

ANALYSIS



Downsizing: policy options to reduce portion sizes to help tackle obesity

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Larger portions of food increase consumption. **Theresa Marteau and colleagues** suggest ways to reduce their size, availability, and appeal

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The worldwide prevalence of obesity and overweight has risen substantially over the past three decades with no country yet achieving a reduction.¹ International and national ambitions to “end childhood obesity”² and “reduce non-communicable diseases by 25% by 2025”³ are unmatched by policies that could realise them. The causes of obesity are complex but overconsumption of food and sugary drinks is a critical proximal determinant, driven in part by large portion sizes. The importance of developing interventions and policies to reduce the size, availability, and appeal of large portions is underscored by the compelling evidence that people eat and drink more from larger portions.⁴

The problem

The size of portions, packages, and tableware has increased over the past 50 years (fig 1⇓). Our recent Cochrane review shows that people consistently consume more food or non-alcoholic drinks when offered larger sized portions or packages, or when using larger items of tableware.⁴ The size of this effect suggests that eliminating larger portions from the diet could reduce average daily energy consumed by 12-16% among UK adults and by 22-29% among US adults. Our estimates are in line with those generated in another review on portion size using different methods.⁵

Crucially, portion size is a modifiable determinant of dietary energy intake. Although clearer guidance on healthy portion sizes for a range of foods and drinks is awaited,⁶ most national and international policies to prevent obesity highlight a need to reduce portion sizes.^{7 8} Indeed, a recent economic analysis ranked reduced portion size as having the highest potential to reduce the population health burden of obesity.⁹

The mechanisms underlying the “portion size effect” are not fully understood.^{10 11} However, it seems that the social and personal norms for what constitutes a suitable amount to

consume are shaped by food portions we routinely encounter in supermarkets, restaurants, or the home, including images used in marketing. As exposure to larger portions has become more common, these sizes have come to be viewed as appropriate, with consumption correspondingly increasing. This suggests that reductions in portion size might, over time, recalibrate consumption norms, even if there were some initial resistance from consumers and industry. The effect may often operate without awareness,^{10 12} making default portion, package, and tableware size an effective psychophysical barrier to our ability to regulate the amounts of food and energy we consume.⁴ This explains why providing information about the effect¹³ or guidance, such as labelling, to indicate an appropriate portion size seems to have only a small effect.^{14 15}

Policy options

Given that larger portions are now an established part of the highly competitive food market, change will require active intervention. 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. There has been little research on interventions to reduce portion size and existing studies have shown mixed effects.¹¹ It seems likely, however, that effective interventions will reduce demand and supply, setting up a virtuous circle, to recalibrate portion sizes. Achieving such change will require support from the public, industry, and politicians. We consider what interventions might work, where and how they can be made, and who needs to act (fig 2⇓).

What interventions might work?

The box shows interventions with the potential to reduce portion sizes. Interventions in physical environments include reducing the availability of larger sizes for energy dense foods and drinks and the tableware used for their consumption, designing packaging to demarcate single portion sizes, and limiting portion sizes used in advertisements.

Price is cited by shoppers as a major influence on product choice.¹⁷ This makes foods and drinks in larger portions and packages more appealing because they often cost less in relative (and sometimes absolute) terms. However, restrictions on such pricing practices may be limited by differences in the true cost of production and Competition Commission rules.

While the evidence for the effectiveness of changes in physical and economic environments in relation to portion size is limited, there is strong evidence that interventions that reduce availability and increase price reduce tobacco and alcohol consumption.^{18 19}

Reducing portion sizes across the whole diet to realise large reductions in consumption may mean reverting to sizes of portions and tableware similar to those in the 1950s (fig 1). This would involve reductions of over 50% for some energy dense products, far greater than the typical 5% reductions currently offered and negotiated with the food industry.²⁰

Key uncertainties

Most of the existing evidence on the effects of reducing portion size comes from studies of very large portions. We therefore cannot be certain that reducing smaller portions would be as effective in reducing food consumption.

