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CIPR Study

“Rising Health Care Costs: Drivers, Challenges and Solutions

Executive Summary

By Julie Mix McPeak

NAIC President and Tennessee Insurance Commissioner

Food is Medicine:

Why Healthier Eating Should Be a Priority
for Health Care Providers, Insurers, and Government

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December 2018



Rising Health Care Costs: Drivers, Challenges and Solutions

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This study would not have been possible without the valuable contributions by the notable authors from the regulatory community, academia and industry distinguished for their expertise in the fields of health care and insurance.

Disclaimer: This series of papers represents the opinions of the author(s) and is the product of professional research. It is not intended to represent the position or opinions of the National Association of Insurance Commissioners (NAIC) or its members, nor is it the official position of any NAIC staff members. Any errors are the responsibility of the author(s).

Acknowledgements: The authors are grateful to all those who reviewed and contributed to this study and helped improve it with their valuable and insightful comments. Special thanks to the following for their valued comments and edits: Andrew J. Beal, Chief Operating Officer and Chief Legal Officer, NAIC; Nikki Hall, Assistant Director, CIPR; Anne Obersteadt, Senior Researcher, CIPR; and Dimitris Karapiperis, Research Analyst, CIPR.



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Contents

Executive Summary.....1

 Research Study Papers.....2

 The Importance of Nutrition.....2

 Market Factors Driving Health Care Costs.....3

 Responding to Regional Cost Differences.....3

 Prescription Drugs.....4

 Value-Based Reimbursement System.....5

 Reducing Waste.....6

 Administrative Cost Savings.....6

 Data Science and Advanced Technologies.....6

 Upcoming Papers.....7

Food is Medicine.....8

 Introduction.....8

 Dietary Priorities.....9

 The Health Care System.....11

 Worksites.....14

 Food Deserts–Retail and Restaurant Food Access.....15

 Healthier SNAP.....17

 Schools.....20

 Food and Nutrition Innovation.....22

 Recent Federal Actions.....24

 The Path Forward.....25

Rising Health Care Costs: Drivers, Challenges and Solutions

Executive Summary

By Julie Mix McPeak, NAIC President and Tennessee Insurance Commissioner

As President of the NAIC, examining the drivers of rising health care costs is an important part of my key initiatives this year. Health care expenditures as a component of U.S. economic activity have climbed steadily over the past half-century. Out-of-pocket health care expenses are the largest share of household spending and rose 3.9% in 2016, surpassing the average rate of growth of 2% from 2008 to 2015.¹ During the same time, costs for health services and prescription drugs have been rising faster than wages.² As a result, health care expenditures are consuming greater portions of family and public budgets. Left unchecked, health care spending may become an unsustainable financial burden.

Consumers gauge the growing costs of health care through the expenses they pay. For much of the U.S. population, this is primarily in the form of premiums, deductibles and copayments on private health insurance. Health insurance deductibles and coinsurance amounts are rising faster than the total cost for covered benefits in many plans. Premiums are also increasing, with average annual premiums for family coverage nearing \$20,000.³ In the next two decades, average family premiums could account for most of the U.S. median household income.⁴

Higher premiums, deductibles and copayments have led to a misperception that insurance is the issue. However, for private health insurance, only about one-third of health care expenditures in the U.S. contribute towards premiums.⁵ Additionally, health insurance premiums are a reflection of underlying health care costs. For this reason, solutions to controlling costs aim to address their underlying factors. This includes rethinking the way health care is paid and delivered. The goal is to contain health care costs while improving health care access and outcomes.

To accomplish this, I have asked the NAIC Health Insurance and Managed Care (B) Committee and the NAIC Center for Insurance Policy and Research (CIPR) to examine this critical issue. Accordingly, this CIPR study brings together thought leaders, researchers and practitioners in the health care field to provide a wide spectrum of viewpoints. The study, by intention, is a compilation of individually authored papers

¹ www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html.

² www.kff.org/health-costs/press-release/employer-sponsored-family-coverage-premiums-rise-5-percent-in-2018/

³ Kaiser Family Foundation, 2018. "2018 Employer Health Benefits Survey," Oct. 3, 2018. Accessed at www.kff.org/report-section/2018-employer-health-benefits-survey-summary-of-findings/.

⁴ <http://healthsystemredesign.org/downloads/20160824%20Projected%20and%20Actual%20Health%20Care%20and%20Health%20Insurance%20Costs%20in%202013%20Article%20by%20Simons%20and%20Adams.pdf>

⁵ National Institute for Health Care Management, "Spending for Private Health Insurance in the United States", *NIHCM Foundation Data Brief*, January 2013. Accessed at www.nihcm.org/pdf/Spending%20for%20Private%20Health%20Insurance.pdf.

Executive Summary

designed to address various drivers of health care costs. The contributing authors will also present recent government actions and advance possible solutions for all stakeholders to consider.

It should be noted the views expressed are the opinions of the authors. They are not meant to represent the position or opinions of the NAIC/CIPR or its members. They are also not the official position of any staff members. However, it is my hope that the study will further the conversation on effective health care cost solutions.

Research Study Papers

“Food is Medicine: Why Healthier Eating Should Be a Priority for Health Care Providers, Insurers and Government” is the first paper in this series. Nutrition is the basis of good health and well-being. As such, good nutrition is a powerful public health tool for policymakers. The paper provides a comprehensive understanding of the connection between good nutrition and health care expenditures. It also describes how improved diets can be a potent antidote to many chronic diseases.

The second paper examines the key underlying factors driving health care costs. It focuses primarily on unit prices and changing market dynamics. It also presents policy options and insurance regulatory actions available to effect change. Additionally, the paper suggests state insurance regulators could play a greater role as informed truth-tellers.

The next four papers included in the series discuss regional cost variations, the increasing rise in prescription drugs prices, the growing acceptance of value-based reimbursement, and the issue of waste and administrative costs. The seventh and final paper examines the role of data analytics in the health care system.

The Importance of Nutrition

Nutrition is closely related to health care expenditures through its link to chronic disease. More than two-thirds of health care expenditures in the U.S. are from chronic disease treatment.⁶ The incidence of chronic disease is high, with more than half of adults having at least one chronic disease. However, most of these diseases are preventable through nutritional eating and healthy lifestyle. Better dietary nutrition would reduce chronic diseases and their impact on health care expenditures.⁷ Yet, prevention of chronic diseases accounts for less than 1% of health care expenditures.⁸

This paper discusses how food is almost ignored in our health care system. The subject of food and nutrition is generally absent in health care providers’ electronic health records (EHR), in medical school education and in health services quality and reimbursement guidelines.⁹ Incorporating advice on food

⁶ <https://www.ncoa.org/news/resources-for-reporters/get-the-facts/chronic-disease-facts/>

⁷ Mozaffarian D., 2016. “Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: A comprehensive review,” *Circulation*, 133:187–225.

⁸ <https://www.ncoa.org/news/resources-for-reporters/get-the-facts/chronic-disease-facts/>

⁹ Mozaffarian D., 2017. “Want to fix America’s health care? First, focus on food,” *The Conversation*, Sept. 12, 2017. Accessed at <http://theconversation.com/want-to-fix-americas-health-care-first-focus-on-food-81307>

and nutrition into the EHR could be a crucial foundational step to enable health assessment and treatment by providers.

The author recommends nutrition be incorporated into health information technology (IT) and EHR standards for the medical assessment of diet quality and food security. In addition, insurance policies could cover medically tailored meals for the highest-risk patients. Policies could also incorporate technology-based patient incentive and education programs for healthier eating. Educating future doctors should be done by including nutrition in their medical school training.

This paper also examines how diet-related diseases disproportionately harm lower-income Americans, contributing to existing disparities. Inequality, connected to lack of access to healthy foods and affordable health care, fuels health care costs, which, in turn, can further increase inequality.¹⁰

Market Factors Driving Health Care Costs

Chronic diseases increase the demand for health care. However, the cost of health care is mostly influenced by the pricing of health care services. About 75% of health costs in the U.S. go to hospitals, health care providers and pharmaceutical companies.¹¹ The growing market power of hospitals and specialists could negatively impact pricing in the future.

This paper examines how policymakers could help contain health care costs by improving price transparency. Consumers and providers need better disclosure of health services to comparison shop and make informed decisions. Insurers could be required to issue reports showing how national findings on underlying costs appear in their claims data. Reports could also illustrate trends in the provision of high-, low- and no-value services. This could allow patients with high-cost conditions to easily identify value-based payment methods providing the best care. Furthermore, insurers could be encouraged to expand wellness programs designed to help prevent more serious and expensive health conditions.

