Ultra-processed Foods and Children

State-of-the-art review

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FOREWORD

Children's diets are undergoing a rapid transformation. Throughout the world, traditional meals, based on whole and minimally processed foods, are increasingly being displaced by diets dominated by ultra-processed foods (UPFs).

UPFs are formulated to maximize profit – not to nourish children. They combine sugars, fats, salt and additives designed to stimulate reward pathways in the brain and encourage overconsumption. Their long shelf-life, low production costs and pervasive marketing enable UPFs to out-compete more nutritious foods.

This state-of-the-art review on ultra-processed foods and children builds on the 2025 *Lancet* Series on ultra-processed foods and human health, by consolidating evidence on how rising UPF consumption undermines children's nutrition, health and well-being.

Our findings indicate that children and adolescents are increasingly exposed to UPFs from early life. In many high-income countries, more than half of children's daily calories come from UPFs. However, intakes are also rising rapidly across low- and middle-income countries – contexts where undernutrition remains widespread.

There is strong evidence that UPF intake in children is linked with poor diet quality, overweight and obesity, and dental caries. A growing body of research also associates UPF intake in children with undernutrition, micronutrient deficiencies, mental health concerns, metabolic changes and an increased risk of chronic diseases later in life.

The economic costs of unhealthy diets are substantial. Diet-related diseases impose a financial strain on households, while governments face rising health system costs and productivity losses. Meanwhile, the UPF industry generates enormous profits – which it reinvests in product expansion, marketing and lobbying to reinforce its dominance in the food system.

UPF marketing is sophisticated and targeted, reaching children in schools, streets, sports settings and across digital platforms. Such tactics normalize daily UPF consumption and exploit children's limited ability to recognize persuasive intent.

These corporate practices shape food systems and violate children's rights to health, adequate food, information and protection from commercial exploitation. Protecting children from harmful food environments is not only a public health imperative; it is also an ethical and legal obligation for governments.

Proven policies and measures exist to reduce UPF purchasing and consumption – such as front-of-pack labelling, marketing restrictions, school food standards and taxes on sugar-sweetened beverages. In addition, countries should fully implement the International Code of Marketing of Breast-milk Substitutes and subsequent World Health Assembly resolutions to protect and promote breastfeeding and complementary feeding in early life. These measures must be paired with policies that incentivize the production, distribution and consumption of nutritious, safe, affordable and sustainable foods.

This review of evidence is a call to action. It urges governments, United Nations agencies, research institutions and civil society to counter the rise of UPFs through actions that protect children's food environments and place child rights before commercial interests.

Joan Matji
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CHAPTER 1

Food systems and children: The global threat of ultra-processed foods

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Abstract

This chapter introduces the urgent and growing threat of ultra-processed foods (UPFs) and outlines the purpose of this state-of-the-art review to examine the evidence on UPFs and their implications for children and adolescents. The chapter describes how early and sustained exposure to UPFs during childhood and adolescence leads to poor diet quality, imbalanced nutrient intakes, and overweight and obesity. In addition, there is emerging evidence linking UPFs to stunting and micronutrient deficiencies, lower educational achievement and mental health concerns in children and adolescents. The shift to ultra-processed dietary patterns is not driven by poor individual choices but by the powerful commercial interests of the UPF industry, which shape food systems in ways that have led to the widespread availability and marketing of UPFs in children's food environments. UNICEF and the World Health Organization (WHO) recommend a set of mandatory legal measures and policies to create healthy food environments for children, focusing on protecting breastfeeding and first foods (complementary feeding), healthy school food environments, food marketing restrictions, food labelling, food subsidies and taxes, and food reformulation. This state-of-the-art review builds on the 2025 *Lancet* Series on ultra-processed foods and human health by consolidating evidence on UPFs and their implications for children's nutrition, health and well-being. It includes chapters reviewing the evidence on UPFs, sugar-sweetened beverages, commercially produced foods marketed for infants and young children, and on the context of West Africa, a predominantly low-income setting. This evidence will guide future actions to protect children from the commercial forces that flood children's food environments with UPFs and prioritize profit over children's right to food, nutrition and health.

Introduction

Across the world, traditional diets comprising whole and minimally processed foods are being replaced by unhealthy diets dominated by UPFs.[1] These dietary transitions first emerged in high-income countries but are now affecting children and adolescents in low- and middle-income countries – with profound implications for their nutrition, health and well-being.

UPFs are industrially formulated edible products composed primarily of chemically modified substances extracted from foods, together with cosmetic additives and preservatives to enhance taste, texture, appearance and shelf-life.[2] These products are typically energy-dense and high in free sugars, refined starches, salt and unhealthy fats, while offering little nutritional value in terms of vitamins, minerals or dietary fibre.

The 2025 *Lancet* Series on ultra-processed foods and human health examined evidence on the impacts of UPFs on human health and concluded that "*the displacement of long-established dietary patterns by ultra-processed foods is a key driver of the escalating global burden of multiple diet-related chronic diseases*".[3]

The evidence presented in the *Lancet* focuses largely on adults due to the relatively small number of studies on children and adolescents.

While research on the impacts of UPFs on children and adolescents is more limited, it is a crucial area of enquiry and there is a steadily growing evidence base.

Children and adolescents are uniquely vulnerable to the impacts of UPFs because their bodies and brains are developing and they are more sensitive to the nutritional deficiencies and metabolic disruptions caused by UPFs.[4] Repeated exposure to UPFs in early childhood conditions lifelong preferences for sweet, salty and artificially flavoured foods, with lifelong impacts.[5] Furthermore, children and adolescents are more susceptible to the aggressive marketing strategies of the UPF industry and struggle to recognize persuasive content.[6]

This state-of-the-art review brings together available evidence from market data, original research, narrative and systematic reviews and meta-analyses on UPF and their implications for children's nutrition, health and well-being.

The changing face of child malnutrition

The global landscape of childhood malnutrition is undergoing a rapid and profound transformation, reflecting parallel shifts in dietary patterns.

Historically, undernutrition and micronutrient deficiencies have been the most prevalent forms of malnutrition among children and adolescents worldwide. While they remain pressing concerns in many low- and middle-income countries, significant progress has been made. Since 2000, the number of children under 5 years of age with stunted growth has fallen by 57 million, the number of school-age children and adolescents (5–19 years) suffering from underweight has declined by 43 million, and the global burdens of iodine deficiency and vitamin A deficiency have fallen substantially.[7–9]

These achievements contrast sharply with the trajectory of overweight and obesity, as highlighted in the UNICEF 2025 Child Nutrition Report, *Feeding Profit: How food environments are failing children.*[10] Between 2000 and 2022, the number of school-age children and adolescents living with overweight and obesity doubled from 194 million to 391 million (*Figure 1*). In 2025, for the first time in history, the global prevalence of obesity among school-age children and adolescents surpassed that of underweight (*Figure 2*).

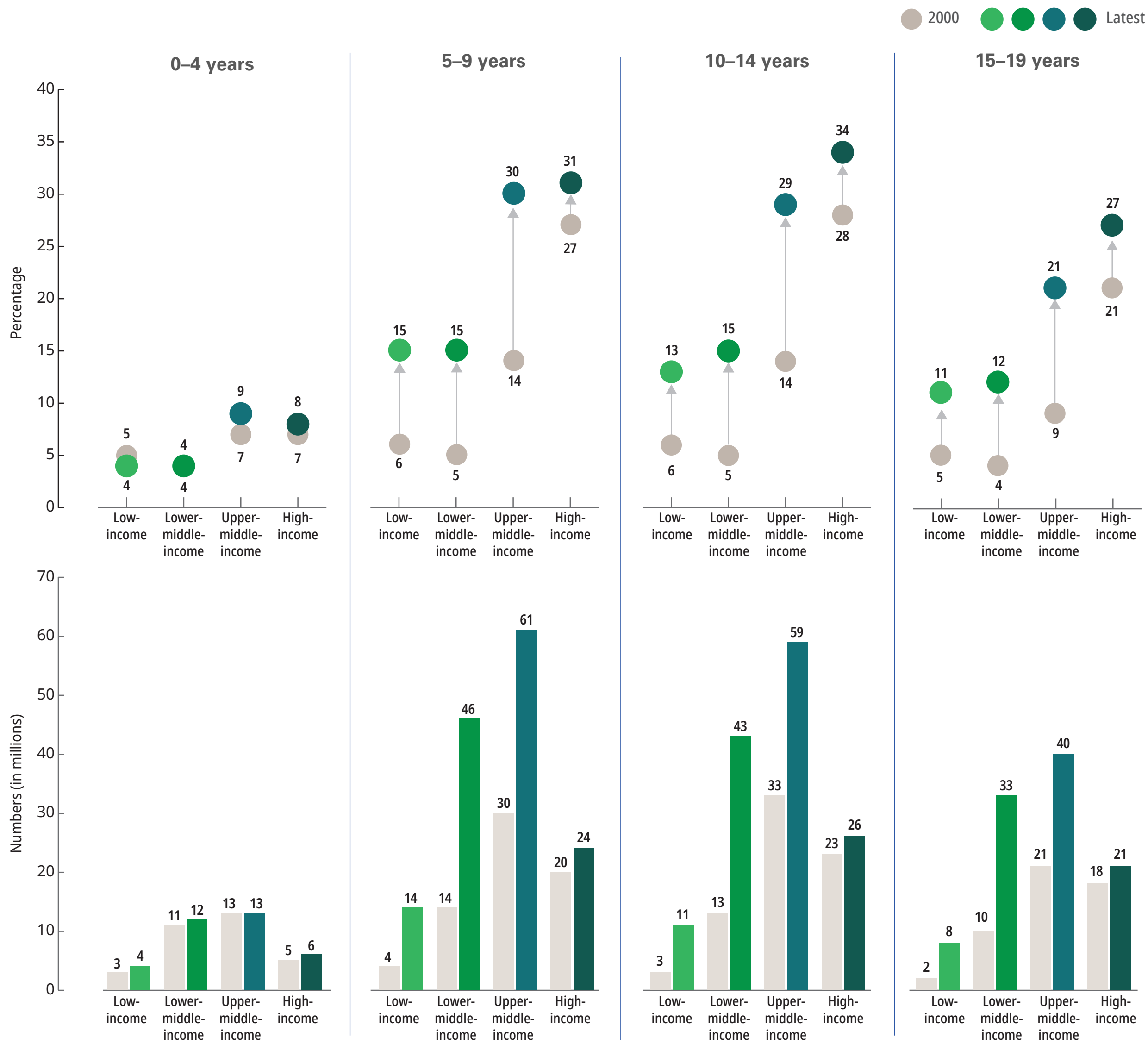


FIGURE 1. **Trends in percentage and numbers (in millions) of children and adolescents with overweight, by age group and by country income classification, 2000 and latest**

Source: United Nations Children's Fund, World Health Organization and World Bank, Joint Child Malnutrition Estimates for children under 5 and UNICEF analysis of data from NCD-RisC for children and adolescents 5–19 years.
Note: Latest estimates are from the year 2024 for children under 5 and from the year 2022 for children and adolescents 5–19 years.

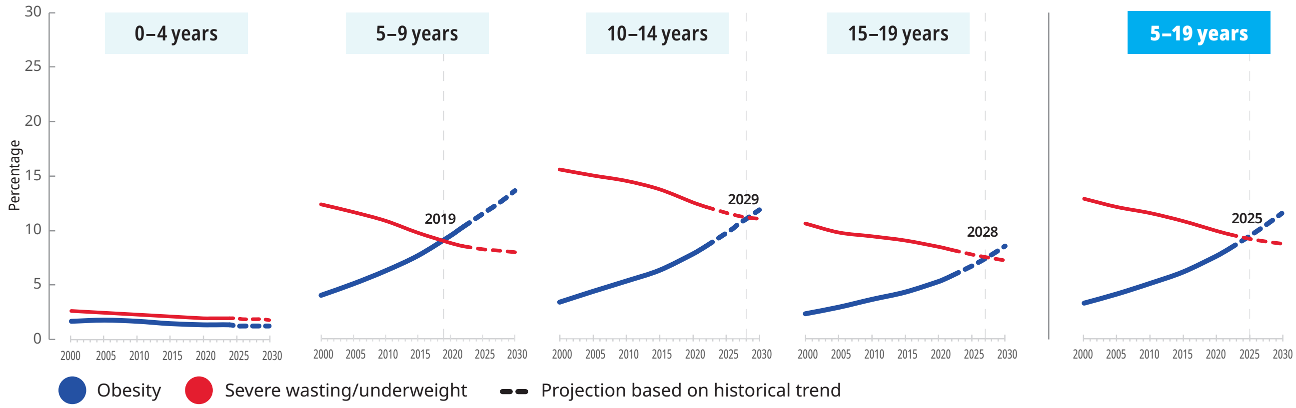


FIGURE 2. **Trends in the percentage of children and adolescents with (a) obesity; and (b) severe wasting/underweight, 2000 to the latest and projections to 2030, by age group, globally**

Source: UNICEF, WHO and World Bank Joint Child Malnutrition Estimates for children under 5 and UNICEF analysis of data from NCD-RisC for children and adolescents 5–19 years.
Note: Latest estimates are from the year 2024 for children under 5 and from the year 2022 for children and adolescents 5–19 years. Severe wasting for children under 5; underweight for children and adolescents 5–19 years.

The rapid increase in obesity is particularly alarming. Between 2000 and 2022, the number of school-age children and adolescents living with obesity almost tripled, rising by more than 100 million. In 2022, 42 per cent of all school-age children and adolescents with overweight were living with obesity (163 million out of 391 million), a sharp increase from 30 per cent in 2000 (58 million out of 194 million). This trend is deeply concerning because obesity is more difficult to reverse than overweight and has a greater risk of serious health conditions.

High-income countries have the highest prevalence of overweight and obesity. However, low- and middle-income countries are experiencing the steepest rise in prevalence (*Figure 2*), while still grappling with child undernutrition. In 2022, low- and middle-income countries were home to 81 per cent of school-age children and adolescents living with overweight and obesity globally, up from 66 per cent in 2000.

The shift in the global burden of overweight and obesity to low- and middle-income countries is unleashing dire consequences on the health, development and future potential of children, communities and nations.

How ultra-processed foods are driving a crisis in children's diets

Across the globe, UPFs are introduced to children in early life. Many young children, including in low- and middle-income countries, are fed commercially produced complementary foods and beverages, such as ultra-processed cereal mixes, dairy foods, puréed meals and soups, desserts, snack foods and beverages.[11–13]

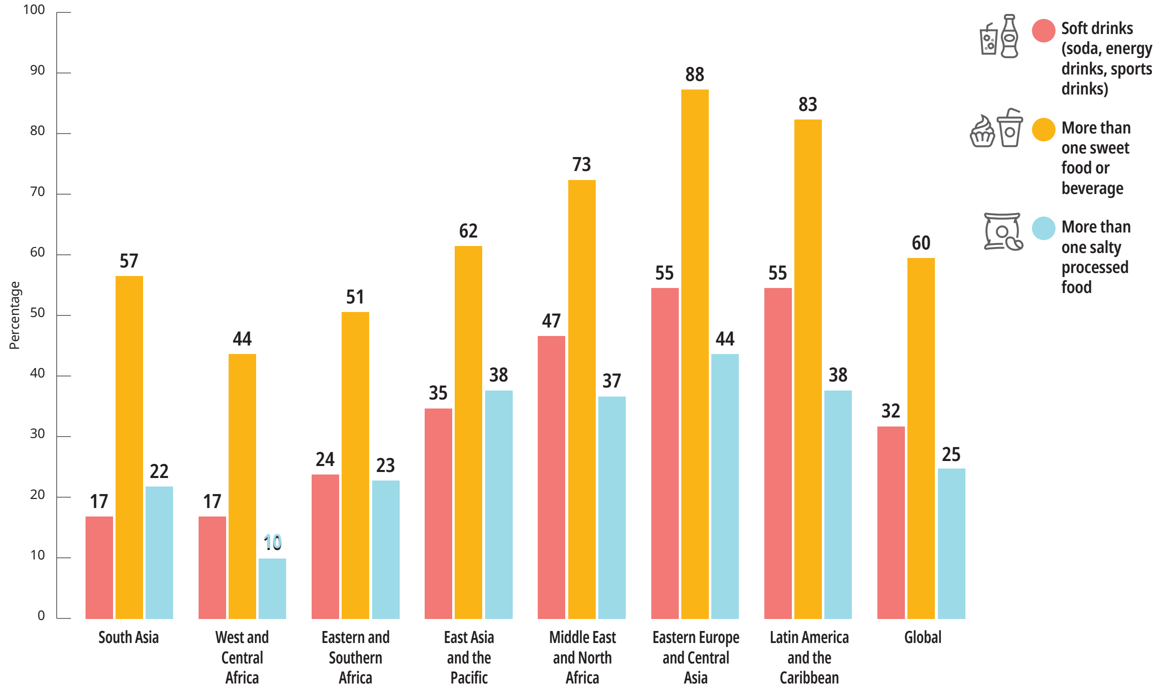
UNICEF research across seven Southeast Asian countries found that nearly half (48 per cent) of commercially produced complementary foods are ultra-processed.[14] Even children living in severe food poverty – whose diets comprise two or fewer food groups a day – consume UPFs. For example, a UNICEF review of survey data from 11 countries found that between 10 per cent and 35 per cent of children under 5 living in severe child food poverty had consumed a sweet beverage in the previous 24 hours.[15]

UPFs continue to dominate children's diets throughout middle childhood and adolescence. The 2025 Child Nutrition Report analysis showed that an alarming 60 per cent of adolescents consumed more than one sugary food/beverage during the previous day, 32 per cent consumed sugar-sweetened beverages (SSB) and 25 per cent consumed more than one salty processed food during the previous day (*Figure 3*).[16] Exposure to UPFs is a reality for adolescents everywhere, no matter who they are or where they live: for example, more than half of adolescents in rural areas (53 per cent) and more than half (52 per cent) belonging to the poorest households consumed more than one sugary food/beverage during the previous day.

UPFs drive malnutrition in two key ways. First, they increase the risk of overweight and obesity because they are energy-dense, highly palatable and encourage lifelong taste preferences for these unhealthy foods. Second, there is emerging evidence that they increase the risk of stunting and micronutrient deficiencies because they are low in essential nutrients and displace more nutritious foods, resulting in nutrient-poor diets that fail to support healthy growth and development.[17–20] In addition, industrial manufacturing processes and

FIGURE 3.
Percentage of adolescents aged 15–19 years consuming soft drinks, more than one sugary food or beverage and more than one salt processed food, by UNICEF region and globally, 2021–2024

Source: Gallup World Poll surveys between 2021 and 2024.



industrial ingredients (such as emulsifiers and cosmetic additives) may disturb the gut microbiome, contribute to chronic inflammation and harm children's health.[21–24] There is also emerging evidence that link UPFs with lower academic achievement and mental health concerns such as anxiety, depression and hyperactivity.

Children and adolescents with diets high in UPFs face an increased risk of overweight, obesity and related cardiometabolic conditions.[25–27] The health consequences of overweight and obesity often persist into adulthood – especially among adolescents living with obesity – leading to chronic diseases, such as type 2 diabetes, cardiovascular disease and some cancers.[28,29] Beyond physical health, overweight and obesity can impact children's and adolescent's mental well-being and educational outcomes, and place a significant burden on families, health systems and economies.[30–32] In the absence of effective action, the global economic impact of overweight and obesity in adults will exceed US$4 trillion annually by 2035 – the year when the current cohort of adolescents will all reach adulthood.[33] There is a lack of data on the economic impacts of overweight and obesity among children and adolescents, especially in low- and middle-income countries. However, UNICEF analyses in China and Mexico found that without actions to address childhood overweight and obesity, these countries face lifetime costs equivalent to 3 per cent and 1 per cent of their gross domestic product, respectively.[34,35]

Ultra-processed food environments

The rising consumption of UPFs among children and adolescents is not caused by a lack of a willpower or poor parenting – but by powerful commercial forces that shape what foods are available, accessible, affordable and desirable for children, adolescents and their families.[36]

UPF are substantially more profitable than other foods because they are manufactured using low-cost or subsidized ingredients, engineered and marketed to encourage overconsumption, and shelf-stable.[37,38] Furthermore, the UPF industry has considerable market concentration, economic power and political influence, which it uses to shape public policy and international trade and investment agreements to its commercial advantage.[39,40] These interconnected factors have led to the proliferation of UPFs in food environments and to the progressive displacement of more nutritious and healthy foods.

Food environments are the spaces in which people make decisions about the foods they procure, prepare and consume – such as food retail outlets, schools, sports facilities and recreational venues. In many communities, particularly in low-income neighbourhoods, convenience stores offer predominantly UPFs and outnumber shops stocking whole and minimally processed foods.[41] Schools and sports facilities often rely on vending contracts and sponsorships with UPF companies to supplement

BOX 1

Defining food systems and food environments

Food system comprises the actors, policies and services that influence children's access to nutritious, safe, affordable and sustainable diets. Food systems need to operate in ways that ensure that nutritious, safe and sustainable diets are available, affordable, convenient and desirable for children and their families.

Food environments are the spaces in which people make decisions about the foods they procure, prepare and consume. They comprise a range of influences across 'external' and 'personal' domains that interact in ways that may either help or hinder a child's ability to access and consume a nutritious and healthy diet.

- The **external** food environment encompasses the locations where food is acquired or purchased by children and their families, such as food retailers, informal vendors, restaurants, schools and online food delivery apps.
- The **personal** food environment represents the individual and household-level factors that influence the accessibility, affordability, convenience and desirability of different food and beverage options.

constrained budgets, embedding commercial interests directly into the spaces where young people spend significant time. These factors combine to channel children, adolescents and their families towards UPFs, while nutritious and healthy foods require greater effort and expense to access.

Children and adolescents are highly exposed to relentless marketing by UPF companies. A UNICEF poll across 171 countries found that 75 per cent of young people aged 13–24 years had seen advertisements for sugary/energy drinks, snacks or fast-food during the previous week.[42] Exposure was high even in low-income countries and in countries affected by conflict, where 65 per cent and 68 per cent of young people respectively had been exposed to such marketing.

UPF companies use sophisticated marketing tactics that often bypass parents and directly influence children. Digital marketing is particularly insidious: it is highly personalized, interactive, constantly accessible and poorly regulated, making it a uniquely powerful tool for shaping lifelong unhealthy dietary preferences.[43–46] Through social media, viral games, influencers and celebrity endorsements, the UPF industry exploits children's cognitive vulnerabilities and builds brand loyalty before children have the capacity to recognize persuasive intent.

A policy response to ultra-processed foods

Food systems are failing children in two fundamental ways. First, global and national food systems are failing to provide families and young children with nutritious, safe, affordable and sustainable foods essential for optimal growth and development. Second, food systems are flooding food environments with cheap, nutrient-poor, unhealthy ultra-processed foods that are increasingly available, accessible and heavily marketed, from remote rural communities to major urban centres (*Box 1*).

The UNICEF Nutrition Strategy 2030 acknowledges the central role of the food system – working together with the health, water and sanitation, education and social protection systems – in supporting good nutrition for all children.[47]

UNICEF programmes engage strategically with food systems by advocating for policies, practices and products that promote children's access to nutritious, safe, affordable and sustainable diets. UNICEF's work to make food systems fit for children focuses on three action areas:[48]

1. **Improving children's foods** through actions in public policy, guidelines and standards, and food supply chains, including fortified foods, food supplements and therapeutic foods for children.
2. **Improving children's food environments,** including the places where children live, learn, eat and meet, through actions in public sector policies and programmes and in private sector practices and products.
3. **Improving children's food practices** through policies, strategies and programmes that promote positive individual behaviours, caregiver practices and social norms.

To support action area 2, UNICEF has identified a set of mutually supportive legal measures and policies to create healthy food environments for children (*Box 2*). UNICEF's 2025 Child Nutrition Report explores these measures in more detail, offering specific recommendations for action by governments, along with a range of other actors, for improving food environments in ways that protect children's right to food and nutrition.[49] As described in the 2025 *Lancet* Series on UPF, these mandatory measures must be comprehensively adopted by governments and adapted to directly target UPFs in children's food environments.[50]

Government attempts to adopt and implement legal measures and policies often face staunch resistance from the UPF industry. UNICEF's research across 24 countries found that 70 per cent of government officials and civil society representatives identified industry influence as a major barrier to introducing government-led food marketing controls.[71] Indeed today, no government has enacted a comprehensive and coherent set of mandatory legal measures and policies to protect children from toxic food environments.[72]

The UPF industry uses a range of tactics – such as lobbying, misinformation and legal threats – to delay, weaken, evade or block legal measures and policies designed to promote healthy food environments for children and reduce the consumption of unhealthy UPF.[73–82] Governments and civil society must be empowered and supported to counter these tactics and resist corporate interference in international and national policy processes.[83]

UNICEF's engagement on and with the food and beverage industry is based in child rights and driven by the principle that the best interests of the child must be the primary consideration. The *UNICEF Programme Guidance on Engaging with the Food and Beverage Industry* sets out a set of 10 parameters for engagement with the industry, which are applied as a minimum common standard for all UNICEF programming areas and contexts, including in development, fragile and humanitarian settings.[84] These parameters include, for example, a commitment to not engage in partnerships, branded and/or funded interactions with UPF industries; to avoid all partnerships with food and beverage industries that violate the International Code of Marketing of Breast-milk Substitutes and subsequent World Health Assembly resolutions; and to continue advocating for the food and beverage industry to be excluded from public policymaking.

BOX 2

Priority legal measures and policies to create healthy food environments for children

The UNICEF Nutrition Strategy 2030 and accompanying guidance, together with the WHO Acceleration Plan to Stop Obesity, recommend the following mutually supportive regulatory actions to create healthy food environments for children.[51–54]

Breastfeeding: Implement the International Code of Marketing of Breast-milk Substitutes and subsequent World Health Assembly resolutions, which regulate the promotion of breastmilk substitutes up to the age of 36 months, including in digital environments.[55,58]

First foods: Implement the WHO 2016 Guidance on Ending the Inappropriate Promotion of Foods for Infants and Young Children (contained in World Health Assembly resolution 69.9), which regulates the marketing of foods and beverages to children under the age of 36 months.[59,60]

Food in schools: In schools and pre-schools, implement mandatory standards for meals, foods and beverages, and provide access to free, safe and palatable water. In and around schools, ban the provision, sale and promotion of unhealthy foods and beverages and ban marketing by the ultra-processed food and beverage industry, including sponsorship.[61]

Food marketing: Implement the WHO Guideline on Policies to Protect Children from the Harmful Impact of Food Marketing, through mandatory policies that cover all forms of marketing, all forms of media and all settings to which children under 18 years of age may be exposed.[62,63]

Food labelling: Implement mandatory labelling standards, including front-of-pack labelling, to help children, adolescents and families identify foods and beverages that are high in free sugars, salt, unhealthy fats and other harmful ingredients, and make healthier purchasing decisions.[64,65]

Food subsidies: Implement targeted agricultural, trade and consumer subsidies to incentivize the production, distribution and consumption of affordable, nutritious and healthy foods. These measures should prioritize supply chains that improve access for vulnerable populations.[66,67]

Food taxes: Implement taxes to discourage the purchase and consumption of unhealthy foods and beverages, such as sugar-sweetened beverages.[68,69]

Food reformulation: Implement mandatory regulations on the nutritional composition of processed foods and beverages to eliminate industrially produced trans-fat and reduce other potentially harmful ingredients, such as salt.[70]

A state-of-the-art review on ultra-processed foods and their impact on children

This state-of-the-art review takes a deep dive into evidence on the widespread consumption of UPFs among children and adolescents and explores the implications of shifts in dietary patterns for their nutrition, health and well-being. It complements the 2025 *Lancet* Series on ultra-processed foods and human health[85–87] by focusing specifically on children and adolescents and consolidating evidence about how ultra-processed food environments and UPFs undermine children's right to food and nutrition.

The review aims to answer the following questions:

- To what extent is the consumption of UPF, SSB and commercially produced foods marketed for infants and young children (CFIYC) rising in children and adolescents around the world?
- How does the consumption of UPFs, SSBs and CFIYC affect the nutrition, health and well-being of children and adolescents?
- How do the policies and practices of the food and beverage industry influence the purchasing behaviours of parents, caregivers, children and adolescents?
- What policies, regulatory actions and programme measures are effective in protecting children and adolescents from unhealthy UPFs, SSBs and CFIYC?
- What are the recommended actions that national governments and their partners can take to protect children and adolescents from unhealthy UPFs, SSBs and CFIYC?
- To what extent are ultra-processed food environments affecting children and adolescents in developing economies where nutrient-poor diets and child undernutrition are continuing challenges?

Chapter 1 has introduced the purpose of this state-of-the-art review and described how UPFs are inundating children's food systems and driving a crisis of child and adolescent diets that is threatening child health and development.

Chapter 2 provides an overview of **UPF consumption** among children and adolescents globally, examining its impact on nutrition, health and well-being, identifying key drivers and offering policy recommendations for shaping food environments that are fit for children.

Chapter 3 discusses global trends, health and nutrition impacts and drivers of **SSB consumption** among children and adolescents, exploring how these products came to dominate children's diets and highlighting opportunities for better protecting children and adolescents.

Chapter 4 documents the rise in **CFIYC as the first UPFs** consumed by infants and young children across all regions, particularly in middle-income countries, and outlines policy measures to protect children's food environments in early life.

Chapter 5 charts the rising consumption of UPFs among children and adolescents in **West Africa**, examining the drivers and implications of unhealthy, ultra-processed food environments, identifying key data gaps that need to be filled, and identifying regulatory actions to protect children's nutrition and health in the region.

Together, this evidence on the harmful impacts of ultra-processed dietary patterns and food environments for children and adolescents provides the basis for advocating for and developing stronger legal measures and policies to protect them. It will guide future actions to protect children from the commercial forces that flood food environments with UPF and prioritize profit over children's right to food, nutrition and health.

CHAPTER 2

Ultra-processed foods: An emerging concern for children's and adolescents' diets

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Abstract

This chapter provides an overview of the global consumption of ultra-processed foods among children and adolescents, highlighting the variations in intakes across contexts. It summarizes the evidence on how long-term consumption of diets dominant in ultra-processed foods impacts nutrition and health status. The chapter goes on to synthesize the drivers of ultra-processed food consumption within the personal and external food environments. Finally, it serves to provide policy recommendations that target UPF-related actors and environments. The evidence, while complex, incomplete and precluding a full understanding of long-term patterns and disparities in intakes across socioeconomic groups and between UPF sub-categories, suggests that UPF are now the predominant source of daily calories for children and adolescents in high-income countries. Emerging research links UPF consumption to the triple burden of malnutrition, metabolic alterations and mental health concerns, including depression and hyperactivity. Future longitudinal work could bolster the cross-sectional nature of the evidence base. Drivers that influence UPF availability, accessibility, affordability and acceptability within the food environment capture what, when, where, why, with whom and how children and adolescents purchase, prepare and consume UPF. Implementing synergistic and complementary policies – underpinned by a child rights-based framework – is key to maximizing impact. These policies must target the drivers of UPF intake, be sensitive to local food systems and adaptive to context-specific impacts, dietary patterns and nutrition and health priorities. This chapter is intended to further the dialogue and action on ultra-processed foods as they relate to the nutrition, health and well-being of children and adolescents.

Introduction

Ensuring nutritious, safe, affordable and sustainable diets for children and adolescents is central to achieving the Sustainable Developmental Goals.[1] Childhood and adolescence are critical periods for growth and development, and during this time it is important to monitor whether children's diets are indeed delivering the nutrients they require for optimal growth and development.[2] The amount of ultra-processed foods and beverages (UPFs) in children's diets serves as an important metric for examining dietary sufficiency and predicts the short- and long-term nutrition and health of children and adolescents. Additionally, examining children's UPF access and purchase reflects how they and their caregivers interact and engage with their food environments and the broader food system. This in turn can highlight if existing food environments are protective of children's unique vulnerabilities. Understanding the drivers of UPF purchase within food environments may illuminate potential opportunities to strengthen existing systems to better support the dietary needs of children and adolescents.

To understand the consumption, health effects and causes of UPF intake, a clear and explicit definition of UPFs and how they differ from other types of processed foods is needed. The term UPFs was introduced and defined by the Nova categorization system.[3] Nova differentiates food into four groups based on the extent and purpose of their processing (*see Annex 1*).

As conceptualized within Nova, UPFs are industrial formulations made from cheap ingredients derived from whole food along with cosmetic additives; they contain little, if any, whole food.[3] UPFs undergo several chemical and physical processes, including those used to obtain their ingredients (e.g., hydrolysis, hydrogenation, extrusion and pulverization), combine them and package the final product. They are designed and marketed to displace other food groups and to encourage overconsumption. UPFs are typically highly profitable, globally marketed, hyper-palatable and convenient (ready-to-consume and with a long shelf-life). Common UPFs include soft drinks; flavoured drinks; extruded breakfast cereals; sweet and savoury snacks; industrial breads; industrial sauces and spreads; reconstituted meat products; shelf-stable or frozen meals; and industrial desserts.[3]

Within Nova, food is more than just the delivery mechanism for nutrients. The *manner* in and the *extent* to which the food is processed play a central role in determining both its nutrient profile and its non-nutritive characteristics, including texture, palatability and the presence of xenobiotics. In alluding to the *purpose* of industrial processing, the concept of UPF within Nova highlights the commercial intent of actors that develop these products and directly benefit from their sale, making salient their responsibility in driving UPF consumption. This conceptualization shifts the emphasis from individual consumer responsibility for the consumption of these products to the practices of UPF-related actors in driving the production, supply, access, availability, promotion and sale of UPFs.

In line with this shift in emphasis, this chapter will focus on the systemic and environmental level factors associated with UPF consumption in children and adolescents. Specifically, this chapter aims to: (1) provide an overview of global UPF intakes among children and adolescents; (2) summarize the evidence of the impact of long-term UPF consumption on the nutrition and health status of this age group; (3) examine the environmental drivers of UPF intake; and (4) provide policy recommendations that target the UPF-related actors and environments.

Methods

This chapter synthesizes evidence from peer-reviewed literature (original research articles, reviews and meta-analyses) and reports from authoritative health organizations and scientific bodies (UNICEF, the World Health Organization, the Food and Agriculture Organization of the United Nations), the National Academy of Sciences of the United States) in the English language. Sources that primarily focused on children and adolescents informed the writing of this chapter. Children and adolescents were defined as individuals ≤19 years of age. Early childhood was defined as 0–5 years of age, middle childhood as 5–9 years of age and adolescence as 10–19 years of age. A key inclusion criterion was the use of the Nova classification system to define UPF, ensuring comparability across studies. Evidence on UPF intake was drawn from nationally representative dietary surveys, household-level purchase data and sales data. Evidence on the impacts of UPF consumption on nutrition sufficiency and health included observational and randomized controlled studies on the outcomes of obesity, stunting, wasting, inadequate micronutrient intake, micronutrient deficiencies and neurodevelopment. Retrospective studies and case-control studies were excluded. Evidence on the drivers of UPF was guided by the Innocenti Framework on Food Systems for Children and Adolescents[4] and included relevant quantitative and qualitative studies on UPF. Exceptions to the inclusion criteria were made for the section on emergent UPF policy and regulatory responses, where pioneering UPF policies were highlighted along with nutrient-centric policies with the potential to expand to account for the degree of food processing.

