



Conference on ‘What governs what we eat?’ Symposium 3: Drivers of food choice at the individual level

Interventions to accelerate change towards a healthier diet

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Poor diets are a significant contributor to non-communicable diseases and obesity. Despite years of health promotion, change in dietary habits is slow and there is growing recognition of the need to provide greater support to individuals and to complement individual efforts with changes in the food environment to shift the default towards healthier diets. The present paper summarises opportunities for intervention at the individual and population level. It discusses the role of voluntary or mandatory approaches to drive change in the food industry and the need for improved methods to monitor and evaluate progress. It concludes with a call to action from all stakeholders to accelerate change towards a healthier diet.

Diet: Obesity: Interventions: Policy

The case for change

Around the world, poor diets are a significant cause of ill health and premature death⁽¹⁾. The nutrition transition, which has seen millions of people gain greater access to food and a decline in the prevalence of undernutrition and deficiency diseases, has brought with it a second wave of diet-related diseases⁽²⁾. For the most part, these are chronic diseases linked to an excess of nutrients, principally saturated fat, sugars and salt, and access to an abundance of food which greatly exceeds energy needs. Change has happened at pace in the system of food production, supply and distribution but the changes have not always supported healthier diets.

In the UK today, dietary risk factors account for 12.4 % of the disability-adjusted life years lost, with a further 8.6 % due to excess weight⁽³⁾. It has been estimated that meeting dietary recommendations with respect to dietary fats, fruits/vegetables and salt could avert 33 157 premature deaths from CHD, stroke and cancer every year⁽⁴⁾. This model only partly accounts for the impact of diet on body weight and is therefore likely to be a substantial underestimate.

Obesity arises in large part due to overconsumption and is the cause of substantial morbidity and premature mortality. A recent systematic review has found that

compared with adults at healthy weight (BMI 18.5 to <25 kg/m²), total annual healthcare costs were 12 and 36 % higher for adults with a BMI of 25 to <30 kg/m² or >30 kg/m², respectively⁽⁵⁾. This reflects the wide range of conditions which are adversely affected by excess weight, in particular, the higher incidence of metabolic disease especially type 2 diabetes and problems such as osteoarthritis which increases the need for joint replacements. In the UK in 2014, a quarter of adults were classified as obese with a further 36 % overweight, representing a 3-fold increase in 30 years⁽⁶⁾. Excess weight develops early in life, with one in ten children aged 4/5 years already identified as obese and the proportion increases throughout childhood⁽⁷⁾. Children who are overweight are more likely to be overweight as adults, especially those whose parents are also overweight⁽⁸⁾. Future trends in adult overweight are unlikely to be reversed without significant intervention earlier in life to prevent obesity; nonetheless, most adults who are obese were not overweight as children⁽⁹⁾. Together these data emphasise the importance of whole population strategies for prevention to reduce the burden of ill health associated with obesity together with effective interventions to treat obesity, which will bring direct benefits to individuals and potentially benefit future generations too.

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Enabling change

The association between a poor diet and reductions in the quality and length of life for individuals, the economic drag caused by lower productivity at work and the additional healthcare costs makes a powerful case for interventions to accelerate change towards a healthier diet. This has been reflected in a series of reports, initiatives and strategies for dietary change over several decades primarily intended to prevent obesity, but also to reduce saturated fat, sugar and salt to reduce the risk of CVD⁽¹⁰⁾. But despite decades of health promotion, the changes in dietary intake are slow and the rates of obesity have continued to increase.

There is growing evidence that many of the decisions about food are automatic rather than reflective. Social psychologists have identified a persistent inclination to overemphasise the importance of internal characteristics such as knowledge, while undervaluing the influence of external factors on human behaviour, which they term the fundamental attribution error⁽¹¹⁾. The implication for public health policy is that while education to increase knowledge about diet and health may be useful to motivate and inspire people to change, it is often insufficient to change behaviour⁽¹²⁾. Changes in the environmental cues to consumption are an important part of a holistic strategy to change diet. These external food cues may exert their influence within the micro-environment of a family or a community such as a school or a workplace, through to local areas or national culture.

