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Future diets in the developing world

Questions, answers and gaps

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Key messages

- Developing regions, where undernutrition and infectious diseases have long been the concern, have seen a sharp rise in overweight and obesity, bringing an epidemic of non-communicable diseases (NCDs).
- Diets are changing in the developing world. While they are becoming more diverse and tastier, the tendency is to over-consume energy and salt, and to under-consume fruit and vegetables.
- Rising overweight and obesity is driven by several factors, including rising incomes, falling real costs of many foods, advertising and increasingly sedentary lives.
- Much debate surrounds which of the causes matter most, including the question of whether people have free choice and responsibility for their diet, or whether the many influences in their surroundings heavily constrain those choices.
- Policies to alter food prices, to regulate the availability of foods, and to ban the advertising of junk food are among the more effective actions. Success is even more likely where different measures are combined.
- Two major knowledge gaps stand out: explaining heterogeneity, particularly identification of 'positive deviants', where bodyweights are not increasing to unhealthy levels; and evaluating policies influence on diets in different circumstances influenced by multiple variables.

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1. Introduction

As low-income countries develop, people's diets change. They tend to move from being high in cereals (maize, rice, wheat), starchy staples (potato, cassava, plantain), and fibre, to more westernized patterns that are high in sugars, fats, and animal-source foods. This has been termed the nutrition transition (Popkin 1993). It is usually accompanied by increasingly sedentary lifestyles (as technology displaces manual labour or physical play, for instance), as well as demographic and epidemiological shifts.

This paper poses some key questions about diets across the developing world and their implications. It also highlights important gaps in understanding that require more attention, research, and analysis.

The questions tackled, in five sections are:

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- What forms does malnutrition take?
- Who is affected?
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2. Nutritional status and diets

What forms does malnutrition take? Who is affected?

Malnutrition takes several forms. It refers to deficiencies, excesses or imbalances in a person's intake of energy or nutrients – carbohydrates, fats, proteins, vitamins and minerals. The term malnutrition covers two broad groups of conditions:

1. **Undernutrition:** inadequate intake and use of calories, protein, vitamins and minerals. Manifested in stunting (low height for age), wasting (low weight for height), underweight (low weight for age), anaemia, goitre, blindness, etc.; and,
2. **Overweight and obesity:** excess intake of food, raising the risk of diet-related non-communicable diseases such as heart disease, stroke, diabetes, and some cancers (WHO, 2016).

Under-consumption of dietary energy, protein and micronutrients is still a problem for hundreds of millions of people. Most of them live in the developing world, where the greatest concern is the inadequate nutrition for infants that impairs their mental and physical development and puts them at a life-long disadvantage.

Progress on reducing the incidence of stunting amongst children has been slow. Up to one-third of infants in the developing world are stunted. Some 159 million under-fives were stunted (chronic malnutrition) and 50 million wasted (acute malnutrition) in 2011 (WHO, 2016).

Increasingly, however, concern is less about energy and protein intake, and more about deficits of key minerals and vitamins – particularly iron, iodine, vitamin A and zinc – that affect an estimated 2 billion or more people. For example, of 528 million women of reproductive age, some 29% are affected by anaemia; half of which would be amenable to iron supplementation (WHO, 2016)

At same time, the over-consumption of food, coupled with lives that are increasingly sedentary, is producing large numbers of people who are overweight and obese. While the incidence is highest in high-income countries, prevalence is rising fast in emerging economies and even some low-income countries.

Indeed, the world has seen an explosion in overweight and obesity in the past 30 years. Globally, there were an estimated 42 million overweight or obese under-fives in 2013 (6.3%) (Mendis et al., 2014), while the percentage of adults who were overweight or obese grew from 23% in 1980 to 34% in 2008, with the vast majority of this increase seen in the developing world. Here, the numbers of people affected more than tripled from around 250 million people in 1980 to 904 million in 2008. By contrast, the number of people who were overweight or obese in high-income countries increased 1.7 times over the same period, from 321 million to 557 million (Keats and Wiggins, 2014; data from Stevens et al., 2012).

