

Research Paper

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Reviewing Interventions for Healthy and Sustainable Diets



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Contents

Summary	2
Introduction	3
Inform and Empower	8
Guide and Influence	10
Incentivize, Discourage or Restrict	12
The 'Macro' Context	15
Considerations for Policy-makers	18
Acronyms	22
About the Authors	23
Acknowledgments	24

Summary

- Human obesity has reached pandemic proportions. More than 1.9 billion adults worldwide are now overweight. Of these, 600 million are classed as obese. Around 3 million people die each year as a result of being overweight or obese. This is a problem for the entire global community, not only high-income countries, and action can be taken.
- Environmental costs of food production are very high, with agriculture a key driver of water scarcity. Irrigation accounts for approximately 70 per cent of freshwater withdrawals around the world – up to 90 per cent in some low- and middle-income countries (LMICs). Food production is also responsible for 30 per cent of greenhouse gas emissions. These impacts are unsustainable.
- What is good for public health is often good for the environment. However, rising to the challenge of changing patterns of food consumption on the scale needed to have an impact at the global level is a complex task. Behaviour can be influenced through many different approaches.
- There is no single definition of a healthy and sustainable diet. The range of relevant eating behaviours is large, and although the reduction of some dietary constituents – such as red and processed meat – can offer clear co-benefits for health and sustainability, in other areas, ‘win-wins’ may not be possible.
- Most research on interventions is concerned with either health or sustainability objectives, but evidence on interventions designed to achieve co-benefits is scarce. There is also a lack of evidence on interventions in LMICs. This is an obstacle to progress, since high population and economic growth, along with rapid urbanization, mean that it is in LMICs that much of the increase in consumption of unhealthy and unsustainable foods will occur in the future.
- The available evidence is strongest for the impact of fiscal and restrictive measures. In isolation, neither information provision nor ‘nudges’ appear likely to change consumption patterns sufficiently at the population level. However, combination strategies are likely to be important.
- The evidence highlights the risk of unintended consequences, such as leakage and substitution effects, rebound effects and ‘halo’ effects. Modelling can help anticipate some of these factors, and independent evaluation can be incorporated into interventions, not only to build evidence but also to monitor unintended consequences and inform modifications to policy and strategy.
- This paper offers a preliminary overview of the available evidence for interventions, to inform policy decisions for strategies aimed at encouraging healthy and sustainable diets. It is intended to promote discussion and follow-on activities.

Introduction

Current global dietary trends are a problem from both a public health and a sustainability perspective. In 2014, according to the World Health Organization (WHO), more than 1.9 billion adults were overweight, of whom over 600 million were classed as obese.¹ Some 42 million children under five years of age were classed as overweight or obese in 2013.² More than half of adults in industrialized countries (i.e. countries of the Organisation for Economic Co-operation and Development – OECD) are overweight, and nearly one in five is obese.³ The problem is not confined to high-income countries (HICs): half of the world’s overweight people live in nine countries including China, India, Brazil, Mexico, Indonesia and Turkey. North Africa, Central America, South America and Southern Africa have some of the highest levels of obesity in the world – exceeding 25 per cent of the adult population.⁴

Poor nutrition and overconsumption come at great cost to societies. It is estimated that obesity and excess weight result in the death of 2.8 million people globally each year as a result of the increasing incidence of non-communicable diseases (NCDs) – coronary heart disease, ischemic stroke, type 2 diabetes and some common cancers.⁵ Dietary factors are estimated to account for approximately 30 per cent of cancers in industrialized countries, with diet ranking second after tobacco in the preventable causes of cancer. Four out of five deaths from diet-related NCDs occur in low- and middle-income countries (LMICs),⁶ and this rate is expected to rise as diets shift towards – and outpace – patterns of consumption seen in HICs.⁷ The costs of diet-related NCDs are considerable and are rising in line with dietary trends,⁸ accounting for an estimated 50 per cent increase in OECD country health expenditure between 1999 and 2009.⁹ Within the United Kingdom, obesity-related health issues are estimated to account for more than 5 per cent of the National Health Service (NHS) spending in England alone.¹⁰ The economic costs associated with diabetes in the United States have been estimated at the equivalent of 1.3 per cent of gross domestic product (GDP); in Mexico 2.6 per cent of GDP; and in Brazil 3.8 per cent of GDP.¹¹

¹ World Health Organization. *Obesity and overweight*. Fact sheet No.311. [Online] 2015. Available from: <http://www.who.int/mediacentre/factsheets/fs311/en/> [Accessed 15 April 2015].

² Ibid.

³ Organisation for Economic Co-operation and Development. *OECD Obesity Update 2014*. [Online] 2014. Available from: <http://www.oecd.org/health/obesity-update.htm> [Accessed 15 April 2015].

⁴ Stevens G, Singh G, Lu Y, Danaei G, Lin J, Finucane M et al. National, regional, and global trends in adult overweight and obesity prevalences. *Population Health Metrics*. 2012; 10(1): 22.

⁵ World Health Organization. *World Health Statistics 2012*. Geneva: World Health Organization; 2012.

⁶ Popkin B. Bellagio Declaration 2013. *Obesity Reviews*. 2013; 14: 9–10.

⁷ Stuckler D, McKee M, Ebrahim S, Basu S. Manufacturing Epidemics: The Role of Global Producers in Increased Consumption of Unhealthy Commodities Including Processed Foods, Alcohol, and Tobacco. *PLoS Medicine*. [Online] 2012; 9(6):e1001235. Available from: doi:10.1371/journal.pmed.1001235 [Accessed 21 April 2015].

⁸ Scarborough P, Bhatnagar P, Wickramasinghe K, Allender S, Foster C, Rayner M. The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK: an update to 2006–07 NHS costs. *Journal of Public Health*. 2011; 33(4): 527–535.

⁹ Sassi F, Lauer J, Chisholm D, Cecchini M. Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies. *OECD Health Working Papers*, No. 48. [Online] Paris: OECD Publishing; 2009. Available from: <http://dx.doi.org/10.1787/220087432153> [Accessed 20 April 2015].

¹⁰ The UK government estimates that in England health problems associated with being overweight or obese cost the NHS more than £5 billion annually; NHS England had a budget allocation of £95.6 billion in 2013/14. See Department of Health. *2010 to 2015 government policy: obesity and healthy eating*. [Online] 2015. Available from: <https://www.gov.uk/government/publications/2010-to-2015-government-policy-obesity-and-healthy-eating> [Accessed 10 May 2015]. NHS England. *NHS allocations for 2013/14*. [Online] 2015. Available from: <http://www.england.nhs.uk/allocations-2013-14/> [Accessed 10 May 2015].

¹¹ Yach D, Stuckler D, Brownell K. Epidemiologic and economic consequences of the global epidemics of obesity and diabetes. *Nature Medicine*. 2006; 12(1): 62–66.

