

Socioeconomic Inequalities in Diet Quality: from Identifying the Problem to Implementing Solutions

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Abstract In high-income countries, poor diet is both a leading contributor to the burden of disease and strongly socioeconomically and demographically patterned. The many forms of a poor diet, from food insecurity, through a lack of intake of healthy foods to an excess intake of unhealthy food and drink, represent a substantial modifiable driver of inequalities in health and well-being. Here, we review the drivers of these inequalities, with a critical reflection on the interventions most likely to improve inequalities in a healthy diet. Interventions currently exist at the levels of the individual, the community and society that have the potential to improve diet quality across our communities, with greatest benefit for those with greatest need. We conclude that greater attention needs to be paid to the potential impact of specific population nutrition strategies, their sociocultural applicability, their implementation, and their evaluation, if they are to play a significant role in reducing inequalities in diet and health.

Keywords Socioeconomic position · Race · Ethnicity · Diet · Diet quality · Inequalities · Developed countries

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Introduction

The recent 2015 Global Nutrition Report is a useful summary of the global progress in reducing malnutrition in all its forms, demonstrating that while there has been significant progress, there are still billions of people around the world experiencing malnutrition or overweight and obesity [1••]. It is a call to action to continue in our efforts to improve all the systems that support good nutrition for all. Globally, there are many levels of inequality when it comes to having a “good” diet. While much of the global effort rightly focuses on reducing the large between country inequalities, there are also large within country inequalities, with many high-income countries experiencing avoidable differences in diet quality across their populations.

With an unhealthy diet as one of the main drivers of burden of disease globally, avoidable inequalities in a healthy diet is an important driver of avoidable inequalities in disease, disability, and mortality. A focus on inequality reflects concern for health differences resulting from factors considered to be both avoidable and unfair. In high-income countries such as the UK and Australia, poor diets are the leading modifiable contributor to cardiovascular disease and burden of disease and their associated socioeconomic inequalities [2]. Inequalities in diet quality are also likely to lead to a cycle of downward socioeconomic mobility. Reducing avoidable socioeconomic inequalities in health is an important goal of a just society, and in the case of poor diet, will also improve overall health and well-being and reduce productivity costs [3, 4].

In high-income countries, there are many systemic contributors to inequalities in diet quality [5]. These contribute to sociodemographic and economic gradients and gaps in diet quality and consequent ill health across many facets of our communities, such as gender, race/ethnicity, income, occupation and education, and area of residence. In this review, we will provide an overview of the current relationship between

sociodemographic and economic characteristics with diet quality in high-income countries. We will focus on the role of the various contributors to these avoidable inequalities, with a reflection on potential approaches to reducing the current sociodemographic and economic inequalities in diet quality in these countries.

Approach

This review concerns itself with sociodemographic and economic differences, and with diet quality. Each of these is a complex concept. Here, we define the scope of each for this review. The review is restricted to the context of high-income countries.

Sociodemographic and Economic Inequalities Here, we are interested in all reported differences in diet quality, viewing sociodemographic and economic characteristics as broadly as possible. Measures included are race/ethnicity, education, income, occupation, and area of residence. While we are interested in those differences that are potentially avoidable, many reports are simply on the observed differences and we will review those here. In our discussion of actions to prevent inequalities, we will focus on those differences that are potentially avoidable. We will refer to the various measures of sociodemographic and economic position as SEP.

Diet Quality Here, we are interested in the variety of measures of diet quality that indicate the range from undernourishment (both overall and for specific nutrients) through to excess nutritional intake. This is reflected in many different concepts and constructs, both in national dietary guidelines and in the research literature. We will include the range of concepts, from food insecurity, through specific nutritional deficits, fruit and vegetable recommendations, to measures of dietary variety and national dietary guidelines, to consumption of unhealthy food and drink.