In addition, we do not know by how much large portion sizes can be reduced before becoming unacceptably small. While the portion size effect seems to operate without awareness,^{10 12} overt actions to reduce portion sizes, particularly when prices do not also decrease, may prompt consumer resistance.²¹ This may not recede until social norms are recalibrated and pricing is adjusted to reflect a smaller size.²²

Reducing exposure to larger portion sizes could also have unintended compensatory effects, encouraging consumption of multiple smaller portions or additional foods. At present there is no strong evidence for this. The few primary studies that have assessed this directly found no such effects—for example, consumption of a reduced size of breakfast did not affect the amount of food consumed over the rest of the day.²³

Where can these interventions be made?

Public sector environments

Implementation of portion size interventions will be easier in public sector organisations, such as schools, hospitals, military bases, and prisons, than in commercial environments. Intervening in health related environments could have a particular potency, removing the “health halo” that comes from providing less healthy foods, including larger portions, in these environments.²⁴ The public sector in England spends £1.2bn a year on food and drink and the food procurement plan for public bodies in England, which makes the provision of healthy, tasty, and sustainable food priorities alongside value for money, could include default procurement of smaller portion sizes.²⁵

Commercial sector environments

Interventions in commercial environments pose major challenges. For example, the attempt to introduce a 16 ounce (454 mL) limit on the size of sugar sweetened beverages sold

in food outlets in New York City met with much resistance and has been unsuccessful.²⁶ There has been an effort to reduce portion size in England through voluntary agreements as part of the Public Health Responsibility Deal. For example, Mars, Nestlé, and Mondelez, the three largest chocolate manufacturers have committed to limiting the energy content of single serve confectionery to 250 kcal. However, broader change across companies and products is fragmented, and there has been no evaluation of the net reduction in energy intake as a consequence of portion size reductions. Some cinema chains in England have voluntarily removed their largest cup size of soft drinks so that the maximum is now 32 ounces, but this is still a large amount and the fact that not all cinemas have signed up illustrates the limits of a voluntary approach.

How can these interventions be achieved?

A combination of regulatory and non-regulatory measures is likely to be needed.²⁷ Indeed, the food industry may find it difficult to act without regulation given “first mover disadvantage.”²⁸ Including disincentives or sanctions for non-participation in voluntary agreements may also help.²⁹

Effective interventions will also need to take into account industry innovations that may circumvent the intended effects of policy approaches. For example, the agreement of confectionery manufacturers to phase out king size chocolate bars in 2005 led to the introduction of bars containing multiple portions, ostensibly for sharing or consuming at different times. A 2015 poll reported that 40% of those aged under 25 regularly eat a whole 150 g “sharing bag” of crisps, which can contain up to a third of an adult’s recommended daily intake of calories and salt and almost a quarter of the recommended intake of fat.³⁰ Conversely, very small portions may also increase consumption if they encourage non-consumers to try the product or if small individual units are offered in bulk quantities that may increase frequency of consumption.

Who needs to act?

Although policy makers and the food industry have primary responsibility for action, public acceptability is likely to be an important facilitator. Public acceptance of government intervention to prevent obesity is mixed but stronger when it is focused on children.^{31 32} More specifically, little is known about the acceptability of reducing portion or package sizes. A newspaper survey of New York residents in 2012 reported 60% opposed the proposed 16 ounce cap on sugary drinks.³³ This was during a media campaign, funded by soda manufacturers, highlighting the rights of citizens to purchase soda in sizes “without interference from bureaucrats.” By contrast, a more recent survey of UK and US participants found greater support for this intervention, with 59.9% and 53.5%, respectively, finding it acceptable (unpublished data). Some studies have suggested the acceptability of smaller portion sizes. For example, a study in a US university campus restaurant found that 14–33% of those invited to halve the size of a starchy side dish accepted regardless of whether they were offered a discount to do so.³⁴ While public acceptance seems necessary for governments and the private sector to act, real progress may require more coordinated public demand.³⁵ The introduction of many tobacco control measures reflects the mobilisation of public support, not yet evident for obesity control.³⁶ Strategies that inform and enable communities could increase their demand for change to tackle obesity. Providing information about the effectiveness of interventions increases support for them.^{37 38} Communities can also be enabled to act through stronger non-governmental