The environmental costs of food production are also very high. Agriculture is a major driver of increasing water scarcity.¹² According to UN-Water, irrigation accounts for 70 per cent of water withdrawals worldwide, while in the majority of the world's least developed countries agriculture accounts for at least 90 per cent of water withdrawals.¹³ By 2030 it is estimated that agricultural demand for water may have increased by 30 per cent, leading to increased tensions with industrial and municipal water users.¹⁴

Food production is responsible for some 30 per cent of global greenhouse gas emissions.¹⁵ Production of meat and dairy products results in more greenhouse gas emissions than the total generated by aircraft, trains, motor vehicles and ships combined. Recent analyses indicate that without radical shifts in global meat consumption, it is unlikely that global temperature rises can be kept below 2°C – the international community's stated aim.¹⁶ Agriculture is, furthermore, the primary driver of habitat destruction, genetic erosion and species loss.¹⁷ According to one recent study, agriculture accounted for more than half of global deforestation between 1990 and 2008.¹⁸

The social and environmental costs associated with current patterns of consumption imply that a widespread move towards more healthy and sustainable diets would yield significant benefits. However, to achieve behaviour change on the scale needed is an immense and complex challenge.

Rising to the challenge is made more complex because it does not simply involve eliminating the consumption of foods harmful to health and the environment, even if this were achievable. Many foods can bring health benefits, or are not harmful, when consumed in moderation; although eating too much red meat can increase heart disease and colorectal cancer risk,¹⁹ consuming small quantities can provide important nutrients.

The link between consumption and production practices must also be taken into account. For example, although a significant amount of palm oil is produced at the expense of rainforest, it can be produced in a more sustainable manner. Supply-side interventions such as regulations, subsidies and extension services can make production more sustainable, but changes in consumption preferences may also play an important role. For example, demand-side interventions that increase demand for sustainably produced foods can incentivize sustainable production. This paper is concerned with demand-side interventions to influence dietary choices, but both supply- and demand-side interventions will be required to make progress in the medium and longer term.

¹² According to the Water Resources Group, global demand for water already exceeds sustainable supply; and by 2030 the supply gap could be as high as 40 per cent. See 2030 Water Resources Group. *Charting Our Water Future*. 2009.

¹³ UN-Water. *Agriculture is the biggest water user, with irrigation accounting for 70% of global water withdrawals*. [Online] Available from: <http://www.unwater.org/statistics/statistics-detail/en/c/246663/> [Accessed 15 April 2015].

¹⁴ Lee B, Preston F, Kooroshy J, Bailey R, Lahn G. *Resources Futures*. [Online] London: Chatham House, the Royal Institute of International Affairs; 2012. Available from: http://www.chathamhouse.org/sites/files/chathamhouse/public/Research/Energy,%20Environment%20and%20Development/1212r_resourcesfutures.pdf [Accessed 14 April 2015].

¹⁵ Bellarby J, Foereid B, Hastings A, Smith P. *Cool Farming: Climate Impacts of Agriculture and Mitigation Potential*. [Online] Amsterdam: Greenpeace International; 2008. Available from: <http://www.greenpeace.org/international/en/publications/reports/cool-farming-full-report/>.

¹⁶ Bailey R, Froggatt A, Wellesley L. *Livestock – Climate Change's Forgotten Sector: Global Public Opinion on Meat and Dairy Consumption*. [Online] London: Chatham House, the Royal Institute of International Affairs; 2014. Available from: http://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20141203LivestockClimateChangeBaileyFroggattWellesley.pdf [Accessed 14 April 2015].

¹⁷ Nellemann C, MacDevette M, Manders T, Eickhout B, Svihus B, Prins A, Kaltenborn B (eds.). *The environmental food crisis – The environment's role in averting future food crises*. Arendal: UNEP; 2009.

¹⁸ Cuyppers D, Lust A, Geerken T, Gorissen L, Peters G, Karstensen J et al. *The impact of EU consumption on deforestation*. Luxembourg: European Commission; 2013.

¹⁹ World Health Organization International Agency for Research on Cancer. *Report of the Advisory Group to Recommend Priorities for IARC Monographs during 2015–2019*. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. [Online] Lyon: International Agency for Research on Cancer; 2014. Available from: <http://monographs.iarc.fr/ENG/Publications/internrep/14-002.pdf> [Accessed 26 April 2015].

In addition to discouraging unhealthy and unsustainable diets, interventions must also encourage the consumption of sustainable, healthy alternatives. There is no single, precise definition of a sustainable diet, but there is a broad consensus that diets that are lower in meat, fish and dairy products, and higher in whole grains, fruits, vegetables and legumes can provide good nutrition at lower environmental cost.²⁰ Even though the health benefits of fish are well known, a minimally processed diet that is predominantly plant-based is ‘decisively associated with health promotion and disease prevention’, according to a recent review of the scientific literature.²¹

Building an evidence base on which stakeholders can design effective and appropriate strategies to promote healthy and sustainable diets is a critical research challenge. This paper offers a preliminary overview of the evidence available, recognizing that considerable gaps and uncertainties exist. It draws on a supporting literature review,²² which, in light of the requirement for rapid results, was inevitably constrained. The review focuses on a specific subset of four key eating practices within the general pattern of a healthy and sustainable diet: increased plant foods, especially fruit and vegetables; reduced meat; reduced palm oil; and reduced sugar. It has a bias towards HICs, as this is where much of the pertinent research has been undertaken.

This paper also incorporates expert advice from a roundtable discussion held at Chatham House on 10 April 2015.

The limited evidence base means it is not possible at this stage to arrive at concrete recommendations. However, this paper does offer some initial thoughts for policy-makers to consider alongside proposals for further research and action. The paper is intended to inform an ongoing process involving further consultation and with more extensive analysis, as part of the next steps towards the development of definitive policy options and recommendations.

Health and environmental co-benefits

What is good for public health is often also good for the environment. Table 1 provides some examples of particular foods where reduced consumption could generate important environmental and public health co-benefits.

Table 1: Health and environmental rationales for reduced consumption of meat, palm oil and sugar

	Health concerns	Environmental concerns
Meat	<ul style="list-style-type: none"> Diets high in red and processed meat are associated with increased risk of heart disease and colorectal cancer. Widespread use of antibiotics in intensive livestock systems may increase risk of antimicrobial resistance, and have a negative impact on human health. 	<ul style="list-style-type: none"> Livestock products embody more than half of agricultural deforestation and almost 15 per cent of global anthropogenic emissions. Climate change models indicate that without a shift in consumption trends, it will probably be impossible to limit global warming to 2°C. Animal grazing and feed production are major drivers of biodiversity loss. Effluent from intensive livestock systems can pollute water systems.

²⁰ Garnett T. *What is a sustainable healthy diet?* [Online] Oxford: Food Climate Research Network; 2015. Available from: http://www.fcrn.org.uk/sites/default/files/fcrn_what_is_a_sustainable_healthy_diet_final.pdf [Accessed 23 March 2015].

²¹ Katz D, Meller S. Can We Say What Diet Is Best for Health? *Annual Review of Public Health*. 2014; 35(1): 83–103.

²² Garnett T, Mathewson S, Angelides P, Borthwick F. *Policies and actions to shift eating patterns: What works? A review of the evidence of the effectiveness of interventions aimed at shifting diets in more sustainable and healthy directions*. [Online] Oxford: Food Climate Research Network, University of Oxford; 2015. Available from: <http://www.fcrn.org.uk/fcrn-publications/reports/policies-and-actions-shift-eating-patterns-what-works>.

