

Blueprint for halving obesity: rapid review

Portion size reductions as an intervention for reducing obesity



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Summary table

Title	Portion, package or tableware size for changing selection and consumption of food, alcohol and tobacco
Author & year	Hollands et al. (2015)
Type of study	Cochrane Review
Outcome variable	Reduction in energy intake
Treatment	Exposure to smaller portion sizes in terms of package or tableware size, or shape of food product
Control	No exposure
Magnitude of effect (Adults)	247kcal
Magnitude of effect (Children)	95kcal

Rapid umbrella review

Background

Portion sizes of food products have progressively increased over time and these large portion sizes have been identified as a potential contributor to an increase in obesity and overweight prevalence. Reducing portion size or serving size of food products is one of the potential interventions that has been shown to be effective in reducing obesity. Reduced portion sizes in terms of a food product's shape, package or tableware size has been shown to effectively reduce the calorie intake of the individual in that ingestive event. If sustained across all meals, then this intervention can lead to the individual being in calorie deficit thereby leading to a reduction in weight of individuals.

Objective

To summarise the best available evidence on the impact of reduced portion size (in terms of quantity of food) on energy intake or body weight.

Methods

We aimed to identify reviews that included quantitative research synthesis (ie, meta-analysis) of the effectiveness of portion size reduction on outcomes relevant to calorie consumption, energy intake, weight loss or obesity. If more than one review was identified that answered our research question, we aimed to identify the review that is reflective of the best evidence, based on (a) year published and (b) quality of review (judged by JBI checklist).

Eligibility criteria

Types of review. To be eligible for inclusion, articles were required to use systematic review methodology (ie, use of systematic search and inclusion strategy to identify all available studies) with randomised control trials and include quantitative data synthesis (ie, meta-analysis) of multiple studies that examined the effect of portion

size reduction on outcomes relevant to calorie consumption, energy intake, weight loss or obesity.

If the search did not identify any studies where a meta-analysis had been conducted due to heterogeneity of outcomes of interest, we intended to include reviews with narrative syntheses. We did not set inclusion criteria on the number or type of databases searched.

We selected a single review that best represented our research question. If more than one review was identified, we assessed the quality and selected the one with the highest rating (taking into account year of publication).

Participants. To be eligible for inclusion, articles could examine the effect of portion size reductions on adults or children. We report the findings for children and adults in this report.

Intervention. Reviews were required to synthesise interventions that manipulated portion sizes in terms of package or tableware size, or shape of food product consumed by an individual and should have involved comparison of effects to exposure to at least two sets of physical dimensions of portions.

Comparator. The comparators were individuals who were exposed to a larger portion size of the food product.

Outcomes. To be eligible for inclusion, reviews needed to include either clinical (eg, weight, BMI, % fat change) or behavioural outcomes (including, but not limited to: eating behaviour, food diaries). Reviews that only included measures of intentions/plans for future behaviour were excluded due to evidence of the gap between intended and actual eating behaviour.

Information sources and article selection

The search strategy was designed to identify syntheses of research evidence such as systematic reviews between the year 2010 and the date of search. Initial keywords were identified via a scoping review of relevant papers and reports as well as via MEDLINE using the MeSH function. A search was performed in MEDLINE and the Cochrane Database of Systematic Reviews. We searched grey literature using

Google Scholar and Google to identify relevant reports. The search was run in January 2023.

Screening

Due to the rapid nature of the reviews, a single reviewer screened titles and abstracts and discussed any uncertainty with a second reviewer. For relevant titles/abstracts, the full text was retrieved for full text review. One reviewer reviewed the full texts and discussed uncertainties with a second reviewer.

Assessment of methodological quality

All relevant reviews were critically appraised by two reviewers individually using the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses. We selected the highest quality and up-to-date review for data extraction. Suitability to our research question was also taken into account when selecting the final review for extraction.

Data extraction

The JBI Data Extraction Form for Review for Systematic Reviews and Research Syntheses was used for data extraction for the final included review. Extracted characteristics included:

- Review characteristics: author/year, objectives, participants (characteristics, total number), setting/context, interventions of interest, date range of included studies, detailed description of the included studies (number/type/country of origin), appraisal instrument and rating, type of review/method of analyses and outcomes.
- Results: findings of the review and comments.

Results

[Hollands et al. \(2015\)](#) conducted a systematic review which aimed to determine the effect of exposure to smaller portion sizes on energy intake/calorie consumption in children and adults compared with intervention controls (ie, exposure to different portion sizes).

What studies did the review include?

