

INEQUITY IN ACCESS TO HEALTHY FOODS

SYNTHESIS FROM A MULTIDISCIPLINARY PERSPECTIVE



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Kate R. Schneider, Alexandra L. Bellows, Shauna Downs, Winnie Bell, Ramya Ambikapathi, Stella Nordhagen, Francesco Branca, William A. Masters, and Jessica C. Fanzo

ABOUT GAIN

The Global Alliance for Improved Nutrition (GAIN) is a Swiss-based foundation launched at the UN in 2002 to tackle the human suffering caused by malnutrition. Working with governments, businesses and civil society, we aim to transform food systems so that they deliver more nutritious food for all people, especially the most vulnerable.

ABOUT FSEC

The Food System Economics Commission (FSEC) is an independent academic commission set up to analyse the economics of a sustainable food system transformation and to identify a feasible agenda for implementing positive change. Our goal is to present lessons and feasible options for economic decision-makers on what needs to be done to ensure a more inclusive, healthier, and nature-positive future for our food systems, by drawing on the best scientific analysis from economics and across the social sciences.

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The Global Alliance for Improved Nutrition (GAIN)
Rue de Varembe 7
1202 Geneva
Switzerland
T: +41 22 749 18 50
E: info@gainhealth.org



SUMMARY

The ability to choose a nutritious diet is conditioned by inequities in food access—which stem from broader social inequities. Though these systemic forces significantly impact nutrition and health outcomes, food and nutrition policies often focus on food availability, nutritional content, and behavioural incentives and change. In this paper, we undertake a narrative review to synthesise the existing literature on how inequities shape access to healthy diets upstream from individual choice. With a focus on the downstream parts of the food system our synthesis sheds light on the complex and heterogeneous patterns of inequities in individuals' lived experiences, resources, and capabilities; the food environments they face; and the resulting contexts that condition the options available and resource constraints within which they must make choices. Examining the literature from a multidisciplinary perspective highlights subtleties that are not explained by research from any one angle. Yet policies often consider only one aspect – for example, locating supermarkets to address the problem of food deserts (lack of physical access).

The review demonstrates that designing policies to holistically address underlying drivers of inequity would require data disaggregated at the level of relevant social groups, with adequate geographic granularity, as well as qualitative data from the perspectives of affected people spanning food environments, socioeconomic information, and the food security, nutrition, and health issues that policies target. A case study of the United States – a country with rich nationally representative datasets on relevant topics – demonstrates clear gaps in data needed to understand social access to food, non-monetary resources, capabilities and agency, and that intersectional analyses are hampered by small sample sizes.

KEY MESSAGES

- We undertake a narrative review to synthesise the existing literature, across fields, on how social inequities shape access to healthy diets—and thus influence food security, nutrition and health outcomes.
- We find that inequities manifest in the food environment (food availability, prices, and properties), including through 'food deserts' and differences in food prices, though evidence is mixed in terms of whether these differences impact diets.
- Individual factors – including economic resources, knowledge and abilities, and psychosocial resources – also impact food access in inequitable ways.
- Through a case study of the relatively data-rich US, we show how data are currently inadequate to analyse food system inequities across various sociodemographic groups. Filling these data gaps is a key first step towards making policies to improve equity in food access.

BACKGROUND AND OBJECTIVE

Inequalities in food security, nutrition, and health outcomes have been widely observed across geographies, social groups, and income levels, including by gender, education level, racial and ethnic identity, Indigenous heritage, household wealth, urban and rural areas, migration status, and broadly by country income level (1,2). These disparities are well documented and recognised to reflect the broader economic and social disparities present within and across societies worldwide (1,3–11). Equity is central to the definition of food security, which exists when 'all people, at all times, have physical, economic, and social access to a diet that meets their nutritional needs and dietary preferences' (12,13). Yet only recently has equity received direct attention in frameworks related to nutrition, food security, and diets (11,14–16).

Scholars of justice define inequity as any inequality in outcomes (differences across groups) that is avoidable with positive human intervention on the grounds of inherent unfairness (10,16,17). Structural inequities refer to the power imbalances that marginalise some groups while protecting the power of others (1,11,18,19). The history of colonisation, enslavement, exclusion from political processes, and the exploitation and theft of land and other resources have shaped economic and social systems worldwide (2,11,15,20–25). Various aspects of one's identity confer relative privilege or oppression, as stipulated by the framework of intersectionality (26). The interaction between these aspects of identity produces context-specific net effects that structure a person's interactions in daily life and engagement with systems, and food systems are no exception (16,26–29).

This paper undertakes a narrative review to synthesise the existing literature, across fields, on how inequities shape access to healthy diets. It is motivated in part by the observation that many studies aiming to understand the drivers of unequal outcomes in food security, diets, and health cite literature from limited perspectives, creating disconnected scholarly dialogues about the same research questions testing similar and different hypotheses about the same observed phenomenon. For instance, research on food deserts has been carried out by largely separate scholarly communities from that on food apartheid, despite addressing very similar research questions (36,58,90–93). Furthermore, different disciplines approach questions of disparities in outcomes from different theoretical underpinnings, that together test a wider range of hypotheses about the drivers of outcomes than any one approach alone. This suggests that a holistic synthesis of the entire body of literature is needed to inform policy. Similarly, studies focused on high-income countries (HICs) are often considered separately from those concentrating on low- and middle-income countries (LMICs), despite many common experiences shared by people with low incomes and who experience social exclusion and marginalisation across settings (94). Bringing these multiple bodies of literature together can contribute to a more comprehensive picture of what is known about how inequities manifest in the parts of the food system proximal to diets, which we use to develop a clearer view of the policy-oriented evidence gaps that need to be filled.

The paper is structured following a food systems framework (95) that builds closely on that of the HLPE (96) and shares the main characteristics of other food system frameworks (97,98). Specifically, we organise the synthesis around the terminology consistent with these frameworks at the stages proximal to diet outcomes: food environments, individual factors, and the access dimensions of food security. Though we preserve the terminology of 'individual factors' found in Fanzo et al. (95) and HLPE (96), we clarify this does not refer to things under the control or responsibility of an individual but rather the features of food access and determinants of food choice that vary at the level of the individual.

In this review, we focus on those aspects largely outside the control of the individual because of our interest in systemic inequities and their link to food security and diet outcomes. These conditioning factors could alternatively be referred to by terms more common in the equity literature, such as positionality or lived experiences. The thesis of the paper is that food environments and individual resources are structurally shaped, and when an individual, given their resources, meets a particular food environment, the presence or absence of each dimension of access to food can be observed. This shapes overall access to the healthy foods that together comprise a diet that promotes long-term health.¹

METHODS

Many studies in varying contexts focus on inequalities and inequities in food systems (30–34); food environments (35–43); access to food (37,44,53–61,45–52); food security (9,24,69–73,52,62–68); diet quality (2,21,82–85,74–81); and nutrition and health outcomes (1,7,89,8,11,18,39,65,86–88). The studies included in this synthesis were uncovered through narrative review and extensive search and span a wide array of disciplines, such as public health and nutrition; economics; sociology; geography; psychology; and urban, environmental, food, and development studies, among others. The search was carried out iteratively using Google Scholar and the Johns Hopkins University library search engine beginning with the terms 'food systems', 'access to food', 'food security', 'diet quality', and 'nutrition' followed subsequently by the terms shown in Figure 1, below, that emerged as the common themes across literatures, in combination with 'inequity', 'equity', 'inequality', and 'disparities'.

We aim in this paper to explore the full breadth of work contributing to understanding and addressing inequities in food security and diets. As such, we intentionally cite relevant work liberally in an effort to counteract the consistent under-citation of work by female-identifying and minoritised scholars traditionally underrepresented in the academy.

Figure 1 depicts the conceptual model of the literature and structure of the review. First, we review food environments, then individual factors, and then how inequity manifests at their intersection in the realms of physical, economic, and social access to food. Following the broad review of the literature, we attempt a case study in the

¹ We use the term 'healthy foods' throughout to refer to the nutrient-dense foods that are the necessary components of an overall healthy diet. A high quality (healthy) diet is characterized as a combination of foods – mostly healthy foods (nutrient-dense foods) – that meets nutrient needs, with macronutrient and energy balance, limited intake of salt, added sugars, and saturated fats, as well as variety over time (99).

U.S. to test exactly how much insight existing data can offer to understand inequities in the three dimensions of access to food as well as in diet quality outcomes. Recommendations to close the identified evidence gaps to enable policy advancement to address inequities conclude the paper.