	Health concerns	Environmental concerns
Palm oil	<ul style="list-style-type: none"> • Palm oil is high in saturated fat, and consumption is associated with an increased risk of cardiovascular disease and death. 	<ul style="list-style-type: none"> • Palm oil is estimated to have accounted for 8 per cent of global crop-driven deforestation between 1990 and 2008. • Deforestation is primarily of peat swamp and lowland rainforest in Indonesia and Malaysia – of high carbon stock and high biodiversity.
Sugar	<ul style="list-style-type: none"> • Sugar consumption is linked to obesity and increased risk of NCDs, in particular diabetes. • Research has linked high levels of sugar consumption to increased risk of cardiovascular disease and death, irrespective of other factors such as body mass index, activity levels and diet. • Sugar consumption is a major cause of tooth decay, which accounts for 5–10 per cent of health spending in HICs. 	<ul style="list-style-type: none"> • Added sugars are produced principally from sugar cane, sugar beet and maize (corn). Problems associated with industrial monocropping include soil erosion and degradation, air pollution, water pollution, biodiversity loss and land clearance. • Sugar cane is estimated to have accounted for 5 per cent of global crop-driven deforestation between 1990 and 2008.

Sources: Bailey et al (2014);²³ Brack and Bailey (2013);²⁴ European Commission (2013);²⁵ Yang et al (2014);²⁶ WHO (2015);²⁷ WWF (2004);²⁸ Chen et al (2011).²⁹

Examining the evidence

There is an important policy agenda concerned with the promotion of more healthy and sustainable diets. Researchers have developed a variety of conceptual frameworks to understand and organize interventions to influence consumer behaviours.³⁰ Approaches can be considered in terms of a continuum of increasing intervention,³¹ ranging from providing information and ‘nudging’ consumers towards better choices,³² to fiscal incentives and finally to banning undesirable foods outright. Approaches may involve different actors. For example, governments are required to develop regulations or fiscal measures, and retailers can shape the contexts in which purchasing decisions are made. Governments, business or civil society can provide consumers with information, and many approaches may lend themselves to collaboration. These different interventions can be organized into a three-by-three matrix, shown in Figure 1.

²³ Bailey R et al. *Livestock – Climate Change’s Forgotten Sector*. 2014.

²⁴ Brack D, Bailey R. *Ending Global Deforestation: Policy Options for Consumer Countries*. [Online] London: Chatham House, the Royal Institute of International Affairs; 2013. Available from: http://www.chathamhouse.org/sites/files/chathamhouse/public/Research/Energy,%20Environment%20and%20Development/0913pr_deforestation.pdf [Accessed 21 April 2015].

²⁵ Cuyppers D et al. *The impact of EU consumption on deforestation*. 2013.

²⁶ Yang Q, Zhang Z, Gregg EW, Flanders W, Merritt R, Hu FB. Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults. *JAMA Internal Medicine*. [Online] 2014; 174(4): 516–524. Available from: doi:10.1001/jamainternmed.2013.13563 [Accessed 20 April 2015].

²⁷ World Health Organization. *Healthy diet*. Fact sheet No.394. [Online] 2015. Available from: <http://www.who.int/mediacentre/factsheets/fs394/en/> [Accessed 10 May 2015].

²⁸ Loh J, Wackernagel M. *Living planet report 2004*. Gland: WWF International; 2004.

²⁹ Chen B, Seligman B, Farquhar J, Goldhaber-Fiebert J. Multi-Country analysis of palm oil consumption and cardiovascular disease mortality for countries at different stages of economic development: 1980–1997. *Globalization and Health*. 2011; 7(1): 45.

³⁰ Garnett T et al. *Policies and actions to shift eating patterns: What works?* 2015.


³¹ For example, the Nuffield Ladder. See World Health Organization. *Nuffield intervention ladder*. [Online] Available from: http://apps.who.int/adolescent/second-decade/section/section_8/level8_8.php [Accessed 26 March 2015].

³² Such approaches encourage consumers to make better choices using insights from behavioural economics. They emphasize designing the ‘choice architecture’ to increase the likelihood of desirable decisions, through for example changing the default option or shaping the context in which choices are made. See Thaler R, Sunstein C. *Nudge: Improving Decisions About Health, Wealth, and Happiness*. New York: Penguin Books; 2009.

There is a wide range of available approaches that use different policies, include different actors and target different foodstuffs. However, considerable uncertainty surrounds the potential of different interventions, making it difficult to design effective strategies. Particular issues include:

- **Efficacy:** How effective will the intervention be at delivering the desired result?
- **Implementation:** How challenging, both technically and financially, will it be to design and implement an appropriate intervention?
- **Distributional effects:** How might outcomes vary across different sections of society and income groups?
- **Unintended consequences:** What are the risks of perverse outcomes?
- **Reaction:** What are the risks of criticism, for example for governments at risk of complaints of ‘nanny state’ interference?

Figure 1: Targeted interventions for influencing food consumption

		Increasing intervention 		
		Inform and empower	Guide and influence	Incentivize, discourage or restrict
Business		<ul style="list-style-type: none"> • Product labelling with nutritional or environmental information 	<ul style="list-style-type: none"> • Positive positioning of healthy and sustainable foods within retail settings • Reduced plate sizes in restaurants to encourage lower consumption 	<ul style="list-style-type: none"> • Voluntary commitment to use sustainable ingredients, e.g. 100% sustainable palm oil
	Collaborative	<ul style="list-style-type: none"> • Government–industry agreements on standardized labelling • Multi-stakeholder certification schemes 	<ul style="list-style-type: none"> • Government–industry agreements to reduce sales of unhealthy or unsustainable foods 	<ul style="list-style-type: none"> • Government–industry agreements to reduce content of undesirable ingredients
Government	<ul style="list-style-type: none"> • Public information campaigns • Advertising regulations • Labelling regulations • Nutritional guidelines 	<ul style="list-style-type: none"> • Changed default food options in public institutions, e.g. make salad or green vegetables rather than chips the default side order in schools, hospitals, etc. 	<ul style="list-style-type: none"> • Banning or taxation of unhealthy or unsustainable foods • Subsidized healthy and sustainable foods • Exclusion of unhealthy or unsustainable foods from public procurement 	

Inform and Empower

The least intrusive strategy to influence consumer behaviour involves providing people with information. There are two propositions for how this can influence consumer choice. The first is that better information on the health or environmental impacts of foods can empower people to make better-informed choices. The second is that providing people with information on the behaviours of others can encourage them also to make certain choices; this is often termed normative feedback.

Better information

Consumers can be informed of the environmental or health impacts of food choices through a variety of channels, including public information campaigns, guidelines, and labelling and certification initiatives.

Public information campaigns

In some countries, governments have launched public information campaigns to encourage healthier diets. However, the evidence generally shows that while these have been successful in raising awareness, this has not been translated into the desired positive changes in consumption.

Guidelines

Many governments have adopted food-based dietary guidelines.³³ These can provide guidance for public and institutional procurement as well as for public information and education campaigns. Very few have incorporated environmental considerations, but increasingly these are being taken into account.³⁴ Guidelines are unlikely to influence consumer selection directly, but they can provide a benchmark against which to assess the food offer of manufacturers, catering companies, restaurant companies and public institutions such as hospitals and schools, helping to provide an incentive for supply-side change.³⁵

Labelling

Foods can be labelled with environmental and nutritional information. Nutritional labels – for example providing information on calories and on salt, fat, carbohydrate and protein content – are much more widespread. The evidence is mixed regarding how effective such labels are. Research indicates that the impacts that labels have on consumer awareness and selection is complex and highly context-specific.³⁶ Methodologically, it is difficult to isolate the impact of labelling from other contextual, demographic or policy factors. Fundamentally, there is considerable evidence that at the population level, better-informed consumers do not necessarily make better-informed choices, even when they state that they would like to do so. Factors such as price, taste, habit or convenience

³³ See Food and Agriculture Organization of the United Nations. *Food-based dietary guidelines*. [Online] 2015. Available from: <http://www.fao.org/nutrition/education/food-dietary-guidelines/home/en/> [Accessed 18 April 2015].