One of the challenges to interventions directed at the external environment is the perception that action by the state may infringe individual autonomy. The Nuffield Council in their report on the bioethics of public health proposed a ladder of interventions to frame a proportionate response⁽¹³⁾. The lower rungs of the ladder are policies based on boosting knowledge and capability of individuals, progressing through incentives and disincentives for behaviour change and onto more coercive policies that restrict or eliminate choice. The Nuffield Council proposed a model of libertarian paternalism which suggested that interventions at higher levels of the ladder should be reserved for situations in which less intrusive actions were insufficient to effect change, or when the risk to public health justifies stronger intervention. In practice, while the top and bottom of the ladder represent the extremes of individual responsibility and state control, actions in the middle are frequently deployed in a more flexible manner, depending on the opportunity and acceptability of specific actions in different settings or for particular subgroups of the population⁽¹⁴⁾. For example, the UK government introduced nutritional standards for food in schools in 2004, which prevent the sale of confectionery or sugar-sweetened beverages, effectively restricting/eliminating choice which was justified on the basis of the duty of care of the state to protect the health of children at school. Yet, it has only recently set out plans for a levy to provide a modest disincentive to the sale and consumption of sugar-sweetened beverages for the entire population.

Supporting dietary change among individuals

Health promotion campaigns and more recently, social marketing have been used extensively to try to motivate individuals to change their dietary habits and to equip them with the skills to do so. While this can be successful in enhancing knowledge, there is less evidence that it is sufficient to drive sustained changes in behaviour⁽¹⁵⁾.

There are a number of models to describe behaviour change at the individual level⁽¹⁶⁾ and a raft of intervention studies which have sought to achieve dietary changes, although many interventions are poorly grounded in theory⁽¹⁷⁾. There are examples in which people have successfully modified their diet, at least in the short term, usually in intensive research studies or specialist clinical trials, but it has proved much harder to scale-up these interventions to make an impact at the public health level. For example, the US Diabetes Prevention Program which offered an intensive diet and physical activity intervention led to a mean weight loss of 5.6 kg and a 58 % reduction in the incidence of diabetes compared with a minimal control intervention over 2.8 years⁽¹⁸⁾, but a similar protocol in a routine primary care context had limited success in improving diet quality or physical activity and there was only minimal weight loss which was not significantly different to the control group (-0.8 (SD 5.1) v. -0.4 (SD 4.7) kg; $P = 0.69$)⁽¹⁹⁾.

However there is clearly an opportunity, especially in primary care, to reach very large numbers of people who have the potential to derive health benefits from dietary change and a pressing need to identify effective interventions. For the treatment of obesity, we have shown that referral from general practitioners to commercial weight-loss groups in the community leads to weight losses and improvements in glycated haemoglobin of similar magnitude to the Diabetes Prevention Program⁽²⁰⁾. This approach combines the credibility and authority of the general practitioner with a structured programme offered by a trusted brand and ongoing support within a community group. Importantly there is good evidence that this type of referral scheme can be applied at scale. In the authors' study of an opportunistic screening programme for obesity in primary care, offering support through referral to an effective community-based weight-loss programme achieved a mean weight loss of 2.4 kg (1.4 kg greater than control) at 1 year⁽²¹⁾. If such an intervention was to be rolled out across the country with the intervention offered to every eligible person attending primary care on one occasion per year, modelling suggests that it would more than halve the prevalence of obesity within 20 years.

One of the challenges for health professionals in delivering more specific dietary advice pertaining to individual nutrients, such as saturated fat, sugar or salt, is that it requires an in-depth knowledge of food composition and an individual's current dietary habits. However, a recent study has shown some promise for a smartphone app which offers personalised suggestions for lower salt alternatives which can be used while shopping to encourage healthier food purchasing. Over 4 weeks, there was a



reduction in mean household purchases of salt equivalent to approximately 0.7 g salt per person daily greater than control households⁽²²⁾. Other digital products allow individuals to track their food purchases or consumption as a form of self-monitoring. A pilot study of a smartphone app incorporating goal setting, self-monitoring of diet and activity, and feedback via weekly text message led to a weight loss after 6 months of -4.6 kg (95 % CI -6.2 , -3.0) compared with only -1.3 kg (95 % CI -2.7 , 0.1) in a control group given access to a website with resources for weight loss⁽²⁵⁾. This type of individual-level intervention, if delivered at scale, has the potential to achieve population-level impact.

