Rapid Evidence Review:
Implementation of Portion Size and Portion-Related Energy Reductions in Out of Home Settings

Date: June 2026

Authors: Ahlima Roumane[1], Benjamin JJ McCormick[1], Caroline Robertson[2] and David McBey[1]

1 The Rowett Institute, University of Aberdeen
2 Food Standards Scotland

1. Executive Summary

This rapid scoping review summarises recent evidence on portion-related interventions in out of home (OOH) settings that aim to reduce the energy selected, purchased or consumed from meals, snacks or drinks. The review includes evidence published from 2016 onwards and considers intervention type, study setting, outcomes measured, and implications for policy and implementation in Scotland.

The evidence suggests that portion-related interventions can reduce energy purchased or consumed in OOH settings, particularly when they change the default offer, standardise smaller portions, or redesign meals so that lower-energy choices are easy and acceptable. Direct physical portion reduction and portion standardisation were the most commonly identified intervention components. Smaller portions were generally more acceptable when they were clearly offered, framed as a normal option, and accompanied by proportionate price reductions.

Portion composition and meal redesign may also reduce energy while preserving perceived meal size or value. These approaches include reducing higher-energy meal components, increasing lower-energy components, or combining modest portion reductions with changes to meal composition. Such approaches may be especially relevant where visible portion reduction could affect perceived value for money or customer acceptability.

Evidence for information and labelling approaches was more mixed. Information alone had limited and context-dependent effects but appeared more useful when paired with changes to the ordering environment, pricing, defaults or menu architecture. Across studies, portion choice was shaped not only by preference, but also by cues about value, normality, availability and convenience.

The evidence base has important limitations. Studies varied in setting, intervention type, outcome measure and follow-up duration. Many were laboratory or simulated ordering studies, while fewer assessed longer-term implementation in real-world OOH businesses. Few studies measured compensatory behaviour, such as additional side orders, later intake, or snacking after a reduced portion. Evidence on business outcomes, including sales, customer satisfaction, operational burden and commercial feasibility, remains limited.

For Scotland, the current evidence is most immediately useful for guidance, piloting and voluntary implementation rather than immediate mandatory policy. Promising approaches include making smaller portions more visible, using smaller portions as defaults, aligning prices with portion size, and redesigning meals to reduce energy while maintaining perceived value. Future Scottish evaluations should measure total energy purchased per transaction, compensation, customer acceptability, food waste, sales patterns and business implementation costs.

2. Background

Foods consumed out of home (OOH) include sit-down meals purchased from restaurants, pubs and bars, café and coffee shops, workplaces, takeaways, and food purchased for immediate consumption on the go such as sandwiches or baked goods from convenience stores, bakeries and sandwich shops, vending machines and more. OOH foods and drinks can contribute meaningfully to daily energy intake and are often high in nutrients of public health concern, including saturated fat, free sugars and sodium.

OOH foods also come in a wide range of portion sizes. A central rationale for reducing portion sizes is the "portion size effect": people tend to consume more when offered larger portions, package sizes, or tableware, even without reporting greater hunger. Reducing how much is offered, for example through smaller portion sizes, smaller default sizes, or smaller individual unit sizes or packages, can reduce the risk of overconsumption of energy and therefore contribute to reducing the risk of weight gain in OOH settings.

Reducing portion sizes could also have implications for businesses. In principle, smaller portions can reduce ingredient costs and, in some contexts, food waste, although impacts on revenue and acceptability depend on pricing, promotions, and how changes are implemented. In addition to directly reducing the standard portion sizes, reduction in energy can be achieved using several methods, including reducing the availability of large portions, increasing availability of smaller portions, advertising smaller portions, restricting promotions of large portion sizes and using smaller table- or serve-ware.

This rapid scoping review summarises recent evidence on portion-related interventions in OOH settings that aim to reduce the energy selected, purchased or consumed from meals, snacks or drinks. These interventions include direct reductions in physical portion size, standardisation of portion sizes, redesign of meal components to lower the energy content of the portion offered, and behavioural or informational approaches intended to support selection of smaller portions. Only evidence after 2016 was included because earlier evidence was included in a review of consumer-side portion size interventions. A rapid review method is used, consistent with prior FSS rapid reviews.