Responding to Regional Cost Differences

Knowledge of regional conditions can help policymakers craft approaches specific to the issues facing their jurisdictions. Across the states, inpatient care has seen the greatest variation in price.¹² A combination of unnecessary care, low-value care, harmful complications, missed diagnoses, medical error and high administrative costs has been observed. The first step to reducing expenses is identifying and addressing inefficiencies and waste.

This paper examines how stakeholders have come together through a network of regional health improvement collaboratives (RHICs) to solve these waste issues. Stakeholders include providers, insurers, employers, unions, patient groups and government agencies. RHICs mobilize resources at the

¹⁰ Mozaffarian, D/, Benjamin, E.J., Go, A.S., et al., 2016. "Heart Disease and Stroke Statistics-2016 Update: A Report from the American Heart Association," *Circulation*, 133(4):e38–e360.

¹¹ Kamal R. and Cox, C., "How has U.S. spending on healthcare changed over time?" *Kaiser Family Foundation*, Dec. 20, 2017. Accessed at www.healthsystemtracker.org/chart-collection/u-s-spending-healthcare-changed-time.

¹² Network for Regional Healthcare Improvement, 2018. "Healthcare Affordability: Untangling Cost Drivers," Feb. 13, 2018. Accessed at www.nrhi.org/uploads/benchmark_report_final_web.pdf.

local level to improve access to quality lower-cost health care in their communities. Regional coalitions allow for the testing of new care models, as well as regional performance measurement and reporting.

Available data has shown prices and care delivery patterns vary across the states and within states across markets. Those differences drive regional cost variations.¹³ The insights gained from the data enables local comparisons by providing consumers information on cost difference. The common use of data also helps facilitate a multi-stakeholder understanding of the best path to improve health, reduce prices and remove waste. The potential outcome is the development of aligned goals and consensus-driven strategies.

This paper also explores how these collaborative projects would not be possible without the necessary regulatory support to allow data-sharing and cross-sector cooperation. Achieving real improvements in spending and health outcomes requires a regulatory environment supportive of robust transparency. Moreover, the insights gained from the data and collaboration could provide policymakers with clear, aligned direction from a broad group of stakeholders.

Prescription Drugs

Prescription drug costs represent a significant share of health care expenditures. In recent years, prescription drug price increases have exceeded increases in other medical costs. This trend is expected to continue into the foreseeable future. More expensive brand and specialty drugs make up the greatest share of drug spending for all payers.

This paper examines how pharmacy benefit managers (PBMs) contract with health plans, employers, government agencies and other payers to manage prescription drug benefits. Just three PBMs handle about 75% of all prescription drug claims.¹⁴ To incentivize sales, drug manufacturers may offer brand drug rebates to receive a favorable position or preferred status. While PBMs pass some of the rebates along to insurers, precise amounts and how they are divided between parties is mostly unknown.¹⁵

This non-transparent pricing structure can potentially result in misaligned incentives. Often, because patients' cost-sharing is applied on the retail value, the payer could receive payment greater than cost. In such cases, it may be in the payer's best interest to direct patients to more expensive prescription drugs. Furthermore, drug manufacturers provide insureds with copay cards or coupons for certain brand or specialty drugs. This could allow them to circumvent any attempt by insurers to lower costs.

¹³ Network for Regional Healthcare Improvement, 2018. "Healthcare Affordability: Untangling Cost Drivers," Feb. 13, 2018. Accessed at www.nrhi.org/uploads/benchmark_report_final_web.pdf.

¹⁴ Yu, N.L., Attebery, P., and Bach, P.B., 2018. "Spending On Prescription Drugs In The US: Where Does All The Money Go?" *Health Affairs*, July, 31, 2018. Accessed at <https://www.healthaffairs.org/doi/10.1377/hblog20180726.670593/full>.

¹⁵ Dieguez, G., Alston, M., and Tomicki, S., 2018. "A primer on prescription drug rebates: Insights into why rebates are a target for reducing prices," *Milliman White Paper*. Accessed at www.milliman.com/uploadedFiles/insight/2018/Prescription-drug-rebates.pdf.

Another factor for rising health care costs is medication non-adherence; i.e., the intentional or unwitting failure to take medications as prescribed. This paper also examines how medication non-adherence can result in increased emergency and inpatient utilization. Adherence measures have been included in value-based contracts of Medicare drug plans.¹⁶

The paper concludes with recommendations on how technological innovations may be able to provide new solutions. Automated notification reminders to patients who use long-term medication is one example. However, for this type of innovation to gain wide acceptance, several privacy concerns first need to be resolved.

The fee-for-service arrangement under which most pharmaceuticals are currently being reimbursed is largely ineffective and wasteful. Insurers and drug manufacturers are beginning to explore alternative contracting arrangements, such as value-based contracts. Value-based contracts share risks between pharmaceutical companies and insurers for treatment costs and outcomes. As such, they show promise for improving costs and outcomes.

Value-Based Reimbursement System

A value-based reimbursement system is a health care delivery model where providers (i.e., hospitals and physicians) are reimbursed based on their patients' health outcomes. It differs from the traditional fee-for-service in which health care providers are paid based on the amount of services they provide. The growing adoption of value-based reimbursement, by both public and private insurers, is changing the way health care is provided.¹⁷ Value focuses both on the quality of care and on its cost. Centering on value-based payment may potentially reverse the trajectory of national health care costs by improving individual care and population health.

This paper examines how value-based payment models can transform the delivery of health care by aligning provider compensation with improvements in care and cost controls. However, this shift in the way care is measured, billed and paid is far from complete or certain. Innovation and experimentation are ongoing and a range of issues could slow or add costs to progress. Identifying opportunity areas and resolving identified issues could help facilitate the implementation of value-based reimbursement systems.

Reducing Waste

Waste in health care spending now exceeds \$1 trillion per year. This amount could fund the entire Medicaid program twice over.¹⁸ A disproportionate share of the waste is attributable to administrative

¹⁶ Qian, H., Deguzman, L., Jacobs, S., Chiang, K., and Chang, C., 2018. "Improving Performance on Medicare Stars Medication Adherence Measures through Predictive Analytics," *The Permanente Journal*, Spring 2018, Volume 22, Number 2. Accessed at www.thepermanentejournal.org/issues/2018/spring.html.

¹⁷ <https://hitconsultant.net/2018/06/18/value-based-care-trends/>

¹⁸ O'Neil, D.P., and Scheinker, D., 2018. "Wasted Health Spending: Who's Picking Up The Tab?" *Health Affairs*, May 31, 2018. Accessed at www.healthaffairs.org/doi/10.1377/hblog20180530.245587/full/.

Executive Summary

complexity and billing bureaucracy. Administrative overhead consumes approximately 25% of hospital outlays. Waste represents about 31% of spending in the U.S. health care system.¹⁹

This paper examines how the development of all-payer claims databases would permit greater clarity in understanding the burden of waste. Data trends could potentially help identify opportunities to curtail unnecessary spending. Additionally, regulatory intervention may be needed to address administrative complexity. Regulatory actions focused on standardizing claim coding and payment rules may help cut costs for privately administered coverage. The paper also explores how insurers could act by providing lower reimbursement for low-value diagnostics.

Administrative Cost Savings

An important component of excessive administrative expenses is the use of time-consuming manual business processes. For instance, claims-related transactions between insurers, providers and vendors are frequently completed by phone, fax or mail. Adopting electronic transactions could help reduce the administrative burden of processing claims, requesting eligibility and making payment. This would mean fewer overhead expenses for providers and insurers.

This paper explores how tracking the adoption of cost-savings opportunities is essential for assessing progress and momentum. The Council for Affordable Quality Healthcare (CAQH) Index is a widely used source for tracking health plan and provider adoption of fully electronic administrative transactions.²⁰ By benchmarking progress, the industry and policymakers could better identify potential barriers to adopting electronic administrative transactions. These insights may prompt new initiatives to help contain administrative costs.

Data Science and Advanced Technologies

Data analytics can potentially enhance providers' and insurers' abilities to reduce waste without impacting quality of care. Analytics can help leverage the data-collection and sharing trends currently underway to make true change. Its potential uses are unlimited. Analytics can support clinical decisions by making information more easily accessible. It can trace fraudulent and incorrect payments, facilitate care coordination and track patient lifestyle choices. It also makes it easier to identify ineffective treatments and areas of variation.

The federal Affordable Care Act has helped meaningful use of patient data mature. Health care organizations have begun to aggregate and build a consolidated view of the data. Built-in visualization tools and third-party applications from Microsoft, SAP and Tableau have supported this movement.²¹

¹⁹ O'Neil, D.P., and Scheinker, D., 2018. "Wasted Health Spending: Who's Picking Up The Tab?" *Health Affairs*, May 31, 2018. Accessed at www.healthaffairs.org/doi/10.1377/hblog20180530.245587/full/.

