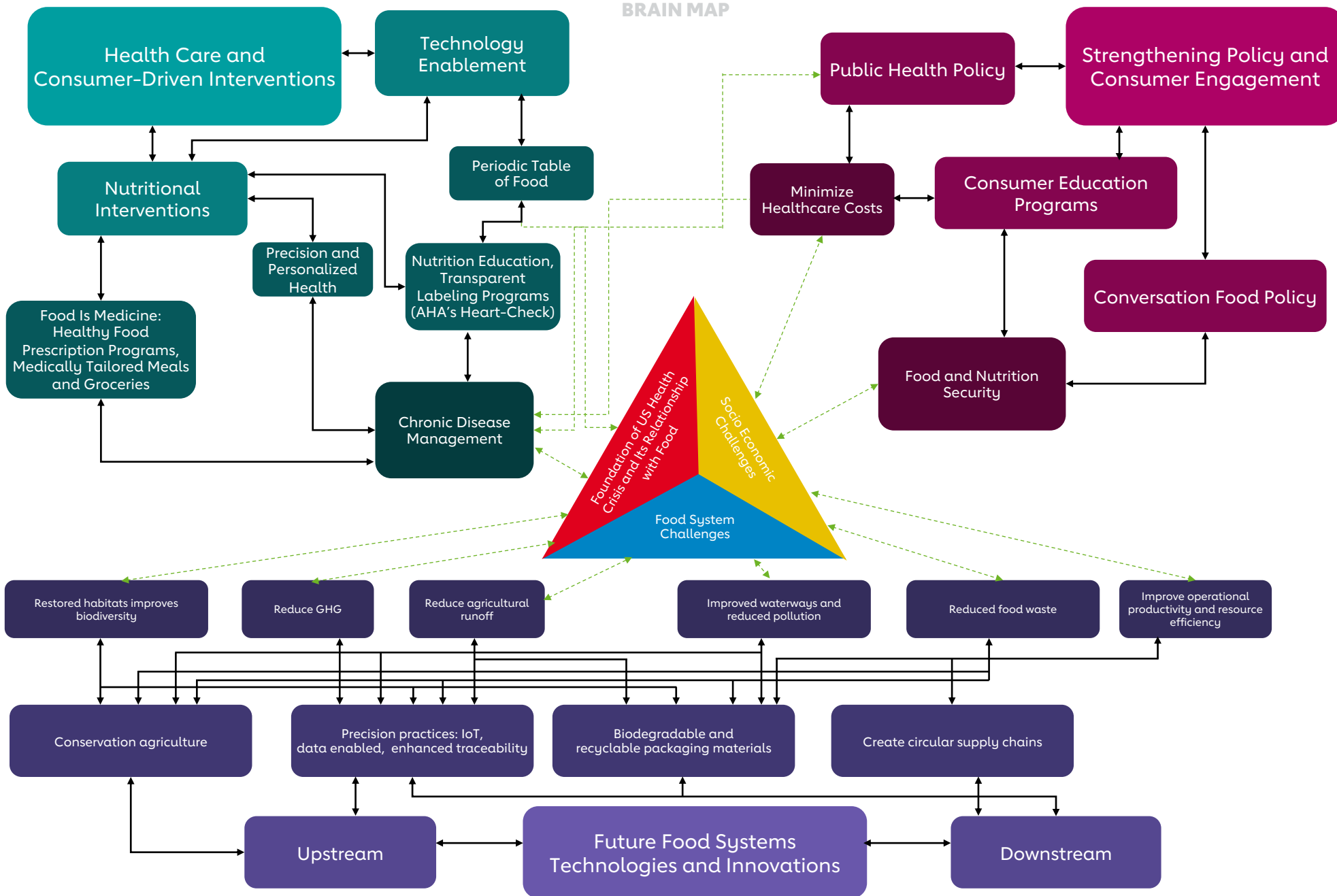
Collaborative efforts among government bodies, private industries, and consumers pave the way for mutual benefits, enhancing each sector's role in creating resilient future food systems. The American Heart Association has convened the Industry Nutrition Forum to foster multi-sector dialogue for a more holistic understanding of challenges and potential solutions, and to advance collaborative action in the food system. By encouraging active engagement from individuals, backed by robust policies, innovative solutions and communication strategies, they can help to initiate a transformative shift towards better health and nutrition security.