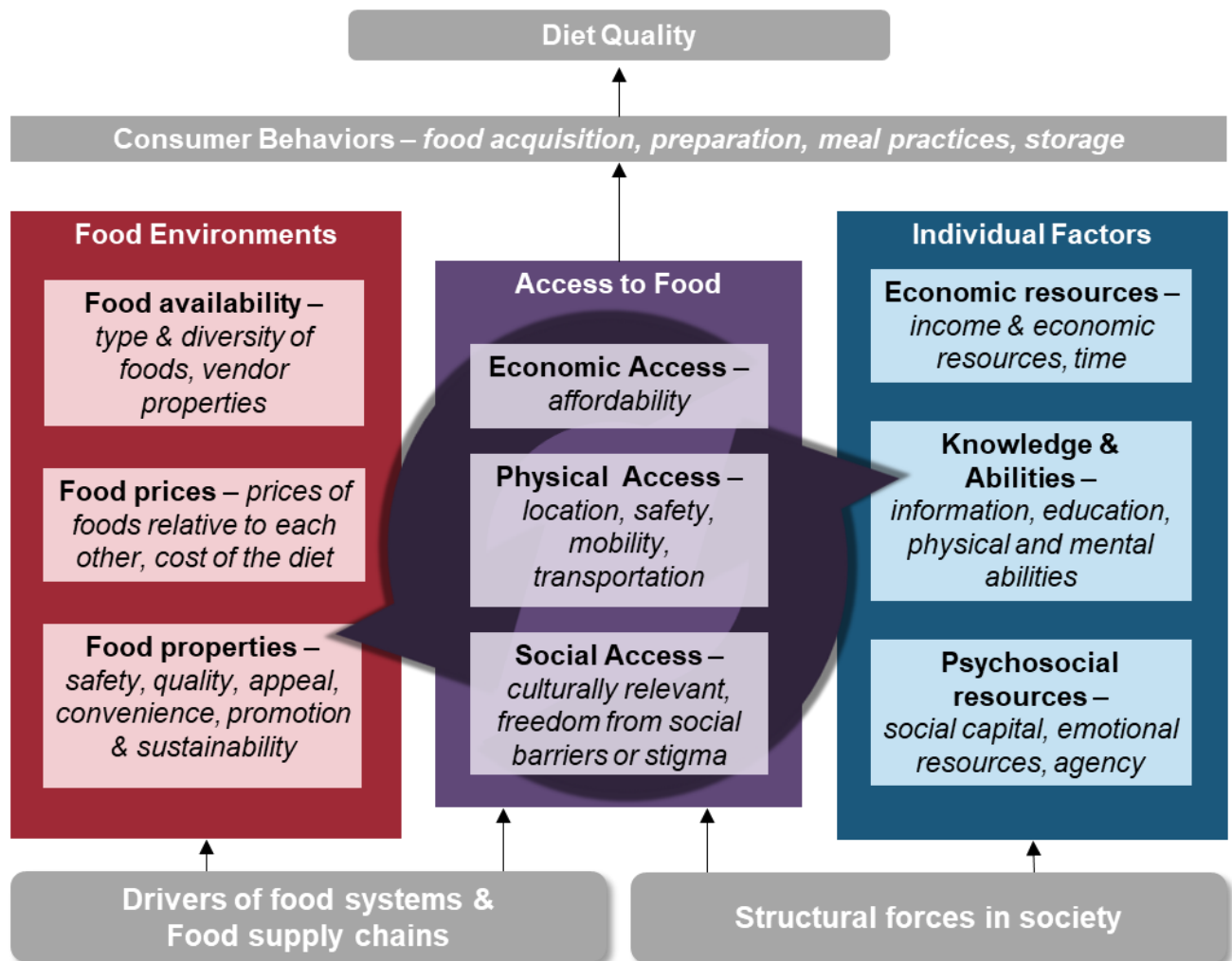


Figure 1. Conceptual Model of Literature Synthesis

Source: Authors modification of a subset of the Fanzo et al. (95) food system framework. Gray boxes indicate drivers, mediators, and the ultimate diet quality outcomes that are outside the scope of this review, depicted to illustrate the links between the focus of this review and the rest of a food system.

FOOD ENVIRONMENTS

Food environments are the places where people acquire food and make decisions about what to eat, and are defined by their features such as the availability, prices, and other properties (e.g., quality) of the food items on offer (42,95,100). Food environments interact upstream with food supply chains and other drivers of food systems (e.g., climate, trade, etc.) to influence the types of foods available and their properties (prices, quality, sustainability). Where food access points are located relative to where people live and spend time, what products are sold and their properties, and how different foods and beverages are promoted and marketed also interact with structural racism and other systemic forces of social exclusion and marginalisation (29,92).

FOOD AVAILABILITY

Much of the equity-focused literature on food availability has concentrated on the properties of vendors and the types of foods sold (101,102). In HICs, this has mostly focused on mapping the number of supermarkets, fast food outlets, corner stores, and other outlets that are available within a given distance of one's home, school, or other location (23,102–108). This has led to the identification of 'food deserts' to describe areas with limited availability of grocery stores selling nutritious foods and 'food swamps' to denote a high number of convenience stores and fast-food outlets (91,96,109). Studies (mostly in HICs) have found a higher likelihood of a 'food desert,' 'food swamp,' or both in lower-income communities and communities of people of colour (110–115). In some cases, lower-income neighbourhoods have a higher density of all food vendor types, including those selling less healthy foods as well as those selling healthier foods (109,114,116). In rural areas of LMICs, food availability may play a different role in access to healthy foods because such areas remain predominantly agricultural and local availability is more closely tied to local production. However, even in farming areas, most households purchase more food than they grow, indicating a need for availability of all types of healthy foods in the market (117,118).

More recent literature has focused on the underlying forces that have led to disparities in food availability deriving from structural (historic, state-sponsored) discrimination, often referred to as food apartheid (92,115). For example, researchers have argued that, in the US context, where food stores are located, and the choices consumers make about the stores they frequent enact racialised capitalism. In other words, urban spaces are invested or disinvested in by both food companies (supply) and residents – especially White residents – (demand) to reinforce racial segregation and hierarchy (93,115). Scholars of food apartheid argue it results when the areas predominantly occupied by people of colour and marginalised communities have been systematically disinvested in by the public and private sector alike (92,93,115,119).

FOOD PRICES

Several literatures aim to better understand the relationships between food prices and inequities. The first examines the impact of changes in food prices on welfare outcomes, including food insecurity (117,120–122), food consumption and diet quality (123–125), nutrition (123,126–130), and other welfare outcomes such as child labour (131) and mortality (132). An increase in food prices without a commensurate increase in wages and incomes will leave (net) consumers worse off; these studies examine in which ways and by how much. Since a large share of the world's poorest people are also farmers who might benefit from higher prices, other studies aim to understand how higher food prices affect poverty and food insecurity for farmers, arriving at mixed results (117,121,133,134).

A growing body of literature concentrates on research questions regarding whether observed differences in the cost of foods and diets are inequitable. Two groups of studies ask if healthy or sustainable foods and diets cost more than unhealthy or unsustainable ones. Though studied separately, many of the findings are consistent

regarding both health and sustainability. Several studies find healthy or sustainable foods and diets to cost more than unhealthy or unsustainable ones (135–141), while others find healthier diets to cost less than current, less healthy diets (142,143). Another group of studies asks if the same foods cost more for low-income consumers than for higher-income consumers in the food environments they frequent. No universal patterns have been observed regarding whether people living in poverty pay more for food in general (i.e., a higher price for a unit of the same product of any food) than their wealthier counterparts or whether healthy diets cost more than less healthy options in a given place and time (144). Studies across settings have observed several divergent findings. In the US and Viet Nam, studies have found that lower-income consumers purchase in bulk to save money per unit (144,145). In India and Malawi researchers found the reverse: lower-income consumers pay higher unit costs because they cannot afford to purchase in bulk (146,147). In Viet Nam lower-income consumers were found to encounter lower prices in poorer neighbourhoods (144) while in Malawi, Canada, the US, and Australia, higher prices were found in low-income and rural areas (22,51,147–149). Other researchers caution against such comparisons on the grounds that lower-income people may make different food choices, limiting diet cost comparability (150).