These two sets of problems are not necessarily always separated sharply by income and class. In developing countries, it is becoming increasingly common to find some members of a household suffering from undernutrition while others are overweight. Indeed, individuals may be doubly troubled by being both overweight yet suffering from micronutrient deficiencies (WHO 2016).

More countries surveyed and more frequent surveys of child and adult anthropometrics are needed to determine rates of malnutrition such as stunting and obesity, and to identify where they are changing and why.

What factors influence people's diets? How have people's diets changed since 1990 in the developing world?

Various factors influence diet, including;

- Human biology and physiological needs that give rise to being hungry;
- Costs of foods and level of income;
- Preferences formed by habit, culture, religion, information and advertising; and,
- Work patterns and time to prepare food.

Contributing to these factors are economic growth, trade, technical changes in food industries and retailing, and public policy.

Since the early 1990s, average diet across the world shows strong increases in the consumption of fruits and vegetables, meat, fish, dairy, eggs, and vegetable oils; modest increases in pulses and starchy roots, fairly stable consumption of sugars, and small declines in cereals and animal fats (Table 1).

Typical diets across the world, when compared to those recommended for healthy and active living, have more than enough grains but are usually low in dairy and fruit. In high-income countries, such as the US, consumption of oil, fat and sugar is well above recommended levels. At the other end of the scale, many people in the developing world have diets short of fruit, vegetables, dairy and other protein-rich foods, such as fish and meat (Keats and Wiggins, 2014).

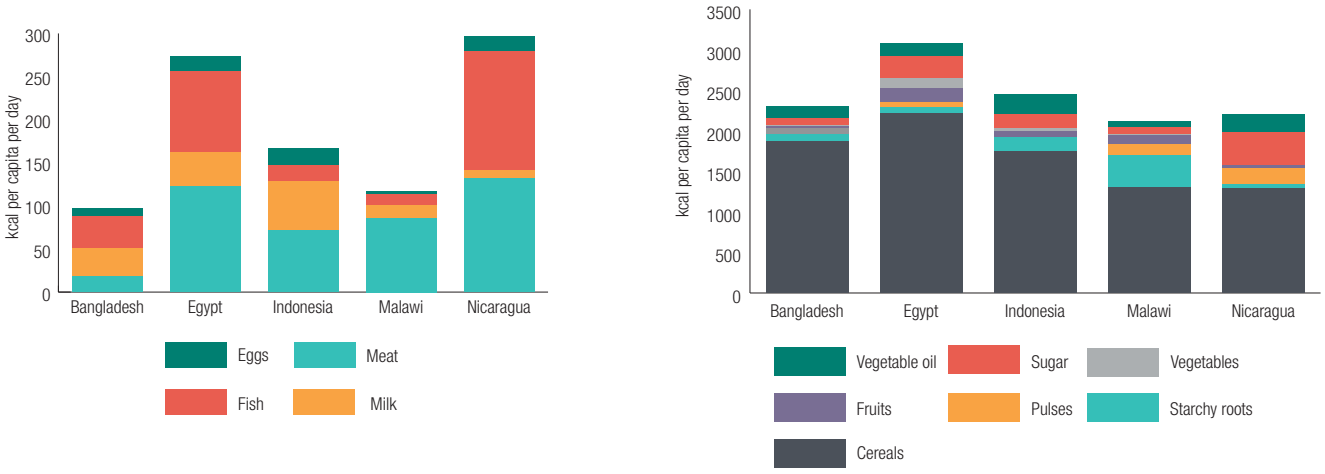
This is not to suggest diets are necessarily converging on a global norm. Considerable variation exists across developing regions, with diets remaining heterogeneous by region, country (Figure 1), social group, and individual. Even at the level of food groups marked diversity across countries can be seen, particularly for animal produce. In Bangladesh, for example, milk and fish consumption are nearly equal, while in Nicaragua, on average people consume around 18 times as much milk as fish.