Actions to change the food environment

There is now widespread agreement that the food environment is an important determinant of eating habits and that efforts by individuals to change their diet can be enhanced by supportive changes in the food environment to make healthier choices easier⁽²⁴⁾. The evidence base for specific interventions is mixed. In some cases, such as clearer nutritional labelling on menus⁽²⁵⁾, or actions to control the promotion and marketing of foods⁽²⁶⁾, there is moderate evidence from trials that intervention leads to healthier food choices. Fiscal interventions, whether subsidies for healthier options, or increases in the price of less healthy choices, especially sugar-sweetened beverages, can also provide a powerful stimulus for behaviour change and are gradually being introduced in a number of countries around the world⁽²⁷⁾. These interventions require political leadership, usually combined with public acceptance of the case for intervention.

In some cases, changes in the food environment can alter the default option in a manner which makes the healthier choice more likely without any specific engagement on the part of consumers, such as product reformulation to reduce saturated fat, sugar or salt or reductions in portion size or procurement of healthier products by caterers. However, these interventions demand a high level of cooperation with the food industry and it is not yet clear how best to encourage the changes needed in business practices.

In England, there has been a programme of voluntary action underway since 2005 to reformulate the food supply⁽²⁸⁾. This commenced with salt reduction before being expanded to include saturated fat reduction, energy reduction and most recently a specific sugar reduction programme. However, there is an ongoing debate about the effectiveness of voluntary initiatives. For salt, progress has been monitored through a series of repeated urinary sodium surveys, which provide an objective measure of salt intake, together with an analysis of data on product composition. Changes in consumption reflect both product reformulation and changes in consumer preferences for food and the two are not easily separated. However, the magnitude of reductions seen in the salt content of food⁽²⁹⁾ suggests strongly that reformulation has been a very important contributor to the

decline in measured sodium excretion from 9.5 to 8.1 g/d over 7 years⁽³⁰⁾.

For other nutrients, monitoring progress in product reformulation has relied on a mixture of industry self-reporting and independent analysis of sales data. Both have their limitations and neither are comprehensive. Industry tends to report on product successes rather than the totality of their product portfolio, while sales data are commercially sensitive and it is hard for researchers to gain access. Data provided by companies such as Euromonitor, Kantar or Neilson may not be fully up-to-date in terms of nutritional composition data and/or completeness of the sales data⁽³¹⁾. Tracking progress in the out of home sector is particularly challenging.

The evaluation of the US Healthy Weight Commitment Foundation reflects the most comprehensive analysis to date of a specific reformulation initiative. It showed a reduction of 414 kJ/capita/d, with 326 kJ/capita/d of the total reduction observed from products sold by companies participating in the US Healthy Weight Commitment Foundation⁽³²⁾. However, this was against a background trend of declining purchases of energy for in-home consumption and hence an assessment of the true effectiveness depends on assumptions about the counter-factual scenario, leaving considerable scope for commentators to make their own interpretations about the added value of the process⁽³³⁾. An evaluation of the impact of the Public Health Responsibility Deal Food Network in England which oversaw reformulation work from 2011 to 2015 did not measure the magnitude of changes in the composition of the food supply but instead took a subjective approach to the evaluation of the programme. It concluded that 37 % of commitments would have happened without the Responsibility Deal, 26 % were likely to be attributable to the initiative and the remaining 37 % were potentially motivated by this process⁽³⁴⁾.

