

The global obesity pandemic: shaped by global drivers and local environments

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Summary

The simultaneous increases in obesity in almost all countries seem to be driven mainly by changes in the global food system, which is producing more processed, affordable, and effectively marketed food than ever before. This passive overconsumption of energy leading to obesity is a predictable outcome of market economies predicated on consumption-based growth. The global food system drivers interact with local environmental factors to create a wide variation in obesity prevalence between populations. Within populations, the interactions between environmental and individual factors, including genetic makeup, explain variability in body size between individuals. However, even with this individual variation, the epidemic has predictable patterns in subpopulations. In low-income countries, obesity mostly affects middle-aged adults (especially women) from wealthy, urban environments; whereas in high-income countries it affects both sexes and all ages, but is disproportionately greater in disadvantaged groups. Unlike other major causes of preventable death and disability, such as tobacco use, injuries, and infectious diseases, there are no exemplar populations in which the obesity epidemic has been reversed by public health measures. This absence increases the urgency for evidence-creating policy action, with a priority on reduction of the supply-side drivers.

This is the first in a **Series** of four papers about obesity

Introduction

As UN member states prepare to gather in New York in September, 2011, for the first High-Level Meeting of the UN General Assembly on non-communicable diseases (NCDs), the inexorable global rise of obesity will be the toughest challenge that they face. Many countries can serve as excellent exemplars for reduction of infectious diseases, injuries, and some of the risk factors for NCDs, such as smoking, high cholesterol, and hypertension. However, no country can act as a public health exemplar for reduction of obesity and type 2 diabetes. All countries are searching for answers about how to reverse the rising tide of adult and childhood obesity.

The 2004 WHO global strategy on diet, physical activity and health¹ provides an excellent overall guide for societal action. However, with few exceptions, governments have made very slow progress in the implementation of these strategies. The food and media industries have, by contrast, moved rapidly by making various national² and international³ pledges, including self-regulatory codes of practice. Although independent assessment of the true effect of these pledges is needed, governments also need to meet their obligations for policy action and leadership, which are described in several authoritative reports.^{1–5}

The aim of *The Lancet's* Obesity Series is to state the case for action on obesity: what is the size and nature of the problem, what is driving its global increase, what will the future obesity burden be under a business-as-usual scenario, and what action is needed to reverse the epidemic? In this first report in the Series, we describe the obesity epidemic and explain the reasons for its concurrent rise across countries and the wide variation in obesity prevalence between countries. The interaction of these major determinants of obesity has important implications for the action needed to reverse the epidemic.

Key messages

- Changes in the global food system, including reductions in the time-cost of food, seem to be the major drivers of the rise of the global obesity epidemic during the past 3–4 decades, although substantial differences in national and local environments (especially sociocultural, economic, and transport environments) produce the wide variation in obesity prevalence recorded across populations.
- In the first half of the 20th century, increased mechanisation and motorisation were accompanied by corresponding decreases in food energy supply (indicative of consumption), thereby keeping obesity prevalence low. In many high-income countries, an energy balance flipping point seems to have occurred in the 1960s–70s, with an increasing food energy supply now pushing up energy intake and population weight.
- Adult obesity continues to increase almost universally, but in some childhood and adolescent populations the epidemic seems to be flattening or even decreasing.
- Present systems for monitoring population weight and nutrition are inadequate in almost all countries.
- Obesity is the result of people responding normally to the obesogenic environments they find themselves in. Support for individuals to counteract obesogenic environments will continue to be important, but the priority should be for policies to reverse the obesogenic nature of these environments.
- Governments have largely abdicated the responsibility for addressing obesity to individuals, the private sector, and non-governmental organisations, yet the obesity epidemic will not be reversed without government leadership, regulation, and investment in programmes, monitoring, and research.