Due to the complexity of the fields of sociodemographic and economic position and diet quality, and our desire to identify a range of solutions, we conducted an umbrella review. We performed a systematic search of terms related to socioeconomic position/race/ethnicity AND diet, restricted to high-income countries in PubMed (“diet”[MeSH Terms] OR “diet”[All Fields]) AND (“socioeconomic factors”[MeSH Terms] OR “socioeconomic”[All Fields] AND “factors”[All Fields]) OR “socioeconomic factors”[All Fields] OR “inequality”[All Fields] OR (“continental”[All Fields] AND “population”[All Fields] AND “groups”[All Fields]) OR “continental population groups”[All Fields] OR “race”[All Fields]) AND (“developed countries”[MeSH Terms] OR (“developed”[All Fields] AND “countries”[All Fields]) OR “developed countries”[All Fields]) AND (Review[ptyp] AND “humans”[MeSH Terms]). We selected reviews only

and then supplemented these with snowball referencing, where the reference lists of retrieved articles are used to source further articles, to provide detail as needed. We excluded those reviews and studies focused on disease-specific populations.

Identifying the Problem

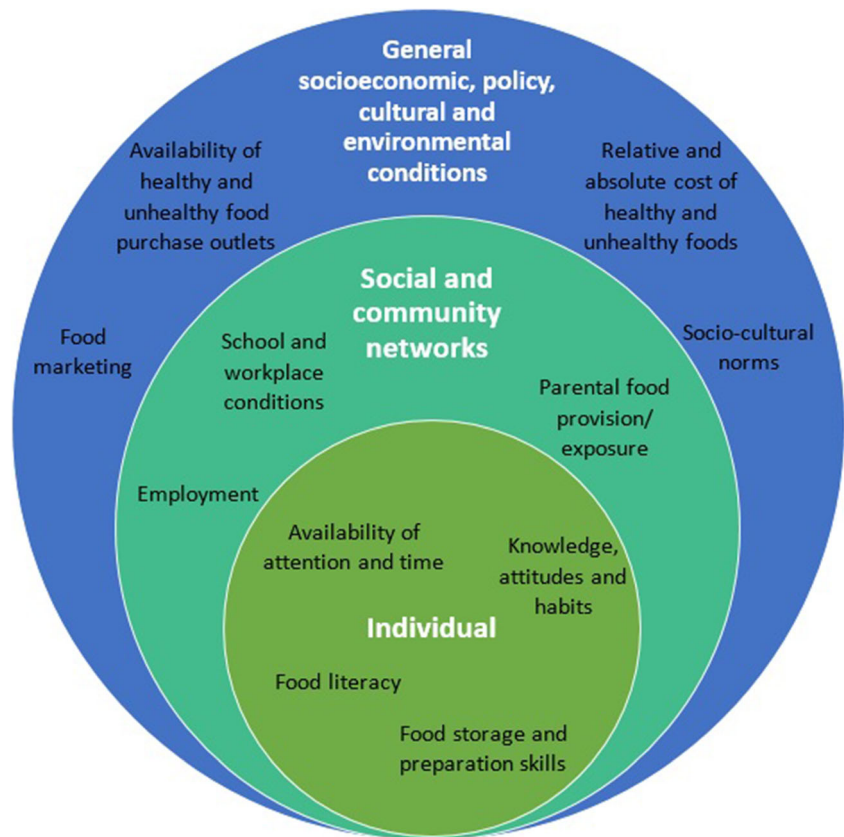
Healthier dietary patterns by most indicators have been associated with higher education and other measures of SEP [6–9]. This shows a gradation (with poorer diet quality with reducing social status) [7, 10]. In Europe, the direction of association between SEP and total energy intakes (a proxy for diet quality) has been found to be inconsistent [10, 11]. Similarly, mixed results for total fat intake [10, 11] (a poor marker of dietary quality [12]) are in part likely due to differences in sources of dietary fat and ultimately dietary patterns among low and high SEP groups. Two reviews have found higher cheese consumption in men and women of higher SEP classes in Europe [13] by education and occupation measures [14], and mixed relationships for butter consumption for different countries [13].

