



National Institutes of Health  
Office of Nutrition Research

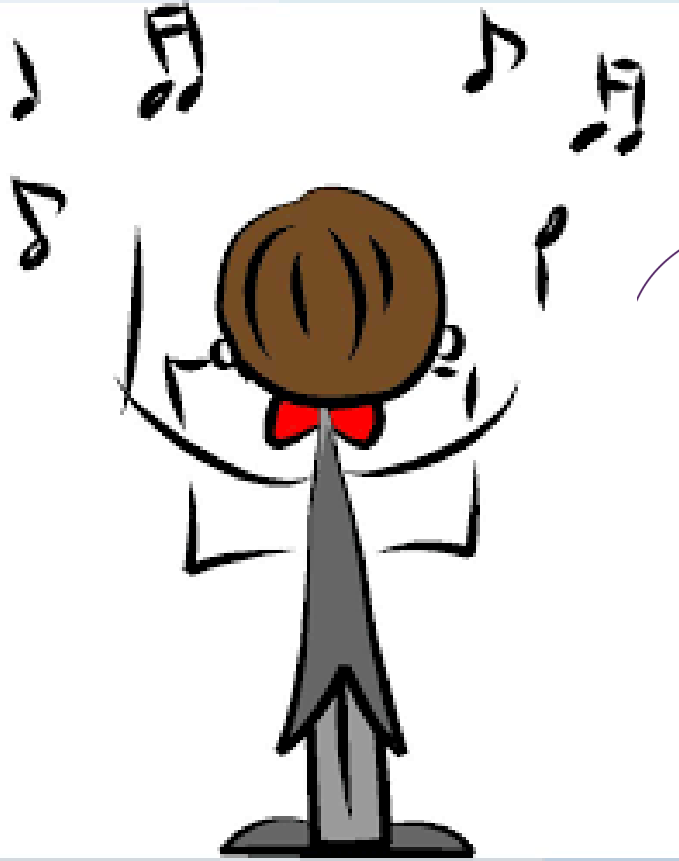
# The Office of Nutrition Research

## *Nutrition Is Who We Are!*

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Director, Office of Nutrition Research (ONR)  
Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI)  
National Institutes of Health (NIH)  
United States of America (USA)



# So, who are we?



Samantha Adas



Teniola Akingbade



Kimberly Barch



Jennifer Gorman Wright



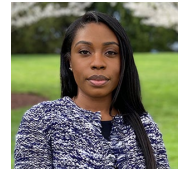
Nicholas Jury



Holly Nicastro



Daniel Raiten



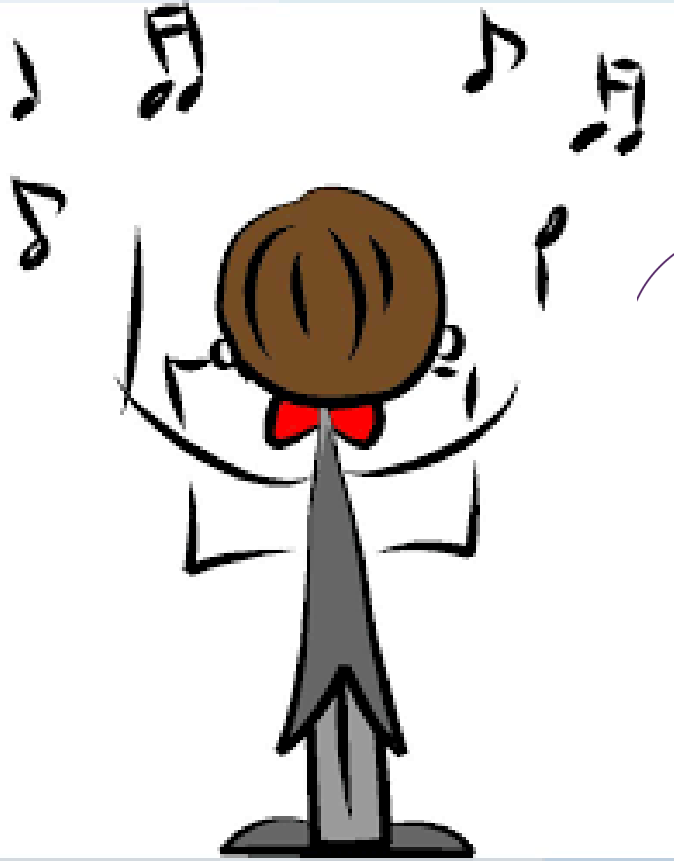
Krista Zanetti





# So, who are we?

You'll be hearing from Holly and Dan next (and it's worth the wait! 😊)