Divergent findings are also due in part to differences in methodological choices, such as how foods and diets are classified (e.g., what is considered healthy) (151,152) and how prices are measured (e.g., per calorie, by weight, diet cost) (135,153). Underlying each study focused on these questions and its methodological choices are differing views of whether prices, availability, or choices are the underlying drivers of differences in diet quality, which then carry forward into the interpretation of results and suggested policy solutions (e.g., subsidies, open stores, education) (154). Drawing valid comparisons requires methodological consistency. For example, comparing the cost of nutrient-adequate diets using standardised data and methods, Bai et al (2022) found little difference in diet cost across countries (155), while incomes differed greatly (152,155). Low incomes hinder affordability of healthy foods even when such foods are available at similar cost to all (within and across societies) (46).

FOOD PROPERTIES

Exposure to food promotion and marketing is not equally distributed across populations (1,11,156). Promotion by the food industry aims to shift food preferences towards the marketed items, often using cultural symbols, linguistic styles, and norms of a targeted consumer (107,157). Items with the highest profit margins, typically packaged and processed foods and beverages, generate the greatest return on marketing investment (156). There is mounting evidence that unhealthy food marketing is more aggressively targeted at children, minoritised populations, and increasingly to consumers in LMICs, where advertising literacy may be lower and/or fewer regulations exist or are enforced to limit misleading or predatory advertising (32,107,166,158–165). In some LMICs, evidence shows food companies take advantage of weak governance and market aggressively (164,165).

Lower-income consumers often face trade-offs between the price or value of food and its properties (perceived or objective) such as safety, quality, healthfulness, preparation requirements, and appeal (30,167–171). Regarding food safety, there is evidence of mislabelled and unsafe foods (e.g., adulterated oils, expired products) being sold in LMICs and to poorer consumers (30,167,169,172–174). Similarly, consumers in some LMICs often report high perceived pesticide levels in the fruits and vegetables that they have access to; however, they are often unable to pay the price premium for alternatives (174). Research into sustainability properties (e.g., organic, packaging, animal welfare) is more recent. There is some evidence from high-income countries that making food choices based on environmental considerations is a privilege low-income people largely feel is unaffordable. At the same time, sustainability considerations may overlap with food safety considerations, leading to more sustainable choices motivated by food safety concerns rather than explicitly by sustainability concerns (175).

Regarding healthfulness, the property of processing level is more complicated. Processed foods exist along a spectrum from minimally processed (e.g., pasteurised milk), to semi-processed (e.g., whole grain flour), to moderately processed (e.g., commercial breads), to highly processed (also often known as ultra-processed) foods that can only be created using modern technologies (e.g., extruded corn puffs). Increased consumption of energy-dense, nutrient-poor highly (or ultra-) processed foods has been linked to poor nutrition and health outcomes (176–181). In HICs, unhealthy, processed food items and sugar-sweetened beverages have been found to be more prevalent in food environments frequented by lower-income consumers (54,109,182). In LMICs, these products are becoming more affordable, but even where they remain perceived as expensive, they are highly desirable (aspirational) goods (183,184). Consumption has been increasing even in remote areas and by the lowest-income consumers, raising health concerns (185–189).

Excluding the ultra-processed foods with few identifiable health benefits, processed foods and ingredients that save time and energy also have numerous benefits that are relevant to reducing inequities. The initial introduction of time- and labour-saving processed foods (and other household technologies) in HICs, and especially in the US, in the 1940s-1980s has been shown to have substantially reduced women's workload and allowed many to enter the formal workforce, growing economies and reducing poverty (186,190–193); reducing micronutrient deficiencies through widespread fortification (194–196); increasing food safety (197–199); allowing consumers to take advantage of bulk purchasing discounts (lower unit costs) when foods have a longer shelf life (197,198); and improving diet quality among people with limited skills, interest, or facilities for cooking (192,193,200).

INDIVIDUAL FACTORS

Individuals come to food environments from different positions and with different lived experiences that condition their options and preferences. These individual factors are disaggregated in the food systems framework as economic, cognitive, aspirational, and situational (95,96). We focus on the elements of lived experience that are

affected by structural forces (i.e., largely outside individual control). We use the terms *economic resources* (income, assets, time), *knowledge and abilities* (mental and physical), and *psychosocial resources* (emotional, social capital, agency), which are components of the economic, situational, and cognitive factors articulated in the food systems framework (Fig. 1).

ECONOMIC RESOURCES

Economic resources are necessary but insufficient to provide access to healthy foods. Income provides a flow of economic resources to individuals and households and dictates the budget available for food. Across the world, wealth and pay gaps have been observed with respect to gender, race, ethnicity, age, religion, caste, and body size (201–210). Both the level and the stability of income flows are important for year-round access to healthy foods. As such, unpredictable or highly seasonal income presents an additional barrier to food access relative to low income alone and affects people with irregular employment or shift work and those who work as day laborers, many of whom work within food systems as smallholder farmers, farmworkers, and food service workers (211,212). In HICs, men are more likely to work in the informal economy where labour rights are not enforced and incomes may be unpredictable; in LMICs, it is women who are more likely to do so (213). Parenthood also contributes to women's financial hardships more often than men's (214), and gender pay gaps persist (210,215,216).

Income is not the only economic resource that factors into access to healthy foods. Several types of assets (durable goods and productive assets) are directly tied to food security and diet quality, including housing, modes of personal transportation, cooking equipment, and refrigeration (217–220). Most evidence on the role of housing comes from HICs, where lower-income people are much more likely to face housing insecurity, live in overcrowded conditions, and consequently have lower access to reliable and safe cooking and food storage facilities, limiting their food options further than income constraints alone already do (221–223). Discrimination in housing markets by race, ethnicity, caste, and religion has been observed worldwide, exacerbating disparities in access to housing and food preparation facilities (224–228). In rural areas of LMICs, the assets most closely tied to diet quality include livestock, safe and efficient cooking equipment (stoves, fuel, storage containers, water, washing facilities), and refrigeration (219).

Time is a critical resource to acquire, prepare, and consume food, especially the healthy foods that require more time to prepare and cook (e.g., chopping vegetables, cooking whole rather than refined grains). As with monetary resources, time constraints also impose boundaries on the choices available and the trade-offs an individual must make when determining how to allocate their time and the attention and effort that are intertwined with any time-allocation choice. Women with low incomes across settings are commonly found to face the most time poverty (229–232), and time is often cited as a driver of food choices (175,193,223,233,234). Money and time can be substitutes, when a good or service can be purchased to save time or a task can be done oneself to save money; in this way, convenience foods may

offer ways to save time, while cooking for oneself might appear to save money (though may not actually if time and energy costs are accounted for) (193,223,233,235,236). Time is quantitatively finite, but individuals also make choices about how to spend their time based on the activity type and its value to the individual, which also factors into resource allocation decisions and may further explain observed choices and outcomes compared to looking at the role of monetary resources alone (237,238).

KNOWLEDGE AND ABILITIES

Multiple forms of knowledge influence diet quality, and individuals' social position and lived experiences influence the knowledge to which a person is exposed and their opportunities to seek knowledge. Formal education is associated with higher levels of nutrition knowledge and is thought to act as a mediator that can help individuals translate nutrition knowledge into health-promoting dietary choices, yet access to formal education is not equitably distributed within or across countries (239–243). Across numerous LMIC contexts, parental education has been observed to be associated with children's nutrition and diets (244,245,254–259,246–253). In the US and Europe, university graduates tend to consume more fruits, vegetables, and whole grains (84,260).

Beyond formal education and the socioeconomic privilege commonly associated with it, health literacy – defined as the extent to which individuals obtain, process, and understand information to make informed health-related decisions (261) – is a stronger predictor of individual health than sociodemographic characteristics (262–264). As with formal education, access to building health literacy is similarly inequitably distributed, in line with social patterns of exclusion and deprivation. In general, higher levels of nutrition-related literacy, which track patterns of social privilege, are associated with better diet quality, suggesting an additional programming avenue to reduce inequities, at least in HICs where there is evidence of the nutrient literacy-diet quality relationship (265–267).²

Indigenous knowledge can play an important role in improving diets and the sustainability of food systems (269,270). The loss of Indigenous and traditional knowledge has been identified as one of the drivers of worsening diet quality across many settings (271–273). Global reliance on a narrow set of crop species and varieties (often excluding traditional or indigenous crops) has reduced the resilience of global food systems, putting food security at risk in the face of shocks. Many researchers and advocates have called for greater engagement with Indigenous knowledge to improve food system resilience, preserve global biodiversity, and improve diet quality through greater diversity of wild, foraged, and cultivated foods from Indigenous traditions (270,271,273–276).