The strongest and most consistent socioeconomic gradient is seen for the association of higher fruit and vegetable intake with higher occupational and educational status in men and women in Europe [7, 8, 11, 15, 16] and with race/ethnicity in children [17]. There are also consistent observations of less healthy dietary consumption patterns and lower fruit and vegetable intake in underserved, ethnically diverse population groups in many high-income countries [18–21]. Less strong or inconsistent associations have been found among higher compared to lower SEP populations for higher intakes of vegetable fats, low-fat milk and cheese, whole grains [10], and wholegrain bread [7], and less meat [22, 23], animal fats and sugar [10]. Higher intakes of nutrient-dense foods are reflected in clusters of higher micronutrient [8, 10] and fiber intakes [10] in higher socioeconomic groups [10], in particular higher calcium and vitamin C intakes [10]. Serum micronutrient status has been generally reported to be higher among higher SEP groups [10].

Heterogeneity in results may be due to real differences between countries [11, 24], the sexes [7, 11], changes in food consumption trends over time [24], and differences between adult and child populations, with more limited data available for children and adolescents [7, 11, 25]. Heterogeneity may also be due to real differences in relationship of dietary outcomes to certain SEP measures [7, 26, 27].

Many factors have been identified that contribute to inequalities in nutritional status in high-income countries. These can be grouped according to the different levels of influence, from individual level, through social and community level to the underlying societal determinants of health (Fig. 1). It is also important to understand that they act across the life course and play an important role in the intergenerational transfer of healthy inequalities over time [28].

Fig. 1 Factors contributing to socioeconomic and demographic inequalities in healthy diets in high-income countries (structure informed by Dahlgren and Whitehead [93])



Individual Level

At the level of the individual, there are a number of factors that affect an individual's likelihood of consuming a healthy diet. The capacity to appropriately store and cook healthy food has been consistently associated with sociodemographic and economic factors. Groups within society for whom this can be a particular issue include those in more remote communities, those who are homeless, and the elderly [10]. Consistent evidence exists also for a range of differences in food knowledge, attitudes, and habits across income and educational groups [29]. Relevant knowledge and skill differences that have been identified include early life parent feeding practices, including the range from breastfeeding through early introduction of solids to the capacity to understand packaged food labels, and basic food storage and cooking skills [10, 30–35]. In more disadvantaged communities, competing life priorities often diminish the attention and time available for pursuit of a healthy diet [36, 37]. Food insecurity, which can come in many forms in high-income countries, is an extreme example of this, where concrete choices between essential living conditions need to be made [38, 39].

Social and Community Level

A number of social and community level factors have been identified that are both socially patterned and associated with

unhealthy dietary patterns. In most cultures food is an important aspect of family and community life. However, these sociocultural norms have varying and often competing effects on diet quality depending on gender, racial or cultural group, immigration status, and broader socioeconomic characteristics [21, 40, 41]. For example, Airhihenbuwa et al. found that the adoption of diets lower in total fat, saturated fat, and salt and higher in fiber would be contrary to some traditional African American cultural practices [41]. Similarly, Schultz et al. concluded that it was important to take into account the markedly different sociocultural perspectives of obesity in Fiji and Tonga compared with Western countries when planning obesity prevention policies [40]. Work and employment characteristics are also likely to play a role with some studies demonstrating associations between shift work and less healthy dietary patterns [42]. Reported associations with diet and occupation are varied and likely to be occupation and culturally specific.

General Socioeconomic, Policy, Cultural, and Environmental Level

At the level of societal determinants of diet three key elements of the food system emerged from the literature: cost of food, location of unhealthy food stores, and marketing of unhealthy food and drink. While a clear association is present in the literature between a greater prevalence of fast food stores in

neighborhoods that are predominantly low income or ethnic minority populations, this is not universally observed [43]. The dominance of US studies in these findings makes it difficult to identify the extent to which this is a generalizable phenomenon or restricted to the US where there is a greater prevalence of food deserts [44]. In the review by Fleischhacker et al., all the studies showing no association between disadvantaged communities and concentration of fast food stores were outside the US [43].