Interventions to target portion size

Physical environment*

Food and drink

Sizing—Make default serving sizes smaller for energy dense foods and drinks—eg, reduce size of single serve confectionery and serving size of chips and cakes in canteens

Availability—Reduce availability of larger portion and package sizes†—eg, remove largest serving size of drinks; increase availability of smaller portion and package sizes—eg, offer option of smaller portions to diners in restaurants

Placement—Place larger portion sizes in stores and cafes less accessibly†—eg, portion size limits at checkouts, aisle ends, and special displays

Design—Demarcate single portion sizes in packaging through wrapping or visual cues†—eg, individual wrapping of biscuits

Marketing—Restrict portion and package sizes used in advertisements and other marketing

Tableware (plates, cups, glasses, and cutlery)

Sizing—Make smaller tableware the default for self service and served foods and drinks†

Availability—Increase availability of smaller tableware and reduce availability of larger tableware for home use

Design—Develop tableware that maximises the mechanisms underlying the portion size effect—eg, shallow plates, straight sided glasses, cutlery that holds smaller mouthfuls

Economic environment

Restrict pricing practices whereby larger portion and package sizes cost less in relative (and sometimes absolute) monetary terms than smaller sizes†

Restrict price promotions on larger portion and package sizes†

Price tableware in relation to size

*Subheadings taken from a typology for interventions in physical microenvironments¹⁶

†Actions most consistent with evidence from our systematic review⁴

organisations (NGOs) as seen in Mexico where, through Bloomberg Philanthropies, NGOs purchased prominent advertising space to effectively counter industry opposition to soda taxes.

Conclusion

The compelling evidence that larger portion sizes of food and non-alcoholic drinks increase consumption is currently unmatched by similarly strong evidence on how to reduce this effect. This requires independent and rigorous evaluation of interventions that aim to reduce the size, availability, and appeal of larger portions. Successful interventions, if implemented at sufficient scale, have the potential to help prevent obesity as part of a wider obesity strategy.²⁷ Aligning the will of the public, private industry, and political leadership is key to progress.

Contributors and sources: This article was prompted by the completion of our Cochrane review⁴ and the desire to draw out the policy implications of this and other cognate studies. TMM and GJH have expertise in behaviour and behaviour change, GJH and IDS have expertise in evidence synthesis, SAJ has expertise in nutrition and public policy to change diet. TMM is the guarantor of the article.

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- 1 Ng M, Fleming T, Robinson M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014;384:766-81.
- 2 World Health Organization. Interim report of the Commission on Ending Childhood Obesity. WHO, 2015:1-30.
- 3 World Health Organization. Follow-up to the political declaration of the high-level meeting of the general assembly on the prevention and control of non-communicable diseases the sixty-sixth World Health Assembly. WHO, 2013:1-55.

