

What do we know about **THE FUTURE OF DIETS AND NUTRITION?**

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Key messages

- Diets continue to evolve and nutrition challenges are changing as diets shift from traditional to more modern ones that are higher in animal-source foods, refined grains, and processed and ultra-processed foods; high in saturated fats, sugar, and salt; and low in fiber.
- Important progress, though uneven, has been made over several decades in improving diets and nutrition, but these trends have reversed or slowed since 2010.
- Undernutrition has decreased over time, while micronutrient deficiencies have not. Overweight and obesity are rapidly rising in all low- and middle-income countries (LMICs) and remain high in high-income countries. Multiple burdens of malnutrition coexist within countries, regions, communities, households, and individuals.
- Nutrition literature increasingly highlights the multiple burdens of malnutrition but rarely looks explicitly at future trajectories for nutritional indicators.
- Simulation studies explore alternative futures explicitly and give a good indication regarding dietary trends but are limited with respect to nutritional outcome trends.
- A critical need and opportunity exist for more work that combines nutrition with foresight modeling, particularly with a focus on LMICs.

RECENT TRENDS AND CHALLENGES

Human nutrition is the result of dietary practices as well as individuals' health and a combination of environmental and societal factors, all of which interact in a dynamic process. Nutrition is inextricably linked to diets, and factors that affect diets influence the resulting nutritional status of individuals, along with many others that determine bio-availability of nutrients from foods consumed and individuals' health status. We focus on the future developments of the diet and nutritional dimensions of this complex topic, especially in low- and middle-income countries (LMICs) and regions in which CGIAR works.

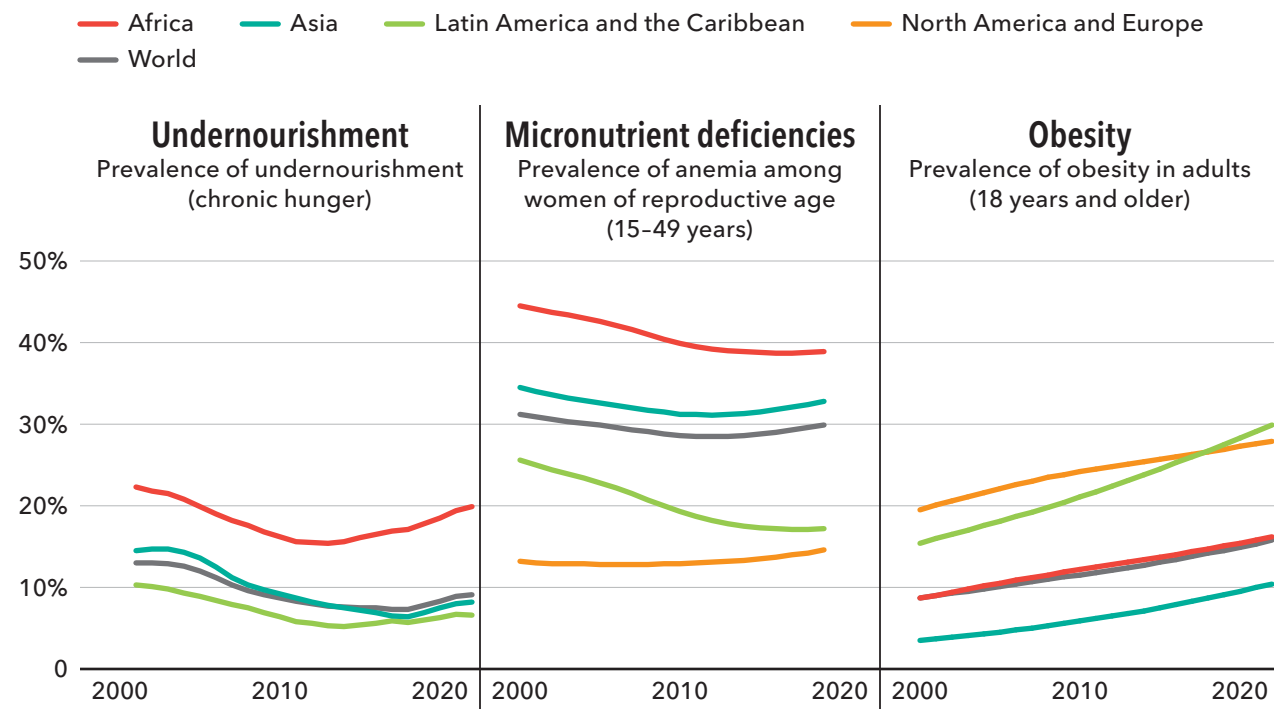
Diets and nutrition are evolving in dynamic ways as technological, agricultural, environmental, and cultural systems change and interact. Diets evolve in response to changing preferences, prices, and incomes and to cultural forces. It is well established that as incomes rise, the share of nutrient-dense foods in the diet increases (Bennett 1941a, 1941b); with near certainty, we can expect this will remain true in the future.