Physical and mental abilities also constrain food procurement, preparation, and consumption options, and people with disabilities are more likely to have low incomes

² While various methods and tools exist for measuring nutrition-related health literacy (264,266), rigorous studies to understand its relationship to diet quality that focus on LMICs and are representative of relevant social groups are lacking and would be necessary to understand whether this presents an entry point for intervention in LMIC contexts, as well (268).

and experience food insecurity than their non-disabled counterparts worldwide (47). For example, individuals with mobility constraints may not be able to access a food retail location even if it is nearby (47,59). Disability inclusion has not been adequately addressed in food system research and policy to date (277,278).

Finally, the prevalence of food insecurity, poor diet quality, and poorer health is higher among older adults than younger people across multiple countries (studies from the US, Malaysia, and Mexico were identified in a systematic review, (279)). This occurs in part because the aging process decreases mobility, dexterity, and the sensitivity of smell and taste, and also due to limited incomes (57,280).

PSYCHOSOCIAL RESOURCES

Psychosocial resources refer to cognitive and emotional capacities and interpersonal ties that confer value in navigating the world (281). One psychosocial resource that interacts with the food environment to condition access to healthy foods is social capital. Across disciplines, social capital is understood to be a resource grounded in social ties (networks, trust, and reciprocity) that serves as a safety net and insurance when faced with adverse shocks (282,283). In the case of access to food, social capital can broadly be understood as the additional social resources one can mobilise to acquire and prepare food; some aspects can substitute for economic resources, while others cannot be purchased at all. Mutual aid, kinship networks, and reciprocity are examples of social capital that are common across all income settings, where individuals and groups share with each other in times of need (284–287). Lack of social capital has been associated with food insecurity across settings (286–292). In LMICs where food resources are scarce at certain times of the year and policy responses to smooth this scarcity are lacking, mutual aid in the form of food sharing between households is commonly observed (292). However, those who are the most marginalised in a society are more limited in their access to social networks and kinship ties, further reducing access to food.

Food is deeply personal and emotional, and people choose foods for many valid reasons beyond health. However, most people share a desire to eat healthfully most of the time, and typically cite other barriers (things other than desire) to their ability to do so (154,237,293–295). For many people, preparing food is an act of love or self-care (296). Food has symbolic and emotional meaning to people and provides an essential experience of pleasure (298). Failing to consider the emotional work required to make certain food choices or the emotional benefit of food choices misses a critical aspect of how people relate to food (237,297–302). Evidence shows that poverty, and the stress it inflicts, take an enormous toll on emotional and psychological resources (303–308). As a consequence, the means and ability to expend the emotional and psychological resources necessary to prioritise the long-term, health-giving benefits of nutritious food are not equitably distributed, even if most people share a desire to eat healthfully (154,237,293–295). For example, one study in the US found that lower self-efficacy related to food preparation and planning was described among key reasons parents purchased processed and pre-packaged food (200).

Agency has recently received increased attention in the food security literature, building on the seminal work of Amartya Sen and others who developed the capabilities approach. Agency is a core component of empowerment, 'the ability to define one's goals and act upon them' (309–311). Specifically in the context of food systems, the High-Level Panel of Experts on Food Security and Nutrition of the United Nations' Committee on World Food Security recently defined agency as 'individuals or groups having the capacity to act independently to make choices about what they eat, the foods they produce, how that food is produced, processed and distributed, and to engage in policy processes that shape food systems. The protection of agency requires socio-political systems that uphold governance structures that enable the achievement of [food security and nutrition] for all' (311).

Food agency has also been conceptualised in other ways, including as the ability and willingness to prepare a meal for oneself and based on the interaction between technical skills, cognitive capacities, and the presence (or absence) of social and cultural support (318). Burchi & De Muro (2016) developed the concept of nutritional capabilities as the capability to be food secure, encompassing agency, utilisation (implicating knowledge), and stability, broadly defined as long-term human security or resilience (312). Clapp et al. (2021) called for the addition of agency (and sustainability) to the existing four pillars of the food security concept (availability, access, utilisation, and stability) (313). They demonstrated multiple existing policies, including the Right to Food Guidelines at the highest level, that already incorporate the role of agency and the right of citizens to 'feed themselves and their families in freedom and dignity' (313,314). Yet only a minority of countries worldwide have any degree of legal recognition of the Right to Food (315).

Agency can vary across individuals and groups. At the individual level, for example, adolescence is a critical life stage where increasing individual agency is often exercised through food choices, and where desire to express individuality and experience belonging intersect with food environments in ways that can foster unhealthy diets (316). At the community level, marginalised communities articulate increasing agency and local determination of food systems as the route to food justice (19,34,184,317).

FOOD SECURITY AND ACCESS TO FOOD

The interaction between individual factors and the features of the food environment produce heterogeneous patterns of access, thereby conditioning whether and how a person experiences food security. Here we further synthesise the literature through the lens of food security, defined as having economic, physical, and social access to food (311,319,320).

ECONOMIC ACCESS

Affordability reflects the relative relationship between food prices and individual resources. Food prices are a feature of food environments, but food environments usually serve consumers of a limited range of economic resources due to neighbourhood effects, sorting, and policies, suggesting that affordability may differ

by food environment and consumer segment (321). As noted above, at the global level the least-cost foods for a nutrient-adequate diet differ in inflation-adjusted prices by at most a factor of two, while incomes range twenty-fold or more (152). This suggests that policy solutions to address the affordability of healthy diets may lie more with labour market and social protection interventions that raise incomes than changes in food prices. In times of high inflationary pressures on foods and other goods, macroeconomic policy may be needed to ensure affordability of healthy foods (322,323).

People's perceptions of whether a healthy, satisfying, and safe diet is affordable are not typically captured in economic assessments of affordability, but qualitative evidence shows these perceptions figure into food choices (154,163,324). Evidence from Canada, Australia, and the US to Indonesia, China, and South Africa consistently shows that many low-income consumers do not perceive fruits, vegetables, and other nutrient-dense foods as affordable (154,325,334–336,326–333). Those who experience food insecurity across settings express prioritising food quantity, often at the expense of diet quality (154,325,337,338). One element of inequity appears through gender, as women, transgender, and non-binary people are more likely to earn less and experience food insecurity at higher rates than men (19,67,73,214,339–342). At the same time, biological females – especially adolescents and those who are pregnant and breastfeeding – also require more nutrient-dense foods in their diet (155,343,344).

Perceived affordability is inherently a subjective judgment of the food's value relative to its cost, where value encompasses much more than nutritional content and cost is not only monetary (154,170,345). Additional value considerations have been found to include food safety (170,333); symbolic value such as supporting family and other social relationships or to express identity and culture (157,298,327,346,347); emotional value (e.g., being able to say yes to one's child or bonding emotionally with others) (237,298,327); and taste (325). Food is a means to enact one's culture, which may serve a particularly important emotional function for individuals living outside of that culture (348). Other factors such as satiety, risk of spoilage or waste, and time also play a role. For instance, the risk of the food being wasted decreases its perceived affordability because wasted food is wasted money (154,237,349). Foods that can be stored, are sold in a size that is enough but not too much, can be prepared in the time afforded, are satiating, and are reliably eaten by kids and other discriminating household members are a logical and rational choice for many low-income families, even if this results in a food basket that may compromise long-term health (154). Finally, the value of a particular food may differ by gender, especially when influenced by the different roles men and women play in the physical and emotional work of feeding a family (339).

PHYSICAL ACCESS

Physical access occurs when foods are available and a person can, for example, go to the store or market and bring goods home, grow food, or have goods delivered and is physically able to do any required food preparation. Physical proximity has been used as a proxy for access, due in part to the observation that there are stark

differences in the type and density of food retail options in areas with high levels of poverty and minoritised populations relative to higher-income and more privileged areas, both within and across countries (54). Numerous studies testing the hypothesis that physical proximity and the proximate food environment affect diets have found either no impact or only modest impacts of increasing physical proximity on food security and diet quality (36). General consensus is emerging in the literature that physical access plays a smaller role in geographic and socioeconomic diet quality disparities than previously thought (36,108). However, for those who are limited to food shopping near where they live, studies confirm a nearby store does improve access (350) and affordability (321). Other studies have found that decreased distance to a supermarket or grocery store improves food security, consumption of fruits and vegetables, or redemption of benefits, but increased purchase of unhealthy foods and beverages has also been observed (108,351–354). Even if physical proximity is at best weakly related to diet quality, decreasing distance could reduce disparities in the time burden to acquire food and disproportionately benefit people with disabilities and other mobility limitations who largely need or prefer to shop nearby (355). Interactions with food and transport prices also qualify the importance of physical distance to food retail and diet quality, including the role of gas prices and whether traveling further for lower food prices will result in a net benefit (345,356–360).