Samantha Adas



Teniola Akingbade



Kimberly Barch



Jennifer Gorman Wright



Nicholas Jury



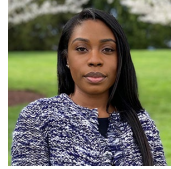
Holly Nicastro



Daniel Raiten

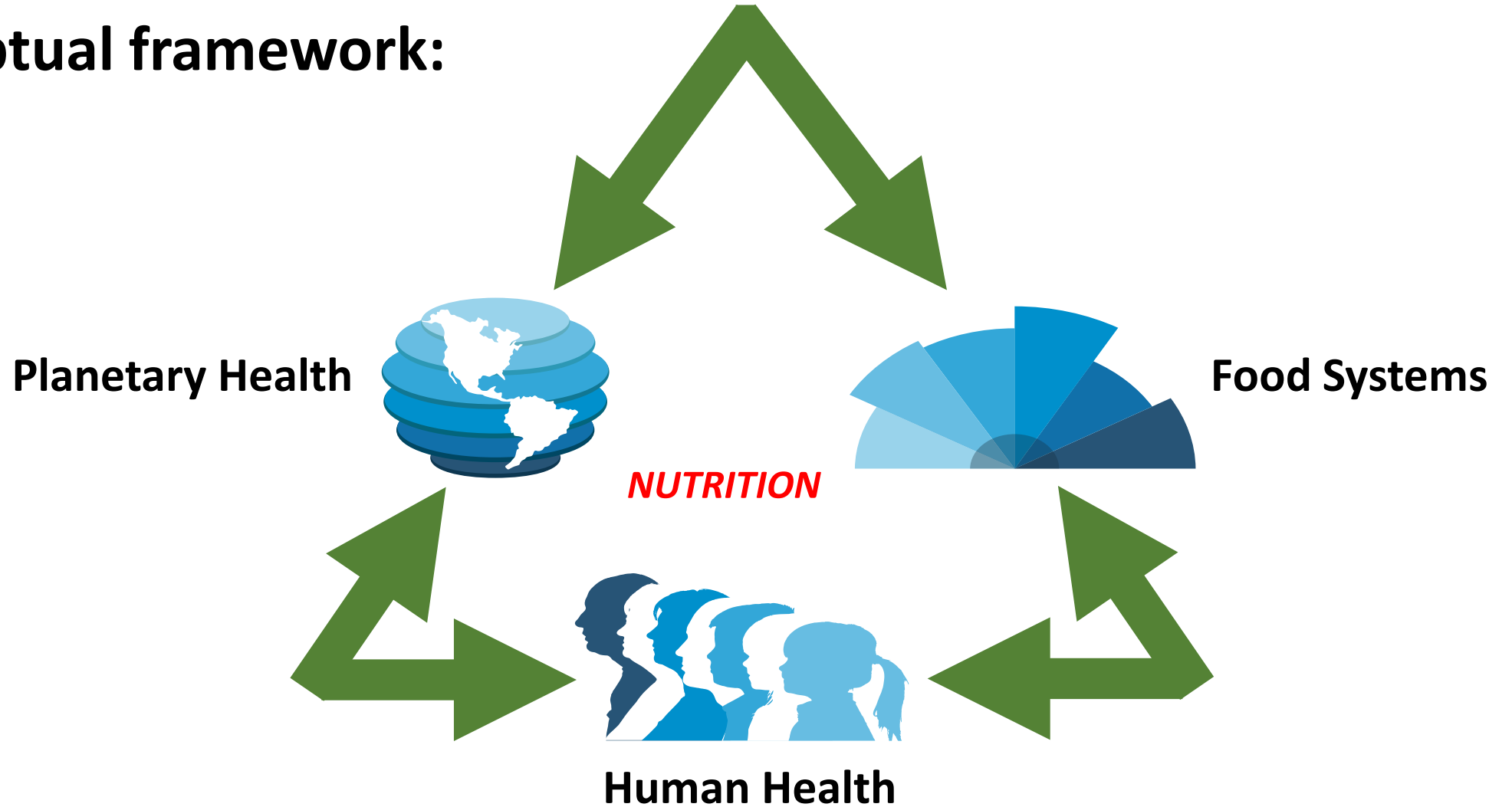


Krista Zanetti





# Our conceptual framework:





## Why do we care so much? So What?

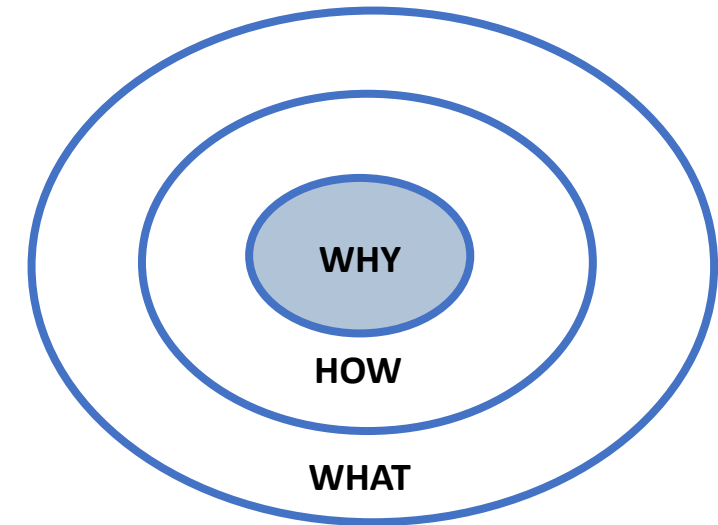
- The US and the whole world are facing an urgent nutrition-related health crisis
- In the US specifically, suboptimal nutrition is threatening our public health, economy, and national security, and is estimated to lead to the death of ~15,000 Americans each week
- The yearly combined health care spending and lost productivity from suboptimal diets costs the US economy >\$1.1 trillion
- Suboptimal diets are responsible for more deaths globally than any other risk factor – including air pollution, tobacco smoking, and high blood pressure
- As many Americans die each year from diet-related illnesses as died during the entire American Civil War and World War II combined



## Our “why”:

To lead the NIH (and the federal government) in stimulating research to address key elements of the domestic and global nutrition enterprise so that there is an evidence-base to support the implementation of context-specific, equitable, culturally appropriate, resilient, and sustainable solutions addressing priority diet, nutrition, and health challenges

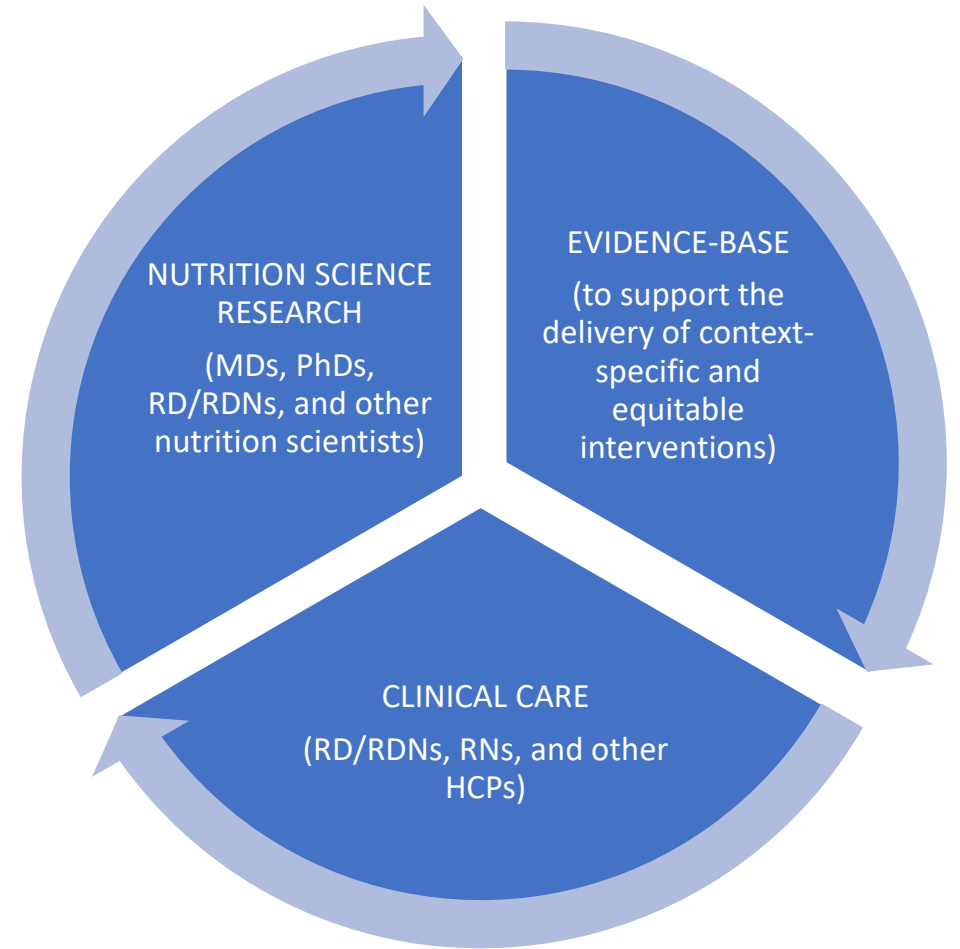
### *The Golden Circle*





## Our goals:

- ONR is committed to addressing priority issues in public health and nutrition and to the concept of translational research and the development of new and evidence-informed assessment methodologies and interventions to lead and move biomedical science and discovery in all areas of nutrition
- ONR supports the delivery of evidence-informed, equitable, context-specific, culturally-appropriate, resilient, and sustainable solutions to inform programs, policies, and practices to address priority diet, nutrition, and health challenges in the US and globally





**National Institutes of Health**  
*Office of Nutrition Research*

**And now, to Dan**



The NIH logo consists of the letters "NIH" in a bold, white, sans-serif font, positioned to the left of a blue chevron shape that points to the right. The chevron is composed of two parallel lines that meet at a point on the right side.

**NIH**

**National Institutes of Health**  
*Turning Discovery Into Health*

**Addressing complexity in a complex world**

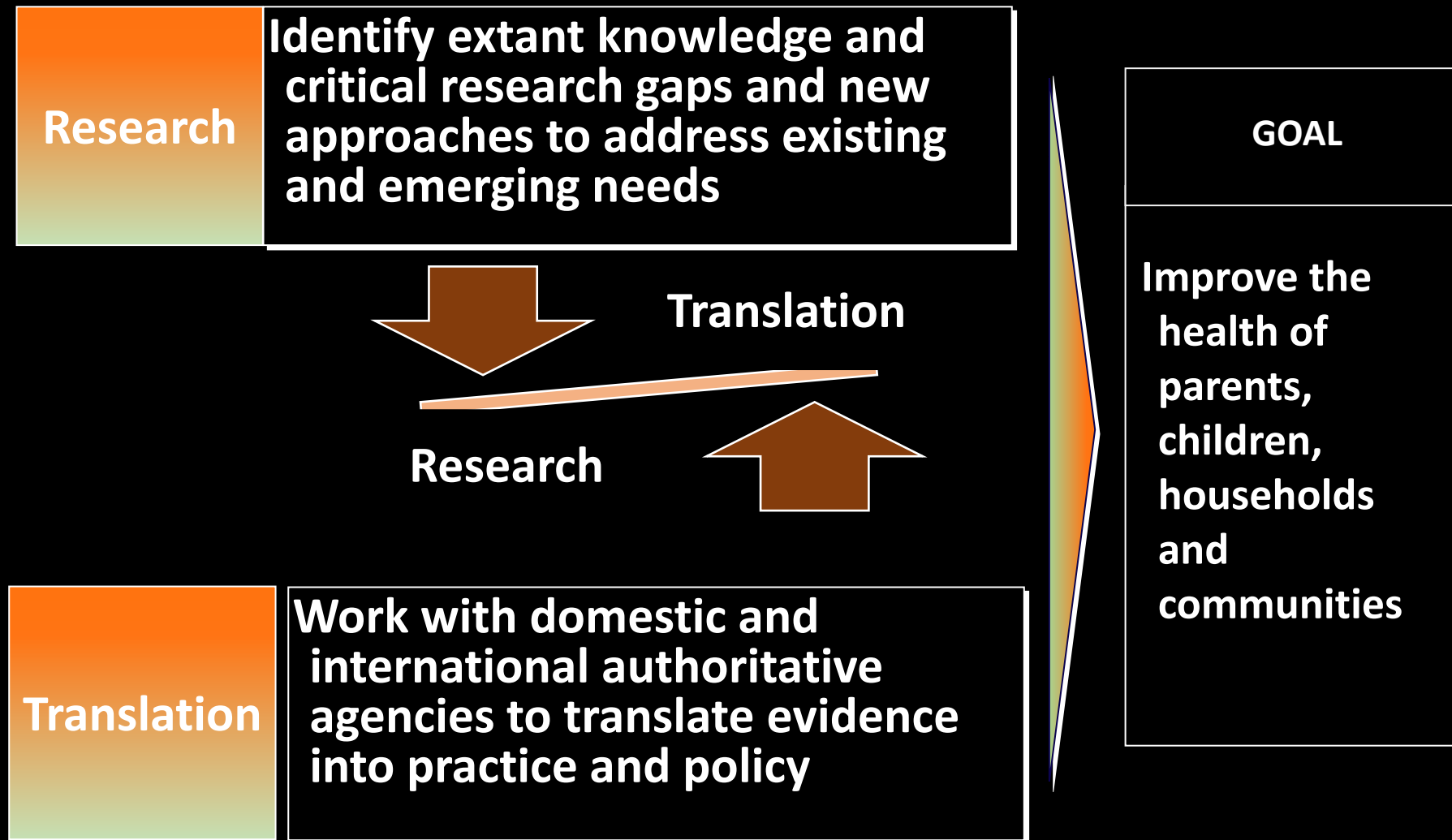
**Approaches to understanding the  
Intersection of Climate/Environmental Change  
(CEC), food systems, diet, nutrition and health**