The nutrient content of food evolves due to factors such as breeding, production practices, climate impacts, and processing methods. Societal drivers such as education, health, and sanitation systems also exert a huge influence on the levels of nutrition that are possible with available food and diets.

Malnutrition takes three forms: **undernourishment** (energy deficiency, also referred to as "chronic hunger"), which manifests itself in child wasting or stunting and adult underweight; **micronutrient deficiencies** (also referred to as "hidden hunger"); and **overweight/obesity** and diet-related noncommunicable diseases (Figure 1). Poverty, conflict, and access issues are key drivers in the stalling and reversal of positive trends in hunger and malnutrition.

While undernourishment has decreased over the past several decades, events in recent years have either stalled progress or reversed trends in many regions. The global prevalence of undernourishment dropped 2 to 6 percentage points, depending on the region, between 2000 and 2022. Chronic hunger hit a low point in the 2010s but has been on the rise ever since.

FIGURE 1 Recent nutrition trends



Source: FAOSTAT 2025. <https://www.fao.org/faostat/>

Note: Chronic hunger is not tracked when it is below 5 percent, as in North America and Europe.

Although little information is available on the prevalence of micronutrient deficiencies globally, anemia—a proxy indicator of iron and potentially other micronutrient deficiencies—has declined since 2000 around the world (except in North America and Europe), but these trends have either slowed or reversed course since the 2010s. Micronutrient deficiencies are driven by a complex mix of factors, some of them related to poverty, unaffordability of nutritious foods, and poor health, and others related to awareness and preferences that cut across income levels.

Overweight/obesity is widespread and increased consistently over the same period in all regions, with prevalence doubling in many regions between 2000 and 2022. Rising incomes, urbanization, and changing food systems are the main drivers of overweight/obesity and the double burden of malnutrition, characterized by the coexistence of multiple forms of malnutrition in the same countries, households, or individuals (Popkin, Corvalan, and Grummer-Strawn. 2020).

LATEST FORESIGHT RESEARCH

A strong literature and research base documents past trends and current status across the various dimensions of diets and nutrition, and many efforts to improve nutrition in the future.

Several current research and development efforts aiming to change the future of nutrition are highly focused on specific improvements that could be achieved in the near term, though in isolation and without consideration of the full agrifood system. Nutritional benefits are foreseen from these types of improvements if and when they can be achieved and scaled up. Some of the most prominent approaches include:

- Improvements in the plants and animals we eat, including biofortification and other management and breeding efforts (Bouis and Saltzman 2017; White and Broadley 2009; Sands et al. 2009; Flax et al. 2023; Boy et al. 2024), as well as improving the mix of food items in the average food basket (Golden et al. 2021; Herforth et al. 2019).
- Supplementation and fortification, including large-scale fortification of staple foods or condiments (for

example, salt, bouillon cubes) with essential micronutrients, and micronutrient-fortified products formulated for nutritionally vulnerable groups, such as lipid-based nutrient supplements or micronutrient sprinkles (Dewey et al. 2023; Osendarp et al. 2018).

- Behavior change communication strategies to educate and shape consumer preferences and food choices, as well as interventions to improve the healthiness of food environments (Fretes, Marshall, and Leroy 2024; Kim et al. 2024; Springmann et al. 2016, 2018).

