

What Matters for Sustainable Diets?

Results of a Global Expert Elicitation across Environmental, Social, Health, and Economic Domains

Katherine Fuller

| Sean B. Cash

| Nicole Blackstone

| Shibani Ghosh



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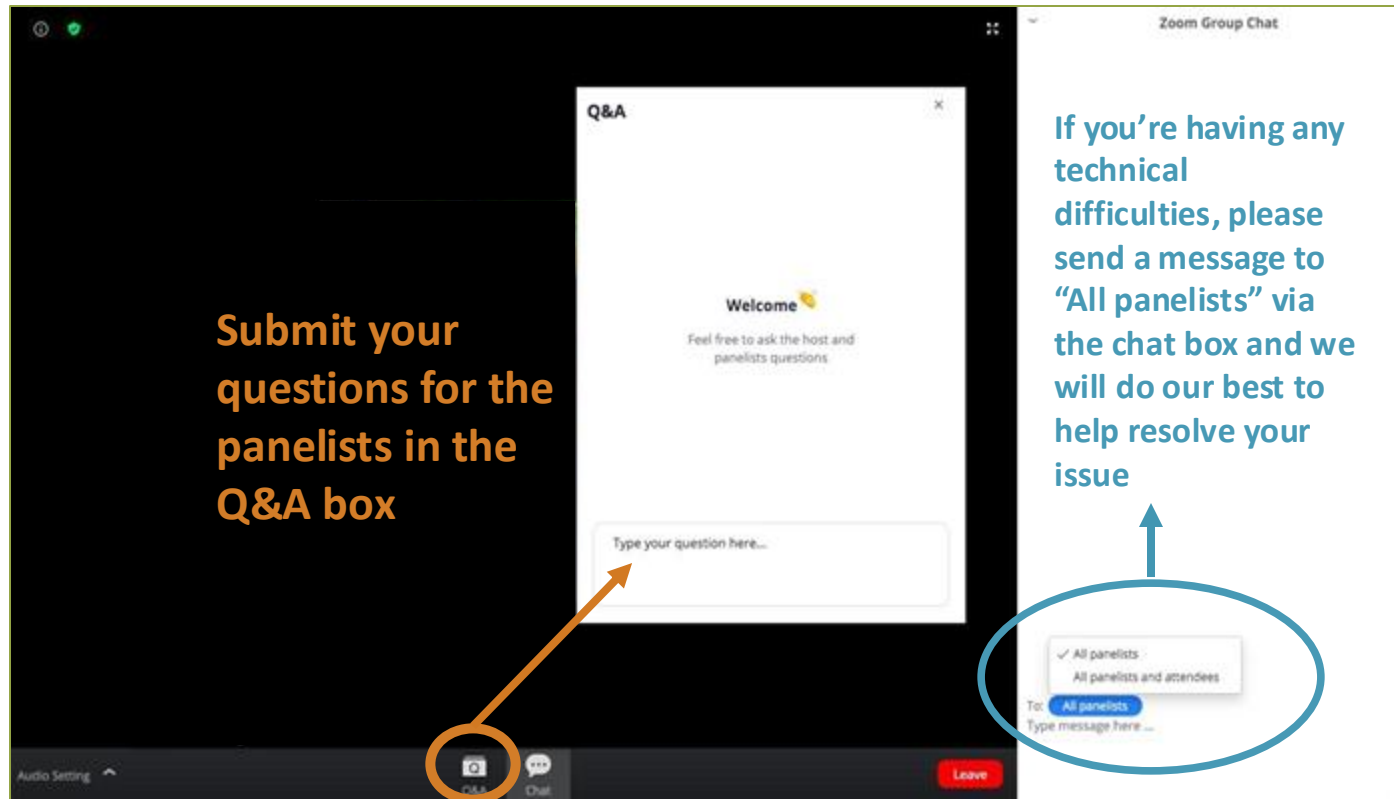
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The Food Systems for Nutrition Innovation Lab and the LASTING Project Present:

What Matters for Sustainable Diets? Results of a Global Expert Elicitation Across Environmental, Social, Health and Economic Domains

Moderator



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Zoom Webinar | Thursday, Dec 5th 2024 | 11:00-12:00 PM (ET)

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December 5, 2024

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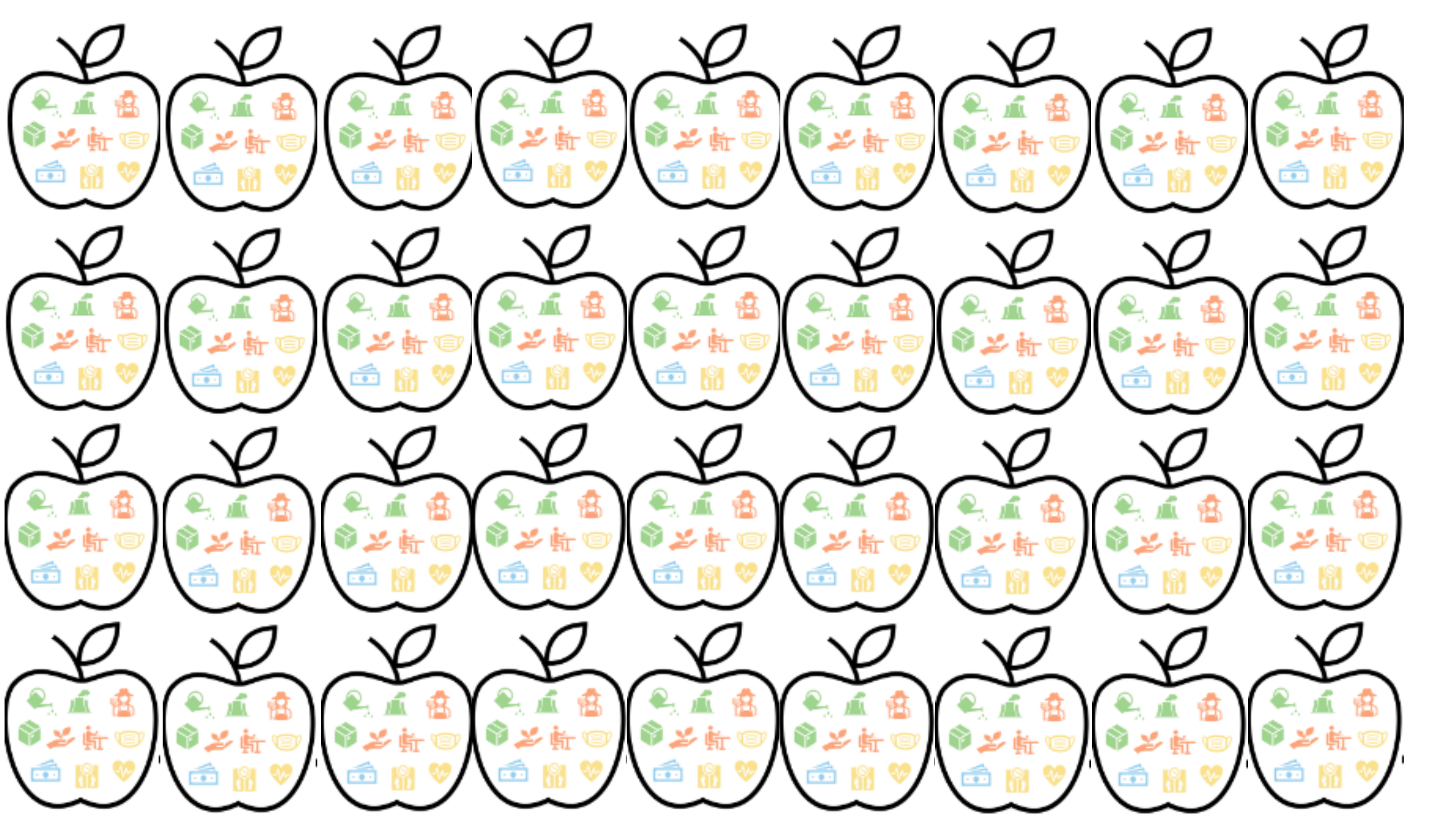
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Source: Minnesota Ag in the Classroom