Table 1: Supply of different broad food groups, early 1990s to recent times

		Grams per person per day		
		1990-92	2011-13	% change
Vegetable source foods	Cereals	410	402	-2
	Starchy roots	157	174	11
	Fruits and vegetables	352	590	68
	Pulses	16	19	17
	Vegetable oils	25	31	24
	Sugar and sweeteners	66	67	2
Animal source foods	Meat	92	117	27
	Fish, seafood	36	52	45
	Milk	207	248	20
	Eggs	18	25	41
	Animal fats	10	9	-6

Source: Data from FAOSTAT.
Note: 2013 is the last year for which estimates are available

Figure 1: Contribution of selected food groups to calories supplied per capita, 5 countries across the developing world, 2013



Source: UNICEF and WHO, 2015.

3. Why we care

What health concerns are linked to poor diets and overweight and obesity? How important is diet?

The nutrition transition is accompanied by a shift in the importance of communicable and non-communicable diseases (NCDs):

> *'… from endemic deficiency and infectious diseases (for which poor nutrition is a risk factor), toward diet-related chronic diseases, including ischemic heart disease (IHD), diabetes, obesity, hypertension, stroke, and certain cancers' (Popkin et al., 2001)*

NCDs are the leading causes of death globally, accounting for 68% of deaths in 2012, more than 40% of which were premature deaths – that is, of people aged below 70 years, with almost three quarters of all NCD deaths, and most premature deaths, occurring in low- and middle-income countries (82%)(Mendis et al., 2014).[1]

The degree to which death and disability is attributable to dietary factors varies by country; but it is common to find five or more problems related to poor diet among the leading ten risks for disability and death (Table 2).

Globally, dietary risks are implicated in more deaths than low physical activity, tobacco smoke, and alcohol and drug use combined; deaths attributed to dietary risk also grew between 2005 and 2015 (Figure 2, overleaf).

Table 2: Leading risk factors for disability-adjusted life-years lost, 5 country cases, 2015

Bangladesh	Egypt	Indonesia	Malawi	Nicaragua
High blood pressure	High blood pressure	High blood pressure	Unsafe sex	Diabetes / pre-diabetes
Smoking	High body-mass index	Diabetes / pre-diabetes	Childhood undernutrition	High blood pressure
Household air pollution from solid fuels	Diabetes/ pre-diabetes	Smoking	Unsafe water source	High body-mass index
Ambient particulate matter pollution	Ambient particulate matter pollution	High body-mass index	Household air pollution from solid fuels	Alcohol use
Diabetes / pre-diabetes	High total cholesterol	Diet low in whole grains	Unsafe sanitation	Poor kidney function
Childhood Undernutrition	Smoking	Diet low in fruit	No handwashing with soap	Unsafe sex
Diet low in fruit	Diet low in whole grains	High total cholesterol	Suboptimal breastfeeding	High total cholesterol
Diet low in whole grains	Childhood undernutrition	Diet low in vegetables	High blood pressure	Iron deficiency
High total cholesterol	Poor kidney function	Childhood undernutrition	Ambient particulate matter pollution	Childhood undernutrition
Unsafe water source	Diet high in sodium	Diet high in sodium	Iron deficiency	Smoking

Source: Data from Figure 7 in GBD 2015 Risk Factors Collaborators, 2016. This includes 195 countries and regions
Note: Disability-adjusted life-years measure overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. Diet factors in orange. Factors often related to diet in green. Diabetes/ pre-diabetes is marked by 'high fasting plasma glucose'. Poor kidney function is marked by 'Low glomerular filtration rate'

1 Low and middle-income countries accounted for about 84% of global population in 2012. Though NCD incidence is lower in many of these countries than in high-income settings, medical services and responses are lacking.

With a crude global death rate of around 7.7 per 1000, some 57 million people died in 2015. Diet, implicated in over 12 million deaths, was thus a contributing factor in over 20%, or one-fifth of deaths.

What diet risks exist? What are the costs of overweight and obesity?

Diets low in fruit and vegetables, high in salt, low in whole grains, nuts and omega 3 fatty acids were associated with 16 million deaths in 2015, and many more lost disability-adjusted life-years (DALYs) (Table 3, overleaf).

While some of the diet deficiencies seen in Table 3 may be associated with poverty, many are typically seen in the diets of people in high-income and emerging economies who have incomes that allow them wide choice of food. The diets of people overweight and obese often include several of the risks listed in Table 3.

