The role of the Food Industry in Health: Lessons from Tobacco?

Professor Simon Capewell & Dr Ffion Lloyd Williams

Department of Public Health and Policy, University of Liverpool, UK

Corresponding Author:
Dr Ffion Lloyd Williams
University of Liverpool.
Department of Public Health & Policy,
Institute of Psychology, Health & Society.
Whelan Building, Quadrangle,
LIVERPOOL, L69 3GB
United Kingdom
Telephone: 0044 (0)151 794 5576
Fax: 0044 (0)151 795 8467
Email: ffionlw@liverpool.ac.uk

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STRUCTURED ABSTRACT

Introduction

In this review we highlight poor diet as the biggest risk factor for non-communicable diseases. We examine the denial tactics used by the food industry, how they reflect the tactics previously used by the tobacco industry, and how campaigners can use this knowledge to achieve future public health successes.

Sources of data

Data sources are wide ranging, notably publications relating to public health, obesity and processed food, the effectiveness hierarchy, and food industry denialism tactics.

Areas of agreement

Global burden of disease analyses consistently demonstrate that poor diet produces a bigger burden of non-communicable disease than tobacco, alcohol and inactivity put together. The lessons learnt from the tobacco control experience of successfully fighting the tobacco industry can be applied to other industries including processed food and sugary drinks.

Areas of controversy

Tackling obesity and poor diet is a more complex issue than tobacco. Food industries continue to promote weak or ineffective policies such as voluntary reformulation, and resist regulation and taxation. However, the UK food industry now faces increasing pressure from professionals, public and politicians to accept reformulation and taxes, or face more stringent measures.

Growing points and areas timely for developing research

The rise in childhood and adult obesity needs to be arrested and then reversed. Unhealthy processed food and sugary drinks are a major contributing factor. There is increasing interest in the tactics being used by the food industry to resist change. Advocacy and activism will be essential to counter these denialism tactics and ensure that scientific evidence is translated into effective regulation and taxation.

KEY WORDS: Food Industry, denialism, public health, diet, disease, prevention policy

Introduction

This review briefly considers four related issues:

1) the burden of non-communicable diseases (NCDs), and food as a major risk factor for NCDs;
2) the lessons learnt from successes in tobacco control over six decades;
3) corporate political activity (CPA) - the denialism tactics (using rhetorical arguments to give the appearance of legitimate debate where none exists, with the ultimate goal of rejecting a proposition on which there is scientific consensus[1] used by Tobacco corporations and other harmful industries; and
4) public health successes and the lessons they offer for the future.

Non-communicable diseases (NCDs) and poor diet

Non-communicable diseases (NCDs) include cardiovascular diseases, cancers, COPD, diabetes and dementia.[2] NCDs account for two thirds of all global deaths, and are also the commonest cause of disability. The Global Burden of Disease study represents a huge collaborative achievement involving over 1800 scientists from 127 countries and has comprehensively assessed mortality and disability from major diseases, injuries, and risk factors.[3]

However, most of these premature NCD deaths are avoidable.[4,5] The WHO NCD Global Action Plan[6] for 2013-2020 therefore states a key principle for addressing NCDs using a "human rights approach":

"It should be recognized that the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being, without distinction of race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status, as enshrined in the Universal Declaration of Human Rights (paragraph 18)." [6]

Crucially, these analyses have consistently shown that poor diet generates more deaths and Disability Adjusted Life Years than tobacco, alcohol and physical inactivity combined.[2] Poor diet can elevate specific risk factors and subsequent disease: a high body mass index (i.e. obesity), increased systolic blood pressure (which is strongly correlated with salt intake), an elevated blood glucose (correlated with frank diabetes) and a high blood cholesterol (correlated with dietary fat, carbohydrates and sugar). Even with a conservative analysis, these factors in combination account for some 40% of the disease burden.[2] Poor diet is thus a bigger contributor to mortality and morbidity than tobacco (6%) plus alcohol (5%) plus physical inactivity (3%).[2]