Daniel J. Raiten, PhD, FASN  
NIH Office of Nutrition Research

# Disclosures

No conflicts to disclose

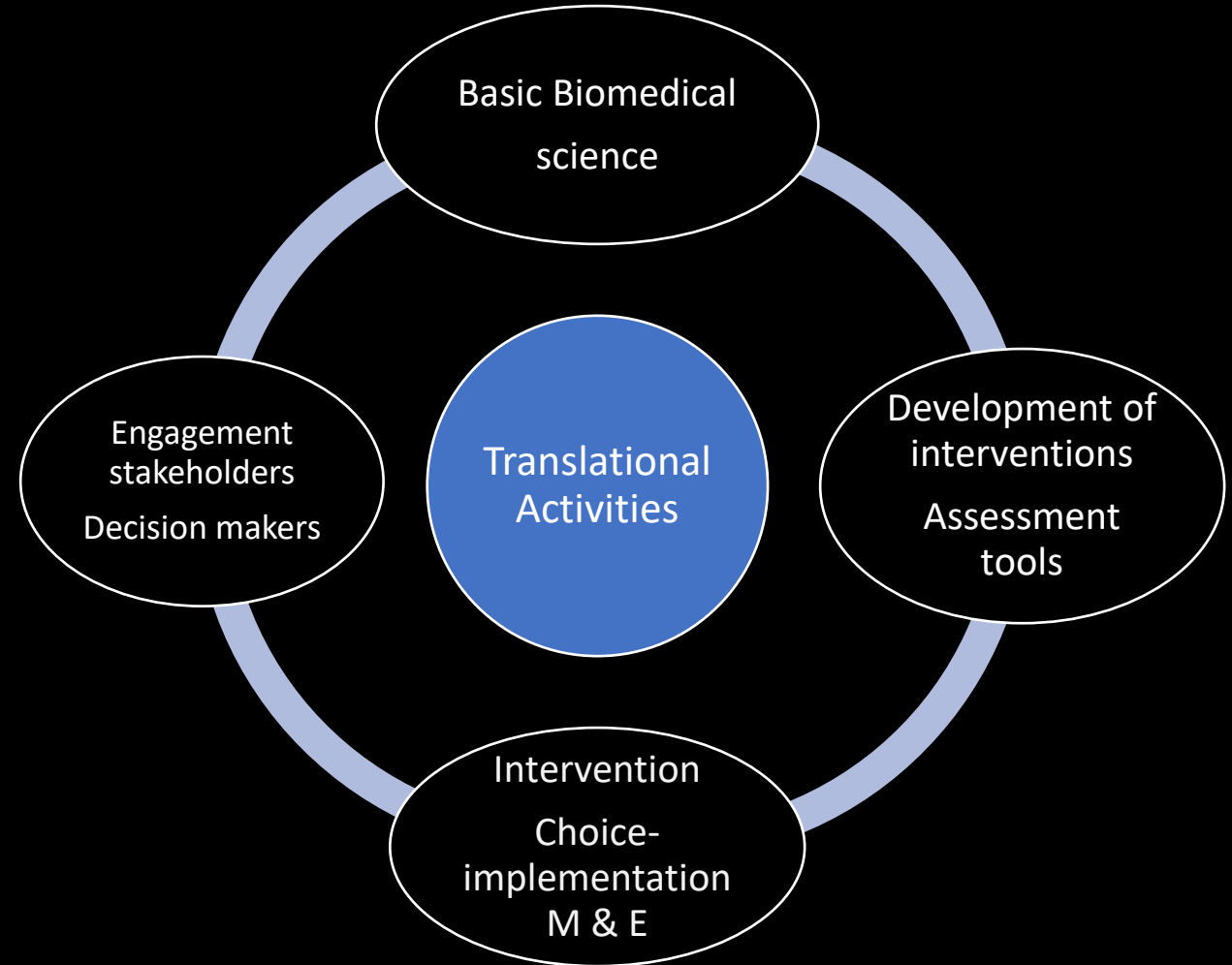
# An approach to addressing the role of nutrition in public health



# The translational continuum: Diet and Health

**The translational science spectrum represents each stage of research along the path from the biological basis of health and disease to interventions that improve the health of individuals and the public.**

**The spectrum is not linear or unidirectional; each stage builds upon and informs the others.  
(NIH/NCATS)**



# Core Principles and Drivers of Nutrition Research

## The core target: Nutritional Status

Nutritional status is the operational measure of the adequacy of the diet to support health and is the result of a series of genetic, behavioral, physiological, and metabolic processes involved in acquiring, and utilizing dietary substances/nutrients required to support growth, repair, and maintenance of the body as a whole or in any of its parts [Raiten and Combs, 2015]

Conceivably, from both a clinical and public health perspective, nutritional assessment should be viewed as involving more than one nutrient and, functionally, as the potential interactions of multiple nutrients within biological systems of interest.(Raiten et al., 2021: NABV)

Some thoughts....

**Food ≠ Nutrition: Nutrition research/clinical assessment/care should not be limited to what we consume.**

**Nutritional status is a biological variable reflecting its intimate and inextricable role in *all* biological systems.**

**The nature of these relationships in most systems is reciprocal (i.e., nutrition affects and is affected by the function of the particular system)**

**Nutritional status is both an *input* and an *outcome of health and disease*..**

**Knowing an individual's nutrient status reveals little about function, effect or etiology.**

# Objectives of Nutritional Assessment

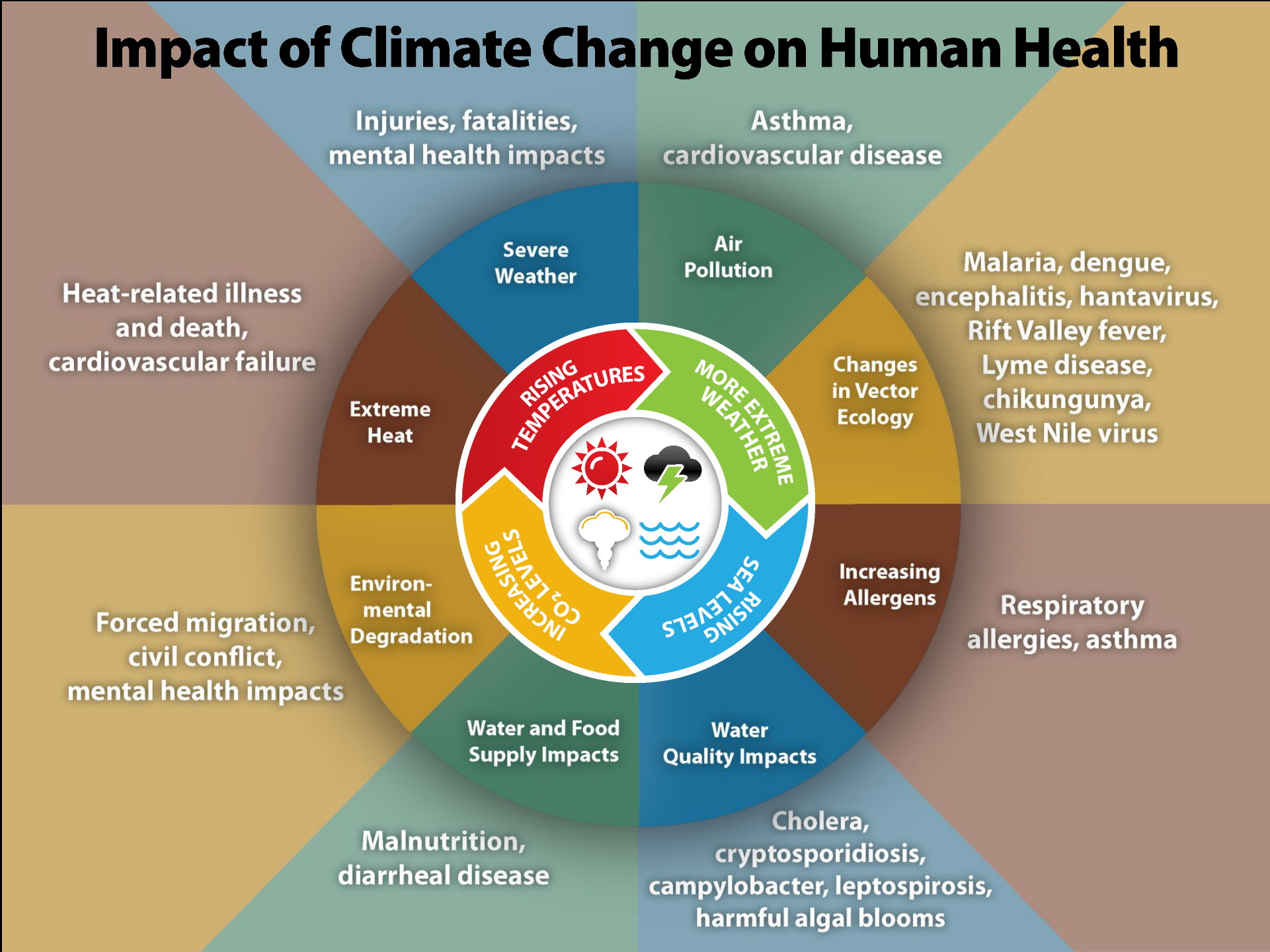
Our ability to understand the role of nutrition in health is driven by our capacity to address four fundamental questions:

1. Where do normal nutrient requirements end and specific health/physiological condition-related interactions and needs begin?
2. What is the role of diet/nutrition in conditions that require special consideration above and beyond the provision of a balanced diet that contains all essential nutrients required for growth, development, and health?
3. What is the role of factors within an individual's internal (health, genetics, developmental stage, etc.) and external (home, school, community, food system, physical) environment that contribute to these differences?
4. What are the best types and amounts of evidence to support the establishment of standards of care and the development of programs to address the role of nutrition in health promotion and disease prevention?



# The Global Health Context

# Impact of Climate Change on Human Health



Injuries, fatalities,  
mental health impacts

Asthma,  
cardiovascular disease

Malaria, dengue,  
encephalitis, hantavirus,  
Rift Valley fever,  
Lyme disease,  
chikungunya,  
West Nile virus

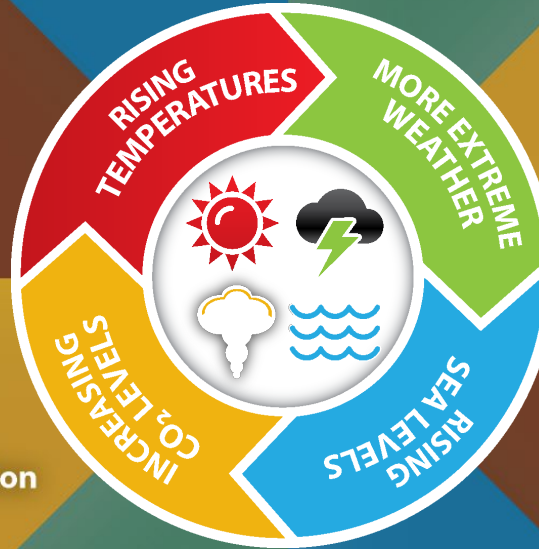
Respiratory  
allergies, asthma

Cholera,  
cryptosporidiosis,  
campylobacter, leptospirosis,  
harmful algal blooms