²⁰ www.caqh.org/about/press-release/increasing-automation-claims-related-business-transactions-would-save-healthcare

²¹ <https://healthitanalytics.com/features/using-visual-analytics-big-data-dashboards-for-healthcare-insights>

Executive Summary

This paper examines how the use of data in health care is still lagging far behind other industries. For instance, electronic health records (EHRs) have been widely adopted. Yet, analytical insights from the use of the data have not been fully realized. The full integration of the data into the EHR is a next step in harnessing these technologies to reduce health care expenses.²² Currently, the major EHR vendors have created data warehouses to support analytics and ad-hoc queries. While each is substantially different from the other, they all help support a more cost-effective delivery of health care services.

Upcoming Releases

This study begins with the publication of the executive summary and the first paper on nutrition. The remainder of the papers in this research series will be released on a rolling basis starting in early 2019. All the papers will be available to download on the CIPR webpage at cipr.naic.org.

²² Frenzel, J., Incalcaterra, J.R., Shook, K.A., Recinos, I., Andrabi, T., Guzman, A.B., Speer, B.B., and French, K.E., 2018. "Using a New EHR System to Increase Patient Engagement, Improve Efficiency, and Decrease Cost," *NEJM Catalyst*, Aug. 23, 2018. Accessed at <https://catalyst.nejm.org/new-ehr-health-information-system/>.

Rising Health Care Costs: Drivers, Challenges and Solutions

Part One

Food is Medicine: Why Healthier Eating Should Be a Priority for Health Care Providers, Insurers, and Government

By Dariush Mozaffarian, MD DrPH, Dean, Jean Mayer Professor of Nutrition and Medicine, Friedman School of Nutrition Science & Policy, Tufts University, and Division of Cardiology, Tufts Medical Center

Introduction

“Let food be thy medicine and medicine be thy food” – Hippocrates, 431 B.C.

The amount Americans spend on health care nationally is mind-boggling: a total of \$3.2 trillion per year, or nearly 1 in 5 dollars in the entire U.S. economy.¹ This approaches nearly \$1,000 each month for every person in the country, or \$4,000 per month for a family of four. These costs exceed most households’ budgets for food, gas, housing or other common necessities. And much of this is diet-related.

Suboptimal diet is the leading cause of poor health in the U.S., especially due to chronic diseases.^{2,3,4,5} Just 10 dietary factors are estimated to cause nearly half of all U.S. deaths from heart disease, stroke and Type 2 diabetes—nearly 1,000 deaths each day.⁶ One in three

¹ Centers for Medicare & Medicaid Services, 2018. “National Health Expenditures: 2016 Highlights,” 2018. Accessed at www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/highlights.pdf.

² US Burden of Disease Collaborators, 2013. “The state of US health, 1990–2010: Burden of diseases, injuries, and risk factors,” *JAMA*, 310 (6):591–608.

³ Mozaffarian D., 2016. “Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: A comprehensive review,” *Circulation*, 133:187–225.

⁴ Waters, H. and DeVol, R., 2016. “Weighing Down America: The Health and Economic Impact of Obesity,” The Milken Institute. Accessed at <http://assets1b.milkeninstitute.org/assets/Publication/ResearchReport/PDF/Weighing-Down-America-WEB.pdf>.

⁵ Micha, R., Shulkin, M.L., Penalvo, J.L., et al., 2017. “Etiologic effects and optimal intakes of foods and nutrients for risk of cardiovascular diseases and diabetes: Systematic reviews and meta-analyses from the Nutrition and Chronic Diseases Expert Group” *PLoS One*, 12(4):e0175149.

⁶ Micha, R., Penalvo, J.L., Cudhea, F., Imamura, F., Rehm, C.D., and Mozaffarian, D., 2017. “Association Between Dietary Factors and Mortality from Heart Disease, Stroke, and Type 2 Diabetes in the United States,” *JAMA*, 317(9):912–924.

children born after 2000 will develop Type 2 diabetes in their lifetime. Two children in three will become overweight or obese.⁷

Annual direct health care expenditures are estimated at \$193 billion for cardiovascular diseases and \$112 billion for Type 2 diabetes. The estimated cost to the economy in terms of lost productivity for these conditions is the combined costs of all obesity-related conditions are estimated to be \$1.42 trillion per year, or about 8% of U.S. gross domestic product. These diet-related burdens also disproportionately harm lower-income Americans, contributing to major socioeconomic disparities.⁸

Given its core role in health care costs, leveraging food for better health should be a priority for health care, businesses, insurance payers and government. This paper reviews the latest science on dietary priorities for better health. It also examines the evidence for effective systems to facilitate better nutrition. Discussion will focus on the health care system, worksite wellness, food assistance programs, schools, research and innovation.

Dietary Priorities

Modern nutrition science is a surprisingly young field. The first vitamins were not identified and isolated until the late 1920s. The science of nutrition and chronic diseases is even younger, with meaningful focus beginning only in the 1970s.⁹ Fortunately, as with other sciences, rapid advances have occurred, especially over the past two decades.

Key progress includes: 1) new research methods such as prospective cohorts, controlled metabolic studies and long-term clinical trials; 2) more rigorous approaches for assessing dietary habits and reducing misclassification and bias; and 3) a corresponding explosion in the quality and quantity of evidence. For example, a PubMed search for the terms “diet” and “cardiovascular” reveals 3,129 scientific publications from 1961 to 1980. The number then jumps to 9,809 from 1981 to 2000, and 31,673 from 2001 to 2017 (just 17 years). Respective numbers of scientific publications for “diet” and “diabetes” are 3,771, 10,324 and 38,141; and for “diet” and “obesity,” 3,894, 9,220 and 47,531.

With these scientific advances, several important lessons have emerged (Box 1).¹⁰

⁷ Narayan, K.M., Boyle, J.P., Thompson, T.J., Sorensen, S.W., Williamson, D.F., 2013. “Lifetime risk for diabetes mellitus in the United States,” *JAMA*, 290(14):1884–1890.

⁸ Mozaffarian, D/, Benjamin, E.J., Go, A.S., et al., 2016. “Heart Disease and Stroke Statistics-2016 Update: A Report from the American Heart Association,” *Circulation*, 133(4):e38–e360.

⁹ Mozaffarian, D. and Forouhi, G., 2018. “Dietary guidelines and health: Is nutrition science up to the task?” *The BMJ*, 360:k822.

¹⁰ Dietary Guidelines Advisory Committee, 2015. “Scientific Report of the 2015 Dietary Guidelines Advisory Committee.” Accessed at www.health.gov/dietaryguidelines/2015-scientific-report/.

Box 1. Examples of Important Advances and New Lessons in Nutrition Science

- Dietary guidance should emphasize specific food groups and overall dietary patterns, rather than reductionist approaches focused on isolated single nutrients.
- Foods influence numerous, diverse, complex biological pathways. This limits the utility of any single surrogate outcome (e.g., blood cholesterol, obesity) for making inferences on overall health effects.
- For weight gain and obesity, not all calories are created equal. Different foods have varying effects on long-term modulators of energy balance. This includes hunger, satiety, brain reward, glycemic responses, hepatic fat synthesis, adipocyte function, metabolic expenditure and the microbiome.
- Knowledge alone is often insufficient for behavior change. Systems changes must incentivize and normalize healthier foods and disincentive unhealthy options.

The pace and scope of nutritional discoveries has naturally led to evolving priorities. For example, there is less focus today on dietary fat, isolated antioxidant vitamins or overall macronutrients such as total protein or carbohydrates.

At the same time, attention on the health effects of food processing, refined starch and added sugars has grown. There is also greater emphasis on the role of flavanols and other phytochemicals; the benefits of whole foods such as fruits, nuts, beans, vegetables and whole grains; the harms of additives like salt and trans-fat; and the role of the gut microbiome.¹¹

Despite advances in our understanding of nutrition, many controversies remain. This includes: 1) the relevance of saturated fat; 2) the role of very low-carbohydrate diets; 3) the optimal lowest target for dietary salt; 4) the utility of dietary supplements; 5) the impact of non-caloric sweeteners; 6) the effectiveness of emphasizing total calories versus diet quality for long-term weight control; and 7) the importance of topics of popular interest such as gluten, organic foods, genetically modified foods or popular diets (such as Atkins, paleo, keto, vegan and more).¹²

While further research is needed, these questions should not distract us as a society from learning and adopting well-balanced and healthy diets. Nutritious eating should be a lifestyle.

¹¹ Mozaffarian. D. and Forouhi, G., 2018. "Dietary guidelines and health: Is nutrition science up to the task?" *The BMJ*, 360:k822.