The global rise in obesity prevalence

The rise of the obesity epidemic seemed to begin almost concurrently in most high-income countries in the 1970s and 1980s;⁶ since then, most middle-income and many low-income countries have joined the global surge in obesity prevalence in adults and children.^{7–9} By 2008, an estimated 1.46 billion adults globally were overweight (body-mass index [BMI] >25 kg/m²) and 502 million adults were obese (BMI >30 kg/m²).⁹ Furthermore, an estimated 170 million children (aged <18 years) globally were classified as overweight or obese.¹⁰ This estimate includes more than 25% of all children in some countries, more than double the proportions from the start of the epidemic ([figure 1](#)).

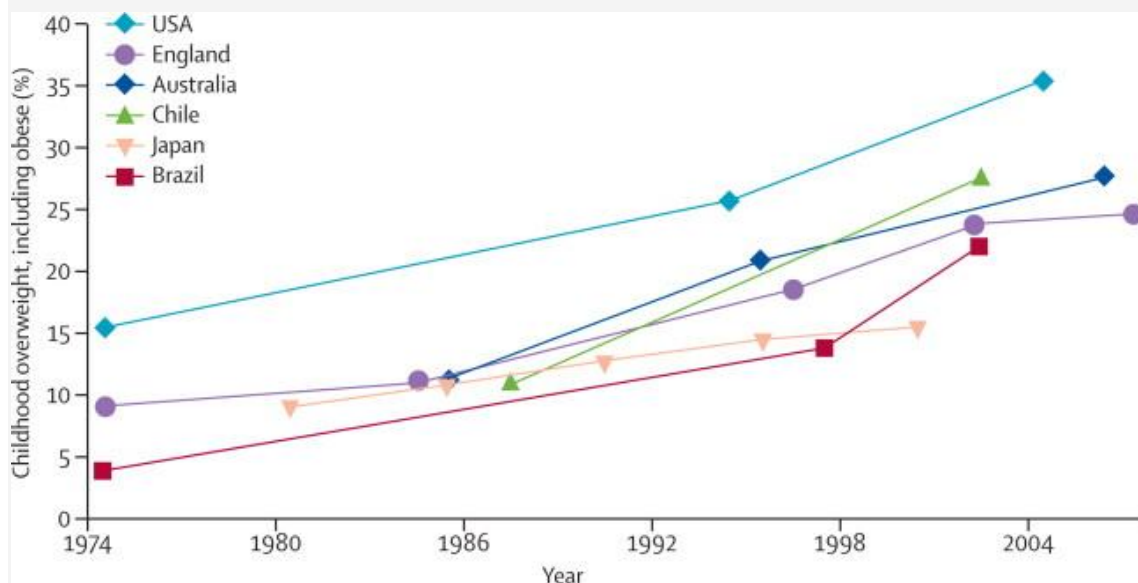


Figure 1

Estimates of percentage of childhood population overweight, including obese (with use of International Obesity Taskforce cutoffs) in a selection of countries

Based on data from Wang and Lobstein,¹¹ International Association for the Study of Obesity,¹² and Matsushita and colleagues.¹³

Analysis of the patterns of the obesity epidemic in the past four decades is limited by the absence of representative data from different countries.¹¹ Nevertheless, the pattern by which obesity prevalence rises in particular populations seems predictable. In low-income and middle-income countries, groups of high socioeconomic status in urban areas tend to be the first to have high obesity prevalence, but the burden of obesity shifts to low socioeconomic status groups and rural areas as a country's gross domestic product (GDP) increases.^{14, 15} In Brazil, one of the few middle-income countries with repeated cross-sectional surveys of BMI, this pattern was particularly evident for women, with obesity rates increasing rapidly in the lowest income groups.¹⁶ The highest prevalences of overweight and obesity are in middle-age groups (45–59 years) throughout this transition.^{12, 17}

