

**Impact of Globalization on Nutritional Adequacy on School going Children: A Critical Narrative Review**

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**Abstract**

Globalisation has transformed the environments in which schoolgoing children obtain, perceive and consume food. Its nutritional consequences are neither uniformly beneficial nor uniformly harmful: expanding trade, investment, technology and information flows can improve food availability, fortification, safety and access to nutrition knowledge, while the global expansion of ultra-processed foods, transnational marketing, modern retail and digital platforms can displace diverse, nutrient-dense diets. This critical narrative review synthesises peer-reviewed studies, systematic reviews, international guidelines and national evidence, with particular attention to low- and middle-income countries and India. The evidence indicates that globalisation affects nutritional adequacy through changes in food supply, prices, retail structure, commercial promotion, time use, social norms and children’s autonomy. These pathways contribute to a double or triple burden in which thinness, micronutrient deficiencies and overweight coexist within populations and even households. School food environments can amplify these pressures when unhealthy products are readily sold or advertised, but schools can also buffer them through nutritious meal provision, procurement standards, restrictions on unhealthy foods, nutrition education and supportive choice architecture. The review concludes that the policy objective should not be to reverse globalisation, but to govern its food-system effects. Coordinated action is required across trade, agriculture, education, health, digital regulation and social protection so that nutritious foods become affordable, convenient and socially desirable for all children.

**Keywords:** globalisation; nutritional adequacy; schoolgoing children; food systems; nutrition transition; ultra-processed foods; school food environment; double burden of malnutrition

1. Introduction

School age and adolescence are periods of rapid physical growth, neurocognitive development and behavioural formation. Adequate nutrition during these stages requires more than sufficient calories. It also requires dietary diversity, appropriate protein quality, adequate vitamins and minerals, and moderation of free sugars, sodium, saturated fat and industrially produced trans fat. A child may therefore consume enough or excessive energy while remaining deficient in iron, zinc, vitamin A, vitamin D or other essential nutrients. Nutritional adequacy must consequently be understood as a multidimensional balance between deficiency prevention, healthy growth and protection against diet-related disease.

Globalisation is a major upstream determinant of this balance. It links national food systems through trade, foreign direct investment, transnational corporations, migration, communication technologies, global media

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and the diffusion of production and retail models. These forces alter what foods are produced, imported, formulated, distributed, priced and promoted. *Hawkes (2006)* described the resulting dietary development as uneven because global processes may increase availability and choice while simultaneously encouraging consumption patterns associated with obesity and chronic disease. In Asia, the growing influence of transnational food and beverage corporations, supermarkets and food-service chains has changed the availability, price, desirability and consumption of ultra-processed products (*Baker and Friel, 2016*).

The consequences for schoolgoing children deserve specific attention. Children spend a substantial part of each day in and around school; increasingly make independent purchases; respond to peer norms; and are intensively exposed to broadcast, outdoor and digital marketing. Their diets are shaped by family resources, but also by canteens, vendors, delivery platforms, product placement, celebrity endorsements and social media. At the same time, schools provide an institutional setting through which governments can deliver meals, set procurement standards and reduce nutritional inequality (*WHO, 2021; WHO, 2026*).

This paper critically examines how globalisation influences the nutritional adequacy of schoolgoing children. Its objectives are to: (i) identify the principal food-system, commercial, social and school-based pathways; (ii) assess evidence on dietary quality, undernutrition, micronutrient deficiency and overweight; (iii) explain why effects differ across socioeconomic and geographic groups; (iv) consider potentially beneficial dimensions of globalisation; and (v) propose policy and research priorities, with particular reference to low- and middle-income countries.

## 2. Methods

A critical narrative review design was used because globalisation is a distal and multidimensional exposure that cannot be represented by a single intervention or outcome. Searches were undertaken up to June 2026 in PubMed and the websites or repositories of the World Health Organization (WHO), United Nations Children’s Fund (UNICEF), Food and Agriculture Organization of the United Nations (FAO), and the Government of India. Search concepts included combinations of globalisation/globalization, nutrition transition, food systems, school-age children, adolescents, dietary adequacy, dietary diversity, ultra-processed food, food marketing, digital media, school meals, school food environment, micronutrient deficiency, thinness, overweight and double burden.

Priority was given to systematic reviews and meta-analyses, multi-country studies, nationally representative surveys, seminal conceptual papers and authoritative guidelines. Evidence relating only to adults was used sparingly and only when it clarified food-system mechanisms relevant to children. The synthesis was organised around causal pathways rather than effect-size pooling. Because the search was structured but not intended to be exhaustive, the paper should be interpreted as a critical narrative review rather than a PRISMA-compliant systematic review.

