Academy of Nutrition and Dietetics
Academy of Nutrition and Dietetics Foundation

Nutrition Science Forum 2026

Food as Medicine: Advancing Research and Integrating Systems for Health

April 14-15, 2026 | Kimpton Hotel Monaco Baltimore

Welcome to the 2026 Nutrition Science Forum!

The **2026 Nutrition Science Forum**, *Food as Medicine: Advancing Research and Integrating Systems for Health*, focuses on the impact of Food as Medicine programs. This event will highlight the important connections between the health care system, a robust food system, and community-based food programs. Over one and a half days, experts from various sectors will present the latest research and data demonstrating the benefits of Food as Medicine (FAM) programs for managing and preventing chronic conditions.

Forum goals include:

- Showcasing successful Food as Medicine approaches and strategies, including medically-tailored meals and culinary medicine.
- Understanding the crucial links between food systems and Food as Medicine.
- Identifying current evidence gaps and future research opportunities.
- Assessing the role of policy in advancing Food as Medicine.
- Exploring the integration of Food as Medicine in health care settings with RDNs as key members of the health care team.

Thank you for joining us for the forum. We are excited to explore this important topic with you.

Sincerely,

Deanne Brandstetter,
MBA, RDN, CDN, FAND
President, Academy of Nutrition and Dietetics

Catherine Christie,
PhD, RDN, LDN, FAND
Chair, Academy of Nutrition and Dietetics Foundation

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Tuesday, April 14, 2026

8:00 a.m. – 6:30 p.m. (Eastern time)

7:15 a.m.

Breakfast

Location: Vienna North

8:00 a.m.

Welcome

Wylecia Wiggs Harris, PhD, CAE
Location: Paris Ballroom

8:15 a.m.

Moderated Panel: Introducing the Links between Agriculture and Health Care

- *Moderator:* Drew Bremer, MD, PhD, MAS
- Howard Sesso, ScD, MPH, FAHA
- John de la Parra, PhD
- Alissa Wassung

9:25 a.m.

Digging into Regenerative Agriculture: From Principles to Application

Pamela Bachman, PhD
Sponsored by Bayer CropScience LLC

9:45 a.m.

Sustainable Beef Systems to Strengthen Food as Medicine

Jason Sawyer, PhD
Sponsored by National Cattlemen's Beef Association

10:10 a.m.

Q&A

- Pamela Bachman, PhD
- Jason Sawyer, PhD

10:20 a.m.

Break

10:30 a.m.

Food Systems and Food as Medicine

- Robin White, PhD
- Stephan van Vliet, PhD
- Kristopher Marx
- Dan Kittredge
- Moderated Q&A

11:40 a.m.

Driving Nutrition Data for Improved Access

Christina Valentine, MD, RDN
Sponsored by Kate Farms

12:10 p.m.

Lunch

Location: Vienna North
Sponsored by POM Wonderful

1:10 p.m.

Breakout Sessions *(select one)*

Culinary Medicine Demo
Hope Barkoukis, PhD, RDN, LD, FAND

Farming that is Healthy for the Planet: Vertical to Regenerative
Kristopher Marx

Bioactives and Super Nutrients
Taylor Wallace, PhD, CFS, FACN

1:55 p.m.

Break

2:05 p.m.

Malnutrition Policy and Food as Medicine: Current State and Opportunities for Coordination

Shelby Harrington, MS, RN
Sponsored by Abbott

2:25 p.m.

Linking Health Care and Food Service to Community-Based Organizations

- Tara Eichert, RDN, LDN, CNSC
- Lisa Roberson, RDN, LD
- Wendy Phillips, MS, RD, LD, FAND, FASPEN

Sponsored by Morrison Healthcare

2:50 p.m.

Q&A

- Tara Eichert, RDN, LDN, CNSC
- Christina Valentine, MD, RDN
- Shelby Harrington, MS, RN
- Lisa Roberson, RDN, LD
- Wendy Phillips, MS, RD, FAND, FASPEN

3:05 p.m.

Food as Medicine Programs: Evidence Landscape

- Nicole Cawrse, MS, RD, PMP
- Hope Barkoukis, PhD, RDN, LD, FAND
- Moderated Q&A

4:00 p.m.

Small Group Breakouts – Facilitated Discussion

4:40 p.m.

Closing Remarks

Alison Steiber, PhD, RDN

5:00 p.m.

Reception

Location: Athens Ballroom

Wednesday, April 15, 2026

8:00 a.m. – 12:45 p.m. (Eastern time)

7:15 a.m.

Breakfast
Location: Vienna North
Sponsored by McCormick & Company

8:00 a.m.

Welcome
Cathy Christie, PhD, RDN, LDN, FAND
Location: Paris Ballroom

8:10 a.m.

Academy's Strategic Roadmap for Food as Medicine
Deanna Brandstetter, MBA, RDN, CDN, FAND

8:40 a.m.

Breakout Sessions *(select one)*

Ending the Wait: What are Community-Based Meal Provision Organizations Doing to Reduce Waitlists?
- Deirdre McGinley-Gieser
- Margot Corruzzi
- Sam Zisow-McClean, MPH, RDN, LDN

Scaling Access: Reimagining Nutrition Incentives in Food as Medicine Programs through Online Retail
- Jillian Griffith, MSPH, RDN
- Gabby Headrick, PhD

Linking the Medical Centers to Medically-Tailored Meal Providers
Nicole Cawrse, MS, RD, PMP

9:35 a.m.

Moderated Panel: Highlighting the Crucial Role of the RDN in Food as Medicine Programs
- *Moderator:* Tammy Randall, MS, RDN, LD, CDCES, FAND
- Uche Akobundu, PhD, RD
- Aidan Dewar
- Patricia Montague, FASAE, CAE

10:10 a.m.

Personalized Food as Medicine Programs Powered by Real Patient Data
Aidan Dewar
Sponsored by Nourish

10:40 a.m.

Break

10:50 a.m.

Food as Medicine and Telehealth
Jason Langheier, MD, MPH
Sponsored by Foodsmart

11:10 a.m.

Q&A
- Aidan Dewar
- Jason Langheier, MD, MPH

11:20 a.m.

Department of Health and Human Services
Sam Watters

11:40 a.m.

Policy and Payment
- Dan Farmer
- Kelly Horton, MS, RDN
- Moderated Q&A

12:25 p.m.

Closing Remarks
Tammy Randall, MS, RDN, LD, CDCES, FAND

12:30 p.m.

Adjourn
Boxed lunches to go

Social Media Guidelines

The **2026 Nutrition Science Forum**, *Food as Medicine: Advancing Research and Integrating Systems for Health,* is a closed-door summit. For those who wish to engage in social media activities related to the Forum, adherence to the following guidelines is required:

- Participants must obtain explicit permission in advance before tagging the profiles of presenters, participants or guests. Please do not tag Academy organization profiles (for example, @eatright or @eatrightPRO).
- Sharing of presentation slides, discussion details or any content containing quotes, names or images/likeness of participants or presenters requires explicit permission in advance.
- All social media activity must align with the goodwill and fundamental principles of professional conduct, uphold privacy and dignity, and refrain from vulgar or obscene language or imagery.
- The Academy reserves the right to delete from its social streams any posts that violate these guidelines.

Uche Akobundu, PhD

Nutrition, Senior Director, Meals on Wheels America

Uche Akobundu, PhD serves as the Nutrition, Senior Director at Meals on Wheels America where she leads the design and execution of the Association's nutrition strategy. This work includes leading a portfolio of initiatives designed to build the capacity of senior nutrition programs to provide evidence-based, competitive, and client-responsive meal and nutrition services. In addition, she works with diverse national and local strategic partners to field, evaluate, and scale targeted, placed-based initiatives that bolster and advance the impact of local nutrition and aging professionals. She holds a MS in Nutrition with a concentration in public health from the University of Massachusetts, Amherst, and a PhD in Nutrition from the University of Maryland, College Park, supported by a public health nutrition-focused dietetic training from Hunter College, New York, NY.

Pamela Bachman, PhD

Director Sustainability Data Science, Bayer Crop Science

Pamela Bachman, PhD is a multi-disciplinary scientific leader with extensive expertise in regulatory systems, regenerative agriculture, and data/digital platforms. In her current role as Director, Sustainability Data Science at Bayer Crop Science, she leads key initiatives to optimize data-driven strategies in regenerative agriculture utilizing advanced models and turning complex data into actionable insights. Additionally, her work focusses on the science and technology behind sustainability measurement, reporting, and verification (MRV) systems to track improvements in soil health, greenhouse gas reduction, and biodiversity.

Dr. Bachman has built strong partnerships across industry, academia, regulatory bodies, and NGOs, helping shape policy and public opinion on issues like biodiversity, pollinator conservation, and sustainable farming. Notable activities include co-authoring the "Nature & Economy" chapter for *The Nature Record* (formerly known as the U.S. Global Change Research Program's First National Nature Assessment) and serving as a Technical Expert on the National Space Council's Users Advisory Group, focusing on agriculture uses of earth observation data.

Dr. Bachman has a PhD in Ecology & Ecotoxicology and is a Bayer Senior Science Fellow.

Hope Barkoukis, PhD, RDN, LD, FAND

Chair, Dept. Nutrition School of Medicine, Case Western Reserve University

Hope Barkoukis, PhD, RDN, LD, FAND is the Chair of the Department of Nutrition at Case Western Reserve University School of Medicine. A former Board member of the Academy of Nutrition and Dietetics, she leads the Mandel Wellness & Preventive Care Pathway for medical students. Dr. Barkoukis's work spans nutrition program development for Fortune 500 companies, culinary education, and research on aging, glucose metabolism, and the Mediterranean Diet. She has received numerous awards for teaching and innovation, including the School of Medicine's *Excellence in Health Science Innovation Award*.