In LMIC contexts distance to markets (typically the operational definition of 'market access') plays a more important role in diet quality. Greater market access is associated with better year-round access to a high-quality diet, though it also increases access to packaged and processed foods (361–365). Most studies focus on agricultural settings and broadly find that in areas with low market access, home production of nutrient-dense foods increases household consumption of those foods and is associated with various measures of diet quality, though this does not always extend to a positive association with measures of nutrition outcomes (364,366,375–380,367–374). In places with greater access to markets, a weaker relationship between production and consumption has been observed, though market access itself is generally associated with better diet quality (233,366,381,382). Market access also smooths seasonality in food consumption, reducing the presence, duration, or severity of the 'lean season' (383,384). At the same time, market access has also been shown to increase consumption of processed foods (385,386). As in HIC contexts, improving the physical availability of foods is necessary but insufficient to improve the quality of diets (387,388).

SOCIAL ACCESS

Social access remains an understudied aspect of access to food relative to physical and economic access (389,390), yet it is central to understanding inequities. Social access was not present in the original World Food Summit definition of food security (12), though it was debated at the time (391). The phrase was subsequently added in the 2001 State of Food Insecurity report as well as to the Declaration of the Committee on World Food Security in the '5 years on' meeting following the World Food Summit (391). However, there is little documentation regarding how and why this addition was made nor further explanation of its intended meaning. In the

development and validation of the experiential scale used to measure food security in the US, which was ongoing but not completed in 1996, the ability to procure food in socially acceptable ways was found to be a hallmark of food security (392). The influence of this measure in addition to the adoption of the Millennium Development Goals may have been factors influencing the subsequent addition of social access to the FAO definition of food security that remains the most globally accepted definition today (313,393). There is no single meaning of social access, we review here four conceptualisations.

First, social access to food has been defined as the ability to procure food in socially acceptable ways (394–396). Having to rely on socially unacceptable means to acquire food has been found to be a common experience of food insecurity across cultures (394). From a human rights perspective, this reflects the ability to acquire food with dignity and without stigma (397), essential enabling conditions to fulfil the right to mental health (398). There is evidence across settings, though concentrated in HICs, that many people feel a sense of shame or stigma using food charities (e.g., food pantries, 'soup kitchens'), free or reduced school meals, food aid, or relying on gifts from friends and family (32,325,406–412,397,399–405). The shift from food stamps to electronic benefit transfers in the US, for example, has been credited with reducing the stigma of receiving food assistance (413,414). People in larger bodies also face stigma as their food choices are (and/or feel) scrutinised because of social and/or internalised weight bias (408,415–420). In other instances, stigma is associated with poverty itself; those with limited resources can face judgement for making food choices for reasons that do not seem objectively economically rational or motivated by health. A specific example (also related to psychosocial resources) comes from Fielding-Singh (2021) who describes a mother who spends \$10 on fancy coffee drinks for herself and her daughter when the car needs gas, and the pantry is bare. Very little else for only \$10 could put a smile on her child's face; the decision was entirely rational from the mom's perspective (237).

Second, social access has also been understood to mean that minoritised and vulnerable groups face additional barriers to accessing food because of their marginalised identity. One manifestation occurs through the intrahousehold allocation of resources, typically studied in LMICs. Patterns of unequal (shared in different amounts) and inequitable (not shared according to need) food allocation by gender have been widely observed (50,80,421–424). At the societal level, social hierarchies among groups are enacted in everyday interpersonal interactions. For example, recipients of food-based public assistance programmes commonly report rude behaviour from store staff when paying with benefits or encountering unexpected changes in items eligible to be purchased under the programme (345). Similarly, people living with HIV/AIDS also experience discrimination in access to food (71,425,426). Social barriers could also be invoked through the content of foods being distributed to vulnerable people (427). For instance, foods provided to tribal communities through the US Federal Distribution Program on Indian Reservations are often not culturally appropriate (or nutritionally balanced) (428). Finally, physical and social access intertwine when social norms limit women's mobility (429).

Third, social access has been understood as access to foods that are culturally relevant and appropriate (348,389). For instance, among recent Latin American migrants to Toronto, lack of culturally relevant foods emerged as a salient barrier to food access (325). Cultural relevance is also an aspect of value, which affects perceived affordability of foods and economic access. For example, among Muslims who observe religious rules on food consumption, if the only meat available is non-Halal, then there is no access to culturally appropriate meat even if the cost would be affordable (or free) (430). Finally, culturally relevant foods may be present but unaccounted for in metrics designed by a dominant group unfamiliar with the cultural context of a minoritised population. For example, when assessments of food availability and affordability in Indigenous communities overlook traditional wild foods, food access is underestimated (22).³

CASE STUDY

The above synthesis of the literature emphasises that generating policy-relevant insights requires information about the full set of food environment characteristics and which consumers are likely to encounter different food environment features. Similarly, we need a comprehensive understanding of the resources and capabilities (that are largely structurally conditioned) with which individuals show up in a given food environment. Finally, to understand how these structural conditions result in food security and diet quality outcomes, we need evidence of the patterns of economic, physical, and social access as well as indicators of food security and diet quality outcomes by relevant social groups. As noted above, the relevant disaggregation for a study of inequities varies by context but is commonly related to race, ethnicity, gender, social class, religion, and/or age. The vast literature cited earlier on inequities across various parts of food systems and in these outcomes points consistently to data gaps and the need for creative statistical methodologies to overcome the issue of sampling strategies ill-suited for disaggregated and intersectional analyses (189,399,433–440).

In this section we undertake an exploratory case study of the US to examine the limits of existing data. The US was selected because of the greater availability of nationally representative data on multiple topics covered in the literature reviewed above that can be analysed by sub-populations relevant for equity concerns in the US context. However, even in this uniquely data-rich setting, we can only address diet quality and food security by some sub-populations and identity characteristics.

We selected the outcomes and sub-populations for this analysis purposively based on the literature synthesis and the variables available in the data. We aimed to showcase a variety of different sub-populations and intersectional groupings wherever possible, determined by the sample sizes and available variables. Further, while there are data to examine economic and physical access to food, social access to food presents a clear data gap. The sub-populations and experiences that are most relevant to

³ Though we discussed social capital under psychosocial resources, some have also defined social access as having social capital resources that can compensate for lack of financial or other resources (13,431,432).

identify and address inequities vary across societies; we use this case study of the US to illustrate how national policymakers could begin to understand inequities in food systems that underlie diet quality and nutrition disparities using nationally representative survey data. Our analysis is purely descriptive, meant to illustrate the variables available and general patterns that are observable with respect to the themes discussed above.

We use three surveys in our brief empirical case study. First, the Centers for Disease Control and Prevention annually collect the National Health and Nutrition Examination Survey (NHANES), which collects information on individual dietary intakes and household food security outcomes together with detailed socioeconomic information. We use the 2017-2018 data as the last complete year prior to the Covid-19 pandemic. We analyse adults 18 years and above and do not impute any missing data, so we restrict our analysis to the 4,420 (of 4,983) adults for whom data are complete. NHANES deliberately oversamples minoritised groups to allow for analyses of intersectional inequities to be adequately powered. Specifically, it oversamples Black and Hispanic Americans and people living below the poverty line (441). Supplemental Tables 1 and 2 include detailed sample size and summary statistics for the variables included in our analysis. Sampling weights are used throughout our analysis to generate nationally representative estimates.

We calculate food security and diet quality outcome indicators using NHANES data. The Healthy Eating Index (HEI-2015) score is a measure of diet quality that compares an individual's dietary intake to the Dietary Guidelines for Americans, the food-based dietary guideline for the US. Scores range from 0 to 100, with higher meaning closer alignment with recommendations. Calculations are at the individual level and follow established methodology (442–444) using the National Cancer Institute's SAS code (445) and an R package adapted by Bellows (446) from Folsom & Nagraj (447). Food security is measured using the US Food Security Survey Module developed by the US Department of Agriculture (392,448). It is an experiential indicator defined by responses to a 10-item questionnaire for households without children and 18 items for those with children. Food security is categorised as full food security, marginal food security, low food security, and very low food security based on item responses (448).