The global rise of obesity has serious health effects. Raised BMI is an established risk factor for diseases such as type 2 diabetes, cardiovascular diseases, and many cancers.^{4, 18, 19} The disability attributable to obesity and its consequences was calculated in 2004 at more than 36 million disability-adjusted life-years,¹⁸ with obesity accounting for between 2% and 6% of total health-care costs in many countries.²⁰ NCDs are now the dominant cause of preventable disease burden even in many low-income countries,^{18, 21} and obesity has overtaken tobacco as the largest preventable cause of disease burden in some regions.²² Although the reduction in premature mortality and morbidity from cardiovascular diseases in high-income countries during the past 40 years has been substantial, there is serious concern that the rise of obesity and type 2 diabetes will slow or even reverse this trend.^{23–25}

The increases in overweight and obesity in adults are widely projected to continue to heighten the burden of obesity-related morbidity and mortality in the coming decades.^{1, 26} However,

encouraging reports are emerging from countries such as Sweden, Switzerland, France, and Australia that overweight and obesity prevalence in some childhood age groups might be flattening or even decreasing.²⁷ But, overall prevalence is still high. Crucially, very few countries have adequate monitoring systems in place, which is remarkable in view of the importance of this issue. Consequently, the frequency and standard of monitoring urgently needs to improve so that the progress of the global epidemic can be tracked and lessons from the experiences of different countries and population groups can be learnt.

The available data show very wide variations in obesity prevalence globally, particularly for women ([figure 2](#)). For some populations (eg, China), small body-frame sizes mean that a BMI cutoff point of 30 kg/m² for obesity will underestimate the amount of over-fatness and comorbidities, compared with other populations with larger frame sizes (eg, Tonga).²⁸ However, this definitional difficulty does not account for the 100-times differences between the populations (0.7% vs 70%). Many of the reasons for the variations across populations are intuitive. For example, Ethiopia does not have sufficient national wealth for obesity to have manifested itself, and populations in Hong Kong and Jordan have had a greater exposure to obesogenic food environments than do their counterparts in China and Yemen. However, many complexities exist in understanding why some populations and subpopulations are more susceptible to the drivers of obesity than others, and how mediating factors affect different population groups.

Broad economic effects on obesity

The most obvious environmental precondition for a population to develop obesity is sufficient wealth. The relation between GDP and mean BMI is positive and linear up to a GDP of about US\$5000 per person per year; at greater GDP, the relation with GDP and BMI is almost flat.²⁹ A degree of economic prosperity is thus an enabler for obesity, but the level of prosperity does not have to be high for obesity to manifest; in some low-income countries, such as Pacific Island nations, obesity prevalence is very high.¹⁷ A return to national poverty is not a recommended approach to reduce obesity and type 2 diabetes but, as seen in Cuba and Nauru,^{30, 31} it can have that effect.

The economic transition towards increasing GDP brings with it several other transitions: demographic (younger to older population distribution, rural to urban); epidemiological or health (infectious diseases to NCDs); technological (low to high mechanisation and motorisation); and nutritional (traditional foods and cuisines to more processed energy-dense foods).³² The pace of change of these transitions has increased substantially in recent decades; so many countries in transition are faced with double burdens of disease. For example, most countries that still have a substantial burden of undernutrition and its related diseases also have a substantial or emerging burden of overnutrition and its related NCDs. Both these conditions need to be addressed together for several important reasons: fetal and infant undernutrition followed by adult overnutrition has a double effect on the later burden of NCDs;³³ the underlying drivers within the food system (eg, food quality and food distribution) are often common to both disorders; and NCDs cannot be ignored even while efforts to reduce undernutrition continue.