Box 1 Terminology used and their definitions

Terminology	Definition
Food Industry	A complex, global collective of diverse businesses and corporations that supplies most of the food consumed by urban populations
Big food	The multinational food and beverage corporations with global market power
Ultra-processed foods	Industrial food formulations high in salt, sugar, oils and saturated fats, which include substances not used in culinary preparations, in particular additives used to imitate sensorial qualities of minimally processed foods
Sugary drinks	Any beverage with added sugar, including non-diet soft drinks/sodas, flavoured juice drinks, sports drinks, sweetened tea, coffee drinks and energy drinks
Processed food	The transformation of cooked ingredients, by physical or chemical means into food, or of food into other forms
Unhealthy food	Foods that are perceived to have little or no nutritional value (i.e. containing "empty calories")
Junk food	Cheap food containing high levels of calories, sugar, fat or salt
Whole food	Plant foods that are unprocessed and unrefined, or processed and refined as little as possible, before being consumed.

Lessons from Tobacco Control

Invaluable lessons can be learned from tobacco controls' six decade experience of persistently and successfully fighting the tobacco industry. Effective tobacco control has been achieved by comprehensive strategies which address the **"3 As"** of Affordability, Acceptability and Availability. Affordability includes increasing prices and taxes on all tobacco products. Acceptability includes advertising bans, smoke free laws, (so that smoking is no longer acceptable in pubs, clubs or cafes, and therefore no longer the social norm); and plain packaging (attractive packaging being a recognised form of marketing to children as well as adults.[7]

). Availability includes licensing of retailers, age checks in retail outlets and the elimination of vending machines. These comprehensive approaches to tobacco control work because they lower smoking initiation, increase cessation and reduce consumption.

The effectiveness of these comprehensive prevention strategies and their specific actions have been demonstrated by trend analyses of smoking prevalence in many countries, including the US, UK and Australia. These analyses consistently demonstrate the impact of successive interventions. Initially, they primarily disseminated information on the harms of tobacco. This was followed by progressive bans on TV advertising and marketing, reinforced by progressive rises in taxes. The culmination of these factors then makes the social environment increasingly hostile to smoking.[8] As public understanding and awareness of the harms of tobacco widens, politicians become increasing willing to advocate for and implement changes to improve public health. This is demonstrated by politicians resisting intense pressure and lobbying from the industry. At a broader level, these lessons can be applied across a wide range of issues, a phenomenon sometimes described as the "effectiveness hierarchy".[9]

The public health effectiveness hierarchy

Increasing evidence supports the concept of an effectiveness hierarchy. "Downstream" preventive activities targeting individuals (such as 1:1 personal advice to stop smoking or take exercise, health education, primary prevention medications) consistently achieve a smaller population health impact than interventions aimed further "upstream" (for instance, smoke-free legislation, tobacco taxes, alcohol minimum pricing or regulations eliminating dietary trans-fats). These comprehensive, policy-based interventions affect the whole population and do not depend on a sustained "agentic" individual response. They thus tend to be more effective, more rapid, more equitable and also cost-saving.[9,10]

The effectiveness hierarchy is certainly evident when evaluating strategies to promote healthier diets. Hyseni et al.[11,12] have recently completed two systematic reviews on the most effective interventions to reduce the dietary intake of industrial transfats and salt respectively. Dietary salt consumption remains much higher than recommended, increasing the incidence of hypertension, cardiovascular disease and stomach cancer.[13] Substantial reductions in salt intake are therefore urgently needed. However, the debate continues about the most effective approaches. To inform future prevention programmes, Hyseni et al. systematically reviewed the evidence on the effectiveness of possible salt reduction interventions and compared "downstream, agentic" approaches targeting individuals with "upstream, structural" policy-based population strategies.