## 3. Conceptualising Globalisation and Nutritional Adequacy

Globalisation operates at several interconnected levels. At the macro level, trade agreements, investment rules, agricultural policy and currency conditions influence the relative prices of commodities and processed foods. At the meso level, food manufacturers, retailers, restaurant chains and logistics firms determine product formulation, distribution and promotion. At the micro level, households and children respond to income, convenience, taste, information, time constraints and social identity. School rules and local retail environments mediate the translation of these forces into actual consumption.

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This framework avoids two common errors. First, globalisation should not be treated as synonymous with economic growth. Income can improve food security, sanitation, schooling and access to diverse foods, yet it can also increase purchasing power for unhealthy products. Second, all imported or industrially processed foods should not be treated as nutritionally equivalent. Pasteurised milk, fortified staples and safely preserved foods may contribute to adequacy, whereas many ultra-processed products are designed for long shelf life, convenience and intensive marketing and are commonly high in free sugars, sodium or unhealthy fats and low in fibre or micronutrient density.

The expected outcome is therefore conditional rather than deterministic. Globalisation improves child nutrition when it increases reliable access to affordable, safe and nutrient-dense foods and when regulation aligns commercial incentives with public health. It undermines adequacy when it makes energy-dense, nutrient-poor products cheaper, more available and more desirable than minimally processed foods, while shifting dietary norms away from diverse local meals.

#### 4. Pathways Linking Globalisation to Children's Diets

**4.1 Trade, investment and food supply.** Liberalised trade and foreign direct investment can expand the year-round supply of foods, ingredients and technologies. Cold chains, refrigeration, improved packaging and more efficient distribution may reduce spoilage and widen access to dairy products, fruits, vegetables and fortified foods. However, the same systems also enable rapid market penetration by transnational manufacturers of sweetened beverages, packaged snacks, confectionery, instant meals and fast food. *Baker and Friel (2016)* showed that transformations in Asian food manufacturing, retail and food service were accompanied by rapid growth in ultra-processed food markets. The nutritional effect depends on which products expand most rapidly and whether healthier options remain affordable.

Trade policy also changes relative prices. Globally sourced refined oils, sugars, starches and additives can be combined into inexpensive branded products with long shelf lives and high profit margins. Fresh foods often face greater losses, seasonality and distribution costs. For a child with limited pocket money, a highly promoted packaged snack may therefore be cheaper, more portable and more predictable than fruit, milk, eggs or a freshly prepared meal. Price, convenience and status can outweigh nutrition knowledge.

**4.2 Supermarketisation, food service and platform economies.** Modern retail expands product variety and can improve food safety, standardisation and labelling. Yet shelf placement, price promotions, checkout displays and large package sizes often favour branded, highly processed products. International and domestic fast-food chains further normalise meals high in refined carbohydrates, sodium and fats. Digital delivery platforms increase the reach of restaurants and snacks beyond traditional commercial centres. These changes compress the time and effort required to obtain food, an advantage for time-constrained families, but they may also displace home-prepared meals based on cereals, pulses, vegetables and other culturally established foods.

**4.3 Marketing and the commercial production of preference.** Globalisation transmits not only foods but meanings. Brands associate products with modernity, aspiration, sport, entertainment and social belonging. A meta-analysis of randomised trials found that exposure to unhealthy food and beverage marketing increased children's immediate dietary intake and influenced preferences (*Sadeghirad et al., 2016*). The effect is particularly concerning because children may recognise advertisements without fully understanding persuasive intent.

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Digital media has widened this commercial influence. Social media marketing can be embedded in entertainment, influencer content, games and peer-to-peer sharing, making it less recognisable than conventional advertising. A systematic review concluded that social media affects adolescents' food choices and is actively used by food and beverage companies to target this age group (Kucharczuk, Oliver and Dowdell, 2022). Cross-border platforms allow campaigns and brand identities to circulate faster than many national regulatory systems can respond.

**4.4 Autonomy, peer culture and changing household life.** Adolescence brings greater mobility, control over pocket money and sensitivity to peer approval. Neufeld *et al.* (2022) emphasised that food choice during adolescence is shaped by autonomy and agency within a wider food environment. Globalised products may become symbols of participation in an urban, youthful or cosmopolitan culture. Meanwhile, urbanisation, women's paid employment, commuting and academic pressures can reduce time for food preparation. Convenience foods may represent a rational household response to time scarcity, even when their routine use lowers dietary quality.