Foresight research that explicitly analyzes the future of nutrition outcomes remains relatively limited, even as dietary projections at the aggregated commodity level are available (Bodirsky et al. 2015; Valin et al. 2014; van Dijk et al. 2021). Some research—such as Tigchelaar et al. (2024) or many of the EAT-Lancet analyses for a planetary health diet—assesses future diets in a quantitative framework without an economic equilibrium. This is important given the pace of change in factors affecting diets and nutrition; the time lags involved in developing approaches to address those changes; and system dynamics, with prices, preferences, and production interacting and changing simultaneously.

Quantitative foresight modeling looks at the complex interplay of drivers to estimate potential trajectories for the agrifood system. This approach provides an estimate of both the supply of and demand for agricultural commodities and many other aspects of the agrifood system. One key component of many foresight studies in the agrifood sector is the evolution of diets in terms of a complex economic equilibrium of demand and availability. Cenacchi, Sulser, and Mishra (2025) provide one example using the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) model. Using the same set of results, this brief highlights the changes in food availability from different food groups and of nutrients available in the food supply as shown in the projections below.

Nutritional outcomes can be included as part of the projections, depending on the focus of the research. The prevalence of undernourishment—associated with the risk of hunger and a measure of chronic hunger—is the most common metric used in foresight studies (Hasegawa et al. 2019; Sulser et al. 2021b), while hidden hunger is assessed by means of ratios of nutrient availability to recommended levels of intake (Beach et al. 2019; Nelson et al.

2018). Projections of chronic and hidden hunger can be combined into estimates of future trends in disability-adjusted life years (Sulser et al. 2021a). Several quantitative foresight analyses that focus on specific commodities or commodity groups elevate the importance of nutrition derived from particular types of foods, such as from aquatic foods (Chan et al. 2021), livestock (Enahoro et al. 2018), and fruits and vegetables (Mason-D'Croz et al. 2019). Modeling the future of overweight/obesity is estimated by a complex combination of calculations and assumptions (Bodirsky et al. 2020) and has been done by few modeling groups to date. Given the connection of modeling parameters to past trends and estimates of the structural relationships across factors in the agrifood system, the overall outlook is generally a continuation of trends that see improvements in chronic and hidden hunger and a steady increase in overweight/obesity. This broad regional outlook masks details at the country and subnational level, however, as many segments of the population face increasingly challenging situations.

Climate change is a topic of wide interest in relation to diets and nutrition. As temperature and precipitation deviate from historical trends, food production systems must adapt and the transition to new agricultural practices often leads to increased prices and less food availability, particularly in the Global South (Kompas, Nhu Che, and Grafton 2024; Sulser et al. 2021b). At the same time, the nutritional quality of food is projected to change with increasing carbon dioxide, with decreases in protein, minerals, and many vitamins, while enhancing energy content and a few select vitamins (Beach et al. 2019; Loladze 2014; Myers et al. 2014; Zhu et al. 2018). Extreme events and variability lead to additional challenges for nutrition that are often missing from many modeling exercises (Hasegawa et al. 2021).

In general, future changes in population and income are important drivers that far outweigh the climate changes represented in most model-based analyses (Hasegawa et al. 2015; Nelson et al. 2018; Sulser et al. 2021b). Increasing per capita incomes make diverse diets and their nutritional and health benefits more readily available, though concurrently, many negative forces come to the fore, including increased consumption outside the home and preferences for convenience foods that are often unhealthy, with an excess of saturated fats, sugar, and salt. At the same time, increased incomes could curb the overweight and obesity crisis if consumers adopt healthier, more balanced diets. Continued population growth

and constrained incomes, on the other hand, lead to challenges for reducing chronic and hidden hunger in many regions. Both over- and undernutrition can occur simultaneously at certain levels of aggregated geographies (Bodirsky et al. 2020; Hawkes et al. 2020; Popkin, Corvalan, and Grummer-Strawn 2020).