This systematic review found that multi-component strategies (involving both upstream and downstream interventions) generally achieved the biggest reductions in salt consumption across an entire population, most notably 4g/day in Finland and Japan, 3g/day in Turkey and 1.3g/day recently in the UK. Mandatory reformulation alone could achieve a reduction of approximately 1.45g/day, followed by voluntary reformulation (-0.8g/day), school interventions (-0.7g/day), short term dietary advice (-0.6g/day) and nutrition labelling (-0.4g/day). Tax and community based counselling could typically reduce salt intake by 0.3g/day, whilst even smaller population benefits were derived from health education media campaigns (-0.1g/day). Worksite interventions achieved an increase in intake (+0.5g/day), however, with a very wide range. Long term dietary advice could achieve a -2g/day reduction under optimal research trial conditions; however, substantially smaller reductions might be anticipated in unselected individuals over the longer term.[11]

The conclusions were clear. Comprehensive strategies involving multiple components (voluntary reformulation, food labelling and media campaigns) and "upstream" population-wide policies such as mandatory reformulation generally appear to reduce salt intake more effectively than "downstream", individually focussed interventions in achieving population-wide reductions in salt consumption. The

authors concluded that the 'effectiveness hierarchy' might deserve greater emphasis in future NCD prevention strategies.[11]

Likewise with industrial trans fats, intake in most countries still exceeds the WHO target. Hyseni et al.[12] systematically reviewed trans-fat interventions and compared "upstream" structural policies covering whole populations with "downstream" agentic interventions targeting individuals. Again, multi-component interventions which included a legislative ban to eliminate trans-fats from food products appeared the most effective strategy. Reformulation and other multi-component interventions can also achieve useful reductions. By contrast, more "downstream" interventions consistently achieve smaller reductions. They concluded that future prevention strategies should consider this "effectiveness hierarchy" in order to achieve the largest reductions in the consumption of trans-fats.[12]

An effectiveness hierarchy is also apparent when considering wider interventions to promote healthy eating. McGill et al.[14] used a "5Ps" Framework to categorise healthy eating interventions (Price, Place, Product, Promotion and Person). They found differential effects on healthy eating outcomes by socioeconomic position. "Upstream" interventions categorised as "Price" (fiscal measures) appeared to decrease health inequalities, and were most effective in groups with lower socioeconomic position (SEP). All interventions that combined taxes and subsidies consistently decreased health inequalities. Conversely, "downstream" "Person" interventions (individual-based information and education), particularly dietary counselling, had a smaller impact and also tended to widen health inequalities. [14]

Sugar, sugary drinks and junk food

So why the recent focus on sugar? There is increasing evidence identifying sugar as an important contributor to diverse harms, notably obesity, diabetes, cardiovascular disease and dental decay.[15] In England, one in 10 children entering the reception year at primary school are obese, and by year 6 this increases to 1 in 5 children.[16] Severe dental decay is the commonest cause of hospital admissions in young children In the UK; this has increased by some 25% in the last decade.[17]

Furthermore, obesity is increasingly a worldwide problem in adults and children. The Final Report of the Commission on Ending Childhood Obesity (ECHO),[18] 2016 recently stated:

> *"Government and society have a moral responsibility to act on behalf of the child to reduce the risk of obesity. Tackling childhood obesity resonates with the universal acceptance of the rights of the child to a healthy life as well as the obligations assumed by State Parties to the Convention of the Rights of the Child." (page 8)*

The sugary drinks industry have objected to comparisons with the tobacco industry. However, there is increasing evidence indicating the use of similar tactics. The last 10 years has also seen an increasing confidence with which public health professionals have identified commercial activity as determinants of ill health, and a major problem to be addressed. Thus in 2009, Kelly Brownell and Ken Warner[19] published a seminal review in the Millbank Quarterly with the title *'Big tobacco played dirty and millions died, how similar is big food?'* They stated:

> *"The food industry differs from tobacco companies in important ways, but there are significant similarities in the actions that the industries have taken. Obesity is now a major concern. The world cannot afford a repeat of tobacco history."*