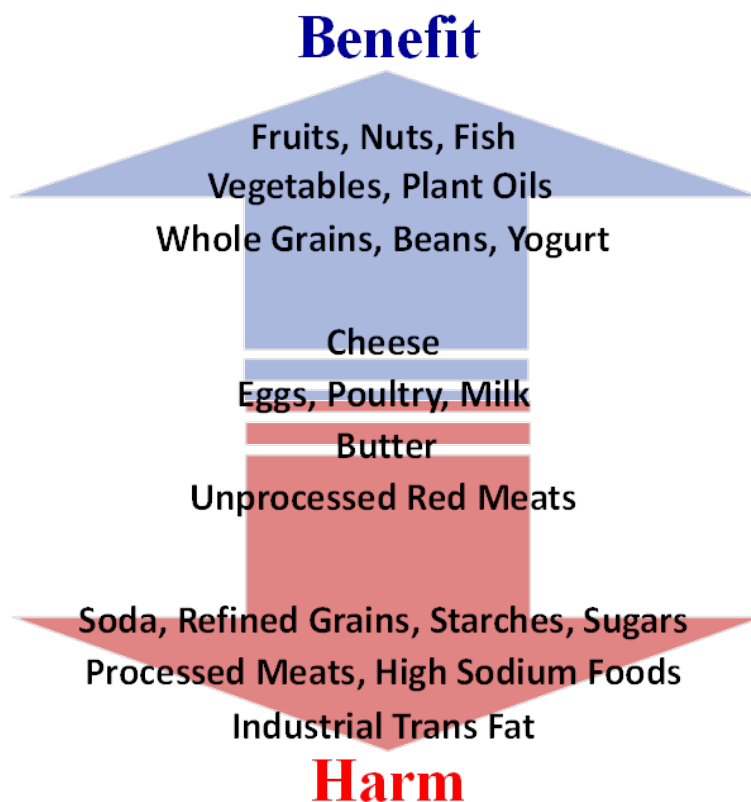
¹² Mozaffarian D., 2016. "Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: A comprehensive review," *Circulation*, 133:187–225.

The current state of nutrition science enables conclusions on several reasonable dietary priorities for health (Figure 1).

One of the most important among these is to eat minimally processed, bioactive-rich foods. This includes fruits, nuts, seeds, beans, vegetables and whole grains, as well as plant oils, yogurt and fish. Conversely, excessively processed foods rich in refined starch, sugars and industrial additives should be avoided.¹³ These represent appropriate, actionable nutrition targets for healthier eating systems and health care.

Figure 1: Food is Medicine – Dietary Priorities for Action

Source: Figure reproduced with permission and adaptations from Mozaffarian D., *Circulation* 2016; 133:187–225.



The Health Care System

While Americans' food choices are a primary driver of poor health, food is currently almost ignored in the health care system. Food and nutrition are generally absent in the electronic health record, in medical education, and in practice quality and reimbursement guidelines.

¹³ Mozaffarian D., 2016. "Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: A comprehensive review," *Circulation*, 133:187–225.

Similarly, food was scarcely discussed during the 2017 national health care debates or in the federal Affordable Care Act.

Clearly, the health care system has failed to incorporate and address the leading cause of poor health. This singular irony explains many of the challenges and disappointments of recent decades to reign in ever-spiraling health care costs. Fortunately, concrete health care reforms can begin to recognize and leverage the power of better nutrition for reducing disease and lowering costs (Box 2).

Box 2. Recommended Priority Actions in Health Care

- Electronic health records (EHRs): Nutrition should be incorporated into health information technology (IT) and EHR standards, including screening tools and comprehensive assessments of diet quality and food security.
- Medically tailored meals: Policies should cover medically tailored meals on hospital discharge for highest-risk patients with complex chronic diseases. This cost-savings strategy has proven to reduce high rates of emergency room visits and hospital readmissions.¹⁴
- Healthy food prescriptions: Policies should subsidize prescriptions for healthier food purchases, targeted to people in-need to prevent or treat disease.¹² Such programs already exist nationally and have shown to be effective.¹⁵ Their cost-effectiveness has been similar to conventional drug-based approaches, such as statin therapy for primary prevention of cardiovascular disease.
- Innovative technology-based approaches to patient education and incentives: Policies should incorporate, evaluate, refine and scale novel technology-based patient incentive and education programs for healthier eating. Programs using gamification and economic rebates are already being implemented by many private worksites and payers to improve nutrition knowledge and food purchasing.^{16,17}
- Medical education: Research shows training on food, nutrition and behavior change is severely lacking and in high demand within medical provider education, specialty training and licensing standards.¹⁸ Reforming licensing exam standards to focus 5% to 10% of content on nutrition and behavior change would help establish the prioritization of food as a leading determinant of health.

¹⁴ www.fimcoalition.org.

¹⁵ www.wholesomewave.org/how-we-work/produce-prescriptions.

¹⁶ www.johnhancockinsurance.com/life/John-Hancock-Vitality-Program.aspx.

¹⁷ www.nutrisavings.com.

¹⁸ Daley, B.J., Cherry-Bukowiec, J., Van Way, C.W., 3rd, et al., 2016. "Current Status of Nutrition Training in Graduate Medical Education from a Survey of Residency Program Directors: A Formal Nutrition Education Course is Necessary," *JPEN J Parenter Enteral Nutr.* 40(1):95–99.

- Reimbursement and quality metrics: Food and nutrition must be integrated into internal and external reimbursement and quality metrics. This provides the needed incentive for nutrition assessment and promotion to address the health and utilization burdens of diet-related illness.
- Procurement standards for hospital foods, cafeterias and vending: Hospitals should leverage procurement standards to improve the nutritional quality of food available to patients, employees and visitors, for example, based on the federal standards for workplace cafeterias and other food service.¹⁹ Hospital procurement standards should also support the purchase of healthier foods from the local community. This will increase community engagement and economic development.

It is self-evident food and nutrition, as the leading cause of poor health in the U.S., must be incorporated into the EHR. This can include a brief screening—e.g., a “nutrition vital sign”—to assess food insecurity and diet quality at each clinical visit. A more comprehensive “annual nutrition physical” could be performed during the annual primary care exam. This more robust dietary assessment should include biomarker testing for appropriate patient subgroups.

Existing technology platforms could facilitate questionnaires being partly or fully completed with nursing staff, in the waiting room or even at home. For hospital admissions, additional EHR-based nutrition screening should be performed to assess potential need for medically tailored meals at discharge (Box 2).

Models and precedents for such lifestyle assessments exist. For example, Kaiser Permanente recently began using an EHR-based screener called “Exercise Vital Sign” (EVS). The EVS identifies and tracks patients not meeting physical activity recommendations and assists health care providers in promoting physical activity.^{20,21,22} It was developed as part of the national *Exercise is Medicine* initiative and adapted from the Behavioral Risk Factor Surveillance System (BRFSS) physical activity questions.

Care was taken to ensure the EVS would be practical to use, acceptable to medical staff and optimized to minimize errors in data entry. On average, the EVS takes less than one minute to administer and is performed regularly at every clinic visit for all 12 million Kaiser Permanente

¹⁹ Food Service Guidelines Federal Workgroup, 2017. “Food Service Guidelines for Federal Facilities,” U.S. Department of Health and Human Services.

²⁰ Coleman, K.J., Ngor, E., Reynolds, K., et al., 2102. “Initial validation of an exercise ‘vital sign’ in electronic medical records,” *Med Sci Sports Exerc.* 44(11):2071–2076.

²¹ Young, D.R., Coleman, K.J., Ngor, E., Reynolds, K., Sidell, M., and Sallis, R., 2014. “Associations between physical activity and cardiometabolic risk factors assessed in a Southern California health care system,” *Preventing Chronic Disease*, 2014;11:E219.

²² Grant, R.W., Schmittiel, J.A., Neugebauer, R.S., Uratsu, C.S., and Sternfeld, B., 2014. “Exercise as a vital sign: A quasi-experimental analysis of a health system intervention to collect patient-reported exercise levels,” *J Gen Intern Med.*, 2014;29(2):341–348.

enrollees. It predicts substantial differences in metabolic risk factors such as blood pressure and glycemic control;²³ is linked to higher rates of appropriate referrals, weight loss and HbA1c decline;²⁴ and is now performed regularly at every clinic visit for all 12 million Kaiser Permanente enrollees.

Incorporating food and nutrition into the EHR is a crucial foundational step to facilitate assessment and treatment by providers. It will also inform quality-improvement programs, assessment of new interventions and development of performance metrics.