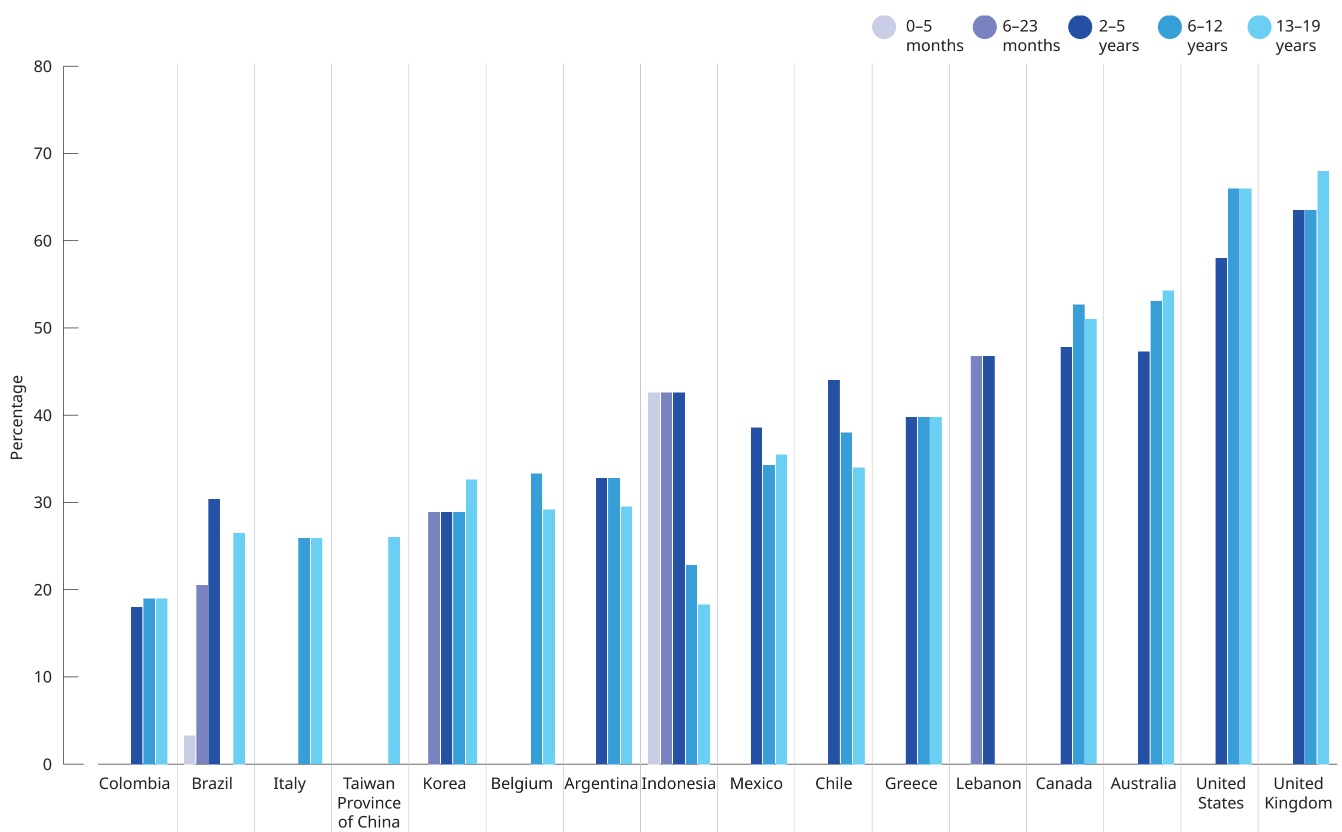

FIGURE 1. **Mean contribution of ultra-processed food to total caloric intake among children and adolescents across different countries**

Source: Compiled by authors using nationally representative survey data.

Global evidence on the consumption of ultra-processed food

Prevalence of ultra-processed food consumption

Cross-sectional national dietary surveys from 16 countries provide a snapshot of the variation in UPF consumption among children and adolescents across regions. In these studies, UPF consumption was obtained through food frequency questionnaires, and between one and three 24-hour diet recalls, and expressed as a percentage of total energy intake, unless otherwise stated (*see Figure 1*). Nationally representative cross-sectional studies conducted between 2004 and 2019 demonstrate marked heterogeneity in intake levels across countries and age groups. Overall, UPF consumption tended to increase with age. In Brazil, intake increased from 3 per cent among infants under 5 months of age to 21 per cent among children aged 6–23 months.[5] In Indonesia, children aged 0–4 years received 43 per cent of their daily calories from UPF.[6] Among 2–5-year-olds, intake ranged from 18 per cent (Colombia),[7] to 64 per cent (United Kingdom),[8] with intermediate levels in Brazil (30 per cent),[5] Mexico (39 per cent),[9] Canada (48 per cent)[10] and the United States (58 per cent).[11]

Direct evidence of UPF intake among children and adolescents living in Africa is limited. However, data from Demographic and Health Surveys, which capture the per cent of children between 6 and 23 months of age who reported intakes of sentinel food in the previous 24 hours, suggest that UPF intake in the African region is not insignificant.[12] Although not explicitly capturing UPF, the sentinel unhealthy foods captured in *Figure 2* – chocolates, candies, cakes, cookies, vishetti (sweet fried dough), sweet biscuits, ice-cream, chips, bagia (savoury fried fritter), mandaazi (semi-sweet fried dough), fried potatoes, fried cassava, fried sweet potatoes and instant noodles – are likely to substantially overlap with UPF.

Among older children aged 6–12 years, UPF contributed between 19 per cent of total calories in Colombia to more than 50 per cent of total calories in Australia and Canada, peaking at 64 per cent in the United Kingdom and 66 per cent in the United States.[7,8,10,11,13] Among adolescents, UPF caloric intake ranged from 18 per cent in Indonesia to 68 per cent in the United Kingdom, with intermediate values in Italy and Taiwan (26 per cent), Brazil (27 per cent), the Republic of Korea (33 per cent) and Mexico (36 per cent).[6,8,9,14,16,18] In Greece, children aged 2–18 years obtained 40 per cent of their total daily energy from UPF.[18]

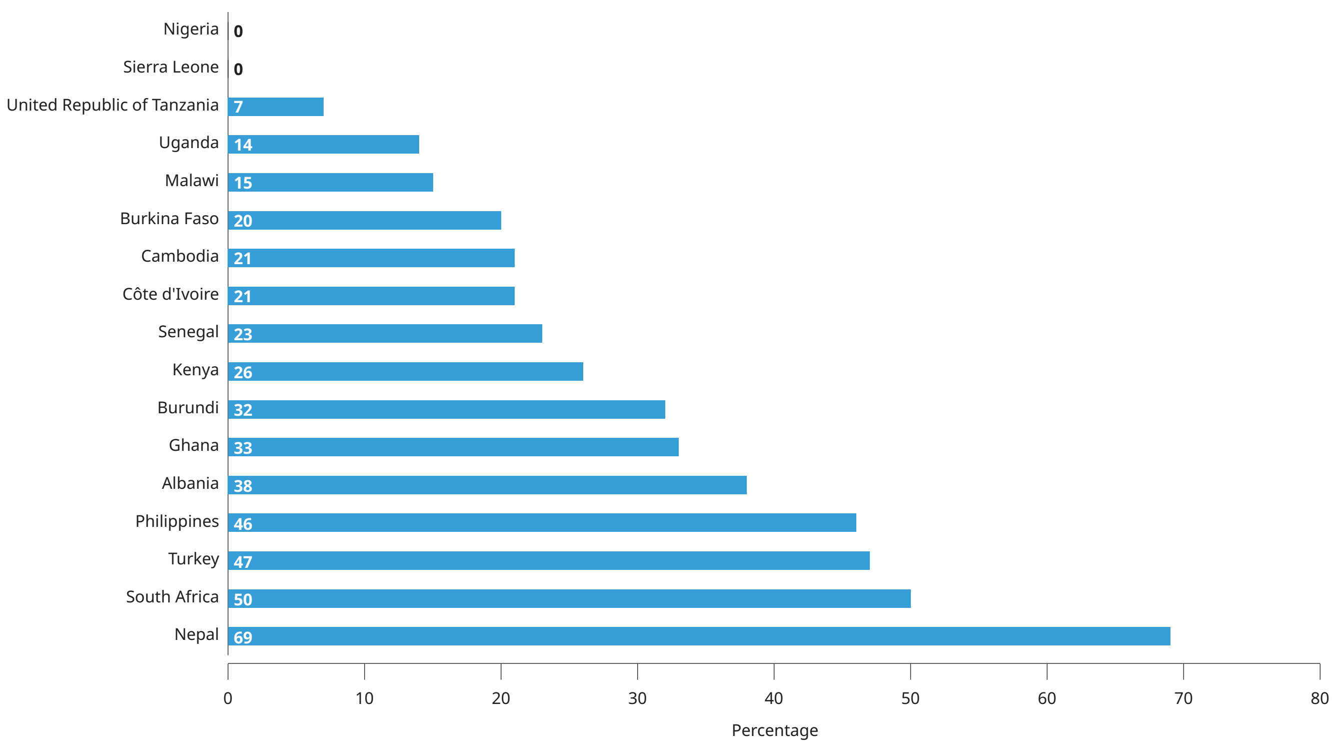

FIGURE 2. **Per cent of children who reported consuming unhealthy foods in the previous 24 hours**

Source: The Demographic and Health Surveys Program. Adapted with permission from Popkin, B. M., & Laar, A., 'Nutrition transition's latest stage: Are ultra-processed food increases in low- and middle-income countries dooming our preschoolers' diets and future health?', *Pediatric Obesity*, 70002, 2025.
Notes: As described by the authors of the study, unhealthy foods include sweet foods (chocolates, candies, cakes, cookies, vishetti, sweet biscuits, ice-cream) and fried or salty foods (chips, bagia, mandaazi, fried potatoes, fried cassava, fried sweet potatoes, instant noodles).

Socioeconomic disparities in UPF intake were also evident. In the United Kingdom, the United States, Canada and Italy, children from families with lower parental education, manual occupations or food insecurity obtained a greater proportion of their calories from UPF.[8,10,15,19] In contrast, higher intake by the same UPF metric was seen among children with more educated parents in the Philippines, Portugal and the Republic of Korea.[17,20,21] Household size showed mixed associations; a greater number of household members was inversely related to UPF intake in Filipino children but positively associated in Spain.[22]

Trends in ultra-processed food consumption

While trend data on UPF intake remains limited to a few countries, available evidence suggests a steady increase in both the availability and consumption of these products worldwide. Proxy indicators, such as sales volumes, obtained from the Euromonitor Global Market Database reflecting sales data from trade associations, industry bodies, company financial reports and government statistics, serve as a proxy for global UPF intake. Euromonitor data for 93 countries between 2007 and 2022 revealed several key patterns (*see Figure 3*): (1) in all countries, sales from sweetened carbonated drinks and sweetened non-carbonated drinks contributed to more than 50 per cent of all the UPF sales per capita; (2) the mean annual per capita sales of UPF among low-income countries was low in 2007 (<50 kg per capita) but increased by approximately 15 per cent over the period, largely driven by growth in ultra-processed beverages; (3) in lower-middle-income countries, sales of UPF from all categories increased by about 15 per cent; (4) in upper-middle-income countries, UPF sales averaged about 100 kg per capita and grew by around 20 per cent, with beverages contributing to over 70 per cent of these sales; (5) in high-income countries, sales remained high at approximately 200 kg per capita and relatively stable, with a slight decline in sweetened carbonated beverage sales offset by sweetened non-carbonated beverages.[23]

Similar trends were found by a recent review that looked at sales volume of non-essential food, including cakes, pastries, chocolate and sugar confectionery, chilled and shelf-stable desserts, frozen desserts, ice-cream, sweet biscuits, snack bars, processed fruit snacks, salty snacks, savoury biscuits, popcorn and other savoury snacks – products that were almost entirely UPF.[11] It found increases in total sales volume of these foods between 2004 and 2022, across six world regions, with only Egypt and Ukraine showing marginal decreases (*see Figure 4*).

These increases in UPF sales are corroborated by household purchase data, which provide a closer link to consumption. In Canada, relative calories from UPF in household food baskets increased from 24.4 per cent

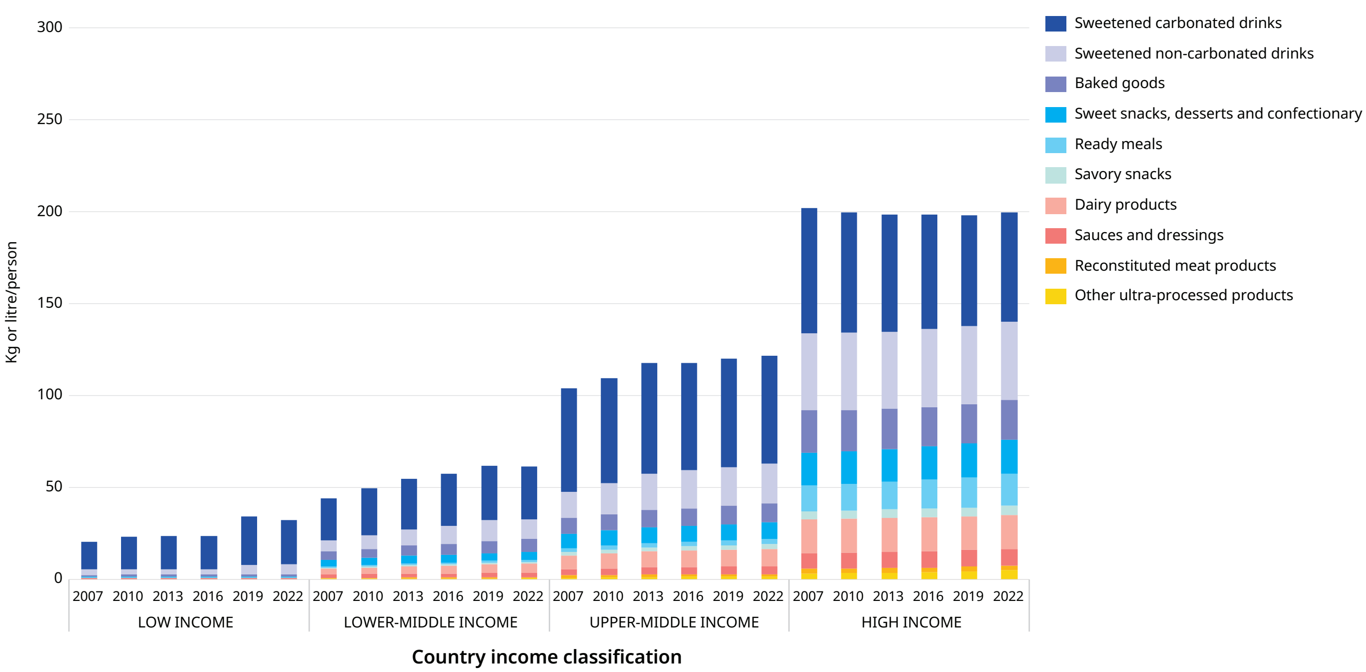

FIGURE 3. **Time trends in Euromonitor annual volume retail sales (kg) per capita category-specific ultra-processed food in 93 countries grouped according to income levels, 2007–2022**

Source: Used with permission: Monteiro, Carlos A, et al, 'Ultra-Processed Foods and Human Health: The main thesis and the evidence', *Lancet*, 18 November 2025, https://doi.org/10.1016/S0140-6736(25)01565-X.

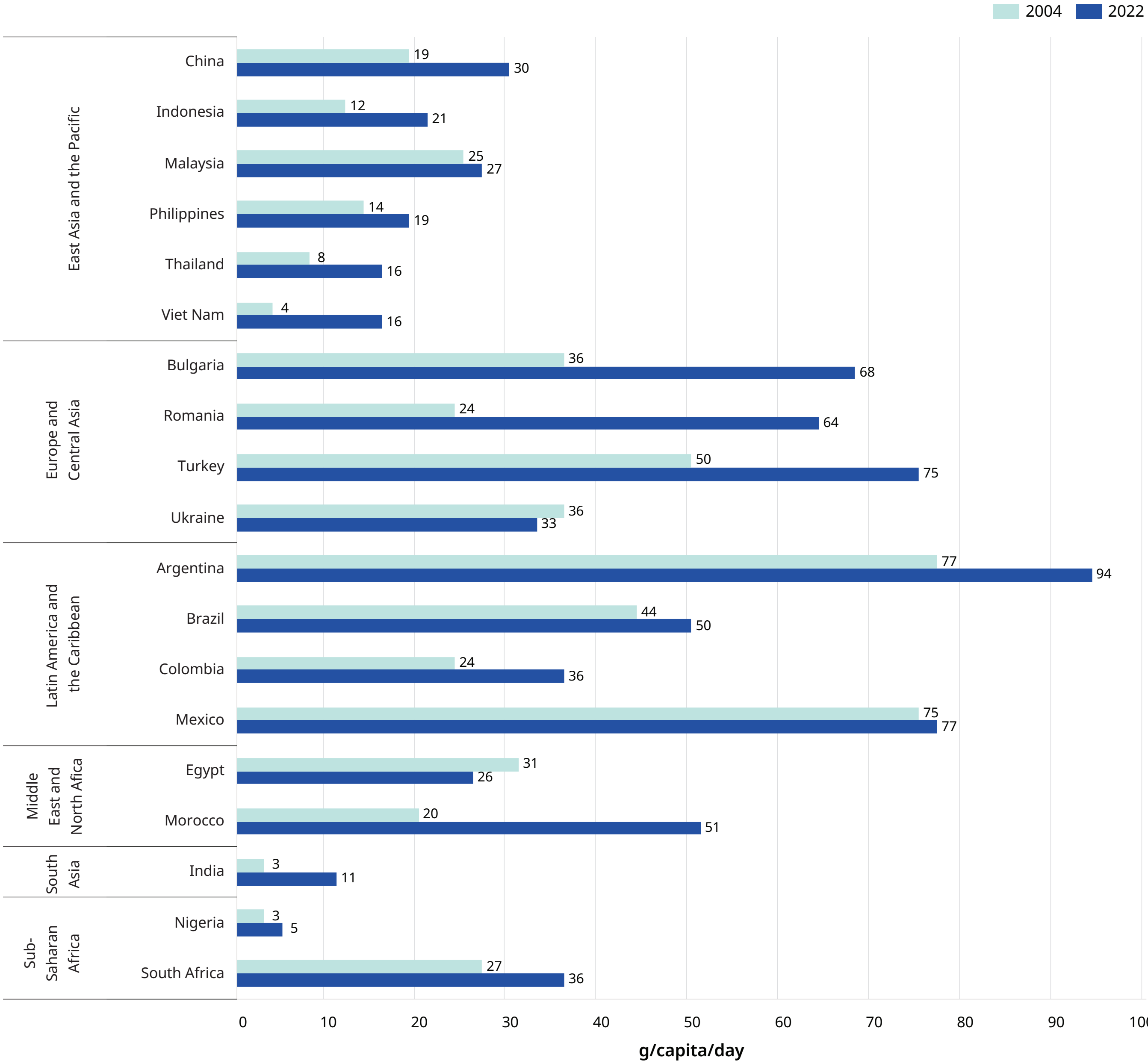

FIGURE 4. **Sales volumes of non-essential foods in 2004 and 2022, by region and country**

Source: Adapted with permission from Popkin, B. M., & Laar, A., 'Nutrition Transition's Latest Stage: Are ultra-processed food increases in low-and middle-income countries dooming our preschoolers' diets and future health?', *Pediatric Obesity*, 70002, 2025.
Notes: As described by the authors of the study, non-essential foods include cakes, pastries, chocolate and sugar confectionery, chilled and shelf-stable desserts, frozen desserts, ice-cream, sweet biscuits, snack bars, processed fruit snacks, salty snacks, savoury biscuits, popcorn and other savoury snacks. Data are from Euromonitor International.

in 1940 to 54.9 per cent in 2001.[24] Similarly, in Mexico and Brazil, UPF purchases rose from 10 per cent of total calories in the mid-1980s to 23 per cent by 2015.[9,25] In Spain, the share of UPF calories in household purchases increased from 11 per cent in 1988 to 31.7 per cent in 2008,[26] and in Argentina, from 19 per cent to 29 per cent between 2005 and 2015.[27] These data, while more proximal to household consumption, remain limited to a few contexts.

Finally, data on direct UPF intake further illustrate rising consumption patterns. Among children and adolescents, the data reveal stable or moderate increases in UPF consumption. In general, adolescents had higher UPF intakes than adults and the elderly, except in Indonesia, Brazil, Argentina, Canada and Chile, where younger children were the largest consumers.[6,16,24,27,28] In the United States, UPF intake as a proportion of total energy among children aged 2–19 years increased from 61.4 per cent to 67 per cent between 1999 and 2018.[11] In the Republic of Korea, UPF consumption among children aged 1–12 years rose from 27.5 per cent to 29.6 per cent between 2010–2012, and among adolescents from 30.9 per cent to 34.4 per cent between 2016–2018.[17] In Taiwan Province of China, UPF intake among adolescents aged 16–18 years increased from 22 per cent to 26 per cent between the 1993–1996 period and the year 2011.[14] Conversely, a slight decline was observed in the United Kingdom, where UPF intake among adolescents decreased from 67.7 per cent to 62.8 per cent of total kcals between 2008 and 2019.[29] In Brazil, UPF consumption among adolescents aged 10 years and older rose from 18.6 per cent in 2008 to 19.6 per cent in 2018, with the most pronounced increases among Black and Indigenous populations, rural residents, individuals with lower education levels, and residents of the less economically developed north and northeast regions.[16]

Taken together, these data – of prevalent UPF intake among children and adolescents in 17 countries, trend analyses of prevalent UPF intake among children and adolescents in six countries, and household-level purchase data in five contexts – highlight the significant contribution of UPF to global diets. Per capita sales data across nearly a hundred countries suggest a growth in UPF sales in the last two decades in low-, lower-middle and upper-middle-income countries, where baselines sales were low to begin with, and a plateauing of sales in high-income countries where sales were five times higher than in low-income settings. The evidence, while complex, incomplete and precluding a full understanding of long-term patterns and disparities in intakes across socioeconomic groups and between UPF sub-categories, suggests that UPF are now the predominant source of daily calories for children and adolescents in high-income countries. In low- and middle-income countries, although UPF consumption remains relatively low, adolescents consume 20–40 per cent of their daily calories from UPF. Trade patterns, rapid population growth and rising incomes in these countries suggest that UPF consumption will likely continue to increase.

Impact of ultra-processed food consumption on nutritional and health status

A growing body of evidence demonstrates the negative impact of UPF-dominant diets on children's nutritional status, including nutritional deficiencies and multiple chronic health outcomes. The biological pathways linking a UPF-dominant diet to these health conditions are likely to be complex and interrelated. Several pathways have been hypothesized, of which some have been demonstrated and will be briefly mentioned in this section. Characteristics of UPF that are captured by a UPF-dominant diet are likely to underlie these biological pathways, such as: (1) their imbalanced nutrient composition; (2) their damaged food matrix, soft texture and hyper-palatability; (3) the presence of cosmetic additives and ingredients of rare culinary use; (4) contaminants from the synthetic packaging that they are sold in; and (5) contaminants from the processing techniques.[3] Individually, these characteristics are themselves a focus of further research. The health-related impact of their combined exposure is detailed below.

Imbalanced nutrient intakes

There is consistent evidence from diverse regions to show that a UPF-dominant diet results in imbalanced nutrient intakes, displacing more nutritious food from children's diets and potentially compromising overall diet quality. Evidence from Spain shows that children aged 4–7 years with a UPF-dominant diet when compared to a non-UPF-dominant diet had a greater likelihood of inadequate intake of three or more micronutrients.[22] Similar associations have been observed among adolescents in Taiwan Province of China,[14] Lebanon[30] and Latin America.[31,32] A meta-analysis covering 13 high-, middle- and low-income countries found that high UPF consumption was correlated with lower potassium, fibre, protein, zinc, magnesium, and vitamins A, C, D, E, B12 and niacin and higher energy density, free sugars and total and saturated fats, but not with intakes of sodium.[33] In keeping with the theory that UPF displace foods that tend to be nutrient-dense (such as unprocessed or minimally processed food and meals made from them), the review found a negative correlation with fruits, vegetables, legumes, whole grains, cereal and other minimally processed staples.[33] These patterns are particularly concerning during periods of rapid growth, when nutritional requirements are elevated and crucial for healthy development.

Overweight and obesity

The evidence on the link between UPF consumption and overweight and obesity in children and adolescents is compelling. A recent review by the 2025 United States Dietary Guidelines Advisory Committee concluded that UPF-dominant diets were associated with greater adiposity as measured by increased fat mass, waist circumference and body mass index (BMI), as well as a higher risk of overweight in children and adolescents,[34] corroborating results from a 2018 systematic review.[35]

To date, 13 cohort studies and 11 cross-sectional studies have examined the relationship between UPF consumption and obesity in children and adolescents (*see Annex 2*). Eleven of the 13 prospective cohort studies report significant positive associations between UPF consumption and obesity, emphasizing the role of UPF in promoting unhealthy weight gain and predicting increased adiposity over time, including higher BMI, BMI z-scores, subscapular and triceps skinfold thickness, fat mass and waist circumference. The Growing Up Today Study reported significant BMI increases annually and over a 4–5 year follow-up period among children in the United States with a UPF-dominant diet.[36] Similarly, the Portugal Generation XXI Cohort found accelerated trajectories of weight gain, BMI z-score, waist circumference and fat mass percentage,[20] while the Avon Longitudinal Study of Parents and Children in England and the Food and Environment Chilean Cohort both found increased BMI, waist circumference and fat mass index with high UPF intakes.[37] There may be sex-based and age-related differences in impacts to further scrutinize, with stronger detrimental associations observed among Canadian boys[10] and at lower ages.[38,39]

While experimental evidence in children is limited, a landmark randomized crossover controlled trial in adults showed that consuming ~80 per cent of calories from UPF led to weight gain of 0.8± 0.3 kg in two weeks, while a minimally processed diet resulted in weight loss.[40] The energy intake was nearly +500 kcal/day when participants received the UPF diet, which can be attributed to faster eating rates, lower satiety and greater palatability of UPFs. A week-long clinical trial in Japan[41] and an eight-week pilot intervention in the United States[42] yielded similar results. The observed overconsumption of UPF is by design, given that most UPF are industrially engineered to have properties such as hyper-palatability.[43] Their imbalanced nutritional composition, along with the presence of cosmetic additives, may promote hedonic eating and disrupt satiety signals, leading to overconsumption. Additives, such as artificial sweeteners and emulsifiers, may also alter the gut microbiota and promote metabolic dysfunction.[44] Finally, packaging chemicals and processing contaminants, such as bisphenols and acrylamides, may act as endocrine disruptors, potentially increasing abdominal adiposity and insulin resistance.[45,46]

Nutritional deficiencies

The displacement of nutrient-dense food by nutrient-poor UPF is one of many potential mechanisms underlying UPF-associated micronutrient deficiencies. Despite strong evidence linking UPF consumption to imbalanced nutrient intakes, its direct association with anaemia and micronutrient deficiencies is less well established. The MINA-Brazil birth cohort study found that UPF consumption was significantly associated with anaemia in one-year-old children.[47] Smaller cross-sectional studies of socially vulnerable Brazilian children under 5 years of age (children growing up in environments marked by poverty, insecure housing and limited access to essential services), found that an early introduction of UPF and higher UPF contribution to total calories increased the likelihood of anaemia.[48,49] In a Mexican sample, UPF intake was linked to the coexistence of anaemia and excess weight (double burden of malnutrition), particularly among low-income children and high-income adolescents.[50] Contradictory results were seen in a few cross-sectional studies, where moderate to high UPF intakes were associated with lower prevalence of anaemia and vitamin A deficiency among children aged 6–59 months[51,52] and lower anaemia risk in three-year-old children.[52] These inconsistencies are likely due to reverse causation and may also reflect residual confounding or inadequate adjustment for linear growth (children experiencing greater height-for-age gains have increased iron requirements to support blood volume expansion and tissue development), underscoring the need for continued research on this topic.

Stunting

Although less well established, UPF intake has been linked to suboptimal growth outcomes, including stunting. A prospective cohort in Portugal found that four-year-olds had slower height gain over time with greater UPF intake.[53] In Brazil, higher UPF consumption at 2 years of age was associated with lower length-for-age z-scores at 4 years of age.[54] Similar associations were observed in studies from Malawi,[55] Ecuador[56] and Nepal,[57] suggesting that these findings may apply across diverse settings. UPF consumption may contribute to stunting by displacing nutrient-dense food and reducing intake of key growth-related nutrients, especially zinc, vitamin A, folate and protein.[33,58] Additionally, emulsifiers and additives in UPF may disrupt the gut microbiota, increase intestinal permeability and promote low-grade inflammation, all of which could impair nutrient absorption and growth.[59,60]

Neurodevelopment

Emerging evidence is suggestive of the potential impact of UPF on brain development, cognitive performance, emotional well-being and mental health. When compared to a Mediterranean diet, a UPF-dominant diet was associated with worse academic performance and school functioning.[61] A UPF-dominant diet among three- to four-year-old Brazilian children was associated with greater hyperactivity symptoms during adolescence.[62] A UPF-dominant diet was associated with reduced verbal comprehension scores among Chinese children aged 4–7 years,[63] and to lower academic achievement in Spanish adolescents.[64] Sleep and emotional well-being may also be impacted as demonstrated by a recent systematic review.[65] A positive association was found between UPF intake and the risk of insomnia in adolescents and adults, across seven meta-analysed studies.[65] The literature is also suggestive of shorter sleep duration among adolescents, particularly boys.[66]

Several hypotheses have been put forth to explain the biological mechanisms linking UPF to brain development and emotional regulation. UPF are rich in food additives, such as artificial sweeteners and emulsifiers, which have been shown to alter gut microbiota composition, disrupt hormonal signalling and induce systemic inflammation.[67,68] The high content of added sugars and saturated fats in a UPF-dominant diet may contribute to neuroinflammation and oxidative stress, which can impair brain plasticity and executive function.[69–71] Cognitive development, including memory, learning and mood regulation, may also be compromised through appetite dysregulation and UPF-intake-induced nutrient imbalances in iron, zinc, iodine, folate and omega-3 fatty acids.[72]

Contextualizing the evidence on the impact of ultra-processed food consumption on nutritional and health status

The evidence on the negative health impacts of UPF is strongest and most consistent for weight gain, overweight and obesity, having been demonstrated in diverse samples and across diverse study designs that have captured UPF through different instruments and at different life-stages. The Bradford Hill criteria[73] – the strength of associations, their consistency across different samples and settings, the biological gradient (dose-response relationship seen in the evidence on adults), the coherence with experimental and mechanistic studies and the biological plausibility – reinforce the plausibility of a causal link between UPF consumption and weight gain in children and adolescents.

Emerging research links UPF consumption to the triple burden of malnutrition, metabolic alterations and mental health concerns, including depression and hyperactivity, but the evidence base is patchy and cross-sectional. Longitudinal cohort studies would provide stronger evidence by capturing UPF impact across developmental stages and over time, getting closer to establishing causality. Overcoming other methodological limitations – by developing validated tools for capturing UPF consumption in children, accounting for changes in UPF intake over time and consistently adjusting for confounders – would contribute to more robust and replicable findings.

Drivers of ultra-processed food consumption

UPF intake and health impacts may be best understood when contextualized in the physical, economic, political and sociocultural contexts in which children and adolescents purchase, prepare and consume food[4] and the processes and structural factors that affect the functioning of these contexts. That is, examining the food environments and the drivers that influence UPF availability, accessibility, affordability and acceptability will best explain what, when, where, why, with whom and how children and adolescents purchase, prepare and consume UPF. Systemic level factors, such as the political drivers (including governmental systems, structures and policies that impact purchase and consumption of UPF) and the commercial drivers (factors at the level of the UPF manufacturers who leverage their substantial material resources and economic power to consolidate market control, undermine regulatory action and expand market growth), are likely to also play an important role.[74,75] This section will focus specifically on the drivers of UPF consumption within the personal food environment and the external food environment.

As defined by the Innocenti Framework on Food Systems for Children and Adolescents,[4] personal food environments include the individual and household-level factors that consumers bring to the food environment, such as purchasing power, access, convenience and desirability, and inform why people choose to procure the food that they do; while external food environments are the retail and commercial markets, schools and informal vendors where consumers interface with food and reflect aspects of availability, food price, marketing and advertising, and vendor and product properties.[4] Personal and external food environments serve as the main points of interaction with the food system for children and adolescents.

Convenience of ultra-processed food

UPF, which are almost entirely ready-to-eat, ready-to-heat, or relatively easier to prepare than their less processed equivalents, are often characterized as convenience food.[76] Food that is considered convenient requires minimal time as well as minimal physical and mental effort to plan for, prepare, consume and cleanup after.[77] Consumer valuation of the multidimensional concept of convenience reflects motivations, preferences and consequent behaviour to a large extent. Convenience-food-seeking orientation has been negatively related to perceived cooking enjoyment, involvement with food, variety seeking, household size and having children, and has been positively related to role overload.[78] Several studies have found that factors such as time pressure, physical effort, value for money and woman-associated chores positively predict convenience food consumption.[77] On the other hand, age, being female, sociability and enjoyment of eating with others, knowledge of nutrition, cooking skills, physical effort for cooking and cherishing naturalness, and avoiding waste, have often negatively predicted convenience food consumption considered UPF.[77]

While the convenience-food-seeking orientation has been less well studied in children and adolescents, the predictors of convenience (as captured by parents' cooking skills, home-cooking, home-meals and children's sociability, location of eating and eating contexts) have been studied. Less frequent cooking and shorter time cooking among parents has been shown to be associated with an increase in the share of UPF calories in their children's dinners.[79] On the other hand, an increase in parents' confidence in their cooking skills was associated with a decrease in relative calories from UPF in their children's dinner,[80] while a higher frequency of cooking dinner in households with children and adolescents was associated with lower UPF intake and higher overall diet quality.[81] The convenience of eating UPF in different contexts or eating context patterns, such as "eating with family while watching TV", "eating away from home" and "eating alone in the bedroom" were associated with higher UPF intakes, while "eating at school with friends" was associated with lower UPF intakes among a representative sample of British children.[82] Eating at home offered some protection against UPF intake among children and adolescents, while eating in leisure, fast-food joints and sports places promoted UPF intake.[83]

Price of ultra-processed food

Price is potentially one of the strongest drivers of food selection and purchase. Estimating the price of UPF and the cost of a UPF-dominant diet is complex but data from several contexts suggest that the cost of a UPF-dominant diet is lower than that of a minimally processed or a non-UPF diet, making price an important factor in UPF purchase and consumption. Among a representative Belgian sample, a UPF-dominant diet was found to be significantly cheaper than a non-UPF diet and a minimally processed food-dominant diet was much more expensive.[84] The average price per 100 kcal for UPF was also found to be significantly cheaper when compared to minimally processed food.[84] Similarly lower costs were found for UPF in a representative Dutch sample.[85] UPF cost per calorie was also found to be lower in the US,[86] with lower price increases over 12 years compared to minimally processed food. The price of UPF in Brazil was recorded as being higher in comparison to other Nova groups but has been dropping over the years and is projected to be lower than minimally processed food in 2026.[87]

The response of consumers to UPF prices may be reflected by their current intakes. A review covering sociodemographic determinants of high UPF intake that included nationally representative studies from 32 low-middle- and high-income countries, found that children and adolescents across all contexts had the highest UPF intakes compared with older age groups.[88] Income and socioeconomic status, which could reflect how price sensitive consumers were to UPF intake, varied in their association with UPF intake and depended on the country content.[88] A higher-income and a higher socioeconomic status were associated with a higher UPF intake in Chile and Brazil and in Colombia and Mexico respectively. Lower-income levels in the United States sample and a low socioeconomic status among samples in Australia and in the United Kingdom were associated with higher UPF intake.[88] As financially dependent consumers, children's price responsiveness to UPF is likely to be a function of their cognitive abilities and age.[89]

Marketing and advertising of ultra-processed food

The marketing of UPF across the food environments that children and adolescents frequent is potentially the most important driver of the consumption of these products.