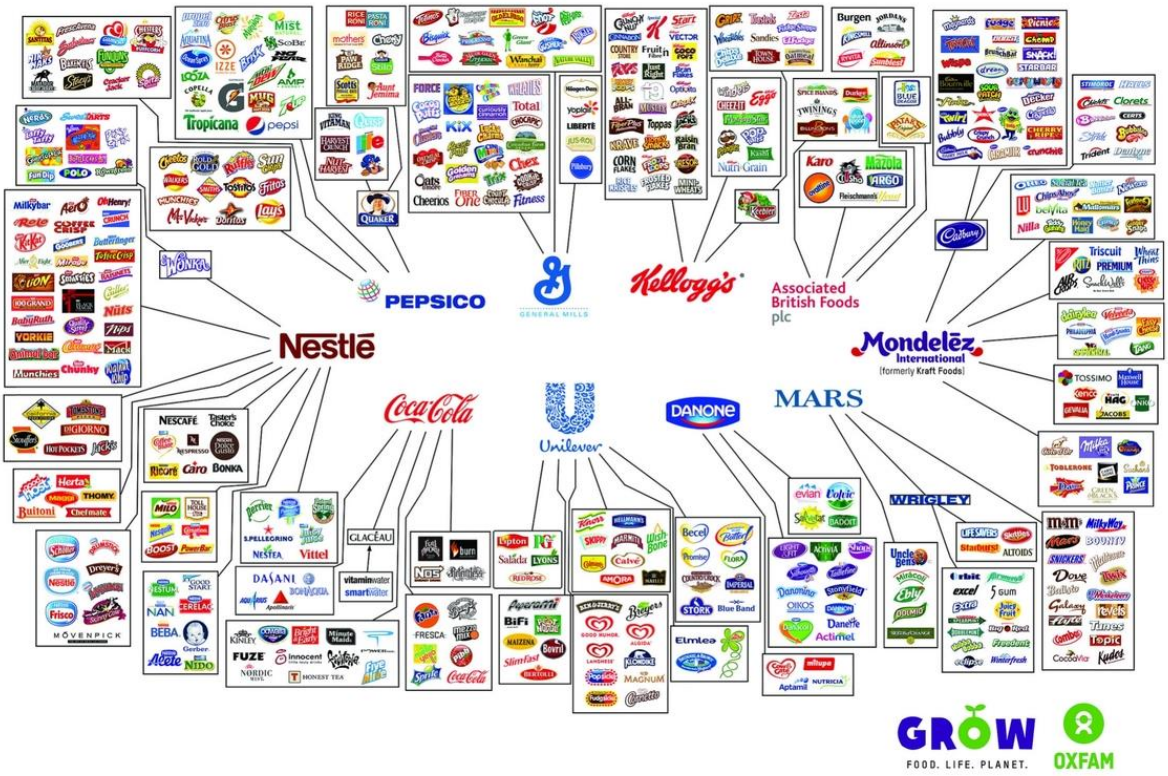
1n 2011, Anna Gilmore and colleagues[20] described specific multinational corporations as "vectors of disease". Though chilling, the analogy was clearly apposite. Much like mosquito vectors carrying malaria, the tobacco, alcohol and sugary drinks companies constantly supply and promote unhealthy products and use skilled marketing techniques to ensure individuals continue to purchase and consume them. In 2012, PLOS Medicine published a seminal series addressing the problem of the "Big Food" industry. Edited by David Stuckler and Marion Nestle[21], this series included articles on 'big tobacco', 'big food' and 'big alcohol'. By examining tobacco company documents, valuable insights have been gained about the methods the industry used to avoid or defy public health interventions that might threaten their profits.

Considerable evidence now shows that unhealthy food and beverage companies use similar tactics to preserve their own profits by routinely undermining public health responses such as taxation and regulation.

In 2013, Moodie and colleagues[22] published an extensive Lancet review starkly titled *"Profits and Pandemics".* They described the same industry denialism tactics, then assessed the effects of countermeasures to promote public health. They emphasised the similar techniques that harmful commodity industries use to avoid regulation and taxation (policies that threaten to reduce sales and hence profits). The tobacco, alcohol, and ultra-processed food and drink industries had ostentatiously advocated self-regulation, and public-private partnerships. All notably ineffective, and thus no threat to sales or profits. They concluded that unhealthy commodity industries should have no role in the formation of national or international NCD policy. Furthermore, public regulation and market intervention are the only evidence-based mechanisms to prevent harm caused by the unhealthy commodity industries.