3. Aim

To summarise recent evidence on portion-related interventions in OOH contexts that aim to reduce the energy selected, purchased or consumed, with emphasis on intervention type, study setting, outcomes, and implications for policy and implementation in Scotland.

3.1 Research questions

1. What portion-related approaches to reducing the energy selected, purchased or consumed in OOH settings have been evaluated since 2016, including direct physical portion reduction, portion standardisation, meal-component redesign, and interventions that support selection of smaller portions?
2. What outcomes have been measured (for example, energy purchased, energy consumed, compensatory intake, food waste), and what direction of effects is observed?
3. What do we know about feasibility and implementation considerations relevant to the Scottish OOH context?

4. Methods

A rapid review of the published literature was undertaken to identify studies that explored portion-related interventions intended to reduce the energy selected, purchased or consumed in out-of-home settings.

Rapid reviews are based on explicit and systematic methods that can identify and extract data but have restricted scope and time frames compared to systematic reviews. The aim is to synthesise evidence quickly and provide qualitative and limited interpretation of data, in this case to inform best practice for future interventions, campaigns and frameworks, for example The Eating out Eating well framework currently being developed by Public Health Scotland and Food Standards Scotland. Whilst a rapid review will be less comprehensive, it is also more timely.

This review was conducted in accordance with the guidance developed by the Cochrane Rapid Reviews Methods Group and follows the principles for reporting reviews.

4.1 Search strategy

Following a published review of portion size interventions in 2015, this search was limited to papers published between 2016 and 2025 (inclusive) and was intended to identify recent empirical intervention studies. To retrieve relevant literature, the Web of Science and PubMed databases were searched using the following terms: 'out of home' OR restaurant OR takeaway OR 'din* out' OR 'eat* out' AND 'portion size'. There were no restrictions on study outcomes and study population characteristics, so these were not included in the search terms. In addition, a Google search was performed to identify grey literature from relevant bodies reporting on food portion size reduction approaches. The literature search was completed in December 2025. Searches were designed to capture relevant empirical intervention studies, but review articles and other non-empirical publications identified through the search were excluded during screening.

Studies were included if they:

1. evaluated an intervention intended to reduce the energy selected, purchased or consumed from OOH foods through portion-related mechanisms, including direct physical portion reduction, standardisation of portion sizes, redesign of meal composition, or interventions intended to increase selection of smaller portions;
2. were conducted in an OOH food environment (for example restaurants, cafés, takeaways, cafeterias/canteens) or in an experimental setting designed to reproduce an OOH portion selection or consumption context;
3. reported sufficient methodological information to interpret the study design and intervention; and
4. reported at least one relevant outcome (for example portion size selected/ordered, energy purchased/ordered, energy consumed, plate waste/leftovers, compensatory intake, acceptability or satisfaction).

Studies were excluded if they were out of scope for the review question (for example not focused on portion-size interventions), were not an empirical intervention evaluation (for example protocols, commentaries, reviews), or did not report relevant outcomes. Delphi studies and focus group-only studies were excluded because they do not provide quantitative evidence on intervention effects. Searches were limited to English-language studies published from 2016 onwards. If there was uncertainty at the stage of reviewing title and abstracts, records were retained for full-text assessment.

4.2 Data extraction from the literature and reports

For each study included, the following data were extracted:

- The study objective stated by the authors;
- The study type;
- The study design;
- An overview of the portion-related intervention approach or approaches evaluated;
- A summary of outcomes, for example, in terms of reducing calories or food waste;
- The settings in which data were collected;
- The duration of the study;
- The sample size;
- Stated limitations of the study.

Full details of the extracted data can be found in Supplementary data.

5. Results

Database searching identified 211 records (Web of Science n = 147; PubMed n = 64). After deduplication and removal of non-English records, 162 records were screened at title/abstract and 34 full-text reports were retrieved and assessed for eligibility; 8 were excluded (7 reviews and 1 outside the 2016 onwards date range). One additional grey literature report was identified via Google searching and included (Table 1), giving 27 included records in total (26 peer-reviewed and 1 grey). The evidence base was concentrated in the United States (9/27, 33%) and the United Kingdom (9/27, 33%), with additional studies from the Netherlands (3/27, 11%) and other countries (6/27, 22%). Across the peer-reviewed studies, publication years ranged from 2016 to 2024, with most studies published between 2018 and 2023.