³⁴ For example, in Norway, Brazil and the Netherlands guidelines include sustainability and health considerations. At the time of writing, consultations are under way on guidelines in the USA that would do so. Garnett T et al. *Policies and actions to shift eating patterns: What works?* 2015.

³⁵ For example, Unilever states that it monitors product reformulation against globally recognized dietary guidelines. See Unilever. *Improving nutrition*. [Online] Available from: <http://www.unilever.com/sustainable-living/the-sustainable-living-plan/improving-health-and-well-being/improving-nutrition/index.html> [Accessed 15 April 2015].

³⁶ Hawkes C, Smith T, Jewell J, Wardle J, Hammond R, Friel S et al. Smart food policies for obesity prevention. *The Lancet*. [Online] 2015. Available from: [http://dx.doi.org/10.1016/S0140-6736\(14\)61745-1](http://dx.doi.org/10.1016/S0140-6736(14)61745-1) [Accessed 1 May 2015].

have been shown to be more important than health or environmental concerns in shaping purchase decisions. Consequently, providing information to people has limited impact on selection at the point of sale.³⁷ Nevertheless, nutritional labelling could contribute to other positive outcomes – in particular, there is some evidence that it provides an incentive for food manufacturers to reformulate their products.³⁸

Certification

Most environmental labelling schemes are certification initiatives: rather than providing information about the environmental impacts of a particular food, the label simply confirms that its production has met minimum sustainability standards. As such, they may help consumers to make a simple choice, selecting one product over another similar one. Many commodity certification schemes, such as the Roundtable on Sustainable Palm Oil (RSPO) or Bonsucro (for sugar cane), set both social and environmental standards. Most of these schemes are multi-stakeholder initiatives, with participation from the private sector, civil society and sometimes government.

Certification schemes appear to have been somewhat successful in shifting the market towards certified products.³⁹ However, it is not clear that this has been due to consumer demand. For example, the RSPO, perhaps the most established food commodity certification scheme, is not ‘consumer-facing’. RSPO certification provides information to food manufacturers rather than to consumers; no label appears on retail products containing RSPO-certified palm oil. Use of RSPO-certified palm oil can perhaps be explained by the desire of companies to demonstrate their sustainability credentials and mitigate the risk of potentially damaging criticism from NGOs (some of which have run high-profile campaigns on palm oil and criticized well-known companies). Governments and public authorities might also drive demand for certified products, for example by making certification a requirement for procurement.

Normative feedback

It is well established that people can change their behaviour when presented with information about the behaviour of others. People might be encouraged to behave healthily or sustainably when they are shown that others do so. However, research on alcohol consumption among students indicates that normative feedback sometimes has limited efficacy.⁴⁰

On environmental issues, studies have identified potentially significant impacts on reducing household energy or water use by including information on neighbours’ consumption with utility bills. But changes in behaviour are often not sustained, and households soon ‘backslide’ to previous patterns of consumption.⁴¹ More research is needed on the effectiveness of normative feedback in relation to healthy and sustainable diets.

³⁷ Garnett T et al. *Policies and actions to shift eating patterns: What works?* 2015.

³⁸ Hawkes C et al. *Smart food policies for obesity prevention.* 2015.

³⁹ Garnett T et al. *Policies and actions to shift eating patterns: What works?* 2015.

⁴⁰ Foxcroft DR, Moreira M, Almeida Santiamo NML, Smith LA. Social norm interventions are not effective enough to reduce alcohol misuse among university or college students. *Cochrane Review*. [Online] 2015. Available from: http://www.cochrane.org/CD006748/ADDICTN_social-norms-interventions-are-not-effective-enough-to-reduce-alcohol-misuse-among-university-or-college-students [Accessed 1 May 2015].

⁴¹ Croson R, Treich N. Behavioral Environmental Economics: Promises and Challenges. *Environmental and Resource Economics*. 2014; 58(3): 335–351.

Guide and Influence

It might be considered that changing the price of an item or providing information could encourage rational consumer behaviour. But a significant body of evidence demonstrates people do not always behave rationally and instead make contradictory choices – such as the person trying to lose weight who nevertheless picks up a chocolate bar while queuing at the checkout. Here, the retailer has designed an environment at the point of sale that increases the likelihood of selling food that the customer had no intention of buying when they entered the shop.⁴² This is distinct from influencing choice through price or the provision of information, both of which appeal to conscious reasoning.

Such approaches are in widespread use for commercial advantage in the retail sector. However, in recent years there has been a growing interest in using them in public policy development, potentially to guide people towards choices that are desirable from a societal perspective. Illustrative examples are given in Table 2. Strategies commonly aim to change contextual cues, alter the prominence of different options or change default options. These types of intervention are commonly referred to as ‘nudges’. They may have low implementation costs and hold particular appeal for governments wishing to avoid regulation.

Table 2: Illustrative examples of policy nudges

Policy objective	Intervention
Increase pension enrolment	<ul style="list-style-type: none"> Change the default from ‘opt in’ to ‘opt out’.
Improve diet	<ul style="list-style-type: none"> Provide a cue to purchase fruit and vegetables in supermarkets by including a designated space in shopping trolleys. Increase the prominence of healthy foods in canteens or on supermarket shelves. Change the default side option in restaurants and cafeterias from chips to salad or green vegetables.
Increase physical activity	<ul style="list-style-type: none"> Provide a cue to use the stairs by designing buildings so that stairways are more prominent and appealing. Increase the prominence of cycling in towns by building cycle lanes and rolling out cycle hire schemes.
Reduce alcohol consumption	<ul style="list-style-type: none"> Make smaller glasses or lower-alcohol wines the default option in bars and restaurants. Increase the prominence of low-alcohol beers on supermarket shelves.

Sources: Authors’ analysis; Marteau et al (2011).⁴³

However, despite showing success in commercial applications, a large body of literature on designing so-called ‘choice architecture’ for public health, and the high hopes of policy-makers and politicians, there is little empirical evidence that these approaches can deliver sustained results at scale or perform better than alternative strategies.⁴⁴ This is not to say that nudges cannot play a role as part of combination

⁴² In practice, supermarkets have been found often to position confectionery at children’s eye level. Bonell C, McKee M, Fletcher A, Wilkinson P, Haines A. One nudge forward, two steps back. *BMJ*. 2011; 342:d401. Available from: <http://dx.doi.org/10.1136/bmj.d401> [Accessed 15 April 2015].

⁴³ Marteau T, Ogilvie D, Roland M, Suhrcke M, Kelly M. Judging nudging: can nudging improve population health? *BMJ*. [Online] 2011; 342:d228. Available from: <http://dx.doi.org/10.1136/bmj.d228> [Accessed 1 May 2015].