**3.0 SOLUTIONS**  
**MULTIFACETED**  
**APPROACHES AND**  
**SOLUTIONS**

**MULTIFACETED APPROACHES AND SOLUTIONS**

**BRAIN MAP**



**Legend**    **↔** Direct Effect    **- - - - -** Compounding / Indirect Effect    **■** Future Food Systems Technologies and Innovations    **■** Health Care and Consumer-Driven Solutions    **■** Strengthening Policy and Consumer Engagement

# 4.0 CONCLUSION: FUTURE ORIENTATION FOR HEALTHIER GENERATIONS AND ECOSYSTEMS



**FUTURE ORIENTATION  
FOR HEALTHIER GENERATIONS  
AND ECOSYSTEMS**

This paper explored the intricate relationship between food systems and health outcomes, underscoring the decisive role sustainable and equitable food practices have in influencing current inadequacies and diet-related chronic diseases. The intersection between food systems and health outcomes is a key determinant of the future of food, and the U.S. food systems play a significant role in shaping both national and global health and food and nutrition security. Understanding the future of food requires a comprehensive understanding of the interplay between food systems and how both challenges and solutions can compound health outcomes. It calls for a critical evaluation of the current challenges and a commitment to sustainable, equitable solutions that can support both local and global health. The path forward necessitates a collective and robust response involving diverse stakeholders, including health care professionals, food

industries, individuals, and policy makers, to foster innovations and adopt sustainable practices aimed at overhauling the food landscape. It is through such collaborative and innovative efforts that we can transition towards a future where food systems bolster health outcomes rather than detract from them.

The need for unified action is crucial, especially when addressing the interconnected issues of nutrition security, public health, and environmental impact. Strategies that are efficient, inclusive, resilient, and sustainable, all of which provide concurrent benefits to both food systems and health outcomes, are needed.<sup>cxxxvi</sup>

This endeavor calls for involvement from a broad spectrum of food and nutrition stakeholders who work across sectors to translate nutrition and science into recipes, meal ideas, and dietary guidance:



Patients, family members, and caregivers who provide insights into community needs



Companies and farmers that are responsible for cultivation, production, processing, packaging, and distribution of food



Grocers, retailers, food service providers, and restaurants who ensure the availability of affordable, nutritious foods



Clinicians and healthcare professionals who incorporate nutrition into healthcare strategies



Researchers who contribute to the body of knowledge, evidence, and innovation



Non-profit organizations and community groups that work towards food security and public health goals



Hospital administrators, payers, and policymakers who support the integration of nutrition-centered practices into health care and food systems, shape policies, and allocate resources<sup>cxxxvii</sup>

**FUTURE ORIENTATION  
FOR HEALTHIER GENERATIONS  
AND ECOSYSTEMS**

All stakeholders, including future generations, have an important role to play in prioritizing health and sustainability. Moreover, adopting holistic and systems thinking approaches and embracing technological advances in food production and distribution may enhance the resilience of food systems, and make strides towards solving the complex health care challenges intrinsically linked.

This is a call for all to commit to transformative changes that can benefit the collective health of communities today and future generations. Collaboration and active engagement across the public and private sectors, as well as among individuals, are key to driving the necessary change towards a healthier, more sustainable future. The role of collective action cannot be overstated. By fostering an environment that encourages active consumer participation and advocates for societal shifts towards sustainable consumption and production, empowers diverse communities to make informed decisions that support sustainable and health-centric food systems.