In terms of setting, 13 of the 26 peer-reviewed studies were conducted in real-world settings, such as restaurants, cafés, cafeterias/canteens, or takeaways. Eight studies were conducted in laboratory settings and five in online or simulated environments. This mix is useful for understanding mechanisms and feasibility, but it also means that effects observed in laboratory or hypothetical ordering studies may not translate directly to fast-paced OOH purchasing contexts.

Table 1: Number of articles identified, screened and analysed

Stage	Description
Identification	Web of Science records identified: 147 PubMed records identified: 64 Total records identified: 211 Grey literature identified (Google): 1
Screening	Duplicates removed: 47 Non-English records removed: 2 Records screened (title/abstract): 162 Records excluded (title/abstract): 127
Eligibility	Full-text reports sought: 35 Full-text reports not retrieved: 1 Full-text reports assessed: 34 Full-text reports excluded: 8 Reviews: 7 Outside date range (2015): 1
Analysis	Included peer-reviewed studies: 26 Included grey literature reports: 1
Studies included	Total included records: 27

Studies clustered around four broad and sometimes overlapping intervention types: (1) direct physical portion reduction and portion standardisation, where the amount served or sold was reduced or standardised; (2) portion composition or meal redesign, where the energy content of the portion offered was reduced by changing component balance or replacing higher-energy elements; (3) behavioural nudges, portion norms and menu architecture, where interventions aimed to shift what feels normal or encourage selection of smaller portion options; and (4) information and

labelling approaches, where calorie, portion or related messaging was used to support smaller choices. Because many studies combined more than one intervention element, some studies are discussed in more than one subsection where relevant to different mechanisms of action.

Using the study categorisation completed during extraction, direct physical portion reduction and portion standardisation were the most commonly identified intervention components (15/26 peer-reviewed articles). Information, labelling or communication features appeared in 8/26 studies. Format manipulation approaches (for example, plateware or packaging related) were present in 5/26 studies. Elements relating to social norms and pricing appeared in 4/26 studies each. Waste management features were present in 3/26 studies, and supply-chain level interventions were identified in 2/26 studies. Approaches were often combined rather than tested in isolation: 13 studies used a single main approach, 11 used two approaches, and 2 combined three approaches.

The included studies varied considerably in their policy relevance and evidential strength. Some were real-world evaluations conducted in restaurants, cafeterias or other OOH settings over multiple days or weeks and using purchasing or sales data, while others were short laboratory or simulated ordering studies designed to test specific mechanisms. This distinction is important when interpreting the findings: controlled studies are useful for understanding how portion-related interventions may work, but real-world studies are more informative for implementation, feasibility, and likely impact in OOH settings.

5.1 Direct physical portion reduction and portion standardisation

Direct physical portion reduction and portion standardisation were the most commonly identified intervention components in the included evidence. These interventions reduced the amount served or sold of a target item, introduced smaller portions as standard, or used operational changes such as standardised serving tools, containers or portion specifications to deliver smaller portions more consistently. A smaller subset of studies reduced the energy content of the portion offered through changes to meal composition or by combining replacement of higher-energy elements with modest portion reduction; these are considered separately below because they are not equivalent to reducing physical portion size alone.

In a natural field experiment conducted in a restaurant over nine days, Kee et al. (2022) examined the role of selecting a standard portion or a smaller (50% fewer calories) portion size across all menu items at lunchtime. The smaller portion was accompanied with a donation to a food charity and/or messaging about food waste. The donation increased selection of smaller portions by 22.2%, increasing to 23.6% when combined with the food waste messaging. The change in purchasing was more commonly seen in those living with overweight.

Reimann et al. (2017) examined a somewhat different context, testing children's meal choices in a school-based setting using food options sourced from McDonald's. In that study, a toy was paired with a smaller children's meal, reducing energy by

160 kcal, and children preferentially selected the smaller meal (43% chose a smaller meal when it was paired with a toy, versus 7% when a regular-sized meal was paired with a toy). This suggests smaller portions can be made more attractive in children's meal settings, although the relevance of this finding to adult OOH meal choices is limited.