⁴⁴ Ibid.

strategies that include these interventions. This appears to hold in institutional settings – such as workplaces, schools and hospitals – where government (or the relevant administrative authority) can specifically design the choice architecture directly, as well as in commercial settings.⁴⁵

The important question in commercial settings is not whether nudges are more or less effective than alternative interventions, but rather whether there is meaningful scope for companies to use nudges for environmental or health objectives. The business case for designing choice architectures that are supportive of health and/or environmental objectives may in some cases be clear. For example, when a food that is good for the environment or health has a high retail margin, then the incentive is there for the retailer to maximize sales at the expense of other products with a lower profit margin. Therefore, to the extent that sustainable and/or healthy foods can command a price premium, there is a rationale to design choice architectures that favour these products. In other cases, it might be the role of government to work with or incentivize business to nudge consumers towards more healthy and sustainable choices.

There are various examples of voluntary agreements between government and business on public health issues where nudge approaches have been used. One such is the UK's Public Health Responsibility Deal, launched under the auspices of the Department of Health in 2011, whereby 'partners' have made a series of pledges in areas including reducing alcohol, salt and saturated fat content.⁴⁶ 'Nudging' was central to the strategy, and explicit in the then secretary of state's notion of the Responsibility Deal: 'Rather than nannying people, we will nudge them by working with industry to make healthier lifestyles easier'.⁴⁷ The deal has been criticized by organizations including the British Medical Association and the Royal College of Physicians for undermining prospects for more effective regulatory interventions and providing companies with undue influence over policy-making,⁴⁸ but has been defended on the grounds that business has an important role to play in public health and should be a stakeholder.⁴⁹

In general, evidence on public health interventions demonstrates that voluntary agreements with the food, alcohol and tobacco industries have been less effective than have regulatory alternatives.⁵⁰ In practice, voluntary agreements tend to be more effective the less 'voluntary' they are. Those including coercive elements such as economic incentives and sanctions have tended to perform best.⁵¹

⁴⁵ Liberato S, Bailie R, Brimblecombe J. Nutrition interventions at point-of-sale to encourage healthier food purchasing: a systematic review. *BMC Public Health*. 2014; 14(1): 919.

⁴⁶ Department of Health. *Public Health Responsibility Deal*. [Online] Available from: <https://responsibilitydeal.dh.gov.uk/> [Accessed 10 May 2015].

⁴⁷ BBC News. People to be 'nudged' into good health by government'. *BBC News*. [Online] 30 November 2010. Available from: <http://www.bbc.com/news/health-11878873> [Accessed 20 April 2015].

⁴⁸ See for example British Medical Association. *Behaviour change, public health and the role of the state – BMA Position Statement*. [Online] 2012. Available from: <http://bma.org.uk/working-for-change/improving-and-protecting-health/behaviour-change> [Accessed 22 April 2015]. Royal College of Physicians. *Key health organisations do not sign responsibility deal*. [Online] 2011. Available from: <https://www.rcplondon.ac.uk/press-releases/key-health-organisations-do-not-sign-responsibility-deal> [Accessed 22 April 2015].

⁴⁹ Lansley A. The role of business in public health. *The Lancet*. 2011; 377(9760): 121.

⁵⁰ Marteau T et al. Judging nudging. 2011. Sharma L, Teret S, Brownell K. The Food Industry and Self-Regulation: Standards to Promote Success and to Avoid Public Health Failures. *American Journal of Public Health*. 2010; 100(2): 240–6. Anderson P. Global alcohol policy and the alcohol industry. *Current Opinion in Psychiatry*. 2009; 22(3): 253–257. Action on Smoking and Health. *The smoke-filled room: How Big Tobacco influences health policy in the UK*. [Online] 2010. Available from: <http://www.ash.org.uk/media-room/press-releases/:the-smoke-filled-room-how-big-tobacco-influences-health-policy-in-the-uk> [Accessed 25 April 2015].

⁵¹ Bryden A, Petticrew M, Mays N, Eastmure E, Knai C. *Scoping Review of Evaluations of Voluntary Agreements Between Government and Business*. [Online] London: Policy Innovation Research Unit; 2012. Available from: [http://www.piru.ac.uk/assets/files/RD%20SCOPING%20lit%20review%20\(Bryden%20et%20al\),%2011%20Apr%2012.pdf](http://www.piru.ac.uk/assets/files/RD%20SCOPING%20lit%20review%20(Bryden%20et%20al),%2011%20Apr%2012.pdf) [Accessed 25 April 2015].

Incentivize, Discourage or Restrict

Governments can discourage consumption of unhealthy and/or unsustainable foods by increasing their price relative to alternatives. Conversely, they can incentivize consumption of healthy and/or sustainable foods by lowering the relative price. The most straightforward way to do this is via fiscal measures – i.e. by means of taxation or subsidy. Government can also impose restrictions and limits on the sale or use of undesirable foodstuffs, or ban them outright. In addition, business can voluntarily restrict unsustainable ingredients in foods.

Restricting ‘bad’ foods

Governments have a number of means at their disposal to restrict consumption of harmful foods. Public procurement is a clear example. Although national governments do not typically apply this to food, there is growing interest in doing so. In the United Kingdom, for example, where public procurement for offices, prisons, hospitals, schools and the military accounts for about 10 per cent of the catering sector, the government has committed to a target of 100 per cent sustainable palm oil by the end of 2015 as part of a wider initiative with industry groups and NGOs.⁵² There are further examples of sustainable food procurement policies among local, municipal and regional governments.⁵³

In the public health arena, much attention is currently focused on restricting consumption of salt, excessive consumption of which is associated with an increased risk of hypertension, heart disease and stroke. Legislation to restrict salt content in Japan and Finland resulted in reductions of 5g a day per person; in the United Kingdom voluntary commitments from food manufacturers have seen more modest reductions.⁵⁴

Moves to restrict partially hydrogenated oils (PHOs – the primary source of dietary trans fats, which are strongly associated with cardiovascular disease) have particular relevance for health and sustainability. Denmark, Austria, Switzerland, Iceland and Sweden have all imposed limits on PHO content; the US Food and Drug Administration has proposed that PHOs should not be ‘generally recognized as safe’, which, if followed through, would effectively constitute a ban.

In response, the food industry has increasingly turned to palm oil as an alternative. However, palm oil contains a high proportion of saturated fat, which is also associated with cardiovascular disease. Palm oil consumption in LMICs has been linked to higher rates of cardiovascular disease mortality.⁵⁵ The link in HICs is weaker, probably in part reflecting the low levels of palm oil consumption relative to other sources of saturated fat (such as meat and dairy products). For these reasons, increasing use of palm oil as a ‘healthier’ alternative to PHOs is a cause for concern.⁵⁶

Increasing palm oil demand also has environmental consequences. More than 80 per cent of production occurs in Indonesia and Malaysia, where demand has been met primarily by the expansion

⁵² Brack D, Bailey R. *Ending Global Deforestation*. 2013.

⁵³ Ibid.

⁵⁴ Marteau T, Hollands G, Fletcher P. Changing Human Behavior to Prevent Disease: The Importance of Targeting Automatic Processes. *Science*. 2012; 337(6101): 1492–5.

⁵⁵ Chen B et al. Multi-Country analysis of palm oil consumption and cardiovascular disease mortality for countries at different stages of economic development. 2011.

⁵⁶ Ibid.

of plantations into peat swamp and lowland rainforest – among the world’s most biologically diverse and carbon-rich biomes.

Fiscal measures: subsidizing the good and taxing the bad

Experience with fiscal measures, whether through subsidies, taxes or combinations of the two, is mainly confined to the health sphere. The most common interventions have been taxes on sugar-sweetened beverages (SSBs). The rationale for targeting SSBs, rather than sugar itself, is that sugary drinks constitute a ‘disposable’ part of an individual’s diet, so the tax might be considered less intrusive. Countries that have used SSB taxes include Hungary, France, Finland, Norway, the United States (at state level), Mexico (see Box 1) and a number of Pacific islands (see Box 3). Subsidies have tended to focus on fruit and vegetables.