BOX 1.

Marketing to children and adolescents

Marketing is defined as any form of commercial communication, message or action that serves to advertise or otherwise promote a product or service, or its related brand, and is designed to increase, or has the effect of increasing, the recognition, appeal and/or consumption of products or services. Advertising is one type of marketing activity.[90]

Children and adolescents represent primary consumers (making their own consumption decisions), secondary consumers (influencing parental consumption decisions through 'pester power'), and important future consumers (consumption habits acquired in childhood carry into adulthood), and therefore, are the most important market segment that food manufacturers target. Additionally, parents' and caregivers' exposure to food marketing impacts their personal purchase decisions, determines their household food environment, and in turn influences children's exposure to and consumption of these marketed products.

Food marketing targets the developmental vulnerabilities of children and adolescents, and their limited ability to discriminate between unbiased information and marketing.[91] Multiple channels and platforms – such as food packaging design, in-school marketing, magazines, television and radio advertising, outdoor advertising, digital media and the internet – ensure the frequency and reach (exposure) to food marketing. The power of food marketing is defined by the "content, design and creative strategies used to target and persuade", such as spokes-characters, advergames, brand personalities, collectibles, deals, claims, pop-up ads, product images and brands, social media engagement tools, social media influencer content and sponsorship.[90,91] Digital marketing practices – which refer to the marketing of food and beverages across digital media platforms, including websites, mobile apps, social media, video sharing, gaming platforms, livestream gaming and streaming TV – allow for marketing content to be tailored based on individual data about the child's online behaviour, preferences and physical location.[90,91]

The Institute of Medicine of the United States released a landmark report in 2006 that thoroughly investigated the science on the impacts of marketing to youth and children.[90–92] The conclusions were damning. They found moderate to strong evidence that television advertising influenced: (i) food and beverage preferences; (ii) food and beverage purchase requests; (iii) beliefs; (iv) preference and requests for high-calorie and low-nutrient food and beverages; (v) short-term consumption; (vi) usual dietary intake; (v) and adiposity (an association that remained after taking alternative explanations into account). The evidence was particularly strong for children ages 2–11 years and less compelling for adolescents aged 12–18 years. The food and beverages in question were almost exclusively calorie-dense and nutrient-poor and very likely to have been considered ultra-processed, although the concept was not defined at the time.

A systematic review and meta-analysis conducted more recently as part of the World Health Organization Nutrition Guidance Expert Advisory Group Subgroup on Policy Actions, which included academic literature published between 2009 to 2020, came to a similar conclusion as the 2006 report.[93] The systematic review and meta-analysis captured the influence of commercial food or non-alcoholic beverage marketing on the preferences, behaviours and health of children (0–19 years) across 64 randomized clinical trials and 32 non-randomized studies. While there was little published evidence on health outcomes – body weight, BMI and dental caries – to draw any conclusions, the review found compelling evidence that food marketing significantly increased food intake, choice, preference and purchase requests among children.[93] Foods marketed in these studies were predominantly ultra-processed – fast-food, sugary drinks, candy, sweet and salty snacks and breakfast cereals high in sugar. Notably, there was an absence of marketing of healthy food.[94] Indeed, products with child-directed marketing on their packages, including the presence of nutrition and health claims, promotional characters and premium offers, have been found to be overwhelmingly ultra-processed.[95]

The targeted nature of marketing practices is also made salient through these reviews. The evidence demonstrated that food marketing promoting UPF was prevalent in settings where children gather (schools and sports clubs).[90] In the context of marketing on TV, promotions were more frequent during "children's typical viewing times, during school holidays, on children's channels or around children's programming relative to other time periods, channels or programming genres".[90] Exposure to food marketing was also documented to be higher among less affluent, lower-socioeconomic neighbourhoods, among fast-food outlets located in public housing development neighbourhoods, or around schools with the greatest number of socioeconomically deprived children, in comparison to affluent, high-socioeconomic communities or schools.[96,97]

Digital marketing has been hypothesized to worsen health disparities. A comprehensive examination by Healthy Eating Research, a national programme of the Robert Wood Johnson Foundation, found that the impact of digital marketing of all forms was similar to traditional marketing. Across 49 studies published between 2013 and 2024, digital marketing was found to increase acute caloric intake, unhealthy food choices and requests to parents, while decreasing longer-term diet quality. It also increased positive attitudes towards unhealthy food advertisements and advertised products and increased intent or requests to purchase the products among both young children and adolescents.[98]

Availability of ultra-processed food in school food environments

Exposure to UPF within schools and in the surrounding food retail environment plays a critical role in shaping children's preferences and dietary behaviours. Evidence suggests that school environments, where children and adolescents spend a significant portion of their time, are increasingly dominated by UPF, particularly in high-income countries and urban areas in middle-income countries. The presence of UPF in daycare settings, school meals, cafeterias and retail outlets in close proximity to schools strongly influences children's purchase and consumption.

In the United Kingdom, school lunches, while containing lower levels of UPF than packed lunches, still contributed substantially to children's overall UPF consumption, particularly among older and lower-income students.[99] Similarly, in Australia, UPF accounted for about 20 per cent of the foods and beverages provided at lunch and during snack times in daycare centres, highlighting early exposure to these products.[100] The availability of UPF in school cafeteria menus was associated with higher UPF intakes among Brazilian students.[101] Similarly, greater availability and diversity of UPF in cafeterias in urban schools in Brazil was correlated with increased frequency of consumption, demonstrating a dose-response effect.[102] The profitability of UPF may incentivize school vendors to prioritize these products, exacerbating their prevalence in school cafeterias.[103] A recent systematic review further corroborated these findings.[104]

Beyond school premises, the surrounding food retail environment also plays a crucial role in children's UPF consumption. Food stores primarily selling UPF are often significantly closer to Brazilian schools in affluent urban areas than those selling minimally processed food.[105] The density of such outlets was lower in more rural, less affluent districts, suggesting regional and socioeconomic disparities in availability of UPF in the food environment. Conversely, in New Zealand, secondary schools in lower-income areas had significantly more ultra-processed fast-food and convenience outlets within an 800-metre radius than those in higher-income areas.[106] Increased availability of UPF in school neighbourhoods has been linked to both higher UPF intake and lower consumption of healthier food among children.[107] Similar associations between proximity of UPF-dominant establishments and high UPF intake, emerge in other contexts. In the Lao People's Democratic Republic, adolescent consumption of UPF was strongly influenced by the availability of UPF in multiple locations, including schools, homes and nearby stores.[108]

Qualitative evidence lends credence to the above-mentioned drivers of UPF intake. Children's preferences are shaped by their exposure to UPF outside of the home and in child-directed advertisements viewed on television, on food packaging and in stores. Parent-directed marketing, shelf-stability, low-cost and their fast and easy-to-prepare attributes strongly influenced parent/caregiver purchases of UPF.[109] UPF were also valued by parents balancing busy schedules, appeasing picky eaters and aiding household members who lack the time or cooking skills to prepare a meal, and when both parents worked long hours or children participated in after school activities.

Considerations for policy, regulatory and programming responses

UPF consumption levels and their potential for nutrition and health harm make clear the urgency for preventive action to safeguard the health and nutrition of children and adolescents. A child rights-based framework – the United Nations Convention on the Rights of the Child – and the precautionary principle approach, could provide the necessary foundation to address the risks to child health posed by high UPF intake.[110] As the most ratified human rights instrument in the world, the Convention on the Rights of the Child, rooted in the International Bill of Human Rights, provides governments with the mandate, the legal framework and the legal responsibility within which to act on UPF consumption.[110] The precautionary principle, housed within the Treaty on the Functioning of the European Union, could be invoked given the potential for adverse effects identified by research.[111] This principle could also support the shifting of the burden of proof for the absence of a health risk from high UPF intake, from public health agencies to food manufacturers.[112]

While research continues to uncover UPF epidemiology and physiological impacts, UPF consumption behaviour can be targeted in parallel through policy and programmes. Implementing synergistic and complementary policies that target several drivers of UPF intake and that are sensitive to local food systems and adaptive to context-specific dietary patterns and nutrition and health priorities, are likely to be key to maximizing impact. For the purpose of these policies and depending on the existing nutrient- and ingredient-disclosure regulations in the context of implementation, UPF could either be identified through food groups, through nutrient profiling models, through nutrient-and-additive profiling models or through Nova-based profiling models.[113] Alternatively, in an identification-through-negation approach, non-UPF could be identified for policy and any product not meeting the non-UPF criteria could be designated as UPF. While UPF-specific policies are emergent, current food policies and some nutrient-centric policies with the potential of expanding to processing-centric policies and are presented below.

Incorporating ultra-processed food in national food-based dietary guidelines

Dietary guidelines provide evidence-based and context-specific recommendations for preventing the single, double or triple burden of malnutrition (acute and/or chronic undernutrition, micronutrient deficiencies, obesity and diet-related diseases). They are widely considered a foundational policy – forming the basis for other nutrition and food assistance programmes, supporting nutrition education efforts and guiding national health promotion and disease prevention initiatives.[114] Incorporating advice on UPF intake in food-based dietary guidelines would be an important step up from the nutrient-centric approach taken by most dietary guidelines. Several health organizations, such as the American Heart Association and the European Association for the Study of the Liver, already endorse limiting UPF intake and increasing the consumption of minimally and unprocessed food,[115,116] as do the food-based guidelines of Brazil, Belgium, Chile, Ecuador, France, India, Israel, Malaysia, the Maldives, Mexico, Peru and Uruguay.[117,118] Brazil is the only country that recommends UPF avoidance in its dietary guidelines for both adults and for children under 2 years of age,[119,120] with the exception of infant formula.

Policies on the marketing and advertising of ultra-processed food

Mandatory restrictions on the marketing of all UPF to children and adolescents aged 18 years of age or younger target an important driver of UPF intake and are perhaps the measures most likely to directly benefit the target population. Such restrictions should use a broad definition of marketing (beyond direct promotion), limit UPF sub-category exclusions and reduce exposure to the persuasive power of marketing across digital media, traditional broadcast media (such as TV and radio) and in environments such as childcare centres, educational institutions, supermarket check-out aisles, entertainment and sporting venues.[121] Together, these strategies make UPF less appealing to children and adolescents and provide parents with greater support in making healthy food choices.

At the time of writing, 13 countries had mandatory policies regulating food marketing to children. In Chile and Mexico, marketing restrictions were part of a wider suite of polices aimed at reducing the consumption of unhealthy foods. The policies varied in their exposure (media channels and environments covered), power (marketing techniques targeted) and the age range of children protected.[122] Of these, the marketing restrictions imposed by Portugal in 2019 cover all broadcast media (TV, radio and cinema), all digital media (web and social media) and all print and environmental marketing (outdoor signs, food packaging, point-of-sale, events and venues), targeting children younger than 16 years of age.[122] On the other hand, the United Kingdom policy – likely to be implemented in January 2026 (delayed from October 2025) – bans advertising for foods or drinks from 13 food categories that meet or exceed pre-defined nutrient thresholds, on television between 5 a.m. and 9 p.m., and paid-for advertising online at any time.[123] The policy is not entirely comprehensive, meaning that companies can still advertise products that are under the nutrient thresholds, promote only the brand rather than individual products, and advertise in retail and outdoor venues and billboards. However, it is projected to remove 7.2 billion calories from children's diets per year and help prevent around 20,000 cases of childhood obesity, with health benefits estimated at £2 billion.[123]

Policies that target the price of ultra-processed food

Fiscal policies, such as UPF taxes, may serve to address UPF purchases and subsequent consumption among both children and their parents. These taxes could be designed to raise the relative price of UPF and disincentivize their purchase, while supporting the shift to healthier foods and mitigating the regressive impacts of the tax by subsidizing minimally processed food.[124] UPF taxes could also serve as important sources of revenue for the government and tools to encourage product reformulation by the food industry. They may be value-added taxes, sales taxes, excise taxes or import or custom duties, structured to either be *ad valorem* or specific taxes and applied in either a uniform or tiered manner.[125] Both sales and value-added taxes are reflected in the final retail price and paid by the consumer, although the former are levied at the final point-of-sale (generally the shelf-price, but could also be at point of check-out), making them easier to administer, while the latter are applied along the value chain of the product.[125] These may be less suited to target UPF as they apply broadly to all products and services.

UPF excise taxes may be more appropriate, as they are applied to specific products, such as sugar-sweetened beverages (SSB). SSB taxes are generally levied on the producer or at point-of-entry on the importer, and are passed on to the consumer in the form of higher prices.[126] They may be *ad valorem* (percentage of the value of a product) or specific (rate based on the weight, volume or nutrient content of product), or a mix of both.[126] Colombia implemented an expansive UPF tax in 2023, targeting both food and beverages. The excise tax increases based on the added sugar content of the beverage (specific tiered tax), or the sodium, free sugar and saturated fat content of the solid food (specific tax). For solid UPF, the tax rates were increased in phases, from 10 per cent in 2023, 15 per cent in 2024, to 20 per cent in 2025.[127] Ongoing efforts would be needed to monitor unanticipated consequences of any UPF tax, particularly for low-income consumers.

A recent review found evidence of decreasing sales, purchases or intakes of taxed foods, especially in combination with subsidies. Higher tax rates were found to be more effective, with differences in effectiveness across income levels – lowest-income groups were most responsive to these measures.[124]

Policies that target ultra-processed food access and availability

Procurement policies, school feeding programmes and strategies that promote UPF-free child food environments by tackling the availability and access of UPF show promise in reducing child and adolescent exposure to UPF, while encouraging non-UPF intake. Brazil's National School Feeding Program serves as a model for procurement and feeding policies, imposing restrictions on the procurement of processed foods and UPF (regardless of their nutrient content) to 20 per cent or less of the national funding (lowered to 10 per cent by 2026), with 90 per cent of meals made from unprocessed or minimally processed food.[128,129] This programme also ensures that at least 30 per cent of all foods are sourced from local farmers, and that meals made for the 40 million children who benefit from the School Feeding Program meet at least 15 per cent of their daily nutritional needs.[129,113]

UPF-free school food environments and childcare settings in Chile or measures such as the no-UPF *National Basic Food Basket* in Brazil are other examples of policies to address UPF access and availability. As part of a comprehensive set of policies implemented in 2016, packaged products that meet or exceed a pre-defined threshold for total sugars, saturated fats, sodium or energy and display a warning label are prohibited from sale, promotion and marketing within Chilean schools.[130] Brazil's Basic Food Basket, on the other hand, excludes UPF and is limited to 10 essential food groups, including legumes, cereals, roots, vegetables, fruits, meats, dairy products, sugars, salt, oils and beverages like coffee and tea. Revised in 2024, the regulation underlying this reform aligns with several other UPF-limiting policies, including the Brazilian Dietary Guidelines of 2014, the Dietary Guidelines for Children Under Two Years of Age, the National Policy on Food and Nutrition and the recent tax reform.[131]

Policies to improve consumer information asymmetry

Beyond marketing restrictions, packaging-related nutrition information asymmetries that promote UPF purchase could also be addressed through mandatory *front-of-pack labelling* policies that signal a UPF, or through a *declaration of processing techniques*, which indicates the processes that the product has undergone alongside its list of ingredients. Front-of-pack warning labels, implemented in several Latin American countries, currently target excess nutrient content in products, a significant proportion of which are UPF. In Argentina, Colombia and Mexico, they target proxy indicators of UPF – non-nutritive sweeteners and caffeine or non-nutritive sweeteners only (Colombia) – through additional warning claims.[132-135] Beyond dissuading purchase and encouraging reformulation, these policies could also benefit food regulatory agencies and their efforts to monitor the prevalence and change in the share of UPF in the food supply.

Programmes to change the acceptability and desirability attributes of ultra-processed food: Consumer awareness, health promotion, skill-building and nutrition education programmes targeting children, are other avenues that could address UPF acceptability and desirability. The perceived convenience of UPF could be targeted through awareness-building campaigns that employ methods such as social marketing and highlight the true cost of UPF consumption, encompassing health, environmental, biodiversity and labour welfare impacts. These efforts could also target social norms around cooking and increase the perceived value of meal planning, home-meals, fresh food, plant-based diets. Mandatory cooking skills and UPF-targeted nutrition education could be part of school syllabi, while counselling to dissuade families from consuming UPFs could also be integrated into primary care visits and health screening.[136]

Policies that address the concentration and consolidation of power of ultra-processed food-related corporate entities: Recognizing the contribution of UPF-related corporate entities to economic prosperity and development, job creation and technological progress, also means recognizing the enormous economic power that UPF manufacturers have acquired and consolidated. The use of corporate political strategies (through political donations, lobbying and regulatory capture) and market strategies (through mergers and acquisitions, supply chain control and marketing to increase consumer demand, among others)[137] serve to increase short-term profits and structure supply chains and retail food environments to promote UPF uptake. These strategies facilitate the consolidation of corporate power and often come at the expense of population health.[138]

Policy instruments can be leveraged to curb the corporate power that UPF-related entities wield. These policy instruments could reign in the political lobbying of UPF manufacturers and their supporters that aims to weaken or prevent regulatory action, target UPF-related entities that attempt to control supply chains, market share of products and prices, and other activities that negatively impact consumer health and worsen health inequity.[137]

Competition policies and anti-trust laws, which have often been used to oversee the legality of mergers and acquisitions intended to improve financial performance, generate shareholder value and capture market share of UPF-related corporate entities, could expand in scope.[139] Beyond their focus on the price impacts of mergers and acquisitions, anti-trust policies could also ensure that broader market structure impacts are avoided, such as those on health, environment and labour well-being.[137] *Local and diversified food system policies* serve as another complement to pro-child health regulation. These diverse policies could support local food production; local storage, processing, distribution and retail; and direct farmer-to-consumer sale. They can also strengthen food safety and quality, and support alternative food business models like food cooperatives.[139]

Evidence on the impact and effectiveness of several of the above-mentioned policies and programmes targeting UPF on the health of children is likely to emerge in the coming years. Short-term studies demonstrate promising results for several of these strategies, including those targeting marketing restrictions, price of UPF, procurement and front-of-pack labelling. The greatest impact on the food supply, and on consumer behaviour and health, is likely to come from a muti-pronged strategy where several of these policies are combined to work synergistically to target different stakeholders and UPF drivers, as pioneered by Chile's comprehensive Food Labelling and Advertising Law.[130]

Conclusions and recommendations

Meeting the dietary needs of children and adolescents is paramount to healthy societies. Nova and the concept of UPF have provided a new perspective from which to examine the sufficiency of the food supply and diets, redefined the boundaries for research on diet-disease associations and mechanisms in children and adolescents, and opened new avenues for policy and regulatory action to safeguard their health. Across all contexts, children and adolescents consume a greater proportion of calories from UPF than other age groups. In high-income countries, UPFs comprise over 60 per cent of the total calories in children's diets, with intakes seemingly stable over time. In contexts with lower UPF intakes, some evidence suggests that they are likely to increase. The nutritional and health impacts are a cause for public health concern. Evidence on the contribution of UPF dietary patterns to overweight and obesity is compelling and the risk among children and adolescents is high.

Future research on UPF will provide greater insights on the impact that these products have on key growth stages through the life course. Mechanistic studies on the biological pathways underlying UPF health impacts may help uncover the independent impacts of additives, processing and packaging-related contaminants and matrix degradation, strengthening what is already known about the nutritional impacts of these products. Behavioural insights will add to our understanding of the homeostatic and hedonic feeding pathways of UPF intake, their physiological responses and the potential habit-forming nature of these products – all particularly relevant evidence from the perspective of children and adolescents. Measuring the health impacts of UPF, mediated through the environmental impact indicators of greenhouse gas emissions, land use, freshwater use, eutrophication and biodiversity, presents yet another frontier of this science.

The current evidence on UPF is compelling enough to call for concerted action to minimize the consumption of UPF and increase intakes of minimally processed foods and meals based on them. Multiple stakeholders have a crucial role to play in ensuring that children and adolescents thrive.

We conclude with the following recommendations:

Governments and regulatory agencies

- Enact, implement, monitor and enforce a suite of strong, context-specific, synergistic policy, regulatory and programming responses that target UPF, UPF producers and retailers and UPF-dominant environments.
- Enforce strong legal and governance frameworks to prevent interference from UPF-associated entities in influencing policy and regulatory processes.
- Prioritize national surveillance systems targeting the food supply and children's and adolescents' food environments, diets, nutritional status and health.

United Nations agencies, academic institutions and civil society organizations

- Support Member States in prioritizing and promoting healthier, safer and more sustainable diets based on minimally processed foods through in-country policy, regulatory and programming responses that target the drivers of UPF intakes and safeguard food environments for children and adolescents.
- Conduct robust, independent research, free from conflicts of interest on the UPF dietary pattern and child health outcomes and on the underlying diet-disease pathophysiology. Track the impact of UPF-related policies and assess disparities in UPF intakes over time, nationally, regionally and globally.
- Build public demand for legal measures and comprehensive policies that support children's and adolescents' access to nutritious and healthy foods and reduce exposure to UPF; create opportunities for youth-led strategies to counter information asymmetry on UPF; and provide relevant training support to health care workers to promote healthy diets.

CHAPTER 3

Sugar-sweetened beverages: A major contributor to ultra-processed diets in children and adolescents

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Abstract

Added sugars, primarily from sugar-sweetened beverages (SSB), remain the main source of excess sugar intake among children and adolescents, contributing to weight gain, which often precedes non-communicable diseases (NCDs) and other adverse health and nutrition outcomes. This chapter explores the global trends, health and nutrition impacts and drivers of SSB consumption among children and adolescents. Findings show that drivers of increased SSB consumption include broader global forces, such as shifts towards modern food systems, global trade and market concentration, economic growth, urbanization and commercial determinants of health, particularly industry pervasive marketing and other strategies aimed at weakening public health policies, especially in low- and middle-income countries. These key drivers of consumption operate through the dimensions of availability, accessibility, affordability and desirability. Overweight and obesity and related NCDs, along with tooth decay, are the main nutrition and health impacts associated with SSB consumption in children and adolescents. Reducing or eliminating SSB consumption among this population is needed as a part of a multi-pronged government-led approach to prevent overweight and obesity and diet-related NCDs. No single policy is sufficient on its own. SSB taxes have proven to be effective in reducing SSB purchases. Other public health policies, such as marketing restrictions, front-of-pack nutrition labelling, regulations in the school food environment and access to potable and palatable drinking water have also contributed to reducing the purchase and consumption of SSB. This chapter concludes with actionable recommendations for governments, United Nations agencies, civil society and academia; highlighting the necessity to implement or strengthen a comprehensive set of mandatory policies and regulations, together with actions to limit industry interference in public health policymaking and enforcement. Implementing these measures is essential to safeguard children's and adolescents' health, uphold their right to health and nutrition and ensure they reach their full potential as healthy adults.

Introduction

Over the past five decades, traditional diets have been gradually replaced by highly processed, energy-dense diets high in sugars, fat and salt,[1-5] This shift has contributed to all forms of malnutrition and has driven rising rates of overweight and obesity and diet-related non-communicable diseases (NCDs), such as coronary heart disease, type 2 diabetes and certain types of cancer.[4-6]

These transitions begin early in life,[7] as dietary habits begin to develop,[8,9] resulting in considerable health implications.[10] In 2024, global overweight prevalence among children under 5 years of age reached 5.5 per cent and is projected to continue rising by 2030. In 2022, the prevalence of overweight and obesity among children and adolescents aged 5–19 years was 20 per cent.[11] Obesity among school-age children (5–9 years) increased from 4 per cent in 2000 to 10.2 per cent in 2022, with projections to reach 14.4 per cent by 2030. Among adolescents, obesity prevalence rose from 2.8 per cent to 7.2 per cent over two decades and is projected to hit 10 per cent by 2030.[4] By 2022, the prevalence of obesity among school-aged children and adolescents aged 5–19 years had surpassed thinness in 133 countries.[12]

Added sugars, predominantly from SSB are a leading contributor to overweight and obesity among children and adolescents.[13,14] Evidence consistently shows that SSB consumption is strongly associated with weight gain in this age group.[15-17] SSB are classified as ultra-processed foods under the Nova classification [18] and comprise all non-alcoholic, non-dairy drinks with added caloric sweeteners (such as sucrose, high-fructose corn syrup, dextrose, raw sugar, maltose and malt syrup).[19,20] They include carbonated soft drinks, fruit juices with less than 100 per cent fruit content and added sugars, sugar-sweetened energy and sports drinks, flavoured waters and sweetened coffee and tea.[21] On average, SSB contain about 10.4 g of sugar per 100 ml.[22]

Between 1990 and 2018, global SSB consumption among children and adolescents aged 3–19 years increased by 23 per cent, averaging 227 g per week (877 ml) by 2018. The greatest increases occurred in low- and middle-income countries and urbanized areas.[23] These trends are shaped by unhealthy food environments and a complex set of interrelated factors, including demographic, sociocultural, political, economic, technological and environmental influences, alongside the commercial determinants of health and nutrition.[24,25] Understanding these drivers is important for designing targeted interventions that foster protective environments in which children and adolescents can grow up healthy and reach their full potential.[24,26-28]

This review seeks to gather the latest evidence on SSB consumption and its impact on children's and adolescents' nutrition and health, analyse the primary drivers behind consumption trends, and evaluate the tactics used by industry to influence children's and adolescents' drinking habits. Additionally, it synthesizes the effectiveness of existing policies designed to reduce SSB consumption and provides evidence-based public health recommendations to protect and promote health and the right to nutrition for children and adolescents.

Methods

We conducted a state-of-the-art literature review to synthesize the latest evidence on SSB consumption among children and adolescents, structured around four thematic areas: a) global trends in SSB sales and consumption; b) the impact of SSB on diet quality, nutrition, health and the environment; c) drivers of SSB consumption; and d) policy, regulatory and programmatic responses. The search strategy used combinations of keywords related to SSB, health and nutrition outcomes, consumption behaviours, industry practices and public policy. We included peer-reviewed articles published between 2014 and 2024, as well as relevant global reports and publications from international organizations, focusing on children and adolescents from birth to 18 years. We excluded studies sponsored by the food or beverage industry or studies focusing on highly specific, non-representative populations. Eligible beverage types included all non-alcoholic, non-dairy drinks with added caloric sweeteners. Data were extracted into a structured matrix capturing the author, year, key findings and target age group. Thematic summaries were developed collaboratively by the authors, and final drafts were reviewed by an expert panel convened by UNICEF. Based on the synthesized evidence, we developed a set of actionable recommendations for national governments, United agencies, research institutions and academia.

Global trends in SSB sales and consumption among children and adolescents

Between 2007 and 2021, SSB sales followed distinct regional trends, highlighting geographic differences in consumption. The highest rise in SSB sales occurred in low- and middle-income countries, where total sales exceeded those of high-income countries. During this period, per capita SSB sales rose sharply in Nigeria, Pakistan, Paraguay, the Plurinational State of Bolivia, South Africa, Türkiye and Viet Nam. Uruguay experienced the highest growth in consumption, increasing from 73 ml to 115 ml.[29]

In 2020, the total sales volume of SSB (in litres) declined, likely due to the COVID-19 pandemic. Sales rebounded by approximately 10 per cent in 2021 as the market began to recover.[30] Between 2018 and 2023, sales of reduced sugar beverages outperformed their regular SSB counterparts.[31] Although sales remained high in 2024, a slight decline was observed. Still, projections indicate a rebound, with steady growth in sales volume expected through 2029.[30]

Global monitoring of SSB consumption among children and adolescents remains limited. The most recent study on this topic, which conducted systematic searches for all relevant surveys, found that this gap stems primarily from the limited availability of survey data across specific countries and time periods.[23,32] Therefore, comprehensive global data are available only up to 2018 and the findings in this section reflect that time frame. Between 1990 and 2018, global intake of SSB among children and adolescents aged 3–19 years increased by 23 per cent. The most substantial increase was observed in sub-Saharan Africa, where consumption grew by an alarming 106 per cent. By 2018, the global average intake reached 3.6 servings (893 ml) per week. Regional differences were evident, with Latin America and the Caribbean reporting the highest consumption, as children and adolescents consumed an average of 9.1 servings (2,257 ml) per week. Meanwhile, South Asia had the lowest intake, averaging 1.3 servings (322 ml) per week.[23] Consumption was highest among older adolescents (15–19 years of age), particularly in Mexico, where average consumption reached 10.1 servings (2,505 ml) per week.

Among school-age children across 21 European countries, prevalence of daily SSB consumption (one or more times per day) declined steadily between 2002 and 2018 among adolescents aged 11–15 years (quantities were not reported). The extent of the decline varied by region, with Northern Europe consistently reporting lower daily consumption compared to Southern and Eastern Europe.[3] In 2018, daily consumption ranged from 4.2 per cent in Finland to 29.4 per cent in Belgium.[34] However, follow-up data from the 2021–2022 period indicated that despite overall declines, 15 per cent of adolescents continued to consume SSB daily. Prevalence also increased with age, peaking among older adolescents rather than their younger counterparts.[35]

Analyses of the Global School-Based Student Health Surveys between 2008 and 2015 showed persistently high prevalences of daily SSB consumption among adolescents.[36-38] Approximately 43 per cent of individuals aged 12–17 years consumed carbonated SSB daily, with the Americas leading both prevalence (62 per cent) and average daily intake frequency (1.54 times per day).[37] An expanded analysis across 53 countries showed that more than 50 per cent of adolescents consumed carbonated SSB daily. In Central and South America, over 25 per cent of adolescents consumed them three or more times per day.[38]

A systematic review of SSB intake from 1990 to 2015 among adolescents aged 11–19 years found notable increases in consumption in the Republic of Korea (50–100 to 150–200 kcal per day) and in Mexico, where intake rose among children aged 6–11 years and adolescents aged 11–19 years from 50–70 to 100–120 kcal per day. Declines were observed in Australia, China, Norway and the United Kingdom. Overall, adolescent consumption ranged from 20 to 300 kcal per day, with the largest increases over time observed in Mexico and the Republic of Korea.[39]

SSB consumption among infants and young children under 24 months remains a significant concern, particularly in low- and middle-income countries. Findings from a systematic review reported that SSB and processed savoury and sweet snacks – mostly energy-dense, nutrient-poor foods – contributed 13 per cent to 38 per cent of total energy intake among urban children under 23 months of age. In Mexico, total energy intake from these sources increased with age, from 8 per cent for children aged 6–8 months to 19 per cent by 12–23 months.[40]

In summary, SSB consumption in children and adolescents increased globally from 1990–2018, with the highest average consumption reported in Latin America and the lowest in South Asia. While adolescent SSB intake has declined in parts of Europe, high prevalences persist in other regions, particularly in the Americas. Among infants and young children, especially in low- and middle-income countries, SSB and processed snacks now account for a growing share of total energy intake. These trends reflect ongoing regional disparities and underscore the need for country-specific surveys that capture more recent consumption patterns.