Obesity, together with excessive consumption of fat and salt, is linked to the rising incidence of NCDs including some cancers, diabetes, heart disease and strokes. Inactivity, smoking and excessive alcohol consumption often also contribute.

The costs of overweight and obesity are high for individuals, their families and friends, and their country as a whole. For individuals, being overweight brings the risks of illness, disability and early death. It may also leave them unhappy, being stigmatised by others as 'fat'. In many countries, overweight and obese individuals face stigma and discrimination, leading to unfairness at school, work, and even when in clinics and hospitals (Puhl and Heuer, 2009). In the United States, weight discrimination

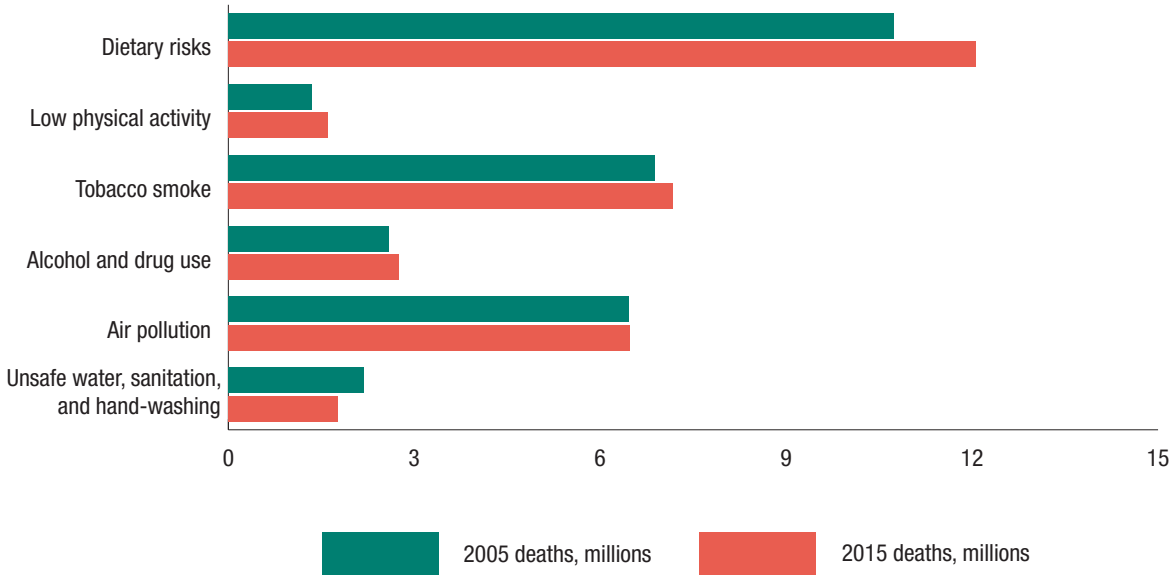
Table 3: Breakdown of deaths and disability-adjusted life-years (DALYs) in 2015 attributable to various dietary risks

Diet	Deaths, thousands	DALYs, millions
Low in fruits and/or vegetables	4,918	117.2
High in sodium	4,130	83.0
Low in whole grains	3,142	79.8
Low in nuts and seeds	2,131	49.4
Low in seafood omega-3 fatty acids	1,472	31.3
High in trans fatty acids	448	11.6
Low in polyunsaturated fatty acids	388	8.3
Low in fibre	387	8.4
Low in calcium	160	3.3
Low in milk	126	2.6
High in red meat	43	1.8
High in sugar-sweetened beverages*	39	1.4

Source: Data from Table 4 in GDD 2015 Risk Factors Collaborators, 2016

** Other research has found sugar-sweetened beverages to be implicated in over twice as many deaths globally: as many as 184,000 in 2010 (Singh et al., 2015)*

Figure 2: Millions of deaths attributable to selected risk factors in 2005 and 2015, global estimates



Source: UNICEF and WHO, 2015.

is comparable to rates of racial discrimination, particularly among women (ibid).

Family and friends may need to spend more time caring for those who have fallen ill, and face the sadness of early bereavement.