In a review by Darmon et al. across multiple high-income countries, energy-dense foods were found to be less expensive than nutrient-dense foods both within and between food groups, across a wide range of food groups [45••]. In this review, cost relative to energy density was typically derived from €/100 kcal. Cost relative to nutrient density was derived from price compared to either the SAIN/LIM ratio or the Nutrient Rich Food Index. The SAIN/LIM ratio compares the relative amounts of beneficial nutrients (protein, fiber, vitamins, and minerals) to harmful nutrients (saturated fat, added sugar, and sodium) adjusted for kcal/100 g [46]. Similarly, the Nutrient Rich Food Index summarizes the percentage of daily intake requirements of nine beneficial and three harmful nutrients provided by 100 kcal worth of the food item [47].

Lower-quality dietary patterns were also found to be less expensive across most countries and measures of diet quality. These differences were in particular driven by higher costs of fruit and vegetables, and lower costs of fats, oils, sugars, and refined grains [45••].

A meta-analysis in ten high-income countries found healthier dietary food patterns cost a mean of US\$1.54 more per day (\$1.15–\$1.94) than less healthy options [48]. Although sometimes theoretically possible to meet nutritional requirements on a low food budget, low-cost modeled diets often contain foods that are considered to be unpalatable or otherwise socially unacceptable to lower income consumers [45••]. Financial barriers to nutritious, affordable, and culturally acceptable diets are such that food cost has been found through modeling to mediate inequalities in dietary intake in the USA by several measures of SEP including income and education [49].

There is consistent evidence that children and adults from lower income households have greater exposure to unhealthy food and drink marketing. Most studies look at television advertising. In a recent UK study, total exposure to both all food advertising and unhealthy food advertising was twice as high among the least affluent compared to the most affluent viewers [50]. In addition to these substantial differences in viewing habits, evidence has also emerged from the US of targeting of such marketing to African American populations [51]. A recent study from Australia demonstrated that other forms of marketing are likely to be socioeconomically patterned. They found that food advertisements on bus shelters in more disadvantaged suburbs were more likely to promote chain-brand fast food and less likely to promote diet varieties of soft drinks [52].

Identifying Solutions

There are many reports and guidelines identifying approaches to improve population diets [53–56]. The concordance of these recommendations is striking and they generally include strategies across the four traditional marketing Ps of product, placement, pricing, and promotion. All these approaches are needed, in combination, and greater general availability and affordability of healthy food and beverages is likely to improve diet quality across the socioeconomic and demographic gradient. However, specific attention is required to ensure that we also act to reduce inequalities in diet quality across the population. Recent reviews and frameworks suggest that those interventions that address the more upstream determinants and barriers of healthy eating, such as pricing and changing the availability of healthy and unhealthy foods across the key settings in which we work and live, are those interventions most likely to be equitable [57, 58•]. Current evidence suggests that the most equitable approach to population diet will be a strategic combination of these structural population-level interventions with well-designed culturally sensitive interventions tailored to those at highest risk of a poor diet quality (Table 1).

Individual Level

Information and skill building approaches are consistently identified as essential components in any strategy to improve population diet quality. Recent reviews focused on the African American community underscore the need for these to be culturally appropriate [59, 60•]. In 2013, Di Niola et al. published recommendations on how to approach this for the African American community, but little evidence exists for other marginalized or disadvantaged communities [61]. The evidence on the strong sociocultural dietary drivers underscores the importance of ensuring that all interventions are embedded in a culturally relevant context. This is further underscored by the number of educational strategies found to be ineffective in lower socioeconomic groups in recent reviews of the topic [58•, 62].

Both excess gestational weight gain and early infant feeding patterns are strongly socially patterned and linked to obesity and unhealthy diets throughout life. Consequently, maternal education and support needs to include both support for the mother's own diet and for parenting practices, including reinforcing guidelines for breastfeeding and appropriate complementary feeding practices [63]. Some evidence exists for the effective impact of maternal obesity prevention interventions targeted to low-income families on the child's diet but further research is needed in this area [64]. The effect was generally consistent for both home-based and primary healthcare-based interventions.