NHANES data permit disaggregation along several characteristics relevant to inequity in the US context. The available race-ethnicity variable identifies Mexican Americans, other Hispanics, non-Hispanic White, Black, and Asian Americans and others including those who identify as multi-racial. Incomes are provided at the family level (unit related by biology, adoption, marriage, or cohabitation) and household level (multiple families who live together) by income ranges and relative to the poverty line. No continuous income measures are made public. We use the family income variable as well as the income-to-poverty ratio, which we also categorise into quintiles for interpretability. Education level, age (years), disability status, and gender are also available for disaggregation. We dichotomise an indicator of any disability as equal to 1 if the person responds affirmatively to any questions about visual, hearing, or physical impairments including difficulty dressing oneself and doing errands alone. The gender variable is collected as binary, with no option for 'other'.

To assess the economic resource of time, the second survey we use is the 2019 American Time Use Survey (ATUS) from the US Bureau of Labor Statistics. Food-related activities include all procurement, preparation, eating and drinking, and cleaning up. We compare time spent on food to sleep time, work time (primary and secondary jobs), and household work and caregiving (household maintenance activities and caring for others), including any related travel and waiting time for work and household/care. To illustrate food-related activities in relation to work and sleep, we consider the sample of full-time employed adults (18-64 years), disaggregated by racial/ethnic group and gender. Work and sleep were selected due to the large body of time use evidence that low-income people often work more hours and are not able to get an amount of sleep that feels sufficient or that is recommended by experts for health (449–454). The sub-sample is 4,340 respondents (46% of total) who are 55% male and 81% 'White only'. Full details on the sample and sub-sample are provided in Supplemental Table 3, and we apply sampling weights to generate nationally representative estimates. Though the sampling frame is nationally representative (455), the sample is not; only 60% of the US population are 'White only' (456). Non-response bias is probable; the response rate was 42% in 2019 (455). Participating in the survey is time-consuming, suggesting those who are more time-constrained may be less likely to agree to participate. We remain sceptical that the results are reflective of marginalised populations given the small sample size, but it is nonetheless illustrative of the need to understand time resources in addition to monetary resources when considering drivers of food choice.

The last survey we examine is the US Department of Agriculture (USDA) 2020 county-level Food Environment Atlas data, which provides a measure to assess physical access to food (457). Low access is defined as a person living more than one mile (urban) or 10 miles (rural) from a supermarket or large grocery store (53,458). The USDA 2013 Rural-urban Continuum Codes dataset classifies counties along an urban-rural continuum by population size and adjacency to a municipal area (see Supplemental Table 4 for number of counties per group) (459). Though the dataset refers to the food environment in its title, the measure only reflects one aspect of physical access: distance to a large food retailer.

DIET QUALITY

Table 1 shows that diet quality is poor, on average, for most Americans, with a mean HEI score of 52. Column 1 shows the available socioeconomic and demographic variables, and Column 2 shows the same but with the addition of an interaction between race-ethnicity and gender. The same insights emerge from both models. First, formal education (discussed above) explains more variation in diet quality than any other factor. Those with a college degree have higher diet quality scores than people with less formal education, on average, and with each additional education level, diet quality is higher on average relative to the level lower, all else equal. Of course, education is highly correlated with income, race, and ethnicity, which we address in the next analysis.

HEI is also statistically significantly different across racial-ethnic groups, with people who identify as Mexican American, Hispanic (other), and as non-Hispanic Asian having better diet quality than the non-Hispanic White reference group, by 3, 5, and 7 HEI points, respectively, on average and all else equal. Women and people with any disability have slightly higher diet quality than the average for the reference group (non-Hispanic White men with household income in the category containing the US median income, with a college degree, and who experience food security). Of note, the interaction of race-ethnicity and gender does not have more explanatory power than the factors already listed; none of the interaction terms (as a proxy for intersectionality) are statistically significant. We note, however, that race-ethnicity is not a proxy for experiencing racism, which requires further research (460).

Women, on average, have higher diet quality than men by almost two points, and age is also significantly associated with HEI, though the magnitude of impact on diet quality is small (0.13 points higher HEI score per year of age). Interestingly, experiencing very low food security is associated with lower diet quality (as would be expected), yet there is no statistically significant difference in diet quality between those with marginal and low food security relative to those who are food secure. Finally, it would be relevant to look at geographic disaggregation by urban-rural, however, no geographic identifiers are available in the public NHANES data, so sub-national results are not feasible.

Table 1. Socioeconomic factors associated with diet quality among US adults (18 y+), 2017-2018

	(1)		(2)	
	Coef.	SE	Coef.	SE.
Female	1.664**	(0.475)	1.706*	(0.671)
Age (years)	0.131***	(0.018)	0.131***	(0.018)
Annual family income				
Under \$20,000	-0.733	(0.982)	-0.706	(0.982)
\$20,000 to \$24,999	-0.402	(1.034)	-0.402	(1.044)
\$25,000 to \$34,999 (contains median income)	Reference			
\$35,000 to \$44,999	0.794	(0.797)	0.902	(0.789)
\$45,000 to \$54,999	-0.270	(1.321)	-0.242	(1.305)
\$55,000 to \$64,999	-1.251	(1.504)	-1.228	(1.512)
\$65,000 to \$74,999	-1.114	(1.069)	-1.028	(1.081)
\$75,000 to \$99,999	-0.456	(1.129)	-0.471	(1.119)
\$100,000 and Over	-0.359	(1.228)	-0.327	(1.233)
Race-ethnicity				
Mexican American	4.120**	(1.338)	3.152*	(1.468)
Other Hispanic	5.864**	(1.521)	5.441**	(1.394)
Non-Hispanic White	Reference			
Non-Hispanic Black	1.279	(1.101)	1.211	(1.162)
Non-Hispanic Asian	6.408***	(1.004)	7.312***	(1.127)
Other Race, incl. Multi-Racial	0.634	(1.565)	2.375	(2.383)
Education level				
Less than 9th grade	-4.779***	(1.147)	-4.690**	(1.157)
9-11th grade (Includes 12th grade with no diploma)	-8.537***	(1.624)	-8.546***	(1.611)
High school graduate/GED or equivalent	-7.661***	(0.996)	-7.627***	(1.010)
Some college or AA degree	-6.227***	(0.733)	-6.212***	(0.744)
College graduate or above	Reference			
Total number of people in the Family	-0.599*	(0.278)	-0.598*	(0.275)
# of children 5 years or younger in household	0.0232	(0.529)	0.00523	(0.529)
# of children 6-17 years old in household	0.106	(0.491)	0.0994	(0.494)
Any disability	1.771*	(0.829)	1.779*	(0.821)
Household food security status				
Food secure	Reference			
Marginal food security	-0.546	(1.019)	-0.550	(1.014)
Low food security	-1.115	(1.079)	-1.123	(1.096)
Very low food security	-2.577**	(0.737)	-2.602**	(0.722)
Race-Ethnicity * Female				
Mexican American			1.903	(1.266)
Other Hispanic			0.804	(0.992)
Non-Hispanic White	Reference			
Non-Hispanic Black			0.123	(1.508)
Non-Hispanic Asian			-1.683	(1.049)
Other Race, incl. Multi-Racial			-3.669	(2.374)
Constant	47.91***	(1.869)	47.85***	(1.904)
R-squared	0.1313		0.1328	
	Mean	SE		
HEI Score	52.13	(0.743)		
Observations	4,614			

Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: (461)

Notes: Population statistics corrected with sampling weights. Excludes those who refused to give income (n=86), did not know (n=96), or who reported their income as the category '\$20,000 and above' (n=128) due to limited interpretability. Also excludes those who refused to give education level (n=2) or did not know (n=6).

Figure 2 illustrates the average HEI score by education level and gender, showing evidence of a U-shaped relationship between education and diet quality. The least and most educated American adults appear to have the healthiest diets and are the only two groups whose median HEI score rests above the overall median of 51. For men, those with the most education have higher-quality diets than those with the least, while for women the reverse appears, where those with least education have slightly higher diet quality than those with the most. Examining the membership of the group with the lowest education, the vast majority were born outside of the US. One hypothesis is that their dietary patterns reflect continued consumption of basic diets (staple grains, beans, vegetables) that would be common in lower-income countries of origin, with the addition of items unaffordable in those contexts but more affordable in the US, such as fruits and animal-source foods. Together this pattern would form a relatively higher-quality diet than the modal American diet (outside the scope of this paper, but a testable hypothesis).