Worksites

Most adults spend more time at the office than at home, making this a powerful environment for influencing eating habits. The impact of worksite-based interventions on lifestyle, diet, physical activity and tobacco has been systematically reviewed.²⁵ In contrast, the combination of education with environmental changes significantly improves purchasing behaviors. Environmental changes include nutritional procurement standards, as well as location and prices of foods and beverages served. Such worksite interventions have also demonstrated improvements in adiposity measures.^{26,27} Several analyses demonstrate the cost-effectiveness of robust worksite wellness programs. For example, improving diet-related health risks by just 1% could save employers \$83 to \$103 per employee per year.^{28,29}

Increasing workforce fluidity has justifiably made employers wary of investments in long-term health. However, the health benefits of improved diet quality accrue quickly. For example, significant reductions in blood lipids, blood pressure and other metabolic risk factors occur

²³ Young, D.R., Coleman, K.J., Ngor, E., Reynolds, K., Sidell, M., and Sallis, R.E., 2014. "Associations between physical activity and cardiometabolic risk factors assessed in a Southern California health care system," *Preventing Chronic Disease*, 2014;11:E219.

²⁴ Grant, R.W., Schmittziel, J.A., Neugebauer, R.S., Uratsu, C.S., Sternfeld, B., 2014. "Exercise as a vital sign: A quasi-experimental analysis of a health system intervention to collect patient-reported exercise levels," *J Gen Intern Med.*, 2014;29(2):341–348.

²⁵ Mozaffarian, D., Afshin, A., Benowitz, N.L., et al., 2012. "Population approaches to improve diet, physical activity, and smoking habits: A scientific statement from the American Heart Association," *Circulation*, 126(12):1514–1563.

²⁶ Anderson L.M., Quinn, T.A., Glanz, K., et al., 2009. "The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity: A systematic review," *Am J Prev Med.* 37(4):340–357.

²⁷ Groeneveld, I.F., Proper, K.I., van der Beek, A.J., Hildebrandt, V.H., and van Mechelen, W., 2010. "Lifestyle-focused interventions at the workplace to reduce the risk of cardiovascular disease: A systematic review," *Scand J Work Environ Health*, 36(3):202–215.

²⁸ Kirkham, H.S., Clark, B.L., Bolas, C.A., et al., 2015. "Which modifiable health risks are associated with changes in productivity costs?" *Popul Health Manag.*, 18(1):30–38.

²⁹ Henke, R.M., Carls, G.S., Short, M.E., et al., 2010. "The relationship between health risks and health and productivity costs among employees at Pepsi Bottling Group," *Journal of Occupational and Environmental Medicine*, 52(5):519–527.

within 4–8 weeks, even with no changes in weight.^{30,31} Health benefits are even larger if weight loss also occurs.³² Accordingly, in a meta-analysis on costs and savings of worksite wellness programs, every dollar spent on wellness programs generated \$3.27 in lower medical costs.³³

Advances in technology provide 21st century solutions to incentivize better nutrition. For example, the John Hancock Vitality life insurance program rewards clients for healthier living with lower insurance premiums. The program also provides fitness tracking devices and a healthy food purchasing platform integrated with existing supermarket shopper reward cards across the country.³⁴ This program saves John Hancock money through improved client health. It allows John Hancock to provide direct benefits of up to \$600 per year per client for nutritious grocery purchases.

Food Deserts – Retail and Restaurant Food Access

There is considerable interest in the health implications of the local food environment, including the presence and accessibility of retail stores (supermarkets, grocery stores, convenience stores) and restaurants (fast-food, casual, full-service). Several studies have shown that low-income urban and rural areas are likely to have fewer grocery stores and supermarkets and larger numbers of fast-food restaurants and convenience stores.³⁵ In one analysis, nearly 30 million Americans in low-income neighborhoods were found to live more than a mile from a supermarket.³⁶

These findings have popularized the notion that “food deserts” are major causes of poor diets and corresponding diet-related illness. However, the actual evidence for dietary or health

³⁰ Sacks, F.M., Svetkey, L.P., Vollmer, W.M., et al., 2011. “Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group,” *N Engl J Med.* 344(1):3–10.

³¹ Chen, S.T., Maruthur, N.M., and Appel, L.J., 2010. “The effect of dietary patterns on estimated coronary heart disease risk: Results from the Dietary Approaches to Stop Hypertension (DASH) trial,” *Circ Cardiovasc Qual Outcomes*, 3(5):484–489.

³² Gardner, C.D., Trepanowski, J.F., Del Gobbo, L.C., et al., 2018. “Effect of Low-Fat vs. Low-Carbohydrate Diet on 12-Month Weight Loss in Overweight Adults and the Association with Genotype Pattern or Insulin Secretion: The DIETFITS Randomized Clinical Trial,” *JAMA*, 319(7):667–679.

³³ Baicker, K., Cutler, D., and Song, Z., 2010. “Workplace wellness programs can generate savings,” *Health Affairs*, 29:1–8.

³⁴ John Hancock Vitality, 2018. Accessed at <https://jhrewardslife.johnhancockinsurance.com/about-vitality.html>.

³⁵ Afshin, A., Penalvo, J., Del Gobbo, L., et al., 2015. “CVD prevention through policy: a review of mass media, food/menu labeling, taxation/subsidies, built environment, school procurement, worksite wellness, and marketing standards to improve diet,” *Curr Cardiol Rep.* 17(11):98.

³⁶ Ver Ploeg, M., Breneman, V., Dutko, P., Williams, R., Snyder, S., Dicken, C., and Kaufman, P., 2012. “Access to Affordable and Nutritious Food: Updated Estimates of Distance to Supermarkets Using 2010 Data,” ERR-143, U.S. Department of Agriculture, Economic Research Service, November 2012.

effects of the local built food environment remains surprisingly limited.^{37,38} Availability and accessibility have typically been studied cross-sectionally, assessing density (per area or per capita) or distance (e.g. to home, school, or work) of food outlets in relation to adiposity, other obesity-related outcomes, or (less commonly) dietary habits. Some studies have also explored walkability to food outlets, participation in farmers' markets or community gardens, and in-store food availability.

Overall, cross-sectional studies have generally observed inverse associations between adiposity and supermarket availability, but far more inconsistent associations for other types of retail stores (e.g., grocery stores, convenience stores) or restaurants (e.g., fast-food, full-service). However, in such cross-sectional studies, one cannot determine whether lack of supermarkets drives poor dietary choices and obesity, or whether the neighborhood demand for certain foods drives the market for food outlets.

When these relationships have been evaluated longitudinally over time, allowing better assessment of the timing of effects, no clear or consistent associations have been seen between availability or accessibility of food outlets, including supermarkets, and measures of diet quality or obesity.^{39,40} For example, in 2011, the Obama Administration established the Healthy Food Financing Initiative (HFFI) as part of the federal Farm Bill, which has since invested over \$220 million in one-time financing assistance to help catalyze the opening of full-service supermarkets in low-income "food deserts." However, several studies have prospectively assessed the impact of these new supermarkets and found no consistent changes in dietary habits, obesity, or even overall access to healthier foods, including in Philadelphia,⁴¹ New York City,⁴² and Pittsburgh.^{43,44}

³⁷ Afshin, A., Penalvo, J., Del Gobbo, L., et al., 2015. "CVD prevention through policy: a review of mass media, food/menu labeling, taxation/subsidies, built environment, school procurement, worksite wellness, and marketing standards to improve diet," *Curr Cardiol Rep.* 17(11):98.

³⁸ Mozaffarian, D., Afshin, A., Benowitz, N.L., et al., 2012. "Population approaches to improve diet, physical activity, and smoking habits: A scientific statement from the American Heart Association," *Circulation*, 126(12):1514–1563.

³⁹ Boone-Heinonen, J., Gordon-Larsen, P., Kiefe, C., Shikany, J.M., Lewis, C.E., and Popkin, B.M., 2011. "Fast food restaurants and food stores: longitudinal associations with diet in young to middle-aged adults: the CARDIA study," *Arch Intern Med.* 171(13):1162-1170.

⁴⁰ Smith, D., Cummins, S., Clark, C., and Stansfeld, S., 2013. "Does the local food environment around schools affect diet? Longitudinal associations in adolescents attending secondary schools in East London," *BMC Public Health.* 13:70.

⁴¹ Cummins, S., Flint, E., and Matthews, S.A., 2014. "New neighborhood grocery store increased awareness of food access but did not alter dietary habits or obesity," *Health affairs (Project Hope).* 33(2):283-291.

⁴² Elbel, B., Moran, A., Dixon, L.B., et al., 2015. "Assessment of a government-subsidized supermarket in a high-need area on household food availability and children's dietary intakes," *Public Health Nutr.* 18(15):2881-2890.