For the community and nation more widely, the diet risks of illness, disability and early death mean days of work lost and careers cut short; plus the costs of medical care. Half of those who die from chronic NCDs are in the prime of their productive years (Bloom et al., 2011). The economic costs of ill health and premature death from NCDs far outweigh costs to health services of combatting the rise in NCDs:

> *'During 2011–2025, cumulative economic losses due to NCDs under a "business as usual" scenario in low- and middle-income countries have been estimated at US$ 7 trillion. This sum far outweighs the annual US$ 11.2 billion cost of implementing a set of high-impact interventions to reduce the NCD burden.' (Mendis et al., 2014)*

The consequences of NCDs are particularly devastating for populations on low incomes (Mendis et al., 2014). Financial costs may deter people suffering from NCDs from seeking treatment, leading to higher morbidity and mortality. Low income households in developing countries, where health insurance and public health care are often lacking, can face ruinously high costs from NCDs, both in care and medicines such as insulin, and in lost time to earn incomes (Kankeu et al., 2013).

4. Drivers of overweight and obesity

What drives overweight and obesity? What factors matter, and in which circumstances?

Many factors influence an individual's chance of being overweight or obese. In broad terms, they divide between physical and medical factors that apply to individuals, and economic and social influences that arise as individuals interact with the economy and society within which they live.

Economic and social factors determine diet that then becomes the main reason why most people become overweight and obese. A long causal chain thus links underlying economic and social drivers to diet, obesity and disease (Table 4). Food costs can be taken as a starting point. They are defined by the efficiency of farming, food processing, and the food supply chains. For most foods, costs in real terms have been falling for the last fifty years or longer.

The cost of food then interacts with demand for food, itself the result of incomes and preferences, to set prices in markets. These prices, again in combination with preferences and incomes, then determine what people buy, cook and eat. In turn, diet, together with health and exercise, influences bodyweight — with attendant risks for those overweight and obese.

With so many variables potentially leading to overweight and obesity, the importance of the different factors will vary through time, place, social group and indeed individuals. That means that policies (see next section) need tailoring to circumstances.

Table 4: Causal chain from costs of food to consumption, obesity and ill health

Level	Direct links	Other factors
0	Increases in productivity … in • Agriculture; • Food processing; and, • Food transport,storage, distribution and retailing … that reduce unit costs of food.	Public policy: Taxes, Subsidies Pricing as marketing strategy – offers, loss leaders, etc.
1	Change in food prices, constant, net of inflation • Absolute, compared to other goods and services • Relative, one food or group of foods, compared to another	Incomes Transfers – food stamps Preferences – influenced by advertising, public education, media, peers Availability – e.g. food 'deserts'
2	Change in (purchase and) consumption	Genetic and physical factors – ability to use energy,store fat Physical activity – influenced by work, transport,sports and leisure options, etc.
3	Change in weight (BMI, fat composition)	Remedial medical interventions such as prescribed drugs
4	Disease and ill heath: • Premature death, disability, illness • Costs of health care • Economic losses	

Source: Wiggins et al, 2015

Debates: food versus exercise, individual choice versus the environment

Two major debates have arisen over the causes of overweight and obesity.

One concerns the extent to which obesity is driven by food consumption as opposed to ever-more sedentary lives. Since growing overweight is almost always the result of ingesting more energy than expended, then it is axiomatic either eating more, or exercising less, will yield the same result. Food industry lobbies, not surprisingly, are keen to argue that lack of exercise is more culpable than diet and the food industry produces. They may have a point;[2] UK food consumption per person has fallen over the last 20 or more years, yet the prevalence of people overweight has risen. (Griffith et al., 2013) The problem, however, is that it is hard to know for sure if food consumption really has fallen: the increasing share of food eaten outside the home and as snacks, rather than formal meals, makes it very difficult to track actual intake for groups and populations. Personal surveys are not necessarily accurate, since it is probably that people under-report eating treats such as chocolate; in the UK a large gap exists between sales of chocolate and what is reported consumed.