Deanne Brandstetter, MBA, RDN, CDN, FAND

President, Academy of Nutrition and Dietetics

Deanne Brandstetter, MBA, RDN, CDN, FAND has over thirty years of experience in the food and nutrition business. She recently retired as Vice President of Nutrition and Wellness for Compass Group, North America, where she led a team that coordinated wellness programs for foodservice clients and developed innovative and award winning cross sector nutrition and wellness initiatives. She also directed the nutrition program for the 2002 Winter Olympic Games in Salt Lake City, Utah as part of the Compass Olympics Lead Management Team.

She earned an American Culinary Federation Silver medal for Healthy Cuisine and has presented at meetings in the U.S. and globally. Deanne is a Culinary Institute of America Fellow, was a member of the Academy of Nutrition and Dietetics Sustainable Food Systems Roundtable and Task Force on Menu Labeling, Past-Chair of the Academy of Nutrition and Dietetics Nominating Committee, member of the Academy Diversity Committee, Past-Chair of Dietitians in Business and Communications Dietetic Practice Group, 2022-23 Treasurer of the Academy of Nutrition and Dietetics and is the 2025-26 Academy President. She also serves on the Advisory Board to the Dean of the School of Education, Health, and Society at Miami University. She was awarded a WELL Community Award in 2021 and the Dietitians in Business and Communications Dietetic Practice Group Outstanding Leader in 2022.

Andrew A. Bremer, MD, PhD, MAS

Director of the NIH Office of Nutrition Research (ONR)

Drew Bremer, MD, PhD, MAS is a board-certified internist, pediatrician, and pediatric endocrinologist and has a PhD in pharmacology. Since April 2025, he has also been the Acting Director of the NIH Office of Dietary Supplements (ODS) within DPCPSI.

Prior to his appointment as the ONR Director, Dr. Bremer was the Chief of the Pediatric Growth and Nutrition Branch at the Eunice Kennedy Shriver National Institute of Child Health and Human Development. His areas of expertise include endocrine disorders, obesity, developmental origins of health and disease, and the role of nutrition in health throughout the life cycle. He earned his BS at Yale University, completed his MD/PhD training at Boston University, his internal medicine and pediatric residencies at the Baylor College of Medicine, his pediatric endocrinology fellowship at the University of California, San Francisco, and subsequently received an MAS degree in clinical research from the University of California, Davis. He joined the NIH in 2013 after holding academic positions at the University of California, Davis (2007-2010) and Vanderbilt University (2010-2013).

Nicole Cawrse, MS, RDN, PMP

Nutrition Researcher, Academy of Nutrition and Dietetics

Nicole Cawrse, MS, RDN, PMP is a registered dietitian nutritionist and certified Project Management Professional with more than a decade of experience working at the intersection of health care, public health, and research. She currently serves as a Nutrition Researcher with the Academy of Nutrition and Dietetics, where she supports multi-site clinical research by training and guiding study teams, maintaining regulatory and study documentation, and monitoring data quality and protocol compliance across participating sites. Nicole is passionate about translating research into practical systems that improve patient care and strengthen community health programs.

Originally trained in dietetics at Bowling Green State University, Nicole earned her Master's in Human Nutrition from Case Western Reserve University.

Catherine Christie, PhD, RDN, LDN, FAND

Chair, Academy of Nutrition and Dietetics Foundation

Cathy Christie, PhD, RDN, LDN, FAND is Associate Dean and Professor Emerita in the Brooks College of Health at the University of North Florida. She has published dozens of research papers and book chapters on the prevention and treatment of excess weight and obesity; nutrition in chronic disease prevention; and interprofessional collaboration in education and health care.

Dr. Christie is the past editor of the Florida Academy of Nutrition and Dietetics' Manual of Medical Nutrition Therapy. In her lengthy service to the Academy, Christie chaired the Member Sponsor Review Committee, Professional Development Committee, and Nominating Committee; served on the Licensure, Scope of Practice and Competition Work Group and the Publications Committee; served several terms in the House of Delegates; chaired the Nutrition Counseling Task Force and the Ethics Committee; and is a past president of the Florida Academy of Nutrition and Dietetics. Christie received a 2022 Academy Medallion Award, a 2010 Excellence in Practice in Dietetic Education Award, and the 2007 Outstanding Dietetic Educator Award.

Dr. Christie is a graduate of Florida State University, where she also earned a master's degree and doctorate in nutrition and dietetics.

Margo Coruzzi

Vice President, Program Strategy and Impact, Meals on Wheels of Central Maryland

Margo Coruzzi is the Vice President of Strategy and Impact for Meals on Wheels of Central Maryland and has been with Meals on Wheels since 2015. She has over 17 years of experience working in the non-profit field in Maryland. Her work at Meals on Wheels advocates for clients through strategic programs and data driven analysis. She has used assessments, surveys, and data analysis to help develop and implement programs with outcomes in isolation reduction, improving home safety, and enhancing health equity.

Dr. John de la Parra, PhD

Managing Director, The Rockefeller Foundation

Dr. John de la Parra, PhD is an ethnobotanist and plant chemist who serves as Managing Director of the Food Initiative at The Rockefeller Foundation. In this role, he leads global efforts to build a more nourishing, regenerative, and just food system.

His portfolio includes work on regenerative agriculture, Indigenous food systems, and school feeding strategies around the world, as well as the ethical integration of AI into food systems. He also spearheaded the creation of The Periodic Table of Food Initiative, the world's most comprehensive effort to map the biochemical diversity of food.

Dr. de la Parra has held research and teaching appointments at Harvard University, the MIT Media Lab, Tufts University, and Northeastern University. He is the former President of the Society for Ethnobotany.

Aidan Dewar

CEO and Co-Founder, Nourish

Aidan Dewar is the co-founder and CEO of Nourish, the leading food as medicine platform addressing the root cause of the chronic disease crisis through AI-powered, insurance-covered virtual nutrition care. Nourish is tackling one of the most important challenges in the world — our broken health care system — by building a consumer-centric digital health system focused on nutrition and lifestyle change that improves outcomes, lowers costs, and helps people live healthier, longer lives. Nourish's platform integrates lab testing to deliver more personalized, data-driven care, and its AI-powered mobile app enables patients to easily track progress and stay engaged with their health goals. With thousands of registered dietitians in its network, Nourish serves millions of patients across all 50 states.

Tara Eichert, RDN, LDN, CNSC

Director, Telehealth and Remote Nutrition Services, Morrison Healthcare

Tara Eichert, RDN, LDN, CNSC is the Director of Telehealth and Remote Nutrition Services for Morrison Healthcare, where she leads national initiatives to expand virtual nutrition care. With over a decade of experience spanning acute care, outpatient, home infusion, and leadership, she is known for developing innovative nutrition programs, mentoring emerging dietitians, and advancing quality improvement in patient care.

Daniel Farmer

Principal, BGR Group

Dan Farmer, Principal and Co-Lead of the Access and Reimbursement Working Group, joined BGR in January 2020. He helps clients navigate the world of federal reimbursement policy, with a focus on the work of the Centers for Medicare & Medicaid Services (CMS) and the Department of Health and Human Services (HHS).

Dan comes to the firm from Cleveland Clinic, one of the nation's premier health care systems, where he led federal advocacy efforts in Congress and in the Administration.

Prior to his time at Cleveland Clinic, Dan worked in several roles at CMS, focusing on Medicare payment policy. He was one of the early hires of the Center for Medicare and Medicaid Innovation, where he was closely involved in the development and launch of some of CMS's first innovative payment models, including the Pioneer ACO Model.

Dan received his undergraduate degree from Carleton College in Minnesota.

Jillian Griffith, MSPH, RDN

Senior Health Partnerships Manager, Amazon Access

Jillian Griffith, MSPH, RDN is a Registered Dietitian and Senior Health Partnerships Manager at Amazon Access, where she leads strategic partnerships that expand access to nutritious food and essential benefits. Her work focuses on leveraging retail, health care, and technology to improve health outcomes while increasing convenience and affordability for everyday consumers. Jillian holds a BSPH in Nutrition from the University of North Carolina at Chapel Hill and a Master of Science in Public Health from the Johns Hopkins Bloomberg School of Public Health. With a background spanning public health, retail nutrition, and cross-sector partnerships, she brings a systems-level perspective to advancing food access. Driven by a passion for equity and accessibility, Jillian is committed to making healthy choices easier and more attainable for all.

Shelby Harrington, MS, RN

Managing Director, Evidence & Strategy, Avalere Health

Shelby Harrington, MS, RN serves as Managing Director for the Evidence & Strategy practice at Avalere Health, a health care-only global consulting firm. Shelby supports clients in navigating the transition to value-based care with a focus on quality of care, clinical and financial outcomes, and patient-centeredness, working to develop value-based care strategies and then shape the landscape through policy and regulatory levers such as quality measures, value-based payment models, and large-scale implementation of improvement initiatives. She also drives a focus on patient-centered drug development and associated value messaging through qualitative and mixed-methods research to characterize patient-centric outcomes (e.g., improved mental health, relationships, employment, ability to parent) and patient preferences and priorities for treatment.

Shelby holds a bachelor's degree in public policy analysis from the University of North Carolina at Chapel Hill and bachelor's and master's degrees in nursing from Virginia Commonwealth University.