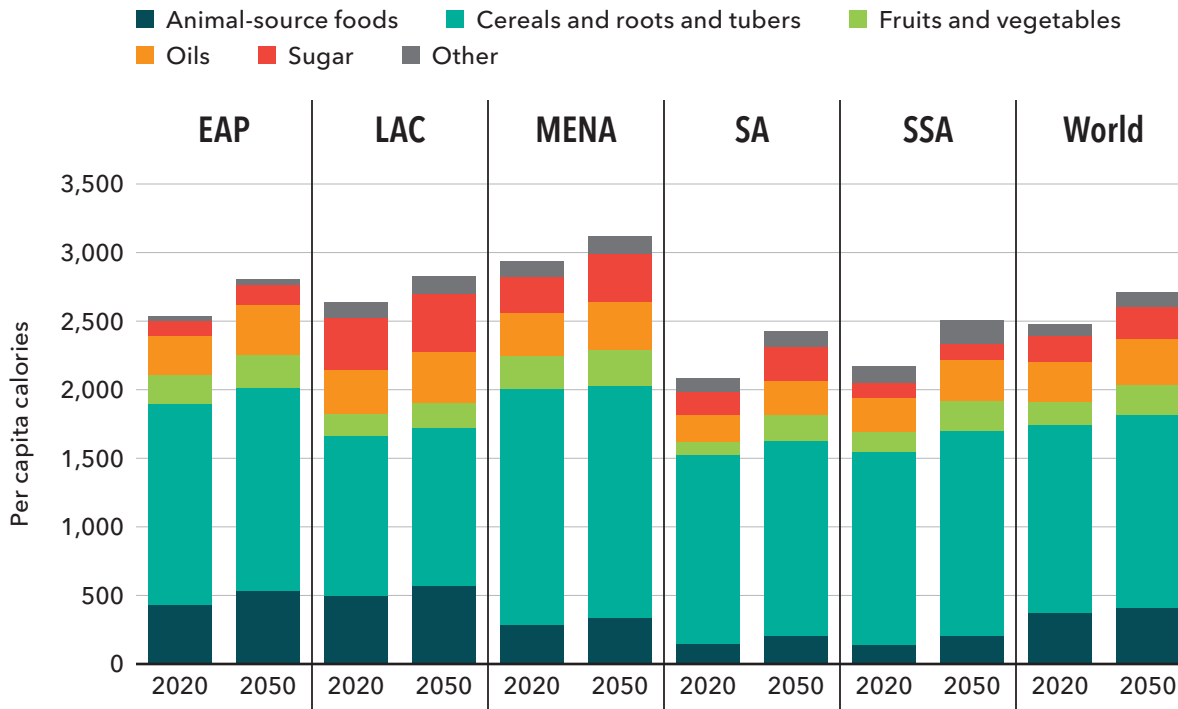
The EAT-Lancet Commission on Food, Planet, and Health (Willett et al. 2019) designed and advocated a planetary health diet that attempts to achieve the goals of healthy diets for all while keeping the agrifood system within sustainable environmental bounds for the future. This effort sparked a great deal of interest, but also skepticism regarding adoption of very low or nonmeat diets and was criticized for its focus on high-income countries and limited applicability elsewhere. Other concerns relate to its nutritional inadequacy for population groups with high nutrient requirements (for example, pregnant or lactating women) and the potentially more costly minimum adequate diet (Beal, Ortenzi, and Fanzo. 2023; Hirvonen et al. 2020). A follow-up to this work (EAT-Lancet 2.0) currently underway aims to update, expand, and strengthen this analysis while addressing some of these critiques (EAT-Lancet 2.0 Commissioners et al. 2023).

Another important development is the work to establish a standard metric of the cost of a healthy diet that ties together nationally developed food-based dietary guidelines with consumer prices, especially in low-income countries (Herforth et al. 2022). This is now incorporated in regular reports by the Food and Agriculture Organization of the United Nations and the World Bank (FAO 2024; World Bank 2024) and is the basis for work that is developing a forward-looking perspective using model projections (Costlow et al. 2025).

Recent projections from the IMPACT model provide a quick look at dietary evolution and nutrition projections (see Chapter 36 in this volume). As an extension to that presentation, Figure 2 shows the change in per capita calorie availability for major food types across regions. Several takeaway messages present themselves:

- The increase in per capita consumption of oils and sugar is clearly shown in East Asia and the Pacific, South Asia, and the Middle East and North Africa, each increasing by over 100 calories combined by 2050. The high-income countries, however, are projected to consume more than 1.5 times more calories from oils and sugars than LMICs.