Moodie et al.[22] also highlighted a seminal report by Oxfam[23] entitled "*Behind the Brands: Food justice and the "Big 10*" *food and beverage companies".* The report included a very powerful infographic (Figure 1). The figure shows that across the world, the majority of processed food consumed each day is produced by one of only ten huge multinational corporations: Associated British Foods (ABF), Coca-Cola, Danone, General Mills, Kellogg, Mars, Mondelez International (previously known as Kraft), Nestle, PepsiCo and Unilever. However, the control and influence of these large food multinationals is not well recognised. Neither do many people appreciate that every single corporation is legally obliged to focus on just one objective, maximising profits for its shareholders. This suggests that corporate messaging about public health (for example, consistently focusing upon and promoting the benefits of physical activity as opposed to reducing the consumption of sugary drinks to address the obesity epidemic) can thus be viewed as merely public relations and marketing to maximise sales. Industry has been very effective in achieving its goals by adopting this strategy. But how and why has industry been so successful with this approach?

Figure 1 ***Behind the Brands: Food justice and the "Big 10" food and beverage companies***



Source: Joki Gauthier for Oxfam 2012. http://www.behindthebrands.org

Denialism tactics by corporations

The last decade has seen an explosion in research evidence and analysis detailing these industry denialism tactics, now increasingly termed corporate political activity (CPA). Hastings[24] and Stuckler[25] have highlighted the harmful influence and effects marketing campaigns by multinational corporations are having on our health. Freudenberg[26] has researched and published extensively on ideology of the corporate consumption complex and the resulting "hyper-consumption" across modern society.

Williams[27] agrees that corporations are powerful, and contemporary food markets are structured by corporate activity, reflecting the well-known 'hour-glass' between producers and consumers. The resulting markets promote processed foods, which are invariably less healthy than whole foods. However, their efforts at self-regulation are predictably ineffective. Their inability to reform is demonstrated by their lack of willingness to stop marketing to children, promoting processed foods, or conducting constructive discussions about regulation and reformulation. Conversely, regulation is liberating from a societal perspective, because it results in more freedom and choice for the consumer, and corporations' domination of agricultural producers and markets become increasingly restricted.

Happily, this understanding of corporate tactics has disseminated progressively across the wider policy arena. Thus in 2013, Dr Margaret Chan[28], the Director General of the World Health Organisation was able to say:

> *It's not just big tobacco anymore, its big food, big soda and big alcohol, all of these industries fear regulation because it harms their profits and they're using the same tactics. Focus groups, lobbies, law suits, promise of self-regulation which doesn't work and the industry funded research that confuses the evidence and keeps the public in doubt. Doubt is one of the major products and its a very effective one.*[28]

Then in 2014, Anand Grover, UN Special Rapporteur on the Right to Health, stated:

> *'Owing to the inherent problems associated with self-regulation and public–private partnerships, there is a need for States to adopt laws that prevent companies from using insidious marketing strategies. The responsibility to protect the enjoyment of the right to health warrants State intervention in situations when third parties, such as food companies, use their position to influence dietary habits by directly or indirectly encouraging unhealthy diets, which negatively affect people's health. Therefore, States have a positive duty to regulate unhealthy food advertising and the promotion strategies of food companies. Under the right to health, States are especially required to protect vulnerable groups such as children from violations of their right to health.'*[29]

This message has since been echoed by Olivier De Schutter,[30] UN Special Rapporteur on the Right to Food, and Dainius Puras, UN Special Rapporteur on the Right to Health.[31]

The MARSH corporate political activity

The identification and role of CPA has been well recognised for decades in tobacco control circles.[32,33] The industry acts to undermine any public health regulation which might threaten profits. Recognition of similar tactics in other industries is a much more recent phenomenon. In 2010, McKee and Diethelm used the phrase "denialism" as a concept to describe these tactics used by multinational companies, including CPA. [34,35]