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Diets account for **20% of premature disease-mediated mortality** worldwide (Afshin et al. 2019)

>3 billion people suffer from 1+ manifestations of poor nutrition: undernutrition, overweight/obesity, and/or micronutrient deficiencies (FAO et al. 2020)

Current U.S. diets linked to **preventable cancer, heart disease, stroke, and diabetes** outcomes (Zhang et al. 2019; Micha et al. 2017)

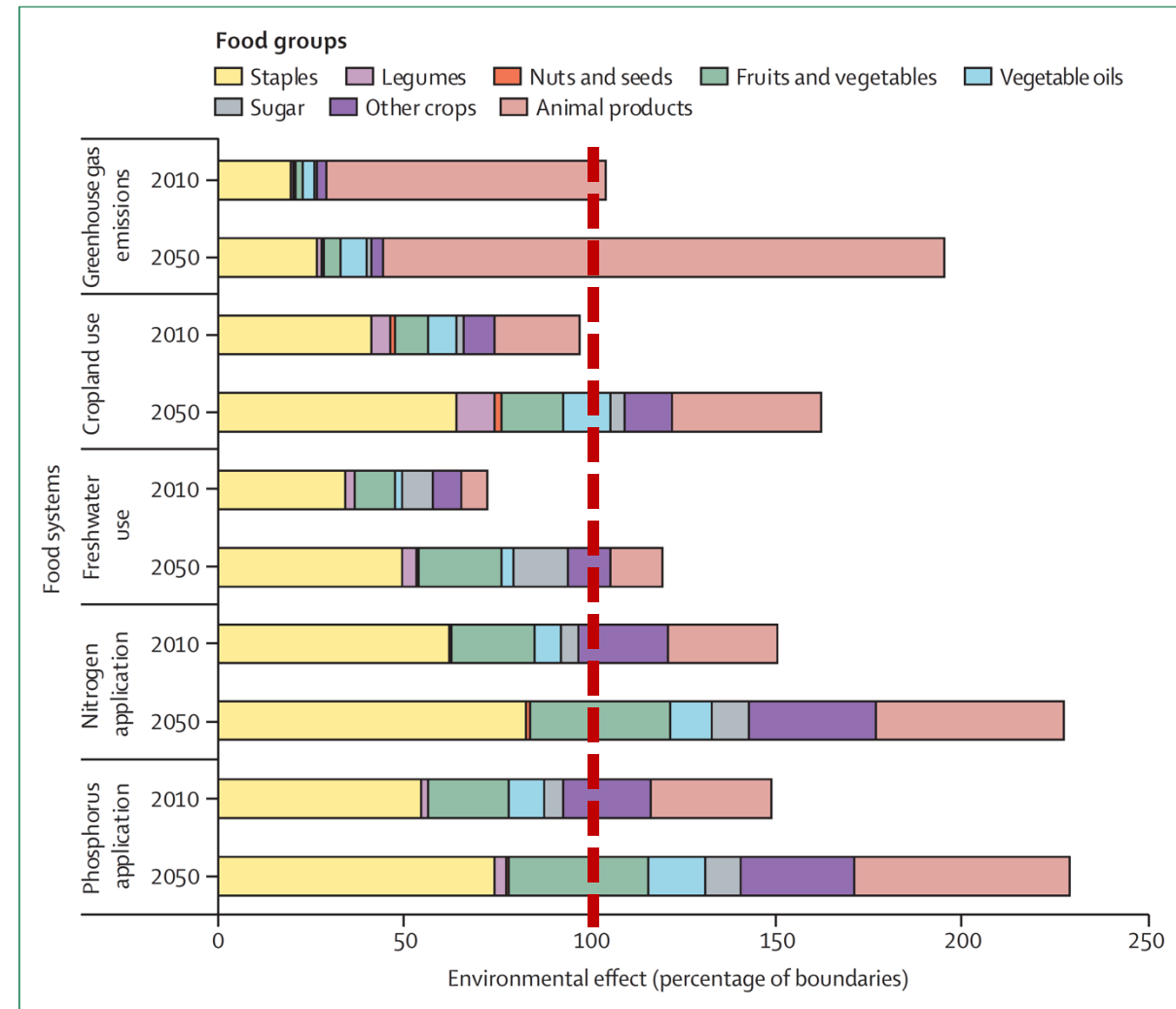


Figure 5: Environmental effects in 2010 and 2050 by food groups on various Earth systems based on business-as-usual projections for consumption and production

Source: Willet et al., 2019, *The Lancet*

SOCIAL AND ECONOMIC ASPECTS

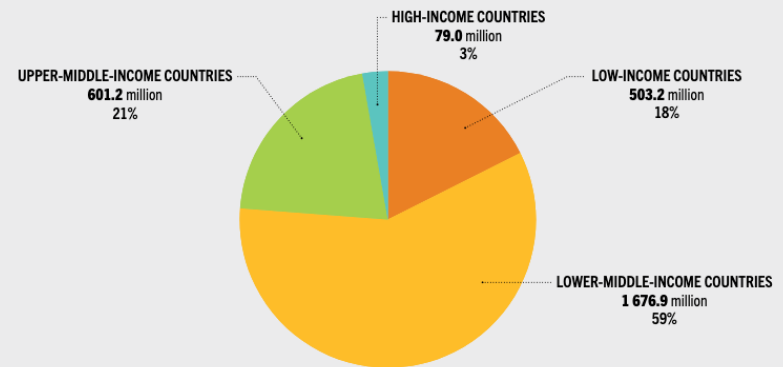
1.2B people employed in food systems globally (FAO 2023)

Agriculture, forestry, and fishing sector has one of the **highest rates of forced labor** (ILO)

High risk of forced labor in the US food system (Blackstone et al., 2023)

1/3 of global population **cannot afford** a healthy diet (FAO 2024)

FIGURE 9 THREE-QUARTERS OF THE PEOPLE WHO ARE UNABLE TO AFFORD A HEALTHY DIET LIVE IN LOW- AND LOWER-MIDDLE-INCOME COUNTRIES



NOTES: The global number of people unable to afford a healthy diet (NUA) estimate is obtained by multiplying the prevalence of unaffordability for each of the five world regions by the total population size in each region. Calculating the global NUA estimate as the sum of the NUA estimates of other country groupings, such as those based on income levels, should be avoided.

SOURCE: FAO. 2024. FAOSTAT: Cost and Affordability of a Healthy Diet (CoAHD). [Accessed on 24 July 2024]. www.fao.org/faostat/en/#data/CAHD. Licence: CC-BY-4.0.