Malnutrition,  
diarrheal disease

Forced migration,  
civil conflict,  
mental health impacts

Heat-related illness  
and death,  
cardiovascular failure



Extreme  
Heat

Changes  
in Vector  
Ecology

Increasing  
Allergens

Water  
Quality Impacts

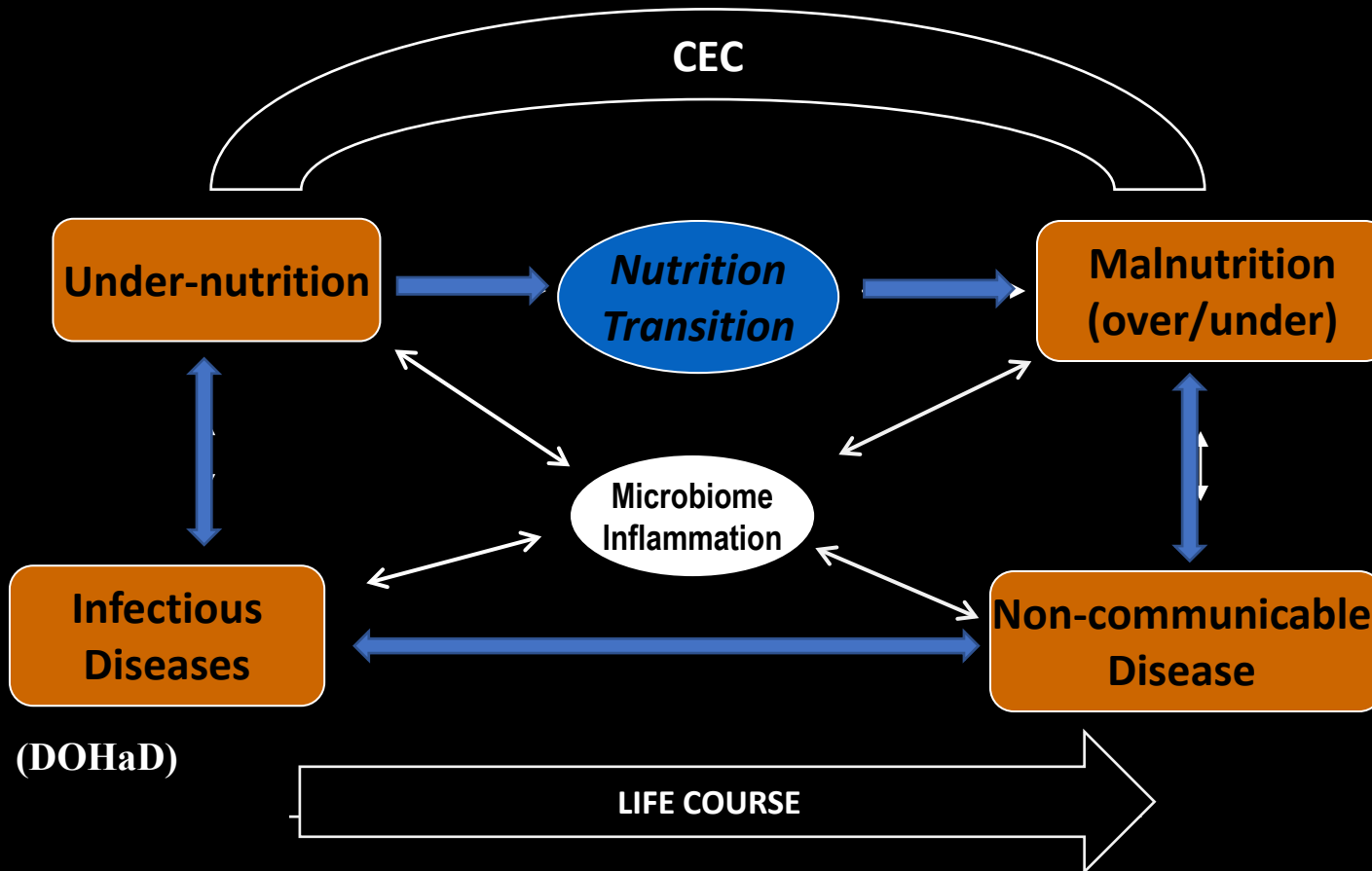
Water and Food  
Supply Impacts

Environ-  
mental  
Degradation

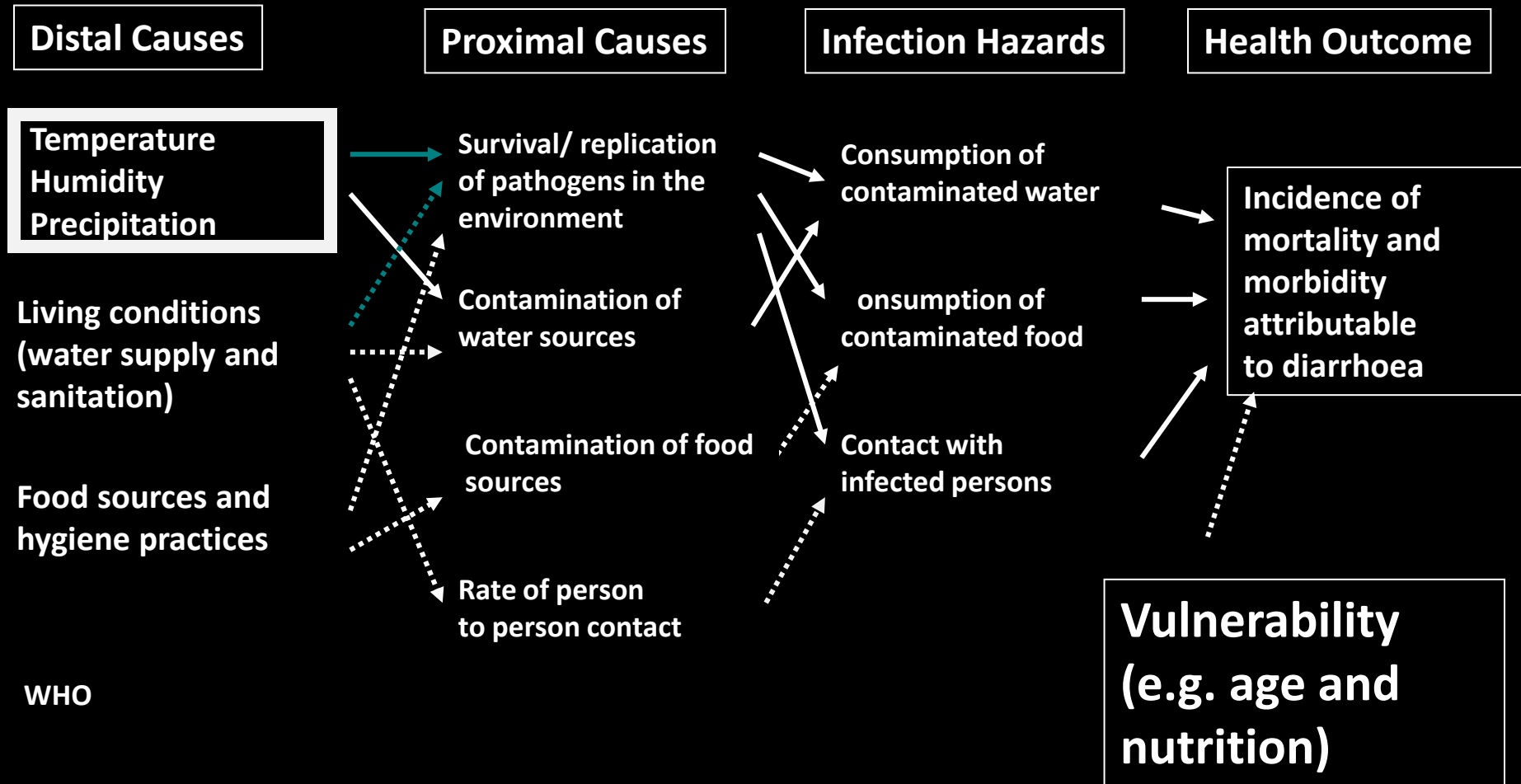
Severe  
Weather

Air  
Pollution

# A Complex Health Context: it's not just about too much or too little!



# More complexity: Pathways for Weather to Affect Health: Example - Diarrheal Disease

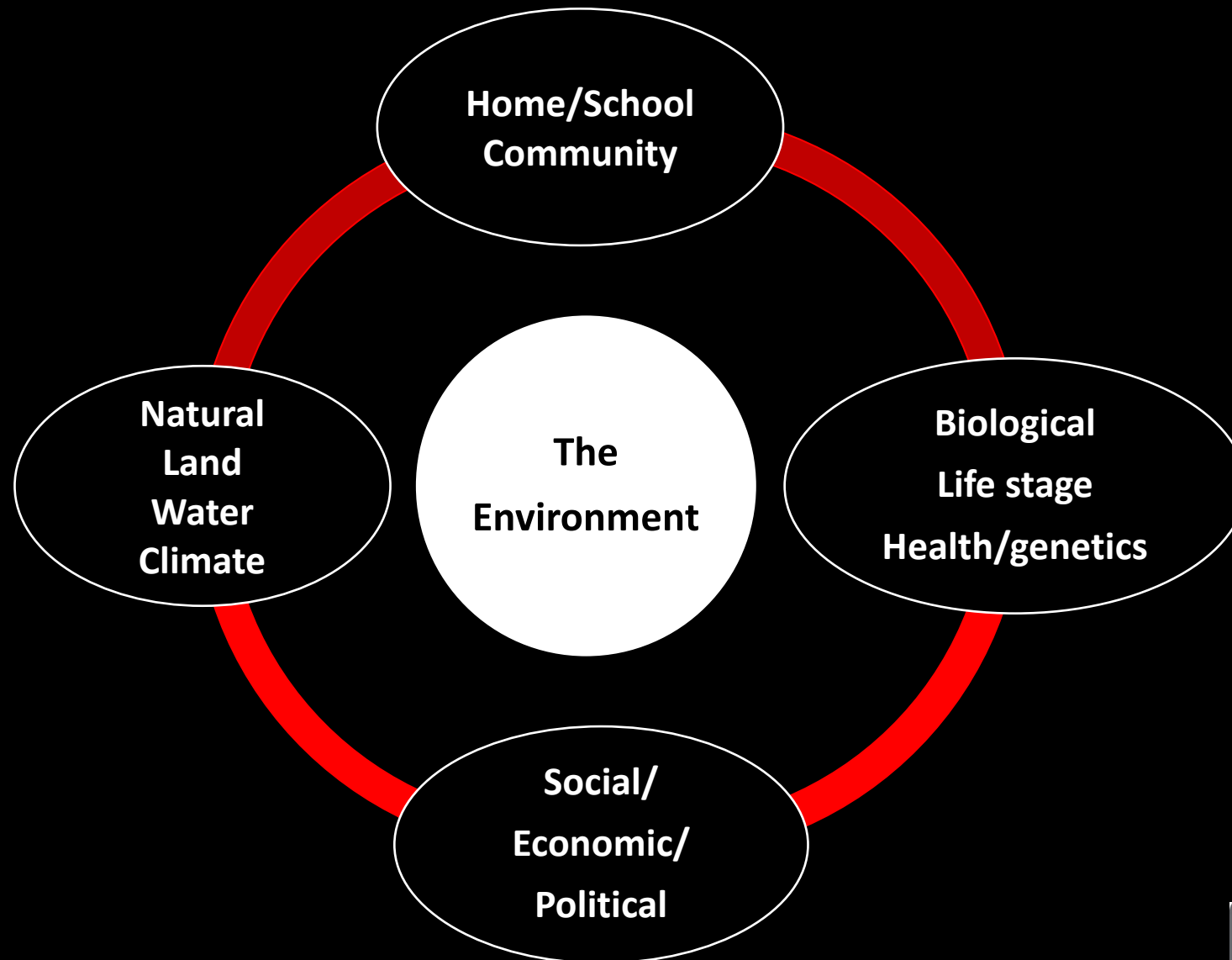


How can we address this complexity?  
**Understanding the Nutritional  
Ecology**