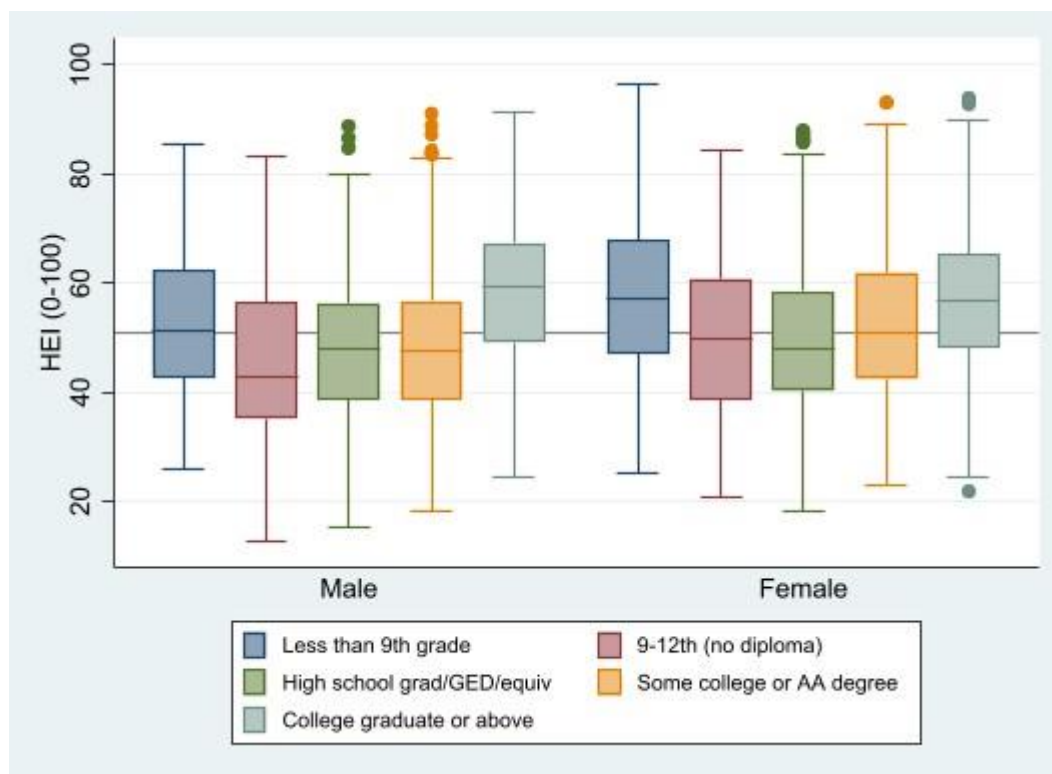


Figure 2. Distribution of Healthy Eating Index (HEI-2015) scores, by education level and sex, 2017-2018

Source: (461). Notes: Population statistics corrected with sampling weights. Gray line indicates median HEI overall of 51.

FOOD INSECURITY

Table 2 presents the odds of having a college degree and of experiencing food insecurity by socioeconomic factors. Though education appears to best explain variation in observed diet quality in the US, access to education is inequitably distributed by race-ethnicity, and education, income, and race/ethnicity are known to be highly correlated (64,462). Mexican Americans are least likely to have a college degree and most likely to experience food insecurity (though the food insecurity results are not statistically significantly different from other groups except non-Hispanic

Asian people). Non-Hispanic Asian people, on the other hand, show the opposite: most likely to have a college degree and least likely to experience food insecurity. Women have higher odds of experiencing food insecurity, relative to men. Those with the highest incomes are most likely to have a college degree and least likely to experience food insecurity, as would be expected, though this cross-sectional analysis cannot identify the direction of that relationship. Furthermore, we see the relationship that from high school diploma to any further education increasingly reduces the odds of experiencing food insecurity independent of both race-ethnicity and income.

Table 2. Odds of College Degree and Food Insecurity by Race-ethnicity and Income, US adults (18 y+), 2017-2018

	College Degree		Experience Food Insecurity	
	Odds Ratio	SE	Odds Ratio	SE
Race-ethnicity				
Mexican American	Reference			
Other Hispanic	2.934***	(0.625)	1.719	(0.473)
Non-Hispanic White	3.098***	(0.481)	0.690	(0.191)
Non-Hispanic Black	2.632***	(0.303)	0.974	(0.321)
Non-Hispanic Asian	8.445***	(1.734)	0.601	(0.201)
Other Race, incl. Multi-Racial	3.092**	(1.036)	1.413	(0.407)
Income-to-Poverty Quintile				
Lowest quintile (0-1.18)	Reference			
Second quintile (1.19-2)	1.992*	(0.514)	0.453***	(0.071)
Third Quintile (2.01-3.08)	2.772***	(0.630)	0.263***	(0.040)
Fourth Quintile (3.09-4.45)	7.833***	(1.715)	0.174***	(0.035)
Highest Quintile (4.47+)	16.58***	(3.863)	0.0425***	(0.010)
Education				
Less than 9th grade	Reference			
9-12th (no diploma)			0.899	(0.147)
High school grad/GED/equiv.			0.677*	(0.110)
Some college or AA degree			0.495***	(0.065)
College graduate or above			0.265***	(0.046)
Female (%)	1.262	(0.149)	1.220*	(0.090)
Age (years)	0.996	(0.005)	0.983**	(0.005)
Observations	4,424		4,424	

Source: CDC and NCHS (2018). Notes: Population statistics corrected with sampling weights. Exponentiated coefficients. Standard errors in parentheses. Experiencing any degree of food insecurity is defined as having marginal, low, or very low food security. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

ACCESS TO FOOD

As described above, incomes are only one aspect of economic resources that may influence food choices. Time use is less commonly considered in the formation of food policies, and time-use data are uniquely capable of illustrating which groups are more time-poor and how different people make choices about trade-offs with this finite resource (463–467). **Figure 3** shows daily minutes spent by full-time employed adults in the US on food-related activities (procuring, preparing, consuming, and cleaning up after eating and drinking), sleep, and work, for different intersectional identities. Comparing just across sex, women spend approximately 18 minutes more on average

than men on food-related activities ($p < 0.001$) (full comparisons by sex, race, and their interaction in Supplemental Tables 5 and 6). No other statistically significant differences are observable, though we question the validity of this conclusion given the low response rates of non-White people (see Supplemental Table 2).

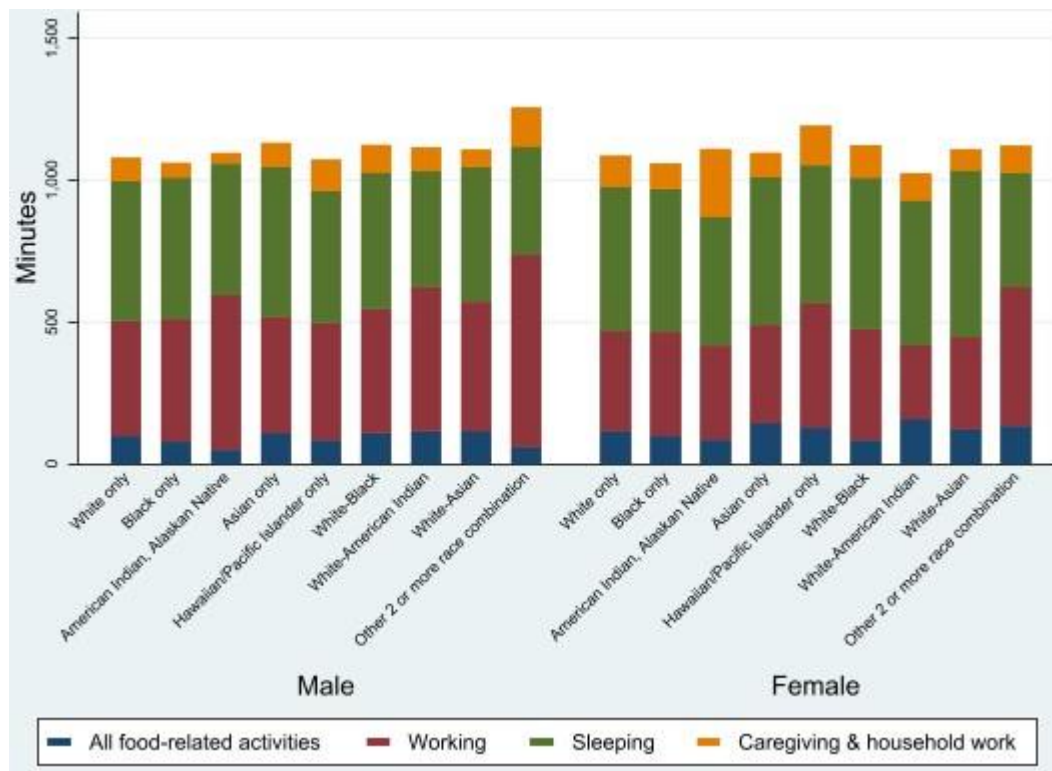


Figure 3. Mean number of minutes per day for food-related activities, sleep, household work and caregiving, and work among full-time employed adults (18-64 years), by sex and racial group identity in the US, 2019

Source: (468). Notes: Sample statistics corrected for population weights. Sample size = 4,340, details in Supplemental Table 3. Number of minutes do not add up to 100% of time, e.g., leisure, health, travel time for activities unrelated to work and food, and education activities not shown.