FIGURE 2 Per capita calorie availability from major food groups in current and future diets, 2020 and 2050, by region



Source: IMPACT v3.4, in Rosegrant et al. (2024).

Note: EAP = East Asia and Pacific; LAC = Latin America and Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

- The share of calories from starchy cereals and roots and tubers is declining relative to more nutrient-dense, animal-source foods, fruits and vegetables, and oils and sugars. Some regions even show negative growth trends for calories from starches.
- The increased share of animal-source foods, especially in East Asia and the Pacific and Latin America and the Caribbean, will require careful consideration to focus on healthier options and avoid processed red meat, associated with harmful health outcomes.

Based on per capita food availability, we compare nutrient availability with recommended nutrient intake levels (RNI ratios), following Beach et al. (2019) and Nelson et al. (2018). RNI ratios close to one mean that the average consumer might be able to meet recommendations while values below one indicate the opposite.

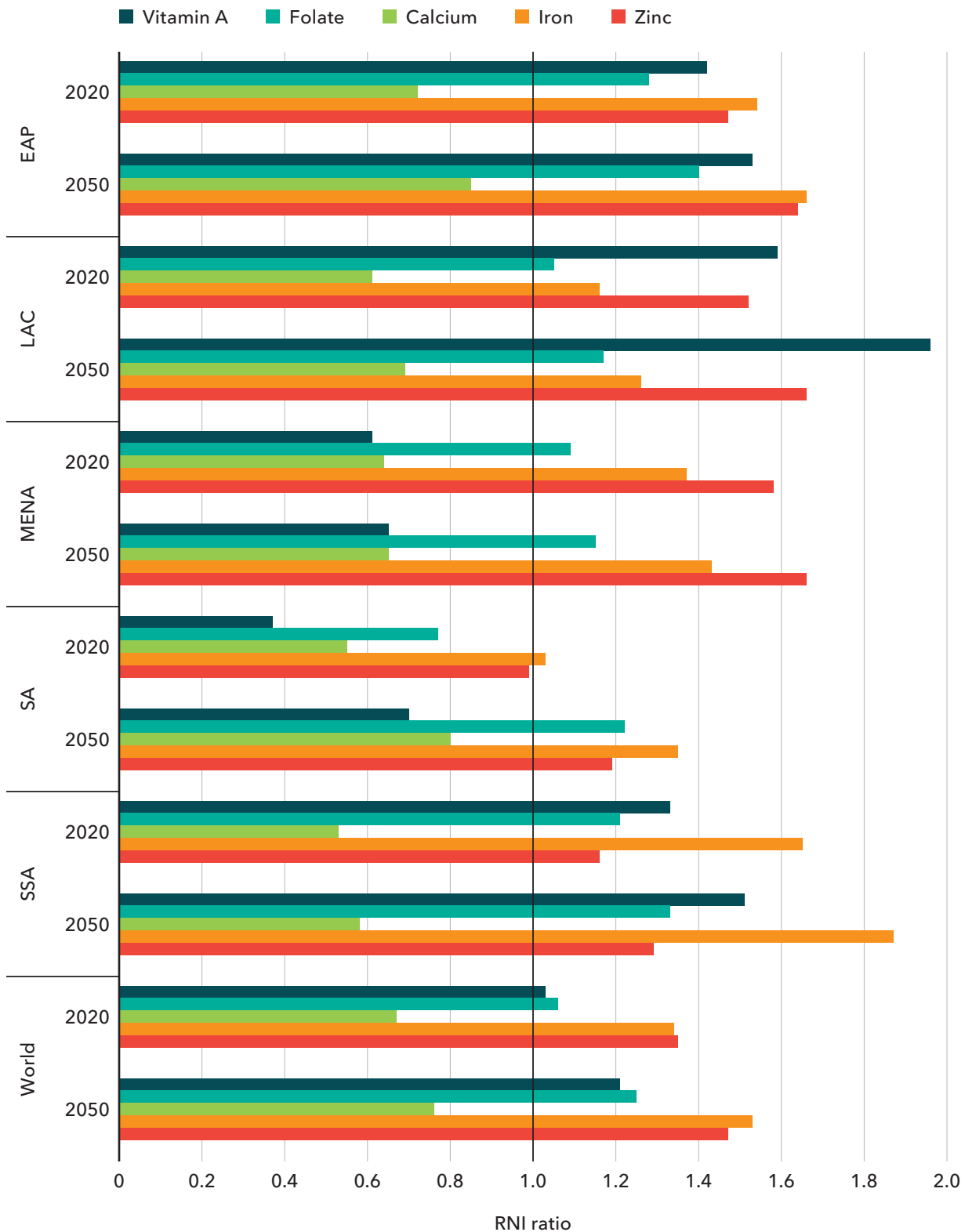
Figure 3 shows the change in regional RNI ratios for five key vitamins and minerals for 2020 and 2050. Calcium supplies are insufficient everywhere to meet dietary requirements. In contrast, iron and zinc have RNI ratios