Gabby Headrick, PhD, MSPH, RDN

Assistant Professor, Milken Institute School of Public Health

Gabby Headrick, PhD, MSPH, RDN is an Assistant Professor in the Department of Exercise and Nutrition Sciences and Director of the Undergraduate Program in Nutrition at the Milken Institute School of Public Health at George Washington University, where she also serves as Associate Director of Food and Nutrition Policy at the Institute for Food Safety & Nutrition Security. As a food systems dietitian, her research, teaching, and practice focus on the social, environmental, and political determinants of food and nutrition security in the United States, with particular attention to urban food systems and advancing equitable, just food access. She collaborates across nutrition sciences, social sciences, urban planning, and health policy and prioritizes community-engaged research that partners with practitioners, policymakers, and grassroots leaders to translate evidence into action. Prior to joining George Washington University in Fall 2023, she earned her PhD and MSPH from the Johns Hopkins Bloomberg School of Public Health and completed a certificate in food systems, environment, and public health at the Center for a Livable Future. She is a registered dietitian nutritionist with experience in clinical, community, and governmental settings.

Kelly Horton, MS, RDN

Senior Vice President, Public Policy and Government Relations, Academy of Nutrition and Dietetics

Kelly Horton, MS, RDN oversees the Academy's public policy agenda and advocacy efforts that promote health and reduce the burden of chronic disease through evidence-based nutrition services and interventions. Her role supports the pursuit of legislative and regulatory policies that expand access to nutrition care. Her team's portfolio of programs includes those impacting consumer protection and licensure and health care policy and payment.

Kelly is a high-performing executive level leader and nationally recognized food, nutrition, hunger, food safety, and agriculture policy and program expert. Her experience includes launching a novel nutrition intervention which grew into the basis of what is now known as the Food as/is Medicine movement, being a founding member of one of the nation's first regional food policy councils and creating the Sustainable Food Policy Alliance — a food industry collaboration advocating for policies that improve people's lives and protect the planet.

Kelly has served in leadership roles in private and publicly held for-profit companies and nonprofit organizations, as a fellow within the USDA's Food and Nutrition Service, and as a Senior Nutrition and Agriculture Advisor to Members of Congress. Kelly earned her Master of Science in Food Policy and Applied Nutrition from Tufts University's Friedman School of Nutrition Science and Policy and her certification in dietetics from Simmons College. She also holds a Bachelor of Science in Business Management.

Dan Kittredge

Executive Director, Bionutrient Food Association

Dan Kittredge has been an organic farmer for more than 30 years and is the founder and Executive Director of the Bionutrient Food Association (BFA), a nonprofit whose mission is to "increase quality in the food supply."

Dan has solidified himself as an expert in the world of "nutrient density" and biological or regenerative agriculture. Through this mission, the Bionutrient Institute was launched, with partner organizations, Our-Sci LLC, FarmOS, and Next 7, to demonstrate and share the connections between nutrient density and soil, plant, and human health.

Jason Langheier, MD, MPH

Founder and Chief Science Officer, Foodsmart

Jason Langheier, MD, MPH is the CEO and Founder of Foodsmart – the leading foodcare platform designed to make eating well simple and affordable. Though Dr. Langheier has experience with medicine, pediatrics, nutritional epidemiology, neuroscience, and founding digital health companies, his blue collar upbringing in rural Buffalo where obesity-related chronic disease is high — and being a beneficiary of food stamps and free school lunches — guides his focus on healthy equity and sustainable prevention.

Foodsmart is on a mission to end food and nutrition insecurity and diet-related chronic disease. With the largest network of outpatient registered dietitians, Foodsmart telenutrition enables members to connect via phone or video to learn about tailored, personalized nutrition programs that consider individual health, budget, cultural preferences, and lifestyle needs.

Following neuroscience training at Williams College and Cambridge University, Dr. Langheier was a consultant with Mercer, helped found the pediatric obesity clinic at Boston Medical Center, and later received his MD from Duke, MPH from Harvard, and studied clinical research and environmental drivers of child obesity at UCSF. He is currently the board chair of Synapticure, a leader in combating neurodegenerative disease, and a Board Director for the Partnership for a Healthier America Board of Directors.

Kristopher Marx

Vice President of Product Strategy, Sensei Ag

Kristopher Marx is a mission-driven operator, executive, and board leader with more than 15 years of experience building and scaling high-impact ventures across food, agriculture, CPG, ag-tech, and nonprofit sectors. He specializes in translating long-term vision into operating models that deliver measurable social, environmental, and economic outcomes.

As Vice President of Product Strategy at Sensei Ag, Kristopher helps develop innovation pipelines, crop strategy, and external partnerships across plant science and controlled-environment agriculture. He works closely with executive leadership to integrate market intelligence, competitive analysis, and financial insight to support company-wide strategy and growth.

In parallel, Kristopher is Board Chair of The Common Market, a national nonprofit food distributor advancing equitable local food systems across four U.S. regions. In this role, he oversees a $26 million annual budget, advises on revenue diversification and capital strategy, and has contributed to more than $250 million in lifetime local food purchasing. He has also played a key role in acquisition-driven regional expansion.

Deirdre McGinley-Gieser

Chief Strategy and Impact Officer, Meals on Wheels America

Deirdre McGinley-Gieser is the Chief Strategy and Impact Officer for Meals on Wheels America. Deirdre is responsible for the organization's strategic and operational planning and for the programmatic work that underpins our core service areas. She has many years of experience in public health and program management, including scientific research, education, and outreach. Prior to joining Meals on Wheels, Deirdre served in multiple roles with the American Institute for Cancer Research (AICR). Most recently, she served as Executive Vice President.

Deirdre had the privilege of working on all three of the World Cancer Research Fund International (WCRF) and American Institute for Cancer Research (AICR) Expert Reports, published in 1997, 2007 and 2018, respectively, that created the scientific evidence base for AICR's program strategy. Deirdre received a bachelor's degree in French and English from the University of Kent, Canterbury, U.K.

Patricia Montague, FASAE, CAE

Chief Executive Officer, School Nutrition Association

Patricia (Patti) Montague, FASAE, CAE currently serves as Chief Executive Officer of the School Nutrition Association (SNA) and School Nutrition Foundation (SNF). SNA is a 501(c) (4) professional association with more than 50,000 members who are responsible for providing healthy and nutritious meals to students in primary and secondary schools across the country every school day.

Patti has more than 35 years of association management, marketing, and communications experience working at associations and advertising agencies. During her 31 years with SNA, she has had a number of different positions, including serving as Chief Operations Officer for eight years, and in 2012 she was named SNA's CEO. Patti is a member of the American Society of Association Executives where she has served on several national committees and earned her Certified Association Executive (CAE) certificate in 2005 and named an ASAE Fellow in 2020.

She has a Bachelor of Science in Political Science from the State University of New York, Oneonta and has completed graduate level course work in Business Administration.

Wendy Phillips, MS, RD, LD, FAND, FASPEN

Regional Vice President, Morrison Healthcare

Wendy Phillips, MS, RD, LD, FAND, FASPEN is a regional vice president for Morrison Healthcare, based out of Cleveland, Ohio. She leads a multi-state food service management team, as well as program development and implementation of population health efforts to address chronic disease and nutrition security in Northeast Ohio. She has been a RDN for over 20 years, starting her career as a public health dietitian in pediatrics, then for 10 years as a nutrition support specialist in the NICU and adult ICU. Wendy has held leadership positions in national committees for the Academy of Nutrition and Dietetics and the American Society for Parenteral and Enteral Nutrition and multiple dietetic practice groups. She has held leadership positions in the local and state dietetic associations in Virginia, Utah, and Ohio.

Wendy has published more than 85 peer reviewed journal articles and book chapters in the areas of malnutrition, food security, nutrition support, outcomes research, productivity, order writing privileges for RDNs, mentoring and leadership, nutrition management of ADHD, and nutrition-related public policy.

Wendy has been honored as Morrison's Regional Vice President of the Year twice and has earned multiple awards for her work in nutrition management and public policy, including the Academy of Nutrition and Dietetics' Grassroots Advocacy Award, the Academy's Excellence in Practice – Management Practice awards, and most recently the Academy's Medallion Award during FNCE® 2022.

Tammy Randall, MS, RDN, LD, CDCES, FAND

President-Elect, Academy of Nutrition and Dietetics

Tammy Randall, MS, RDN, LD, CDCES, FAND is an Instructor in the Department of Nutrition and Director of the MS in Public Health Nutrition Dietetic Internship program at Case Western Reserve University where she teaches classes on public health nutrition and diabetes prevention and management. Tammy has been recognized for her teaching and mentoring, recently being named NDEP's North Central Outstanding Dietetic Educator in a Dietetic Internship and the recipient of Case Western Reserve University's J. Bruce Jackson Award for Excellence in Undergraduate Mentoring.

Tammy has served the profession in a number of volunteer leadership roles, including President of both the Greater Cleveland Academy of Nutrition and Dietetics and Ohio Academy of Nutrition and Dietetics; speaker of the Academy's House of Delegates; Chair of the Member Services Advisory Committee; and member of CDR's Exam Panel. Tammy will assume her role of 2026-2027 President of the Academy of Nutrition and Dietetics on June 1.

Lisa Roberson, RDN, LD

National Director, Population Health & Sustainability, Morrison Healthcare

Lisa Roberson, RDN, LD is the National Director of Population Health and Sustainability Strategy at Morrison Healthcare, where she leads innovative efforts to improve health outcomes through food and nutrition at scale. A registered dietitian nutritionist with more than 25 years of experience in health care nutrition leadership, Lisa brings deep clinical expertise and a system-level population health lens to her work with hospitals and communities across the country.

In her role, Lisa partners with health care systems to design and support community-based population health initiatives that extend care beyond hospital walls. She has played a key role in advancing food pharmacies, medically tailored meal programs, and teaching kitchens, collaborating closely with community-based organizations to address food insecurity, chronic disease management, and health equity. Her work focuses on translating evidence-based nutrition science into scalable, sustainable programs that meet the needs of diverse populations.