This is a largely unproductive debate: both changing diets and boosting exercisewould counter the rise in obesity. Which of these, however, is simpler to effect?

Part of the answer to this question is linked to the other grand debate of individual choice versus circumstances that make healthy choices difficult. In principle, people are free to choose what they eat, how much they exercise, and if they grow overweight as a result, then that is their own business. In reality many people in high-income countries and the new cities of emerging economies live in environments that are 'obesogenic'; that is, they actively contribute to obesity (Box 1). Yes, people may have some choice, but in practice they are constantly tempted to eat, and to eat tasty but less healthy options, and take little exercise.

This debate fills pages of newsprint, particularly in western countries – see, for example, Winterman, 2012; Pica, 2016; and Kirkey, 2017 – where stigmas and stereotypes about overweight or obese people abound. Some allege that emphasising personal choice is convenient for industry lobbyists.

Box 1: What is an obesogenic environment?

The term 'obesogenic environment', probably coined by New Zealand public health expert Boyd Swinburn around thirty years ago (BBC News, 2014), refers to an environment encourages weight gain. Such environwments include:

- Road layouts that promote use of cars and vehicles, instead of walking or cycling;
- Lifts and escalators in buildings and public spaces to avoid climbing stairs;
- Neighbourhoods without parks and playgrounds;
- Schools lacking playing fields or gyms;
- Heavy advertising of processed foods high in energy, salt and sugar;
- High prevalence of shops, fast-food outlets and vending machines selling energy-dense foods;
- Lack of shops selling fresh fruits and vegetables — particularly seen in low-income neighbourhoods that have thus been described as 'food deserts'.

2 But they may also overplay their hand, as this observation on lobbying in Ireland, suggests: there is nothing dishonourable in making and selling soft drinks, but for our most prominent nutritional scientists to claim that the obesity problem is primarily one of inadequate physical activity rather than of overconsumption of unhealthy foods and drinks is either incompetent or disingenuous. For them to argue that sugar taxes or restricting advertising of unhealthy foods to children are bad ideas, while actively denying any conflict of interest despite working for the very companies that stand to lose from these public health initiatives, is a grievous failure to declare that interest. (Finucane, 2017)

5. Policy responses

Which is more effective and feasible: to prevent or to cure obesity?

Preventing obesity is likely to be more effective than seeking to cure it after the fact. It is very difficult to lose weight once accumulated to the point of obesity (Fildes et al., 2015). [3] While diets may work in the short term, the chance of keeping weight off for five or more years is only around 5%, and yo-yo diets characterised by cycles of weight loss and gain are thought to be particularly unhealthy (Brown, 2015).[4]

Prospects for prevention however are fairly good considering the relatively small average imbalance in excess energy intakes thought to contribute to weight gain.

> *'Because obesity is so challenging to treat after it has developed, the primary prevention of weight gain is a promising strategy for individual patients and for populations. An average American adult gains only ≈1 lb (0.45 kg) per year, consistent with habitual excess energy intakes as small as ≈50 kcal/d explaining the gradual weight gain seen in many people. This finding accentuates just how well our body's homeostatic mechanisms actually function to maintain long-term weight stability. Yet, when sustained over many years, this minor annual weight gain drives population obesity, e.g., leading to 10 lbs weight gain over 10 years, 20 lbs over 20 years, and so on.' (Mozaffarian, 2016)*

What policies have been proposed to tackle dietary risks?

Many policies and public investments influence diets indirectly. For example, agricultural development programmes as well as investments in roads and ports that support improved logistics can reduce the cost of food. The focus here, however, is on measures that have specific dietary objectives.

The **aims** of policies to influence diet are straightforward: to encourage people to consume diets that contain the energy, protein, vitamins and minerals they need, without excess consumption. More specifically, for many people this translates to eating (a little) less, and shifting the balance from unhealthy foods to more healthy options.

Policies for diets can be categorised by the **means** used, dividing them into:

- information to influence individual choice of foods;
- price incentives to change the cost of all or particular foods, plus income measures to make foods more affordable; and
- restrictions and rules on food processing, advertising and retailing.

