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[Intervention Review]

Portion, package or tableware size for changing selection and consumption of food, alcohol and tobacco

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ABSTRACT

Background

Overeating and harmful alcohol and tobacco use have been linked to the aetiology of various non-communicable diseases, which are among the leading global causes of morbidity and premature mortality. As people are repeatedly exposed to varying sizes and shapes of food, alcohol and tobacco products in environments such as shops, restaurants, bars and homes, this has stimulated public health policy interest in product size and shape as potential targets for intervention.

Objectives

- 1) To assess the effects of interventions involving exposure to different sizes or sets of physical dimensions of a portion, package, individual unit or item of tableware on unregulated selection or consumption of food, alcohol or tobacco products in adults and children.
- 2) To assess the extent to which these effects may be modified by study, intervention and participant characteristics.

Search methods

We searched CENTRAL, MEDLINE, EMBASE, PsycINFO, eight other published or grey literature databases, trial registries and key websites up to November 2012, followed by citation searches and contacts with study authors. This original search identified eligible studies published up to July 2013, which are fully incorporated into the review. We conducted an updated search up to 30 January 2015 but further eligible studies are not yet fully incorporated due to their minimal potential to change the conclusions.

Selection criteria

Randomised controlled trials with between-subjects (parallel-group) or within-subjects (cross-over) designs, conducted in laboratory or field settings, in adults or children. Eligible studies compared at least two groups of participants, each exposed to a different size or shape

of a portion of a food (including non-alcoholic beverages), alcohol or tobacco product, its package or individual unit size, or of an item of tableware used to consume it, and included a measure of unregulated selection or consumption of food, alcohol or tobacco.

Data collection and analysis

We applied standard Cochrane methods to select eligible studies for inclusion and to collect data and assess risk of bias. We calculated study-level effect sizes as standardised mean differences (SMDs) between comparison groups, measured as quantities selected or consumed. We combined these results using random-effects meta-analysis models to estimate summary effect sizes (SMDs with 95% confidence intervals (CIs)) for each outcome for size and shape comparisons. We rated the overall quality of evidence using the GRADE system. Finally, we used meta-regression analysis to investigate statistical associations between summary effect sizes and variant study, intervention or participant characteristics.

Main results

The current version of this review includes 72 studies, published between 1978 and July 2013, assessed as being at overall unclear or high risk of bias with respect to selection and consumption outcomes. Ninety-six per cent of included studies (69/72) manipulated food products and 4% (3/72) manipulated cigarettes. No included studies manipulated alcohol products. Forty-nine per cent (35/72) manipulated portion size, 14% (10/72) package size and 21% (15/72) tableware size or shape. More studies investigated effects among adults (76% (55/72)) than children and all studies were conducted in high-income countries - predominantly in the USA (81% (58/72)). Sources of funding were reported for the majority of studies, with no evidence of funding by agencies with possible commercial interests in their results.

A meta-analysis of 86 independent comparisons from 58 studies (6603 participants) found a small to moderate effect of portion, package, individual unit or tableware size on consumption of food (SMD 0.38, 95% CI 0.29 to 0.46), providing moderate quality evidence that exposure to larger sizes increased quantities of food consumed among children (SMD 0.21, 95% CI 0.10 to 0.31) and adults (SMD 0.46, 95% CI 0.40 to 0.52). The size of this effect suggests that, if sustained reductions in exposure to larger-sized food portions, packages and tableware could be achieved across the whole diet, this could reduce average daily energy consumed from food by between 144 and 228 kcal (8.5% to 13.5% from a baseline of 1689 kcal) among UK children and adults. A meta-analysis of six independent comparisons from three studies (108 participants) found low quality evidence for no difference in the effect of cigarette length on consumption (SMD 0.25, 95% CI -0.14 to 0.65).

One included study (50 participants) estimated a large effect on consumption of exposure to differently shaped tableware (SMD 1.17, 95% CI 0.57 to 1.78), rated as very low quality evidence that exposure to shorter, wider bottles (versus taller, narrower bottles) increased quantities of water consumed by young adult participants.

A meta-analysis of 13 independent comparisons from 10 studies (1164 participants) found a small to moderate effect of portion or tableware size on selection of food (SMD 0.42, 95% CI 0.24 to 0.59), rated as moderate quality evidence that exposure to larger sizes increased the quantities of food people selected for subsequent consumption. This effect was present among adults (SMD 0.55, 95% CI 0.35 to 0.75) but not children (SMD 0.14, 95% CI -0.06 to 0.34).