Efficacy and evidence

A general lack of empirical data makes assessing the effectiveness of fiscal measures difficult. Implementation often occurs in the absence of a suitable monitoring and evaluation process that would result in publicly available data, although this was not the case in Mexico, where preliminary results from a real-time evaluation process are encouraging (Box 1).

Box 1: Mexico’s tax on sugar-sweetened beverages

Mexico has an obesity crisis. Two-thirds of the adult population are overweight or obese. Some estimates suggest that as many as one in six may have diabetes, which, with heart disease, is one of the top two causes of death in the country.

Mexicans consume more soda than almost any other population in the world, with the average person consuming almost half-a-litre a day. Amid growing concern about the state of the nation’s health, attention has turned to the role of SSBs as a possible contributor to the crisis.

In 2013 a civil society coalition launched a provocative media campaign to raise awareness about the sugar content of SSBs and the links with diabetes, accompanied by a demand for a 20 per cent tax on SSBs. As momentum for the tax grew, beverage manufacturers responded with their own campaign warning that a tax would cost jobs and hit small independent retailers and low-income consumer households hardest.

The outcome was a 10 per cent tax, effective from 1 January 2014, introduced alongside a proposal to allocate resulting revenues to improving access to drinking water in schools. Mexico’s National Institute of Public Health also established a monitoring and evaluation programme. Comprehensive data are not yet available, but preliminary data for the first quarter of 2014 reportedly indicate a 10 per cent decline in consumption of SSBs and an increase in consumption of bottled water.

Proponents of the tax have argued that the social signal sent by the tax – that SSBs are harmful and should be dealt with in the same way as tobacco and alcohol – is more important than the economic signal. In the words of one health official, it is an ‘educative tax’ that ‘sends a message from the government to the people that this is bad for you’.

Despite this challenge, the number of cases in which governments have applied fiscal interventions provides researchers with a relatively large – if imperfect – evidence base.⁵⁷ Modelling can also help policy-makers and researchers anticipate the impacts of prices in the absence of robust empirical data. However, models are only an approximation of reality, and results depend heavily on the assumptions made regarding, for example, price, demand and substitution effects. Reviews of empirical and modelled data in HICs indicate that taxes can reduce consumption of unhealthy foods.⁵⁸ Changes in consumption tend to be proportional to the level of the tax, suggesting that significant interventions may be required for major behavioural change.⁵⁹ Nevertheless, marginal changes in consumption can still generate important health benefits in many cases.⁶⁰

The evidence base concerning environmental measures is weaker. Models of carbon pricing typically focus on energy and industrial uses, despite the food system accounting for as much as 30 per cent of global emissions. Nevertheless, those studies that do exist indicate that a carbon tax on food products could reduce agricultural emissions, particularly through reduced consumption of meat.⁶¹ Modelling also suggests that a carbon tax on foods could have important health benefits through reduced consumption of meat and saturated fat, leading to reduced prevalence of diet-related NCDs.⁶²

⁵⁷ World Health Organization. *Using price policies to promote healthier diets*. [Online] Geneva: World Health Organization; 2015. Available from: http://www.euro.who.int/__data/assets/pdf_file/0008/273662/Using-price-policies-to-promote-healthier-diets.pdf [Accessed 25 April 2015].

⁵⁸ See for example Hawkes C et al. Smart food policies for obesity prevention. 2015. World Health Organization. *Using price policies to promote healthier diets*. 2015. Eyles H, Ni Mhurchu C, Nghiem N, Blakely T. Food Pricing Strategies, Population Diets, and Non-Communicable Disease: A Systematic Review of Simulation Studies. *PLoS Medicine*. [Online] 2012; 9(12):e1001353. Available from: doi:10.1371/journal.pmed.1001353 [Accessed 20 April 2015]. Andreyeva T, Long M, Brownell K. The Impact of Food Prices on Consumption: A Systematic Review of Research on the Price Elasticity of Demand for Food. *American Journal of Public Health*. 2010; 100(2): 216–222.

⁵⁹ World Health Organization. *Using price policies to promote healthier diets*. 2015. Chaloupka F, Powell L, Chiqui J. *Sugar-Sweetened Beverage Taxes and Public Health*. [Online] Princeton: Robert Wood Johnson Foundation; 2009. Available from: http://www.rwjf.org/content/dam/farm/reports/issue_briefs/2009/rwjf43487 [Accessed 24 April 2015]. Lavin R, Timpson H. *Exploring the Acceptability of a Tax on Sugar-Sweetened Beverages*. [Online] Liverpool: Centre for Public Health, Liverpool John Moores University; 2013. Available from: http://www.cph.org.uk/wp-content/uploads/2013/11/SSB-Evidence-Review_Apr-2013-2.pdf [Accessed 24 April 2015].

⁶⁰ World Health Organization. *Using price policies to promote healthier diets*. 2015.

⁶¹ Wirsenius et al modelled a €60-per-tonne CO₂e carbon tax on animal products in the EU, and predicted a 15 per cent reduction in meat consumption and 7 per cent reduction in EU agricultural emissions. See Wirsenius S, Hedenus F, Mohlin K. Greenhouse gas taxes on animal food products: rationale, tax scheme and climate mitigation effects. *Climatic Change*. 2010; 108(1–2): 159–84.

⁶² Briggs A, Kehlbacher A, Tiffin R, Garnett T, Rayner M, Scarborough P. Assessing the impact on chronic disease of incorporating the societal cost of greenhouse gases into the price of food: an econometric and comparative risk assessment modelling study. *BMJ Open*. 2013; 3(10):e003543. Available from: doi:10.1136/bmjopen-2013-003543 [Accessed 20 April 2015].

The ‘Macro’ Context

The interventions discussed so far and summarized in Figure 1 target the consumer directly (through price or information, for example) or indirectly (by shaping the ‘micro’ context in which purchasing occurs). However, diets are also heavily influenced by a wider set of social, political and economic conditions – the ‘macro’ context.

Trade

Trade affects the availability and affordability of foods. Increasing trade and investment has contributed to the nutrition transition in LMICs, where consumption is shifting from traditional to more ‘Western’ diets that are heavy in processed foods. As foods become more processed and value chains become longer and more complex, the link between farm-gate prices and retail prices weakens, potentially reducing the ability of demand-side price interventions to influence agricultural practices.

Trade integration also increases the risk of leakage⁶³ and substitution effects. For example, the efficacy of a national intervention to reduce agricultural emissions through a carbon tax on meat would be undermined if the livestock sector simply reoriented to export markets. The low price and high availability of palm oil have made it the ‘marginal oil’ of the global food system. It has become the substitute of choice when food manufacturers have switched from PHOs, with potential consequences for the environment and health.

In addition, the international trade regime may limit the policy space for governments to pursue certain interventions. Actions taken to reduce the importation of ‘harmful’ foods could be considered discriminatory under World Trade Organization (WTO) rules if other foods that might be considered ‘like’ products are not subject to the same interventions (see Box 2). It is also difficult for governments to discriminate on the basis of *how* otherwise identical foods are produced. For example, a measure that favoured ‘sustainable’ palm oil over other palm oil might be challenged under WTO rules.