- 4 Hollands G, Shemilt I, Marteau T, et al. Portion, package or tableware size for changing selection and consumption of food, alcohol and tobacco. *Cochrane Database Syst Rev* 2015;9:CD011045.
- 5 Zlatevska N, Dubelaar C, Holden SS. Sizing up the effect of portion size on consumption: a meta-analytic review. *J Marketing* 2014;78:140-54.
- 6 Clift J. Portion distortion: how much are we really eating? British Heart Foundation, 2013:22.
- 7 NICE. Maintaining a healthy weight and preventing excess weight gain among adults and children. NICE guideline 7. 2015. www.nice.org.uk/guidance/ng7.
- 8 WHO. European food and nutrition action plan 2015-2020. WHO Europe, 2014.
- 9 Dobbs R, Sawers C, Thompson F, et al. Overcoming obesity: an initial economic analysis. McKinsey Global Institute, 2014.
- 10 Benton D. Portion size: what we know and what we need to know. *Crit Rev Food Sci Nutr* 2015;55:988-1004.
- 11 Steenhuis I, Vermeer W. Portion size: review and framework for interventions. *Int J Behav Nutr Phys Act* 2009;6:1-58.
- 12 Dilberti N, Bordi PL, Conklin MT, et al. Increased portion size leads to increased energy intake in a restaurant meal. *Obes Res* 2004;12:562-8.
- 13 Cavanagh K, Vartanian LR, Herman CP, et al. The effect of portion size on food intake is robust to brief education and mindfulness exercises. *J Health Psychol* 2014;19:730-9.
- 14 Spanos S, Kenda AS, Vartanian LR. Can serving-size labels reduce the portion-size effect? A pilot study. *Eat Behav* 2015;16:40-2.
- 15 Versluis I, Papias EK, Marchiori D. Preventing the pack size effect: exploring the effectiveness of pictorial and non-pictorial serving size recommendations. *Appetite* 2015;87:116-26.
- 16 Hollands GJ, Shemilt I, Marteau TM, et al. Altering micro-environments to change population health behaviour: towards an evidence base for choice architecture interventions. *BMC Public Health* 2013;13:1218.
- 17 Department for Environment Food and Rural Affairs. Food statistics pocketbook . 2014. Defra, 2014.
- 18 Surgeon General. The health consequences of smoking—50 years of progress. Atlanta, US Department of Health and Human Services, 2014.
- 19 World Health Organization. Evidence for the effectiveness and cost-effectiveness of interventions to reduce alcohol-related harm. WHO, 2009.
- 20 Knai C, Petticrew M, Durand MA, et al. 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* 2015;54:1-10.
- 21 Eight everyday products that are getting smaller: shrinking goods include Surf, Cif and Hovis bread. *Which ?* 2015 Mar. www.which.co.uk/news/2015/03/eight-everyday-products-that-are-getting-smaller-396942/.
- 22 Hawkes C, Smith TG, Jewell J, et al. Smart food policies for obesity prevention. *Lancet* 2015;385:2410-21.
- 23 Lewis HB, Ahern AL, Solis-Trapala I, et al. Effect of reducing portion size at a compulsory meal on later energy intake, gut hormones, and appetite in overweight adults. *Obesity* 2015;23:1362-70.
- 24 Sahud HB, Binns HJ, Meadow WL, et al. Marketing fast food: impact of fast food restaurants in children's hospitals. *Pediatrics* 2006;118:2290-7.
- 25 Bonfield P. A plan for public procurement: enabling a healthy future for our people, farmers and food producers. Department for Environment, Food, and Rural Affairs, 2014.
- 26 Pomeranz JL, Brownell KD. Can government regulate portion sizes? *N Engl J Med* 2014;371:1956-8.
- 27 Rutter H. The single most important intervention to tackle obesity. *Int J Public Health* 2012;57:657-8.
- 28 House of Lords Science and Technology Committee. Behaviour change: 2nd report of session 2010-12. 2011. www.publications.parliament.uk/pa/ld201012/ldselect/ldstech/179/179.pdf.

Key messages

People consistently consume more food or non-alcoholic drinks when offered larger sized portions or when they use larger tableware
 Actions in public and private sectors to reduce the size, availability, and appeal of larger portion sizes might help prevent obesity
 Some interventions will probably require regulation and legislation, facilitated by public demand for change
 Independent and rigorous evaluation is essential to ensure actions are effective