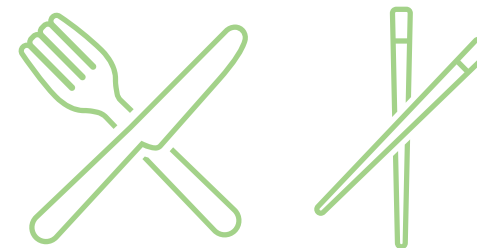
FOOD SYSTEMS MUST TRANSFORM



Improve
ecological
efficiency of
agriculture



Reduce food
waste and loss
along the
value chain



Shift dietary
patterns



Leading
A
Sustainability
Transition
In
Nutrition
Globally



Nicole Tichenor
Blackstone



Sean Cash



Patrick Webb



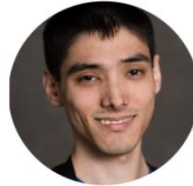
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Edgar Rodríguez-
Huerta



Amin Nikkhah



Zach Conrad



Bethany Jackson

OUR GOAL

Create evidence-based **recommendations, methods, and metrics** for integrated sustainability assessment of dietary patterns



DEFINING A SUSTAINABLE HEALTHY DIET

FAO defines “Sustainable Healthy Diets” as “dietary patterns that promote all dimensions of individuals’ **health** and wellbeing; have low **environmental** pressure and impact; are accessible, **affordable**, safe and **equitable**; and are **culturally acceptable**”

Citation: FAO and WHO. 2019. Sustainable healthy diets – Guiding principles. Rome

SCOPING REVIEW

Criteria:

- Published from Jan 2015 to 31 Dec 2021.
- Must consider dietary pattern links to 2 or more pillars.
- Must be analytical rather than conceptual.

Check for updates

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Measurement of diets that are healthy, environmentally sustainable, affordable, and equitable: A scoping review of metrics, findings, and research gaps

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Introduction: Research on the impacts of dietary patterns on human and planetary health is a rapidly growing field. A wide range of metrics, datasets, and analytical techniques has been used to explore the role of dietary choices/constraints in driving greenhouse gas (GHG) emissions, environmental degradation, health and disease outcomes, and the affordability of food baskets. Many argue that each domain is important, but few have tackled all simultaneously in analyzing diet-outcome relationships.

Methods: This paper reviews studies published between January 2015 and December 2021 (inclusive) that examined dietary patterns in relation to at least two of the following four thematic pillars: (i) planetary health, including, climate change, environmental quality, and natural resource impacts, (ii) human health and disease, (iii) economic outcomes, including diet cost/affordability, and (iv)

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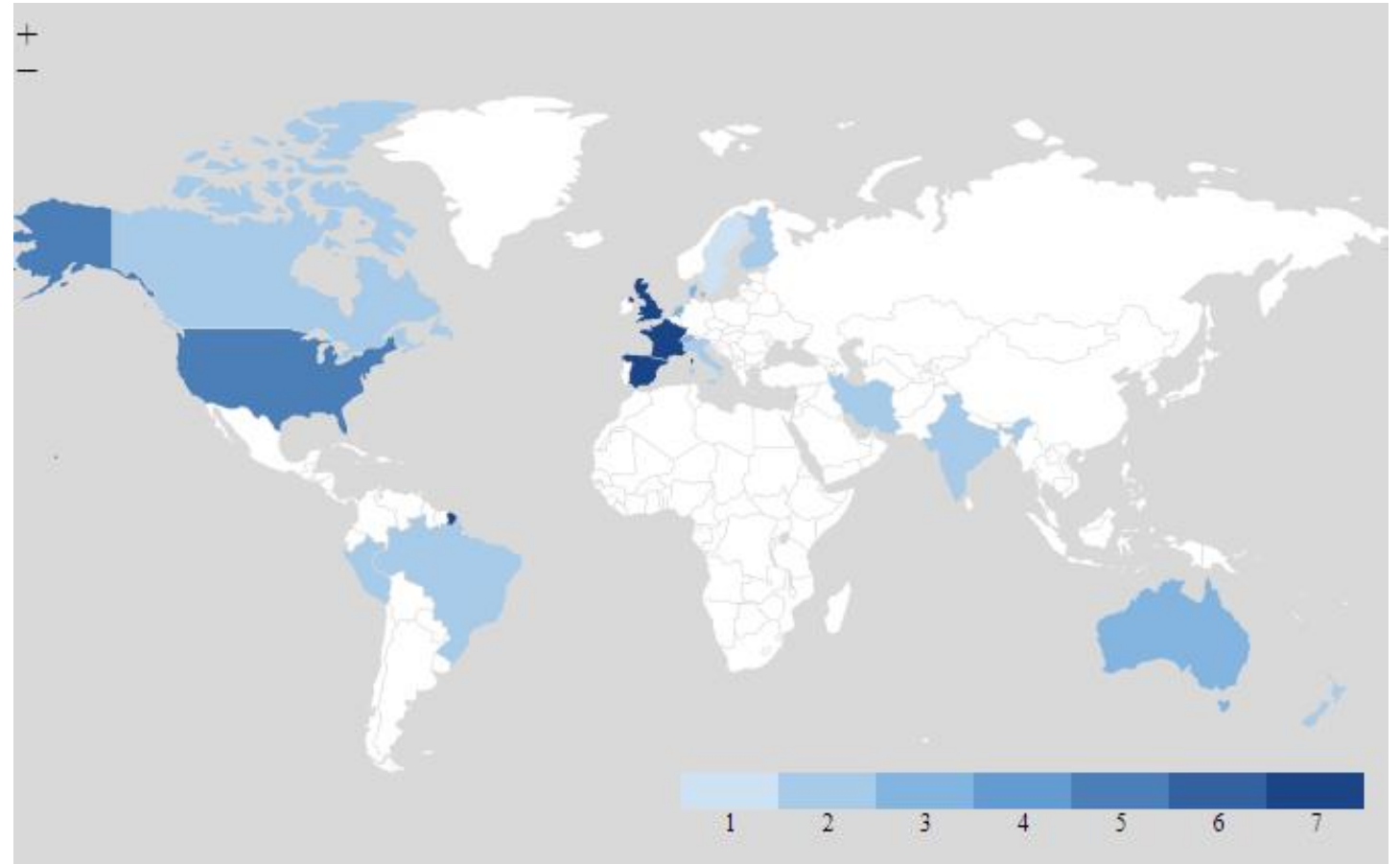
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PILLAR DEFINITIONS

- **Health:** Outcomes related to diseases or human wellbeing that are associated with meeting nutrient needs, supporting physiological and cognitive growth and development, and promoting wellness.
- **Environment:** The impacts on climate, ecosystems, and natural resources resulting from the production, distribution, consumption, and disposal of food commodities and products that underpin dietary patterns.
- **Social:** The underlying conditions within, and the impacts of food supply chains on, stakeholders who are directly or indirectly affected by food system functions. Stakeholder groups include workers, value chain actors, local communities, society, and children. While the wellbeing of people is most focused-on, the wellbeing of animals is also a concern.
- **Economic:** Outcomes related to consumers' affordability and access to desired foods, relative food prices, and the cost of policy actions, as well as the viability of the supply chains and institutions that support all food system functions.