⁴³ Dubowitz, T., Ghosh-Dastidar, M., Cohen, D.A., et al., 2015. "Diet And Perceptions Change With Supermarket Introduction In A Food Desert, But Not Because Of Supermarket Use," *Health affairs (Project Hope).* 34(11):1858-1868.

These findings suggest that, while the notion of “food deserts” is conceptually attractive and easy to grasp by the public and popular media, access to nutritious food stems from more than just local proximity to supermarkets or grocery stores.⁴⁵ Differences in income, education, preferences, kitchen facilities, and time are each major influences on the capacity and opportunity cost of buying and cooking healthier food at home. Leveraging specific changes in the healthcare system, worksites, schools, federal feeding programs, and nutrition research and innovation—each outlined in other sections of this paper—appear to be promising actions to improve demand, availability, and affordability of healthier food.

Healthier SNAP

National food assistance programs are among the largest and most promising opportunities to improve food choices and health while reducing costs and disparities. The size, scope and potential for impact are staggering. For instance, the U.S. Supplemental Nutrition Assistance Program’s (SNAP) annual budget of \$74 billion per year exceeds the budgets of the National Institutes of Health (NIH), the U.S. Centers for Disease Control and Prevention (CDC) and the U.S. Food and Drug Administration (FDA) combined.⁴⁶

SNAP provides monthly benefits for retail food purchases to approximately 42 million low-income individuals, or about 1 in 7 Americans.^{47,48} It was established as the federal Food Stamp Act in 1964 “to safeguard the health and well-being of the Nation’s population and raise levels of nutrition among low-income households.”⁴⁹

Several studies suggest SNAP already reduces health care costs. Low-income adults on SNAP experience about \$1,400 per person per year lower health care expenditures, compared to Americans of similar income not on SNAP.

Additionally, women on SNAP during pregnancy experience a 23% lower incidence of low birth weight. The use of food assistance in utero and through early childhood is also associated with

⁴⁴ Ghosh-Dastidar, M., Hunter, G., Collins, R.L., et al., 2017. “Does opening a supermarket in a food desert change the food environment?” *Health Place*. 46:249-256.

⁴⁵ Haspel, T., 2018. “Food deserts don’t cause obesity. But that doesn’t mean they don’t matter,” *The Washington Post*. Accessed at www.washingtonpost.com/lifestyle/food/food-deserts-dont-cause-obesity-but-that-doesnt-mean-they-dont-matter/2018/08/22/df31afc0-a61b-11e8-a656-943eefab5daf_story.html?noredirect=on&utm_term=.d307267f8587

⁴⁶ U.S. Department of Agriculture, 2018. “Supplemental Nutrition Assistance Program Participation and Costs.” Accessed at <https://fns-prod.azureedge.net/sites/default/files/pd/SNAPsummary.pdf>.

⁴⁷ U.S. Department of Agriculture, 2018. “Supplemental Nutrition Assistance Program Participation and Costs.” Accessed at <https://fns-prod.azureedge.net/sites/default/files/pd/SNAPsummary.pdf>

⁴⁸ Tiehen, L., Jolliffe, D., and Gundersen, C., 2012. “Alleviating Poverty in the United States,” U.S. Department of Agriculture.

⁴⁹ The Food Stamp Act of 1964. *Pub L 88-525(1964)*. Accessed at https://fns-prod.azureedge.net/sites/default/files/PL_88-525.pdf.

better health and economic self-sufficiency among disadvantaged women. Seniors receiving Medicaid and enrolled in SNAP are 14% less likely to be hospitalized and 23% less likely to enter a nursing home compared with seniors receiving Medicaid alone.^{50,51}

These and other findings demonstrate SNAP is an essential safety net and successfully reduces food insecurity and its consequences.⁵² However, relatively little programmatic emphasis has been on nutrition or diet-related chronic diseases. Disparities remain or have worsened in the diets of low-income Americans.^{53,54,55} SNAP participants experience significantly higher all-cause, cardiovascular and diabetes mortality compared to other American adults.^{56,57,58}

Additional strengthening and leveraging of SNAP for better nutrition is crucial to providing critical cost-savings in health care. Savings for the federal government and the states could then be invested in other economic priorities (Box 3). For example, based on National Health and Nutrition Examination Survey (NHANES) data, 61% of Medicaid recipients and 13% of Medicare recipients are also on SNAP.

⁵⁰ Berkowitz, S.A., Seligman, H.K., Rigdon, J., Meigs, J.B., and Basu, S., 2017. "Supplemental Nutrition Assistance Program (SNAP) Participation and Health Care Expenditures Among Low-Income Adults," *JAMA Internal Medicine*, 177(11):1642–1649

⁵¹ Samuel, L.J., Szanton, S.L., Cahill, R., et al., 2017. "Does the Supplemental Nutrition Assistance Program Affect Hospital Utilization Among Older Adults? The Case of Maryland," *Popul Health Manag.*

⁵² U.S. Department of Agriculture, 2013. "Measuring the Effect of Supplemental Nutrition Assistance Program (SNAP) Participation on Food Security." Accessed at <https://fns-prod.azureedge.net/sites/default/files/Measuring2013.pdf>.

⁵³ Rehm, C.D., Penalvo, J.L., Afshin A., and Mozaffarian, D., 2016. "Dietary Intake Among US Adults, 1999–2012," *JAMA*, 315(23):2542–2553.

⁵⁴ Wang, D.D., Leung, C.W., Li, Y., et al., 2014 "Trends in dietary quality among adults in the United States, 1999 through 2010," *JAMA Internal Medicine*, 174(10):1587–1595.

⁵⁵ Leung, C.W., Ding, E.L., Catalano, P.J., Villamor, E., Rimm, E.B., and Willett, W.C., 2012. "Dietary intake and dietary quality of low-income adults in the Supplemental Nutrition Assistance Program," *Am J Clin Nutr.*, 96(5):977–988.

⁵⁶ Conrad, Z., Rehm, C.D., Wilde, P., and Mozaffarian, D., 2017. "Cardiometabolic Mortality by Supplemental Nutrition Assistance Program Participation and Eligibility in the United States," *Am J Public Health*, 107(3):466–474.

⁵⁷ Nguyen, B.T., Shuval, K., Bertmann, F., Yaroch, A.L., 2015. "The Supplemental Nutrition Assistance Program, Food Insecurity, Dietary Quality, and Obesity Among U.S. Adults," *Am J Public Health*, 105(7):1453–1459.

⁵⁸ Leung, C.W., Willett, W.C., and Ding, E.L., 2012. "Low-income Supplemental Nutrition Assistance Program participation is related to adiposity and metabolic risk factors," *Am J Clin Nutr.*, 95(1):17–24.

Box 3. Recommended Priority Actions in SNAP

- Make diet quality a core objective: SNAP's current two core objectives (food security and fiscal integrity) should be continued and complemented with an additional, congressionally mandated focus on diet quality and healthy nutrition.
- Authorize funds for the USDA to conduct a range of evidence-based pilots to improve SNAP participants' diets: Congress should provide the USDA with sufficient funds (e.g., \$100 million+ over five years) to pilot comprehensive, multipronged interventions addressing diet quality, food security and fiscal responsibility.
- SNAP Plus: Combined incentives for healthful foods and partial disincentives for unhealthy foods: A new incentive/disincentive program for Americans on SNAP would improve food selection, preserve participant choice, be budget-neutral or provide cost-savings, and meaningfully improve health and reduce costs. Such a combined incentive/disincentive program would produce large health gains and net cost-savings in the long-term. Research from Tufts University suggests such a program would prevent 940,000 cardiovascular events, gain 2.5 million quality-adjusted life years, and save \$63 billion in health care and food costs over a lifetime of current SNAP recipients.⁵⁹
- Authorize the USDA to collect and share store-level data on all products purchased with SNAP funds: Collecting and sharing store-level SNAP food-purchase data would provide the appropriate level of detail to answer key public health and programmatic questions. At the same time, it would avoid the privacy concerns of collecting purchase data on individual recipients.
- Strengthen SNAP retailer standards to improve the food environment for all shoppers: The USDA should implement new stocking rules to increase the availability of healthy foods at SNAP retailers. In addition, the USDA should study the feasibility of including evidence-based product-placement strategies and restrictions on the marketing of unhealthy products in SNAP retailer standards.
- Create a robust SNAP education infrastructure to support the implementation and evaluation of the program: Priorities include: a) enhancing technical assistance from the USDA regional offices; b) reducing planning and reporting burdens; c) restructuring state reports to focus on program impact; d) developing new tools and components; and e) sharing best practices.
- Increase the monthly food budget and divide into two disbursements: The current monthly benefit (approximately \$4.20 per person day) is often insufficient. The monthly timing can also hamper purchases of healthier perishable foods, such as fresh fruits and vegetables, which cannot last the

⁵⁹ Mozaffarian, D., Liu, J., Sy, S., et al., 2018. "Cost-Effectiveness of Financial Incentives and Disincentives for Improving Food Purchases and Health through the U.S. Supplemental Nutrition Assistance Program (SNAP): A Microsimulation Study," *PLoS Med.*

whole month. Thus, diminished food budgets at the end of each month are associated with a 27% higher rate of hospital admissions due to low blood sugar among low-income adults.⁶⁰

The 2015 National Commission on Hunger and the 2018 Bipartisan Policy Center SNAP Task Force have released concrete policy recommendations for strengthening SNAP to improve health, combat poor nutrition and reduce health care costs.^{61,62}

Schools

Youth consume between one-third and one-half of their meals at school, making this a crucial setting for interventions.⁶³ The diets of most American youth remain poor, with tremendous consequences for metabolic diseases, overweight and obesity, and other diet-related illness.^{64,65,66,67} Childhood is also a critical period of establishing lifelong eating habits influencing the future risk of chronic diseases.^{68,69,70} Based on current evidence, several school-based strategies should be prioritized to establish healthier eating in children (Box 4).