A former chair and volunteer leader of the Academy of Nutrition and Dietetics Council on Future Practice, Lisa is passionate about shaping the future of the dietetics profession and advancing strategies that improve community health, health equity, and long term outcomes through the future of nutrition.

Jason Sawyer, PhD

Chief Science Officer, East Foundation

Jason Sawyer, PhD is the Chief Science Officer for East Foundation, where he leads the Science program of the Foundation, integrating research programs within the Foundation's ongoing ranching operations to enhance and enable effective decision-making by stewards of working lands.

Jason has over 20 years of experience in applied research and management, where he has led and coordinated applied research in livestock production systems in both intensive and extensive settings. His primary interests are the development of strategies to enhance the sustainability of beef production systems, the application of nutritional strategies in these systems, and the development of valid indicators of sustainable production.

Jason has a BS in Rangeland Ecology and Ranch Management from Texas A&M University and MS and PhD degrees in Range Nutrition and Beef Cattle Management from New Mexico State University. He has authored or co-authored over 120 peer-reviewed and invited publications, over 250 abstracts, proceedings, and technical reports, and given over 150 presentations at meetings, workshops, and conferences.

Howard D. Sesso, ScD, MPH, FAHA

Associate Professor of Medicine, Brigham and Women's Hospital

Howard D. Sesso, ScD, MPH, FAHA is an Associate Epidemiologist at the Division of Preventive Medicine at Brigham and Women's Hospital; Associate Professor of Medicine at Harvard Medical School; Associate Professor of Epidemiology at the Harvard T.H. Chan School of Public Health; and Associate Director of the Division of Preventive Medicine and Director of Nutrition and Supplement Research at the Osher Center for Integrative Health.

He designs and conducts randomized clinical trials and epidemiologic studies, focusing on dietary supplements, nutrition, and lifestyle factors to prevent cardiovascular disease, hypertension, cancer, and other aging-related outcomes. Dr. Sesso has been involved in several major trials at the Division of Preventive Medicine, helping lead the Physicians' Health Study (PHS), conducting several ancillary studies in the VITamin D and OmegA-3 TriaL, and co-leading the COcoa Supplement and Multivitamin Outcomes Study (COSMOS). He has also conducted several small-scale clinical trials testing dietary supplements and nutrition, plus initiated an Epigenetics Working Group stemming from several research grants across PHS, VITAL, and COSMOS.

He has published extensively, teaches courses on clinical trials and epidemiology, and enjoys mentoring students and junior faculty.

Alison L. Steiber, PhD, RDN

Chief Mission, Impact and Strategy Officer, Academy of Nutrition and Dietetics

Alison L. Steiber, PhD, RDN is a registered dietitian nutritionist and the Chief Mission, Impact and Strategy Officer at the Academy of Nutrition and Dietetics. Dr. Steiber leads the Research, International, and Scientific Affairs, Practice Excellence (dietetic practice groups), and the Quality, Standards and Interoperability teams. She is an author on dozens of scientific research papers, represents the Academy at key research, scientific and policy conferences, is a member of the Board of Directors for the National Kidney Foundation, and is on the Scientific Advisory Panel for the American Council on Exercise. Dr. Steiber completed her dietetic internship and received her Master of Science in Dietetics at the University of Kansas Medical Center and her Doctorate in Human Nutrition from Michigan State University. In 2021, Dr. Steiber received the Distinguished Health Professions Alumna award from the University of Kansas Medical Center, Kansas City, Kan., and in 2024 she received the College of Agriculture and Natural Resources Alumni Service Award from Michigan State University.

Christina J. Valentine, MD, MS, RD, FAAP, FASPEN

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Dr. Valentine is passionate about increasing the awareness of registered dietitians as authentic and personalized medicine experts in nutrition and driving to improve access for reimbursement. Her academic training began with a BS at Ball State University, a graduate degree in nutrition at The University of Florida, medical school, internship, and residency at Baylor College of Medicine and Texas Children's Hospital, with a Neonatal Fellowship completed at Nationwide Children's/The Ohio State University.

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Alissa Wassung brings more than 15 years of policy and strategy expertise to her role as Executive Director of the Food Is Medicine Coalition (FIMC), a national coalition of nonprofit organizations providing medically tailored meals (MTMs), medically tailored groceries (MTGs), medical nutrition therapy, and nutrition education to people living with severe and chronic illnesses. FIMC advances access to these interventions through policy change, research, evaluation, and best practices.

At FIMC, Alissa unites diverse stakeholders to strengthen the medically tailored food field. Through education, policy briefings, national symposia, technical assistance, and federal and state advocacy, she has helped expand awareness, access, and funding for MTMs and MTGs. Recently, she convened with partner agencies to formalize the first national standard for the MTM intervention, establishing an accreditation model for service providers based on decades of community expertise.

Previously, Alissa served as Senior Director of Policy & Planning at God's Love We Deliver in New York City, where she led its Food Is Medicine initiative and oversaw government funding, research, and cross-sector health policy innovation. She has advised the Aspen Institute's Food Is Medicine Research Initiative and serves multiple national advisory groups focused on access, research, care integration, and nutrition policy. A frequent national speaker, she has presented at leading public health and health care convenings across the country.

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Review

Translating Science to Improve Health—a Report from the "Agriculture and Diet: Value Added for Nutrition, Translation, and Adaptation in a Global Ecology" (ADVANTAGE) Project Working Group 5

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A B S T R A C T

Transforming food systems to improve health amidst accelerating climate and environmental change is a critical global challenge. This paper addresses the imperative and complexity of translating scientific evidence into actionable policies and practices at the climate-food-health nexus. We propose a conceptual and operational framework grounded in ecological systems thinking, highlighting the interdependencies across biological, social, and economic domains. Drawing on existing translational science models from public health, environmental health, and convergent food systems research, we distill 5 core principles for effective translation: *1*) integration of transdisciplinary evidence across scales; *2*) early and sustained engagement with policymakers, practitioners, and affected communities; *3*) contextually nuanced application of evidence; *4*) systematic identification of tradeoffs, conflicts of interest, and unintended consequences; and *5*) strategic communication that bridges knowledge and action. To illustrate these principles, we analyze 5 case studies spanning local, national, and global contexts. Each illustrates the pragmatic and political dimensions of evidence translation, including stakeholder alignment, data infrastructure, and institutional leadership. This paper underscores the need for adaptive governance, cross-sectoral convergence, and innovative implementation science to advance food systems that are resilient, equitable, and sustainable. Our recommendations are intended to inform researchers, decision-makers, and practitioners seeking to enact evidence-informed change in dynamic sociopolitical environments and diverse food systems contexts.

Keywords: food systems, climate change, public health, convergence, translation

Introduction

The ADVANTAGE ("Agriculture and Diet: Value Added for Nutrition, Translation, Adaptation in a Global Ecology") Project seeks to support the development of diet and health interventions in the context of climate and environmental change (CEC) [1]. Specifically, the working groups in this project have examined the potential implications of the impact

Abbreviations: ADVANTAGE, "Agriculture and Diet: Value Added for Nutrition, Translation, Adaptation in a Global Ecology"; CEC, climate and environmental change; CFS, United Nation's Committee on World Food Security; Health Department, New York City Department of Health and Mental Hygiene; HLPE, High-Level Panel of Experts (of the United Nation's Committee on World Food Security); LCA, life cycle assessment; NCATS, National Center for Advancing Translational Sciences; NHANES, National Health and Nutrition Examination Survey; NIEHS, National Institute of Environmental Health Sciences; NIH, National Institutes of Health; NYC, New York City; Standards, NYC Food Standards for Meals and Snacks Purchased and Served; UW, University of Washington; WSDA, Washington State Department of Agriculture.

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of CEC on priority diet-health outcomes [2], dietary patterns and consumer choice [3], and the ability of the food system to meet the dietary needs of target populations [4]. Advancing knowledge of the relationships in this area is challenging because everything about these topics is interrelated across biological, economic, and social systems with complex feedback loops. It is also rewarding; understanding these interrelationships offers a rich and growing productive body of science to understand our world.

How do we translate this science, in all its complexity, into something meaningful—into net positive actions and solutions stemming from both policy and practice that *improve* our world for both people and the planet? That is the subject of this working group report. Specifically, our objective is to present key principles and promising practices for translating science-based evidence into effective policies and programs that promote health. Our core focus here is on human health, and as part of that, we include precursors, such as food security, dietary quality, and optimal nutrition, as well as the reduced burden of disease. We also consider planetary health to be part of human health, because it is a prerequisite for sustaining it. This includes the ability to optimize ecosystem services and biodiversity, as well as to mitigate and adapt to the effects of climate change [5]. Throughout this paper, we consider these interrelationships among CEC, food systems, and health, referring to this as the climate-food-health nexus.

Food systems are a critical part of this nexus, so we begin with a brief description of them. We follow with a brief discussion of science-to-policy and practice translation, what it is, and how different institutions have conceptualized it. Then, we outline core principles for translating scientific evidence in this field, with a focus on key change agents who are levers for advancing sustainability solutions. We follow that with 5 case studies that illustrate the core principles presented here. We conclude with a summary and suggested next steps for translation in this field.

Food Systems: a Brief Description

At its most basic, a food system is everything and everyone involved with growing, processing, distributing, and consuming food [4]. The reality of these systems is immeasurably more complex. Figure 1 illustrates how diets are a result of consumer behaviors that are shaped by both individual-level factors, such as knowledge and income, and the context of food environments that are external to the individual [3,6]. These food environments–the types of food, where they are available, how much they cost, and how heavily they are promoted–are at the interface between the individual and the food supply chain [7].