Without a doubt, driving progress within a voluntary framework is challenging. There are no powerful levers for change, few incentives for companies to participate or disincentives for non-engagement so it may become a coalition of the willing, potentially undermining the added value the process could bring. Companies can resent the requirements for transparency or the time-consuming process of engagement with policymakers and the public health community. Many in the public health community are opposed to such schemes which they perceive as providing too much freedom to businesses about the action they take, or see voluntary commitments as a tactic to offset potentially more stringent regulation. However, others recognise that there is a need to identify approaches which can enhance successful cooperation between policymakers, industry and public health to accelerate progress and success in managing voluntary agreements⁽³⁵⁾.

Some commentators have concluded that mandatory interventions would be a more effective than voluntary action but most of the comparisons have been based on modelling exercises which depend heavily on assumptions about the effectiveness of the two approaches and the likelihood of actions occurring rather than empirical



data⁽³⁶⁾. Others have compared the changes that have occurred in different countries with different types of policies. One of the most commonly cited examples of the benefits of legislation is the decrease in intakes of *trans* fatty acids in Denmark, down from about 8.5 g/d in 1977 to about 1.2 g/d in 2005; most of the latter reflecting naturally occurring *trans* fatty acids in the food supply⁽³⁷⁾. However, most of the decrease had already occurred, in line with international trends, before the regulations were introduced in 2004. The voluntary commitment to reduce *trans* fatty acids made as part of the Responsibility Deal in England in 2011 has been criticised as having minimal impact⁽³⁸⁾, but this should not undermine the success of informal voluntary action by industry prior to this date and total intakes of *trans* fatty acids in the UK are currently very similar to those seen in Denmark at about 1 g/d⁽³⁹⁾.

For regulatory interventions relating to product renovation to be effective, there are a number of critical steps to be overcome. Firstly there needs to be precise, legally defensible targets. This is easier for absolute targets across the whole food system, such as maximum limits for *trans* fatty acids, than for nutrients such as saturated fat or sugar where variable targets will be needed across different food categories. There must be a willingness among policymakers to take on the challenge, which may require high levels of political capital in the face of anticipated opposition. There needs to be a fair and transparent process to establish targets for reformulation or portion size which take account of the contribution of different products to unbalanced diets and the capabilities and resources of different companies, in particular, a method to engage small businesses. The targets need to be achievable but challenging, able to be monitored and policymakers must be willing to take action if the targets are not met.

Some of the challenges in mandating action are apparent in the targets for salt reduction introduced in South Africa. These cover just thirteen product categories and set only a maximum salt content, unlike the more challenging sales-weighted average targets used in the UK and elsewhere, which ensure a downward shift in salt content across the whole category. On average two-thirds of South African products already meet the targets, and in the breakfast cereal category it is already >90 %⁽⁴⁰⁾. It remains to be seen if products that do not meet the targets by 2019 (when the targets will be reviewed) will be taken off the market, but without such action the process will be devalued. Ultimately a thorough evaluation is needed of the impact on the salt intake of the nation which can be compared with the outcomes of voluntary schemes elsewhere in order to provide evidence to guide salt reduction programmes in other countries. The limited enactment of policies to date that mandate the composition of foods suggests that this approach is unpopular among most governments and hard to achieve, thus limiting its effectiveness in practice.

It is in the interests of policymakers, responsible businesses, public health professionals and consumers to develop better and more efficient methods to track progress and to benchmark companies in order to stimulate

a competitive drive for improvement. Ongoing work in this area includes the work of INFORMAS, developing protocols to monitor the food environment in a consistent manner⁽⁴¹⁾ and the Access to Nutrition Index which ranks companies against specific metrics of success⁽⁴²⁾. Interestingly, the investment community is beginning to take a more proactive role in the debate, recognising the long-term financial risk in some parts of the food sector from increased regulation, scrutiny by the public health community and changing consumer behaviour. Investors are well placed to exert influence on companies to stimulate change and to support businesses as they work through a programme of change. A recent report has proposed a series of key performance indicators to allow investors to assess the portfolio and actions of food and drink businesses⁽⁴³⁾ with the aim of encouraging socially responsible business practices.