The retail and restaurant sectors

Food retailing is increasingly dominated by the modern supermarket. Supermarkets have made the option of a diverse diet available to more people. However, they have also increased the availability of unhealthy processed foods and encouraged overconsumption.⁶⁴ As such, the spread of supermarkets in LMICs is argued to have contributed to the nutrition transition.

The nature of retail and restaurant options available to communities has implications for health. Various studies have identified a strong link between the density of shops and restaurants selling highly processed food and rates of obesity,⁶⁵ although other studies have shown no link. Nevertheless, there could be a potential role for public planning in improving people’s food choices.

⁶³ ‘Leakage’ refers to when capital, income, goods or services exit one economy for another; for example, as a consequence of increased regulation or unfavourable economic conditions in a country. Environmental regulations can, for instance, result in leakage when firms seek to reduce costs by relocating production or reorienting exports from regulated markets.

⁶⁴ Hawkes C. Dietary Implications of Supermarket Development: A Global Perspective. *Development Policy Review*. 2008; 26(6): 657–692.

⁶⁵ Other important factors appear to be socio-economic status and educational achievement. See for example Cummins S, Macintyre S. Food environments and obesity—neighbourhood or nation? *International Journal of Epidemiology*. 2005; 35(1): 100–4. Ford P, Dziewaltowski D. Disparities in obesity prevalence due to variation in the retail food environment: three testable hypotheses. *Nutrition Reviews*. 2008; 66(4): 216–28.

Box 2: Tackling obesity and NCDs in the Pacific islands

The Pacific island states provide a good example of nutrition transition. Consumption of traditional, locally produced foods has been replaced by a diet high in imported, energy-dense and processed foods. The islands are now highly dependent on imports, and obesity rates have increased markedly – along with the incidence of NCDs, which now account for three-quarters of deaths. In some states, improvements in life expectancy appear to have reversed in recent years.

Public awareness campaigns have contributed to political and public support for tackling the problem. However, government capacity and resources are generally low. Stakeholders have identified a range of interventions tailored to local capacities and contexts, and governments have implemented taxes on SSBs and other sugary foods. None the less, minimal monitoring and evaluation mean that the impact of these measures is unclear.

The food import dependency of the islands means trade policy can be a useful instrument with which to influence the availability and price of unhealthy foods. However, governments are constrained by international trade rules. Many island governments have raised import tariffs on unhealthy foods up to the bounds permitted under WTO terms, but these limits are generally low compared with many other countries, reflecting the islands' relatively low capacity and weak bargaining power.

Trade rules have also constrained the ability of governments to ban harmful foods. In 2011, for example, Samoa agreed to remove a ban on the import and domestic distribution of turkey tails – a high-fat poultry offcut – and turkey tail products, as part of its accession agreement with the WTO, on the grounds that it was discriminatory because it did not apply to other similarly high-fat foods. Tonga was dissuaded from banning mutton flaps – a high-fat sheep offcut – in part by WTO rules and also because the primary exporter was New Zealand, a principal aid donor.

Sources: Snowdon 2010; Snowdon 2013.

Advertising

Advertising of processed foods has increased as their production and availability have grown. Studies have shown that children are often heavily exposed to such advertisements, particularly through television and the internet, and that this affects their food choices and the requests they make of their parents.⁶⁶

Norms and values

In most countries, there are foods of particular social or cultural significance for which people may be especially reluctant to modify their consumption behaviours. For example, a number of studies indicate that this is often the situation with meat. Similarly, public attitudes to health and sustainability are likely to be important in determining how consumers respond to information-based interventions. Studies generally show that health is considered to be more important than the environment in shaping consumption patterns.

⁶⁶ Garnett T. et al. *Policies and actions to shift eating patterns: What works?* 2015.

Political economy

Although desirable from a societal perspective, reducing consumption of particular foodstuffs will often have a negative impact on certain interest groups. These groups can therefore be expected to make efforts to block change, as happened when the soft drinks industry took action against the proposed SSB tax in Mexico (see Box 1). There are many other examples of business mobilizing against proposals to restrict advertising, or to impose taxes or labelling requirements. For instance, soft drink manufacturers are estimated to have spent more than \$40 million on lobbying in the United States in 2009 – eight times the equivalent spending in the previous year – when Congress was considering a tax on SSBs.⁶⁷ Industry may seek to raise the political stakes for governments by emphasizing risks to jobs or poor consumers. Manufacturers' responses to Denmark's saturated fat tax, introduced in 2011 but withdrawn the following year, emphasized regulatory costs to industry, job losses and regressive impacts on poorer households.⁶⁸ A lack of evidence can be used to justify inaction, particularly if there is a plausible risk of unintended consequences from well-intentioned but poorly designed interventions.⁶⁹ Public support for government action may provide a countervailing effect in such circumstances.

⁶⁷ Wilson D, Roberts J. *Special Report: How Washington went soft on childhood obesity*. Reuters. [Online] 27 April 2012. Available from: <http://www.reuters.com/article/2012/04/27/us-usa-foodlobby-idUSBRE83Q0ED20120427> [Accessed 19 April 2015].

⁶⁸ Holm L, Dejgaard Jensen J, Vallgård S. *The rise and fall of the Danish fat tax*. [Presentation] Academy of Social Sciences International Advisory Group, London. 16 December 2013.

⁶⁹ Bailey R et al. *Livestock – Climate Change's Forgotten Sector*. 2014.

Considerations for Policy-makers

Inform and empower

There is little evidence that information alone can improve diets at the population level. Populations are heterogeneous, and different sections of society will have different levels of awareness about health and environmental issues, as well as different preferences for healthy and sustainable foods, and will be faced with different barriers to making healthy and sustainable choices. To be effective at the point of sale, information interventions may need to be tailored to specific groups and contexts.⁷⁰ Attention should also be paid to the risk of unintended consequences; in particular, some studies have shown that nutritional labelling can lead to the overconsumption of healthier foods.⁷¹

Nevertheless, the wider impacts of information should not be underestimated, and there is evidence that although information may not always empower consumers, it can influence procurement policies, product reformulation and agricultural practices.

Guide and influence

Although there is little doubt that nudges used by the food industry are commercially both very efficient and effective, the evidence for nudge-based public policy on diets is weak. Studies have been largely concerned with small numbers of distinct nudges in restricted circumstances, and – with the exception of some interesting examples – have generated underwhelming results. It may be that in order to have material impact, nudges must be designed and implemented en masse⁷² or as part of large-scale composite strategies incorporating price and information interventions. However, there is little knowledge about how nudges can be employed to achieve behaviour change at the population level.⁷³

The weak evidence base is not helped by inconsistent definitions within the literature and by a lack of comparability.⁷⁴ Nudges may suit environmental objectives, given that sustainability is less of a conscious motivating factor than health is, but the evidence that does exist is primarily concerned only with health outcomes. As policy development continues in this new space, it will be essential to undertake and publish rigorous evaluations.

As with other types of intervention, nudges may have unintended consequences. Rebound effects could occur where consumption is reduced. For example, a study of reduced portion sizes in a Dutch workplace cafeteria found that almost one-fifth of people overcompensated for the smaller meal by

⁷⁰ Hawkes C et al. Smart food policies for obesity prevention. 2015.

⁷¹ Marteau T et al. Judging nudging. 2011.

⁷² Ibid.