⁶⁰ Seligman, H.K., Bolger, A.F., Guzman, D., Lopez, A., and Bibbins-Domingo, K., 2014. "Exhaustion of food budgets at month's end and hospital admissions for hypoglycemia," *Health Affairs*, 33(1):116–123.

⁶¹ Bipartisan Policy Center, 2017. "New BPC SNAP Task Force to Address Ways to Strengthen Nutrition in SNAP." Accessed at <https://bipartisanpolicy.org/press-release/new-bpc-snap-task-force/>.

⁶² Bipartisan Policy Center, 2018. "Leading with Nutrition: Leveraging Federal Programs for Better Health." Accessed at <http://www.bipartisanpolicy.org/SNAP>.

⁶³ Mozaffarian, D, Afshin, A., Benowitz, N.L., et al., 2012. "Population approaches to improve diet, physical activity, and smoking habits: A scientific statement from the American Heart Association," *Circulation*, 126(12):1514–1563

⁶⁴ Mozaffarian, D., Benjamin, E.J., et al., 2016. "Executive Summary: Heart Disease and Stroke Statistics—2016 Update: A Report from the American Heart Association," *Circulation*, 133(4):447–454.

⁶⁵ Simmonds, M., Llewellyn, A., Owen, C.G., and Woolacott, N., 2016. "Predicting adult obesity from childhood obesity: a systematic review and meta-analysis," *Obesity reviews: An official journal of the International Association for the Study of Obesity*, 17(2):95–107.

⁶⁶ Simmonds, M., Burch, J., Llewellyn, A., et al., 2015. "The use of measures of obesity in childhood for predicting obesity and the development of obesity-related diseases in adulthood: a systematic review and meta-analysis," *Health Technology Assessment (Winchester, England)*, 19(43):1–336.

⁶⁷ Craigie, A.M., Lake, A.A., Kelly, A., Adamson, A.J., Mathers, J.C., 2011. "Tracking of obesity-related behaviors from childhood to adulthood: A systematic review," *Maturitas*, 70(3):266–284.

⁶⁸ Mikkila, V., Rasanen, L., Raitakari, O.T., Pietinen, P., and Viikari, J., 2005. "Consistent dietary patterns identified from childhood to adulthood: The cardiovascular risk in young Finns study," *The British Journal of Nutrition*, 93(6):923–931.

⁶⁹ Welker, E., Lott, M., and Story, M., 2016. "The School Food Environment and Obesity Prevention: Progress Over the Last Decade," *Curr Obes Rep.*, 5(2):145–155.

⁷⁰ Birch, L.L., 1998. "Development of food acceptance patterns in the first years of life," *The Proceedings of the Nutrition Society*, 57(4):617-624

Box 4. Recommended Priority Actions in Schools

- Nutrition standards for served meals and snacks: Standards for foods and beverages served in schools, as well as afterschool and early childcare programs.^{71,72,73}
- Nutrition standards for competitive foods: Standards for competitive foods and beverages (i.e., items sold outside of school meal programs), such as restrictions on sugar-sweetened beverages and junk foods.
- Direct provision of healthful foods/beverages: This includes provision of free, reduced-price or full-price healthful foods or beverages outside of usual school meals. This especially pertains to fresh fruit and vegetable programs.
- Comprehensive, multicomponent school-based interventions targeting both diet and physical activity: Successful programs include: a) curriculum on diet and/or physical activity taught by trained teachers; b) supportive school environment and policies; c) a parent/guardian or family component; d) a formal physical activity program (for interventions targeting physical activity); and e) serving of healthy food options in school cafeterias and vending machines.^{74,75}

A recent systematic review and meta-analysis of interventional studies of school environmental policies found specific benefits from direct provision of healthful foods. Direct provision largely included fruits and vegetables.⁷⁶ Specifically, consumption of fruits significantly increased to about one-quarter serving per day with direct provision, with a much smaller impact on vegetables.

Benefits were also found from nutrition standards for competitive food and beverage and school meal nutrition standards. Standards for competitive foods reduced sugar-sweetened beverages and unhealthy snacks; standards for school meals improved students' dietary intakes.

⁷¹ U.S. Department of Agriculture, Food and Nutrition Service, 2018. "School Meals: Healthy, Hunger-Free Kids Act." Accessed at www.fns.usda.gov/school-meals/healthy-hunger-free-kids-act.

⁷² U.S. Department of Agriculture, 2018. "Food and Nutrition Service. Healthier School Day. Tools for Schools: Focusing on Smart Snacks." Accessed at www.fns.usda.gov/healthierschoolday/tools-schools-focusing-smart-snacks.

⁷³ U.S. Department of Agriculture, 2018. "Food and Nutrition Service. Nutrition Standards for School Meals." Accessed at www.fns.usda.gov/school-meals/nutrition-standards-school-meals.

⁷⁴ Brown, T. and Summerbell, C., 2009. "Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: An update to the obesity guidance produced by the National Institute for Health and Clinical Excellence," *Obes Rev.*, 10(1):110-141.

⁷⁵ World Health Organization, 2009. "Interventions on diet and physical activity: What works." Accessed at www.who.int/dietphysicalactivity/whatworks/en/index.

⁷⁶ Micha, R., Karageorgou, D., Bakogianni, I., et al., 2018. "Effectiveness of school food environment policies on children's dietary behaviors: A systematic review and meta-analysis," *PLoS One*, 13(3):e0194555.

Consistent with these benefits, the federal Healthy, Hunger-Free Kids Act of 2010 updated the nutrition standards for all food served in schools, early childcare programs and afterschool programs. Key unhealthy foods, such as sugar-sweetened beverages and vending-machine food, were also eliminated. Furthermore, the act required updating school wellness policies and strengthening the standards for food service personnel. Recently, federal actions have rolled back school nutrition standards for categories such as sodium and whole grains. Given this, it is incumbent on cities and states to independently pursue the Healthy, Hunger-Free Kids Act initiatives.

Systematic reviews of interventional studies also support the effectiveness of comprehensive, multicomponent school-based interventions targeting both diet and physical activity. This includes specific components known to make such interventions successful (Box 6). Community-based participatory research shows the effectiveness of these interventions is augmented by intensive community involvement.⁷⁷ Evidence remains less robust for other approaches, such as school-based education alone or the promotion of water use.

Food and Nutrition Innovation

Ongoing advances in nutrition science are elucidating what people should eat to promote optimal health outcomes. Evidence-informed dietary priorities include increasing fruits, non-starchy vegetables, nuts and seeds, beans, fish, plant-based oils, yogurt and minimally processed whole grains. Reducing sugary drinks, processed meats and foods rich in refined grains, starch, added sugars, salt and trans fat have also become prevalent. However, many crucial questions remain.

For example, more investigation is needed on the cardiometabolic effects of flavonoids and other phenolics. Probiotics and diet-microbiome interactions should also be studied further. Additionally, greater knowledge is needed on the role of fermentation, coffee, tea, cocoa, eggs, specific vegetable and tropical oils, vitamin D, individual fatty acids and dairy fat.

Given the practical importance and implications of these questions, far too little money is invested in nutrition research. Across all federal agencies, total funding for nutrition research is only about \$1.5 billion per year.⁷⁸ In comparison, about \$5 billion per year is spent for U.S. advertising of candy, while nearly \$50 billion per year is spent by U.S. consumers on candy.