The food system is shaped by a myriad of factors, from environmental to sociocultural, and from political to economic [8]. For example, agricultural practices coupled with climate and environmental factors influence the nutrient content and sensory attributes of foods, which in turn, influence food choices and the nutrition and health outcomes of those who eat them. Concurrently, agricultural practices influence the biological dynamics within ecosystems, from plant-soil interactions to greenhouse gas emissions that drive climate, land, and environmental change [9].

At the economic level, foods are produced if there is effective demand and sufficient resources, but what foods are produced, how much, where, and by whom reflect incentives and disincentives, from local to global levels, which are often shaped by political systems [10]. Government policies also impact land ownership, equity, and farming practices, which influence all of the above [11].

Although food systems have evolved in many ways to make food more abundant and accessible, they are also associated with persistent problems globally, such as diet-related acute and chronic diseases, environmental degradation, high greenhouse gas emissions, biodiversity losses, and food waste and loss [12]. These problems are amplified by long-term drivers of change such as population growth, globalization, urbanization, climate

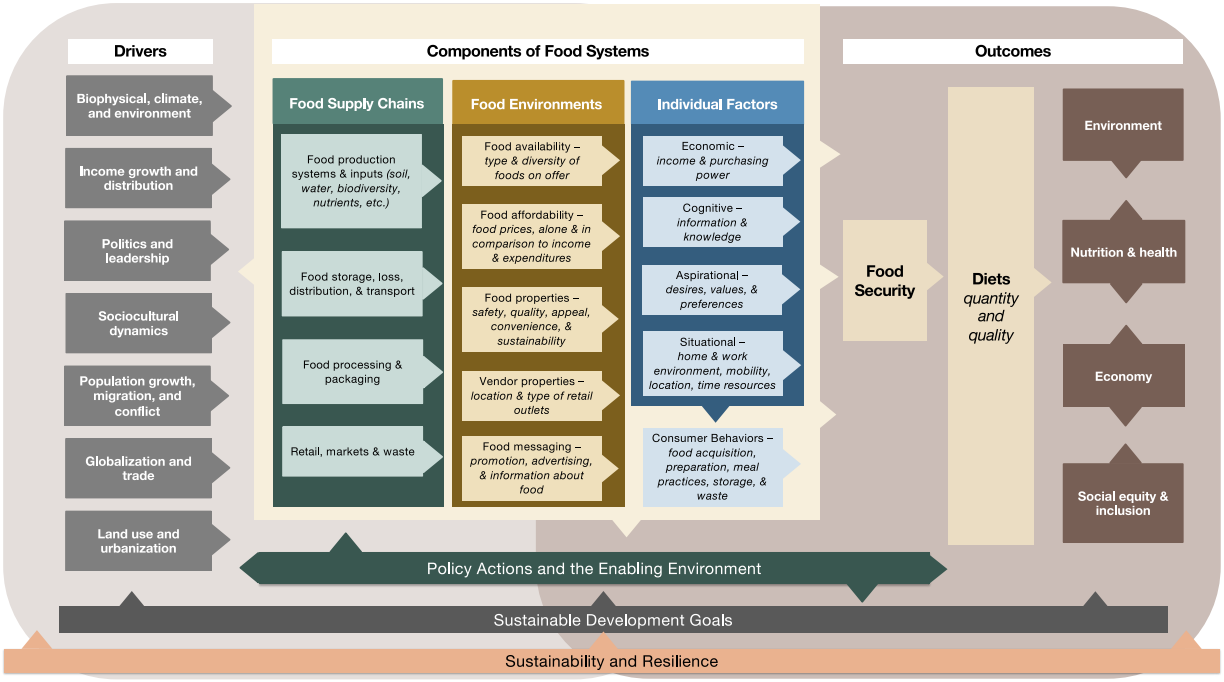

FIGURE 1. A detailed depiction of complex and dynamic food systems. Reproduced from Fanzo et al. [6] (https://doi.org/10.1016/j.foodpol.2021.102163) in accordance with the CC BY-NC-ND license.

change, politics, and trade, and are constrained by environmental and planetary systems [13]. Moreover, food systems are embedded in and interact with other systems—such as environmental, economic, and political systems—and are influenced by a range of local, regional, and global actors.

Addressing the problems listed above requires changes to food systems. However, due to their complex and interdependent nature, it is challenging to foster their transformation because no interventions are absent from tradeoffs. For example, an intervention to reduce iron deficiency through increased red meat consumption could negatively impact climate goals because of increased carbon emissions from beef production. Another example, as seen in the California school meals case study below, is that cutting out sodas in schools can improve children's diets, but might affect the profits of soft drink firms. Such tradeoffs are not unique to food systems interventions but can appear with any policy or program intervention. Moreover, although food systems are highly connected globally, challenges and solutions are often addressed locally or regionally. Governance approaches to foster sustainable transformation often have difficulty aligning at local, regional, and global scales and are challenged by conflicting values and interests, and problematic power imbalances of the various actors across food systems [14]. Food system problems also touch on many disciplines. A transdisciplinary approach integrates science from various disciplines with practical knowledge from nonacademic partners in the public and private sectors to address real-world problems. Although this approach to address food systems complexity and foster informed transformation has been growing [15], it has not been sufficient for impactful translation, as we will describe in the next section.

Translational Frameworks

A number of frameworks that articulate how science can translate into policy and practice have been developed by the United States National Institutes of Health (NIH), environmental health researchers, the food systems community, and others [16–18]. Here, we identify helpful elements from frameworks that provide promising models for translating science for public policy and practice or other translational uses relating to food. Later, we outline a specific set of translational principles that apply to the complex translational effort to address the climate-food-health nexus.

At the NIH, translation is a scientific research activity with the focal point being the National Center for Advancing Translational Sciences (NCATS). For NCATS, translational science can be represented as a spectrum that extends from basic research to preclinical research to clinical research to clinical implementation to public health. The flow of research activities is designed with the aim of developing treatments for disease, testing and implementing them, and ultimately monitoring their impact. Despite the reference to public health, it is largely an individual and disease-focused approach, a "multistep process of turning observations in the lab, clinic, and community, into interventions that improve peoples' lives in the form of diagnostics, therapeutics, medical procedures, devices, and behavioral changes" [19].

Environmental health researchers found it challenging to fit their research activities into this "bench to bedside" paradigm. Instead, Kaufman and Curl [18] have proposed a pathway of scientific activities that goes from discovery to health implications to policy/practice implications to policy/practice implementation to outcome evaluation. In this study, the implementation phase includes public health policy interventions and recommendations for individual actions, not just clinical interventions, as in the NCATS approach. The approach also makes explicit the interdisciplinary nature of the work by listing 7 distinct disciplines that are involved in the earlier stages of this work. The National Institute of Environmental Health Sciences (NIEHS) [20], has also developed its own conceptualization of translational research. Similar to Kaufman and Curl, it includes 5 stages and goes from science that addresses fundamental questions to that which measures impact. However, in the NIEHS approach, each stage is depicted as a concentric circle, implying there is no specific beginning to the translation research process. See Table 1 for a brief description of these different approaches [18,21,22].

Food systems researchers have developed a convergent science framework [22] that may be more useful for our objective of identifying promising practices for translating evidence into effective policies and programs that promote food systems to deliver health. Rather than describing how different scientific disciplines relate to the end goal of promoting health, this approach begins with problem identification–mapping vulnerabilities in food systems and identifying problems and potential solutions–all in concert between scientists and diverse stakeholders from government, the private sector, and civil society. Subsequent stages of the paradigm build on this collaboration to coproduce action-oriented research and eventually scale changes based on its findings, as well as conduct subsequent impact evaluation. Central to this "convergence" approach is the integration of scientists with multiple sectors of society to better link research and evidence to inform policy and decision-making for advancing food systems solutions. However, to date, the convergent science framework has largely only been applied in the context of bringing interdisciplinary teams together to address specific parts of the food system rather than developing holistic approaches that address the interconnectedness of the system [15]. For example, convergence research has disproportionately been directed toward food production and food security, whereas components such as logistics and distribution have been underrepresented [15]. In addition, convergent research that integrates researchers, policymakers, and actors in the private sector and civil society has been rare [15]. There have been few attempts to invest in efforts that integrate researchers and private actors—an intersection of great importance given the proprietary nature of key parts of the food system—and fewer attempts to involve policy and citizen actors [15]. Given the importance of understanding different values and perceptions of actors in fostering change, this is a deficit that needs to be addressed.

Core Principles to Translate Scientific Evidence to Action: Policy, Programs, and Practice

In this section, we outline a set of core principles for how to develop an enabling context for transdisciplinary research translation (principles 1, 2, and 3) and how to translate evidence from the climate-food-health nexus to support policies,

TABLE 1
Examples of translational research frameworks.