Impact of SSB on diet quality, nutrition, health and the environment

Diet quality

SSB consumption contributes to poor diet quality, excessive energy intake and adverse nutrition and health outcomes. This is largely due to their acidity, liquid calories and ingredients, including high amounts of sugar (high-fructose corn syrup or sucrose) and various additives (food colouring, citrates, phosphoric acid and aroma compounds). In addition, SSB lack essential nutrients, such as proteins, vitamins, minerals and fibre.[21]

Beyond their nutritional aspects, SSB trigger physiological and psychological pathways that disrupt hunger and satiety regulation, encouraging repeated and more frequent consumption, resulting in higher overall caloric intake.[21,41] Their liquid form accelerates gastric emptying and disrupts hormonal responses related to satiety.[41] Furthermore, some additives commonly used in SSB have been associated with adverse health consequences, such as disturbed behaviour and cardiovascular diseases, among others.[42]

Cross-sectional studies show that higher SSB consumption is associated with lower diet quality in adolescents, as indicated by lower Healthy Eating Index scores compared with low or non-consumers.[43] Similarly, higher SSB intake in children has been associated with lower Healthy Eating Index scores and greater total energy intake.[44]

Risk of overweight and obesity and metabolic syndrome

Compared to solid sugar sources, liquid added sugars pose a greater risk for obesity, as the rapid absorption of fructose can trigger liver responses and exacerbate metabolic disruptions.[41]

Evidence from cross-sectional and longitudinal studies shows that higher SSB consumption among children and adolescents is associated with greater risk of overweight and obesity.[14] A meta-analysis of experimental and observational studies in children aged 10.9 years and younger from low- and middle-income countries found that SSB consumption contributed to higher body mass index (BMI) and body fat percentage and elevated overweight and obesity risk.[45] Similarly, dose-response meta-analysis found that SSB intake was associated with a 0.75 kg/m^2 increase in BMI, greater waist circumference and greater body fat percentage in children and adolescents.[46]

Pooled estimates from observational studies suggest that consuming SSB four or more times per week increases the risk of overweight and obesity in children and adolescents aged 5–19 years.[47] Meta-analysis of cohort studies and randomized controlled trials found that each additional 340 g daily serving of SSB was associated with a 0.07kg/m^2 increase in BMI and a 0.03 increase in BMI z-score.[17] Other systematic reviews and meta-analyses consistently support these associations.[16,48-51] A systematic review of cross-sectional studies involving children aged 4 months to 12 years reported associations between SSB consumption and increased total and central adiposity, with more consistent findings for total adiposity in children aged up to 5 years.[15]

Cardiometabolic risks and non-communicable chronic diseases

High sugar intake elevates blood glucose and insulin levels, potentially leading to glucose intolerance and insulin resistance.[14,48] Fructose in SSB is strongly associated with visceral fat accumulation, lipid metabolism disruptions and reduced insulin sensitivity,[41] factors linked to cardiovascular diseases and metabolic complications.[2,48,52] SSB also induce oxidative stress, causing inflammation, tissue damage and advanced glycation end-products. Altered microbiota and increased macrophage activity further escalate inflammation, increasing the risk of NCDs.[53]

A prospective cohort study associated higher SSB intake in infancy with higher risk of non-alcoholic fatty liver disease in school-aged children.[54] A crossover feeding study found that children with non-alcoholic fatty liver disease showed worsened metabolic outcomes than children without the disease when consuming fructose.[55] SSB consumption contributes to obesity in children, which is a known risk factor for type 2 diabetes. A retrospective cohort study reported that children with obesity had a higher risk of developing type 2 diabetes by early adulthood.[56] Longitudinal studies associate SSB consumption in young adults with weight gain and type 2 diabetes onset.[57] However, the long-term impact of SSB intake during childhood and adolescence on later type 2 diabetes risk remains partially explored.[48]

Prospective cohort studies showed mixed results on links between higher SSB intake and individual cardiometabolic risk markers but identified associations with elevated overall cardiometabolic risk factor score, which includes a) body fat percentage; b) blood pressure; c) insulin; and d) lipid profiles.[58-59] A systematic review found that higher SSB consumption in children and adolescents was associated with a 1.36-fold greater risk of hypertension and adverse cardiovascular markers, including elevated low-density lipoprotein and triglycerides and reduced high-density lipoprotein.[60]

Tooth decay

Added sugars are the primary contributor to tooth decay, with prolonged acid production by bacteria after sugar intake contributing to the progression of caries and demineralization.[61] Infants, especially in low- and middle-income countries,[40,62] derive a high proportion of their total energy intake from added sugars,[40,62-64] comparable to levels seen in older children in high-income countries.[40] Prospective studies associate early sugar consumption with higher risk of dental caries in later childhood and adolescence,[65] with sugar intake at 3 years of age significantly altering the oral microbiome and worsening oral health by 6 years of age.[65,66] Cohort studies indicate that high sugar intake in infancy is associated with greater risk of caries between ages 6–18 years.[66,67]

A systematic review of cross-sectional studies in children and adolescents identified associations between higher added sugar intake and periodontal disease prevalence, irrespective of sugar source. Prolonged hyperglycaemia from excessive sugar consumption was identified as a major driver of this risk. Findings also highlighted potential alterations in oral microbiome diversity, which may further comprise gingival and periodontal health.[68]

A meta-analysis of observational studies examining the prevalence of diet-induced tooth erosion in children and adolescents concluded that SSB, among other products, significantly increase the incidence of dental erosion.[69] Several studies have concluded that higher SSB consumption increases the risk of dental caries, especially in low-income or minority populations.[14]

Mental health

Mechanisms linking SSB consumption to poor mental health outcomes are attributed to high sugar intake, which is associated with psychological distress through elevated levels of b-endorphins and oxidative stress,[70,71] glucocorticoid-induced stress dysregulation[72] and proinflammatory cytokines linked to higher incidence of depression.[73] Caffeine is tied to increased irritability and nervousness,[14,74,75] while additives such as sodium benzoate are associated with attention deficit hyperactivity disorder in children with high SSB intake.[71]

Cross-sectional studies in adolescents associate frequent SSB consumption (two or more times per day) with higher odds of adverse mental health and behavioural outcomes, including loneliness, anxiety and engagement in risk behaviours and substances, most strongly with alcohol use.[76] A global study across 64 countries found that among adolescents aged 12–18 years, each additional SSB consumed increased the odds of physical altercations and aggressive behaviour by 11 per cent.[77] Similar findings in industrialized countries showed that higher sugar intake, primarily from SSB, was associated with risk behaviours and substance use among school-going adolescents.[78]

Another study found that consuming one or more servings of SSB daily doubled the risk of depressive symptoms,[79] while the combined effects of high screen time and SSB consumption further amplified this risk in adolescents aged 10–19 years.[80] An important finding comes from a longitudinal study that identified reverse causality, suggesting that poor mental health may predict increased SSB consumption as a coping strategy.[81] Thus, while there is evidence of a link between SSB consumption and suboptimal mental health outcomes, it remains unclear whether the consumption of these products leads to a decline in mental health, or if suboptimal mental health leads to excessive consumption.

Other health and developmental impacts

SSB consumption is associated with higher odds of asthma and wheezing in children and adolescents. Meta-analyses reported a 14 per cent higher risk of asthma in those aged 12–18 years and a 9 per cent greater risk of wheezing.[82] In younger children, higher SSB intake raised asthma odds by 28 per cent, while excess fructose nearly tripled it.[83] Caffeine content, especially in energy drinks, has been associated with sleep disturbances and fatigue,[14] particularly in children and young adults.[14,71] SSB consumption is also associated with reduced sleep quality[14,84] insulin resistance, headaches, stomach aches and low appetite.[14]

Moreover, childhood obesity, which is associated with SSB consumption, can have long-term economic consequences. A systematic review in high-income countries found that 44 per cent of studies reported significant adverse effects of obesity on cognitive performance, particularly in adolescence, suggesting cumulative impacts over time along with lower rates of high school graduation and university completion.[85] Furthermore, obesity was associated with lower wages later in life, with women being affected more frequently and significantly than men.[86]

Environmental impact

The production and consumption of SSB have environmental costs, including biodiversity loss, excessive water use and plastic pollution. Instead of being recycled, much of the waste ends up in oceans, natural ecosystems and landfills.[29,87,88] Sugar production contributes to deforestation, soil degradation and high water consumption.[89] It is estimated that 168–309 litres of water is required to produce just 500 ml of SSB.[29]

Some of these environmental impacts may also contribute to climate change, a growing threat to children's rights. Children are particularly vulnerable to environmental degradation due to their unique metabolic, physiological and developmental needs.[90] Changes in temperature, air and water quality can jeopardize their health, development and well-being. These effects often persist, with consequences that extend into adulthood.[91]

Overall, there is evidence about the negative effects of SSB intake on diet quality, overweight and obesity, several NCDs and other health conditions and the environment. Most of the evidence comes from cross-sectional and longitudinal studies, which are subject to bias and confounding. However, randomized controlled trials are also available, and meta-analyses from a large number of longitudinal studies, which adjust for confounding. We find this evidence convincing.

The drivers of SSB consumption

Global forces shaping food environments

Changes in diets, including the increase in SSB intake, have occurred in parallel to, and in two-way causality, with shifts towards a modern food system. This modernization includes the global nature of trade and market concentration, changes in the supply chains from farms through midstream segments of processing, wholesale and logistics to downstream segments of food services and retail, with a rapid rise of supermarkets, large processors, fast-food chains and food logistics firms. Five 'meta-conditioners' have encouraged and facilitated these shifts in the food system, the food environment and the diet. These conditioners include policy liberalization, infrastructure improvement, rise of rural non-farm employment, income growth and urbanization.[92] In many regions, economic growth has occurred alongside rising SSB consumption.[23,93] In Latin America, declines in SSB consumption in the early 1990s reversed after 2005 amid economic recovery, intensified marketing and wider product availability, reflecting a shift towards modern food systems.[23,94] Adolescents in modern food systems have shown higher daily SSB consumption compared to those in mixed and traditional food systems.[37] Globally, urban children with highly educated parents had the highest SSB intake.[23] Patterns of SSB consumption also vary across socioeconomic status, following opposite gradients in high-income countries and low- and middle-income. In high-income countries, lower parental socioeconomic status has been associated with higher SSB intake among children and adolescents,[33,34,95,96] while in low- and middle-income countries, higher socioeconomic status households report greater intake of unhealthy foods, including SSBs.[97]

The shift towards modern food systems creates favourable conditions for the food and beverage industry to expand markets and embed its products in daily life. Such dynamics reflect the role of commercial determinants of health and nutrition, defined as the systems and practices through which profit-driven actors influence planetary and human health outcomes and equity.[25] The industry advances its interests trough political lobbying, self-regulation and trade negotiations to delay or weaken public health measures designed to curb SSB consumption, such as front-of-pack nutrition labelling and SSB taxation.[22,25,98-108]

Industry-funded research often minimizes the health risks associated with SSB consumption, deflecting responsibility from the food industry onto individuals, while corporate sponsorships shape public discourse and institutional agendas on obesity, physical activity, nutrition, sweeteners and public health messaging.[98,109-112] Marketing further reinforces consumption patterns, with children and adolescents especially vulnerable to digital advertising and brand sponsorship.

Key drivers of SSB consumption

Food environments refer to the physical, economic, political and sociocultural settings where children and their families obtain, choose, prepare and consume food.[24,113,114] Unhealthy or obesogenic food environments are characterized by limited availability, accessibility, affordability and desirability of nutritious healthy foods and the widespread, aggressive marketing of unhealthy foods and beverages. They are often described as food deserts, where nutritious options are scarce, or food swamps, where an overabundance of energy-dense, low-nutrient foods dominate the local food landscape.[113,114]

Availability: In food deserts and food swamps, healthy foods are unavailable or scarce and unhealthy foods predominate.[113] SSB, in particular, are widely available and heavily promoted.[108] The SSB industry facilitates the widespread availability of its products across all environments where children live, learn and play, including schools.

Availability of SSB can be measured through store density, defined as the number of outlets selling SSB, including grocery stores, convenience stores, small beverage or water retail shops, and supermarkets by population size. A study in Mexico found that higher store density was associated with greater SSB consumption among adolescents aged 12–19 years.[115] Similarly, a systematic review reported that greater density of food outlets in school neighbourhoods, particularly fast-food retailers, was associated with higher prevalence and frequency of unhealthy purchases among adolescents, including SSB. Findings showed that a high density of unhealthy food retail near schools, or exposure to such outlets on the journey to and from schools, was associated with greater likelihood of unhealthy food purchases.[116]

At the household level, home availability of SBB is one of the strongest predictors of adolescent SSB consumption.[117,118] Adolescents consumed more SSB when parental intake of these products exceeded two times per day and when SSB were stocked at home. In contrast, reduced home availability of SSB was associated with lower intake.[117,119]

Accessibility and convenience: SSB are readily obtained and frequently consumed in daily activities, especially in low-income urban neighbourhoods where physical access to potable water and adequate, nutritious food is limited. Viewed as convenient and ready-to-consume, SSB fit easily into the routines of caregivers balancing work, childcare and other demands.[113]

Household and lifestyle factors can also determine SSB consumption. In early childhood, higher intake has been associated with screen time, frequent snacking, out-of-home care, formula feeding, early introduction of solids and use of food as a reward.[95] Among adolescents, media use (television, computers, smartphones) has been consistently associated with higher SSB intake.[120,121] Parental smoking and lower physical activity have been associated with higher SSB consumption,[122] whereas shared parental-child fruit consumption was associated with lower SSB intake.[123]

Children and adolescents spend a substantial amount of their time in school settings. On-demand access to SSB in school stores, convenience stores and vending machines in and around the school environment can influence SSB and sugary snack consumption in this age group.[116-118]

Across retail outlets, accessibility is reinforced through in-store and point-of-sale tactics, where products are placed and promoted near children. Packaging, strategic product placement and characters/toys are designed to increase appeal and encourage requests to parents.[22,124] In digital environments, accessibility is further increased when promotional content integrates direct purchase links, connecting advertising with immediate sales opportunities.[125]

Affordability: Beyond being widely available and highly accessible, SSB are cheap and, in many settings, more affordable than bottled water. A common metric of affordability is the share of per capita income required to obtain 100 litres of SSB. Under this framing, as that share falls, consumption tends to rise. By 2016, SSB had become more affordable in 79 of 82 countries, driven by flat or falling prices alongside rising incomes, especially in low- and middle-income countries, where affordability increased most rapidly.[126.]

SSB affordability varies widely across countries and generally increases with economic development. In a global study, greater SSB affordability was associated with higher per capita consumption of these products and higher prevalence of overweight and obesity in adults.[127] Higher SSB consumption among adolescents has been observed in settings where SSB are offered at lower prices.[115]

Given this cost-intake relationship, policies that seek to reduce SSB purchase and consumption, such as taxation, are repeatedly obstructed by industry actors. Transnational food and beverage companies have opposed fiscal measures through political practices that seek to question the effectiveness of such measures.[22,99-108,128] These practices* frequently include forming or funding advocacy groups and coalitions to portray themselves as concerned citizens against SSB taxes, claiming to represent the interests of vulnerable, low-income communities and arguing against government regulations while masking their underlying profit-driven agendas.[22,128,129] Moreover, as a strategy for opposing public health policies, they frame government intervention as paternalistic actions of a 'nanny state' that violate freedom of choice.[130]

* Companies use legal systems, such as domestic laws or international trade and investment agreements, to challenge policies, often claiming illegality or violations of laws or agreements.[201]

Desirability and food choices: Evidence suggests that infants have an innate preference for sweet and savoury tastes.[131,132] However, early exposure and habituation can reinforce these preferences later in life.[132-134] Children routinely given added sugars tend to prefer higher sugar levels in juice and cereals compared with those who were never given added sugars.[131] Other studies indicate that SSB desirability can also be influenced by peers' consumption of SSB, social desirability and marketing.[118,135,136]

Marketing is a comprehensive practice that integrates product design, pricing, placement and promotion to influence consumer preferences, perceptions and behaviours.[124,137,138] It uses distribution, advertising, public relations and information services that reinforce one another to create demand and build relationships with consumers,124,137-139 often targeting specific groups by analysing emotions, preferences, behaviours, locations and moments of vulnerability.124,140 Digital environments (including but not limited to social media, websites, email/messaging, streaming services, search engines, e-commerce sites, peer commerce and smartphone apps) broaden the spaces where marketing can access and engage consumers.[139] Interactive modalities are used to deepen engagement by associating a brand with freedom, humour and popularity through celebrity endorsement, giveaways and dynamic campaigns.[136,141-146]

Exposure to food and SSB advertisements triggers reward and attention responses in children and adolescents, increasing product appeal.[135] Elevated exposure has been consistently associated with higher SSB intake; adolescents with strong advertising receptivity report greater consumption and lower perceived harm.[147,148] In the United States, more frequent marketing exposure has been associated with stronger advertisement recall among children and adolescents, which may contribute to increased consumption.[136,149]

A multi-country survey indicated that 62 per cent of adolescents aged 10–17 years reported frequent exposure to SSB marketing (a few times per week to more than once per day).[136] Between 2019 and 2021, follow-up results showed that high prevalences of exposure persisted, ranging from 58–91 per cent, with a clear shift towards digital media as a consequence of the COVID-19 pandemic and online schooling. Across all settings, frequent exposure was associated with higher SSB consumption.[150] Regionally, 69–81 per cent of children and adolescents in Latin America reported seeing food and beverage advertising on social media;[141] in Asia and the Pacific, 19 per cent of televised food ads during peak children's viewing hours promoted SSB, often with character endorsements.[151]

Around schools, SSB promotion is common. In Kampala, Uganda, a study showed that 51 per cent of food advertisements promoted SSB, with a single company responsible for two-thirds of those ads.[152] In Ghana, 32 per cent of food ads near schools in densely populated, lower-poverty areas featured SSB promotion.[153] In the United States, schools in lower-income neighbourhoods were surrounded by significantly more SSB advertisements than schools in wealthier neighbourhoods, with a median of 32.5 additional outdoor ads.[154]

Sponsorships also contribute to desirability by associating SSB with popular teams, athletes and major events.[155,156] These affiliations foster positive emotions and brand loyalty, encouraging children to consume more. Some children consume more to support their favourite teams, while others believe these products will elevate their athletic performance.[156] Sport broadcasts with millions of young viewers have prominently featured SSB sponsorships.[145]

Policy, regulatory and programming responses

Tackling SSB consumption effectively calls for coordinated, government-led, multilevel interventions across sectors, backed by clear policy frameworks.[157,158] Environmental interventions strive to build lasting changes in food environments,[21,159] while behavioural interventions focus on shifting individual preferences.[21]

To guide these interventions, some countries rely on nutrient profile models to classify products, which can provide a unified system to consistently regulate the same set of products across multiple regulations.[160,161] It is important that nutrient profile models are grounded in strong, evidence-based research; developed by the government through a transparent process, free from conflicts of interest; and adapted to national contexts.[158,161] Though commonly used, nutrient profile models are shifting towards food classification models, which often go beyond nutrient content alone and may also consider the degree of processing, such as the Nova classification.[114,160,161]

This chapter focuses on policy-driven interventions designed to modify the environments where children and adolescents grow and develop. It presents global evidence on the effectiveness of these mutually reinforcing policies in reducing SSB consumption among this age group.

Front-of-pack labelling

Front-of-pack labelling (FOPL) is a form of supplementary nutrition information that provides simplified, accessible details about the nutritional value of pre-packaged foods directly on the packaging. It may include symbols, graphics, text or a combination of these elements to highlight nutrients of concern.[162]

FOPL is one of WHO's 'best-buy' interventions, which are highly cost-effective, feasible for implementation and evidence-based interventions to tackle NCDs.[163] In 2021, the Codex Guidelines on Nutrition Labelling were updated to include the Codex Guidelines on FOPL for pre-packaged foods (introduced as Annex 2), providing a flexible framework that supports the development of evidence-based, government-led FOPL systems and calling for consumer education programmes, monitoring and evaluation to determine effectiveness.[162]

Mandatory, government-led FOPL can be an effective policy tool for guiding consumers towards healthier choices.[157] It produces more consistent and significant results than voluntary measures, which are not consistently adopted by the food industry and are typically applied selectively to healthier products.[158,164] Simple, interpretative FOPL, such as warning labels for high levels of nutrients of concern and energy density are the most effective labelling system for encouraging consumers to opt for healthier products.[165-168]

Globally, the Islamic Republic of Iran, Israel, Singapore, Sri Lanka and Thailand have implemented mandatory FOPL[169]. In the Americas, 11 countries have adopted mandatory FOPL and nine have implemented it.[169,170] Most countries in Europe, 10 countries in Asia, three countries in Africa, along with Australia and New Zealand, have government-supported voluntary FOPL policies. Meanwhile, 15 countries are developing FOPL policies but have not yet adopted them.[169]

Early results from countries with mandatory FOPL policies show high compliance and reduced purchases of unhealthy products.[170] In Chile, the Law of Food and Labelling and Advertising introduced mandated FOPL, restricted marketing directed at children and banned the sale of foods and beverages exceeding specific nutrient thresholds in schools. Following implementation, household purchases of unhealthy beverages declined by 23.7 per cent, equivalent to 22.8 ml less per capita per day. Significant declines were also seen in total calories and sugar purchased from high-sugar beverages (-27.5 per cent and -25.1 per cent, respectively).[171]

In Mexico, a study found issues such as "double fronts"* on packaging, prompting the efforts to develop standardized enforcement mechanisms. Major brands were flagged for potential non-compliance, resulting in government raids and product confiscations.[172]

Marketing restrictions

Marketing restrictions aim to safeguard children's health by offering comprehensive protection from exposure to unhealthy food marketing across all media and settings for all children and adolescents up to 18 years, including content not explicitly directed towards them.[114,173]

To be effective, such restrictions must be legally enforced and broad in scope, covering both packaged and certain unpackaged foods, along with their associated brands. They should apply across all platforms and environments where children may be exposed, including, but not limited to, digital environments (e.g., social media, gaming, search engines), retail (e.g., price promotions, product placements), broadcast channels (e.g., TV, radio, cinema) and direct marketing (e.g., emails, app notifications). Marketing in print, outdoor spaces, schools, events and venues, and product packaging must also be covered, including the use of imagery and claims that appeal to children, parents or caregivers.[173]

Robust enforcement mechanisms are essential to ensure compliance, including legal actions

* Double fronts refer to the practice of designing product packaging so that both the front and back appear identical, with only one side displaying the warning labels

for violations. Governments should define clear legislative objectives and set measurable goals to guide implementation. Policies should also include systems for continuous monitoring and evaluation to assess impact and respond to changes in marketing strategies over time.[114,160]

As of 2023, there were 13 countries worldwide implementing national policies regulating the marketing of unhealthy foods to children. These policies vary in scope, enforcement and the age range they cover, which spans children under 12 years of age to those under 19 years of age. Chile and Portugal have implemented the most comprehensive approaches, with restrictions covering both broadcast and non-broadcast media. Eight countries restrict marketing in broadcast media only, while the remaining focus on regulating marketing techniques that appeal to children.[174]

In Chile, advertising of unhealthy foods and beverages to children under 14 years is banned across all media platforms.[160,175] Other countries have introduced policies targeting unhealthy foods in school environments, product-specific regulations (e.g., energy drinks), or bans on featuring children in unhealthy food advertisements. In the United Kingdom, non-broadcast food marketing is subject to restrictions; however, these are overseen by the advertising industry and are not legally binding.[174] A systematic review of observational studies found that mandatory policies restricting the marketing of food and non-alcoholic beverages to children were effective in reducing both the reach and influence of unhealthy food and beverage marketing.[176] In contrast, self-regulatory measures have demonstrated vague commitments that lack enforcement mechanisms, resulting in weaker policy responses and policy substitution.[177]

Nutrition policies in schools

Schools can help promote healthy food environments by restricting the availability of unhealthy food products.[178] Systematic reviews show that legislative and regulatory approaches, such as banning SSB sales and marketing in and around schools, are effective in reducing SSB consumption among students.[179,180] Educational/behavioural interventions have also shown positive results when combined with legislative strategies.[179]

Environmental changes, such as increasing water availability, have been effective in lowering BMI and body fat in children with overweight. Policy-based interventions that restrict or ban the sale or distribution of SSB, paired with educational programmes, have led to increased water intake and reduced SSB consumption among students.[181] Systematic reviews and meta-analyses point out the effectiveness of integrated approaches that combine parental workshops, educational materials and policy change,[179,181,182] along with improvements in food and beverage quality.[183] Five Latin American countries have mandatory school SSB restriction policies. Regulations vary by type of beverage and sugar content and may apply to public and private schools, and primary or high schools.[175]

School feeding programmes can promote healthy eating by providing free, balanced meals aligned with national nutrition guidelines, while limiting access to sugary products.[184] They support dietary intake of nutritious foods, food security and optimal nutritional status. Evidence also shows positive effects on school attendance, enrolment and cognitive development. Together, these programmes foster lifelong healthy eating habits and comprehensive nutritional education, offering both immediate and long-term benefits for students' health and learning.[26,184,185]

Procurement standards ensure that foods provided through school feeding programmes align with health and nutrition goals. Government-led procurement regulations can mandate the nutritional quality of foods in schools and other public institutions.[21,158] For example, a proposed modification to the United States Supplemental Nutrition Assistance Program (SNAP) reduced SSB consumption by restricting unhealthy purchases and encouraging fruit and vegetable intake.[186] In Latin America, Brazil required schools to meet purchasing standards for funding, while Ecuador excluded low-nutritional-quality drinks from public food assistance. However, weak enforcement of these nutritional standards has limited their potential impact.[175]

Economic tools and fiscal policies

Economic tools to reduce SSB consumption include price increases in chain restaurants, leisure centres and convenience stores; financial incentives for low-calorie beverages; and taxation[21] – the most widely used and effective tool. SSB taxes raise prices, reduce consumption and generate revenue for health programmes in jurisdictions where such taxes are earmarked,* supporting long-term health gains and contributing to healthier growth.[20,28,187]

SSB taxes can also encourage product reformulation, especially when based on sugar content.[20] However, growing concerns have emerged around increased consumption of non-caloric sweeteners, which are typically added to replace sugars in reformulated products. WHO does not recommend the use of non-caloric sweeteners, as they do not provide long-term benefits in reducing body fat in adults or children. On the contrary, prolonged use of non-caloric sweeteners is associated with potential adverse health outcomes, such as type 2 diabetes, cardiovascular disease and increased risk of mortality in adults.[188]

There are two main tax measures for SSB: excise taxes (levied at manufacture or distribution and based on volume, sugar content, or value [*ad valorem* taxes]); and import taxes on imported products.[20] Among countries that tax SSB, most apply excise taxes.[189]

As of August 2022, 118 verified SSB taxes covered half of the global population, with higher coverage in low- and middle-income countries (67–73 per cent) compared with high-income countries (29 per cent).[189] Evidence shows that SSB taxation can contribute to meaningful reductions in both purchase and consumption. An 8 per cent excise tax in Berkeley, California (in the United States) and a volume-based tax of US$0.049/L in Mexico effectively reduced SSB sales, while increasing healthier beverage purchases. Experimental studies also found that tax rates of 10–30 per cent reduced purchasing behaviour and behavioural intent, particularly among young populations.[190] A 10 per cent tax on SSB has been shown to reduce consumption by 7–12 per cent, while a 20 per cent tax cut daily sugar intake by 4–6 grams/day, contributing to modest but meaningful improvements in oral health among both children and adults.[191]

A meta-analysis found that a 10 per cent tax on SSB led to an average 10 per cent drop in purchase and consumption, while increasing consumption of untaxed beverages. Taxes based on sugar content thresholds were the most effective.[192]

Another meta-analysis reported a 15 per cent average reduction in SSB sales and a price elasticity of demand at -1.59, showing significant demand sensitivity to tax-induced price increases.[193] Case reviews indicate that taxes on SSB can help reduce health inequities, as lower-income populations tend to be more responsive to price changes. Contrary to industry claims, taxation does not impact employment in the food and beverage sectors.[193,194]

SSB taxes reduce purchase and consumption of sugary drinks, with children among those most positively impacted.[28,108] In Mexico, declines in SSB consumption were greater in households with children or adolescents compared to those with adults only.[195] Similar effects were observed in Thailand, where the largest declines in SSB consumption occurred among children and adolescents.[196]

Behavioural strategies to strengthen environmental interventions

Behavioural strategies to strengthen environmental interventions include public awareness, counselling and skill-building interventions.[21,159] A scoping review found that public health-oriented, technology-based interventions can effectively reduce SSB intake among adolescents when designed to support healthy behaviours. These tools often incorporate goal-setting and tailored feedback and may be complemented by educational modules. When grounded in behavioural theory and culturally adapted, they show promise in discouraging SSB consumption.[197]

Parental involvement through workshops, educational sessions and effective policy development communication improves adherence to nutritional guidelines, leading to increased provision of healthier foods packed from home and consumed at school.[183,198] Moderate-certainty evidence from randomized controlled trials indicates that improving access to low-calorie beverages at home through filtered water or water delivery reduces SSB intake. Home water delivery has also been associated with weight reduction, particularly among adolescents with overweight or obesity, and with high baseline SSB consumption.[21]

* Earmarking refers to setting aside all or a portion of revenue from a tax or group of taxes for a designated expenditure purpose.[202]

Conclusions and recommendations

Global SSB consumption among children and adolescents increased between 1990 and 2018, with the highest intake reported in Latin America. While some regions have seen modest declines, overall consumption remains high. These patterns raise health concerns, including the increased risk of overweight and obesity, tooth decay and longer-term health and environmental implications that are linked to SSB consumption.

Addressing SSB consumption among children and adolescents requires understanding the full set of drivers. Beyond individual choices, global forces that shape food environments, together with policy gaps and the commercial determinants of health and nutrition, create conditions that encourage intake by making SSB more available, accessible, affordable and desirable.

Policy and regulatory responses, such as taxation, marketing restrictions, mandatory FOPL and school nutrition policies are already contributing to reducing SSB purchase and consumption. Sustained progress, however, depends on implementation of integrated approaches (policy packages) supported by a unified nutrient profile model to determine which products should be subject to these packages and robust regulatory frameworks.

Further research is imperative to better understand key drivers of SSB intake, particularly current and evolving marketing trends, especially in digital environments. Likewise, developing tools to monitor the implementation of policy actions and consumption patterns in children and adolescents, especially in the years following 2018, is essential for implementing appropriate regulations. A comprehensive response will not only improve child and adolescent health but also advance broader planetary health goals.

Governments and regulatory agencies

- Enact, implement, monitor and enforce a comprehensive policy package that includes SSB taxation, mandatory FOPL, school nutrition measures and marketing restrictions across all settings frequented by children, including, but not limited to, digital platforms, broadcast media, direct marketing, outdoor spaces, schools, events and product packaging.[27,164,179] A unified nutrient profile model can be used to determine which products should be subject to these combined measures.[114,160,199]
- Protect policies from industry interference through transparent governance, regular monitoring and strong intersectoral coordination.
- Invest in data generation, education and research by improving national dietary surveillance systems, particularly for children and adolescents, and by strengthening school-based food and nutrition education, promoting national dietary guidelines and conducting impact evaluations to assess effectiveness.[25,196,200]

United Nations agencies, academic institutions, and civil society organizations

- Set global standards to improve food environments; lead the development of global policy frameworks for SSB regulation; provide technical assistance and policy guidance to governments; and foster multisectoral collaboration by convening coalitions with intergovernmental bodies, civil society and public health experts to counter industry influence.[101]
- Generate independent, conflict-free evidence to inform policy, support monitoring and evaluation of regulatory impact, and promote transparency by avoiding industry funding.[22,27,101,200]
- Document industry interference, highlight the shortcomings of voluntary measures, and advocate for stronger regulations that shift responsibility away from individuals and hold industry accountable.[27,101,200]

CHAPTER 4

Commercial foods for infants and young children: The first ultra-processed foods

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Abstract

This chapter critically examines the global rise of commercially produced foods for infants and young children (CFIYC), a category encompassing products marketed as suitable for children under 36 months of age, of which many are ultra-processed. Drawing on global sales data and a broad literature base, the chapter investigates the proliferation of CFIYC in diets and the implications for diet quality, nutrition, health and sustainability. The chapter documents rising consumption across all regions, with the fastest growth occurring in middle-income countries. While CFIYC are often promoted as convenient and nutritious, evidence shows they are frequently ultra-processed, high in free sugars, sodium and cosmetic additives, including additives not permitted under international food standards. Their consumption is associated with poor diet quality, reduced breastfeeding duration, elevated risk of overweight and obesity, micronutrient deficiencies and poor oral health. The determinants of CFIYC consumption are described, including the lived realities of children, caregivers and households, the powerful forms of marketing shaping their food environments, and the corporate political activities that undermine government policy responses. While governments are adopting evidence-backed interventions to curb CFIYC consumption and promote healthy diets for infants and young children, worldwide policy responses remain weak and poorly enforced. The chapter concludes by presenting multi-pronged recommendations for governments, international development agencies, civil society organizations, researchers and the media to curb production, restrict marketing and discourage consumption of CFIYC.

Introduction

The nutrition and care that infants and young children receive in their first three years of life have lasting consequences for their growth, development and long-term health. Optimal infant and young child feeding begins with the early initiation of breastfeeding within one hour of birth, exclusive breastfeeding for the first six months, and the timely introduction of complementary foods at 6 months of age, while continuing breastfeeding up to 2 years of age, and beyond.[1,2] Complementary feeding should be responsive and progressively increase in frequency. It should include a variety of foods, tastes, textures and consistencies to meet the evolving nutritional and developmental needs of the child.[3]

An adequate and safe diet is foundational for a child's survival, physical growth, cognitive development and protection against malnutrition and diet-related disease. Yet, young children's diets worldwide are undergoing profound change, characterized by a marked rise in commercially produced, packaged products, many of which are ultra-processed.[4,5] These shifts reflect broader transformations in food systems, and food environments, that are crucial to understand and address through policy. Among these are a broad range of commercially produced foods marketed for infants and young children (CFIYC). These products are often promoted as nutritious, safe and convenient, yet raise concerns for child health due to many being of poor nutritional quality, ultra-processed and intensively marketed.[6,7]

A product is recognizable as a CFIYC when labelled as suitable for ages 6–36 months; when it contains the words baby, toddler or a synonym; when it carries an image of an infant or young child; and/or when it is in any other way represented as suitable for this age group.[7-9] Categories include follow-up formulas and toddler milks/growing-up milks, both of which function as breastmilk substitutes for ages 6–36 months; and commercially produced complementary foods marketed for ages 6–36 months, but sometimes earlier, including juices, flavoured milks, confectionery, cereal mixes, dairy foods, fruit and vegetable purées, smoothies, desserts, puréed meals and soups, and snack foods.[10,11]

This chapter critically examines the global rise of CFIYC in the diets of infants and young children, with the wider context of growing ultra-processed food (UPF) consumption, including the drivers, features of this dietary transition, and the impacts on child diet quality, nutrition, health and environmental sustainability. It begins by presenting global trends in CFIYC purchasing and consumption across countries and regions. It assesses their nutrient profiles, degrees of processing, and taste and texture attributes. The chapter then explores impacts on infant and young child diet quality, nutrition and health – including overweight, undernutrition, micronutrient deficiencies, oral health and sustainability. It outlines the key determinants of rising but varied global CFIYC consumption, focusing on food environments. Finally, it outlines key policy, regulatory and programmatic responses, and recommendations for protecting and promoting healthy and sustainable diets in early life.

While infant formulas are excluded as CFIYC, these products are referred to in places in the chapter, given that companies often cross-promote them. UPF marketed to older children or the general population are often consumed by infants and young children, and hence the chapter also makes reference to such products (see also Chapters 2, 3 and 5).

Methods

This state-of-the-art review proceeded through several steps. First, we sourced relevant academic and grey literature through a combination of structured and branching searches. Second, we sourced CFIYC market sales data to ascertain global trends and patterns. Third, we analysed the literature and sales data and synthesized the results.

Definitions and evaluation criteria: The definition and criteria for identifying CFIYC are adapted from the WHO Guidance on Ending the Inappropriate Promotion of Foods for Infants and Young Children: Implementation Manual.[7] The Nutrient and Promotion Profile Model, developed by the WHO Regional Office for Europe, is referred to for evaluating the nutrient profiles of commercially produced complementary foods.[10] The Nova food classification, developed by Monteiro *et al*. (see Chapter 2), is used when referring to the extent and purpose of processing.[12]

Literature search: We searched Google Scholar and Web of Science using combinations of CFIYC-related terms. The drivers of CFIYC consumption in the context of infant and young child dietary change was structured using the Innocenti Framework on Food Systems for Children and Adolescents, specifically personal and external food environments.[13] Grey literature sources included the United Nations Food and Agriculture Organization, UNICEF, WHO and the World Bank; and civil society organizations, including Save the Children, First Steps Nutrition Trust, Alive & Thrive, International Baby Food Action Network and Helen Keller International.

As our understanding of the topic evolved, and reference lists were examined, we conducted further branching searches, through several iterations of search and discovery. Studies were included if published in English, relevant to the study aim, with described objectives, a clear method (if relevant) and conclusions substantiated by the results. Studies were excluded if reporting corporate funding, or when involving affiliated researchers or organizations, given the reported bias of research supported by the baby food industry.