Towards an integrated approach

There is no one initiative that will achieve comprehensive dietary change across the population. Instead, a more complex mix of interventions is required combining individually targeted actions and environmentally enabling actions. This concept is reflected in the social ecological model; a theory-based framework which identifies five levels: individual, interpersonal, community, organisational and policy environment that interact to determine behaviour. Understanding the relationships between these levels can help to develop a portfolio of initiatives which act synergistically to create an effective strategy for change and to identify any gaps and to guide evaluation⁽⁴⁴⁾. An alternative approach is to consider the roles of different actors in the system and to charge each with taking action in their own sphere of influence. For example, in a case study of potential interventions to decrease portion size, we argued that the abundance of large portion sizes reflects a synergy of public demand with commercial interests; buyers want filling portions at competitive prices, particularly of highly palatable, usually energy-dense foods, and industry benefits from cost savings when supplying and packaging larger portions combined with promotional strategies to increase producers' market share⁽⁴⁵⁾. We described a set of potential interventions and their inter-dependencies which recognise that although policymakers and the food industry have primary responsibility for action, public acceptability is likely to be an important facilitator. In the absence of bold political leadership, real progress may require coordinated public demand⁽⁴⁶⁾.

Most of the public advocacy has been led by non-governmental organisations, for example, in the USA the Centre for Science in the Public Interest has conducted a concerted campaign to support the introduction of energy-labelling on menus since 2002⁽⁴⁷⁾. In the UK, the Children's Food Campaign have led on a series of issues related to food and were instrumental in mobilising public support for the introduction of restrictions on the advertising of foods to children^(48,49). However, health professionals and public health practitioners can

also be important advocates for change. This has been very evident in the UK in the case of tobacco, from the publication of the Royal College of Physicians report and the formation of Action on Smoking and Health⁽⁵⁰⁾. In contrast, the public perception is one of confusion among health professionals about a healthy diet⁽⁵¹⁾, and there has been little joined up activity to advocate for healthier food policies which is hindering progress.

In summary, the need to accelerate the rate of change towards a healthier diet is very clear. There is good enough evidence of the key targets for action and this is reflected in strategies from national and international policymakers. The challenge is to make this happen in practice. This will require concerted effort throughout the food system from 'farm to fork' and from all actors. In particular, policymakers need to place higher priority on the importance of a sustainable food system and provide stronger leadership; financial institutions could use their considerable influence to encourage socially responsible business practices across the food system; the food industry must accelerate the rate of change in product renovation and in marketing practices to encourage consumers to adopt healthier diets; health professionals could do far more at an individual level to motivate and support behaviour change while also acting as advocates for health in wider society; and consumers need to turn their healthy eating aspirations into a market force, which rewards responsible businesses and which demands action by policymakers to curb actions which undermine public health.

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S. A. J. was previously the independent Chair of the Public Health Responsibility Deal Food Network (2011–2015).