Health sector approaches to translation research					
NCATS [21]	Basic research • Fundamental mechanisms of biology, disease, or behavior	Preclinical research • Model interventions to understand the basis of disease and how to treat it • Testing in cell, animal models, tissue samples, computer-assisted simulations	Clinical research • Testing of clinical interventions for safety, effectiveness • Behavioral and observational studies • Outcomes, health services research	Clinical implementation • Adoption of interventions into routine clinical care • Implementation research to evaluate results of clinical trials or gaps in care	Public health • Study of health outcomes at the population level • Assess effects of current interventions, develop new ones
NIEHS [18]	Fundamental questions • Research on biological processes; pathways and systems that are susceptible to environmental stressors	Application and synthesis • Pilot tests of interventions, new tools, approaches	Implementation and adjustment • Implementing interventions, tools, methods in real-world settings, and adjusting for different populations	Practice • Using evidence to inform new guidelines for prevention, diagnosis, treatment • Institutionalizing policies, practices	Impact • Assess broader impacts of practice guidelines or policies
Kaufman, Curl 2019 [18]	Discovery • Discovery of problem source through observational studies or basic science research	Health implications • Confirmation of causal link between exposure and outcome	Policy/practice implications • Identifying appropriate interventions to reduce exposure and improve health outcomes	Policy/practice implementation • Implementation of intervention strategies in standard practice and policy	Outcome evaluation • Measurement of effects of intervention after implementation, assessing needs for change
Food systems convergence research approach					
Sixt et al., 2022 [22]	—	Food system vulnerability mapping • Map climate, economic, political, social vulnerabilities to current, future food system	Problem articulation, scoping, visioning • Identify barriers, leverage points for change • Articulate knowledge gaps, how to fill them	Action-oriented research • Prototype promising solutions • Address barriers to climate and food system transitions	Scaling of food system transformation • Impact assessment, modeling, learning of system behavior change to adapt approaches

Abbreviations: NCATS, National Center for Advancing Translational Sciences; NIEHS, National Institute of Environmental Health Sciences.

programs, and practices (principles 4 and 5) that impact health. In elucidating these principles, we draw heavily on the convergent science framework outlined in the previous section because it has explicit links to food system interventions [22]. This includes our focus below on transdisciplinary evidence, working with policymakers and practitioners, and our concern for the context in which interventions are applied. The 3 health-centered frameworks described above integrate science from different disciplines and are concerned with public health, policies and practices, and impacts and outcomes, which are all of central concern to the development of our principles.

Principle 1: integration of transdisciplinary evidence across scales

An understanding of the climate-food-health nexus requires bringing together a diverse range of disciplines [1–4,23]. These disciplines include planetary sciences that examine climate, environmental, and ecological systems; social sciences that include economics, political sciences, anthropology, sociology, behavioral sciences, and communication sciences; and biological sciences that include agriculture, food, nutrition, and health sciences [24]. This will require different types of knowledge and cultures of valid evidence-gathering, from physical to social sciences to biological sciences to traditional indigenous knowledge [25,26]. Because the relationship among climate change and diet, nutrition, and health is affected deeply by large global forces, yet will play out differently in hyperlocal contexts, it will be critical to integrate evidence at local, national, and global scales [27]. This knowledge integration will also need to occur across food and health systems from agriculture production through supply chains, to consumption and waste management, and ultimately to health outcomes.

Principle 2: early and sustained engagement with policymakers, practitioners, and affected communities

Partnering and engaging with policymakers, practitioners, societal stakeholders, and people with lived experience relevant to the food system issue at hand are critical to guide researchers to address relevant societal needs and understand the priorities, perspectives, frames of reference, and values of diverse stakeholders, along with the implications that research can have in their spheres of influence [28–30]. These policymakers and practitioners, or "change agents," include regulators, private sector food companies, advocacy groups, the media, community-based organizations and individuals, elected officials, political appointees, government workers, farmers, agricultural extensionists, community educators, nutritionists/dietitians, doctors, and other healthcare practitioners [31–33]. Engagement should be early to ensure that research questions are jointly shaped and reflect local needs and contexts, which can enhance the impact of evidence generated from this research, along with its early dissemination in relevant, predetermined ways [34,35]. The approach outlined here borrows from the concept of strategic science [36], which has been adapted to local and state food policymaking with specific process suggestions [37].

Partnership with key change agents can directly inform: *1*) how best to frame research questions of actionable relevance and findings to increase the likelihood that science will be able to inform policy and practice; *2*) which other change agents need to be engaged in the research process and the dissemination of the findings; *3*) which are the most effective channels through which to share results (e.g., personal communication, published report, op-ed, and policy brief); *4*) what is the optimal timing of this dissemination; and *5*) how to conduct and disseminate research in ways that will capture tradeoffs and/or minimize potential unintended consequences (e.g., misrepresentation of a scientific finding in the service of supporting a nonevidence-based policy) [34,35].

Principle 3: contextually nuanced application of evidence

Researchers must be mindful of the context in which research at the climate-food-health nexus will be conducted. The local political environment, economy, culture, geography, and scale matter [38]. The translation of research to policy varies tremendously depending on national economic and political conditions [39]. There are also differences in policy and political environments at the local, state, and federal levels within a country. Research that is useful in one context may not be so in another context, or be applicable even in neighboring jurisdictions. For these reasons, researchers need to partner with change agents who will have a better understanding of the specific context in which to generate, interpret, and apply findings and how to effect change within it. Participatory system mapping is important for food systems [40], as are adaptive implementation strategies [41]. Part of understanding context is being aware of the timing of information generation and dissemination so that it is most useful and actionable for change agents [42,43]. Working with change agents can help identify opportunities when researchers can quickly generate evidence needed for an immediate policy decision [44]. In addition, collaboration with change agents can help identify longer-term research needs that, over time, can influence how policy actors think about priorities.

Principle 4: systematic identification of tradeoffs, conflicts of interest, and unintended consequences

Equitable outcomes should be a key objective of policies and programs that advance food systems, diet, nutrition, health, and the environment [13,45–47]. However, every policy has tradeoffs; some stakeholders are likely to gain from an intervention, whereas others may lose [48,49]. There are also tradeoffs in the choice of food system interventions. Due to scarce resources, funding 1 intervention might preclude funding another. Researchers should work with policymakers and coalitions to identify tradeoffs and how to move forward to best accomplish desired objectives. Conflicts of interest pose a key challenge for evidence-based policymaking because, for example, some decision-makers may prioritize the interests of corporations over those of consumers [50,51]. Furthermore, interest groups that stand to lose because of policy change will mobilize their resources to protect their assets. For this reason, it is important for researchers to work closely with policymakers from the initiation of policy-relevant research ideas. Researchers should also work with advocates and coalitions to identify those whose interests might be threatened by the translation of scientific findings, identify the potential counterarguments to these findings, and address those counterarguments, conducting

additional research as needed to accomplish this [52]. Researchers should also work with policymakers to identify unintended consequences of any recommended policy actions and ways to mitigate those consequences. Several tools to put this principle into practice, including equity impact assessment, scenario modeling, and stakeholder analysis, have been applied in health and food systems work [53–55].

Principle 5: strategic communication that bridges knowledge and action

Typically, science is disseminated through peer-reviewed academic journals. However, to influence policy and practice, scientific evidence must be communicated through multiple channels that speak directly to policymakers, advocates, and the public. Although there are several approaches scientists can take to communicate research to change agents, additional attention is needed to convey the complex connections between climate change, food systems, diet, nutrition, and health. One strategy is to shape public opinion and narratives through popular communications such as writing opinion pieces or popular books or articles, podcasting, engaging with social media, or participating in other emerging channels through which information is disseminated broadly to the public [56]. A second strategy is testifying for public hearings or providing written comments on proposed regulations, paying special attention to using simple language that links the interconnected systems. A third strategy could include developing materials like policy briefs that distill research findings into more accessible formats and reaching out to advocacy groups and policymakers who are receptive to such information. A fourth strategy is direct involvement in making specific policy recommendations through co-creation, such as serving on an advisory committee for dietary guidance. A fifth communication strategy to close the gap between scientific knowledge and societal action is education. More specifically, education targeted toward accessibility for diverse change agents. For example, professional development offerings can fill critical knowledge gaps where advances in scientific discovery, especially evidence in the climate-food-health nexus, have outpaced formal learning opportunities of change agents. Some of these strategies may require that communication, education, and marketing experts be included in the scientific teams, which may call for additional resources. Communication strategies are also enhanced by collaboration with change agents who convey understanding of the specific contexts in which research will be disseminated, as discussed in the third principle. Case studies and a guide for planning effective communication strategies to improve national nutrition programs have been developed by the WHO [57].

Case Studies

This section describes 5 case studies which illustrate aspects of our core principles for translation and provide additional insights into policies and practices associated with food system change. See Table 2 for a synopsis of how each case study illustrates some of these principles. For convenience, we have italicized some of these points in the text itself.

We start with a look at policy changes in California schools, which eliminated sugar-sweetened beverages and some energy-dense snack foods. This eventually became a national model and a model for addressing adjacent food system issues, such as equity and the environmental impacts of school lunch. There was early resistance to these changes, which was overcome by working together with policymakers and researchers across a wide range of fields, by understanding the context, and by conducting research on conflicts of interest.

Next, we discuss the Voluntary Guidelines on Food Systems and Nutrition, the only policy tool on food system interventions to improve nutrition that was negotiated globally. This required working together with a wide range of stakeholders, understanding and accepting that there might be tradeoffs in some of the language used, and making sure to consider local as well as national contexts in their adoption.

The State of Washington provides an interesting case in which a university and a state agriculture department worked together to identify a set of common metrics that could be used to assess progress across the department's food systems initiatives to examine and communicate how the agency's initiatives collectively address and evaluate the state's food systems. Understanding the context of these interventions and having academics, policymakers, and program managers work together from the beginning was instrumental in this success.

The fourth case study examines the development and dissemination of a database to estimate the carbon footprint of individual diets in the United States. Human food systems have a tremendous negative impact on CEC. Dietary carbon footprints offer a way to tie this impact to individuals' choices, which can assist in policymaking to reduce or mitigate it. Integrating multiple disciplines was essential for the development of this database, as was communicating across a wide range of outlets for successful dissemination.

The last case study examines the integration of environmental sustainability into food procurement standards in New York City (NYC). This work resulted from the efforts of 3 different administrations. At the center of this work was the Department of Health and Mental Hygiene, which collaborated with the Mayor's Office on Food Policy to develop a working group of 12 city agencies. Integrating evidence from different disciplines and partnering with a wide range of stakeholders, among other things, were crucial to the work's success.