- 29 Bryden A, Petticrew M, Mays N, et al. Voluntary agreements between government and business—a scoping review of the literature with specific reference to the Public Health Responsibility Deal. *Health Policy* 2013;110:186-97.
- 30 Brown N. Revealed: 40% of young binge on crisps and 75% skip meals. *Grocer* 2015 Jan 30. www.thegrocer.co.uk/reports/digital-features/snack-report-2015/revealed-40-of-young-binge-on-crisps-and-75-skip-meals/512721.article.
- 31 Swinburn B, Kraak V, Rutter H, et al. Strengthening of accountability systems to create healthy food environments and reduce global obesity. *Lancet* 2015;385:2534-45.
- 32 Diepeveen S, Ling T, Suhrcke M, et al. Public acceptability of government intervention to change health-related behaviours: a systematic review and narrative synthesis. *BMC Public Health* 2013;13:756.
- 33 The New York Times's public opinion poll. *New York Times* 2012 Aug 21. www.nytimes.com/interactive/2012/08/22/nyregion/22nyc-poll.html?_r=0.
- 34 Schwartz J, Riis J, Elbel B, et al. Inviting consumers to downsize fast-food portions significantly reduces calorie consumption. *Health Aff (Millwood)* 2012;31:399-407.
- 35 Huang TT, Cawley JH, Ashe M, et al. Mobilisation of public support for policy actions to prevent obesity. *Lancet* 2015;385:2422-31.
- 36 Freudenberg N. *Lethal but legal: corporations, consumption, and protecting public health*. Oxford University Press, 2014.
- 37 Promberger M, Dolan P, Marteau TM. "Pay them if it works": discrete choice experiments on the acceptability of financial incentives to change health related behaviour. *Soc Sci Med* 2012;75:2509-14.
- 38 Pechey R, Burge P, Mentzakis E, et al. Public acceptability of population-level interventions to reduce alcohol consumption: a discrete choice experiment. *Soc Sci Med* 2014;113:104-9.

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Figures

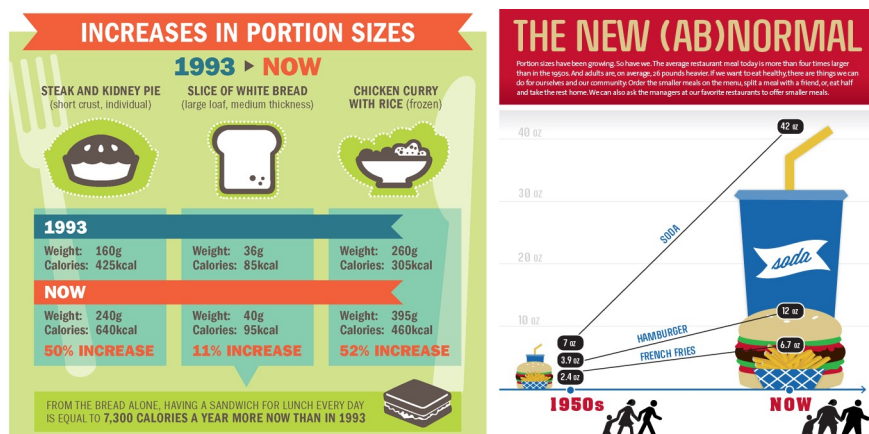


Fig 1 US and UK posters illustrating changes in portion, package, and tableware sizes since the 1950s. Reproduced with permission from Centers for Disease Prevention and Control and World Cancer Research Fund

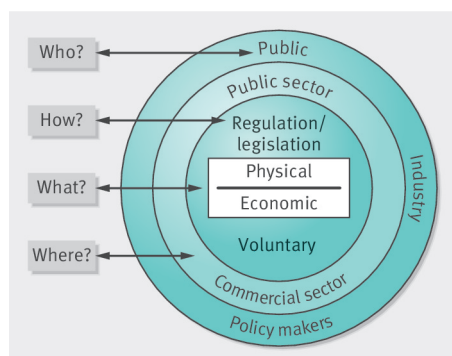


Fig 2 Environments in which changes are needed to reduce exposure to larger portion sizes, the means of achieving these changes, and the change enablers