Authorship

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References

1. G. B. D. Risk Factors Collaborators (2016) Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and

- metabolic risks or clusters of risks, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* **388**, 1659–1724.
2. Popkin BM (2004) The nutrition transition: an overview of world patterns of change. *Nutr Rev* **62**, S140–S143.
3. Newton JN, Briggs AD, Murray CJ *et al.* (2015) Changes in health in England, with analysis by English regions and areas of deprivation, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* **386**, 2257–2274.
4. Scarborough P, Nnoaham KE, Clarke D *et al.* (2012) Modelling the impact of a healthy diet on cardiovascular disease and cancer mortality. *J Epidemiol Commun Health* **66**, 420–426.
5. Kent S, Fusco F, Gray A *et al.* (2017) Body mass index and healthcare costs: a systematic literature review of individual participant data studies. *Obes Rev* **18**, 869–879.
6. Craig R, Fuller E & Mindell J (editors) (2015) Health Survey for England 2014: Health, social care and lifestyles. NHS Digital. <http://www.hscic.gov.uk/pubs/hse2014>
7. Niblett P (2016) National Child Measurement Programme – England, 2015–16 school year. NHS Digital. <http://digital.nhs.uk/catalogue/PUB22269>
8. Whitaker RC, Wright JA, Pepe MS *et al.* (1997) Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med* **337**, 869–873.
9. Power C, Lake JK & Cole TJ (1997) Body mass index and height from childhood to adulthood in the 1958 British born cohort. *Am J Clin Nutr* **66**, 1094–1101.
10. Jebb SA, Aveyard PN & Hawkes C (2013) The evolution of policy and actions to tackle obesity in England. *Obes Rev* **14**(Suppl. 2), 42–59.
11. Strack F & Deutsch R (2004) Reflective and impulsive determinants of social behavior. *Pers Soc Psychol Rev* **8**, 220–247.
12. Marteau TM, Hollands GJ & Fletcher PC (2012) Changing human behavior to prevent disease: the importance of targeting automatic processes. *Science* **337**, 1492–1495.
13. Nuffield Council on Bioethics (2007) *Public Health: Ethical Issues*. <http://nuffieldbioethics.org/wp-content/uploads/2014/07/Public-health-ethical-issues.pdf>.
14. Jebb SA (2015) Carbohydrates and obesity: from evidence to policy in the UK. *Proc Nutr Soc* **74**, 215–220.
15. Croker H, Lucas R & Wardle J (2012) Cluster-randomised trial to evaluate the 'Change for Life' mass media/social marketing campaign in the UK. *BMC Public Health* **12**, 404.
16. Dombrowski S (2018) Sustaining motivation and behaviour change. *Proc Nutr Soc* (In the Press).
17. Prestwich A, Sniehotta FF, Whittington C *et al.* (2014) Does theory influence the effectiveness of health behavior interventions? Meta-analysis. *Health Psychol* **33**, 465–474.
18. Knowler WC, Barrett-Connor E, Fowler SE *et al.* (2002) Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* **346**, 393–403.
19. Vermunt PW, Milder IE, Wilaard F *et al.* (2012) A lifestyle intervention to reduce type 2 diabetes risk in Dutch primary care: 2.5-year results of a randomized controlled trial. *Diab Med* **29**, e223–e231.
20. Ahern AL, Wheeler GM, Aveyard P *et al.* (2017) Extended and standard duration weight-loss programme referrals for adults in primary care (WRAP): a randomised controlled trial. *Lancet* **389**, 2214–2225.
21. Aveyard P, Lewis A, Tearne S *et al.* (2016) Screening and brief intervention for obesity in primary care: a parallel, two-arm, randomised trial. *Lancet* **19**, 2492–2500.