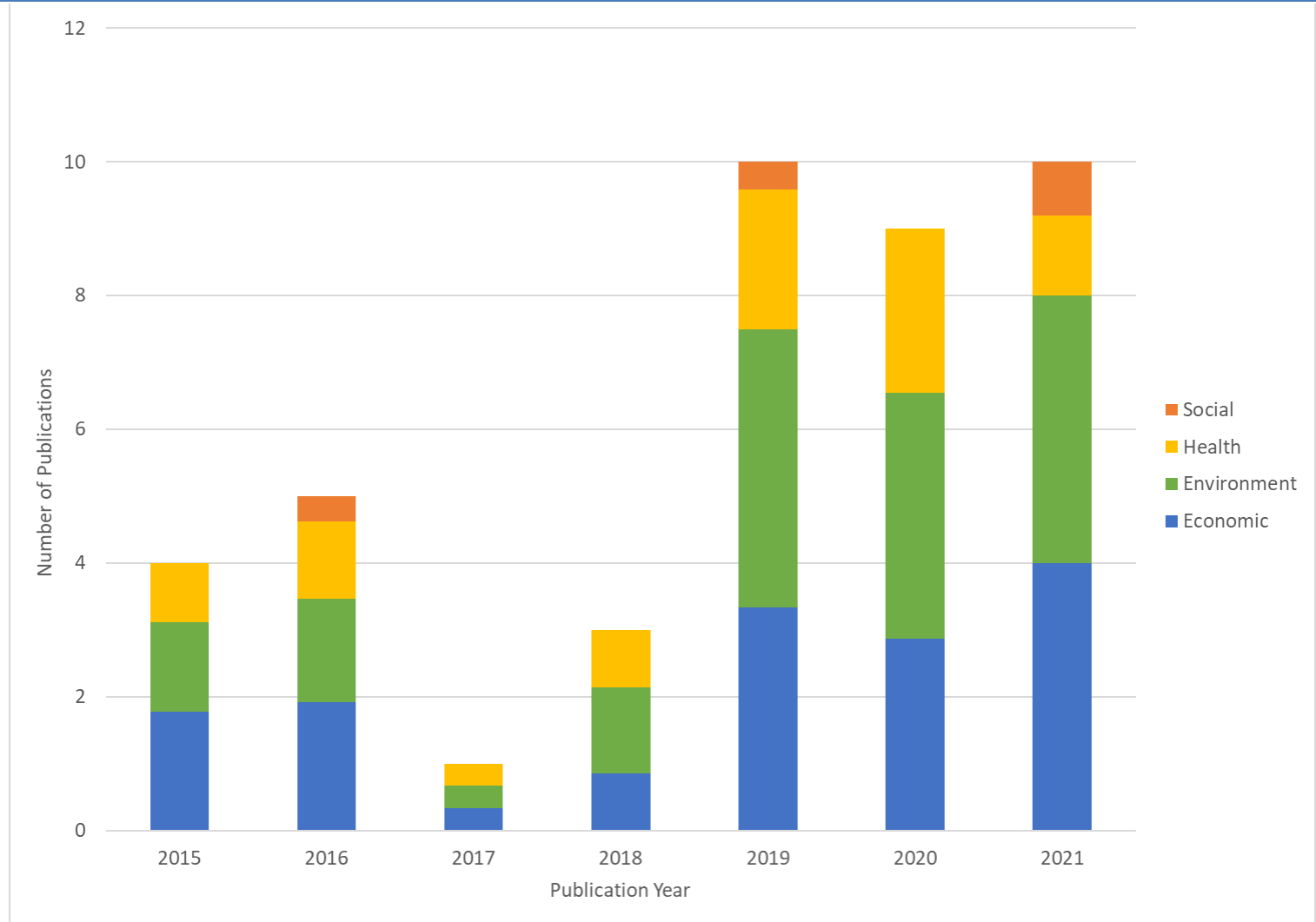
SCOPING REVIEW RESULTS

Geographic distribution of included papers (Webb et al., 2023)



SCOPING REVIEW RESULTS

Frequency count of included pillars, by publication year (Webb et al., 2023)



SCOPING REVIEW RESULTS

Outcome measures by pillar (Webb et al., 2023)



- A *growing number* of analyses integrate interactions across 2 pillars,
 - a *few* tackle 3 pillars,
 - and **none include all 4 pillars**

EXPERT ELICITATION: RESEARCH QUESTIONS

- What are the necessary outcomes to consider when analyzing the impact of dietary patterns from a multidimensional sustainability perspective?
- What are the perceived **importance** and **prioritization** of these outcomes among experts?

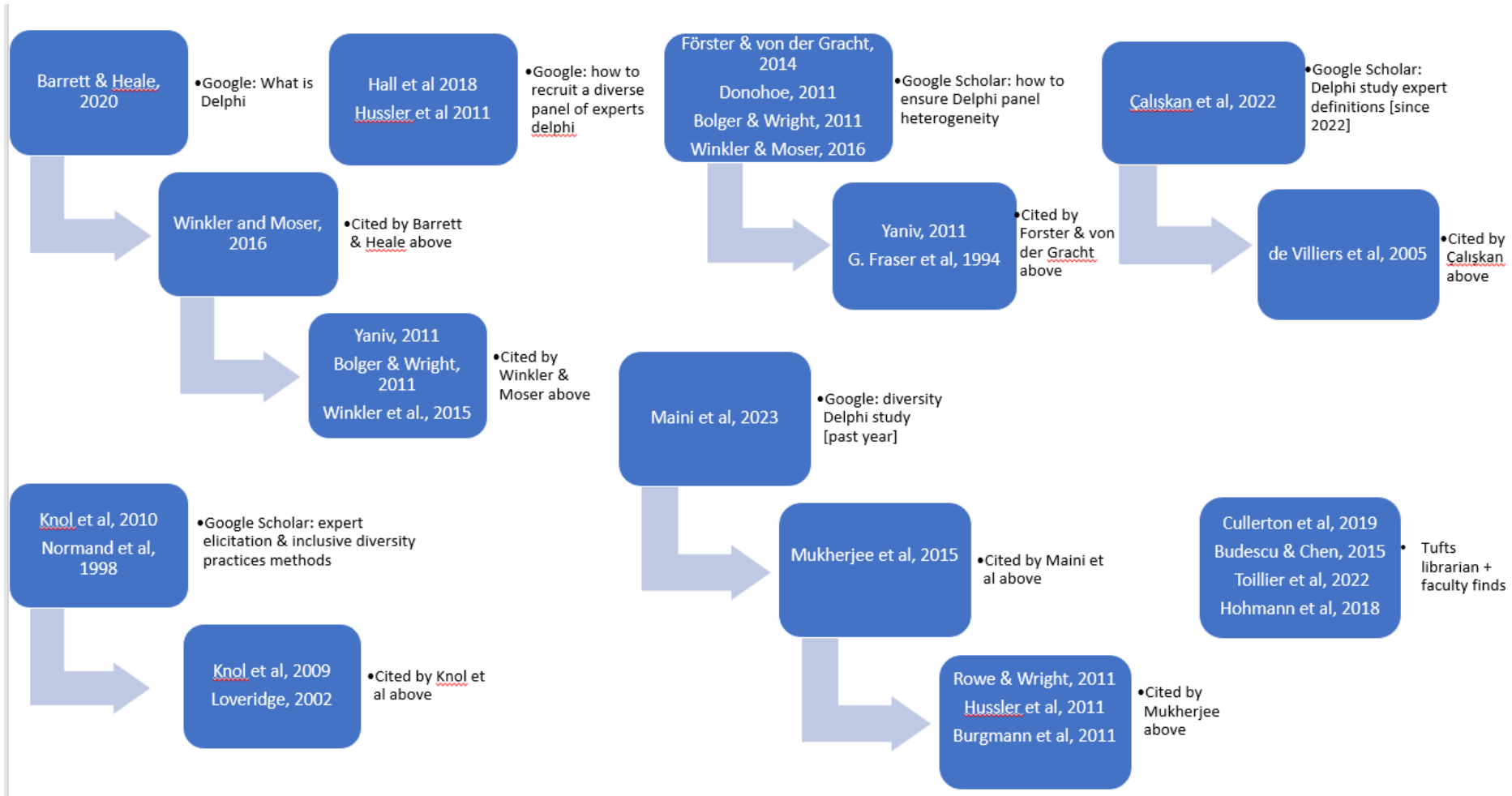
EXPERT ELICITATION: GENERAL APPROACH

- Utilize a modified **Delphi approach** to elicit expert opinions
- Invite authors from our previous scoping review
- Our review found lack of representation from LMICs and limited coverage of social and health pillars
- Recruit additional experts selected to increase inclusivity and representation of expertise and geographic region