⁷⁷ Hoelscher, D.M., Springer, A.E., Ranjit, N., et al., 2010. "Reductions in child obesity among disadvantaged school children with community involvement: The Travis County CATCH Trial," *Obesity*, 18(suppl 1):S36–S44.

⁷⁸ Kuchler, F. and Toole, A., 2015. "Federal Support for Nutrition Research Trends Upward as USDA Share Declines," United States Department of Agriculture, Economic Research Service. Accessed at www.ers.usda.gov/amber-waves/2015/june/federal-support-for-nutrition-research-trends-upward-as-usda-share-declines.

A concerted national effort is needed to substantially increase federal funding for academic research and industry research and development (R&D) in nutrition (Box 5).

Much of the current economic growth in the food industry is for innovative new products with at least the aura of healthfulness. However, while some health and wellness products may be beneficial additions, others are more hype than fact. For example, labeling a product as “healthy,” “all-natural,” or “organic” does not necessarily make it part of a healthy diet. For instance, fat-free packaged foods are often rich in refined starch, added sugar, and/or salt.

Dietary supplements can provide health benefits in selected cases of clinical deficiency, such as pellagra, beriberi, rickets, and scurvy. However, the evidence for general health benefits of supplemented vitamins, mineral, and other compounds is quite limited, including for many popular supplements such as vitamin C, calcium, and vitamin D.⁷⁹ Other newer bioactives and herbal products, such as tumeric, EGCG, flavonols, and probiotics, hold promise but have not yet been rigorously evaluated for health benefits or, notably, potential side effects.

Given the importance of food and nutrition for health, increased productivity, and reduced healthcare costs, federal and state governments should take actions to encourage the production of healthy food products. One option would be to offer government incentives to stimulate greater food industry research and development of truly healthy foods. For federal budget neutrality, potential disincentives could be added (e.g. removal of tax deductions) for development and marketing of unhealthy foods.

Box 5: Recommended Priority Actions for Food and Nutrition Innovation

- **Fundamental research and discovery:** The science of food and nutrition is remarkably young. This is especially true for costly chronic diseases such as obesity, diabetes, heart disease, cancers and dementia. Research and innovation are essential to address these challenges. Accordingly, a substantial increase in dedicated research funding for food and nutrition at the NIH, the USDA and other federal agencies is required. Key areas of focus include: fundamental nutrition discovery; the microbiome; phenolics and other bioactives; economic policy; novel technologies; and nutrition data sciences.
- **Economic incentives for the industry:** The U.S. food industry recognizes the tremendous need and consumer demand for healthier food. Economic and tax incentives are needed for R&D and the marketing of healthier foods across all industries. This includes agriculture, retailers, manufacturers and restaurants. Incentives should be combined with disincentives for the marketing and

⁷⁹ Mozaffarian D., 2016. “Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: A comprehensive review,” *Circulation*, 133:187–225.

promotion of soda and junk foods (e.g., removal of marketing tax deductions). Currently, junk foods are effectively subsidized by billions of dollars of health care spending, while the true economic value of nutritious foods is not fully recognized. These measures would help reverse the inequities in today's food economy.

- National Institute of Nutrition: Congress should consider creating a new National Institute of Nutrition at the NIH to allow appropriate prioritization, synergies and focus on the effects of food on health across the lifespan.

Recent Federal Actions

There is growing government interest in leveraging food and nutrition to improve health, equity and health care costs.^{80,81,82,83,84,85,86} In 2018 alone, the U.S. Congress has pursued several new actions toward incorporating and addressing nutrition, diet-related diseases and associated health care costs into federal policy. It created a new bipartisan *Food is Medicine Working Group* in the U.S. House of Representatives, aiming to craft legislation to leverage food and nutrition for better health and lower health care costs.

There has also been interest in the health benefits and cost savings of *Medically Tailored Meals* for the sickest patients in the health care system. Under this program, insurance would cover three customized meals to be delivered at home daily to the sickest patients, who disproportionately require and utilize costly services.⁸⁷ A U.S. Senate Farm Bill has also proposed a new \$20 million grant program for *Fruit and Vegetable Prescriptions*. This would

⁸⁰ Evich, H.B., 2018. "Bipartisan nutrition working group kicks-off in House." Accessed at www.politicopro.com/agriculture/article/2018/01/bipartisan-nutrition-working-group-kicks-off-in-house-291513.

⁸¹ Barnhill, A., 2011. "Impact and ethics of excluding sweetened beverages from the SNAP program," *American Journal of Public Health*, 101(11):2037–2043.

⁸² Pomeranz, J.L., 2017. "Supplemental Nutrition Assistance Program Reform: Retail Requirements, Eligible Foods," *American Journal of Preventive Medicine*, 52(1):130–133.

⁸³ Lumenthal, S.J., Hoffnagle, E.E., Leung, C.W., et al., 2014. "Strategies to improve the dietary quality of Supplemental Nutrition Assistance Program (SNAP) beneficiaries: An assessment of stakeholder opinions," *Public Health Nutrition*, 17(12):2824–2833

⁸⁴ United States Government Accountability Office, 2008. "Food Stamp Program: Options for delivering financial incentives to participants for purchasing targeted foods." Accessed at www.gao.gov/new.items/d08415.pdf.

⁸⁵ Basu, S., Seligman, H.K., Gardner, C., and Bhattacharya, J., 2014. "Ending SNAP subsidies for sugar-sweetened beverages could reduce obesity and Type 2 diabetes," *Health Affairs (Project Hope)*, 33(6):1032–1039.

⁸⁶ National Commission on Hunger, 2015. "Freedom from Hunger: An Achievable Goal for the United States of America," *Recommendations of the National Commission on Hunger to Congress and the Secretary of the Department of Agriculture*.

⁸⁷ Harvard Center for Health Law and Policy Innovation, 2018. "Improving Health Outcomes While Curbing Costs with Medically Tailored Meals." Accessed at www.chlpi.org/improving-health-outcomes-while-curbing-costs-with-medically-tailored-meals/.

allow health care providers to implement and evaluate interventions using financial and other incentives for patients to purchase fruits and vegetables.⁸⁸

Congress has also directed the NIH to work across agencies to report on and encourage cross-agency collaboration on *research relevant to Food is Medicine*. Research would include medically tailored meals, medical nutrition therapy, and fruit and vegetable prescription programs. The role of proper nutrition in aging and reproductive health would also be examined.⁸⁹ Additionally, the U.S. Government Accountability Office (GAO) is comprehensively auditing federal policies on food and nutrition. Audit findings will be used to provide congressional recommendations on policy improvements to reduce diet-related chronic diseases and associated health care costs.⁹⁰

These actions demonstrate the rapidly growing recognition at the federal level of the importance of nutrition for health and health care expenditures. These initiatives also build on growing public awareness of the central role of food in well-being. Major industry shifts toward accelerating demand for healthier and more transparent products have also occurred. Advances in nutrition and policy science have helped provide reasonable initial targets for action.⁹¹ Policy change is often not linear. The significant impacts of nutrition on disease, health care, the economy, military readiness, disparities and sustainability have created an opportunity for state and federal leadership to create meaningful and lasting solutions.

The Path Forward

A healthier food system is crucial for better well-being and lower health care costs. Although the focus of this paper is on health care costs, it should be noted greater food health benefits all of society. It extends greater sustainability, reduces disparities, improves economic competitiveness and betters military readiness. Remarkable and complementary advances in both nutrition science and technology have brought forward relevant solutions and actionable and impactful priority areas. Policy strategies can now be implemented to help realize the power of *Food as Medicine*. Private businesses and insurance stakeholders have key roles to play and substantial benefits to gain from playing a leading role in these efforts.

⁸⁸ 115th U.S. Congress, 2018. Senate Farm Bill: Sec 4304, Harvesting Health Pilot Projects. Accessed at www.agriculture.senate.gov/imo/media/doc/Agriculture%20Improvement%20Act%20of%202018.pdf.

⁸⁹ 115th U.S. Congress, 2018. Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Bill, 2019: Multi-Institute Research Issues, Food is Medicine. Accessed at <https://docs.house.gov/meetings/AP/AP00/20180626/108473/HRPT-115-HR.pdf>.

⁹⁰ United States Representative Tim Ryan, 2018. "Press Release: Reps. Tim Ryan and Rosa DeLauro Request GAO Report on Food Policy and Public Health." Accessed at <https://timryan.house.gov/media/press-releases/rebs-tim-ryan-and-rosa-de-lauro-request-gao-report-food-policy-and-public-health>.

⁹¹ Mozaffarian, D., Angell, S.Y., Lang, T., and Rivera, J.A., 2018. "Role of government policy in nutrition-barriers to and opportunities for healthier eating," *The BMJ*, 361:k2426.



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