Analysis of market sales data: We sourced market sales data from Euromonitor Passport for follow-up formula, toddler milks and commercially produced complementary foods.[14] We analysed these data to generate descriptive statistics of CFIYC category sales volumes (kg) per infant/child for the period 2005–2019, with projections to 2024 and growth rates for the period 2005–2019, for each World Bank country income level and UNICEF region, using Microsoft Excel. Figures were generated using R v4.5.1 (Foundation for Statistical Computing).

Analysis and synthesis: The results of the literature review and quantitative analysis were synthesized into the findings, which are organized thematically under the sub-headings that structure this manuscript.

Global trends in CFIYC purchasing and consumption

Coinciding with the industrial revolution, CFIYC first emerged in Western Europe and North America in the late nineteenth century. Companies such as Nestlé pioneered the marketing of infant formula, and by the 1940s, were also marketing infant cereals. In North America, mass-produced CFIYC rapidly gained popularity in the late-1920s, led by Gerber. By the end of the 1930s, CFIYC had become a mainstream category. Between 1949 and 1951, sales in the United States tripled, becoming a US$200 million-a-year business by 1952, and by 1958, an estimated 90 per cent of families were feeding children these commercial products. These developments coincided with precipitous declines in the average age of introducing solid foods in the United States, from one year of age or older before the industrial revolution, to 5 to 6 months of age pre-war, to just 4 to 6 weeks by the mid-1950s.[15]

In the 1990s, as sales in the high-income country markets of North America and Western Europe began to stagnate, CFIYC companies pursued new growth

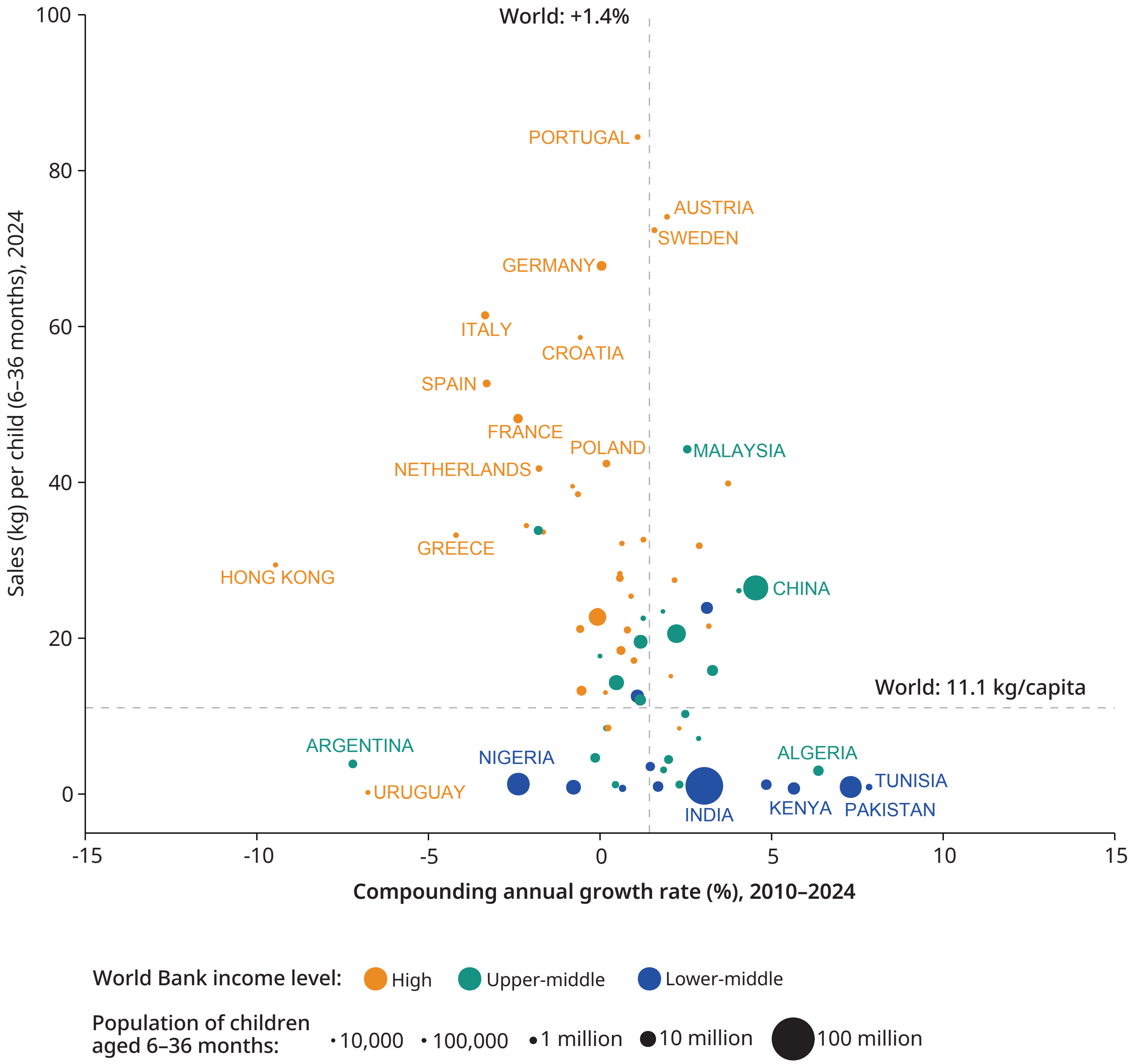

FIGURE 1. **Sales (kg) of CFIYC (marketed for ages 6–36 months) per child, versus compounding annual growth rate for the period 2010–2024**

Source: Data from Euromonitor Passport, 2010–2024.
Notes: compounding annual growth rate is the average annual growth rate of sales over the time period; CFIYC include major categories defined by Euromonitor: dried baby food – products which require the addition of water, and which are usually sold in packets, including cereals and dehydrated soups; prepared baby food – products in jars, cans or flexible pouches that do not require any cooking preparation other than heating, including puréed food, yogurts, chilled desserts, soup, desserts and ice-cream; other baby food – products including baby rusks, teething biscuits, baby fruit juices, baby herbal tea and others; follow-on milk formula – milk-based formulas in powder and ready-to-drink form for ages 7–12 months; growing-up milk formula – milk-based formulas in powder and ready-to-drink form for ages >13 months.

opportunities in emerging markets. Facing tightening regulations of infant formula marketing in the 1980s following the adoption of the International Code of Marketing of Breast-milk Substitutes (the Code) by WHO Member States, baby food companies diversified and began to more aggressively market follow-up formula, toddler milks/growing-up milks, and commercially produced complementary foods to ensure sales growth continued.[16]

The global CFIYC market has since grown rapidly, although with wide variations between countries (Figure 1) in terms of sales volumes and growth rates.[4,5] Between 2010 and 2024, global CFIYC sales grew from US$36.1 to US$50.3 billion, corresponding to volumes of 8.5 to 11.1 kg per child (ages 6–36 months).[14] In 2024, this included US$20.1 billion in sales of commercially produced complementary foods and US$30.3 billion in combined sales of follow-up formula and toddler milks/growing-up milks.[14] While per capita sales are highest in high-income countries, the most rapid growth is occurring in middle-income countries, especially in the highly-populated countries of East and South-East Asia (*Figures 2 and 3*).

The above global sales trends are consistent with country-level survey and household purchasing studies, spanning diverse contexts. The Assessment and Research on Child Feeding Project evaluated CFIYC consumption (6–23 months) in the largest urban areas of four countries experiencing high malnutrition burdens. In Kathmandu, Nepal, on the day prior to survey, 19 per cent of children had consumed a commercially produced complementary food and 74 per cent had consumed a commercial snack food not formulated for this age group. These figures were respectively 5 per cent and 55 per cent in Phnom Penh, Cambodia; 26 per cent and 59 per cent in Dakar, Senegal; and 3 per cent and 23 per cent in Dar es Salaam, United Republic of Tanzania.[17,18] In Uganda, of the caregivers of children (aged 6–23 months) surveyed, 27 per cent had consumed a commercially produced complementary food, 36 per cent had consumed a sugar-sweetened beverage (SSB), and 25 per cent had consumed an ultra-processed snack food the day prior.[19]

The Consortium for Improving Complementary Foods in Southeast Asia (COMMIT) Project, found that among mothers with children aged 6–23 months surveyed in urban centres of Indonesia, Malaysia, Philippines, Thailand and Viet Nam (most from middle- or high-income households), nearly all had purchased commercially produced complementary foods, and most were feeding these products to children daily.[20] Cross-sectional studies from Brazil report that infants and children (aged 6–59 months) are consuming on average 30 per cent of total calories from UPF, and up to 39 per cent among the most socially disadvantaged.[21,22] A scoping review of 12 studies spanning seven high-income countries, reported 40–60 per cent of children

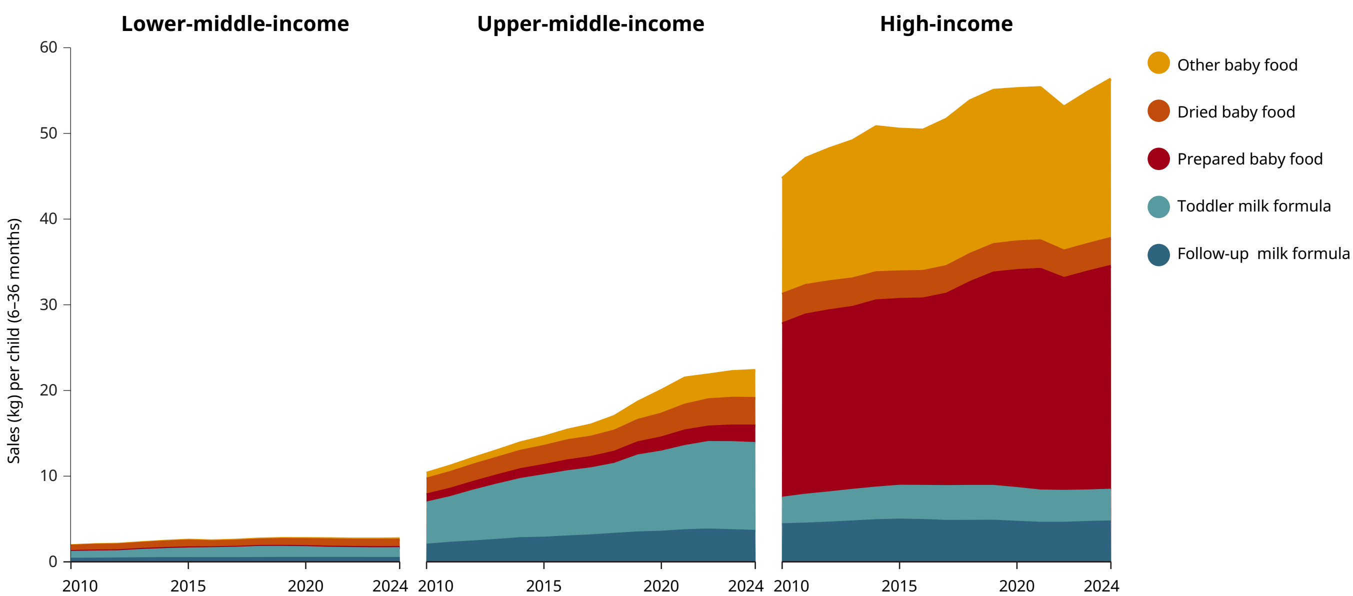

FIGURE 2. **Sales (kg) of CFIYC (marketed for ages 6–36 months) per child, by country income level, 2010–2024**

Source: Data from Euromonitor Passport, 2010–2024.
Notes: Income levels are defined by the World Bank; product definitions are provided in the footnotes of Figure 1.

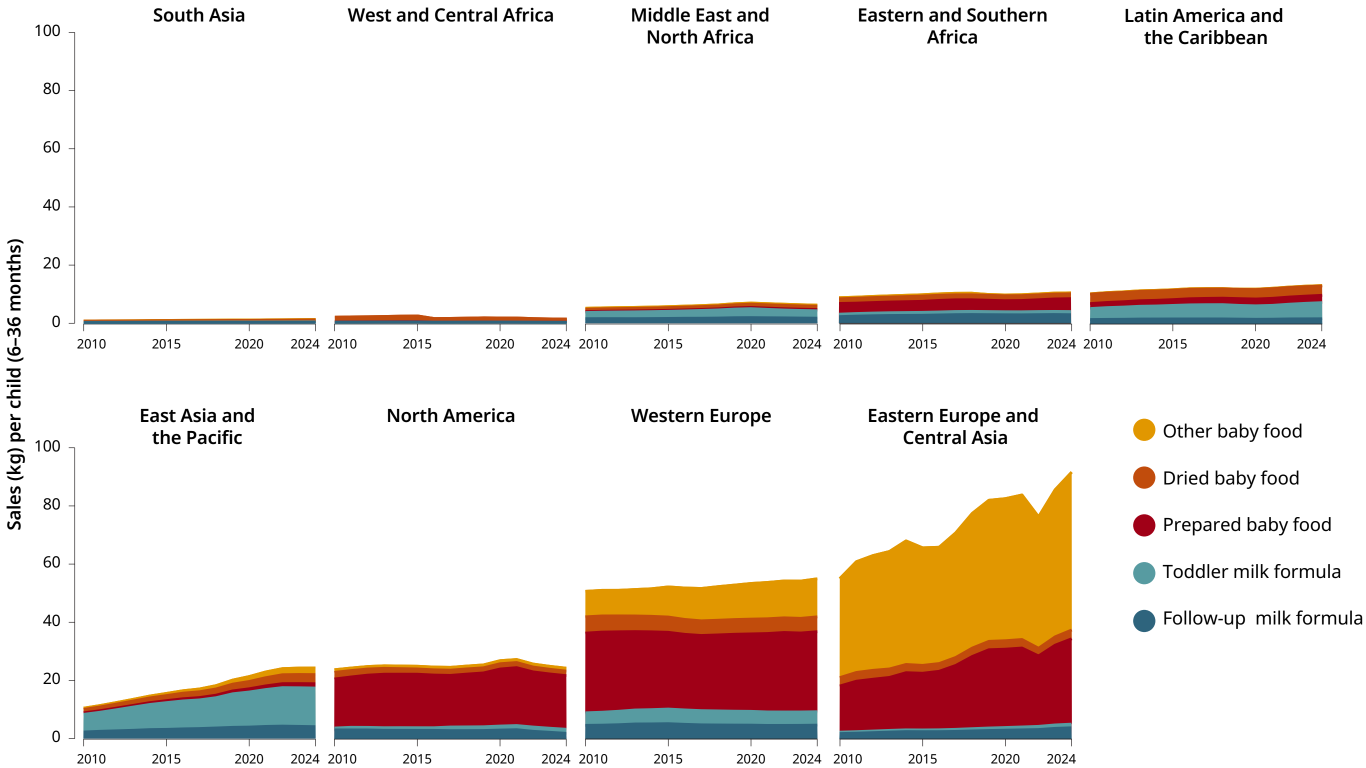

FIGURE 3. **Sales (kg) of CFIYC (marketed for ages 6–36 months) per child, by UNICEF region, 2010–2024**

Source: Data from Euromonitor Passport, 2010–2024.
Notes: Regions are defined by UNICEF; product definitions are provided in the footnotes of Figure 1.

(aged 6–12 months) as consuming CFIYC, the most common being cereal-based products between the ages of 6–12 months, and commercial infant and toddler snacks in the second year.[23]

The above is playing out with the context of a wider transition to more ultra-processed diets. A recent analysis of Demographic and Health Survey data from several countries highlight what Popkin and Laar (2025) refer to as the early socialization of infants and young children to unhealthy discretionary foods, including SSBs and UPFs. For instance, Ghana's 2022 Demographic and Health Survey showed that 31 per cent of children aged 6–23 months were fed a sweet beverage the day prior to survey.[24]

Nutritional quality, composition and processing of CFIYC products

Studies spanning diverse contexts assess the nutrient profiles, ingredient composition and degree of processing of CFIYC. These consistently find that a substantial proportion are ultra-processed, characterized by high levels of sugars, fats, sodium and cosmetic additives, and often fail to meet Codex Alimentarius and WHO standards.

In Brazil, of 1,645 products marketed for infants and children aged 0–36 months were available from urban retailers, including milk formulas, cereal mixes, supplements and purées: 79 per cent were ultra-processed, 17 per cent processed and 4 per cent minimally processed. All cereals and some fruit or vegetable purées and food supplements were ultra-processed, and significantly higher in energy density, carbohydrate, fat and protein content, although lower in fibre, when compared with processed and minimally processed options.[25] A cross-sectional study of Brazilian children (ages 6–24 months) found dietary energy from processed and UPF was associated with higher daily energy intakes from saturated fat and total sugar and daily sodium intake.[21]

The COMMIT study evaluated product labels of commercially produced complementary foods purchased in seven low- and middle-income countries in Southeast Asia, finding almost half were ultra-processed, with significantly higher total sugar and sodium content when compared with minimally processed products. Of these, 35 per cent contained at least one cosmetic additive, most commonly emulsifiers, thickeners and colourants.

Concerningly, 30 per cent of commercially produced complementary foods assessed contained additives not permitted under Codex standards for foods intended for infants and young children, raising serious concerns about regulatory oversight and potential health risks.[26]

A study evaluating the labels of 3,427 CFIYC products launched onto markets across 27 European countries between 2017 and 2021 found that 29 per cent were ultra-processed, 25 per cent were processed and 46 per cent were minimally processed. Of these, 39 per cent listed at least one sugar-contributing ingredient. Products classified as UPF were typically higher in total energy, fat, saturated fat, sugar and sodium and lower in fibre, with 60 per cent containing free sugars and/or fruit and vegetable powders, compared with 28 per cent of the minimally processed or processed products.[27] In Portugal, of 191 products available in urban retail outlets (for ages 0–36 months), only 35 per cent complied with the nutritional requirements of the Nutrient and Promotion Profile Model; indeed, 62 per cent were ultra-processed, 2 per cent were processed and 37 per cent were minimally processed.[28]

In Australia, 85 per cent of 186 products available in supermarkets and pharmacies for ages 0–36 months were ultra-processed, 11 per cent were processed and 4 per cent were minimally processed. Total sugars were higher and sodium lower in minimally processed than in ultra-processed products, while all toddler milks had higher energy, carbohydrate and total sugar levels than full-fat cow's milk.[29]

Impacts on infant and young child diet quality, nutrition, health and sustainability

Diet quality

Growing CFIYC consumption is increasingly associated with markers of poor diet quality in early life. Evidence from diverse settings suggests that these products contribute to the early displacement of breastfeeding and home-prepared complementary foods, and may shape unhealthy dietary preferences that persist into later childhood.

One consequence of rising CFIYC consumption has been a significant historical decline in the age of solid food introduction, contributing to reduced duration of exclusive and continued breastfeeding.[15]

Studies spanning all country income levels show that commercially produced complementary foods are frequently introduced before 6 months of age.[30,31] During infancy, UPF consumption is associated with reduced breastfeeding. In Brazil, for example, early and frequent UPF consumption during infancy (excluding infant formula) was inversely associated with breastfeeding initiation, exclusivity and continuation at 2 years of age.[32] Conversely, breastmilk intake was associated with reduced UPF consumption (excluding infant formula) in the first six months, and breastmilk intake was associated with reduced UPF and SSB consumption from ages 1–2 years.[33]

Several studies have documented how early CFIYC consumption links with poor diet quality. In a prospective German study, higher consumption of commercially produced complementary foods was associated with higher free sugar intake at age 9 months, 3–4 years and 6–7 years, and an inverse association was revealed between commercially produced complementary food consumption and fruit and vegetable consumption during infancy.[34,35] In a cross-sectional study of children aged 12–15 months in the United States, consumption of sweet and salty snack foods and commercial baby snack foods was associated with higher total energy, free sugars and sodium intake. In a cross-sectional study of children in the United States, UPFs were key sources of free sugar and sodium, but also wholegrains, iron and zinc.[36]

In the Gemini United Kingdom prospective cohort study, UPFs were major contributors to free sugar and sodium intake at both 21 months and 7 years of age. Moreover, children with high UPF consumption at 21 months were significantly more likely to have high UPF intake at age 7 years.[37]

Frequent snacking on CFIYC, such as biscuits and puffed snacks, have been purported to reduce exposure to the diverse tastes, textures and colours that support healthy food acceptance.[38] Pouches, in particular, have been shown in a cross-sectional study to reduce a child's opportunity to experience the look, smell and texture of foods, which may be associated with fussy eating.[39] Overall, these CFIYC characteristics contribute to the early habituation to ultra-processed diets and hinder the development of varied, balanced eating habits that are essential for health.[38]

Overweight and obesity

Growing evidence links UPF consumption during infancy and early childhood with increased risks of rapid weight gain, overweight and obesity. In a cross-sectional study of American children aged 12–15-months, consumption of sweet and salty snacks was associated with higher weight-for-length z-scores.[40] Cross-sectional evidence also suggests that infants aged 6–12 months who followed an ultra-processed dietary pattern were more likely to experience rapid weight gain and higher risks of overweight and obesity.[41]

Among American children aged 2–4 years participating in the longitudinal Women, Infants and Children Program, a higher diet quality index score in infancy, based inversely on UPF consumption (SSB, packaged snacks, commercial baby foods), was associated with lower body mass index (BMI) z-scores.[42] Brazilian cross-sectional studies report that UPF consumption (SSB and packaged snacks) is associated with a higher risk of overweight among children aged 12–50 months,[43] and UPF consumption increased the odds of being overweight by 116 per cent in children aged 6–59 months.[22]

In a prospective cohort study of Uruguayan children aged 0–3 years, the consumption of sugar-containing UPF and beverages at baseline was associated with higher BMI z-score at two-year follow-up.[44] However, a cross-sectional study from New Zealand found no difference in BMI z-score from infancy to early childhood between baby food pouch consumers and non-consumers.[45]

Micronutrient deficiencies

A cross-sectional study of socially vulnerable urban Brazilian children aged 6–59 months found that higher caloric intake from UPF was associated with a decrease of approximately 0.12 mg in dietary bioavailable iron and increased the odds of being classified as anaemic by 145 per cent.[22] Another cross-sectional study of Brazilian children aged 12–50 months reported a positive association between the consumption of SSBs and packaged snacks and the risk of anaemia.[43]

Stunting and underweight

Several studies examine associations between UPF consumption by young children and height/weight or age measures. An Ecuadorian cross-sectional study reported an association between UPF consumption and child stunting risk, with bone maturation identified as a potential mediator among 33-month-old children.[46] Among Brazilian children, higher UPF consumption at 2 years of age was associated with higher BMI z-score and lower height z-score at 4 years in a prospective cohort study.[47] However a cross-sectional study of Senegalese children aged 12–35 months in found no correlation was found between commercially produced complementary food intake and child height z-score and weight-for-height z-score.[48]

Dental health and oral-fascial development

The consumption of foods and beverages containing free and added sugars is a key risk factor for early childhood caries. This is defined as the presence of decayed, missing or filled primary teeth. In a cross-sectional study of Brazilian children aged 0–36 months, UPF consumption was associated with a higher risk of cavitated and non-cavitated dental caries.[49] Results from the prospective cohort study of Thai children reported that consumption of sweet foods was associated with dental caries at age increments of 24 and 36 months.[50] Many CFIYC, including purées and pouches, are designed with uniform, smooth textures, requiring less chewing than minimally processed alternatives. Repeated consumption may hinder the development of oral-motor skills, including chewing and swallowing.[51,52]

Environmental sustainability

CFIYC have significant environmental impacts.[53,54] WHO recognizes follow-up formula and toddler milks/growing-up milk as non-essential and unnecessary for infants and young children.[55] The European Food Safety Authority states there is “no unique role” for young child milk formulas in a balanced diets.[56] The production and consumption of such products therefore generate otherwise avoidable environmental burdens and natural resource depletion. Sales of these non-essential products are projected to generate billions of tons of unnecessary CO_2 equivalent greenhouse gas emissions, primarily due to their high skim milk powder content, and the high emissions intensity of dairy production and processing.[57,58]

Such products also generate significant packaging waste – in the United States, an estimated 86,000 tons of metal and 364,000 tons of paper are added to landfills annually from commercial milk formula (including infant formula, follow-up milk and toddler milks/growing-up milk).[59] Commercial milk formula production is water-intensive, requiring ~5,000 litres or more per kilogram of product.[58] The industry contributes to various other harms, including water pollution (eutrophication, contamination from faecal bacteria and drug residues), land degradation and biodiversity losses due to agricultural expansion for dairy feed and grazing, among others. While specific quantified environmental impacts of commercially produced complementary foods are limited, their footprint aligns with general food production impacts, particularly when dairy or meat-based, or ultra-processed – which are significant contributors to global greenhouse gas emissions and resource depletion.[54]

Determinants of CFIYC consumption

This section examines how changes in food systems,[4] and specifically children's food environments, drive transitions to diets higher in CFIYC. The Innocenti Framework on Food Systems for Children and Adolescents defines food environments as "the physical, economic, political and sociocultural context by which consumers interact with food systems to procure, prepare and ultimately consume food."[13] The framework distinguishes two types of food environments. First, personal food environments comprise individual and household-level factors, such as purchasing power, time pressures, access, convenience and desirability. These factors interact with the second, external food environments, referring to commercial, retail and care environments, among others, where children and caregivers interface with CFIYC vendors and products. The external food environment influences availability, pricing, exposure to marketing, and from whom and where products are procured.[13]

Personal food environments

It is important to understand the lived realities of families and caregivers and the complex interplay of individual and household-level factors that shape CFIYC purchasing decisions, feeding practices and consumption.[20,60,61] Purchasing power and cost considerations play a key role, including the level, variability and predictability of household income. Studies in low- and middle-income countries across Africa and Asia report that purchases of commercially produced complementary foods are typically more common among women and caregivers from higher socioeconomic groups.[20] This is consistent with studies showing that, as incomes rise, households purchase a wider variety of foods, including more highly processed options.[62] In some contexts, commercially produced complementary foods may be more often purchased by lower-income households, as reported in Cambodia.[20] Caregivers may view CFIYC as more cost-effective if their child consistently consumes the entire product, reducing waste associated with home-prepared complementary and family foods.[38]

The gendered distribution of household care and food work, family time pressures and demand for convenience are also key. Women often bear the primary responsibility for household food provisioning, including the procurement, preparation and feeding of children's meals – tasks that can add to already heavy workloads, including agricultural labour, caring for family members and demanding jobs outside of the home.[60,61] The pressure to manage these competing demands increases the appeal of pre-prepared convenience products, particularly in the absence of maternity entitlements and other social protections, and without the gendered redistribution of household labour.[63] The widespread availability and convenience of CFIYC, carrying attractive packaging and promotional claims, reinforces their appeal. The COMMIT studies in Southeast Asia, for example, found that commercially produced complementary foods are often purchased for their perceived convenience.[20,64]

Perceived food safety and acceptability to children also shape purchasing and feeding decisions. Parents understandably prioritize foods liked by all household members, including to avoid mealtime battles with children, and hence may prefer options with high sensory appeal and child acceptability, including those demanded by children while shopping. This so-called "pester power" is often leveraged by marketers, by using attractive packaging placed where children will view them, and early life brand association.[60] Parents may also use CFIYC for calming, soothing or distraction. Many CFIYC are designed to appeal to children's innate taste preferences, being formulated with excessive free sugars, fats and sodium and with cosmetic additives. Caregivers may also lack the skills, confidence or knowledge to prepare foods at home that are suitable for children,[65] while for some, limited access to resources including kitchens, cooking equipment, fridges, transportation, energy and clean water can drive households towards pre-prepared options with long-duration shelf-lives.[38]

External food environments

Marketing plays a significant role in driving CFIYC purchasing and consumption, referring to "…any form of commercial communication, message or action that acts to advertise or otherwise promote a product or service, or its related brand, and is designed to increase, or has the effect of increasing, the recognition, appeal and/or consumption of products or services."[66] The marketing of CFIYC is ubiquitous and pervasive in many contexts, reaching parents and caregivers through diverse channels, both traditional and modern.[67,68] Marketing strategies integrate several mutually reinforcing elements – product design, pricing, placement, promotion and public relations.

Product design: In marketing, this encompasses what the food is, how it tastes, its composition and how it is presented to consumers. To generate demand and enhance profitability, companies design CFIYC for maximum convenience, sensory appeal, perceived benefits and shelf-life.[38] Product designs are optimized through large corporate research and development divisions, adapting global brands to local tastes and consumer preferences. Branded products marketed in low- and middle-income countries, for example, are reported as being higher in sugar, compared with the same products in high-income countries.

Many CFIYC are designed to exploit children's innate taste preferences, especially for sweetness. Analyses of toddler milks and commercially produced complementary foods report high levels of free sugars, with ultra-processed products containing higher amounts compared to less processed alternatives.[27,38] Many products labelled with no added sugars still contain free sugars from fruit purées and concentrates, often from sweet tasting ingredients such as carrot or sweet potato. Cosmetic additives, such as emulsifiers, thickeners and colourants, enhance the appearance, flavour and texture of products, and overall appeal to caregivers and children.[26] The uniform texture and softness of products such as purées and cereal mixes reduce the effort required to chew and swallow, potentially delaying the child's satiety and increasing intake.[69]

Nutrition and health claims on packaging project an image that products are nutritious, healthy and suitable for meeting the child's developmental needs, often at inappropriate ages. A cross-sectional evaluation of commercially produced complementary foods available in Austria, Bulgaria, Hungary and Israel found that 28-60 per cent of products were labelled for infants under 6 months of age, between one-third and three-quarters carried a nutrition-related statement, and between 13–35 per cent carried a statement regarding child health or development.[68] Companies frequently reformulate and fortify products to create a "health halo" by slightly reducing sugar or sodium, while carrying claims that they have added iron, vitamins or fatty acids. A cross-sectional evaluation of commercially produced complementary foods in Cambodia, Indonesia and the Philippines found that 66–84 per cent carried nutrient content claims and were more likely to be "high in sugar" compared with products without claims.[70]

Packaging reinforces these perceptions with images of healthy babies, whole fruit and words such as natural, gentle or organic. Caregivers often trust claims or view them uncritically. In a study of 1,078 parents in the United States, 38 per cent viewed toddler milk as equally healthy as cow's milk and 44 per cent viewed it as healthier.[71] Another study reported that 60 per cent of 1,090 caregivers viewed toddler milks as providing nutrition that toddlers could not get from other foods.[72] Products are often made available in ready-to-eat formats, appealing to time-pressed caregivers.[38,65] Plastic pouches are a common and growing packaging format.[39,69] In the United Kingdom, for example, 35 per cent of commercial baby foods are packaged this way,[23] eliminating the need for spoons and bowls, while nozzles reduce feeding effort, and are often promoted for child self-feeding.[38]

Placement and pricing: In the marketing mix, placement refers to where and how products are made available, including distribution channels, store location and shelf positioning, and pricing refers to how much a product costs, and includes strategies such as discounting to increase appeal. Especially in higher-income urban settings, CFIYC are often ubiquitously available in supermarkets, pharmacies and convenience stores, with prominent dedicated baby food sections, and increasingly on digital platforms. In lower-income and peri-urban or rural contexts, CFIYC are often available in smaller stores and kiosks.[4] Companies saturate multiple retail channels and use in-store strategies such as shelf-space positioning, free product samples and special offers, and pricing strategies such as discounts, product bundles and loyalty schemes. Companies often price the same product differently across countries, based for example, on the stage of market development, consumer income levels and competition. They co-locate product portfolios on shelves, reinforcing brand exposure and cross-promoting more highly regulated products like infant formula through similar packaging and label designs.

Promotion: Promotion is a central pillar of the marketing mix, involving advertising, sales promotions, influencer partnerships, sponsorships, in-store displays and digital marketing, with the aim to capture attention, shape caregiver perceptions and generate demand. In a study of 43 retail outlets in Bandung City, Indonesia, promotional activities were observed for nearly three-quarters of commercially produced complementary food products, including prominent in-store displays, price-related promotions (e.g., discounts, multi-buys) and child-oriented packaging.[73] Cross-country evidence from

Cambodia, Nepal, Senegal and the United Republic of Tanzania reports the widespread use of such strategies, with half of stores in Dakar featuring promotions for commercially produced complementary foods. These promotions frequently employed health-related claims and idealized messaging to position commercially produced complementary foods and snacks as essential to child growth and development.[74]

A diverse array of promotional channels are used to reach caregivers, particularly urban, working and middle-class mothers. Traditional media, such as print and television, are reinforced by sophisticated digital marketing, including targeted advertising through social media platforms, parenting websites, mobile applications and reward programmes.[11,67] These channels enable companies to deliver personalized and emotionally resonant content to caregivers from as early as pregnancy, evolving in product focus and content as the child ages. Advertising frequently includes nutrient, health and development claims (described earlier), most without any sound scientific basis. Visual imagery,

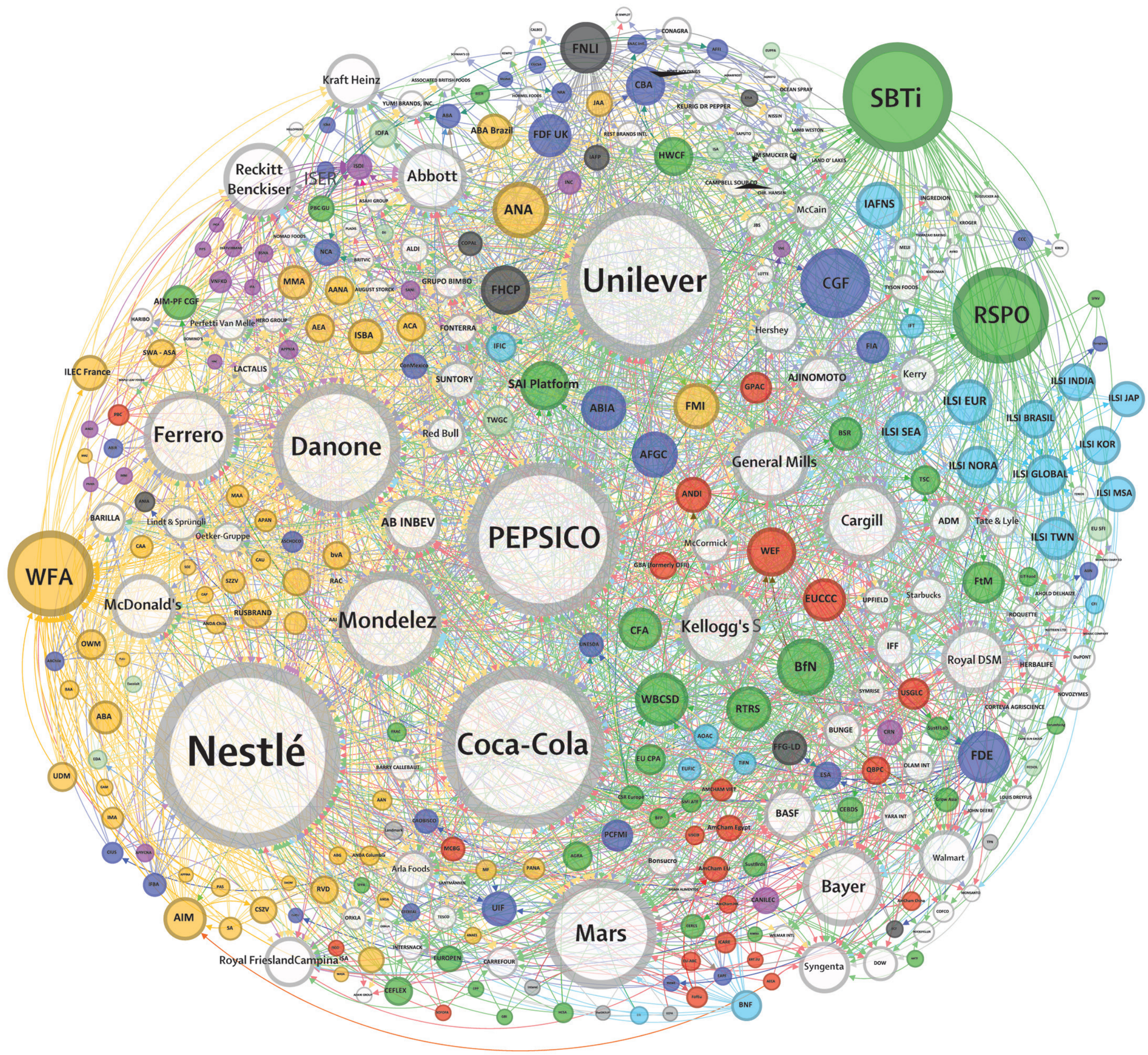

FIGURE 4. **The UPF industry's global network of lobby groups**

Source: Figure sourced from with permission from: Baker Philip, et al, 'Towards Unified Global Action on Ultra-processing Foods: Understanding commercial determinants, countering corporate power, and mobilising a public health response', *Lancet*, 18 November 2025, https://doi.org/10.1016/ S0140-6736(25)01567-3.
Notes: Circle sizes reflect the number of ties each group has within the network; connecting lines indicate declared memberships. Initial 'seed' data came from membership disclosures on company websites, then expanded through interest group websites, snowballing until no further data emerged. Memberships were recorded as publicly listed at the time of data collection. White circles denote corporations in the ultra-processed food sector; light purple circles are those representing the baby food industry; red circles show general business associations; yellow are branding and advertising groups; green circles represent corporate social responsibility bodies and multi-stakeholder platforms; dark blue are food, beverage and grocery manufacturer associations; Light green are agri-business groups spanning production, processing and ingredients; blue are science and consumer information organizations. This graph was generated using Gephi version 0.9.5 (Association Gephi).

including cartoon characters, licensed mascots and pictures of healthy smiling children, are routinely used to appeal to both children and caregivers. Companies frequently present themselves as trusted partners to caregivers, offering complementary feeding guidance and branded gifts, while sponsoring parenting events, and engaging in influencer partnerships.