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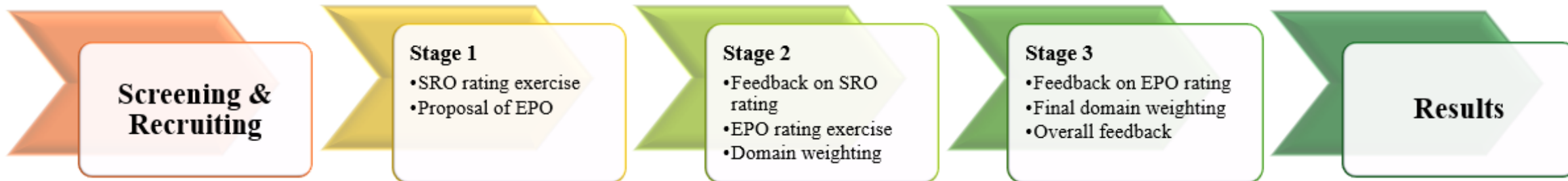
SELECTION CRITERIA FOR ADDITIONAL EXPERTS

(at least one of the following, as self-identified in a screening questionnaire)

1. Evidence of professional productivity in terms of participation in academic or multi-lateral symposia relevant to food systems and/or sustainability (e.g., ANH, COP27)
2. At least five years current or previous experience in the public or governmental sector related to sustainability of dietary patterns and one of the four pillars
3. At least five years current or previous experience in the private sector related to sustainability of dietary patterns and one of the four pillars
4. At least five years teaching or extension portfolio that includes courses dedicated to sustainability of dietary patterns aligned with one of the four pillars
5. Evidence of indigenous knowledge as demonstrated in multi-lateral convenings, or at least five years of leadership experience with an indigenous group



DESIGN AND DATA COLLECTION



EXAMPLE: RATING EXERCISE

With regard to the **health** pillar, how important are the following outcomes in a comprehensive assessment of the sustainability of dietary patterns?

Consider on a scale from 1 as not important at all to 5 as extremely important.

	Not important at all (1)	Somewhat unimportant	Neutral	Somewhat important	Extremely important (5)	Unable to rate
Exposure to food contaminants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

HEALTH OUTCOMES

Abdominal obesity	Arrhythmia	Coronary Artery Disease	Gall Bladder Cancer	Kidney stones (nephrolithiasis)	Osteoporosis	Stress
All cancers (total)	Arthritis	Death due to all causes	Gestational diabetes	Liver cancer	Overnutrition (malnutrition)	Stroke
All cardiovascular diseases (total)	Asthma	Dental cavities	Gout	Liver Disease	Pancreas Cancer	Stunting
All cerebrovascular diseases (total)	Blood cancer (leukemia)	Diarrhea	Heart Failure	Lymphatic cancer	Pericardial diseases	Thyroid cancer
All neurological disorders (total)	Brain tumors	Diet quality	Heart valve diseases	Maternal nutrition	Prostate cancer	Type 2 Diabetes
All non-CVD vascular diseases (total)	Breast Cancer	Disability-adjusted life year (DALY)	Human immunodeficiency virus (HIV)	Mental health (overall)	Pulmonary Embolism	Undernourishment (hunger)
All thyroid disorders (total)	Bronchus and Lung Cancer	Endometrium Cancer	Hyperlipidemia (high cholesterol)	Metabolic syndrome	Quality of life	Undernutrition (malnutrition)
Alzheimer's disease	Cardiomyopathy (heart muscle disease)	Esophageal cancer	Hypertension (high blood pressure)	Micronutrient deficiencies (overall)	Quality-adjusted life year (QALY)	Wasting
Anemia	Case-specific mortality for chronic diseases	Exposure to food contaminants	Hypertensive Heart Disease	Mood	Reproductive disorders	Wellbeing
Antimicrobial resistance	Cervical cancer	Eye and ear disorders	Infant mortality	Myocardial infarction (heart attack)	Rheumatic Heart Disease	Years of life gained or saved
Anxiety	Chronic Kidney Disease	Food allergies	Irritable bowel syndrome	Nonalcoholic fatty liver disease	Skin cancer	Zoonotic diseases
Aortic Aneurysm	Colorectal Cancer	Food poisoning	Kidney Cancer	Obesity	Stomach Cancer	

ENVIRONMENT OUTCOMES

Animal biodiversity	Exposure to ionizing radiation	Land use / occupation	Non-renewable fossil energy use	Respiratory inorganics
Aquatic ecotoxicity	Fish stock depletion	Land use driven biodiversity loss	Ozone layer depletion	Respiratory organics
Blue water / freshwater use	Frequency of extreme events	Local climate effects driven by land use change	Phosphorus footprint	Soil health
Carbon sequestration potential	Freshwater eutrophication	Marine acidification	Phosphorus use / application	Terrestrial acidification
Changes in growing season (degree-days)	Global warming potential	Marine eutrophication	Photochemical ozone effect on vegetation	Terrestrial ecotoxicity
Climate variability*	Grassland use / occupation	Marine food web alterations	Plant biodiversity	Terrestrial eutrophication
Cropland biodiversity footprint	Groundwater depletion	Microplastic pollution	Pollinator abundance	Water footprint (Blue, Green, and Grey)
Cropland use / occupation	Habitat fragmentation	Nanoplastic pollution	Presence of carcinogenic toxins	Water scarcity
Emissions of individual greenhouse gasses	Indirect land use change	Nature use / occupation	Presence of non-carcinogenic toxins	
Energy use/primary energy use	Invasive species	Nitrogen footprint	Renewable energy use	
Exposure to diet-related pesticides	Land degradation	Nitrogen use / application	Resilience	