**4.5 Information, standards and nutrition technology.** Global information flows can also be beneficial. Nutrition science, food-safety systems, product standards, fortification technology and public-health campaigns can spread across borders. Improved labelling and reformulation may reduce trans fats, salt or added sugar. Fortified foods can help address specific micronutrient gaps, especially where diverse diets remain unaffordable. These benefits, however, require credible standards, effective enforcement and attention to equity. Fortification should complement rather than substitute for dietary diversity.

## 5. Effects on Dietary Quality and Nutritional Adequacy

**5.1 Dietary displacement and nutrient dilution.** The central nutritional concern is not simply the presence of processed foods, but the displacement of nutrient-dense foods and meals. In a multi-country study of children and adolescents, higher ultra-processed food consumption was associated with dietary profiles characterised by greater energy density and free sugars and lower fibre (Neri *et al.*, 2022). Systematic reviews likewise associate high consumption of ultra-processed foods in younger populations with poorer diet quality and adverse adiposity or cardiometabolic outcomes, although the strength and consistency of evidence vary across outcomes and most studies are observational (Petridi *et al.*, 2024; Mescoloto, Pongiluppi and Domene, 2024).

Displacement can occur even when total energy intake is adequate. A breakfast dominated by a sweetened beverage and packaged snack may provide calories but little protein, iron, zinc or fibre. Repeated across meals, this pattern produces micronutrient inadequacy without obvious food shortage. Conversely, some packaged foods are fortified and may contribute selected nutrients, but fortification does not automatically correct high sugar, salt or low fibre content.

**5.2 Overweight, obesity and cardiometabolic risk.** Global trends show that the nutritional landscape of children has shifted substantially. The *NCD Risk Factor Collaboration's* pooled analysis of 222 million participants documented worldwide changes in underweight and obesity from 1990 to 2022 and demonstrated that both forms of malnutrition remain relevant among children and adolescents (NCD-RisC, 2024). The growing availability and promotion of energy-dense products interacts with reduced physical activity, motorised transport and screen time. These factors are related but should not be conflated: globalisation changes food intake and activity patterns through distinct mechanisms.

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High ultra-processed food exposure is not confined to affluent adults. In the United States, the share of energy obtained from ultra-processed foods among persons aged 2-19 years increased from 61.4 per cent in 1999 to 67.0 per cent in 2018, while energy from unprocessed or minimally processed foods declined (Wang *et al.*, 2021). Such levels cannot be generalised to all countries, but they illustrate the endpoint of a commercial food environment in which industrial formulations dominate children’s energy intake.

**5.3 Persistent undernutrition and micronutrient deficiency.** Globalisation does not automatically eliminate poverty, infection, inadequate sanitation or unequal intrahousehold food distribution. In many low- and middle-income settings, children face the simultaneous risk of insufficient food quantity and poor food quality. The double burden can exist within the same community, household or individual: a child may have experienced growth restriction earlier in life and later develop excessive weight gain, or may be overweight while anaemic. Popkin, Corvalan and Grummer-Strawn (2020) describe this changing nutrition reality as a rapid convergence of undernutrition and overweight.

Micronutrient adequacy is especially vulnerable because fruits, vegetables, pulses, animal-source foods and fortified staples vary greatly in price and cultural acceptance. Global supply chains may increase access for urban middle-income families but leave poor, remote or socially marginalised populations behind. The result is an unequal nutrition transition: some children obtain wider dietary diversity, while others gain mainly inexpensive calories and branded snacks.

6. India as an Illustration of the Unequal Nutrition Transition

India illustrates how globalising food environments coexist with longstanding nutritional deprivation. The Comprehensive *National Nutrition Survey (CNNS) 2016-18* collected nationally representative anthropometric and biomarker data across children and adolescents. Among children aged 5-9 years, 24 per cent had anaemia and 17 per cent had iron deficiency (MoHFW, UNICEF and Population Council, 2019). The same survey reported limited weekly consumption of several nutrient-dense foods: approximately 40 per cent consumed fruit, 35 per cent eggs, and 36 per cent fish, chicken or meat at least once per week. Consumption of these foods rose with maternal schooling and household wealth, demonstrating that availability alone does not guarantee equitable access.

The survey also recorded emerging risks associated with changing lifestyles. Vitamin D deficiency among children aged 5-9 years was more common in urban than rural areas and in richer than poorer households, a pattern plausibly related to indoor lifestyles, reduced sun exposure and other behavioural differences rather than dietary globalisation alone (MoHFW, UNICEF and Population Council, 2019). Indian adolescents simultaneously experience substantial thinness and a smaller but growing burden of overweight and obesity. This pattern cautions against policies that focus exclusively on calorie deficiency or exclusively on obesity.