The final dataset allows investigation of physical access, though not at the individual level. **Figure 4** classifies the US population by physical proximity to food retail (the USDA measure of food access) along an urban-rural continuum. The proportion of the population considered to have low access to food clusters along the median (pooled over all observations) of 20% for all categories except remote rural counties. However, there are many fewer remote rural counties ($n=92$) than counties in the other groups (all others have >200 , Supplemental Table 3).

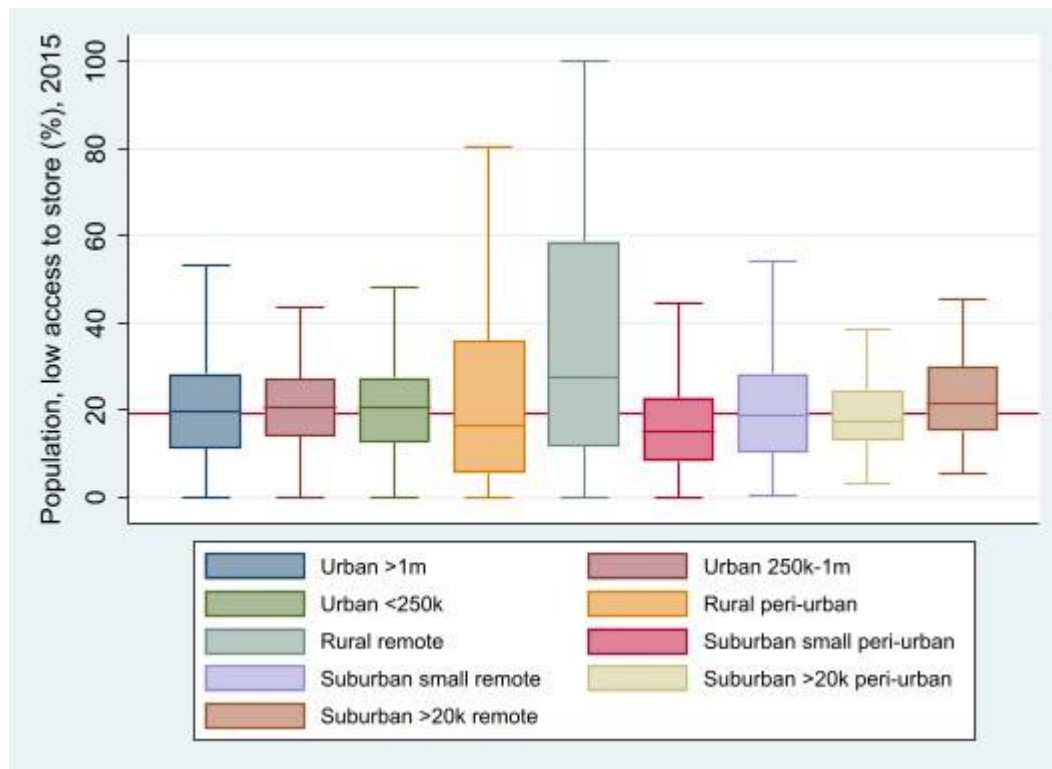


Figure 4. Percent of the Population with Low Access to a Supermarket or Large Grocery Store by Urban-Rural Continuum

Sources: (457,459). Notes: Red line indicates median of 19.2%. Low access defined for urban populations as living >1 mile from a supermarket or large grocery store; defined for rural populations as living >10 miles. Peri-urban denotes a county that is adjacent to a metro area, remote indicates a county that is not adjacent to a metro area. All numbers in the labels refer to total county population. The total number of counties is 3,124. The number of counties per urban-rural classification are listed in the Supplemental Table 3.

DISCUSSION

Considering how inequities and inequality are addressed in the literature across disciplines results in a nuanced understanding of the myriad forces that make it harder for some people to eat a healthy diet, adding insight beyond that provided by any single discipline or perspective. We hope this synthesis can shed new light on practical entry points for researchers, practitioners, and policymakers to better understand and address the ways that structural inequities shape people's access to healthy food. However, our attempt at comprehensive empirical analysis in a data-rich country, the US, underscores critical data gaps.

Our synthesis of the literature makes clear that inequities manifest from multiple forces and are not simply tied to one's income, race, social position, or nature of the food environment, for example, but to a combination that creates complex net effects. A better understanding of these subtleties is necessary to design effective policies to reduce inequities. The synthesis highlighted numerous important next steps to address gaps in quantitative and qualitative experiential evidence, data that can be sufficiently disaggregated into intersectional groups, and metrics especially of social access to food. The pathways forward to close these gaps are clear; failure to do so will inhibit justice and undermine common goals to improve health and wellbeing for all.

ACTIONABLE RECOMMENDATIONS

Before policy can become evidence-based, better data and information are needed. Actionable recommendations emerging from this review thus concentrate on research needs to fill the identified gaps. First, the literature shows that achieving equity in diet outcomes requires addressing all dimensions of access, necessitating the development and testing of holistic interventions. For example, the limited impact of increasing stores in 'food deserts' on food consumption and diet quality illustrates the limitations of a single-dimension approach. Second, inclusive and participatory approaches to better understand limitations to accessing and choosing healthy foods have tremendous value to add in the policy debate, but to date have been largely absent (237,469). Food choices are complex, and especially so for populations facing resource constraints and for families with children; effective policy solutions require a more comprehensive approach to address the complexity of people's lives (154,237). Testing inclusive and participatory interventions is also called for to generate needed evidence to guide a way forward.

Urgent data needs are also clear. First, nationally representative quantitative dietary data with demographic and socioeconomic variables only exist in a few countries (11,461). Second, very few studies disaggregate data in intersectional ways (2,11). This reduces heterogeneous groups of individuals to the single dimension they share, obscuring the ways in which the variation observed may derive from other aspects of identity and experience. There is a growing literature on how to apply intersectional approaches in equity-focused research, which emphasises the need to carefully consider the classification of lived experiences into categories for quantitative study, sampling for intersectional analysis, and greater use of qualitative methods and other approaches capable of capturing the social construction of identities and emergent processes through which they manifest and change (437–439,470–474). Studies going forward need to embrace these recommendations in their design to generate new evidence. Third, diet quality analyses must capture the full spectrum of detrimental and health-promoting dietary patterns (475–477). New metrics collected globally through the Global Diet Quality project are becoming available, but further country coverage across the income spectrum is needed (478). Fourth, data are especially needed to better understand social access to food. Quantitative experiential measures capture certain aspects, but further study of the role of social capital, social networks, and psycho-social factors (e.g., stigma, discrimination, peer effects) is needed to address social drivers of dietary inequities. Finally, though several exist (e.g., Kimura, 2013; Reese, 2019; Daniel, 2020; Fielding-Singh, 2021), more qualitative studies are needed to give voice to how disadvantaged people perceive and experience inequities and make choices about trade-offs especially across contexts and settings (11,107,480).

Methodological collaboration across disciplines is also needed to develop common measures of food environments and access to food and how individual and external forces affect diets. Recent developments to estimate the affordability of healthy diets using consistent methodology across the world provide an example. These analyses offer new insight into the global differences in affordability and have shown that

variation is driven more by differences in incomes than the availability and prices of foods (13,152,155,481,482). However, affordability alone still fails to capture non-monetary costs (time, emotion), food values beyond nutrition, necessary abilities to acquire and prepare the food, or aspects of social access such as freedom from stigma or cultural relevance for non-dominant groups.

CONCLUSION

This paper has synthesised a wide body of literature from across disciplines to identify inequities in access to healthy foods. We hope this synthesis provides a clearer view of how inequities at various entry points can lead to inequities in food security and diets. We offer several recommendations that emerge from the literature and a case study illustrating how researchers, practitioners, and policymakers can begin to better understand the ways that structural inequities shape people's access to healthy food.

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