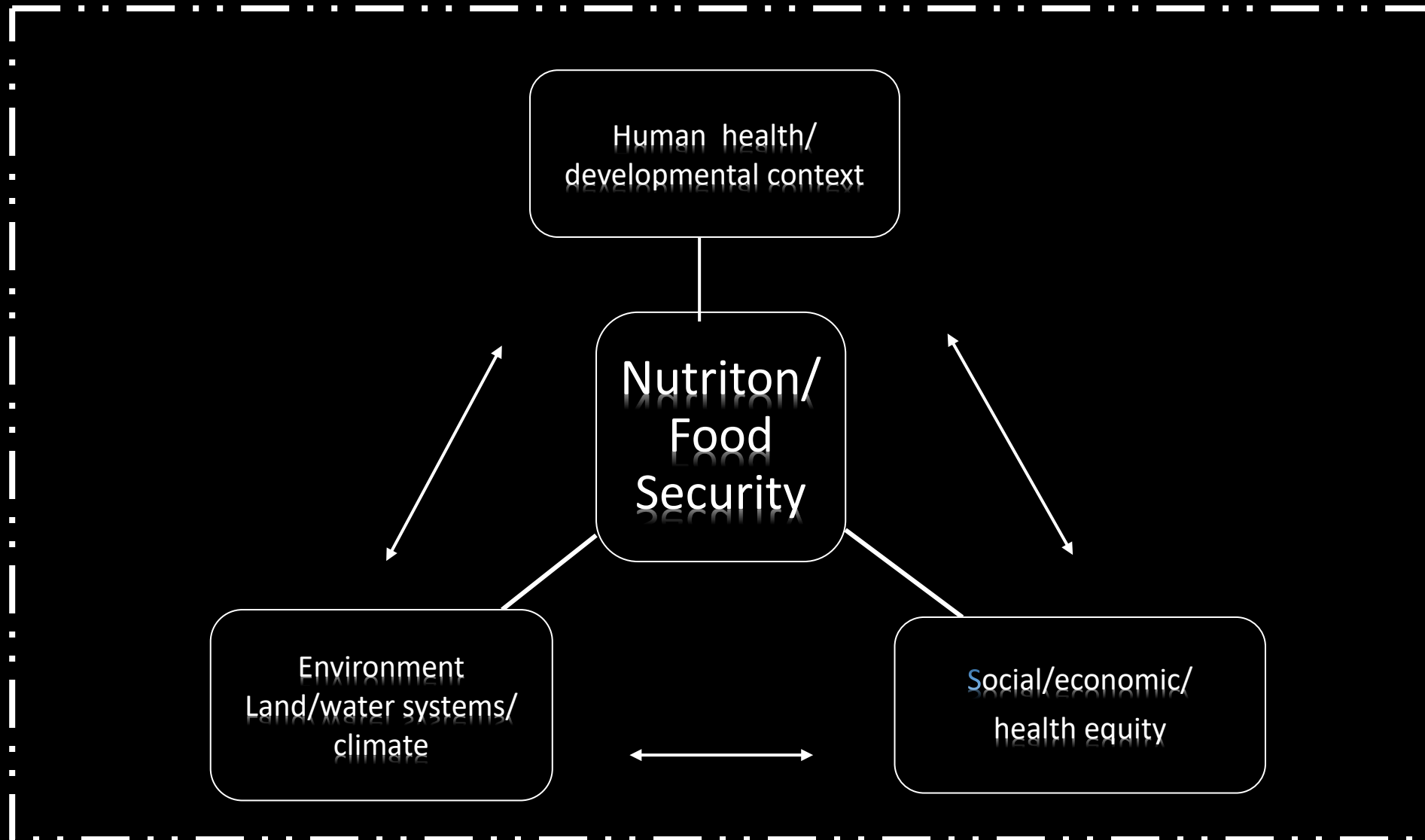
**Ecology:**

“the set of relationships existing between any complex system and its surroundings or environment.” (Dictionary.com)