The review included articles if they reported studies that:

- were randomised control trials with between-subjects (parallel group) or within-subjects (cross-over) designs, conducted in laboratory or field settings in adults or children
- compared the effects of exposure to at least two sizes or sets of visible physical dimensions (that is volume, shape, height, width or depth) of either a portion of the same food (including nonalcoholic beverages), its package or individual unit size, or an item of tableware used to consume it
- had a measure of unregulated selection or consumption of food.

We rated the review methods as having a low risk of bias.

What were the systematic review methods?

The review authors were comprehensive in their search for studies (for example, they searched Cochrane Central Register of Controlled Trials, MEDLINE, Embase, PsycINFO, Applied Social Sciences Index and Abstracts (ProQuest), Food Science and Technology Abstracts (Web of Science), Science Citation Index Expanded (Web of Science), Social Sciences Citation Index (Web of Science) and Trials Register of Promoting Health Interventions (EPPI-Centre) along with grey literature sources such as OpenGrey, and Conference Proceedings Citation Index – Social Science & Humanities). In addition, trial registers of WHO, ClinicalTrials.gov, and websites of key organisations like USA Centers for Disease Control and Prevention (CDC), EU Platform for Action on Diet, Physical Activity and Health (EU PADPAH), International Obesity Task Force and UK Department of Health were searched. The authors engaged in methods to minimise errors in the process of screening articles such as using EPPI Reviewer 4 systematic review software for inclusion and extracting data from included articles. For data extraction, an electronic data extraction form was developed based on the Cochrane Public Health Review Group's template. The assessment of risk of bias in the review was performed using the Cochrane Risk of Bias tool. The authors rated the review methods as low risk of bias (using the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses).

Statistical analysis: Statistical analysis of the results of included studies was done using a series of random-effects and fixed-effect models to estimate summary effect sizes as SMDs with 95% confidence intervals. The statistical analysis involved the following stages:

- Stage 1: A standard meta-analysis to estimate summary effect sizes for all eligible interventions versus all comparators, using metan ([Harris, 2008](#)).
- Stage 2: A meta-regression analysis with type of product (food) as a covariate.
- Stage 3: A meta-regression analysis with study characteristics as additional covariates.
- Stage 4: A meta-regression analysis with intervention characteristics as covariates.
- Stage 5: A meta-regression analysis with participant characteristics and 'Risk of bias' assessment as covariates.

What did the review find?

This is a non-exhaustive summary of the review findings. Please see the [original article](#) for more detail missing here. Sixty-nine studies were included in the review in this review covering portion size manipulations on food products.

A meta-analysis of 86 independent comparisons from 58 studies (6,603 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 228kcal (8.5% to 13.5% from a baseline of 1,689 kcal) among UK children and adults.

However, due to limitations in the scope, quality and quantity of relevant research, the evidence in this review neither convincingly supports, nor undermines, claims that making sizes smaller than have become typical or standard can be expected to have similarly meaningful impacts on food selection or consumption.

Table 1: Characteristics of Hollands et al. (2015) meta-analysis

Total number of studies	Total sample size	Country (number of studies)	Age range	Intervention and comparison	Magnitude of effect in SD (95% CI)	Magnitude of effect in terms of calorie intake	Quality of evidence (GRADE) ¹
58	6,603	High-income countries (lab and field settings); Most studies from USA	Adults (16+ yrs) and Children (3 yrs to 6 yrs)	Intervention: larger-sized portions, package, individual unit or item of tableware Comparison: smaller-sized portions, package, individual unit or item of tableware	Mean consumption in the intervention group was 0.38 standard deviations higher (0.29 higher to 0.46 higher)	Mean daily energy intake from food would be 189kcal (11.2%) higher with the intervention (144 to 228kcal higher) among UK children and adults	Moderate
16	1,421	High-income countries (lab and field)	Children (3 yrs to 6 yrs)	Intervention: larger-sized portions, package, individual	Mean consumption in the intervention	Mean daily energy intake from food would be 95kcal (5.7%)	Moderate

¹ GRADE = Grading of Recommendations, Assessment, Development and Evaluations

		settings); Most studies from USA		unit or item of tableware Comparison: smaller-sized portions, package, individual unit or item of tableware	group was 0.21 standard deviations higher (0.1 higher to 0.31 higher)	higher with the intervention (45 to 140kcal higher) among UK children	
42	5,182	High-income countries (lab and field settings); Most studies from USA	Adults (16+ yrs)	Intervention: larger-sized portions, package, individual unit or item of tableware Comparison: smaller-sized portions, package, individual unit or item of tableware	Mean consumption in the intervention group was 0.46 standard deviations higher (0.40 higher to 0.52 higher)	Mean daily energy intake from food would be 247kcal (14.3%) higher with the intervention (215 to 279kcal higher) among UK adults	Moderate