A further distinction can be made between those measures that seek to remedy the undernutrition that is still concentrated in the developing world and those that try to encourage healthy diets (Figure 3, overleaf).

Policies that aim to reduce consumption of particular foods, or ingredients in prepared food, need to contemplate what may be substituted. The alternatives may be no more healthy than what they replace. For example, when concern about the fat content of diets in high-income countries became strong in the 1980s, some food manufacturers produced low-fat foods. Fat was often replaced by sugar, or even salt. Saturated fats gave way to non-saturated fats, include trans-fats. Nuts were often avoided on the grounds of their fat content. Whole milk was once banned from the US National School Program, while sugar-sweetened chocolate milk was permitted. (Mozaffarian, 2016)

3 In a UK study looking at the probability of an obese adult attaining normal body weight through non-surgical means (Fildes et al., 2015) found: 'In simple obesity (body mass index = 30.0–34.9 kg/m2), the annual probability of attaining normal weight was 1 in 210 for men and 1 in 124 for women, increasing to 1 in 1290 for men and 1 in 677 for women with morbid obesity (body mass index = 40.0–44.9 kg/m2). The annual probability of achieving a 5% weight reduction was 1 in 8 for men and 1 in 7 for women with morbid obesity.'

4 Linked to heart disease, insulin resistance, higher blood pressure, inflammation, and, ironically, long-term weight gain (Brown, 2015).

Figure 3: Typology of policies to influence diets

Source: Keats and Wiggins, 2014, drawing on Capacci et al (2012) and Haddad (2003) reporting Sims (1998)

Examples of policies

Many policies have been tried, especially in the new century. The World Cancer Research Fund (WCRF) has documented them on its website[5] with policies classified by ten different domains, and sorted by country. Some policy examples include:

Using persuasion to influence diets in South Korea

South Korea tries to preserve healthy elements of traditional diet in the face of a nutrition transition. Public campaigns and education, including the large-scale training of women in the preparation of traditional low-fat, high-vegetable meals, has seen less modification of Korean diets than might be predicted, given the country's relatively high average incomes. Korea has about half the level of overweight and obese people as some emerging economies, such as Mexico

Banning trans-fatty acids (TFA) in Denmark

Denmark banned trans-fatty acids (TFA), useful in food manufacturing but carrying high risks for cardio-vascular disease, in 2004. It has contributed to lower prevalence of heart disease.

Limiting salt consumption in Thailand

Thailand started a campaign in 2011 to reduce salt consumption by 50%. Initially researchers and food manufacturers collaborated to reformulate snacks. These, however, were not popular.

A subsequent approach encouraged food processers to reformulate alone, resulting in several marketable products including potato chips with 50% less sodium, and instant noodles with 20% less sodium.

Encouraging students to eat healthily in Brazil

Brazil's national school feeding programme, launched in 1955 and covering nearly 47 million children, aims to contribute to the growth, development, and learning capabilities of students, as well as supporting healthy habits through education and promoting local farms through purchasing. School meals meet national nutrition standards. Brazilian law requires 70% of the food served to children in school meal programmes be unprocessed (e.g. rice, beans, meat, fish, fruits or vegetables) and 30% be locally sourced.

'Regular government purchases from family farms have led to improved quality of unprocessed food and increased availability and consumption of fruits and vegetables by school children.' (Mendis et al., 2014)

How effective are food policies in promoting healthier diets?

Policies to alter food prices and to regulate the availability of foods are among the more effective, according to a recent review of 58 studies (Hyseni et al., 2016). Given that demand for some unhealthy options such as sugar-sweetened beverages (SSB) is relatively elastic, taxes do push down consumption. Regulation can be highly effective: banning trans-fats in Denmark not surprisingly cut consumption to nothing. Banning SSBs from schools reduces consumption by schoolchildren, but not that greatly since they can get SSBs from shops and at home.

Advertising of food can be effective, so that banning television advertising to children reduces their consumption of junk food.

Most other measures, such as food labelling, public education, and voluntary reformulation of foods have only a limited effect.

That said, the review reported that success was more likely where sets of policies combined different measures to achieve the same aim. For example, combining provision of healthy options with public education can make a significant difference to intake of fruit and vegetables.