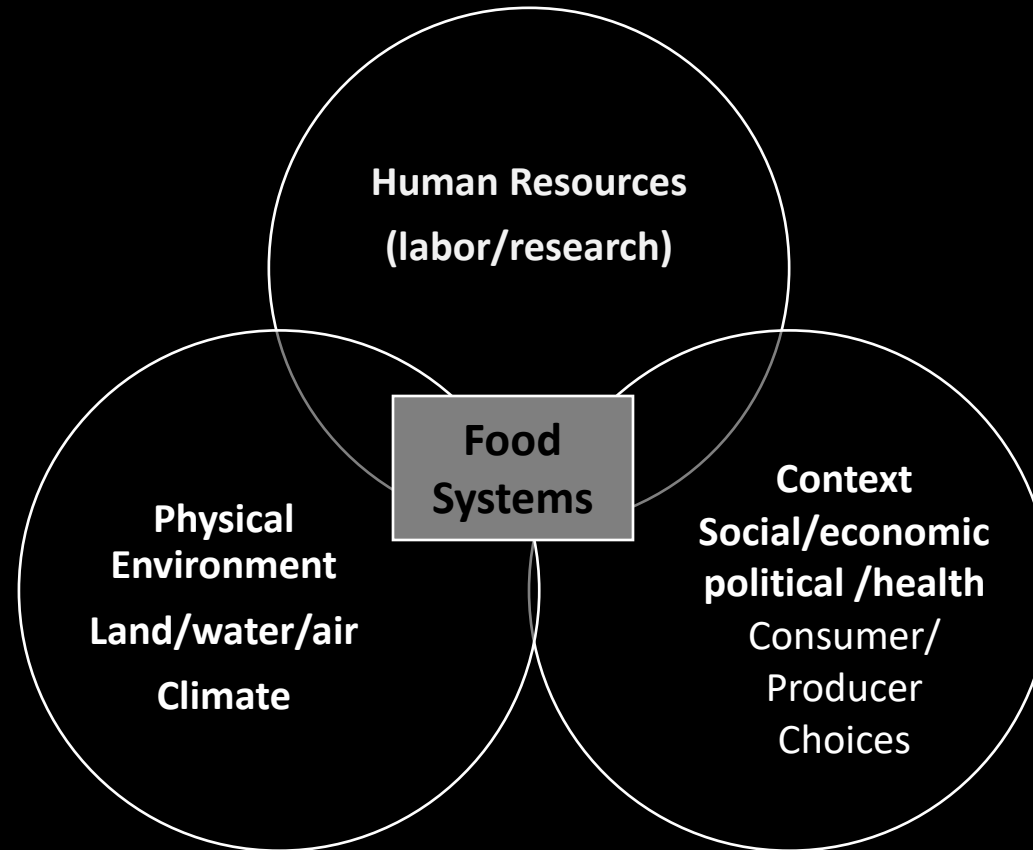
# The “Environment”- a holistic view



# Critical Drivers of Need



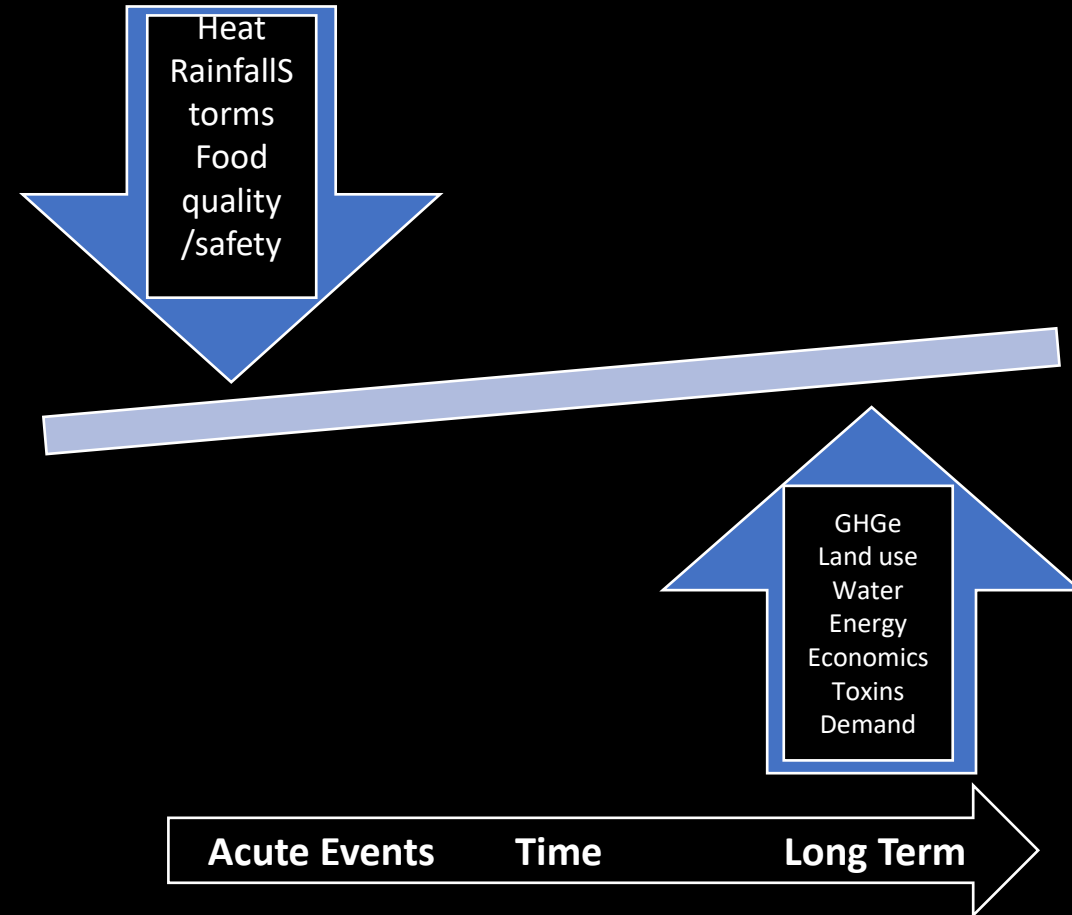
# A Critical Factor: Food Systems



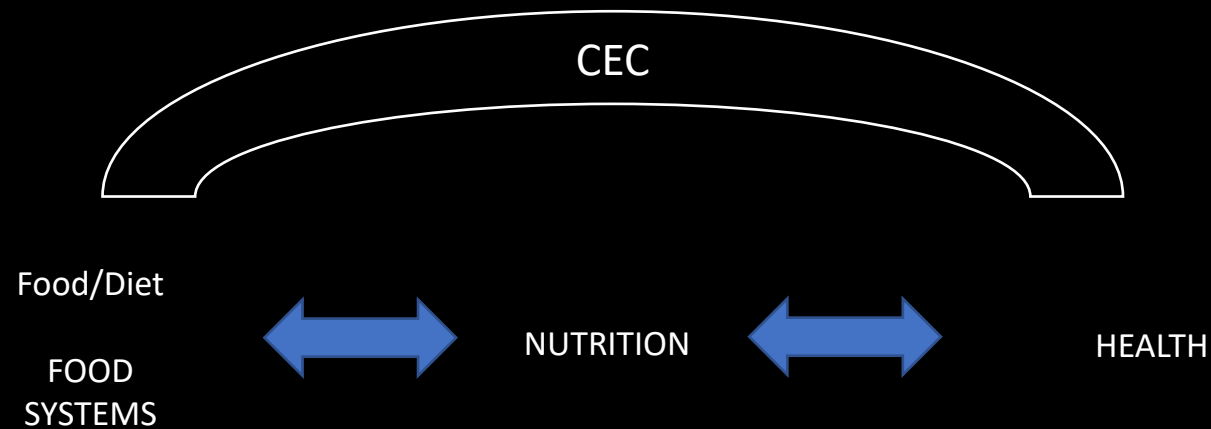
**“Food System (agricultural, marine, commercial):  
includes all processes and infrastructure involved in feeding a population: growing,  
harvesting, processing, packaging, transporting, marketing, consumption, and disposal of  
food and food-related items.” (Wikipedia)**



# CEC and Food Systems: Reciprocity



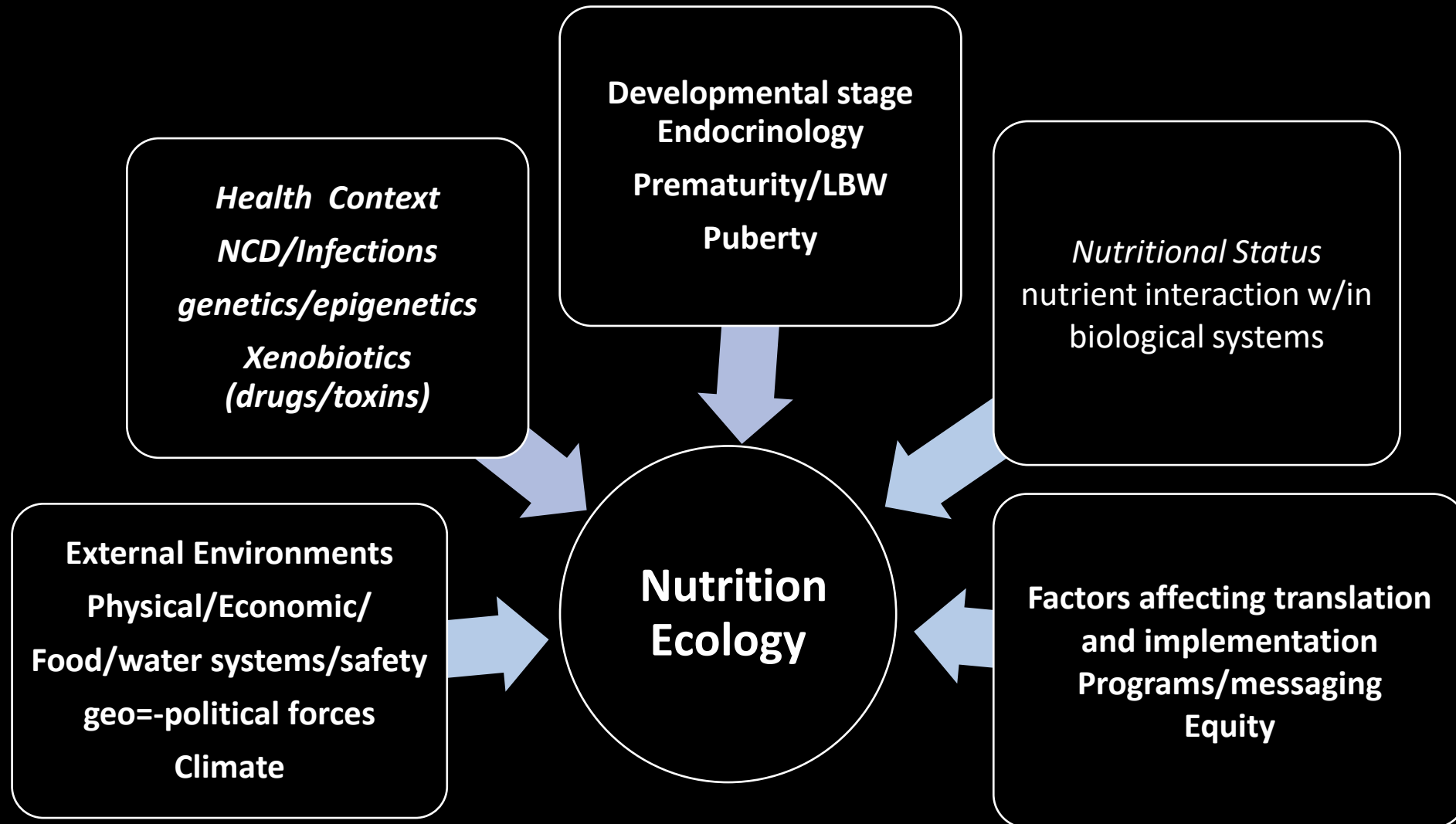
# Fundamental Relationships



Ignoring this fundamental relationship creates the potential for the “food: footprint paradox!”

Nutrition is the “glue” that ties food/food systems to health  
CEC affects and is affected by these relationships in ways that will be explored by ADVANTAGE

# The Nutrition Ecology: Accounting for Sources of Variability



# The State of Global Diet, Health and Malnutrition: Global Response

# Global Food and Nutrition Guidance

- Dietary Guidelines for Americans: dietary patterns to promote health and prevent disease
- Global Nutrition Targets 2025: WHO; focused on reducing/eliminating hunger, and consequences of malnutrition (overweight obesity, low-birth weight, under-nutrition, stunting, wasting, nutrition responsive anemia)
- Sustainable Development Goals (SDGs): eliminate hunger, clean water/sanitation, support sustainable food systems and support economic development

# Status Update: Global Hunger

“ In 2022, 738.9 million people faced hunger, 2.4 billion in 2022 were moderately or severely food insecure, and over 3.1 billion lacked access to healthy diets. The COVID-19 pandemic added 120 million to the chronically undernourished. By 2030, an estimated 590.3 million will suffer hunger. Progress toward global nutrition targets is uneven. “

The planet faces crises, exceeding safe limits in six of nine planetary boundaries, majorly tied to agrifood systems. These systems contribute 30 percent of anthropogenic greenhouse gas (GHG) emissions, impeding climate goals.”

From: [Achieving SDG 2 without breaching the 1.5 °C threshold: A global roadmap, Part 1 \(fao.org\)](#)

**For additional info from FAO:**

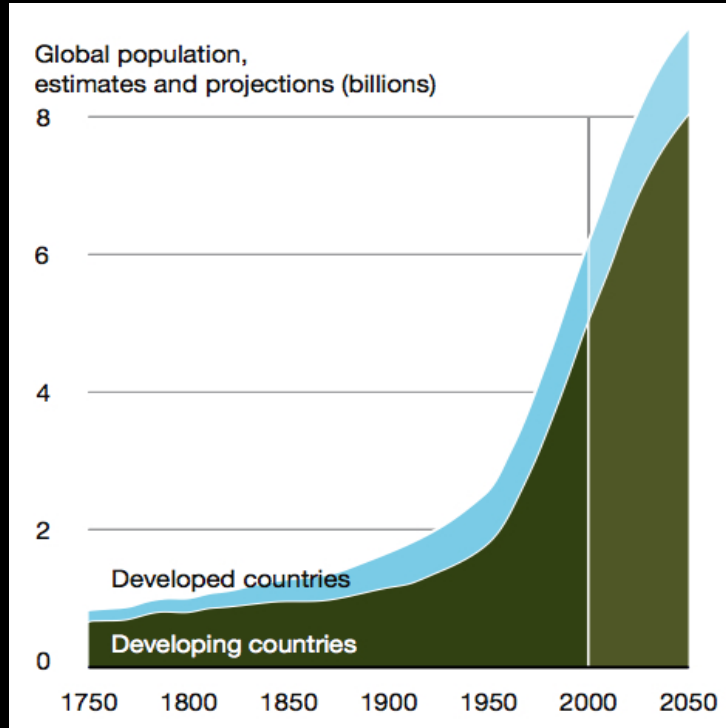
[Hunger | FAO | Food and Agriculture Organization of the United Nations](#)