Recent progress in highlighting CPA has been impressive. A systematic review by Savell, Fooks and Gilmore (2014) found that defensive and aggressive activities by the tobacco industry were far more diverse than previously recognised. Indeed, these industry tactics and arguments were generalisable to multiple jurisdictions and could be used to predict industry activity.[36] This notion of CPA was then extended by Mialon, Swinburn and colleagues (2016), using an extensive review of the evidence to systematically identify, describe and comprehensively categorise CPA in relation to the food industry. Food industry actors were found to use multiple CPA strategies, particularly 'information and messaging' and 'constituency building' strategies.[37]

The challenge is then how best to communicate dense and comprehensive models of CPA for the wider public. Building on Savell et al,[36] we offer ***MARSH*** as a mnemonic. This describes the marsh ("swamp" in the US) deliberately created by industry actors to delay and distract public health and policy makers from implementing the interventions that work best: regulation and taxation. MARSH stands for: **Mis-information; Attack; Recruitment** of allies; **Substituting ineffective policies,** and **Heaps of money**. (Table 1)

TABLE 1.
***MARSH*: tactics used by Tobacco & Food Industries to block market regulation**

M Misinform
Reshaping evidence; **lobbying** (**Direct or** via **third parties); Increase Doubt; Procrastinate**

A Attack
Neutralise, discredit, fragment & destabilise opponents: "Nanny State, Anti-business"
Litigation, challenge policies in courts, threaten legal action or "job losses"

R Recruit
Build internal constituencies, alliances & trade associations. External constituencies, other sectors; policymakers; media; unions; civil society, consumers, employees, public; astroturf *(fake grassroots organizations)*
S Substitute *ineffective interventions*
Voluntary, self-regulation, Public-Private-Partnerships, Education, individual choice

H Heap money *on politicians, journalists & scientists*

SOURCE DATA: Savell E, Gilmore AB, Fooks G. How does the tobacco industry attempt to influence marketing regulations? A systematic review. *PLoS One*. 2014 Feb 5;9(2):e87389. doi: 10.1371/journal.pone.0087389.

Firstly, **Misinformation** and biasing the evidence. Harmful industries (tobacco, alcohol, gambling, sugary drinks etc), systematically spend millions of pounds on generating "research" studies that will undermine the basic evidence of harm. They then misinform policy makers and politicians by direct (e.g. making contact with policymakers to influence legislation and regulation and/or providing hospitality and gifts) and indirect political lobbying (e.g. hiring "independent experts" to talk to policy makers, or the use of "front groups" to put pressure on behalf of the industry, without disclosing their interests). These industry actors market and generate doubt,[38] and hence create delay in any proposed regulation or taxation. Historians have looked at thousands of freedom of information and disclosure documents from the tobacco industry and found part of the tobacco industry's strategy was to fund science to undermine the evidence and create doubt. Thus leading to politicians using the perceived lack of consistent scientific evidence to justify inaction on regulation and taxation.

Secondly, **Attack.** The harmful corporations will attack individuals and organisation and indeed countries. For example, the recent Philip Morris legal onslaught on Uruguay's tobacco control measures.[39] Industry and industry apologists will try and destabilise their public health opponents, and also accuse them of being "nanny state" or "anti-business". Hence the frequent (false) claims that *'you're going to hurt jobs',* or *'you're going to hurt the economy'.* This has occurred ever since the tobacco industry first tried to resist regulation and taxation. Industry will thus readily use legal approaches, both actual litigation and also the simple threat of legal action which can itself successfully achieve "regulatory chill".

Thirdly, **Recruiting** allies and constituencies. Tobacco industries in the past and more recently sugary drinks companies build up internal constituencies and trade associations to create political opposition machines. Furthermore, they also energetically recruit policy makers, media, civil society and consumer groups. For instance sugary drinks taxes are now being introduced in city after city across the US. Yet on each occasion, the sugary drinks companies and American Beverage Association are mobilising opposition,

including multi-million dollar financing of media to air adverts to turn the public against the tax, creating fake grass roots opposition organisations, and by providing "charitable" funding to local community groups.

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Fourthly, **Substituting ineffective interventions** such as education or "individual choice", self-regulation or voluntary agreements. Anything other than regulation or taxation represents a good distraction.[41] Industry actors thus also promote public-private partnerships, which are equally ineffective.[41] Furthermore, note how the junk food industry has been trying to put the blame for children's obesity entirely on physical inactivity.