⁷³ House of Lords Science and Technology Select Committee. *Behaviour Change*. Second Report of Session 2010–12. [Online] London: UK Parliament; 2011. Available from: <http://www.publications.parliament.uk/pa/ld201012/ldselect/ldsctech/179/17902.htm> [Accessed 20 April 2015].

⁷⁴ Hollands G, Shemilt I, Marteau T, Jebb S, Kelly M, Nakamura R et al. Altering micro-environments to change population health behaviour: towards an evidence base for choice architecture interventions. *BMC Public Health*. [Online] 2013; 13(1):1218. Available from: doi:10.1186/1471-2458-13-1218 [Accessed 20 April 2015].

buying more food than they would otherwise have eaten.⁷⁵ Similarly a ‘halo’ effect can result when people over-consume foods with a healthy default side option.⁷⁶

Incentivize, discourage or restrict

Policy-makers considering fiscal measures are faced with a number of other challenges. First, food taxes may be regressive in countries where poorer people tend to be more likely than richer people to consume unhealthy foods (i.e. in HICs).

Second, and related to the first, taxes may be unpopular. A food tax that falls harder on low-income consumers could still be progressive in health terms, but this may be a difficult argument for politicians to make successfully. Taxes perceived to be primarily for the purpose of raising revenue are likely to be more unpopular, and this may go some way to explaining the short life of Denmark’s abortive saturated fat tax.⁷⁷ There is some opinion that public acceptance can be increased if tax revenues from health taxes are reinvested in health programmes.⁷⁸

Third, an intervention may have unintended consequences. For example, the relatively low carbon footprint of sugar means that consumption could increase under a carbon tax, with adverse consequences for public health.⁷⁹ Models suggest it is possible to design fiscal interventions so as to avoid this outcome, but it is not always straightforward to anticipate and mitigate such problems at the outset.

Key points

Despite the relatively thin evidence base regarding the efficacy of different interventions, it is still possible to identify a number of key points for policy-makers to consider.

Be clear what is meant by a ‘healthy and sustainable diet’, and be prepared to prioritize

Although there is general consensus on the principal elements of a healthy and sustainable diet, there is no single definition. The range of relevant eating behaviours is large, and although there are some clear areas – such as with meat – that offer clear co-benefits for health and sustainability, equivalent ‘win-wins’ may not be possible in other areas. For example, fish forms part of a healthy diet, but overfishing causes stocks to collapse and results in extensive damage to marine ecosystems.

Clarity and transparency about what constitutes a healthy and sustainable diet will help policy-makers identify priorities, make trade-offs, design regulations and policies, and monitor for unintended consequences. Clarity of message is also critical to achieving traction with senior policy-makers and politicians.

More evidence is needed, but this is not an excuse for inaction

Most research on interventions is concerned with either health or sustainability objectives, but there is very little evidence on interventions designed to achieve co-benefits.

⁷⁵ Vermeer W, Steenhuis I, Leeuwis F, Heymans M, Seidell J. Small portion sizes in worksite cafeterias: do they help consumers to reduce their food intake? [Online] *International Journal of Obesity*. 2011; 35(9):1200–1207. Available from: doi:10.1038/ijo.2010.271 [Accessed 20 April 2015].

⁷⁶ Marteau T et al. Judging nudging. 2011.

⁷⁷ Vallgård S, Holm L, Jensen J. The Danish tax on saturated fat: why it did not survive. *European Journal of Clinical Nutrition*. 2014; 69(2): 223–6.

⁷⁸ Lavin R, Timpson H. *Exploring the Acceptability of a Tax on Sugar-Sweetened Beverages*. 2013.

⁷⁹ Briggs A et al. Assessing the impact on chronic disease of incorporating the societal cost of greenhouse gases into the price of food. 2013. Edjabou L, Smed S. The effect of using consumption taxes on foods to promote climate friendly diets – The case of Denmark. *Food Policy*. 2013; 39: 84–96.

There is also a lack of evidence on interventions for LMICs. This is an obstacle to progress, since high population and economic growth, together with rapid urbanization, mean that it is in these countries that most of the increase in consumption of unhealthy and unsustainable foods will occur. Many middle-income countries are already struggling with obesity and NCD burdens.

Existing evidence highlights the risk of unintended consequences, such as leakage and substitution effects, rebound effects and halo effects. Modelling can help anticipate some of these problems and inform mitigation strategies. Independent evaluation processes can be integrated into interventions, not only to build evidence but also to monitor for unintended consequences and inform modifications to policy.

Consider indirect and cumulative impacts

The evidence is strongest for the impact of fiscal and restrictive measures. In isolation, neither information provision nor nudges appear likely to change food consumption patterns on the scale needed to have an impact at the global level.

However, interventions are not mutually exclusive, and there is scope to design broad strategies combining price interventions, restrictions, nudges, and information and education strategies. Composite strategies are likely to be important.

Other areas of public policy-making can support these strategies. For example, procurement and catering policies can have important consequences for the availability and accessibility of particular foods.

Government interventions may have an important signalling effect. For example, labels and nutrition guidelines may encourage consumers to accept restrictive or fiscal interventions, or may encourage product reformulation. Interventions to tax or restrict the availability of foods may help to educate people about the social or environmental consequences of consuming these products.

Consider the 'macro' context

Wider social, economic and political factors are important in shaping diets and consumer choices. The combined effect of these factors is often to encourage unhealthy or unsustainable consumption, and they may also undermine the efficacy of targeted interventions. Bringing about far-reaching changes will require a reshaping of the 'macro' context to form an 'enabling environment' for healthy and sustainable diets. Important areas to consider include trade policy, public planning, advertising regulation and wider public education campaigns on health and the environment.

Learn from other areas and sectors

Examples of success and failure from other areas and sectors might be helpful to efforts to encourage healthy and sustainable diets. From the health sector, areas to consider include tobacco control, efforts to address harmful alcohol consumption, and individual policy initiatives such as the UK Public Health Responsibility Deal. In the environment sector, policies and regulations to reduce energy consumption and change transport behaviours could offer important insights. More research is needed to identify transferable lessons.

Moving forward

Encouraging transition towards healthy and sustainable diets is a complex policy challenge. This paper, and the literature review on which it draws, provide some initial considerations for policy-makers, but more research and evidence is needed to address questions relating to the barriers to and enablers for success, and to develop actionable recommendations for policy-makers and business.

A multi-stakeholder task force – including representation from government, civil society, the private sector and academia, and with membership from high-, middle- and low-income countries – should take this agenda forward, developing recommendations where it is possible to do so and identifying priorities for further research. Key elements of the agenda could include:

- Development of ‘deep-dive’ case studies from around the world, examining experience with different intervention strategies in different contexts, and identifying barriers and enablers as well as transferable lessons;
- Provision of advice to policy-makers on frameworks for identifying priorities and ‘best-bet’ interventions, and in designing smart composite strategies;
- Regionally focused workshops to explore the research findings and tailor recommendations to specific contexts.

Acronyms

CO ₂ e	Carbon dioxide equivalent
EU	European Union
GDP	Gross domestic product
HICs	High-income countries
LMICs	Low- and middle-income countries
NCDs	Non-communicable diseases
NHS	National Health Service
OECD	Organisation for Economic Co-operation and Development
PHOs	Partially hydrogenated oils
RSPO	Roundtable on Sustainable Palm Oil
SSBs	Sugar-sweetened beverages
WHO	World Health Organization
WTO	World Trade Organization

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