Overcoming barriers to change: school food policy in California

In the early 2000s, community members, elected officials, nutrition experts, and children's health advocates in California were concerned about the trend toward prepackaged meal service at schools, which had begun in the 1980s. Soda, chips, candies, cookies, and frozen desserts—all prepackaged and highly processed—had become the cultural norm, the items most frequently purchased and consumed at school by many students. A state Senator from East Los Angeles, Martha Escutia, who was passionate about children's health and concerned about preventing diabetes, introduced legislation to change school food environments. She proposed to prohibit the sale of these and other high-sugar and high-fat snack foods and beverages. Initially, the legislation failed to pass. However, thanks to a *partnership that developed among policymakers, researchers, advocates, and other stakeholders, a key concern among those opposing the policy was identified: schools could lose critical revenue if they stopped selling sodas and snack foods*.

TABLE 2
Summary of case study examples illustrating core translation principles.

Principle	School food policy in CA	Voluntary Guidelines on Food Systems & Nutrition	Developing common metrics for food initiatives in WA	Translating the dietary carbon footprint	NYC Food Standards and environmental sustainability
Integrate wide range of disciplines	Nutrition, public health, economics, politics, and environmental science were all integrated in this work.	Evidence for development of Guidelines came from many sources including nutritional, agricultural, and environmental.	Developed metrics that addressed a wide range of programs and initiatives from consumer food assistance to specialty crop production.	Researchers in nutrition, environmental science, epidemiology, economics, and psychology worked to develop databases and illustrate their use.	Science-based approach that included nutrition, food science, environment, and other disciplines.
Partner with different stakeholders	Researchers partnered with elected officials, advocates, practitioners, and others early in the process.	Governments, multilateral agencies, United Nations, civil society, and private sector were engaged from the beginning.	Collaboration between academics, practitioners, and policymakers was crucial to success.	The databases have been shared with external university partners, agencies in the federal government, and private industry.	NYC Health and Mayor's Office of Food Policy established working group of 12 city agencies in initial development of Standards. Met with agencies regularly to get buy-in for updates to reduce carbon emissions.
Understand the context	Researchers understood early opposition to legislation from both food and beverage industry and from school stakeholders.	That which is decided globally must translate l locally, so countries need to select those Guidelines relevant for their context.	Understanding context in which specific programs operate within the state department of agriculture was needed to surface collective goals and outcomes, and to identify common metrics.	—	Standards were developed with an understanding of the political context and history of the policy as well as the context in which each agency would need to implement the standards.
Identify tradeoffs	Schools could lose critical revenues from sales of sodas, snack foods. Research found that when these were not available, students purchased more school meals, which was healthier for students and school finances.	—	It was important to understand unique program goals and outcomes in addition to collective goals and outcomes to ensure program burden was not increased.	—	Standards developed to preempt unintended consequences of increased consumption of ultraprocessed meat alternatives. Standards developed were cost neutral or cost saving.
Invest in communication	—	For governments, words, definitions, and concepts can be interpreted differently and can matter politically, which calls for effective communication strategies.	WA State Department of Agriculture staff created an internal working group to implement common metrics and begin to communicate collective impact.	Authors disseminated results to a wide range of scientific journals and news media, including local, state, and national print, radio, television, and online outlets.	NYC Health communicated clearly with city agencies about changes to Standards and rationale supporting these changes.

Abbreviations: CA, California; WA, Washington; NYC, New York City.

Motivated to explore this concern, University of California researchers launched a study that found that at most schools, when students no longer had access to sodas and snack foods, they instead purchased the federally reimbursable school meals [58,59]. Thus, students purchased a more complete and nutritious meal at school, benefiting their health, and schools broke even or made more money from this change. *The research persuaded enough skeptical stakeholders that prohibiting the sale of sodas and certain snack foods at school would benefit children's nutrition and health without compromising school funding.* Despite continued pushback from the business community and the food and beverage industry, the California legislature passed 2 bills in 2005, 1 prohibiting the sale of sugar-sweetened beverages (Senate Bill 965) and the other restricting the sale of high-calorie, high-sugar and high-fat snack foods (Senate Bill 12).

California's early implementation of these policies coincided with federal interest in improving nutrition among school children. California's successful policy language was adopted nearly verbatim into federal legislation titled the Healthy Hunger-Free Kids Act of 2010, thanks to this interest. Thus, an effort that began with a single state legislator fighting for health justice in her community led to a partnership with other policymakers, researchers, and advocates. Over the course of a few years, this effort transformed school food environments and, subsequently, children's nutrition, first in 1 state and then across the nation. These changes to school food policies also have tremendous impacts on food systems, considering that schools serve nearly 5 billion lunches and >2 billion breakfasts annually [60].

In recent years, the state has built on this early success, passing multiple bills aimed at the joint objectives of improving school food quality and reducing the environmental impact of school food services. For example, California has invested millions in Farm to School programs. These programs support schools to purchase food grown locally and on farms that utilize practices minimizing the environmental impacts of food, and elevate the role of plant foods in school meals, which can lower the overall carbon footprint of school meals.

A number of translation principles can be seen in this work. A wide range of disciplines were brought to bear on the research on school environments, the initial crafting of the legislation, and the subsequent push to add environmental concerns. Researchers partnered with policymakers from the very beginning of this work. Understanding the context of opposition to early legislation and conducting research to explore potential conflicts and tradeoffs facilitated a transformation.

Negotiating globally: the Voluntary Guidelines on Food Systems and Nutrition

A food system has the potential to improve nutrition and reduce hunger, but policymakers may be in the dark about how to make this happen. Tools are desperately needed that provide policymakers with a roadmap to identify key challenges and prioritize actions to transform food systems with beneficial outcomes.

The Voluntary Guidelines on Food Systems and Nutrition ("Guidelines") is one such example. It was developed through the United Nation's Committee on World Food Security (CFS) based on a report from its High-Level Panel of Experts (HLPE). The Guidelines are for governments, specialized institutions, and other stakeholders that seek to address the causes of hunger and poor nutrition from a food systems perspective using policies, investments, and institutional arrangements [61]. The tool includes 105 evidence-based guidelines for achieving healthy diets through sustainable food systems. The Guidelines are categorized by cross-cutting themes (e.g., democratic governance, equitable access, food safety, and gender equality) that address economic, social, and environmental sustainability issues.

These Guidelines are the *only* global policy instrument negotiated at a multilateral level among governments and other stakeholders on the connections between food systems and nutrition. They provide a reference of principles and practices that governments can use when making policies, programs, and investments concerning food systems. All CFS stakeholders–including the 141 member states involved in the negotiations of the Guidelines–are encouraged to promote their use and application, but, in the end, they are voluntary.

During the drafting and negotiation of the Guidelines, there were many lessons on how information from a rigorous, evidence-based report from the HLPE can be translated into a useful tool that governments can be comfortable implementing in their nation-states. First, *it was essential that all actors, including governments, multi- and bilateral agencies, the United Nations, civil society, and the private sector were engaged in the process from the beginning* and that their endorsement to carry out the Guidelines was voted on. Otherwise, they would not have been adopted. Second, although not everyone at the negotiating table agreed with what was written in the text word for word, everyone was heard in the process and was able to voice disagreements in an open, transparent political forum. This was an excellent way to be inclusive and address the inevitable conflicts of interest among food system actors. Third, *for governments and policymakers, words, definitions, and concepts matter politically, are interpreted differently, and are highly debated.* For example, the concepts of what is a "nutritious food," what constitutes a "food environment," what are "ultraprocessed foods," and what it means to "take a food systems approach" were contentious in their definitions and interpretations.

This implies that for the Guidelines to be successful, it is important to invest time and resources in effective communication strategies. Fourth, *evidence for development of the Guidelines came in many forms and from many sources, including those related to nutrition, sustainable agriculture, and the environment* [62]. Policymakers relied on experts and researchers to gather this evidence in inclusive ways and interpret and translate that evidence to facilitate the development of the Guidelines. Lastly, *context is critical, which is decided globally must translate to what happens locally. In terms of the Guidelines, this means that countries need to select those that are relevant for their context, choose how they will enact them, and determine who will be responsible for this*.

Developing common metrics for diverse food programs and initiatives: a collaboration between the University of Washington and the Washington State Department of Agriculture

Evaluation to improve the impact of public sector programs requires specific, clearly defined goals and ongoing measurement. This challenges large organizations, such as state departments of agriculture, which run widely diverse programs

with very different goals. On the surface, measuring the impact of consumer food assistance bears little in common with that of specialty crop production. How, then, can such large organizations measure the impact of their overall collective portfolio on advancing shared food systems goals?

In 2022–2023, *food systems researchers at the University of Washington (UW) worked collaboratively with the Washington State Department of Agriculture (WSDA) to address this challenge, with the goal of developing metrics to help it track the collective progress of its food programs and initiatives and communicate the impact of this work* [63]. UW researchers interviewed 18 WSDA staff and reviewed publicly available and internal documents to identify collective impacts, goals, and outcomes across a broad set of WSDA food-related programs and initiatives. *These encompassed a range of food system activities, including production (e.g., specialty crop programming), distribution and marketing (e.g., direct marketing assistance), and consumption (e.g., emergency food assistance programming)*. The UW team found that although different program areas and initiatives within the WSDA had distinct operations and provided unique services, there were 6 shared impact areas of the WSDA's overall mission. These areas included partnership and networking, learning and communication, food system resiliency, agricultural businesses (including farmers, processors, and distributors), consumers and clients, and equity at all levels.