22. Eyles H, McLean R, Neal B *et al.* (2017) A salt-reduction smartphone app supports lower-salt food purchases for people with cardiovascular disease: findings from the SaltSwitch randomised controlled trial. *Eur J Prev Cardiol* **24**, 1435–1444.
23. Carter MC, Burley VJ, Nykjaer C *et al.* (2013) Adherence to a smartphone application for weight loss compared to website and paper diary: pilot randomized controlled trial. *J Med Internet Res* **15**, e32.
24. Cummins S (2017) The effect of the food environment on health and health inequalities. This symposium.
25. Crockett RA, King SE, Marteau TM *et al.* (2018) Nutritional labelling for healthier food or non-alcoholic drink purchasing and consumption. *Cochrane Database of Systematic Reviews* Issue 1.
26. Sadeghirad B, Duhaney T, Motaghipisheh S *et al.* (2016) Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials. *Obes Rev* **17**, 945–959.
27. Hagenaars LL, Jeurissen PPT & Klazinga NS (2017) The taxation of unhealthy energy-dense foods (EDFs) and sugar-sweetened beverages (SSBs): an overview of patterns observed in the policy content and policy context of 13 case studies. *Health Policy* **121**, 887–894.
28. Buttriss JL (2013) Food reformulation: the challenges to the food industry. *Proc Nutr Soc* **72**, 61–69.
29. Eyles H, Webster J, Jebb S *et al.* (2013) Impact of the UK voluntary sodium reduction targets on the sodium content of processed foods from 2006 to 2011: analysis of household consumer panel data. *Prev Med* **57**, 555–560.
30. He FJ, Brinsden HC & MacGregor GA (2014) Salt reduction in the United Kingdom: a successful experiment in public health. *J Hum Hypertens* **28**, 345–352.
31. Ng SW & Popkin BM (2012) Monitoring foods and nutrients sold and consumed in the United States: dynamics and challenges. *J Acad Nutr Diet* **112**, 41–45, e4.
32. Ng SW, Slining MM & Popkin BM (2014) The Healthy Weight Commitment Foundation pledge: calories sold from U.S. consumer packaged goods, 2007–2012. *Am J Prev Med* **47**, 508–519.
33. Ng SW, Slining MM & Popkin BM (2014) Turning point for US diets? Recessionary effects or behavioral shifts in foods purchased and consumed. *Am J Clin Nutr* **99**, 609–616.
34. Knai C, Petticrew P, Durand MA, Eastmure E *et al.* (2015) Has a public-private partnership resulted in action on healthier diets in England? An analysis of the Public Health Responsibility Deal food pledges. *Food Policy* **54**, 1–10.
35. Kraak VI & Story M (2015) Guiding principles and a decision-making framework for stakeholders pursuing healthy food environments. *Health Aff (Millwood)* **34**, 1972–1978.
36. Gillespie DO, Allen K, Guzman-Castillo M *et al.* (2015) The health equity and effectiveness of policy options to reduce dietary salt intake in England: policy forecast. *PLoS ONE* **10**, e0127927.
37. Stender S, Astrup A & Dyerberg J (2008) Ruminant and industrially produced trans fatty acids: health aspects. *Food Nutr Res* **52**.
38. Knai C, James L, Petticrew M *et al.* (2017) An evaluation of a public-private partnership to reduce artificial trans fatty acids in England, 2011–16. *Eur J Public Health* **27**, 605–608.
39. Public Health England (2016) National Diet and Nutrition Survey. Results from years 5–6 (combined) of the Rolling Programme (2012/13–2013/14). 2016 September.
40. Peters SAE, Dunford E, Ware LJ *et al.* (2017) The sodium content of processed foods in South Africa during the introduction of mandatory sodium limits. *Nutrients* **9**.
41. Kumanyika S (2013) INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): summary and future directions. *Obes Rev* **14**(Suppl. 1), 157–164.
42. Kauer I, Access to Nutrition Foundation (2016) Access to Nutrition Index – Global Index 2016. <https://www.accesstonutrition.org/>
43. Irving E & Crossman M (2017) Sugar, obesity and noncommunicable disease: investor expectations. 2017 February. <http://www.schroders.com/en/sysglobalassets/digital/insights/2017/pdf/2017-sugar-investor-expectations-consumer.pdf>
44. Moore L, de Silva-Sanigorski A & Moore SN (2013) A socio-ecological perspective on behavioural interventions to influence food choice in schools: alternative, complementary or synergistic? *Public Health Nutr* **16**, 1000–1005.
45. Marteau TM, Hollands GJ, Shemilt I *et al.* (2015) Downsizing: policy options to reduce portion sizes to help tackle obesity. *BMJ* **351**, h5863.
46. Huang TT, Cawley JH, Ashe M *et al.* (2015) Mobilisation of public support for policy actions to prevent obesity. *Lancet* **385**, 2422–2431.
47. Centre for Science in the Public Interest (2017) Menu Labeling Timeline: ley milestones in CSPI's campaign to achieve menu labeling nationwide. <https://cspinet.org/resource/menu-labeling-timeline>
48. Dalmeny K & Lobstein T (2003) Broadcasting Bad Health: why food marketing to children needs to be controlled. Children's Food Campaign. https://www.sustainweb.org/publications/broadcasting_bad_health/
49. Sustain the alliance for better food and farming. TV Dinners: what's being served up by the advertisers. 2001 01.01.2001.
50. Evans PA (1962) Smoking and health. Summary of a report of the Royal College of Physicians of London on smoking in relation to cancer of the lung and other diseases. *Cent Afr J Med* **8**, 234–236.
51. Liu AG, Ford NA, Hu FB *et al.* (2017) A healthy approach to dietary fats: understanding the science and taking action to reduce consumer confusion. *Nutr J* **16**, 53.