Finally, **Heaps of money.** Industry provides substantial funding for scientists, journalists, politicians and political parties. In the US Congress for instance, approximately two thirds of representatives declare funding received from the food industry.[42]

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SUPPORT for past and future public health triumphs

However, there is good news. Public health alliances are continuing to battle and win against CPA. The tobacco industry are increasingly constrained by regulation and taxation in high income countries, and face progressive control globally. This is powerfully assisted by the legally binding Framework Convention on Tobacco Control (FCTC), agreed in 2005[43] and now implemented in over 180 countries.
Furthermore, the lessons learned from the public health triumphs over Big Tobacco and many other health threats over the last two centuries offer valuable lessons for the future. Whether it is clean water, sanitation, pollution, slavery abolition, immunisation, seat belts, or smoke free interventions. The pathways for all these triumphs can usefully be summarised by the mnemonic SUPPORT. This stands for:

SCIENTIFIC evidence emerges

UNDERSTANDING spreads

PROFESSIONALS accept the scientific paradigm

PUBLIC & POLITICIANS become aware of the evidence, then supportive of remedies

OPPOSITION from vested interests is anticipated, then progressively OVERCOME, then

REGULATION is introduced, often strengthened by

TAXATION to **reinforce regulations**.

Tobacco control is an excellent example of SUPPORT in action. **Scientific evidence** became irrefutable that tobacco causes heart disease and lung cancer. This was followed by a wider **Understanding** across the scientific community. This understanding then spread more widely. **Professionals** such as doctors initially challenged it but then progressively accepted the concept. The idea then diffused through to the **Public.** The weight of evidence, often amplified by committed advocates, then progressively shifts opinion in the general public and then in **Politicians,** leaving them little choice but to follow and accept the will of the electorate. The UK sugary drinks tax is a good recent example. These progressive proposals then always face certain **Opposition** from vested interests of industry. However, that opposition can be **Overcome** to then pave the way for **Regulation** and, in many cases, **Taxation**.
SUPPORT thus seems to be a potentially useful framework, and appears to apply to most historical public health successes, and also recent ones like sugary drinks regulation and taxation.

Obesity and Sugar

Obesity offers another informative example. It has been on the agenda for some two decades in the UK. However, obesity only started to gain traction as a policy issue when the estimated societal cost of obesity in the UK reached £27 billion per year, (and that is very likely an underestimate).[44]

Obesity initiatives then multiplied, particularly in the last decade. However, most policy initiatives have emphasised politically unchallenging approaches such as information, education and personal choice. All are weak or ineffective,[45] and have thus been encouraged by the industry. However, the UK is now increasingly acknowledging the failure of these past strategies, and identifying more effective interventions. The Parliamentary Health Select Committee, chaired by Sarah Wollaston MP, an advocate of public health, examined the evidence –base for preventing childhood obesity in 2015,[46] and 2017.[47] They have produced important messages and advocated bold action.

Firstly, the obesogenic environment represents a large, complex, and wicked problem. It thus requires a large, multifactorial and multilevel approach[48], because any single intervention in isolation will not be sufficient and will likely have minimal effect. The Health Select Committee therefore recommended a comprehensive strategy comprising 12 evidence-based interventions (Table 2).

Table 2 Health Select Committee recommended a comprehensive strategy including 12 evidence-based interventions

↓↓ Restrictions on Advertising to children
↑↑ Reformulation
↑↑ 20% tax on full sugar soft drinks
↓↓ Price Promotions
↓↓ Placement of food & drink in retail environment
↑↑ Labelling
↓↓ Portion sizes & caps
↑↑ Nutrition standards in ALL schools
↑↑ Support local authorities & wider public sector
↑↑ Early interventions
↓↓ Calorie reduction (not just sugar)
↑ Physical Activity

Progress thus far has been slow but steady. A 20% tax on full sugar soft drinks has now been legislated, but with implementation delayed until Spring 2018.[49] Further restrictions on advertising to children were implemented in late 2016 (but with substantial loopholes remaining); and voluntary industry reformulation of diverse food groups is now being closely supervised by Public Health England.[50,51] With the intention to follow the same path successfully achieved by salt reduction in the last decade.[11,52]