greater than one, indicating that a larger share of the population should have access to adequate supplies of these nutrients though, in practice, many factors could limit their bioavailability. Vitamin A and folate show a pattern similar to iron and zinc in most regions, except the Middle East and North Africa and sub-Saharan Africa, where RNI ratios fall short and few people will be able to achieve adequate levels for a healthy diet.

KEY GAPS AND OPPORTUNITIES FOR FORESIGHT RESEARCH

Looking at complex food systems and the scaling of nutrition interventions and interactions in the longer term is crucial for achieving broad-based, beneficial, and lasting outcomes (Ruel 2024). Understanding the future of diets and nutrition requires connecting nutrition literature and quantitative foresight studies. In general, nutrition literature is essential to understand the many dimensions and

FIGURE 3 Ratio of nutrient availability from projected diets to recommended nutrient intakes (RNI ratios) for key vitamins and minerals in 2020 and 2050, by region



Source: IMPACT v3.4, in Rosegrant et al. (2024).

connections between diets and nutrition. This literature, however, relies on analysis of historical data and is limited in looking explicitly at the future in a systematic way.

Meanwhile, simulation studies that look explicitly at future diets are limited in nutritional detail. Studies linking diets, health, and planetary environmental boundaries tend to focus on the Global North, leaving a need and opportunity to combine nutritional depth with foresight modeling and a focus on LMICs. The most robust approach would rely upon “multimodel” ensembles that provide transparent methodologies for their projections of dietary evolution. The range of potential outcomes will reveal either self-reinforcing agreements among models that provide strong evidence of findings or disagreements that flag areas for further research.

A major question for the future of diets and nutrition is how potential demand changes will play out in global agrifood system dynamics. Quantitative foresight modeling of the agrifood sector from an economic equilibrium perspective can help explore this. For example, if a more environmentally conscious diet were to become more widespread—meaning populations avoid increasing their consumption of animal-source foods as incomes increase, while relying more on plant-based foods—foresight modeling could explicitly handle how preference shifts would react to price changes due to changing levels of demand for these different types of commodities, in turn affecting the final purchase of food baskets by different consumers. Joining this with detailed understanding of how food systems work from a nutrition perspective (food environments, nutrition innovations, etc.) can help policymakers make decisions on how to best allocate resources to support a healthy dietary evolution.

This chapter was supported by the CGIAR Research Initiative on Foresight and the CGIAR Science Program on Policy Innovations. We would like to thank all funders who supported this research through their contributions to the [CGIAR Trust Fund](#).

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Related chapters on the future of food system drivers and impacts, regional and national perspectives, food commodities, and foresight tools are available in our [Table of Contents](#).

Citation: Sulser, T.B., M. Ruel, and S.H. Thilsted. 2025. “What Do We Know About the Future of Diets and Nutrition?” In *What Do We Know About the Future of Food Systems?*, eds. K. Wiebe and E. Gotor, Chapter 3. Washington, DC: IFPRI. <https://hdl.handle.net/10568/175019>

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