Most studies concern high income countries.[6] This area of research is relatively fast-moving, as new polices are rolled out and analysed for efficacy: for instance the junk food tax launched in Mexico at the start of 2014 has already excited significant debate.[7]

Why is public response so inadequate given the scale of the problem?

A paradox of public policy is evident. Politicians fear to be seen to meddle with diets. Most people hate regulation of their access to favoured foods, see taxation of unhealthy foods and ingredients as onerous and unfair, and acquiesce only in response to public information and education. Couple this with lobbying from farming and food industries, and the political will to take strong measures on diets withers.

5 See http://www.wcrf.org/int/policy/nourishing-framework

6 Only a few developing countries were represented in some literature, namely: Brazil, Mexico, India, Trinidad, Pacific Island countries, countries in Central America, Egypt, and Thailand.

7 For instance Colchero et al., 2015; Colchero et al., 2016

Yet the growing scientific consensus is that diets in many high-income countries, and increasingly in emerging economies, have high costs to individuals and society.

The problem is that the costs of poor diets are diffuse and in the future. Even when an obese person suffers serious disease, it is very difficult to attribute this to specific diet choices. When countries began to take action against smoking, several decades ago, it was not hard to link lung cancer to tobacco: a specific, serious disease resulting from a specific behaviour.[8]

Moreover, the policies that seem to have most traction on diet – regulation and taxation – are precisely the policies that are least palatable to both the public and politicians.

In most countries, policies on diets have been so timid to date that we simply do not know what might be achieved by a determined drive to reduce the consumption of calories, and particularly the consumption of fat, salt and sugar. This has hardly ever been attempted, with the rare exception of wartime rationing in Britain. That was an unusual experience to deal with scarcity of food, but which also led to better diet and health. The British public were, however, delighted to abandon it once food supplies had been restored after the Second World War.

That said, the way forward may not be completely blocked, for four reasons. Firstly, the changes that most people need to make to their diets — and exercise — are quite small. In the US, it is reckoned that cutting the average food intake by just 220 kcal a day would not only arrest rising body mass, but even get it back to the levels last seen in 1970, before the great increase in overweight and obesity (Hall et al. 2011). Eating a sandwich less, or taking an extra 20–30 minutes of non-strenuous exercise, would be enough for most people.

Two, combinations of small policy nudges may achieve those changes, without the need for heavy-handed interventions.

Three, awareness of diet and its consequences is rising. Interest in diet has never been stronger in high-income countries as consumers obsess about their waistlines, worry about the social impacts of the marketing strategies of (very) large food retail chains, and enthuse over the culinary art and tradition shown in countless television programmes. Scientifically, a plethora of papers have been drafted in the past 10 years that ponder the rise of obesity worldwide and its implications.

Finally, with every passing year, policy-makers in the different parts of the world are making bolder interventions. Not only does that encourage other countries to follow suit, but also it provides experiences to evaluate. The results of Mexico's introduction of a levy on SSBs, and on food with high energy density, locally described as a 'junk food tax', is being assiduously tracked.

8 The link between smoking and lung cancer was first spotted in 1952, 65 years ago: policies to curb smoking have since been effective, but much remains to be done, and it has taken decades to build public solidarity with anti-smoking campaigns.

6. Knowledge gaps

Knowledge about overweight and obesity in the developing world is imperfect. That said, the broad outlines of the rising incidence of people overweight, the reasons for this, and potential mitigating policies, are fairly clear.

Two major gaps in knowledge stand out. One is explaining heterogeneity. Across the developing world, more people are becoming overweight and obese: but the rate and extent of this varies considerably by country, region, and social group. While explaining such variation may be analytically daunting, it means that there are plenty of exceptions to be found – 'positive deviants' – where bodyweights are not increasing. Understanding such cases can help considerably to formulate effective policy.

The other gap concerns policy. More evidence is needed on the effectiveness of different measures, in different circumstances. Evaluating policy to influence diet is not straightforward, since many variables potentially influence outcomes, so it can very difficult to isolate the effect a single policy. That applies all the more so when different policy measures are applied in combination.

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