In addition, a meta-analysis of three independent comparisons from three studies (232 participants) found a very large effect of exposure to differently shaped tableware on selection of non-alcoholic beverages (SMD 1.47, 95% CI 0.52 to 2.43), rated as low quality evidence that exposure to shorter, wider (versus taller, narrower) glasses or bottles increased the quantities selected for subsequent consumption among adults (SMD 2.31, 95% CI 1.79 to 2.83) and children (SMD 1.03, 95% CI 0.41 to 1.65).

Authors' conclusions

This review found that people consistently consume more food and drink when offered larger-sized portions, packages or tableware than when offered smaller-sized versions. This suggests that policies and practices that successfully reduce the size, availability and appeal of larger-sized portions, packages, individual units and tableware can contribute to meaningful reductions in the quantities of food (including non-alcoholic beverages) people select and consume in the immediate and short term. However, it is uncertain whether reducing portions at the smaller end of the size range can be as effective in reducing food consumption as reductions at the larger end of the range. We are unable to highlight clear implications for tobacco or alcohol policy due to identified gaps in the current evidence base.

PLAIN LANGUAGE SUMMARY

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Review question

We reviewed the evidence to establish by how much the amounts of food, alcohol or tobacco adults and children select or consume change in response to being presented with larger or smaller-sized (or differently shaped) portions or packages of these products, or of items of tableware (such as plates or glasses) used to consume them.

Study characteristics

This review includes 72 randomised controlled trials (RCTs) published up to July 2013 that compared at least two groups of participants, each presented with a different size of a portion, package or item of tableware. Included studies measured the amounts of food, alcohol or

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tobacco selected and/or consumed by participants, typically over a period of one day or less. Almost all of the included studies investigated food, with only three tobacco studies and no alcohol studies found. Almost all assessed participants' responses to different sizes rather than different shapes. The average age of participants in the different studies ranged from three to 55 years, with more studies involving adults than children and most conducted in the USA. Sources of funding were reported for the majority of studies and there was no evidence of study funding by agencies with commercial interests in their results.

Key findings and quality of evidence

Effects of size on consumption: We found evidence that people consistently ate more food or drank more non-alcoholic drinks when offered larger-sized portions, packages or items of tableware than when offered smaller-sized versions. We estimate the size of this effect to be small to moderate among both children and adults. If an effect of this size were sustained across the whole diet it would be equivalent to around a 12% to 16% change in average daily energy intake from food among UK adults. We rated the overall quality of the evidence for this effect as moderate, due to concern about study limitations arising from incomplete or unclear reporting of methods and procedures. From three tobacco studies, we found no effect of longer compared with shorter cigarettes on the amounts of tobacco consumed. We rated the overall quality of evidence for this effect as low due to concerns about study limitations and not having enough evidence.

Effects of shape on consumption: One study found that adults provided with shorter, wider bottles drank larger amounts of water from them, having already poured more, compared with those provided with taller, narrower bottles. However, we rated the quality of this evidence as very low, due to very serious concerns about study limitations and not having enough evidence (only one study with outcome data from 50 participants).

Effects of size on selection: We further found that adults, but not children, consistently chose (selected) more food (including non-alcoholic drinks) when offered larger-sized portions, packages or items of tableware than when offered smaller-sized versions. The estimated size of this effect was again small to moderate. We rated the overall quality of the evidence for this effect as moderate, due to concern about study limitations.

Effects of shape on selection: Evidence from three studies suggested that adults and children provided with shorter, wider bottles or glasses selected increased quantities of non-alcoholic beverages for subsequent consumption, compared with those provided with taller, narrower bottles or glasses. We rated the quality of this evidence as low, again due to concerns about study limitations and unexplained variation in effects between the three studies.

Conclusions

Overall, this review provides the most conclusive evidence to date that acting to reduce the size, availability and appeal of larger-sized portions, packages and tableware has potential to reduce the quantities of food that people select and consume by meaningful amounts. However, it is uncertain whether reducing portions at the smaller end of the size range can be as effective in reducing food consumption as reductions at the larger end of the range. Our findings highlight the need for further research that aims to reduce uncertainties about these effects and address identified gaps in the evidence base, including not having enough evidence for longer-term effects and the absence of evidence about alcohol products.