In the same way as obesity is the result of people responding normally to the obesogenic environments that they find themselves in, so too do these obesogenic environments arise because businesses and governments are responding normally to the broader economic and

political environments that they find themselves in. A central tenet of modern, market-based economies is the benefits of economic growth; and a parallel tenet of business and trade is the benefits of more liberalised, less regulated global markets. Economic growth is especially important for low-income countries to move them from poverty to economic prosperity; however, for high-income countries, higher levels of GDP do not bring greater happiness and wellbeing for their citizens but do bring greater consumption of all products.³⁴ The technological changes that are creating cheaper and more available food calories and the strong economic forces driving consumption will inevitably lead to overconsumption and obesity.^{35–37}

In the broader view, obesity is similar to rising greenhouse gases and environmental degradation as yet another detrimental effect of individual and corporate overconsumption.³⁴ The pressure for market liberalisation means that regulatory approaches, although feasible, are difficult to achieve—as exemplified in the great reluctance of policymakers to regulate reductions in marketing of obesogenic foods and beverages, such as fast foods and sugar-sweetened drinks, to children. There are many reasons for government intervention to restrict marketing to children, including protection of the rights of children,³⁸ public demand for regulations,³⁹ and application of the precautionary principle of preventive action early, even before absolute proof is available.⁴⁰ Although obesity has been described as “a sign of commercial success but a market failure”⁴¹ debate exists about whether market failure provides an additional argument for government intervention with respect to prevention of childhood obesity^{41–45} (panel 1).

Panel 1

Is the market failing children?

A market fails when prices and the quantities bought and sold are no longer indicative of their costs and benefits to society.⁴⁶ Is the market failing children? The first of four reasons for market failure is when vulnerable individuals are not protected.⁴⁷ Children are clearly a vulnerable group that warrant societal protection, and this notion represents the strongest argument for government intervention. They are not mature, they do not have nutritional knowledge, are unable to perceive the risks of their behaviour, and their choices are readily affected by marketing.^{47–49} The second reason is when consumers do not have the information necessary to make fully informed decisions about their food selection,^{47, 50} as is also clearly the case with children. However, generally, interventions to rectify information gaps seem to have modest effects.⁴⁶ The third reason for market failure is when people prioritise immediate gratification over potential long-term negative results, which is a hallmark of childhood. The final reason relates to spill-over effects (or externalities), when the costs of obesity are borne by society. Although yearly health-care costs to the taxpayer are higher for obese than for non-obese people, reduced life expectancy due to obesity makes it uncertain whether the life-time social costs are actually higher.^{42, 51} Externalities might arise at the family level through reduced household income or additional carer duties.⁴⁶ Thus, there is ample justification for protecting children's health from the predatory effects of markets, yet almost universally, governments are failing in this responsibility. The charge of so-called nannyism almost inevitably arises⁴² in relation to regulatory interventions, yet for children, and even for adults, governments have a fundamental role in helping to make healthy choices the easy choices.⁵²

Drivers of the obesity epidemic

We define a driver of the global obesity epidemic as an environmental factor that has changed substantially during the past 40 years (coinciding with the upswing of the epidemic), is global in nature (affecting almost all countries with enabling economic conditions), and is rapidly transmissible (in view of the near simultaneous nature of the epidemic across countries). Some environmental determinants of obesity, such as the built environment, can have important effects on behaviours;⁵³ however, built environments have not changed simultaneously and universally to become more obesogenic during the past few decades. The built environment is thus unlikely to have been a major driver of the global epidemic, although the way in which people have responded to the built environment (eg, increased traffic congestion) has changed with time and might be important. The obvious possible drivers of the epidemic are in the food system:³⁵ the increased supply of cheap, palatable, energy-dense foods; improved distribution systems to make food much more accessible and convenient; and more persuasive and pervasive food marketing.⁵⁴

Several studies have tested the hypothesis that increases in the food supply are the dominant drivers of the weight gain in populations.^{55–57} Results from these investigations show that the rise in food energy supply was more than sufficient to explain the rise in obesity in the USA from the 1970s,^{55, 56} and most of the weight increase in the UK since the 1980s.⁵⁷ A related hypothesis is that the policies put in place in the USA and other countries to increase the food supply from the 1970s led to a situation in which the abundance of food in these countries began to push up population energy intake—a reversal of the previous situation in which energy intake was pulled down by decreases in physical activity ([panel 2, figure](#)