Public relations and corporate political activity: The CFIYC industry engages in extensive corporate political activity to shape policy and regulatory environments in ways that protect corporate interests and undermine child rights.[6] The corporate food industry – in which the leading CFIYC manufacturers are embedded – coordinates a global network of front groups (*Figure 4*) that lobby to weaken, delay or dilute CFIYC regulations. A key strategy involves corporate social responsibility, including donating to child nutrition programmes, sponsoring nutrition education campaigns and funding humanitarian food aid and nutrition responses, creating a public image of benevolence, while lobbying efforts and marketing practices continue.[16,63] Industry-funded research and collaboration with medical, health and nutrition professional associations are used to legitimize products and shape professional practice, early years education and care, and policy. These relationships often serve to soften regulatory pressure by framing companies as partners in child nutrition rather than sources of risk. These strategies are intended to forestall the implementation of stronger regulatory frameworks, ultimately undermining children's rights to food, health and healthy environments.[16,63]

Policy, regulatory and programming responses

Comprehensive policy, regulatory and programming responses are needed to address CFIYC-related harms. This section reviews evidence on effective measures that address determinants outlined in the previous section, focusing on the regulation of CFIYC promotion, labelling, product composition and corporate political activity. These measures complement those addressing UPFs and SSB, covered in Chapters 2, 3 and 5 respectively.

Anchoring responses in a child rights approach

The United Nations Convention on the Rights of the Child establishes governments' legal and moral obligations to protect children's rights. The Convention affirms children's right to adequate nutrition, a healthy food environment and protection from harmful commercial influences, including exploitative marketing. Governments are required to ensure children's access to affordable, nutritious foods, regulate sales and marketing, mandate clear and accurate product labelling, and prevent misleading product claims.[1,6,75,76]

These obligations are reinforced by wider international human rights law, including the rights to adequate food and health. Women, parents and caregivers have the right to make informed choices about how to feed their children and the right to access the information and conditions needed to put those choices into practice. Yet, in many settings these rights are not fully realized. This means governments must adopt strong, rights-based food and nutrition policies that put children's best interests first, prevent harmful marketing and ensure food systems are designed to uphold children's rights.[1,6,75,76]

Guidance, education and communication

The development of dietary and feeding guidelines for infants and young children is essential to guiding responses to address CFIYC-related harms.[1,3] Such guidelines provide evidence-based advice on achieving healthy, safe and sustainable diets to the public, health professionals, advocates, businesses, journalists and policymakers, and provide a foundation for education and behaviour change communication interventions.

Following WHO and UNICEF recommendations, national guidelines should include clear recommendations to initiate breastfeeding at birth, exclusively breastfeed to six months, introduce complementary foods no sooner than 6 months of age, continue breastfeeding up to 2 years of age and beyond, promote the use of nutritious, safe, affordable, diverse, locally available and culturally appropriate complementary foods, and avoid foods high in sugar, salt, trans-fats, sugary drinks and non-sugar sweeteners.[1,3]

Following Brazil's pioneering dietary guidelines for children under 2 years of age, guidelines can recommend that UPFs not be fed to children, excepting infant formula when appropriate (*see also Chapter 2*).[77] Guidelines should address local determinants of poor diets, including local production and availability, accessibility, services, cultural feeding practices, demand for convenience and marketing practices. Integrating guidance into the training of health and nutrition workers and in public communication campaigns, can support consistent, practical advice for caregivers that is responsive to their needs and lived realities.[1,3]

Regulation of promotion, labelling and product composition

To protect infants and young children from CFIYC-related harms, governments can integrate three complementary and reinforcing components into cohesive national food and nutrition policies. This should first involve the implementation and enforcement of the International Code of Marketing of Breast-milk Substitutes and subsequent World Health Assembly resolutions into national law (the Code). Second, it should prohibit inappropriate marketing of commercially produced complementary foods. Third, comprehensive restrictions on marketing should be directed at children of all ages. This includes extending taxes, warning labels, procurement standards and other food policy interventions currently applied to unhealthy foods to also cover CFIYC.[24]

Implementation and enforcement of the Code

A foundational intervention for addressing the inappropriate promotion of CFIYC is the implementation of the Code into national law.[78] The Code, adopted by the World Health Assembly in 1981 and updated biannually through subsequent World Health Assembly resolutions, provides comprehensive provisions for restricting the promotion of CFIYC that function as breastmilk substitutes, including follow-up formulas, toddler milks and commercially produced complementary foods. It is the world's strongest policy framework to protect women, parents, children and health systems from exploitative marketing. Countries with more comprehensive Code legislation show lower violation rates, compared to countries with weaker laws.[79-81]

The WHO 2016 Guidance on Ending Inappropriate Promotion of Foods for Infants and Young Children, adopted as World Health Assembly resolution 69.9, provides specific recommendations for controlling the marketing of all commercial foods and drinks marketed for children aged 6–36 months, including follow-up milks, toddler milks/growing-up milk and commercially produced complementary foods.[7] This includes prohibiting the promotion of products that function as breastmilk substitutes; foods for infants under 6 months of age; cross-promotion; and the requirement for mandatory statements supporting breastfeeding, and appropriate age of introduction.[7,82] The Guidance recommends optimal feeding practices should be promoted, with emphasis on nutrient-rich, home-prepared and locally available foods, and that conflicts of interest involving baby food companies are avoided.

The 2023 WHO Guidance on Regulatory Measures aimed at Restricting Digital Marketing of Breast-milk Substitutes, adopted as World Health Assembly resolution 78.18, addresses the growing challenge of digital marketing and calls for expanded regulation.[83,84] The resolution recommends prohibiting promotion across all digital channels and media, establishing legal duties of digital providers, strengthening digital monitoring systems and the adoption of cross-border jurisdiction mechanisms to address international digital marketing.[83] An evaluation study reported that few countries worldwide include explicit provisions regarding digital marketing regulations, identifying an important regulatory gap.[85] New digital monitoring tools present a scalable approach to monitoring and reporting on violations of national laws and the Code.[86]

Monitoring Code violations is important for strengthening compliance, naming violators and guiding regulators in updating laws. The WHO/UNICEF NetCode toolkit provides evidence-based protocols for monitoring and periodic assessment of Code compliance.[87,88] The toolkit includes standardized questionnaires, procedures for evaluating promotions in retail stores and health care facilities and tools for assessing product labels. It calls for monitoring systems being integrated into existing regulatory frameworks, periodic assessments every 3–5 years to quantify compliance levels and multi-actor monitoring covering mothers, retailers, health workers and media channels. Country studies that systematically apply NetCode protocols are effective at detecting and documenting violations.[89-91]

Many countries have yet to implement the Code comprehensively. In 2024, 146 countries (75 per cent) had enacted at least some Code provisions into national law, yet just 33 were substantially aligned and only 38 covered products for infants and children aged 0–36 months.[92] This lack of regulatory scope means that companies have generated new CFIYC consumption growth by more heavily promoting follow-up formulas, toddler milks and commercially produced complementary foods, and used cross-promotion to market infant formula, as regulations on the promotion of infant formula have tightened.[16,80] WHO has long maintained that follow-up and toddler formulas are unnecessary and unsuitable replacements for breastmilk. Strengthening standards to eliminate added sugars in these products is a priority. Classifying toddler formulas as SSB could subject them to labelling regulations, such as warning labels or taxes (*see also Chapter 2*).

Ending the inappropriate promotion of commercially produced complementary foods

Laws should prohibit the availability and promotion of any commercially produced complementary food that is not compliant with national, regional and international standards for nutrient composition, safety and quality, and with national dietary guidelines. Governments should adopt and enforce such standards and aim to exceed relevant Codex standards, when these are considered inadequate (for instance in determining upper limits for free and added sugars and salt).[82]

For the purposes of regulation, governments can adopt profiling models to identify products unsuitable for promotion. The WHO Regional Office for Europe Nutrient and Promotion Profile Model was developed to guide the regulation of commercial baby food composition, marketing and claims and can be adapted for other regions.[10] This prohibits the addition of free sugars, as well as fruit juices, syrups, honey and non-sugar sweeteners and any marketing of confectionery and sweetened drinks. Products must meet composition thresholds, including no more than 15 per cent of energy from sugar in meals and snacks, maximum sodium, minimum protein and appropriate energy density for some products. Industrial trans-fats are not permitted.

These measures are intended to lower sugar content and sweet taste profiles, improve nutritional quality and prohibit inappropriate promotion. They are recommended to be mandatory in law to achieve meaningful public health impact.[10] Laws should require that commercially produced complementary foods are never marketed for children under 6 months of age and clearly state the age of introduction; prohibit nutrition and health claims; carry statements supporting continued breastfeeding to 2 years of age or more and not introducing complementary foods before 6 months of age; avoid any imagery, text, claims or comparisons that idealize products, undermine breastfeeding, imply equivalence or superiority to breastmilk, suggest commercial foods are superior to home-prepared foods, or mislead caregivers in any other way. It is important that packaging and labels for commercially produced complementary foods are distinct from breastmilk substitutes to prevent brand cross-promotion and ensure compliance with the Code.[7,10,82]

While the Nutrient and Promotion Profile Model is recognized as an important tool, it has several limitations. It covers nutrient and health claims, but not other aspects of marketing related to the idealization of products (e.g., promoting snack foods as a norm) and social desirability (e.g., conveying positive experiences, such as fun, problem solving and happiness).[93] The Nutrient and Promotion Profile Model addresses some markers of ultra-processing, including the prohibition of non-sugar sweeteners, but not others commonly found in ultra-processed products (see Chapter 2). These are considerations for the further development of the Nutrient and Promotion Profile Model and other profiling models worldwide.

Comprehensive restrictions on child-directed marketing

The 2016 WHO guidance further urges governments to fully implement WHO's broader guidelines on policies to protect children from the harmful impact of food marketing, especially in settings where infants and young children gather.[7,66] This calls for mandatory, comprehensive restrictions that protect all children under 18 years from unhealthy food marketing (*see also Chapters 2, 3 and 5*). A systematic review of 44 observational studies found that food marketing policies can reduce marketing exposure and power, lower purchases of unhealthy foods and that the most effective policies are mandatory, government-led and comprehensive.[94]

Effective policy designs address both exposure to marketing and the power of marketing to persuade. These include the use of a government-led profiling model to identify foods subject to restrictions (*see Chapter 2*); include all media and settings (including mass, digital, packaging and point-of-sale, sponsorships, schools and childcare); cover all times and not only children's programming; explicitly limiting persuasive techniques that appeal to children including the use of promotional characters, gifts, games, influencers and celebrities. Voluntary approaches typically show no or unfavourable effects. Policies that are overly-narrow in scope can prompt companies to migrate to other media, time slots or older age groups. Hence policymakers are encouraged to adopt mandatory and comprehensive policy designs, to prevent industry marketing adaptation.[66]

Early childhood education and care interventions

Standards in early childhood education and care environments are essential for promoting healthy diets among infants and young children, and for preventing the introduction and consumption of unhealthy foods.[95,96] WHO guidelines emphasize the importance of standards for early childhood education and care service providers, specifying the provision of nutritious, age-appropriate foods consistent with dietary and feeding guidelines. This includes removing sugary drinks, limiting processed snacks and prohibiting unhealthy food marketing within facilities; requiring providers to incorporate healthy eating education into curriculum; continuous professional development for staff; fostering supportive environments that encourage healthy eating, drinking and breastfeeding; engaging families and local communities to educate and support implementation; and ensuring clean and safe water is available at all times.[97]

Strengthening care, social protection and food systems

To counter the marketing and proliferation of CFIYC, it is essential to also adopt wider policy frameworks that prioritize effective social protection systems and local food provisioning systems. This begins by recognizing the unpaid care and food work – including breastfeeding, food preparation and child feeding – that falls largely on the shoulders of women in many contexts, and calls for policies that resource and redistribute their care work burdens.[63,98] Governments should recognize care work as essential to sustainable food systems and economic development, requiring public policies that reduce women's unpaid workloads and address gender inequities, including through gender-responsive budgeting.[63,99]

Social protections and family-friendly policies are crucial to give families the time and resources they need for optimal infant and young child feeding. Paid maternity and parental leave, access to quality childcare, breastfeeding breaks at work and nursing spaces, provide the necessary time to bond and recover from birth, and to breastfeed for longer.[63] Legally guaranteed maternity leave is essential for supporting breastfeeding, as it allows women to take sufficient time off work while retaining income security. Linking child nutrition, social protection systems and social transfers – including cash, food and vouchers – can help to address household income poverty during times of crisis and need, helping families to access nutritious first foods.[100]

Building up local food provisioning systems is another pillar. Unhealthy CFIYC are often produced and marketed by transnational corporations, highlighting the need for healthier, culturally appropriate and locally-produced alternatives. Initiatives like UNICEF's *First Foods Africa* aims to support local producers and generate demand for nutritious, affordable and culturally appropriate complementary foods.[101] Strengthening local supply chains and food markets through, for example, supporting small businesses that produce porridges or purées from indigenous ingredients, can help families access safe, nutrient-rich first foods aligned with cultural diets, while supporting producer livelihoods and sustaining local food economies.[101]

Conflict of interest and corporate interference safeguards

It is imperative that, as part of the wider set of measures outlined above, governments also legislate to eliminate conflicts of interest in health care systems, as called for under the Code and subsequent guidance. This applies to conflicts of interest arising from interactions between baby food companies and health systems, health workers, professional associations and civil society organizations.[7,82]

Governments should also protect public policy from corporate interference, including conflict-of-interest safeguards in guidelines development and policy decision-making, lobbying restrictions and related measures.[6,63] UNICEF and WHO have developed clear normative positions and guidance that governments and others can follow. UNICEF Programming Guidance on Engaging with the Food and Beverage Industry establishes 10 parameters to guide the organization's engagement with industry. UNICEF will focus on strengthening public policy, and not voluntary industry commitments or regulation, as the primary strategy for transforming food systems for children; not engage in partnerships with UPF industries and those that violate the Code; and will advocate for the exclusion of the UPF industry from public policymaking.[102]

WHO also offers guidance on protecting nutrition policy and programming from corporate interference, recommending that countries establish clear frameworks that protect policy development from such influence, and noting that conflicts of interest are more likely when external actors' business models are misaligned with public health nutrition goals. The Pan American Health Organization has developed a roadmap for implementing WHO's approach in the Americas.[103] Wider measures to end corporate interference include bans or lengthy stand-down periods before individuals can move between roles in government and private industry; mandated political donation limits; and disclosures and lobbyist transparency registers, among others.[104] Professional associations can also adopt measures, including by ending financial ties with industry.[80,105]

Conclusions and recommendations

The evidence compiled in this chapter shows a global rise in CFIYC, many of them ultra-processed, driven by the expansion of the transnational CFIYC industry, powerful marketing techniques, corporate political activity and inadequate policy and regulation. These products often contain excess free and added sugars, sodium and additives not permitted in infant and young child foods, are frequently introduced before 6 months of age, displace breastfeeding and home-prepared complementary foods and are associated with poorer diet quality, rapid weight gain and overweight, micronutrient shortfalls, early childhood caries and missed opportunities for sensory and oral-motor development. The environmental footprint of non-essential products, such as follow-up formulas and toddler milks, is substantial and increases the urgency to act to protect both child health and planetary health.

The child rights obligations of governments require comprehensive responses, anchored in the use of public policy and law, and not ineffective voluntary corporate action. Mutually reinforcing interventions include strong implementation and enforcement of the Code, regulation of the composition and promotion of CFIYC based on well-designed food profiling models and guidance, comprehensive restrictions on child-directed marketing, standards in early child education and care, and safeguards against conflicts of interest and corporate political interference in policymaking.

Equally, caregivers and families need enabling conditions – social protection, time, skills, safe water, supportive services and food systems – so that nutritious, culturally appropriate foods are the default. With coherent policies, and independent monitoring and accountability, governments and partners can reshape food environments so every child can be nourished without reliance on unhealthy products.

We conclude with the following recommendations:

Governments and regulatory agencies

- Anchor policy responses in a child rights approach and fully implement, monitor and enforce the Code in domestic law for all CFIYC products marketed for children under–36 months (including explicit provisions for digital marketing) and strengthen care economies, social protection systems and local food systems.
- Adopt mandatory CFIYC composition, safety and promotion standards that require clear age-of-use statements, and prohibit added sugars and non-sugar sweeteners, the use of claims and label designs that idealize products, and any promotion of products that function as breastmilk substitutes.
- Adopt safeguards against conflict of interest and lobbying that prevent corporate interference in policy design, service delivery and health professional education and practice; do not partner with companies that violate the Code or whose core business conflicts with child nutrition goals.

United Nations agencies, academic institutions and civil society organizations

- Align guidance and technical assistance on CFIYC composition, promotion, labelling and monitoring; provide direct support to Member States on policy and legislative design, implementation and enforcement; expand global surveillance systems to cover CFIYC; and implement robust conflict-of-interest policies across the United Nations system, adopting a joint approach.
- Conduct independent studies on CFIYC markets, composition, degree of processing, exposure to marketing, and health, developmental and sustainability outcomes for infants and young children (with disaggregated analyses to reveal inequities); evaluate policy interventions and enforcement quality.
- Form cross-sector coalitions (health, consumer, environmental and others) to advocate for and advance comprehensive laws on CFIYC marketing, composition, labelling and conflict-of-interest safeguards; monitor and report Code and marketing violations, including by using NetCode-aligned protocols and new digital monitoring tools; file complaints and demand enforcement; and build public demand for healthy child food environments through rights-based campaigns and advocacy that counter deceptive claims.

By adopting the above recommendations, the ultimate goal is to create food environments in which families and caregivers are confident in nourishing infants and young children without unhealthy, ultra-processed products. Achieving this will require political will and sustained effort, but the outcome will be better nutrition and health for millions of children.

CHAPTER 5

Ultra-processed foods and children's diets in developing economies: The case of West Africa

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Abstract

West Africa is undergoing a rapid nutrition transition. While the prevalence of stunting among children under 5 years of age remains among the highest globally, overweight and obesity are increasing rapidly. Unhealthy diets are a key driver of this transition, fuelled by the widespread availability, affordability, convenience and aggressive marketing of ultra-processed foods (UPFs). This chapter examines the drivers and implications of UPF consumption for the nutrition, health and well-being of children and adolescents in West Africa. It uses a state-of-the-art review process, with focused analyses of Cabo Verde, Ghana, Nigeria and Senegal. UPFs permeate food environments in West Africa, shaping diets, especially among children and adolescents. In Nigeria, UPF sales doubled between 2010 and 2025, increasing from 2.9 to 5.9 billion kilograms of product and from US$2.3 billion to $5.2 billion in sales. By 2024, national soft drinks intake in Nigeria had risen to 53 billion litres of non-alcoholic beverages, including 3.4 billion litres of sodas. In Ghana, per capita consumption of sugar-sweetened beverages (SSB) was estimated at US$66.5 in 2023, and supermarkets devoted substantially more shelf-space to unhealthy products than to healthy foods, at a ratio of 6:1. In Senegal, consumption of SSB is rising, and 86.6 per cent of households in Dakar use bouillon cubes, which are typically high in salt and contain artificial additives. Early socialization to UPFs, reinforced by marketing and economic incentives, steers consumers towards these products. Global evidence indicates that healthy food environment policies can reduce UPF consumption. Despite data gaps, converging signals – including rapid UPF penetration and powerful marketing – justify the urgency of precautionary, adaptive policies. Regional harmonization of food standards and policies – including marketing, labelling, fiscal policies and school food measures – via the West African Economic and Monetary Union, the Economic Community of West African States (ECOWAS) and the West Africa Health Organization, can limit regulatory loopholes and improve efficiency.

Introduction

The nutrition transition is a critical public health concern in West Africa, a region with a high proportion of low-income countries.[1] The shift from traditional, minimally processed foods towards UPFs is underpinned by structural factors, including globalization, urbanization, trade liberalization, technological advancement, colonial legacies and the corporate expansion of unhealthy food businesses.[2] Across West Africa, food environments are now saturated with UPFs, including SSBs and sweet and salty snack foods.[1,3, 4-7] Unhealthy food environments are contributing to the triple burden of malnutrition (undernutrition, micronutrient deficiencies, and overweight/obesity), which is well-documented among children and adolescents across West Africa.[8–10]

Recent estimates show persistent hunger and food insecurity in the region (affecting 16.5 per cent of the population)[11] and undernutrition (approximately 30 per cent and 6.5 per cent of children under 5 are affected by stunting and wasting, respectively).[12] While undernutrition and micronutrient deficiencies remain major concerns, overweight and obesity are rising rapidly, especially among school-age children and adolescents.[13] Data from the past two decades for the UNICEF region of West and Central Africa show that the gap is narrowing between the percentage of school-age children and adolescents living with obesity and the percentage affected by underweight (thinness) (*Figure 1*).

Data from four West African countries with the highest prevalence of child obesity show a rapid increase in obesity among children aged 5–19 years between 1990 and 2022 (*Figure 2*): from 0.7 per cent to 4.2 per cent in Cabo Verde, from 1.3 per cent to 7.0 per cent in Ghana, from 0.5 per cent to 3.8 per cent in Nigeria, and from 0.4 per cent to 2.5 per cent in Senegal.

Nutrient-poor, unhealthy diets are a key driver of malnutrition. Demographic and Health Survey data from **Cabo Verde, Ghana, Nigeria** and **Senegal** show improvements in key infant and young child feeding indicators during the last two decades, such as the minimum acceptable diet, minimum dietary diversity and minimum meal frequency among children aged 6–23 months, particularly in Ghana, where the percentage of children consuming a minimally acceptable diet increased from 15 per cent in 2003 to 23 per cent in 2022. However, progress is slow, and unhealthy eating practices are becoming increasingly entrenched in young children's diets, with high consumption of SSBs (for example, 32 per cent in Ghana and 41.2 per cent for

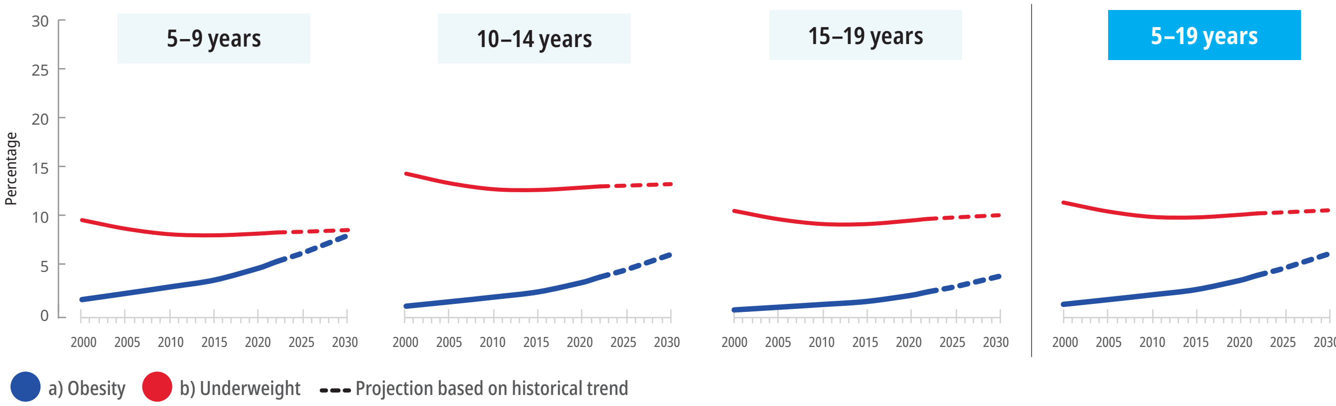

FIGURE 1. **Trends in obesity and underweight in school-age children and adolescents, 2000–2022, with projections to 2030, for the UNICEF region of West and Central Africa, by age group**

Source: United Nations Children's Fund, *Feeding Profit. How food environments are failing children. Child Nutrition Report 2025,* UNICEF, New York, September 2025.

Nigeria). Additionally, zero fruit/vegetable consumption in children aged 6–23 months remains a concern, including in Ghana (31 per cent). A systematic review, which included data from West African countries, reported zero fruit/vegetable consumption ranging from 45 per cent of children in Togo to 76 per cent in Côte d'Ivoire.[14] The ecological shifts in population nutritional status in West Africa correlate with changes in dietary patterns. Given that children and adolescents account for nearly 30 per cent of West Africa´s population, targeted action for the group is pivotal; progress among them will significantly shape overall nutritional status and development outcomes across West Africa.

This chapter examines the drivers and implications of the increasing availability and consumption of UPFs on child nutrition and well-being in West Africa. Drawing on data from Cabo Verde, Ghana, Nigeria and Senegal, this chapter explores trends in the sale and consumption of UPFs and assesses the impacts on children's diet quality, nutrition and health. It identifies drivers of UPF consumption and reviews current policy, regulatory and programme responses. The chapter ends with conclusions on what is known, the evidence gaps and priority actions to curb UPF consumption in the region.

Methods

This paper addresses UPFs in West Africa with a specific focus on children and adolescents. We used a state-of-the-art review approach[15] to critically synthesize the latest evidence on UPFs, distilling emerging trends on UPF consumption and impacts, noting where there is consensus, controversy or gaps. A desk review was conducted, drawing upon a broad range of sources, including scientific literature, publications from regional and international organizations, government and policy documents, and nationally representative surveys, such as Demographic and Health Surveys. These sources provided important context and temporal trends in key nutritional indicators relevant to the region.

To capture recent scientific literature and policy developments, targeted searches were conducted in key academic databases, including PubMed, Scopus, Web of Science, African Journals Online and Google Scholar.

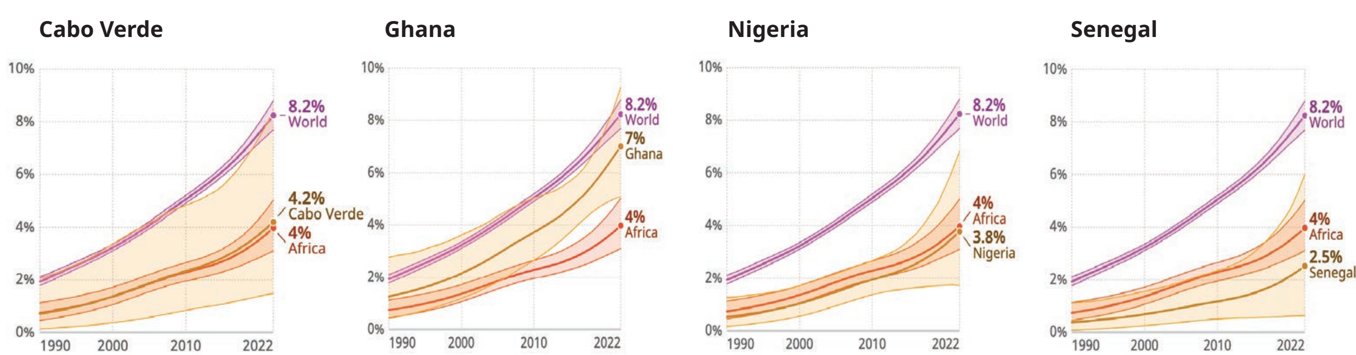

FIGURE 2. **Prevalence of obesity among children and adolescents aged 5–19 years, 1990 to 2022**

Source: World Health Organization, 'Prevalence of obesity among children and adolescents aged 5 to 19 years', 2024, <https://data.who.int/indicators/i/C6262EC/EF93DDB>

Grey literature repositories, including those of ECOWAS, the Food and Agriculture Organization of the United Nations, UNICEF, the West Africa Health Organization and WHO complemented the database searches.

In addition, market-level quantitative data were integrated from Euromonitor International, a commercial market research firm that compiles sales data for food commodities and major corporations. These data provided insights into sales trends, availability and market penetration of UPFs in the target countries.

Trends in UPF sales and consumption in West Africa

UPFs emerged in West African diets in the mid-twentieth century,[8,16] facilitated by several structural factors, including rapid globalization, urbanization, economic liberalization and colonial legacies of agricultural restructuring towards export crops and refined products.[17, 18] By the mid-twentieth century, imported ´white bread´ had already become a 'prestige' food in urban West Africa, shaping dietary aspirations in places such as Ghana and Nigeria. In 1957, Nestlé stablished Africa's first Maggi bouillon cube factory in Côte d'Ivoire; with aggressive pricing and pervasive marketing, this product is now deeply embedded in West African food cultures. Maggi bouillon cubes are used in the preparation of traditional dishes[19,20] – exemplifying the 'glocalization' of a global brand to local cultural preferences.[21]

During and after world war II, the flow of UPFs into West Africa continued, as American food corporations expanded overseas and brands such as Coca-Cola penetrated Africa, positioned as aspirational status symbols – a phenomenon referred to as "Coca-Colonization".[22] With urban elites developing a taste for imported canned goods, confectionery and convenience foods sold in colonial supermarkets, these products would decades later become the population's everyday staples and go-to food choices. By the 1980s, the structural adjustment programmes imposed by the International Monetary Fund/World Bank dramatically reshaped food systems and food environments across the region, opening the floodgates for cheap imported commodities and foreign investment by large food multinationals.[23]

FIGURE 3. **A convenience shop stocking a wide range of products from unprocessed and minimally processed foods to UPFs, Cotonou, Benin**

By the turn of the twenty-first century, fast-food chains – led by Kentucky Fried Chicken – opened in Ghana and Nigeria. Simultaneously, domestic brands proliferated, such as Mr. Bigg's (Nigeria, founded in 1986) and Papaye Fast Food (Ghana, founded in 1990/91). Instant noodles, breads/pastries, packaged snacks, sweetened drinks, fast foods and other UPFs shifted from niche or aspirational to everyday staples. By 2019, global franchises, including Burger King and Domino's Pizza, were established in Ghana and Nigeria, appealing to the middle-class and youth.[24] Indomie, introduced by Indonesian producers in Nigeria in 1988, expanded rapidly, marketed as the "King of All Foods".

During the past two decades, the West Africa region has witnessed rapid growth in the sale of packaged and ultra-processed foods. Economic development, population growth and aggressive marketing by global food corporations have combined to expanding the presence of UPFs in local markets.[25] UPFs are not confined to supermarkets; they are ubiquitous across the retail landscape. In most West African cities, small neighbourhood shops and street kiosks offer a variety of UPF products, from SSBs to instant noodles, pushing UPFs deep into urban informal settlements and rural villages (*Figure 3*).

Data from the United Nations Conference on Trade and Development (UNCTAD) Data Centre for the period 2013–2023 show that West Africa's processed food imports rose from US$8.7 billion to US$11.1 billion, surpassing raw food imports (US$6.4 to $10.5 billion) and minimally processed food imports (<US$1.5 billion). Nigeria peaked at US$3.1 billion (2014); Senegal doubled to US$1.2 billion; Ghana reached US$1.6 billion then US$1.2 billion; and Cabo Verde rose 57 per cent to US$149 million – underscoring a regional dietary shift.

Nigeria – West Africa's largest economy and most populous nation – provides one of the clearest examples of UPF market growth. According to Euromonitor data, Nigeria's total UPF market sales volume doubled from 2.9 to 5.9 billion kilograms between 2010 in 2025, corresponding to US$2.3 to US$5.2 billion in sales. This was equivalent to sales volumes growth from 17.6 to 24.9 kilograms and US$13.9 to US$22 per capita respectively.[26] This growth has occurred despite a slowdown in sales growth in high-income countries and recurrent inflationary and currency depreciation crises, demonstrating how UPF corporations strategically target growing economies.

Five product categories dominate Nigeria's UPF market and the population's ultra-processed dietary pattern: packaged refined breads, carbonated soft drinks, sweet biscuits, instant noodles and bouillon cubes (*Figure 4*). Nigeria serves as a regional hub for the UPF industry, supplying markets in neighbouring countries. Consequently, market strategies and policy decisions in Nigeria shape UPF availability, pricing and marketing across West Africa.