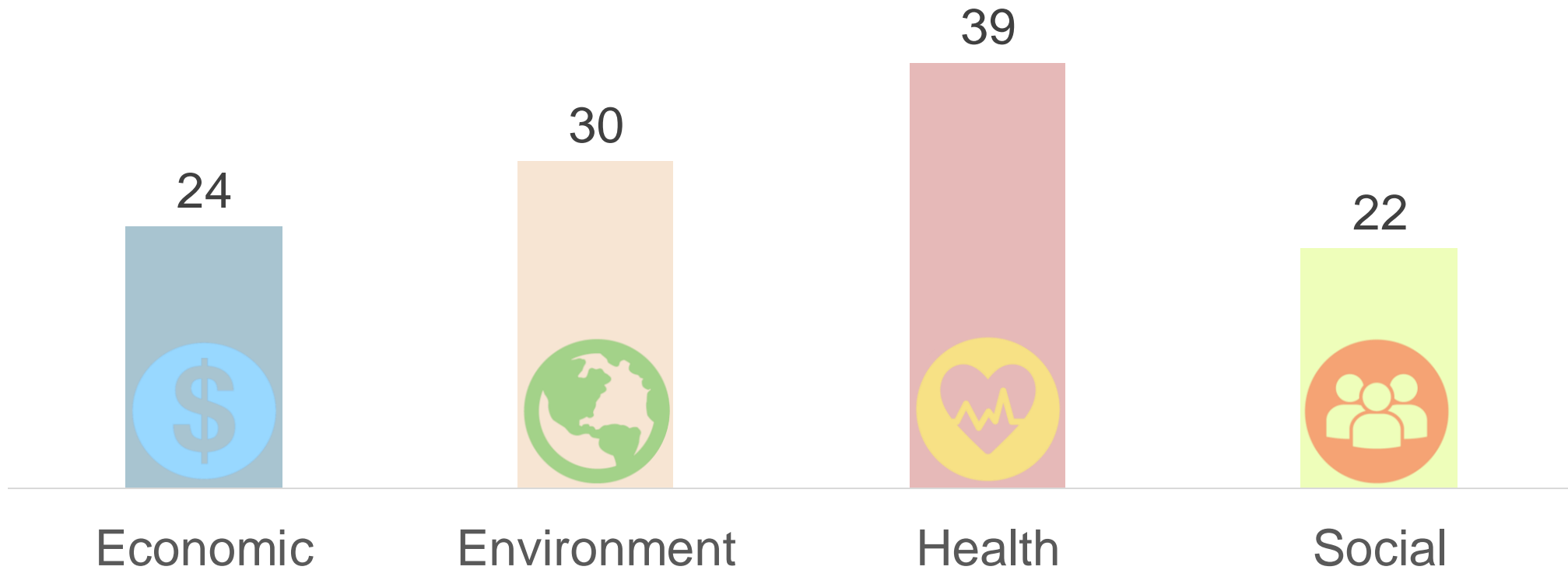
ECONOMIC OUTCOMES

Average individual wealth (per capita GDP)	Food expenditure (total)	Nutrition specialist / nutritionists visit costs
Cost of environmental-related diseases	Food expenditure as a share of income	Policy implementation costs
Cost of food losses	Food inflation relative to overall inflation	Productivity cost
Cost of food production	Food supply chain cost	Productivity losses
Cost of Illness	Gross domestic product (GDP)	Revenue generated from a policy intervention
Cost of nutrition-related diseases	Gross value added (GVA)	Sectoral employment
Cost of preventative healthcare programs	Healthcare Cost / Savings	Total unemployment rate
Food assistance programs	Healthy diet cost	Variation in food price / cost

SOCIAL OUTCOMES

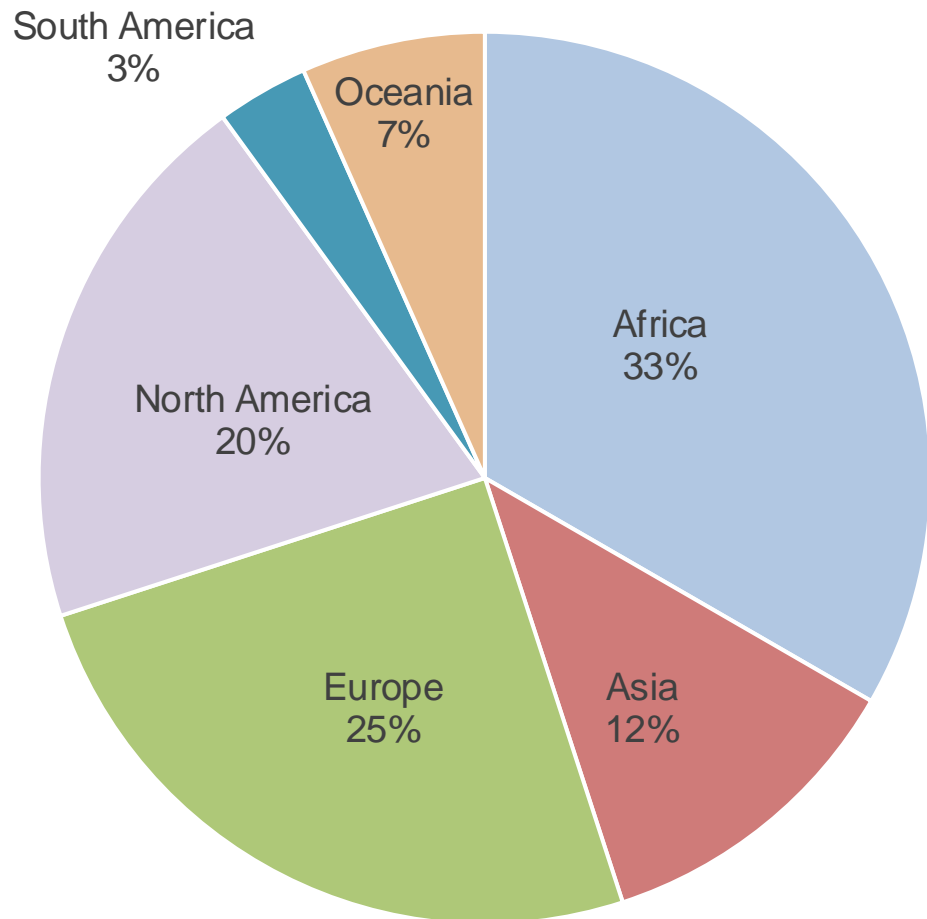
Access to immaterial resources (e.g., education, community services)*	Delocalization and migration*	Gender equality*	Safe work environment (e.g., occupational injury)*
Access to material resources (e.g., land, water, minerals, infrastructure)*	Departure from current or observed diets	Governance risks	Secure living conditions*
Adequate earnings and productive work (e.g., piece rate work, Manufacturing Wage Index)*	Desirability	Native food security*	Social dialogue and workers' and employers' representation (e.g., trade unions, collective bargaining)*
Combining work and family life (e.g., parental leave, workplace protections for pregnant people, etc.)*	Employment opportunities (e.g., unemployment rate, labour force participation rate)*	Prevention and mitigation of armed conflicts*	Social security (e.g., paid sick leave, paid vacation time, etc.)*
Community engagement*	Equal opportunity and treatment in employment (e.g., gender wage gap, discrimination by race, ethnicity, migrant status, etc.)*	Public engagement*	Stability and security of work (e.g., precarious employment rate, job tenure)*
Community risks	Ethical treatment of animals*	Respect of indigenous rights*	Transparency to consumers*
Convenience*	Food availability	Risks to human rights	Wealth distribution*
Cultural heritage*	Food security*	Risks to labor rights and decent work	Work that should be abolished (e.g., forced labour, child labor)*
Cultural relevance*	Food sovereignty*	Risks to workplace safety	
Decent hours (e.g., employment in excessive working time, paid annual leave)*	Freedom from stigma*	Safe living conditions*	

REPRESENTATION PER DOMAIN





REPRESENTATION BY CONTINENT



What continental region do you most identify with personally?