Table 1 Potential strategies to reduce socioeconomic and demographic inequalities in healthy diets in high-income countries

Individual level	Social and community level	General socioeconomic, policy, cultural, and environmental level
Food literacy and skills programs (tailored or targeted)	Targeted food supplementation programs	Pricing measures to decrease the cost of healthy foods and to increase the relative cost of unhealthy foods
Maternal education and support programs (tailored or targeted)	School food supplementation programs	Urban planning regulations and design to increase access to more nutritious food options and decrease access to less nutritious food options
Public awareness campaigns (tailored or targeted)	Comprehensive school food policies, including healthy food provision and education	Subsidized transport and storage of healthy food to regional and remote areas
	Comprehensive workplace food policies, including healthy food provision and education	Regulate to restrict marketing of foods high in fat, salt and sugar to children across all dominant forms of media
	Comprehensive public institution food procurement policies (government, prisons, hospitals and other care institutions)	Enforced food reformulation targets

Social and Community Level

There have been a number of evaluations of currently existing targeted food supplementation programs, such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and the Supplemental Nutrition Assistance Program (SNAP) programs in the US and Healthy Start in the UK. While having different structures, target groups, and delivery methods, these programs essentially provide a combination of financial support for key foods, healthcare referrals, and nutrition education for low-income families, women, infants, and children. In recent years, there has been an increasing focus on aligning these programs with a healthy diet, but the achievement of this goal needs to be further evaluated. A recent review demonstrated high-quality evidence that such programs can lead to improved nutritional status of both the children and adults involved [65]. Similar evaluations of the targeted food voucher program in the UK, Healthy Start provide support for its capacity to reduce inequalities in diet quality [66]. Due to their targeted nature such programs are likely to improve income inequalities in food security. Whether they also lead to overall improvements in diet quality is less clear [67]. There is limited evidence that if such programs are setting based they may be more effective for socioeconomically disadvantaged young children [67].

There is a range of evidence on the impact of school based nutrition interventions on dietary inequalities in children. Studies involving educational strategies, whether or not they are targeted at more disadvantaged children, have little evidence of effectiveness in reducing inequalities [62, 68, 69]. However, multicomponent strategies, including also components such as healthy food provision or skill building, such as through kitchen gardens and changes to healthy vending have some evidence of effectiveness across different sociodemographic and economic groups [58, 62, 68], and African American children [70]. The paucity of evidence in this area requires many more

multicomponent and structural school-based nutrition interventions to be implemented and evaluated according to markers of SEP.

Similar findings have been reported for workplace interventions, whereby those interventions focused primarily on education, even if targeted to more disadvantaged or specific cultural groups have been relatively ineffective at reducing inequalities in diet [71, 72]. A few workplace studies have been reported that appear to reduce inequalities in diet quality, all including worksite environmental changes [58, 71, 73, 74]. Once again, the paucity of available evidence of effectiveness according to markers of SEP makes strong conclusions problematic.

General Socioeconomic, Policy, Cultural, and Environmental Level

As discussed above, in order to substantially reduce inequalities in unhealthy diets it will be critical to intervene at the level of the structural drivers of these inequalities, many of which lie outside the food system. Attree et al. conclude that to combat the fact that many nutrition interventions focus on the individual's responsibility for their own health, and particular on the responsibility of the mother for her children, "a shift in emphasis in health policies, affording a higher priority to enabling measures that tackle the underlying determinants of health, would be advantageous in reducing nutritional inequities for low-income mothers and their children" [75]. Similarly, a recent review of policy interventions to improve nutrition in rural populations in the US concluded that a greater focus was needed on the environmental and societal aspects of the food system, specifically including accommodating distance to food sources, tailoring to local food cultures, and building community partnerships [76]. In addition to intervening on these underlying structural determinants there are a few key levers within the food system itself that could be

manipulated with likely positive impact on inequalities in healthy diets.

There is consistent evidence that pricing strategies are unlikely to worsen inequalities in dietary intake, with some studies demonstrating the potential to reduce inequalities [58, 77]. These proposed improvements in equity are mainly driven by poorer baseline dietary intake [77, 78] and greater price sensitivity [77, 79–81] among lower socioeconomic groups. Potential government pricing strategies range from taxing specific nutrients, such as sugar or saturated fat [82], to specific food or beverages taxes, such as sugar-sweetened beverage taxes [77, 83] to price subsidies on healthier foods, such as fruit and vegetables [84, 85]. The success of such strategies depends on a number of factors, including which foods are targeted and the healthiness of their potential substitutes, and the magnitude of price changes (with greater price changes associated with a greater impact on purchasing) [78]. Recent Australian data underscores the need to see price as one part of the solution, with the majority of the food budget being spent on discretionary food [86].