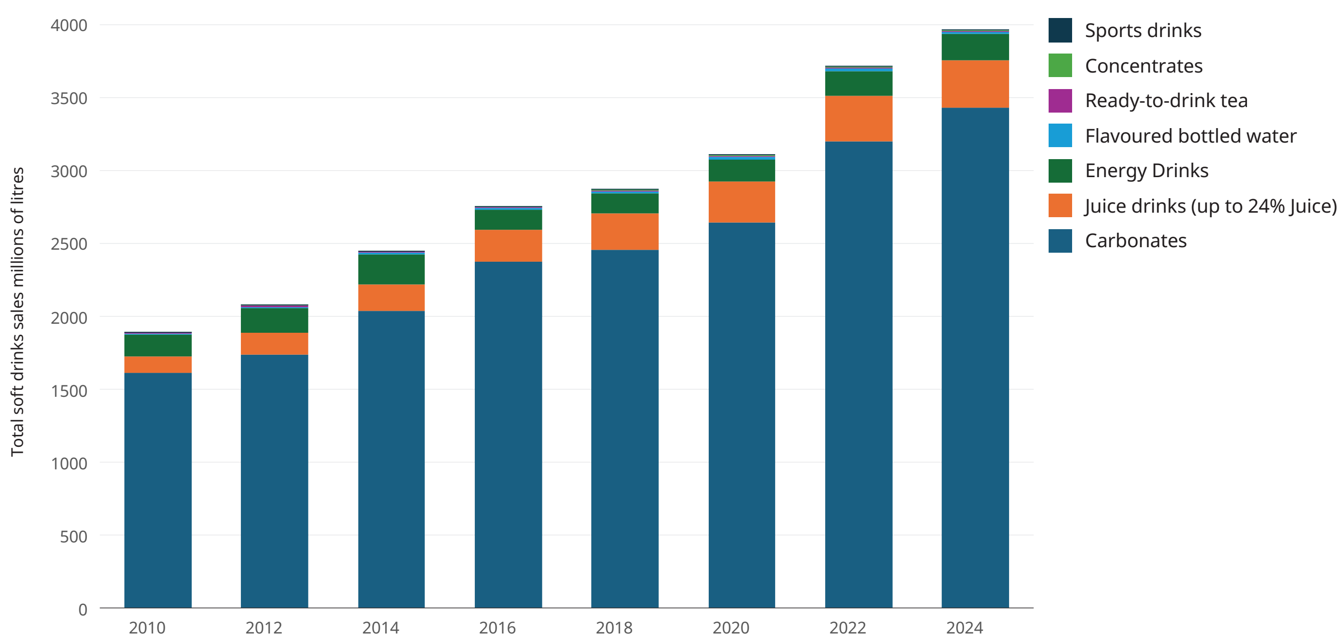

FIGURE 4. **Change in market volume of soft drinks by million litres, 2010–2024, Nigeria**

Source: Euromonitor International, 2025.

Per capita Coca-Cola consumption in Nigeria roughly doubled between the early 2000s and late 2010s.[27] Between 2010 and 2024, sales of Coca-Cola grew in Nigeria by 125 per cent (5.6 per cent annually), from 1.6 to 3.4 billion litres, with the retail value more than tripling over the same period, from US$900 million to US$1.76 billion.[28] When other SSBs are taken into account, Nigeria's dominance in the region's soft drink market is undisputed, with consumption reaching more than 53 billion litres of non-alcoholic beverages in 2024 alone, including 3.4 billion litres of sodas. Nigeria is now the third-largest soft drink market in the world by total volume.

Annual noodle servings in Nigeria climbed from 2.45 billion in 2020 to 3.00 billion in 2024, according to the World Instant Noodles Association.[29] Nigeria has experienced a "noodle revolution" over the past two decades (now the tenth largest consumer of instant noodles in the world).[29] Between 2010 and 2024, Nigeria´s instant noodle market more than doubled in size, from US$179.7 million to US$386.6 million.[26]

Between 2010 and 2024, sales of the Nigerian bouillon cube grew from 189.5 to 230.3 million kilograms, the latter equivalent to 2.9 billion 8 gram units.[26] Nestlé alone sells billions of Maggi cubes annually in Central and West Africa and has launched fortified variants to capitalize on their wide reach.[19] Studies report that the vast majority of households use bouillon cubes daily: nearly 100 per cent of households in Nigeria, more than 90 per cent in Ghana,[30] and 86.6 per cent in Dakar, Senegal, where per capita intakes are up to twice the WHO recommended sodium limit.[31-33]

In comparison with Nigeria, Ghana's retail food market, while smaller, is relatively advanced for the region. It experienced strong growth in packaged food sales through the 2010s, as demonstrated by market volume and growth of soft drinks (*Figure 5*). In 2023, the retail value of UPFs per capita was US$66.5 in Ghana.[34] An assessment of the foods stocked in Ghanaian supermarkets revealed that for every 1 m² of shelf-space allocated to healthy foods, 6 m² was allocated to unhealthy foods.[6] Even rural populations, traditionally insulated from global food industry influences, now increasingly rely on packaged, nutrient-poor foods (particularly SSBs) due to their affordability, convenience and widespread availability.[35] Like Nigeria and Ghana, products of concern in Cabo Verde and Senegal include SSBs, noodles, snack foods, confectionery and various culinary ingredients and condiments.

UPF consumption among children and adolescents in West Africa

Industry leaders have openly articulated their ambition to capture not just market share but *"stomach share"* – i.e., the proportion of human diets occupied by their products.[36] Given West Africa's young demographic, these ambitions explicitly target children, and have been largely achieved: Maggi cubes are used in nearly every sauce across households of all income levels, instant

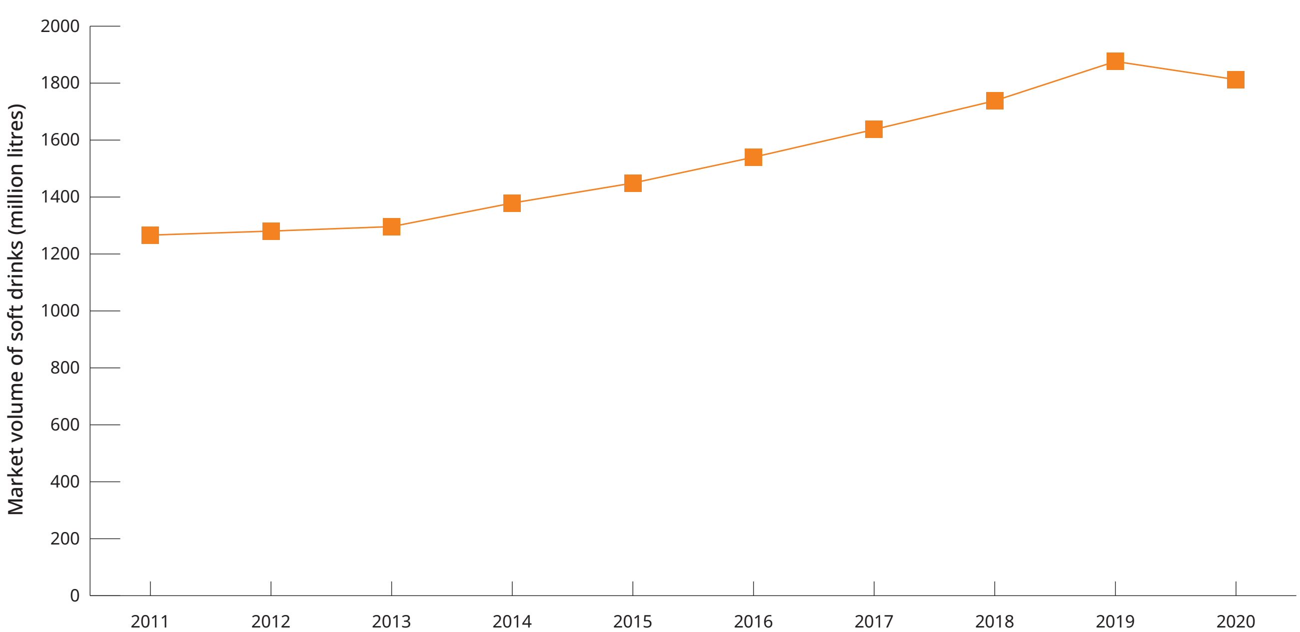

FIGURE 5. **Market volume of soft drinks in Ghana, 2011–2020**
Source: GlobalData Public Limited Company, available at <https://www.globaldata.com/>.

noodles have redefined the notion of a quick meal, and sodas often replace water as a source of hydration for some youth. UPFs are now ubiquitous, with many children expressing strong preferences for instant noodles and sugary beverages.

UPF exposure begins early in West Africa. Infants and children encounter encounter sweetened drinks and snacks, shaping tastes through early socialization. For example, in Burkina Faso, Côte d'Ivoire, Mali and the Niger, 26 per cent to 45 per cent of children aged 6–59 months consumed at least one UPF in the previous 24 hours.37,38 Intake is higher among urban, older and wealthier children, and these foods are typically energy-dense but micronutrient-poor, reducing dietary diversity.38,39

Among adolescents, UPF consumption is also widespread. In 2022, two-thirds of Nigerian secondary students consumed SSBs seven or more times per week.[40] In Ghana and Senegal, children and university students frequently eat instant noodles as cheap, quick meals, often multiple times per day.[4-7, 31-33] In Ghana, consumption of instant noodles and SSBs is rising among youth, with fizzy drinks the top snack among poor communities.[35] While child-specific data from Cabo Verde and Senegal remain scarce, local studies indicate increasing soft drink and juice intake among youth. In Cabo Verde, there has been a shift among urban youth towards consuming Westernized snacks.[41] Across West Africa, UPFs are widely offered in and around schools via canteens, kiosks and street vendors, supported by price promotions and marketing.[4-7]

Impacts of ultra-processed foods on diet quality, nutrition, health, and the environment in West Africa

The *Lancet* Series on UPFs,[42-44] and Chapters 2, 3 and 4 of this state-of-the-art review, present the scientific and epidemiological evidence supporting the links between UPF dietary patterns, poor diet quality, and poor nutrition and health outcomes for children and adolescents.

Irrespective of the setting, children and adolescents who consume large quantities of packaged snacks, sugary drinks and other UPFs often have poor dietary quality. The low nutrient content of UPFs – combined with the displacement of nutritious foods such as fruits, vegetables and other whole foods – leads to insufficient intake of essential nutrients, including iron, zinc, vitamin A and folate.[37-39,45-47] In Ghana, Nigeria and Senegal, urban children frequently consume sweets and sugary beverages, while fruit and vegetable intake remain low, reinforcing energy excess and poor diet quality.[2,48] Studies from West Africa and other low-income settings show that the hyper-palatability of UPFs, added sugars/sodium and marketing shape taste preferences and satiety, creating patterns that consolidate during adolescence.[37-39,49]

UPFs contribute simultaneously to undernutrition, micronutrient deficiencies, and overweight and obesity in children and adolescents, and are also central contributors to diet-related chronic disease. Specific evidence on children and adolescents in West Africa remains limited, and cohort studies in West African youth are needed to address this evidence gap.

The rapid expansion of UPFs globally and in West Africa carries significant environmental consequences. The full life cycle of UPFs – from industrial-scale production of commodity crops to processing, packaging, distribution and waste management – is resource-intensive and polluting.[50,51] A critical concern is plastic waste: UPFs predominantly use single-use packaging (bottles, sachets, wrappers). In West African cities such as Accra, Dakar and Lagos, discarded plastic sachets clog waterways, exacerbating urban flooding and marine pollution.[52,53] These plastics fragment into microplastics that contaminate soil, water and the food chain, posing health risks (e.g., inflammation, endocrine disruption). Coastal waters in West Africa now show microplastic concentrations up to 1,000 particles per cubic metre, largely sourced from domestic plastic refuse.[54,55]

Drivers of ultra-processed food consumption in West Africa

The rapid proliferation of UPFs in West Africa is driven by a complex interplay of factors within external and personal food environments, shaping UPF availability, affordability, appeal and individual choices. This section explores the drivers of UPF consumption through the Innocenti Framework on Food Systems for Children and Adolescents.[56]

External food environment

Supply, marketing and physical access

Colonial legacies have profoundly shaped West Africa's food systems, laying the groundwork for the rise of UPFs. European colonial powers reoriented agriculture towards export crops and introduced refined products, such as white sugar, flour, canned milk and sweetened beverages, which accelerated dietary shifts that persist today. Trade liberalization and globalized food supply chains have also vastly expanded UPF availability in urban and rural West Africa. Modern retail outlets, such as supermarkets, convenience stores and fast-food franchises have grown rapidly in cities, while informal vendors have brought packaged snacks and drinks into remote areas, displacing traditional fresh foods, such as millet and leafy vegetables. Weak import regulations and regional trade policies enable cheap, low-quality UPFs to flood markets, limiting access to healthier staples, especially in low-income areas. "Food deserts" emerge, where UPFs become the default option, readily available near schools, street corners and local shops.

In parallel, the rapid growth of online food ordering and delivery platforms in African cities has made UPFs even more accessible, with motorbike couriers enabling faster, easier purchase of fast foods, snacks and sugary drinks in urban centres.[1,8] Delivery apps further intensify UPF penetration by meeting the demand for convenience, leveraging promotions to attract consumers and making fast-food readily available and accessible in homes and low-income neighbourhoods.[57] Around schools, independent vendors and sales of confectionery and SSBs heighten children´s exposure to and opportunities to purchase UPFs.[5,58] In contrast, school meals can buffer reliance on street foods.[59] Healthier school meals and school food environments have been shown to relate to higher dietary diversity and lower anaemia in Ghana.[60]

Pricing and affordability

UPFs often hold a price advantage over fresh, nutrient-rich foods. Aggressive pricing strategies such as sachetization (i.e., selling products in small, affordable packets) enable even the poorest consumers and children to buy sugary drinks and sugary or salty snacks, making unhealthy calories a cheap source of energy.[61] For example, instant noodles cost less than US$0.25 in Ghana or ₦100 in Nigeria, providing a quick, filling meal, while fruits and vegetables remain expensive.[62] Limited or weak fiscal policies on sugary drinks and snacks, alongside rare subsidies for healthy foods, reinforce UPFs as the path of least resistance in everyday diets.[63]

Marketing and product formulation

Marketing is the engine of UPF demand, extending beyond traditional advertisements to a sophisticated system targeting consumers from childhood. To influence consumers, food companies incorporate the "seven Ps": they engineer hyper-palatable products; set irresistible prices; saturate places (shops, kiosks, schools); flood promotion across media; mobilize people (influencers, vendors); streamline processes for speed and reach; and deploy physical evidence (packaging, displays) that keeps UPFs highly visible and desirable. Child-directed, child-targeted or child-friendly packaging, school sponsorships and digital marketing on social media normalize UPF consumption from an early age.[64,65]

The rise of digital marketing has further amplified reach: companies deploy algorithmic ads on Facebook, Instagram and TikTok, and enlist influencers to promote snacks and drinks to their young followers.[65,66] These stealth promotions blur the line between entertainment and advertisement, embedding brands into the fabric of youths' social media experience.[67, 68] The use of product appeal, competitions and hashtags has been significantly associated with higher user engagement with fast-food promotional content.

In West Africa, advertisements for UPFs are not only ubiquitous, they are now culturally branded as symbols of modernity and success, marginalizing traditional foods.[5] Recent surveys in Accra found that 42 per cent of all outdoor advertisements within 250 m of schools were for foods or drinks and 70 per cent of those were unhealthy UPFs, with sugary beverages the top category.[5] Similar studies at Ghana's largest university found that nearly 60 per cent of food and drink ads on campus were promoting unhealthy products, especially sodas.[58] In Nigeria, adolescent-directed strategies are frequently used by fast-food brands.[69] These include *emotional appeal* usually portraying images of young people expressing positive emotions such as fun or happiness while sharing fast-food, *teen language* often involving the use of slang, as well as *product appeal*, with food quality described using alluring words, such as "hot", "delicious", "simple" accompanied by high-definition images and videos.
Nigeria's soft drink market leader, Coca-Cola Nigeria, uses youth-directed promotional strategies such as Coke Studio, which features campaigns starring popular Nigerian and global music celebrities.[70] Much of the food marketing in West Africa currently operates with minimal regulatory restraint, despite WHO guidelines calling for stringent limits on marketing of unhealthy foods to children.[71]

Policy and regulatory environment

Macro-level political and legal drivers shape the external food environment. Weak governance, patchy policy uptake and suboptimal enforcement tilt the balance towards UPF proliferation.[72,73] Front-of-pack labelling (FOPL) regulations and marketing restrictions on unhealthy foods are limited in many West African countries. Industry lobbying often undermines stronger regulation by framing it as a threat to economic growth and investment. Legal frameworks that could regulate food quality, additives and marketing are underutilized, allowing unchecked flavour engineering and aggressive commercial practices. Strengthening political will and legal mechanisms represents a critical opportunity to address UPF growth. This is discussed in detail in the next section.

Urbanization, globalization and retail transformation
Rapid urbanization and population growth in West Africa - where city populations have increased by 500 million since 1990 - are among the key forces reshaping the region's food systems. Smallholder farms struggle to meet urban demand, while supermarkets and importers supply global UPF brands at the expense of local produce.[74] Urban food environments sometimes lack fresh food outlets but have abundant fast-food and snack vendors, creating "food deserts" and "food swamps". Drawing on household food-expenditure data from Nigeria, Uganda and the United Republic of Tanzania, Dolislager et al. distinguish between unprocessed, low-processed and ultra-processed foods (UPFs).[75] The authors found that while unprocessed foods continue to represent the largest share of food spending across all three countries, particularly in rural areas, UPFs already comprised about 12 per cent of food consumption expenditure for the poor, rising to 20 per cent for lower-middle and 32 per cent for upper-middle-income groups. Across rural and urban settings, expenditure on UPFs increases with income and is higher in urban households, reflecting the growing influence of modernization, convenience and changing food retail environments. Together, these trends create conditions in which fresh foods become less dominant, and time poverty encourages grab-and-go UPF options and snacking behaviours.

Personal food environment

Poverty, accessibility and diet entrapment
Individual food choices in West Africa are profoundly shaped by poverty and economic constraints. For low-income families, the pressing priority is to avoid hunger and stretch limited budgets. This drives households towards the cheapest sources of calories, which are often energy-dense but nutrient-poor processed foods. Over the past five years, the cost of a healthy diet (measured in international dollars), rose from $3.06 in 2019 to $4.21 in 2024. Research on poverty and obesity has shown that energy-dense foods composed of refined grains, sugars and oils tend to cost significantly less per calorie than fruits, vegetables or lean proteins.[76] Thus, impoverished households face an economic incentive to purchase filling but nutrient-poor items, such as instant noodles, biscuits and sugary drinks, because they offer more energy per dollar spent than many other foods. Referred to as the energy density–cost hypothesis,[77] this phenomenon in West Africa manifests as a cycle of dietary entrapment: poverty drives people to UPFs for short-term caloric needs, but over time, the health impacts (obesity, diabetes, hypertension) can deepen poverty via medical costs and reduced productivity. While wealthier households in several African settings currently have greater access to UPFs, spend more on UPF[75] and show higher overweight/obesity – UPF uptake (and related weight gain) is rising fastest among poorer households.[8] This crossover is likely to quicken in West Africa, as sachetization, youth-targeted marketing, and the spread of discount supermarkets and informal snack vendors lower price and access barriers for poorer households. Convenience also drives demand as long work hours and limited cooking time increase reliance on ready-to-eat UPFs, such as instant noodles, canned soups and packaged snacks.[78] Single-serve packets widely sold at transit stations, schools and workplaces facilitate daily consumption, replacing home-cooked meals and entrenching unhealthy dietary patterns.

Taste preferences, sensory conditioning, psychosocial stress and emotional eating
The personal food environment is where biology and psychology intersect, shaping how tastes and cravings are formed and reinforced. Early-life flavour exposure can create lasting preferences.[79,80] In West Africa, as traditional complementary feeding yields to commercial baby foods and flavoured snacks, children increasingly acquire a strong preference for sweetness from the outset.[39] Repeated exposure to sugary cereals, biscuits and sweetened beverages conditions palates to expect intense sweetness, while salty chips and instant noodles set a higher baseline for salt. At the same time, the urban stressors that are common in cities drive emotional eating of UPFs, which have dopamine-stimulating properties that make them appealing under strain.[81] For many, eating, especially sweet or fatty treats, becomes a coping mechanism to blunt negative emotions rather than satisfy hunger. Social modelling then reinforces these habits: in schools and peer groups, frequent UPF snacking becomes normalized. Experts have shown that UPFs are central to this cycle because they rapidly

trigger pleasurable sensations through neurochemical pathways; where high-sugar, high-fat foods spur dopamine and endorphin release, briefly improving mood. This has been likened to "self-medication," where a chocolate bar or packet of cookies momentarily dampens anxiety, sadness or frustration by activating reward centres.[81] Breaking this loop to address the driver of UPF consumption requires nutrition education, accessible mental health support and stress-reduction tools.

Cultural shifts and social norms

Food choices are not merely individual decisions; they are embedded in cultural identity and social norms. Rapid globalization and urbanization in West Africa have fuelled a nutrition transition with deep social meaning. Western-style UPFs – burgers, pizza, fried chicken, soft drinks and instant noodles – are increasingly seen as markers of affluence, modernity and cosmopolitan identity.[8] By contrast, traditional foods, such as cassava with leafy sauce or millet porridge, are sometimes perceived, especially by urban youth, as unsophisticated or symbols of rural poverty.

Media and advertising reinforce these views, portraying branded fast foods as synonymous with success and happiness, while marginalizing local cuisines. Aspiration, peer influence, and the desire for social acceptance therefore amplify UPF consumption: a middle-class family may choose packaged cereal and juice over bean porridge, and children may pressure parents to buy branded snacks to fit in with peers. Sharing processed snacks is increasingly a social norm, displacing older practices of sharing fruits or home-cooked foods. This "culinary colonialism" displaces local food diversity and erodes culinary knowledge and practices, such as the process of fermenting and cooking indigenous staples like gari (cassava root flour) or dawadawa (a condiment made from locust bean seeds). At the same time, high sugar and salt profiles dull palates and steer children towards sweeter, saltier products.[82] The drivers of the popularity and consumption of UPFs are complex; in Senegal, only half of survey participants felt they could cook without bouillon despite awareness of excess-salt harms.[83]

Time poverty

Modern urban life in West Africa has introduced a subtle but powerful driver of UPF consumption – time scarcity and shifting daily rhythms. As cities expand and commutes lengthen, opportunities for traditional cooking and shared meals shrink. Slow cooking yields to fragmented eating and "on-the-run" snacking. Concepts of tempo, periodicity and synchronization explain how rushed routines, irregular snacking and social timetables embed UPFs into everyday life, as observed in Ghana and elsewhere.[78,84] For example, a young professional in Lagos might skip breakfast, grab a meat pie and soda mid-morning and rely on instant noodles at night – choices driven by time poverty and convenience.

Gendered household labour roles intensify this pattern. Across many West African settings, women often carry out a disproportionate amount of the cooking, caregiving and domestic work, often alongside paid employment, which reduces the time available to prepare meals.[85] Time- and labour-saving products, such as bouillon cubes, seasoning mixes, instant noodles and ready-to-heat items, become practical shortcuts. Children's preferences, which are amplified by marketing, character licensing and school-gate promotions, turn convenience foods and SSBs into "peace-keeping" options for busy caregivers.[86]

Policy, regulatory and programmatic responses

The evidence, though incomplete, is sufficient to justify a concerted regional response to the rise of UPFs in the diets of children and adolescents. The global evidence base for policy, regulatory and programmatic responses is presented in Chapters 2, 3 and 4 of this report. In this chapter, we draw on the global evidence where it offers tested design principles, implementation lessons and impact benchmarks for developing policy, regulatory and programmatic responses that can be adapted to West African political economies and food environments.

The call for stronger government action stems from both the responsibility and the opportunity to reduce the health harms associated with UPFs, particularly among children and adolescents. In West Africa, momentum is beginning to build: Senegal has introduced regulations to reduce salt in bouillon products, Ghana and Nigeria have implemented taxes on SSBs, and FOPL is now under active consideration across the region. Yet, regulating an industry deeply embedded in daily life remains challenging.

Evidence from West Africa and global exemplars show that well-designed measures can shift diets and improve health outcomes.[2,72,87] These collective insights motivate the following statement, adapted from the Healthier Diets for Healthy Lives Project, Ghana:

"If the governments of West Africa implement comprehensive policy measures – a mix of low-agency and high-agency food environment policy measures to inform and empower; to guide and influence consumers; to disincentivize consumption of unhealthy foods; and to incentivize the consumption of healthier foods, then food systems actors (producers and consumers) will make immediate or strategic decisions that reduce the availability, appeal, and consumption of unhealthy foods, and conversely, increase the availability, appeal and consumption of healthier alternatives".[88]

Using global datasets, we assessed the status of West African countries for 10 legal measures and policies related to breastfeeding and first foods, school food environments, marketing to children, food reformulation, food labelling, food subsidies and taxation (*Figure 6*). Although this set does not encompass all necessary measures, the analysis provides insight into current progress in the region. Only mandatory measures were considered because research has consistently shown that voluntary measures are considerably less effective.

Fiscal policies: taxes and subsidies

Taxes on unhealthy foods, including SSBs and other UPFs, alongside tax incentives for healthier options, should be applied simultaneously. Excise taxes on SSBs are now widely implemented globally, with evidence they can cut SSB consumption.[89] In West Africa, Ghana's 2023 Excise Duty Amendment Act introduced a 20 per cent tax on SSBs, among the region's highest, with proposals to extend it to other UPFs via a nutrient profile model. Nigeria's 2022 Finance Act imposed a ₦10/litre levy (10–12 per cent) on sweetened drinks – the region's first dedicated SSB tax – with models predicting reductions in consumption of 15–20 per cent; evaluations of the tax are ongoing.[90] Senegal's SSB taxes lack formal assessment. In line with WHO recommendations (including the recent 3by35 initiative, which aims to raise the prices of tobacco, alcohol and sugary drinks through tax increases), governments should raise SSB taxes to at least 20 per cent[91] and earmark revenues for nutrition/NCD prevention.[92]

Subsidies and price incentives are equally vital. In Ghana, sweetened tea or soda sachets cost <0.5 GHS ($0.08), while fruit costs 5–10 GHS. Policies such as value added tax (VAT) exemptions on produce, vouchers for maternal and child nutrition and subsidized school meals can narrow this affordability gap. International evidence indicates that these measures improve affordability and dietary quality.[93] Ghana currently exempts staples from VAT but not import duties.[94]

Tax design in West African countries should be tiered by sugar content, include powders/syrups, and be indexed to inflation to close "sachet" loopholes. Implementation will require routine monitoring, regional coordination via ECOWAS to limit cross-border leakage, countering industry lobbying, strengthening enforcement capacity and public support for the policy.

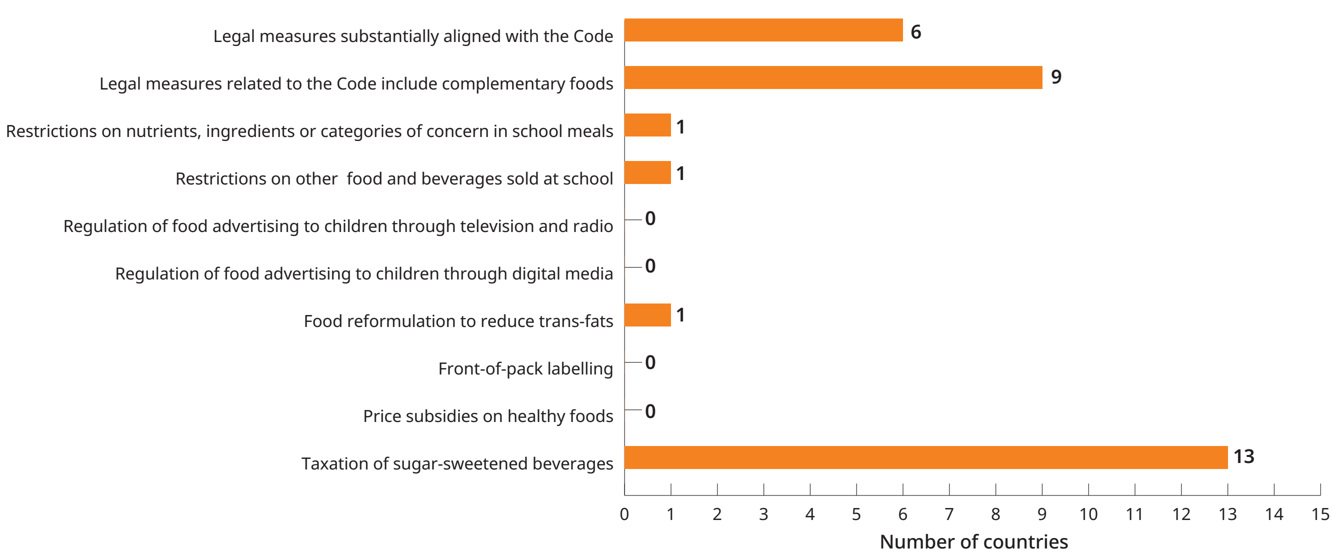

FIGURE 6. **Number of countries in West Africa with mandatory legal measures or policies to protect children from unhealthy food environments, by country income status**

Note: See *UNICEF Child Nutrition Report 2025, Feeding Profit* for the set of policies and sources of data. The Code refers to the International Code of Marketing of Breast-milk Substitutes and subsequent World Health Assembly resolutions. ECOWAS countries and Burkina Faso, Mali and Niger were included in the analysis.

Marketing regulations
Aggressive marketing of UPFs to children and adolescents is a well-established driver of unhealthy diets. UNICEF, WHO and other United Nations agencies now call for comprehensive restrictions on unhealthy food advertising to children.[71,95] For West Africa, it is important to consider the scope and enforceability of marketing restrictions. Policies should cover multiple marketing platforms (broadcast media, billboards, sponsorships, point-of-sale, digital and social media), cover broad time bands and explicitly cover schools and child-focused spaces (including transport to and from school). A simple, regionally harmonized nutrient profile model would help define which products are restricted and ease enforcement across borders. Currently, most countries in West Africa lack mandatory labelling or marketing restrictions. Ghana's Food and Drug Administration has guidelines, but enforcement is limited. Nigeria, Senegal and Cabo Verde also lack comprehensive restrictions. In these countries, key barriers are/will include fragmented mandates across ministries and regulators, limited monitoring capacity, pervasive cross-border media, rapid growth of digital marketing (influencers, advertising technology) and industry lobbying. Therefore, practical adaptations may be needed to make implementation of these regulations more feasible – such as phased implementation (beginning with restrictions on marketing in school settings and for child-directed content, then expanding to a daytime-wide watershed), pre-clearance of ads for child-audience channels, escalating fines and licence consequences, mandatory disclosure/registries for food marketing online, and civil society monitoring. Regional coordination through ECOWAS can reduce cross-border spillovers of marketing content and align policy definitions, while pairing restrictions with public communication campaigns helps build support.

Labelling regulations
FOPL provides clear, interpretive information on packaged foods to help consumers identify unhealthy products. Evidence shows their impact.[96] In West Africa, most packaged foods carry back-of-pack information per Codex Alimentarius standards. Such labels are considered "high-agency" interventions, requiring consumers to expend significant effort to interpret nutrition data. Unsurprisingly, their impact has been limited. Governments in the region should move towards fit-for-purpose local FOPL systems covering salt, sugar, unhealthy fats and UPFs, while building regulatory capacity for enforcement. Draft policies in Ghana and civil society proposals in Nigeria are promising steps, but no binding legislation is yet in place. As governments in the region are being encouraged to roll this out, longstanding challenges must be addressed, including limited regulatory capacity for pre-market label approval and market surveillance; multilingual contexts; and potential barriers (such as very small packaging (sachets) with little label real estate); a large informal retail sector; and industry pushback.

FOPL should also cover commercial foods for infants and young children. The International Code of Marketing of Breast-milk Substitutes and World Health Assembly resolution 69.9 (on ending the inappropriate promotion of foods for infants and young children) provide the framework, yet implementation is partial. Governments should fully implement the Code and subsequent World Health Assembly decisions, set sugar/salt limits in infant cereals and purées, and restrict branding that misleads caregivers. Popkin and Laar,[63] underscore the urgency of extending protections to children under 3 years of age and adopting front-of-pack warning labels that prohibit added sugar and limit sodium. These steps would protect the youngest consumers and support healthier diets over the long-term.

School and public procurement environments
Schools are uniquely powerful settings for shaping lifelong diets. In West Africa, most countries still lack binding, comprehensive standards on the nutritional quality of foods and beverages sold or provided in schools. Home-grown school feeding schemes, such as those in Cabo Verde, Ghana, Nigeria and Senegal, rightly prioritize the prevention of hunger and micronutrient deficiencies, but very few programmes – only about 10 per cent in Africa – explicitly target the prevention of obesity.[97] Meanwhile, informal sales of SSBs and UPF snacks on and around school campuses are common and often child-targeted, as shown in Accra, Ghana. The Nutrition-Friendly Schools Initiative in Ghana is beginning to integrate diet and physical activity goals, but engagement remains at pilot or early policy-integration stages.[98]

A West Africa-appropriate approach would make schools "protected spaces". This would include mandatory nutrient standards and SSB bans for all foods sold or provided in schools; procurement of healthy school meals; and prohibitions on branding, sponsorships and promotions in school settings and at school events. Extending rules to the school perimeter is important where informal retail is dense, including through vendor licensing, zoning buffers and time-of-day restrictions. To maintain cultural acceptability and support livelihoods, standards should be aligned with local staples and home-grown supply chains. The main barriers to protecting school environments are fragmented mandates across ministries, limited inspection capacity, a large informal vendor base and industry lobbying. Practical fixes include phased implementation (beginning with restrictions on SSBs in schools), simple checklist compliance tools, training and incentives for caterers, parent–teacher monitoring and procurement contracts that preference local farmer cooperatives.

Food and beverage industry regulation and accountability

A consistent finding in public health nutrition is that voluntary self-regulation by the food and beverage industry overwhelmingly fails to protect consumers without robust legal frameworks and government enforcement. Unfortunately, this trend is evident in many countries, where major UPF manufacturers and retailers resist stringent regulations, preferring voluntary codes, minimal fines or weak enforcement that allow them to continue their aggressive marketing and keep unhealthy products widely available.[99,100]

Legal and regulatory instruments, such as mandatory marketing restrictions, FOPL laws, taxation on SSBs and strict advertising bans, have been shown to effectively reduce unhealthy food consumption and associated NCDs in high-income countries. In contrast, voluntary measures by industry, such as self-regulation or their variants (including quasi-regulation or co-regulation) consistently demonstrate limited impact, lack transparency and often serve as tactics to delay or weaken government action.[99,100]

For West African governments, the evidence underscores the imperative to move beyond voluntary agreements and adopt comprehensive, legally binding policies that are rigorously monitored and enforced. West Africa must move from simply educating the public to holding systems and their actors (e.g., the UPF industry) accountable for the environments they shape.