Building on this information, the UW team developed an Outcome Map, which linked each common impact area to a set of shared goals and outcomes. For example, for the shared impact area of partnership and networking, one shared goal was that WSDA staff are a trusted and known source of technical assistance. An accompanying outcome of that goal was that agricultural stakeholders became aware of what the WSDA offers and now seek their support. This specificity allowed for a Common Metrics approach where measurable indicators of progress were proposed for the common outcomes of each impact area. See Supplementary Tables 1 and 2 for detailed examples of the outcome map and common metrics approach.

Throughout the process, the UW team held group meetings with agency staff for feedback on the draft outcome map and proposed common metrics. UW also prepared guidance for implementing these metrics through data collection and reporting efforts. The outcome map and common metrics produced from this project are currently under implementation at the WSDA. *Collaboration among academics, practitioners, and policymakers was central to this process and was crucial to its success. An understanding of the context in which specific food programs operate within the WSDA, as well as the larger macro context in which the WSDA operates within society were also crucial to its success*.

The project showcased how a common metrics approach can support informed decision-making about state food system grant programming and investments based on clearly established indicators of needs and priorities [63]. The WSDA hopes to use this approach to identify areas where additional financial investment or technical support would be most worthwhile. The WSDA also hopes the approach will make it easier to identify WSDA programs and grantees that contribute to state goals. In sum, the approach allows the WSDA to more effectively tell the story of how its portfolio and funding have impacted shared food systems goals.

Developing a dietary carbon footprint database for use with individuals in the United States

A dietary carbon footprint is a metric that assesses the climate change impact of producing all the foods that make up one's diet and transporting them from farm to fork. One cannot have a diet without a carbon footprint, and that footprint is not trivial. Globally, human food systems account for a third of greenhouse gas emissions [64]. There is a wide range of impacts depending on what is eaten, at least a 5-fold difference in greenhouse gas emissions associated with the production of either low or high-carbon footprint diets [43,65]. Having such a metric enables consideration of climate goals, along with nutrition and health, when providing guidance on individual diets or doing policy simulations. This is necessary given that large-scale climate goals cannot be met without reducing impacts from the food system [66,67].

In 2015, *researchers in nutrition, environmental science, epidemiology, economics, and psychology formed a collaboration to quantify the potential impacts of individual diets on climate change*. The team had settled on the goal of evaluating individual diets because food choices are ultimately made by individuals, so potential policies to change diets would need to be informed by behaviors at this level.

The National Health and Nutrition Examination Survey (NHANES) was chosen for study, because it provided individual dietary data on a large representative sample of United States adults. NHANES does not contain environmental data, which typically come from life cycle assessment (LCA) studies. An LCA is a systematic environmental accounting of all the inputs and outputs needed to produce, package, transport, and discard the foods we eat. Food LCAs are often conducted on commodities, such as tomatoes, wheat, or milk, and include impacts, such as the amount of greenhouse gas emissions associated with one of these products.

The development of the approach and the final data products presented various challenges, which were ultimately addressed through cross-disciplinary communication. Although LCAs are conducted on commodities, people eat mixed dishes, such as pizza or lasagna. The team found a database developed by the Environmental Protection Agency that translates all the foods and mixed dishes consumed by NHANES respondents into their commodity ingredients [68,69]. Having a commodity linkage to diets allowed for the assembly of a commodity foods-environmental impact database from the LCA literature [65]—one of the main tools produced from the research [70]—and the team was then able to calculate the greenhouse gas emissions embodied in a particular diet.

Results from studies on the commodity level database (database of Food Impacts on the Environment for Linking to Diets) [65,70], as well as the database that links emissions directly to NHANES foods [71,72], have been *disseminated in academic journals in environmental science, nutrition, public health, planetary health, and food science*. Authors helped develop press releases for most of the articles published from this work and have *contributed interviews for stories put out by local, state, and national media in print, radio, television, and online formats. The databases have been distributed to researchers at a dozen universities and agencies within the US Department of Agriculture and the Department of Health and Human Services*. Results from the work have been presented at professional development workshops,

seminars, and webinars for applied nutritionists and health professionals in the United States and Canada. The work has also informed actions by local governments, small businesses, and even art projects.

Incorporating environmental sustainability into the NYC Food Standards

In 2019, NYC Mayor Bill DeBlasio put out a "Green New Deal" to reduce carbon emissions by 2050. As part of that deal, the City committed to reduce purchases of beef by 50% and phase out purchases of processed meat for City meal programs by 2030. The NYC Department of Health and Mental Hygiene (Health Department), which had provided input to the Mayor's Office of Sustainability on the development of this new commitment, set out to incorporate this carbon emissions goal into the NYC Food Standards for Meals and Snacks Purchased and Served (Standards) [73], which specify the nutritional composition (e.g., amounts of saturated fat, sodium) for foods served in City-run and contracted food programs. The Standards already included recommendations regarding environmental sustainability, but this was an opportunity and a new challenge to further *integrate the science of environmental sustainability with the food and nutrition aims of the Standards*.

The Standards were first created pursuant to an Executive Order by Mayor Bloomberg in 2008, and they are updated every 3 y. They address food served in institutions like public school cafeterias, correctional facilities, shelters, older adult centers, early childhood programs, children's services, public hospitals, and home-delivered meals. To support the development and implementation of the original Standards, *the Mayor's Office of Food Policy, in coordination with the Health Department, established a working group of 12 City agencies that regularly met to discuss the implementation process*. The Standards are revised in consultation with the working group members to get their expertise and buy-in, and the Health Department provides technical assistance in support of procurement and menu changes. In addition, the City Council passed a law in 2011 that established the Food Metrics Report, which requires City agencies to report on a range of metrics related to NYC food systems and policy, including compliance with the Standards. In 2017, the Mayor's Office of Food Policy began supporting City agencies to adopt the Good Food Purchasing Framework [74], a set of procurement standards that included nutrition, environment, and other areas. Although these guidelines were recommendations rather than requirements, City agencies had to begin tracking their compliance, which later facilitated their integration of environmental sustainability into the City's food standards.

The COVID-19 pandemic delayed the release of updated Standards, and eventually, Mayor Eric Adams signed an Executive Order in 2022 that recommitted the City to the NYC Food Standards. In addition to requiring limits on servings of beef and phasing out processed meat, the 2022 Standards introduced a requirement for minimum servings per week of whole and minimally processed plant proteins.

For the new standards, the Health Department reviewed the scientific literature from various disciplines and performed policy scans of work in other jurisdictions. *In their design of the standards, they also tried to preempt potential unintended consequences, such as inadvertently increasing consumption of ultra-processed meat alternatives*. This science-based approach allowed the Health Department to make a persuasive case for the changes and to provide leaders of the different agencies with a strong rationale for why they were making certain decisions.

Integrating environmental sustainability into the Standards was successful because it was championed by 2 mayors—DeBlasio and Adams—and predated by Mayor Bloomberg, who had a strong commitment to public health and a data-driven approach to policymaking. Other reasons for success included the science-based process to design the Standards, City requirements to track and report compliance with them, and the potential cost savings by reducing meat purchases. Finally, *the leadership at the Health Department understood the need to clearly communicate with City agencies about changes to the Standards and the rationale supporting those changes*. This case highlights a major public health success to leverage an often overlooked policy tool—government food procurement standards—to advance both human and planetary health.

Next steps for translation

In conclusion, the frameworks, principles, and case studies presented in this paper provide insight into how to develop an enabling context for transdisciplinary research translation and how to translate evidence from the climate-food-health nexus to support policies, programs, and practices across a variety of contexts. The city-to-global level case studies illustrate the application of principles and highlight their varying success.

To address the climate-food-health nexus, the future of science translation to policy and program action is going to require major advances. Food systems researchers, stakeholders, and policymakers will need new approaches and methods to navigate how to simultaneously consider multiple decisions at multiple scales and with multiple change agents. Interdisciplinary research to translation is not enough; we need more ambitious approaches to shift not just the research side but also the application side. We have emphasized a transdisciplinary approach because it integrates science from different disciplines with practical knowledge from nonacademic partners. Just as researchers are moving away from silos by doing this kind of research, government agencies and civil society must also move away from silos or an issues-specific focus and find productive pathways for cross-issue work. Stakeholders in the system must be able to recognize policy and program intersections across multiple domains—including health, environment, trade, and social welfare—and consider how to advance change that optimizes across intersections. We need greater focus on how complementary policies can be bundled and how these bundles result in different policy tradeoffs compared with a single policy- or program-issue focus [75]. Addressing these issues, the Global Panel on Agriculture and Food Systems for Nutrition has developed a tool for a whole-of-government approach that uses the food system as a framework to support multisector collaborative actions and puts the consumer at the heart of the decision-making process [76].

Multistakeholder collaborations are needed now more than ever to create enduring platforms for dialogue, knowledge sharing, and collaborative decision-making that can help to build consensus, overcome barriers, address power structures and values, and foster a sense of ownership among stakeholders. Putting stakeholders at the center can help to anchor the complexity of this work on the impact of its ripple effects [75].

Given the complexity and dynamic nature of systems impacting the climate-food-health nexus, an adaptive governance approach is essential. This should include continuous monitoring and evaluation, flexible decision-making processes that allow for adjustments based on new information, and a willingness to experiment and learn from both successes and failures.

Although translating climate-food-health science into action will continue to require more ambitious work, adopting the principles in this paper can help researchers and change agents to more effectively support the development and translation of scientific evidence into policies, programs, and practices that promote sustainable and equitable food systems for the benefit of both people and the planet. Along these lines, additional implementation, operations, and translational research can help answer real-time policy and practice concerns that are relevant to directing food systems transformations in positive directions. However, understanding how actionable research outcomes are taken up into policymaking and in programs is also critical. Issues such as cost effectiveness, scalability of successes, sustainability of outcomes and impacts, the tradeoffs between certain decisions, and the political feasibility of novel ideas and approaches all require additional research and communication [77].

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Author contributions

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