There has been some recent evidence that while food pricing strategies may improve absolute nutritional intakes in lower socioeconomic groups, equal or greater uptake by higher socioeconomic groups may result in a maintenance or widening of inequalities in dietary intake [84, 87]. However, a systematic review of modeling studies by Eyles et al. found that pricing policies generally had similar relative benefits across different socioeconomic groups with greater absolute impact in lower SEP groups [78]. The strongest evidence of this effect to date has been found for positive nutrition effects of taxation strategies [77, 78]. The limited evidence that exists suggests that a combined approach, such as a tax on unhealthy food and drink with the money leveraged put toward subsidized healthy food and drink is likely to be the most equitable approach [78, 87].

Unfortunately, there is very little data on the effect on population diets of different types of marketing restrictions, product reformulation or urban planning to increase access to more nutritious food options and decrease access to less nutritious food options, and none we could identify across different socioeconomic groups. While it is likely that such policies will be effective across a range of SEP groups due to their universal effect, it will be important to test this hypothesis.

Conclusion

In this review, we identify a consistent, although not universal, relationship between socioeconomic and demographic characteristics and diet quality in high-income countries. This was apparent across multiple measures of SEP and diet quality. Clear drivers of these inequalities were identified across the various levels of the food system from individual level, through social and community level to the underlying societal

determinants of health. Key drivers included food literacy, skills, and attitudes; food availability across key settings; food marketing; and food costs. Opportunities to improve diet quality across the many socioeconomic and demographic groups in our community were identified, with the optimal approach likely involving a combination of culturally designed and targeted food literacy, skills, knowledge, and supplementation interventions with policies that change the food environments with which we intersect each day [57, 88, 89]. Key structural policies likely to not widen inequalities in healthy diet include comprehensive institutional food procurement, pricing strategies, food reformulation, restricting all forms of unhealthy food and drink marketing and urban planning to increase access to more nutritious food options and decrease access to less nutritious food options.

In this review, we have discussed inequalities in diet at their most general level. It is clear that the many different inequalities that exist in our society increase the complexity of identifying the optimal mix of strategies required to reduce these avoidable inequalities. One example of this tension is the need to bring the undernutrition and food security goals and the overnutrition goals closer together. Programs such as WIC in the USA have done so recently, recognizing the need for high-quality food provision in food insecurity assistance packages to prevent both undernutrition and obesity [90].

This complexity also means that it is important to consider how policies and interventions act across gradients of inequality and across the life course, and whether they risk stigmatizing or stereotyping their target groups. It is also clear that there is a wide variety of public health nutrition approaches, focusing on different behaviors, structures, and dietary foci and components. That is why we argue that, although difficult, it will be critical to continue to improve our methods for evaluating population dietary health, both over time and in response to specific interventions.

Here, we reflect on approaches targeting elements of the food system. Any approach to reducing inequalities in diet quality also needs to consider the role of improving inequalities in the underlying determinants such as education, income, and employment opportunities. It also needs to recognize the complex impact of structures such as trade and agricultural practices [91, 92]. However, while there is emerging evidence of the effect of the latter on the overall availability and affordability of healthy food, there is as yet little known about how they affect inequalities. It can be assumed that any structural policy or practice that improves affordability of healthy food and drink will also improve inequalities in healthy diets.

The many forms of a poor diet represent a substantial modifiable driver of inequalities in health and well-being. If we do not act comprehensively to provide socioculturally relevant approaches to improving population nutrition across the social, demographic, and economic gradients of diet quality that

exist in high-income countries, we risk both a growing burden of diet-related ill health, and widening inequalities in health and well-being. We conclude that greater attention needs to be paid to the potential impact of population nutrition strategies, their sociocultural applicability, their implementation, and their evaluation, if they are to play a significant role in reducing inequalities in diet and health.

Compliance with Ethical Standards

Conflict of Interest Anna Peeters and Miranda Blake declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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