# How can we interpret these trends?

1. Great strides have **been** made in reducing the impact of under-nutrition on child health but stunting and under-nutrition remain a major target for the global health community,
2. An alarming trend has emerged in the global prevalence of overweight and obesity and NCDs across the life course, and this trend has extended well into LMIC, **where** historically, the focus of efforts **has been limited to** under-nutrition,
3. Communicable infectious diseases (CID) including COVID-19 and other emerging CID, HIV, malaria, TB and diarrheal disease remain daunting public health concerns, again hitting LMIC hardest, and

**In most settings a collision is occurring of CID, NCD, food insecurity, over- and under-nutrition within the same population and, in many settings, in the same individuals. This collision, including the multiple burdens of malnutrition (over- under-nutrition and increasingly, both), is just beginning to be addressed in any meaningful manner**

# The Perfect Storm



9.2 billion people by 2050  
(8 billion in LMIC countries)

60% more food

Less agricultural land

Urbanization

Climate change

COVID-19 pandemic

Russia's war on Ukraine



# CEC and Decisions...Consumers, Producers, Public Health Policy makers

- Intervention choices: which ones are best for what context?
  - ❖ Dietary diversity
  - ❖ Fortification: bio-fortification, household/commercial
  - ❖ Supplementation
- How do we assess nutritional status of both individuals and populations in a complex health context including CEC, to support the development and use of safe and efficacious interventions?
- Can we produce enough high quality food to meet global health goals: e.g., fruits and vegetables to address the rising rates of type 2 diabetes?
- Can we avoid the risk of unintended consequences such as amelioration of one issue while exacerbating others? (e.g., safety of interventions to address anemia in the context of CEC-induced increases in vector-borne diseases, e.g., malaria): see “exploring the anemia ecology: JN [The Journal of Nutrition | Exploring the Anemia Ecology: A New Approach to an Old Problem | ScienceDirect.com by Elsevier](#)
- Increase burden of demand on diminishing supply (e.g., fisheries, animal source foods, F&V)

Is “One Size Fits All” the gold standard for public health nutrition? NO! Context Matters!



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National Institutes of Health

*Turning Discovery Into Health*

“Agriculture and Diet: Value Added for Nutrition  
Translation/Adaptation in a Global Ecology”

ADVANTAGE Project

Application of the Ecological Approach

# ADVANTAGE: Motives and Aspirations

The ADVANTAGE Project is intended to promote scientific research to better understand the intersection of climate/environmental change, food systems, diet, nutrition, and health.

In so doing, it is hoped that ADVANTAGE will support those agencies/organizations who will rely on the evidence to address the intersection of climate/environmental change, food systems, nutrition and health.

ADVANTAGE is NOT intended to develop guidelines, recommendations, policy or programs.

# Core drivers

## Underlying Premise:

The development of sustainable and resilient diet/nutrition related, evidence informed guidance, recommendations, policy and standards of care to promote health and prevent disease, requires consideration of a) relevant health targets, b) an appreciation of what the population of interest is currently consuming, and c) an understanding of the food systems' capacity to meet the dietary needs of the target populations

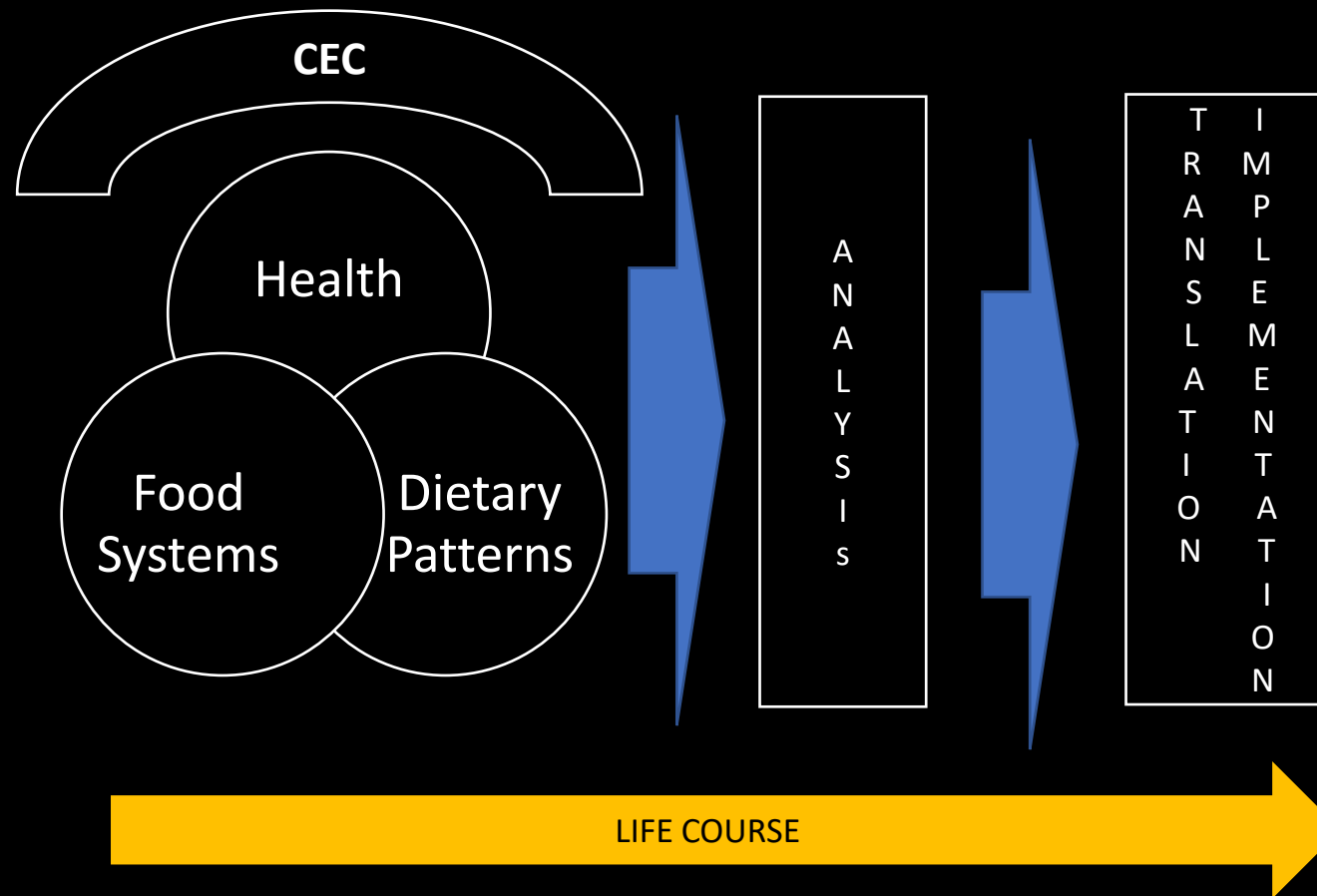
## Core Questions:

- 1) What is the impact of a changing environment on these core questions?
  - 2) Can we achieve precision of assessment and attribution in the absence of consideration of the role of CEC?
- And,
- 3) If not, how can we integrate this ecological approach into our analytical frameworks?

**ADVANTAGE**

**Structure and  
Process**

# An ecological approach to evidence-informed guidance and interventions



# ADVANTAGE WG Chairs/Co-chairs

WG 1: Implications of climate/environmental change (CEC) on priority health outcomes

Co-Chair: Kristie L. Ebi, U. Wash

Co-Chair Nancy Krebs, Univ. CO

WG 2: Impact of CEC on dietary patterns, attitudes, beliefs and choices

Co-Chair: Karen Siegel, Emory Univ.

Co-Chair Lindsey Smith-Taillie, UNC

WG 3: Impact of CEC on food systems

Chair: Robin White, Va Tech

WG 4: Measures and metrics: an integrated approach to understand the intersection of CEC, food systems, nutrition and health

Co-chair: Bruce Y. Lee, CUNY

Co-chair Meg Breuning, Penn State Univ.

WG 5: Translation and implementation: data needs and approaches to the translation of emerging evidence to support context-specific, equitable, safe and efficacious interventions, dietary guidance and standards of care in a changing environment.

Co-Chair: Jessica Fanzo, Johns Hopkins Univ

Co-Chair: Diego Rose, Tulane Univ.

# What's next?

- Need to implement research priorities to fill gaps
- Need to translate the evidence in a manner that fits the mission
- Make the case for added value of integration of new data
- Develop and support efforts to generate context specific, equitable, resilient and sustainable interventions, programs and guidance.
- **ADVANTAGE Website:**
- Summary - Agriculture and Diet: Value Added for Nutrition, Translation, and Adaptation in a Global Ecology (ADVANTAGE) Virtual Meeting Series (cvent.com)



**THANK YOU!**