Optimists present this as great progress,[53,54] which is true. Meanwhile sceptics consider it tokenistic and destined to fail, and cite real grounds for concern.[52] We will not have long to wait, because the current very close monitoring by Public Health England should enable analysis of trends by mid 2018. Meanwhile, ministers claim that they would be prepared to use more radical interventions if necessary. These additional actions have not been specified, but might logically include a tax on the sugar concealed in every food group, a comprehensive ban on TV advertising of junk food and sugary drinks before the 9pm watershed, and regulations to enforce reformulation and reduction in portion sizes. Such regulations then provide a "level playing field" for all companies, as demanded by some distributors. The moral and scientific arguments in favour of such "NannyState" policies are strong.[55] However, the political trends during this Summer of 2017 are not promising, with fears that Brexit inspired deregulation could particularly undermine tobacco control and healthy food policies.[56]

However, unless the rise in childhood obesity is arrested and then reversed, millions of people will face a life shortened by obesity, diabetes and other chronic diseases. And the NHS budget and UK economy will both be harmed.

Future policy issues, and the balance of probabilities

Tackling obesity is undoubtedly a profoundly complicated issue. Major lessons can be learnt from the tobacco industry and the success of tobacco control. In comparison to food, tobacco presents a less complicated problem. The complete disappearance of the tobacco industry would benefit everyone's health. Food is much more complex to address. On the one hand, a century of nutrition science has clearly identified that healthy diets typically emphasise fruit and vegetables, nuts and pulses, fish and olive oil. Conversely, the megatonnes of processed food, ready meals and snacks currently produced annually by the food industry are densely packed with unhealthy salt, sugar and saturated fat, likewise sugary drinks. These promote disease. The food industry is therefore now facing increasing pressure from professionals, public and politicians to reformulate their recipes. Hence ensuring that their products are at least not harmful, and that some products could even be health promoting. Such actions are voluntary at present; but the spectre of tobacco-inspired regulation and taxation probably now haunts every food multinational.[57]

Why are industry players so keen to market doubt? Doubt paralyses the legislative process. How much evidence is needed to justify a public health intervention? The researchers' desire for even greater clarity and an even better understanding of mechanisms is predictable. But the perfect then risks being the enemy of the good. Furthermore, "beyond all reasonable doubt" is the wrong standard. Most public health champions in history have achieved progress once evidence was considered sufficient to satisfy the "balance of probabilities" test. Perfect evidence is impossible to achieve and if corporate actors persuade us to wait for absolute proof, we will wait forever. (For instance, the totality of evidence clearly demonstrates that smoking is very harmful; yet there is still no randomised controlled trial "proving" that smoking "causes" lung cancer). Some 99% of climate scientists are convinced by the evidence that human production of CO2 is warming the globe. We likewise have had evidence since the 1970s that sugar is harmful to health. However, the industry actively perpetuated doubt for three subsequent decades,[58] successfully paralysing all effective public health activity. It is only in the last decade that public health activists such as Brownell, Lustig, MacGregor, Malhotra, Nestle and Stuckler have successfully mobilised public opinion and politicians to address the problem.

Conclusions

Exemplary global burden of disease analyses clearly demonstrate that poor diet produces a bigger burden of non-communicable disease than tobacco, alcohol and inactivity combined.[6] Historical successes in tobacco control, safe water and clean air have highlighted the reality of the Effectiveness Hierarchy, and that the most powerful interventions are "upstream" policies addressing the 3 As of Affordability, Acceptability and Availability.

Modern transnational corporations producing harmful commodities such as junk food, sugary drinks and alcohol aim to maximise profit and avoid regulation. Like tobacco in previous decades, these denialism tactics are predictable, and can be categorised using the MARSH mnemonic.

In conclusion, advocacy and activism are both essential to travel the long SUPPORT path, from the initial scientific evidence to effective regulation and taxation. Happily, we can celebrate many past public health triumphs, profit from these lessons learned, and now plan for future successes.

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