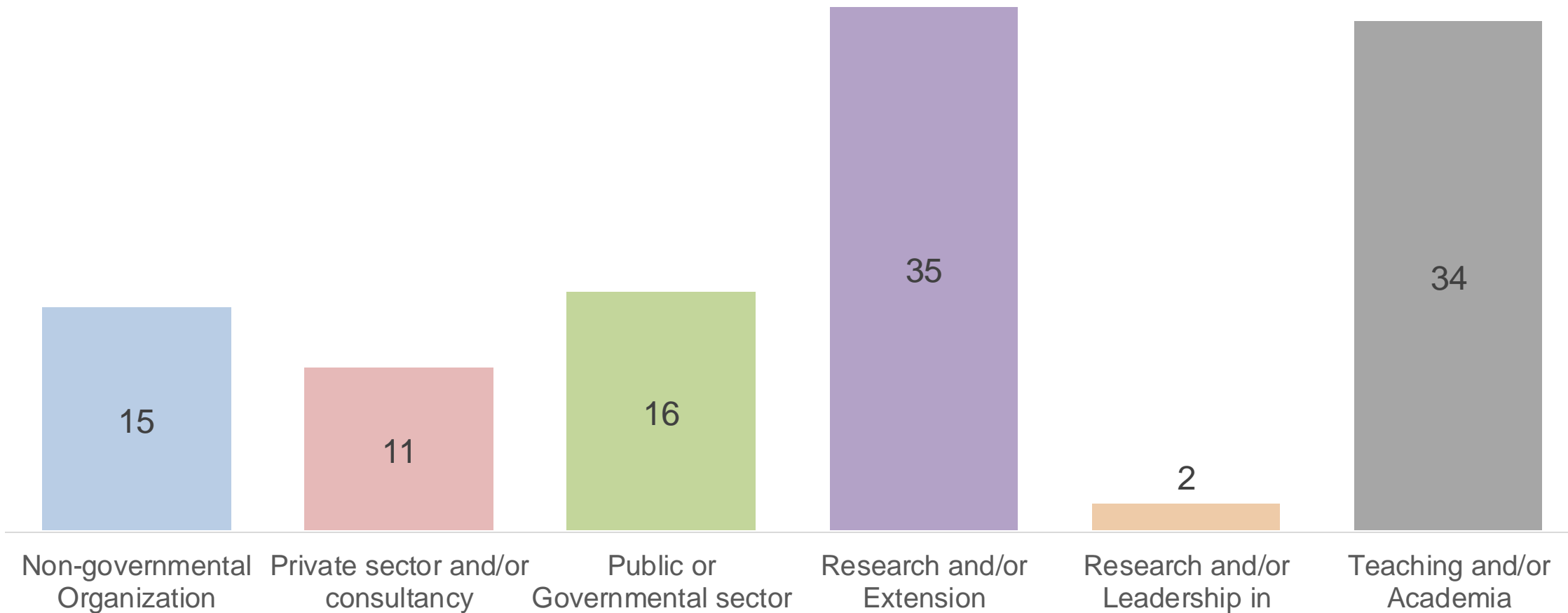




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REPRESENTATION BY AREA OF WORK



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TOTAL OUTCOMES

Domain	Systematic Review Outcomes (SRO)	Expert Proposed Outcomes (EPO)	Total Outcomes SRO + EPO
Environment	31	21	52
Health	27	56	83
Economic	14	10	24
Social	8	30	38



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OUTCOMES RESULTS



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HEALTH

Top Outcomes



Health Pillar	Mean	Variance	% Change	ICC
Micronutrient deficiency (overall)	4.90	0.15	+5.82%	0.88
Undernourishment (hunger)	4.87	0.27	+3.71%	
Undernutrition (malnutrition)	4.87	0.27	+4.74%	
Diet quality	4.87	0.12	+5.40%	
Maternal nutrition	4.82	0.15	+5.35%	



ENVIRONMENT

Top Outcomes

Environment Pillar	Mean	Variance	% Change	ICC
Soil health	4.86	0.12	+1.95%	0.86
Land use-driven biodiversity loss	4.83	0.20	+2.11%	
Water scarcity	4.82	0.48	+0.60%	
Resilience	4.81	0.24	+2.60%	
Cropland use / occupation	4.76	0.19	+0.83%	



ECONOMIC Top Outcomes

Economic Domain	Mean	Variance	% Change	ICC
Food expenditure as a share of income	4.81	0.23	+1.20%	
Healthy diet cost	4.70	0.37	+2.80%	
Healthcare cost / savings	4.59	0.25	+0.03%	0.90
Cost of food production	4.50	0.35	+2.44%	
Cost of nutrition-related diseases	4.50	0.26	+1.61%	

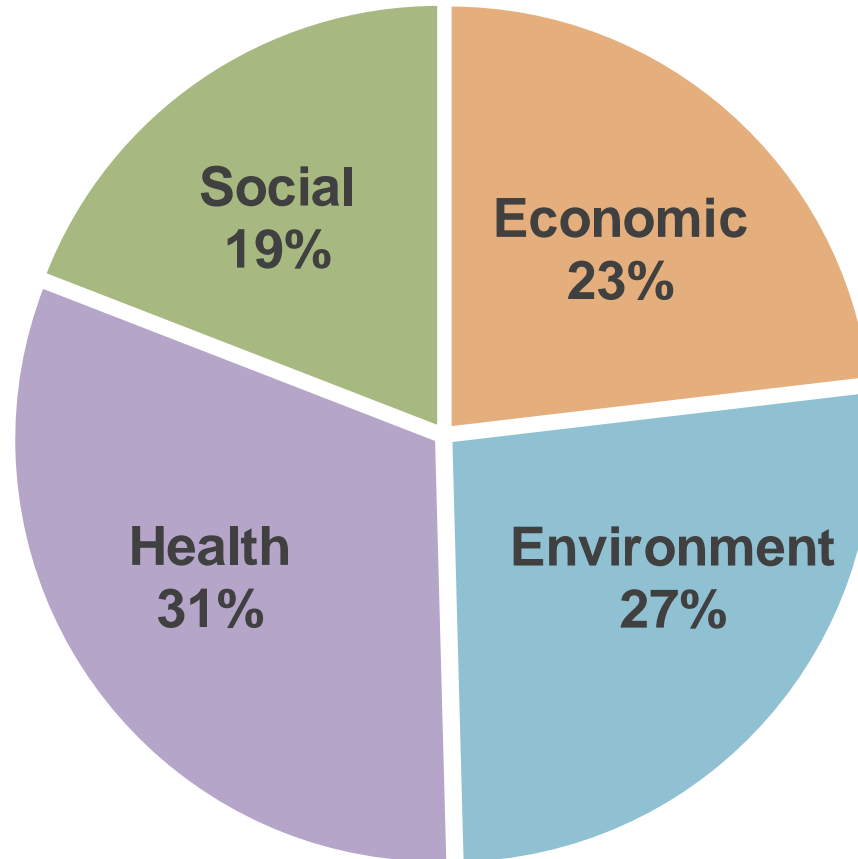
SOCIAL Top Outcomes



Health Pillar	Mean	Variance	% Change	ICC
Food availability	4.92	0.08	+1.12%	
Food security	4.81	0.16	+1.04%	
Access to material resources	4.59	0.35	+1.16%	0.74
Access to immaterial resources	4.45	0.35	-1.01%	
Adequate earnings and productive work	4.45	0.35	+1.59%	