Globalisation interacts with India’s internal diversity. Urban markets, media exposure, household wealth, caste, gender, state-level food cultures and school infrastructure differ widely. The nutritional effect of a supermarket, packaged food or school meal cannot therefore be assumed to be the same in metropolitan, peri-urban, rural and tribal settings. A nutritionally adequate policy response must preserve affordable local foods while improving safety, convenience and access, rather than presenting traditional and modern food systems as mutually exclusive.

### 7. The School Food Environment as Amplifier or Buffer

Schools translate global food-system pressures into daily choices. Foods may be supplied through public meal programmes, brought from home, sold in canteens, purchased from nearby vendors or delivered through digital platforms. Advertising, sponsorship and branded educational materials can further shape norms. Where sweetened drinks and packaged snacks are cheap, visible and convenient, nutrition education alone is unlikely to produce sustained change.

Conversely, school feeding can improve both nutritional and educational outcomes. A systematic review and meta-analysis of interventions in low- and middle-income countries found that school feeding increased height and weight over 12 months and improved attendance, while also noting the need for stronger evidence on several nutrition and learning outcomes (*Wang et al., 2021*). School programmes can reduce short-term hunger, diversify diets, deliver fortified foods or supplements when appropriate, and transfer resources to food-insecure households.

Intervention design matters. Food provision should be based on local nutrient gaps and should avoid replacing one form of malnutrition with another. Procurement can support pulses, vegetables, millets, eggs, dairy or other culturally acceptable foods according to local conditions. Reviews of school food-environment interventions in low- and middle-income countries suggest potential benefits but also reveal heterogeneity and limitations in study quality (*Carducci et al., 2020*).

WHO guidance recommends that foods and beverages provided, served or sold at school support healthy diets and that schools use standards or rules to increase healthier options and limit unhealthy ones (*WHO, 2026*). Implementation requires more than issuing a menu. It involves financing, safe kitchens, water and sanitation, trained staff, transparent procurement, monitoring, restrictions on marketing and vendors, and mechanisms for student and parent participation. Healthy choice architecture - including placement, presentation and pricing - can complement, but not replace, structural provision.

### 8. Distributional Effects and Equity

The effects of globalisation are socially patterned. Higher-income households may initially benefit from broader access to diverse foods but also adopt sedentary lifestyles and energy-dense diets. Lower-income households may remain exposed to undernutrition while purchasing inexpensive ultra-processed calories. As markets mature, unhealthy products can become deeply embedded across income groups, while premium health-oriented foods remain less affordable.

Geography matters because cold chains, retail infrastructure and public services are uneven. Remote populations may face high prices for perishables and limited school-meal capacity, whereas urban children encounter dense marketing and retail exposure. Gender also shapes adequacy through differential food allocation, mobility, body-image pressures and autonomy. Adolescent girls have high iron requirements and may be particularly vulnerable where restrictive dieting, menstrual blood loss and unequal access to animal-source foods coexist.

The digital divide creates another paradox. Connected children face more sophisticated commercial marketing, but digital channels can also deliver nutrition education, social support and service information. Policy must therefore distinguish between access to technology and the commercial architecture of platforms. Protecting children online requires regulation of targeted advertising, influencer promotion, data-driven profiling and cross-border content rather than simply advising families to reduce screen use.

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## 9. Potential Benefits of Globalisation

A balanced assessment must recognise that globalisation can contribute positively to nutritional adequacy. International trade can stabilise supplies after local crop failure and expand seasonal access to foods. Investment can improve storage, testing, traceability and refrigeration. Global scientific collaboration supports fortification, biofortification, food-safety standards and the rapid dissemination of evidence. International norms can strengthen school-meal quality, marketing controls and labelling.

Migration and remittances may increase household food budgets and expose families to new foods and knowledge. Civil-society networks can spread successful school-nutrition models. Global markets can also create demand for traditional grains, pulses and nutrient-rich foods, potentially supporting producer incomes. Yet these benefits are not automatic. Export demand may raise local prices; modern standards may exclude small producers; and nutrition claims can be used to market products of otherwise poor quality.

The appropriate policy stance is thus selective integration. Governments should retain the efficiency, safety and knowledge benefits of connected food systems while correcting market incentives that favour products inconsistent with healthy diets. *FAO and WHO (2019)* emphasise that healthy diets must be nutritionally adequate, safe, culturally acceptable, economically accessible and environmentally sustainable. These criteria provide a useful test for judging global food-system change.