In a stepped-wedge pilot trial in six worksite cafeterias, Hollands et al. (2018) reduced the portion sizes in cafeterias by 10% (by volume), but only for a subset of their products (up to half). With this more modest change, they did not find any significant change in the total number of calories sold each day. However, 44% of customers were in favour of the smaller meals, and this appeared to be linked to the accompanying reduction in price. This latter point was a noted concern from some of the nine businesses involved.

In a real-world intervention in a worksite cafeteria and a restaurant, Berkowitz et al. (2016) offered smaller versions of meals in both a worksite cafeteria (a half sandwich or small salad or soup) and a restaurant (smaller bar versions of full dishes). Both the original meals and reduced-size versions priced at about half the cost were available in both settings. Like Hollands et al. (2018), only a fraction of meals was altered and offered alongside the standard meals. In both settings, average calories consumed were reduced (11.7% and 43.5%, respectively) compared with periods when only the standard portion sizes were available. Reduced-size entrées accounted for 5.3% to 12.8% of selections in the worksite cafeteria and 18.8% to 31.3% in the restaurant setting, indicating that at least part of the reduction reflected uptake of the smaller meal option.

In an uncontrolled before-and-after study in fish and chip shops, Goffe et al. (2019) evaluated a multi-component intervention to promote smaller portions, including supplier-led engagement with shop owners and managers, provision of box packaging for smaller portions, promotional posters, and business incentives. Servings of chips decreased by 60 g for standard portions and 26 g for smaller portions, although fish size increased by 24 g for standard portions and 2 g for smaller portions. Sales of smaller portion sizes increased from 14% pre-intervention to 21% post-intervention.

In a mixed-methods field experiment across three restaurants running from autumn 2022 to spring 2023, Cohen et al. (2024) also investigated the acceptability of changing to smaller standardised meals. They developed new menus using language around "balanced portions" (lunches/dinners ≤ 700 kcal and breakfasts ≤ 500 kcal) using standardised portions (e.g., a ¾ cup for rice). Customer footfall increased with the new menus, and the study suggested that the portion-controlled balanced menus were acceptable to customers. There was also no evidence that customers consumed additional calories on subsequent days. However, of the three participating vendors, one struggled with adherence because of additional preparation time.

In a laboratory self-service study, Haynes et al. (2020) examined how smaller visually presented portions influenced self-service intake by changing bowl size. Portion sizes were determined by asking a separate set of participants to visually

compare images of meals that represented different fractions of the manufacturer-recommended serving size, ranging from 40% to 300%. Three sizes were selected for comparison: a 'normal large' portion (120% of the manufacturer-suggested serving size), a 'normal small' portion (90% of a serving), and a 'smaller than normal' portion (60% of a serving). Participants given the smaller bowl did tend to help themselves to some additional food beyond the initial serving, but typically still consumed fewer calories overall than those given the larger portions.

Over consecutive days, Raghoebar et al. (2019) found that being served a smaller portion (60% of the reference meal made to the manufacturer's recommended serving size) led to participants picking a smaller portion the subsequent day. They conclude that participants' perceived descriptive and injunctive social norms were changed. They noted that personal norms were not changed. By contrast Vermote et al. (2018) reduced the portion size of French fries by 20%, but the majority of people recognised the reduction (even over-estimating the size of the reduction). Despite this, they were still satisfied by the quantity provided.

Direct reduction approaches were evaluated in a mix of settings. In cafeteria and canteen contexts, studies reduced portions of main meals (e.g., lasagna or curry and rice), sandwiches, or snacks. Several studies used purchasing or transactional data and assessed impacts over multiple days or weeks, allowing estimation of changes in energy purchased and feasibility of implementation at scale. In restaurant settings, direct reductions were more commonly tested through field experiments or service-based trials. Laboratory studies in this category tended to focus on measured intake during a single eating occasion. Some studies were designed around a whole meal, others focused on individual food items (e.g., discretionary snacks). These studies help to clarify the likely direction of effect, but provide limited insight into longer-term consumer adaptation or compensatory eating behaviours. Serving sizes tended to either be reduced as a proportion of what was previously used (e.g., in a restaurant setting) or relative to retailer recommended serving sizes.