Regional coordination and cross-sector collaboration to address the risk of ultra-processed foods in West Africa

Given that food markets and media transcend national borders, West African countries stand to benefit significantly from regional harmonization of policies addressing UPFs. ECOWAS and the West African Health Organization (WAHO) are well-positioned to lead collaborative policy development efforts. For example, ECOWAS could establish unified nutrient profiling and labelling standards, ensuring that a product classified as "unhealthy" in Ghana is similarly regulated in Nigeria, Senegal and other member states. Coordinated regulations on marketing, such as synchronized bans on TV advertisements, would prevent food companies from circumventing restrictions by shifting commercials to neighbouring countries' channels. In addition, regional standard regulatory frameworks, such as ECOQMARK (an ECOWAS product certification mark), can serve as essential tools for harmonizing food quality and safety standards across member countries, supporting consistent enforcement and reducing regulatory fragmentation.

ECOWAS and WAHO can also pool technical and financial resources to strengthen surveillance capacities. Capacity building initiatives, including joint training workshops, can equip regulatory staff with the skills to interpret international guidelines and draft robust, enforceable legislation. Moreover, political solidarity among countries can accelerate progress; for instance, if Ghana implements strong double-duty food-based policies (those that tackle both undernutrition and overweight and obesity), such as food-related fiscal measures, FOPL laws, marketing restrictions and public food procurement policies, ECOWAS can facilitate the sharing of Ghana's legislative framework and best practices with neighbouring nations to promote wider regional adoption. To operationalize this, ECOWAS/WAHO could issue model laws/regulations for member adoption, set up mutual recognition and joint enforcement taskforces, and create a West African observatory on UPFs (obesogenic foods monitoring network) to enable systematic tracking of stakeholder action, dietary trends, data-sharing and violations in real time.

Conclusions and recommendations

West Africa is experiencing a rapid nutrition transition marked by rising availability and consumption of UPFs. At the macro level, globalization, trade liberalization, urbanization and supermarket expansion, combined with aggressive marketing, have expanded access to UPFs. At the community level, unhealthy food environments in schools, markets and workplaces shape choices, while at the personal level, time poverty, cultural perceptions and early socialization reinforce reliance on UPFs.

As a result, UPFs are displacing nutrient-rich traditional foods and driving the triple burden of malnutrition: persistent undernutrition, hidden hunger and rising overweight and obesity. Children and adolescents are particularly vulnerable to UPFs because they are growing, developing and forming lifelong taste preferences. They are also highly susceptible to marketing.

Currently, significant knowledge gaps limit effective response. First, nationally representative dietary data, especially for children and adolescents, remain scarce. Second, marketing reach and influence, especially in digital spaces, are poorly documented. Third, local food composition data are insufficient to build nutrient profile models adapted to West Africa. Further, the evidence on long-term effects of early UPF exposure and on the effectiveness of fiscal and regulatory policies in the region is still limited.

Therefore, priority evidence needs include:

1. Nationally representative dietary intake surveys across the life course.
2. Longitudinal cohort studies to establish causal links between UPF consumption and health outcomes.
3. Food environment audits in schools, workplaces and informal markets.
4. Systematic analyses of commercial determinants, such as industry marketing and political influence.

Addressing the threat of UPFs requires urgent, coordinated action at multiple levels by governments, regional bodies, United Nations agencies, academia and civil society.

We conclude with the following recommendations:

Governments, regulatory agencies and regional platforms:

- Develop local context-specific nutrient profile models and use them to guide fiscal measures, marketing restrictions, front-of-pack labels and procurement policies.
- Implement bundled policies – combining SSB and UPF taxes with subsidies for healthy foods, school food standards, FOPL and restrictions on unhealthy food marketing.
- Ensure policy coherence locally and coordinate regionally through ECOWAS/WAHO; and harmonize fiscal and regulatory measures and labelling standards to prevent cross-border loopholes.

United Nations agencies, academic institutions and civil society organizations:

- United Nations should elevate the UPF conversation globally via the United Nations General Assembly, the United Nations Food Systems Summit, the World Health Assembly and Nutrition for Growth Summit platforms to raise the profile of UPF regulation and support technical capacity, providing training, surveillance tools and platforms for knowledge-sharing among West African governments.
- Academia should investigate structural drivers of UPF consumption, including trade, investment and industry tactics shaping food systems and policies. In addition, academia should leverage existing networks, such as the Africa Food Environment Research Network, to build capacity for ongoing surveillance of UPF consumption, marketing practices and policy impacts, including establishing regional observatories on government and industry action, marketing strategies and dietary trends (e.g., ECOWAS obesogenic foods policy monitoring initiative).
- Civil society should advocate for healthy food environments, build community awareness, mobilize public support for healthier diets and monitor industry influence, including tracking conflicts of interest and exposing corporate strategies undermining public health.

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Chapter 2

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Chapter 3

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Chapter 4

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Chapter 5

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ANNEX 1. THE FOUR GROUPS WITHIN THE NOVA CATEGORIZATION SYSTEM

Nova group	Definition	Examples
Unprocessed or minimally processed foods	Unprocessed foods: edible parts of plants (fruits, seeds, leaves, stems, roots, tubers) or of animals (muscle, offal, eggs, milk), and also fungi, algae and water, after separation from nature. Minimally processed foods: unprocessed foods altered by industrial processes, such as removal of inedible or unwanted parts, drying, crushing, grinding, fractioning, roasting, toasting, boiling, pasteurization, refrigeration, freezing, placing in containers, vacuum packaging, non-alcoholic fermentation, and other methods that largely preserve the food matrix and do not add salt, sugar, oils, fats or other food substances to the original food. The main aim of these processes is to extend the life of unprocessed foods, enabling their storage for longer use, and, often, to make their preparation easier or more diverse. Additives are usually not necessary and only exceptionally found in minimally processed foods.	Fresh, squeezed, chilled, frozen or dried fruits and leafy and root vegetables; grains such as brown, parboiled or white rice, corn cob or kernel, wheat berry or grain; legumes such as beans, lentils and chickpeas; starchy roots and tubers such as potatoes, sweet potatoes and cassava; fungi such as fresh or dried mushrooms and yeast; meat, poultry, fish and seafood, whole or in the form of steak fillets and other cuts, fresh or chilled or frozen; eggs; fresh or pasteurized milk; fresh or pasteurized plain yogurt; fresh or pasteurized fruit or vegetable juices (with no added sugar, sweeteners or flavours); grits, flakes or flour made from corn, wheat, oats or cassava; raw or toasted tree and ground nuts and other oily seeds (with no added salt or sugar); herbs and spices used in culinary preparations, such as thyme, oregano, mint, pepper, cloves and cinnamon, whole or powdered, fresh or dried; tea, coffee and drinking water. Also, foods made up of two or more items in this group, such as dried mixed fruits, granola made from cereals, nuts and dried fruits with no added sugar, honey or oil; pasta, couscous and polenta made with flours, flakes or grits and water; and foods with vitamins and minerals added generally to replace nutrients lost during processing, such as wheat or corn flour fortified with iron and folic acid.
Processed culinary ingredients	Substances obtained directly from group 1 foods or from nature by industrial processes such as pressing, centrifuging, extracting, refining, dewatering and mining. Processes here aid in the creation of products used in the seasoning and cooking of group 1 foods and their use in dishes and meals prepared from scratch. Additives are usually not necessary and only exceptionally found in processed culinary ingredients.	Vegetable oils crushed from seeds, nuts or fruits (notably olives); butter and lard obtained from milk and pork; sugar and molasses obtained from cane or beet; honey extracted from combs and syrup from maple trees; vinegar; starches extracted from corn and other plants, and salt mined or from seawater. Also, products consisting of two group 2 items, such as salted butter, and group 2 items with added vitamins or minerals, such as iodized salt.
Processed foods	Relatively simple industrially manufactured food products made by adding at least one group 2 ingredient (such as salt, sugar, oil or fat) to group 1 foods, using preservation methods such as canning and bottling, and, in the case of breads and cheeses, using non-alcoholic fermentation and boiling or baking. Processes and ingredients here aim to increase the durability of group 1 foods and make them more enjoyable by modifying or enhancing their sensory qualities. Processed foods often contain additives that prolong product duration, protect original properties or prevent proliferation of microorganisms (such as preservatives and antioxidants), but not additives with cosmetic functions (see next group).	All canned or bottled vegetables and legumes in brine; salted or sugared nuts and seeds; fruits in syrup; and dried or canned fish. Breads, cheese, pastries, cakes, cookies (biscuits); sweet or savoury snacks; cured meats; and ready-to-heat products such as burgers, and pre-prepared pies, pasta and pizza dishes when these products are made exclusively from group 1 foods and salt, oil, sugar or other Nova group 2 ingredients and do not contain classes of additives with cosmetic function.

Ultra-processed foods	Industrially manufactured food products made up of several ingredients (formulations) including sugar, oils, fats and salt (generally in combination and in higher amounts than in processed foods) and food substances of no or rare culinary use (such as high-fructose corn syrup, hydrogenated oils, modified starches and protein isolates). Group 1 foods are absent or represent a small proportion of the ingredients in the formulation. Processes enabling the manufacture of ultra-processed foods include industrial techniques such as extrusion, moulding and pre-frying; application of additives including those whose function is to make the final product palatable or hyper-palatable such as flavours, colourants, non-sugar sweeteners and emulsifiers; and sophisticated packaging, usually with synthetic materials. Processes and ingredients here are designed to create highly profitable (low-cost ingredients, long shelf-life, emphatic branding), convenient (ready-to-(h)eat or to drink), tasty alternatives to all other Nova food groups and to freshly prepared dishes and meals. Ultra-processed foods are operationally distinguishable from processed foods by the presence of food substances of no culinary use (varieties of sugars such as fructose, high-fructose corn syrup, fruit juice concentrates, invert sugar, maltodextrin, dextrose and lactose; modified starches; modified oils such as hydrogenated or interesterified oils; and protein sources such as hydrolyzed proteins, soya protein isolate, gluten, casein, whey protein and 'mechanically separated meat') or of additives with cosmetic functions (flavours, flavour enhancers, colours, emulsifiers, emulsifying salts, sweeteners, thickeners and anti-foaming, bulking, carbonating, foaming, gelling and glazing agents) in their list of ingredients.	All carbonated soft drinks; reconstituted fruit juices and 'fruit' drinks; 'cocoa' and other dairy drinks, and energy drinks; flavoured yogurt; candies (confectionery); margarines; poultry and fish 'nuggets' and 'sticks', sausages, hot dogs, luncheon meats and other reconstituted meat products; plant-based meat substitutes; extruded breakfast 'cereals'; powdered 'instant' soups, noodles and desserts; infant formulas and 'follow-on' milks; and 'health' and 'slimming' products such as meal-replacement shakes and powders. Breads, pastries, cakes, cookies (biscuits); sweet or savoury snacks; cured meats; and ready-to-heat products such as burgers, and pre-prepared pies and pasta and pizza dishes when these products are made up of food substances of no culinary use and or contain classes of additives with cosmetic function.

Source: Used with permission from Martinez-Steele, E., Khandpur, N., Batis, C. et al., 'Best practices for applying the Nova food classification system', *Nat Food,* vol. 4, 2023, pp. 445–448.

ANNEX 2. A SUMMARY OF STUDIES ON ULTRA-PROCESSED FOODS AND OVERWEIGHT AND OBESITY IN CHILDREN AND ADOLESCENTS

Author / year / setting	Study sample (cohort/ survey name or recruitment source)	Sample characteristics (age at baseline, follow-up duration, sample size)	Dietary assessment / UPF measure	Analytical method / confounders adjusted	Outcomes assessed	Main findings
Cohort studies						
Du 2024 United States	Growing Up Today Study (GUTS), 1 and 2	GUTS 1: Participants aged 7–17 years (1996–2001), n=15,797 GUTS 2: Participants aged 7–17 years (2004–2011), n=9,720	Food frequency questionnaire (FFQ) of seven food categories consumed in the past year: drinks, dairy, main dishes, other foods, bread & cereals, fruits & vegetables, snacks/desserts) % of energy intake from UPF	Multivariable repeated-measure linear mixed models Socioeconomic status and lifestyle factors	Changes in BMI annually and over 2, 4–5 and 7 years	Each 10 per cent increase in UPF intake was associated with modest but significant body mass index (BMI) gains in both GUTS1 and GUTS2 cohorts – 0.01 to 0.02 units per year and 0.07 to 0.09 units over 4–5 years. In GUTS1, higher intake of specific UPFs (e.g., breakfast cereals, savoury snacks, pizza, burgers and ready-to-eat meals) was linked to annual BMI increases of 0.02 to 0.07. No association was observed between UPF intake and overweight/obesity risk.
Magalhães 2024 Portugal	Generation XXI population-based birth cohort	Participants at 4, 7, 10 and 13 years (n range: 5885–6272)	FFQ (35–41 food items consumed in the previous six months; 35, 38 and 41 items at ages 4, 7 and 10 years, respectively) % of grams intake from UPF Four UPF consumption patterns were identified: consistently low (15.4 per cent), consistently intermediate (56.4 per cent), increasing from low to high (11.2 per cent), and consistently high consumption (17.1 per cent)	Mixed-effects model with linear and quadratic terms for age Sex, birthweight, mother's pre-pregnancy BMI, mother's education, consumption of the remaining food groups according to processing level (unprocessed / minimally processed foods, processed culinary ingredients, processed foods)	Outcome trajectories of body weight (kg), height (cm), BMI z-score, waist circumference (WC) (cm) and fat mass (FM) percentage	Compared to consistently low UPF intake, both consistently high and intermediate UPF consumption patterns were associated with greater acceleration in body weight, WC, and FM percentage. High UPF intake was also linked to increased BMI z-scores and reduced height gain over time.
Santos 2024 Brazil	Pelotas Birth Cohort	Participants at 6 and 15 years (n=1,584)	FFQ Those in the higher tertile of UPF consumption at both follow-ups were the 'always-high consumers'	Logistic and linear regression	Fat mass (FM-kg) Fat-free mass (FFM-kg) %FM %FFM FM index (FMI-kg/m²) FFM index (FFMI-kg/ m2)	Consistently high UPF consumption was associated with higher odds of excessive weight and increased FM and fat mass index (FMI). Males in the always-high group had nearly double the FM and FMI compared to the always-low group, while females showed an average 32 per cent increase in both measures.

Author / year / setting	Study sample (cohort/ survey name or recruitment source)	Sample characteristics (age at baseline, follow-up duration, sample size)	Dietary assessment / UPF measure	Analytical method / confounders adjusted	Outcomes assessed	Main findings
Zancheta 2024 Chile	Food and Environment Chilean Cohort	Participants aged 4–6 years (2016–2018, n=962)	24-hour recalls (743 children with one and 183 with two measures of 24-hour recalls) Usual consumption of UPF in % of energy and % of grams (estimated using the Multiple Source Method)	Linear regression Mothers' BMI, age, educational level, and work outside home status, and children´s sex, age, screen time, and usual total caloric intake	Adiposity indicators: BMI z-score, WC (cm), and FM (kg and %)	Positive association between UPF and BMI z-score, WC in cm, log-fat mass in kg and log-percentage fat mass.
Gyimah 2023 Ecuador	Prospective cohort based on the Lulun trial	Participants at 2 years (n=125)	FFQ, adapted to the Ecuadorian context, including sugar-sweetened beverages, sugary foods and salty snacks, with intake ranked into tertiles Subgroups of UPF: Savoury snacks	Linear regression Sex, age, household/ caregiver socioeconomic characteristics, minimum dietary diversity, and group assignment from the Lulun trial	Weight-for-height z-score	Intake of savoury UPF was negatively associated with weight-for-height z-scores.
Heerman 2023 United States	Prospective cohort based on the Growing Right Onto Wellness (GROW) trial	Children 3–5 years (n=595); 3 years	Three 24-h diet recall UPF intake in kcal/day	Longitudinal mixed-effects linear regression Age, sex, mean kcal/ day, mean daily % of time spent in moderate-vigorous physical activity, parent ethnicity, household food security, household participation in federal nutrition assistance programmes and random assignment in trial	BMI z-score	Compared with low UPF intake, high UPF intake was associated with a 1.2 higher BMI z-score at 36 months for three-year-olds (95% confident interval (CI)=[0.5, 1.9]; p<0.001) and a 0.6 higher BMI z-score for four-year-olds (95% CI=[0.2, 1.0]; p=0.007). The difference at 36 months was not statistically significant for five-year-olds (0.1; 95% CI=[0.6, 0.4]; p=0.7) or overall (0.4; 95% CI=[0.02, 0.7]; p=0.07).
Pereyra-González 2023 Uruguay and Brazil	Two prospective cohorts: Encuesta de Nutrición, Desarrollo Infantil y Salud (ENDIS); Pelotas Birth Cohort	Children 2–5 years (n=6,468) 2 years	ENDIS: 24-h recall (first wave) and FFQ assessing diet during previous week (second wave) Pelotas: FFQ assessing diet during the previous day UPF intake frequency (# of items/week)	Poisson regression Birth weight z-score, sex, age, country, exclusive breastfeeding duration and time between measures	BMI z-scores	UPF consumption was associated with obesity (risk ratio: 1.10, 95% CI: 1.02–1.18). However, after adjusting for weight at birth, age, sex, breastfeeding, country and time between waves, the association lost statistical significance.

Author / year / setting	Study sample (cohort/ survey name or recruitment source)	Sample characteristics (age at baseline, follow-up duration, sample size)	Dietary assessment / UPF measure	Analytical method / confounders adjusted	Outcomes assessed	Main findings
Costa 2022 Brazil	Pelotas Birth Cohort	Children at ages 2 and 4 years (n=3,498)	UPF consumption assessed at ages 2 and 4 years from maternal/caregiver yes/no reports on nine pre-defined items, generating a score from 0 to 9 based on the Nova classification	Generalized estimation equations Sex and birth weight of the child, maternal age, education, skin colour and wealth index of the family at baseline; duration of exclusive breastfeeding and age of introduction of complementary feeding at the 12-month-old follow-up; marital status and proxy of physical activity at the two- and four-year-old follow-up	BMI-for-age z-score Length/height-for-age z-score	Higher UPF consumption scores from ages 2 to 4 were associated with higher BMI-for-age z-scores (β = 0.02; 95% CI: 0.01–0.03; p for trend = 0.001) and lower length/height-for-age z-scores (β = –0.03; 95% CI: –0.04 to –0.02; p for trend < 0.001). Children in the highest UPF score tertile had significantly lower height-for-age z-scores (β = –0.06; 95% CI: –0.11 to –0.01; p for trend = 0.023). Consuming six or more UPF subgroups was associated with higher BMI-for-age (β = 0.09; 95% CI: 0.04–0.14) and lower height-for-age z-scores (β = –0.10; 95% CI: –0.14 to –0.06) compared to those consuming five or fewer subgroups (p < 0.001 for both).
Costa 2021 Brazil	Pelotas Birth Cohort	Children at age 6 years (3,128) and age 11 years (n=3,454)	FFQ assessing consumption during the previous year (at six-year follow-up, 54 items and reported by mothers; at 11-year follow-up, 88 items and reported by mothers and participants) UPF intake in g/day	Generalized estimation equations Maternal skin colour, maternal age, maternal schooling, sex, birthweight, screen time, energy intake/ expenditure ratio at six-and eleven-year follow-ups, and grams from other food sources than UPF	Weight, height, and FM (kg)	An increase of 100 g in contribution from UPF to daily food intake at between 6 and 11 years of age was associated with a gain of 0.14 kg/m^2 in FMI in the same period; 58 per cent of the total effect of UPF intake at 6 years (in grams) over the change in FMI from 6 to 11 years was mediated by its calorie content.

Author / year / setting	Study sample (cohort/ survey name or recruitment source)	Sample characteristics (age at baseline, follow-up duration, sample size)	Dietary assessment / UPF measure	Analytical method / confounders adjusted	Outcomes assessed	Main findings
Chang 2021 United Kingdom	Avon Longitudinal Study of Parents and Children	Children 7–24 years of age (n=9,025)	Three-day food diaries % of grams intake from UPF	Linear growth curve models Child's sex, race, birthweight, level of physical activity and Index of Multiple Deprivation quintile; mother's pre-pregnancy BMI, marital status, highest educational attainment, socioeconomic position; child's baseline daily energy intake	Anthropometrics (BMI, weight and WC) Dual-energy x-ray absorptiometry measurements (fat and lean mass indexes [calculated as fat and lean mass, respectively, divided by height in metres squared] and body fat percentage)	Among those in the highest quintile of UPF consumption compared with their lowest quintile counterpart, trajectories of BMI increased by an additional 0.06 (95% CI, 0.04–0.08) per year; FMI, by an additional 0.03 (95% CI, 0.01–0.05) per year; weight, by an additional 0.20 (95% CI, 0.11–0.28) kg per year; and WC, by an additional 0.17 (95% CI, 0.11–0.22) cm per year.
Vedovato 2021 Portugal	Generation XXI population-based birth cohort (G21)	Children 4–10 years (n=8,647)	two- or three-day food diaries for children at ages 4 and 7 years UPF intake (kcal/day)	Linear regression Maternal age, maternal education, maternal BMI before pregnancy, exclusive breastfeeding for the first 6 months, physical exercise and screen time	BMI z-scores	UPF consumption at 4 years of age was significantly associated with BMI z-score at age 10 years, (β = 0·028; 95 % CI 0·006, 0·051). UPF consumption at 7 years of age did not show an association with later BMI.
Costa 2019 Brazil	Follow-up of a randomized controlled trial	Children at 4 and 8 years of age (n=307)	Two 24-h recalls Usual consumption of UPF in % of energy intake (estimated using the Multiple Source Method)	Linear regression Group status in the early phase: intervention and control, pre-pregnancy BMI, sex, birthweight, breastfeeding, family income, maternal schooling and total screen time	Outcomes were expressed as unit changes in measurements (BMI, waist circumference, waist-to-height ratio, and skinfold sum) from age 4 to 8 years (Delta anthropometric measurements = anthropometric measurement at age 8 years minus anthropometric measurement at 4 years of age)	For every 10% increase in energy intake from UPF, delta WC increased by 0.7 cm after adjusting for confounders. After further adjustment for BMI z-score at age 8 years, the magnitude and the statistical significance of the association between UPF consumption at 4 years and WC measurement at age 8 years remained fairly the same.

Author / year / setting	Study sample (cohort/ survey name or recruitment source)	Sample characteristics (age at baseline, follow-up duration, sample size)	Dietary assessment / UPF measure	Analytical method / confounders adjusted	Outcomes assessed	Main findings
Bawaked 2020 Spain	INMA (Infancia y Medio Ambiente) Birth Cohort	Children 4–7 years (n=1,480)	FFQ (105 food items consumed in the previous 12 months) A Child Healthy Lifestyle Score was constructed based on five behaviours: extracurricular physical activity, sleep duration, plant-based food consumption (favourable), and TV time and UPF intake (unfavourable). Behaviours were scored using cohort-specific tertiles (range: 0–10), with higher scores indicating healthier lifestyles. The total Child Healthy Lifestyle Score was categorized into tertiles to define low, medium and high adherence	Linear regression Age, sex, cohort, maternal education and maternal BMI	Sex-specific z-scores for BMI and waist circumference (WC)	Low UPF intake at age 4 was associated with lower BMI z-score (borderline in adjusted models) and significantly lower diastolic blood pressure z-scores at age 7, but not with WC z-scores. Over a median follow-up of 3.1 years, children in the highest tertile of the Child Healthy Lifestyle Score had reduced odds of developing overweight/obesity (odds ratio (OR) = 0.61) and abdominal obesity (OR = 0.48) compared to those in the lowest tertile. Among individual behaviours, low TV time was significantly associated with lower odds of overweight (OR = 0.54) and abdominal obesity (OR = 0.27).
Cross-sectional studies						
Gketsios 2023 Greece	Children from schools in the metropolitan Athens area, Sparta, Kalamata and Pyrgos 2014-2016	Children aged 10–12 years (n=1,728)	Frequency of consumption of ultra-processed beverages, including soft drinks and flavoured drinks, regardless of sugar content (sugar-sweetened, sugar-free or with no added sugar)	Linear regression Children's age, sex, KIDMED score, physical activity status as well as parents' age, BMI, smoking status, physical activity status, educational level, income and MedDietScore	BMI; in kg/m²	Compared to low consumers, children with high ultra-processed beverage intake had significantly higher BMI (+0.89 kg/m²; β = 0.89; SE = 0.37; p = 0.020). High consumers also had higher BMI compared to moderate consumers (+0.69 kg/m²; β = 0.69; SE = 0.32; p = 0.030).

Author / year / setting	Study sample (cohort/ survey name or recruitment source)	Sample characteristics (age at baseline, follow-up duration, sample size)	Dietary assessment / UPF measure	Analytical method / confounders adjusted	Outcomes assessed	Main findings
Khoury 2024 Spain	Baseline analysis. Children from schools and centres in seven cities participating in the Childhood Obesity Risk Assessment Longitudinal Study, March 22, 2019 - June 30, 2022	Children aged 3–6 years (n=1,426)	FFQ (validated 125-item capturing the child's usual diet over the past year) Energy-adjusted UPF consumption (in grams per day)	Linear regression Maternal education, maternal BMI, physical activity, exclusive breastfeeding, recruitment centre size, and Nova group 1, 2 or 3	Age- and sex-specific z-scores of adiposity parameters: BMI, FMI, waist-to-height ratio and WC	Compared with participants in the lowest tertile of energy –adjusted UPF consumption – those in the highest tertile showed higher z-scores of BMI (β coefficient, 0.20; 95% CI, 0.05-0.35), WC (β coefficient, 0.20; 95% CI, 0.05-0.35), and FMI (β coefficient, 0.17; 95% CI, 0.00-0.32). One-standard deviation increments in energy-adjusted UPF consumption were associated with higher z-scores for BMI (β coefficient, 0.11; 95% CI, 0.05-0.17), WC (β coefficient, 0.09; 95% CI, 0.02-0.15), and FMI (β coefficient, 0.11; 95% CI, 0.04-1.18). Substituting 100 g of UPFs with 100 g of unprocessed or minimally processed foods was associated with lower z-scores of BMI (β coefficient, -0.03; 95% CI, -0.06 to -0.01), and FMI (β coefficient, -0.03; 95% CI, -0.06 to 0.00).
Chokor 2024 Lebanon	Early Life Nutrition and Health in Lebanon, 2012	Children aged 6 months to 4.9 years (n=893)	24-h recall % of energy intake from UPF	Logistic regression Child's age, child's sex, household monthly income, mother's education, father's education, mother's employment and mother's age	Overweight Obesity	Children in the second and third tertiles of UPF intake had significantly higher odds of overweight/obesity compared to those in the first tertile (OR: 1.21, 95% CI: 1.09–1.32 and OR: 1.61, 95% CI: 1.47–1.76, respectively), even after adjusting for confounders.
Gomes 2024 Brazil	Children residing in subnormal settlements in Maceió, Alagoas, October 2020 – May 2021	Children aged 12–59 months (n=561)	Premature introduction of UPF was defined as introduction within the child's first year. Twelve types of UPF were assessed	Poisson regression Child's age, breastfeeding status, mother's race/ ethnicity, and receipt of Brazilian government cash transfer benefits	Overweight defined as BMI-for-age z-score > +2 (WHO 2006)	Early introduction of soft drinks (prevalence ratio (PR) = 1.18, 95% CI: 1.02, 1.38), packaged snacks (PR = 1.17, 95% CI: 1.05, 1.30), and powdered soft drinks (PR = 1.36, 95% CI: 1.16, 1.60) was associated with a higher prevalence of overweight in children who consumed these UPF before 12 months, compared to those introduced at or after 12 months.

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Cota 2024 Brazil	PASE Health Assessment Survey, 2015	Children aged 8–9 years (n=364)	Three 24-h dietary recalls UPF intake (% of total kcal/day)	Poisson regression Sex, age, per capita income and screen time	Weight, height and body fat Normal-weight obesity phenotype (a condition characterized by excess body fat despite having a normal BMI) High fat % (≥ 25% or 20% for girls and boys, respectively); those with normal-weight obesity phenotype considered as having overweight or obesity placed in the excess weight group	Increased UPF consumption was associated with higher prevalence of normal-weight obesity, both among normal-weight children (PR T2 vsT1 = 1.9, 95% CI: 1.1 to 3.4; and PR Tertile 3 versus Tertile 1 = 1.8, 95% CI: 1.01 to 3.1) and those with excess weight (PR T versus T1 = 2.0; 95% CI, 1.2 to 3.3).
Neri 2024 United States	NHANES 2009–2018	Infants aged 6 to 12 months (n=744)	Two 24-h dietary recalls (first in person and second by telephone) Dietary pattern based on UPF (with positive loadings for a variety of UPF)	Logistic regression Age, sex, race/ethnicity, educational attainment of household head, ratio of family income to poverty, weight at birth and early introduction of solid foods	Rapid weight gain (>0.67 standard deviations change in weight-for-age z-score from birth to assessment) Overweight/obesity risk (weight-for-height above +1 standard deviation)	Infants who adhere to a dietary pattern characterized by UPF were more likely to present rapid weight gain (adjusted OR 1.3, 95% CI = 1.1, 1.5) and overweight/obesity risk (adjusted OR 1.2, 95% CI = 1.0, 1.4).
Ribeiro 2023 Brazil	Children enrolled in 2019 in public schools in Pernambuco	Children aged 7–10 years (n=139)	Three 24-h food records UPF intake (% of total kcal/day)	Pearson's correlation test used to assess associations	Excess weight WC Percentage of body fatness FFM FM	Children with excess weight had higher total energy intake from UPF (714.30 ± 26.32 kcal versus 848.06 ± 349.46 kcal; p = 0.011). Absolute UPF consumption was positively correlated with WC (r = 0.202; p = 0.023) and %BF (r = 0.198; p = 0.026).

Author / year / setting	Study sample (cohort/ survey name or recruitment source)	Sample characteristics (age at baseline, follow-up duration, sample size)	Dietary assessment / UPF measure	Analytical method / confounders adjusted	Outcomes assessed	Main findings
Neri 2022 United States	NHANES 2011–2016	Adolescents aged 12–19 years (n = 3,587)	Two 24-h dietary recalls (first in person and second by telephone) % of grams intake from UPF	Multiple logistic regressions Sociodemographic covariates, physical activity, total energy intake, whether the individual was following a special diet for weight loss, and indicators of the nutritional quality of the diet	Total overweight/ obesity (BMI-for-age ≥ 85th percentile), visceral overweight/ obesity (SAD-for-age ≥ 85th percentile), and abdominal overweight/ obesity (WC-for-age ≥ 85th percentile)	The highest consumption of UPF was associated with 45%, 52%, and 63% higher odds of total-, abdominal-, and visceral overweight/obesity, respectively (OR 1.45, 95% CI = 1.03, 2.06, p for linear trend = 0.040; OR 1.52, 95% CI = 1.06, 2.18, p for linear trend = 0.026; OR 1.63, 95% CI = 1.19, 2.24, p for linear trend = 0.005, respectively), compared with the lowest consumption. A 10% increment in the proportion of UPF was associated with an increased risk of both abdominal overweight/obesity (OR 1.07; 95% CI = 1.01, 1.13) and visceral overweight/ obesity (OR 1.07; 95% CI = 1.02, 1.13).
Oviedo-Solís CI 2022 Mexico	2006 and 2016 Mexican National Health and Nutrition Surveys	Children aged 5 to 11 years (1,008) and adolescents aged 12 to 19 years (n = 8,599)	Foods and beverages reported in the semiquantitative FFQ were classified as UPF according to Nova classification. Consumption of UPF (% of total energy intake)	Logistic regression models (crude and adjusted), stratified by socioeconomic status. Model 1 adjusted for survey year and energy from Nova groups, and model 2 additionally adjusted for age, socioeconomic status, indigenous status, place of residence, region, screen time, and sex (adolescents only)	Double burden of malnutrition (coexistence of anaemia and excess weight). Excess weight (overweight or obesity)	Higher consumption of UPF was associated with the double burden of malnutrition in children of lower-socioeconomic status (OR = 1.3, 95% CI 1.07, 1.58) and in adolescents of higher socioeconomic status (OR = 1.26, 95% CI 1.03, 1.55).
Crisóstomo 2022 Brazil	Population-based health survey in the municipalities of Teresina and Picos, Piauí 2018–2019	Adolescents 10–19 years (n = 120)	One to two 24-h recall % of energy intake from UPF	Linear regression Sex, age, education, alcohol consumption, smoking status and total diet energy in kcal	BMI z-scores WC	Inverse association between UPF consumption and anthropometric variables (BMI: β= -0.04; 95% CI= -0.06; -0.01; p=0.002; WC: β= -0.07; 95% CI: -0.11; -0.02; p=0.008) only in adolescents.

Author / year / setting	Study sample (cohort/ survey name or recruitment source)	Sample characteristics (age at baseline, follow-up duration, sample size)	Dietary assessment / UPF measure	Analytical method / confounders adjusted	Outcomes assessed	Main findings
Viola 2020 Brazil	Second follow-up of the 1997/98 São Luís Birth Cohort	Adolescents 18 to 19 years (n = 1,525)	FFQ (106 food items consumed in the previous 12 months) % of energy intake from UPF	Linear regression Sex, adolescent education, socioeconomic status, total daily energy intake, dieting to lose weight, physical activity, alcohol consumption, smoking and sleep duration	BMI-for-age WC Total and android body fat percentage Muscle mass and the lean mass index	BMI, muscle mass and lean mass index were inversely associated with consumption of UPF. A 1% increase in the percentage contribution of UPF items to total dietary energy intake was associated with a 0.04 kg decrease in muscle mass (β = -0.04; 95% CI, -0.06 to -0.02; P < 0.001) and a 0.01 kg/m2 decrease in lean body mass (β = -0.01; 95% CI, -0.02 to -0.01; P < 0.001).
Melo 2017 Brazil	All students with regular attendance at the public federal school in Alagoas	Adolescents 14–19 years (n = 249)	FFQ (84 food items consumed in the previous 6 months) UPF intake frequency (<3 per week versus ≥3 per week)	Poisson regression (age and sex)	Excess weight (BMI-for-age) Waist circumference	Minimally processed foods intake was inversely associated with excess weight. The consumption of UPF was not associated with excess weight or waist circumference. However, sausage consumption was positively associated with the prevalence of excess weight (adjusted PR: 1.13, 95% CI 1.01–1.26, P = 0.03).

BMI = Body mass index; CI = Confidence interval; FFQ = Food frequency questionnaire; FFM = Fat-free mass; FM = Fat mass; FMI = Fat mass index; OR = Odds ratio; PR = Prevalence ratio; UPF = Ultra-processed food; WC = waist circumference

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