## 10. Policy Implications

**10.1 Adopt a whole-of-government food-system approach.** Education and health ministries cannot address the problem alone. Trade, agriculture, finance, consumer protection, information technology and urban planning policies shape food prices and exposure. Nutrition impact assessment should be incorporated into major trade and investment decisions, with safeguards for policy space to regulate marketing, labelling and product composition.

**10.2 Establish enforceable school food standards.** Standards should cover meals, canteens, vending machines, nearby vendors, sponsorship and digital ordering during the school day. They should specify foods to promote and products to limit, supported by procurement rules, financing and monitoring. Schools serving disadvantaged populations require additional resources so that standards do not reduce access to food.

**10.3 Protect children from commercial marketing.** *WHO (2023)* recommends comprehensive policies to protect children from the harmful impact of food marketing. Regulation should cover television, packaging, outdoor media, sports sponsorship, games, social media, influencers and data-driven advertising. Voluntary industry pledges are unlikely to provide uniform protection where definitions, age thresholds and enforcement remain weak.

**10.4 Make nutrient-dense foods affordable and convenient.** Fiscal measures, public procurement, supply-chain investment and support for local producers should reduce the price and preparation burden of fruits, vegetables, pulses, whole grains, milk, eggs and other context-appropriate foods. Taxes on sugar-sweetened beverages or other unhealthy products may be useful when paired with transparent use of revenue and policies that improve healthier alternatives.

**10.5 Use labelling, reformulation and fortification carefully.** Front-of-pack information should be understandable and based on transparent nutrient criteria. Reformulation can reduce sodium, free sugars and harmful fats, but it should not be used to create a health halo around products that remain nutritionally poor. Fortification should target demonstrated deficiencies and be monitored for coverage, safety and equity.

**10.6 Strengthen school meals as social protection.** Menus should be designed from local dietary gaps, include culturally acceptable foods and accommodate age, sex and regional needs. Linking school procurement with local agriculture can improve freshness and livelihoods, provided food safety and reliable supply are ensured. Nutrition education is most effective when the foods taught as healthy are also the foods made available and affordable.

**10.7 Monitor the full spectrum of malnutrition.** Surveillance should combine anthropometry with dietary intake, food-source data and biomarkers. Monitoring only body mass index may miss anaemia, iron deficiency and poor diet quality; monitoring only thinness may miss rising adiposity and cardiometabolic risk. Data should be disaggregated by sex, age, income, social group, urban-rural residence and school type.

## 11. Research Gaps

The evidence base has important limitations. Globalisation is usually measured indirectly through market penetration, urbanisation, trade openness or consumption of particular products. These indicators capture related but non-identical processes, making causal attribution difficult. Many studies are cross-sectional and cannot rule out confounding by income, parental education, physical activity or broader lifestyle change.

More longitudinal studies are needed in low- and middle-income countries, especially among children aged 5-9 years, who receive less research attention than preschool children and adolescents. Studies should measure both displacement and addition: whether a new product replaces a nutritious meal, supplements an inadequate diet or merely increases total energy. Research should also examine digital marketing exposure, delivery platforms and commercial activity around schools.

Evaluation of policy combinations is a priority. School standards may be weakened by nearby vendors; marketing restrictions may be undermined by cross-border digital content; and nutrition education may have little effect when healthy foods are unaffordable. Natural experiments and implementation research can identify which packages of fiscal, regulatory, procurement and educational measures work under different conditions.

Finally, children should be treated as participants rather than passive consumers. Participatory research can reveal how taste, identity, convenience, stigma and peer relations influence food choice. Policies designed without this knowledge may be nutritionally sound on paper but poorly accepted in practice.

## 12. Conclusion

Globalisation has reshaped the nutritional opportunities and risks faced by schoolgoing children. It can increase food availability, safety, fortification and access to knowledge, but it also strengthens commercial systems that make ultra-processed, heavily marketed products inexpensive, convenient and socially desirable. The net effect is unequal and context dependent. In many countries, the outcome is not a simple transition from hunger to obesity but a coexistence of thinness, micronutrient deficiency and excessive weight gain.

Schools occupy a strategic position within this transformation. They can reproduce unhealthy commercial environments or serve as protective institutions that guarantee nutritious food, reduce inequality and build lifelong preferences. Effective action requires regulation beyond the school gate, including healthier food prices, comprehensive marketing controls, responsible digital governance and trade and investment policies consistent with public-health goals.

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The central challenge is therefore governance. Nutritional adequacy will not be secured by consumer education alone, nor by rejecting all modern food technology. It requires shaping global and national food systems so that the easiest and most affordable choices for children are also safe, diverse, culturally acceptable and nutritionally adequate.

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