5.2 Portion composition and meal design

A smaller group of studies reduced the energy content of the portion offered without reducing the size of the meal, but by altering the proportion of meal components. This was done for example by reducing higher-energy components and increasing lower-energy components, or by combining the replacement of higher-energy items with modest reductions in portion size. These approaches are relevant to OOH practice because they may preserve perceived meal size or value, but they should be distinguished from direct physical portion reduction.

In a real-world stepped-wedge randomised trial across 19 worksite cafeterias conducted over 25 weeks, Reynolds et al. (2021) tested two ways of reducing calories purchased: replacing higher-energy foods with lower-energy versions and reducing portion size. They replaced 10% of high-energy foods with a lower-energy equivalent (by volume) and also reduced portion sizes (e.g., depending on the food, reducing the size of the serving-ware or reducing the count of meatballs served). Calories purchased reduced by 4% when the availability was changed, and 11%

when both availability and portion size were changed simultaneously. Crucially, foods that were not actively changed also showed a spill-over reduction of 10% calories purchased when the high-energy foods were not available. Hollands et al. (2019) took a different approach and kept the appearance of a standard meal by increasing the serving of vegetables (increasing the vegetable volume between 31 to 237% of their original quantity) while they simultaneously decreased the amount of meat in the meal (by between 12% and 34% of the original meat volume). Across four different settings, including restaurants and self-service buffets, customers ate more vegetables. Reinders et al. (2017) similarly found that replacing a fraction of the meat with more vegetables increased vegetable consumption. The important result was that people were satisfied with the reduced meat content, albeit less satisfied than during the control phase when meals were not reduced. This is relevant because it suggests that portion-related interventions can change not only the energy content of meals, but also the overall balance of meal components, for example by increasing vegetables while reducing meat.

5.3 Behavioural nudges, portion norms, and menu architecture

Rather than physically manipulating portions, several studies aimed to reduce energy ordered or consumed by changing behavioural cues and portion norms. These approaches included prompts and defaults, changes to naming and framing of portion options, social norm messaging, and “choice architecture” changes that make smaller portions more salient or easier to select. Within the extracted evidence, explicit social norm components were identified in 4 studies and format manipulation approaches in 5 studies, often alongside other intervention elements.

In a short experimental laboratory study with two sessions 24 hours apart, Robinson et al. (2019) tested whether participants could be trained to normalise smaller portions by showing participants pictures of smaller portion sizes. First, a study was carried out to identify how many biscuit-sticks were thought to be a portion size (from 2 to 24 were shown, while the manufacturer recommended portion was 11). Participants were then given either a small (6 biscuit sticks, (14g)) or large (16 biscuit sticks, (37g)) serving. Although only over a short 24-hour period, participants exposed to the new normative messaging on the first session tended to eat fewer biscuits on their second session than those originally exposed to the larger portion sizes and also estimated a ‘normal’ portion size as a smaller helping (8 biscuits).

Rather than show what a normal meal looked like, Kee et al. (2022) compared motivations around food choice, using two messages around health that might address personal reasons for food choice or a charitable donation that might impact others. The donation to a food charity was included in the price of a smaller meal (i.e., the portion was smaller, but the relative difference in price compared to a full meal was treated as a donation). The healthy message increased sales of small plates by 15.8% whereas the charitable messaging increased sales of the smaller plates by 22.2%. The two actions together increased sales of smaller portions by 23.6%. Participants living with overweight were more susceptible to all messaging and for this group, the combined messages were substantially more impactful than either alone. In a later study, Kee et al. (2023) used labelling to describe portions

either in neutral size terms or with anthropomorphic labels. In a natural experiment at a State Fair café, the “Regular/Plus Size” labelling increased selection of the smaller portion by 14.3 percentage points when objective portion size information was also provided. Among individuals living with overweight or obesity, participants were 23.4 percentage points more likely to choose the smaller portion under the “Regular/Plus Size” labelling than under the “Slim/Regular” labelling. However, prices and portion sizes were also changed at the same time, with the larger portion priced at double the smaller portion, so the effect of labelling alone cannot be isolated.