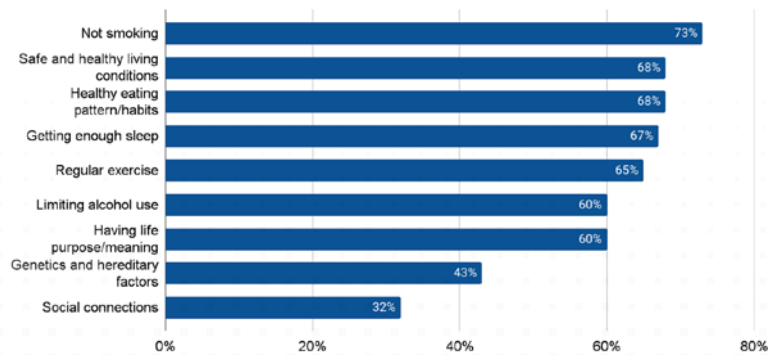
Strategic commitments and an integrated approach to policy, practice, and participation to restore and enhance ecosystems, improve the quality of diets, and innovate continuously within food supply chains, paves the way for a nutritionally secure future, where the health of communities and the integrity of ecosystems are mutually assured.

# NATIONAL ONLINE SURVEY: ATTITUDES ON FOOD AND NUTRITION

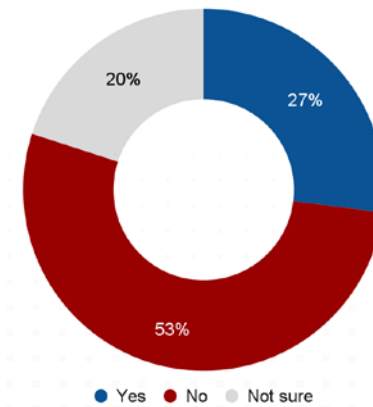
Research!America, in partnership with the American Heart Association, commissioned an online survey, conducted by Zogby Analytics, exploring Americans’ attitudes on food, diet, health, and nutrition. The survey was conducted from 5/10 – 6/3/2024 among 1,001 adults plus an additional 1,205 adults (402 African Americans, 401 Hispanics, 402 Asian Americans) for oversampling of people of underrepresented races and ethnicities. The overall margin of error is +/- 3% with a +/- 5% margin of error for the oversampled groups.

## Highlights

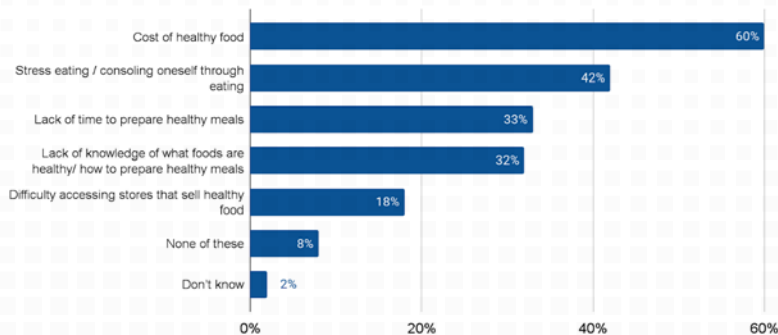
- A strong majority (94%) think that obesity is a somewhat (41%) or very (53%) serious problem in the U.S.
- Respondents recognize healthy eating habits (68%) as an important factor in improving a person’s chance of a long and healthy life.



- Half of respondents (53%) say we are not making enough progress in making nutritious food accessible and affordable the U.S.



- The top barriers to eating a healthier diet reported by respondents are the cost of healthy food (60%), stress eating (42%), lack of time to prepare healthy meals (33%) and lack of knowledge of what foods are healthy and how to prepare healthy meals (32%).



- Only 24% of respondents have ever heard of “food is medicine” before.
  - 22% were familiar with medically tailored meals (MTMs) and produce prescriptions.
    - Of those who said they were familiar with MTMs or produce prescriptions, 84% say programs like medically tailored meals and produce prescriptions to improving health are important.

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Association.

NATIONAL CENTER  
7272 GREENVILLE AVENUE • DALLAS, TEXAS 75231

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