DOMAIN WEIGHT RESULTS

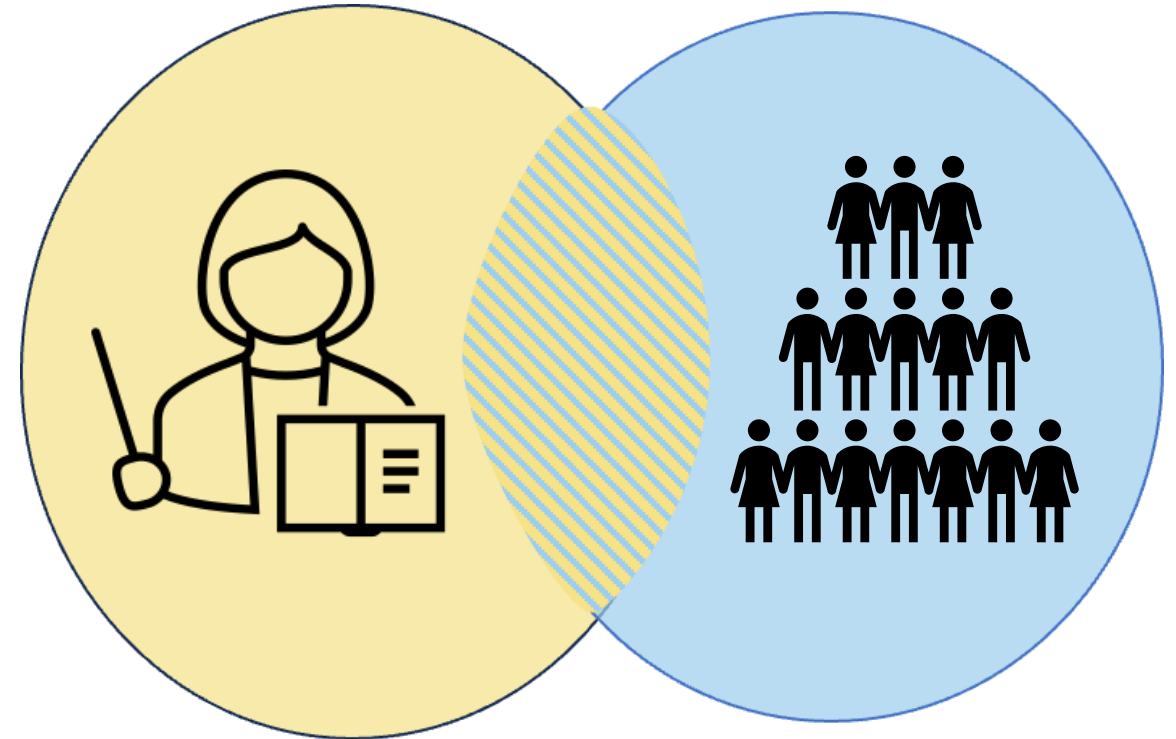


IN CONCLUSION

- The **global representation** of the panel of experts, who have varied areas of work in different domains of sustainability, is key to capturing the importance of the **diverse outcomes** presented and proposed.
- Sustainability challenges require nuanced approaches that reflect the **relative importance** of the different domains (environmental, social, economic, and health), so applying **weights** based on expert insights or contextual factors would provide a more accurate analysis and would help to prioritize actions.
- The **Delphi technique** revealed expert consensus on prioritizing environmental and health outcomes while emphasizing the importance of equity, cultural considerations (social outcomes), food prices, and the cost of healthy diets (economic outcomes).

FUTURE RESEARCH Consumer-Facing Research

Are experts and consumers showing **alignment in priorities** regarding the importance of the outcomes of dietary patterns?



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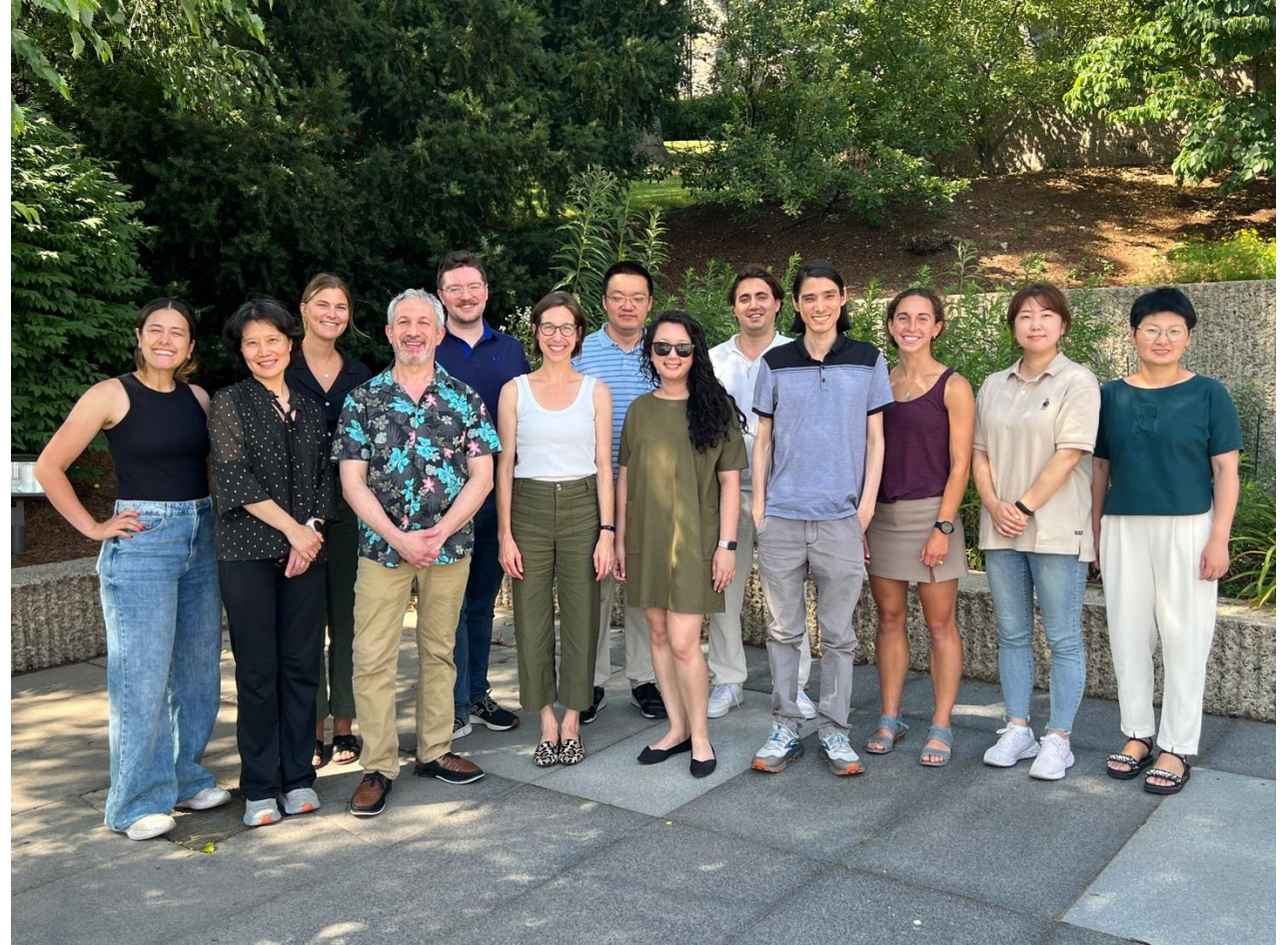
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THANK YOU!

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Q&A



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