Werkman et al. (2022) examined the effects of unit size and serving size on snack intake, waste and satisfaction. In the first part of the study, portion size was manipulated by offering participants either: i) a small serving of small cookies (6 × 3.6 g), ii) a small serving of large cookies (2 × 11 g), iii) a large serving of small cookies (12 × 3.6 g), or iv) a large serving of large cookies (4 × 11 g). When participants were served smaller cookies (3.6 g), they consumed less than when they were served larger cookies (11 g), without reporting lower satisfaction. This was observed for both smaller and larger served portions. Participants also wasted more uneaten food when provided with a larger serving than when provided with a smaller serving. Similarly, in a second part of the study, where participants served themselves, they took less food when gingerbread was presented in smaller units (6.25 g) rather than larger units (25 g). Across the experimental designs, smaller unit sizes consistently reduced intake. Although this evidence was limited to the snack foods provided in the study, calorie intake was reduced by up to 50%. Participants who served themselves smaller units were no less satisfied with the amount eaten than those who had access to larger units. Smaller unit sizes also increased the time participants took to choose their food, suggesting that they considered their options more carefully.

This category includes interventions intended to shift what feels like an appropriate amount, for example by exposure to smaller served portions, redesigning menus so that smaller portions appear as the standard or as the most prominent option and prompts that reframe smaller portions as normal or desirable. Some studies also tested pricing signals as part of the nudge, for example altering relative value cues that can encourage upsizing, recognising that perceived value for money is a major driver of OOH portion choice.

Ayaz et al. (2016) found that changing the size of plates, but not the portion size, had no effect on total energy intake. The logic was that how food appears on a plate ought to change how the portion size is perceived. The difficulty is that people tended to eat what they have been provided, a result shown both by Zuraikat et al. (2018) and Reinders et al. (2017). In a crossover laboratory experiment conducted over four weekly meal sessions, Zuraikat et al. (2018) automatically gave a take-home container for any leftover food to test whether people might eat less there and then. They tested with larger (rather than smaller) portions and found that people ate substantially more with larger portion sizes. ‘Doggy bags’ did reduce how much extra people ate with the larger portions, but people still ate more the more they were provided.

In a series of controlled experimental studies, Schumacher et al. (2020) tested whether describing everyday snack products, such as chocolates and crisps, with a "surprise" label increased their appeal. The intervention was the label itself rather than an actual surprise item or reward. This labelling increased preference for larger snack portions, which the authors interpreted as reflecting positive anticipation.

Ge et al. (2018) asked how customers would respond to smaller portion sizes (up to 40% smaller). People were, on average, willing to pay a small premium for larger portions compared to smaller portions. Unlike Ayaz et al. (2016), this study found a negative relationship between how much of the plate was covered with food and the price premium (the emptier the plate, the lower the acceptable premium), but this relationship was dependent on people's prior beliefs and their intention to buy food (whatever the price).

Overall, norm and nudge approaches provide evidence that portion choice can be influenced without removing autonomy. However, much of this evidence comes from short-duration laboratory or simulated ordering studies, which limits certainty about whether effects would be maintained over time and generalisability to high-throughput takeaway or food-to-go contexts.

5.4 Information and labelling approaches

Information and labelling interventions aimed to support smaller portion choices through calorie information, portion descriptors, prompts, or messaging linked to over-ordering and waste. Within the peer-reviewed evidence base, information, labelling or communication elements were identified in 8 studies. The review also included one grey literature report from NESTA about UK online takeaway ordering, testing multiple interface and messaging interventions in a large, simulated ordering study.

Information approaches were commonly evaluated as menu-based interventions (including online menus), and outcomes were typically calories ordered or selected rather than objectively measured intake. These interventions were often framed as relatively low-burden to implement but also depend on consumers noticing and acting on information at the point of purchase.

Information alone had limited effect on portion size purchases. However, it was a low-effort addition to other interventions that increased effect on portion-size purchases, for example, Haws et al. (2016) and Kee et al. (2022). Similarly, Hua et al. (2023) found that using different language to describe portion sizes, changing standard sizes to "just right" and large to "hearty" didn't substantially matter on its own, but labelling smaller portions in general did increase their sale. However, like other studies, the prices were also decreased, and lower prices for the smaller dishes (either 50 or 70% the price of larger meals) promoted smaller meal choices.

In a simulated online ordering study, Finlay et al. (2023) used a virtual delivery app to look at both calorie labelling and price. Participants in the randomised control trial were able to order from a sandwich shop, coffee shop and a fast-food outlet using an app. The app presented paired combinations of no labelling or labelling the calories,

and standard pricing or pricing proportional to calories (between portion sizes). The calorie labelling didn't change the portion size selected but did reduce the total energy of foods selected. When prices were proportional to calories, fewer large options were selected for the virtual coffee shop, but in the fast-food venue, people compensated for smaller portions by buying more smaller side dishes. An increased spend in all three settings demonstrated that a substantial number of people were still buying the more expensive large options. In a large online randomised experiment involving more than 2,000 participants, Hua et al. (2023) also looked at the sale of smaller portion sizes and found that changing the type of label of the larger portions had no impact on the sale of smaller portions.

In a randomised online hypothetical ordering study, Haws et al. (2016) examined whether participants were willing to select smaller portions when price reductions were proportional. They compared two pricing strategies for calorie-controlled portions, either a proportional (linear) price change or a disproportional price change. Consumers were asked to pick items from an online menu of main dishes in full or half portion sizes. They selected lower calories when the pricing was proportional (halving the price with half-sized portions). The non-linear price reduction (25% lower price for 50% lower calories) led to no change in the calories of foods selected. However, the reduction in calories was not attributed to selecting smaller portions so much as healthier full-sized meals (based on calorie labelling).

A different way of informing consumers about the size of portions was used by Sharma et al. (2023). Here, augmented reality was used to visualise portion size. Compared to a printed picture, the augmented reality reduced over-ordering for home deliveries, but did not change order sizes in a restaurant setting. Lorenz-Walther et al. (2019) also focused on food waste as a motivator, but used posters to highlight the issue. In their study, reducing the portion size did reduce waste, but the posters had negligible effects. They found that customer behaviour split into either making a more conscious effort to clear their plate or ordered something different altogether.

Across studies, effects of information and labelling were variable and context dependent. Effects appeared more plausible when information was paired with changes to the ordering environment (for example prompts, defaults, or clearer value cues), rather than as a standalone strategy.

5.5 Outcomes used to assess impact

Across studies, outcomes were captured at different points in the purchasing and consumption pathway, which limited comparability and precluded meta-analysis. Many studies measured which portion option was selected (for example smaller vs larger, half vs full, or acceptance of default options), often using observed choice, ordering tasks, or transactional measures. Because studies differed in whether they measured selected portion size, calories ordered, calories purchased, immediate intake, or later compensation, effect sizes are not directly comparable across all studies.

A common outcome in field studies and online ordering experiments was calories ordered or purchased. This was frequently derived from menus or product information. In some cases it was taken from sales and transaction data and in one case it was summed for the outlet rather than the individual consumer. These outcomes are directly relevant to population exposure to energy from OOH foods, but they do not capture plate waste or later compensatory eating unless paired with additional measurement.

Laboratory, and some field studies, measured consumption during the eating occasion. These studies provide clearer evidence on intake compared to calories ordered/purchased but often occur under controlled conditions and may not reflect real-world OOH purchasing constraints and habits. They are also specific to the eating occasion rather than representative of a diet.

Very few studies assessed whether reduced portions were followed by increased intake, either at that moment (e.g., ordering additional dishes) or at subsequent eating occasions. When measured, follow-up was usually short and methods varied, limiting firm conclusions about longer-term compensation.

The focus of several studies was food waste rather than food intake. Food waste (food left on the plate) was estimated from the quantity left or, in one case, binned. Several studies examined food waste alongside intake, recognising that portion-related interventions may change plate waste as well as energy consumed. Definitions and measurement approaches varied, including objective plate waste measures and self-reported behaviours (for example intentions to take leftovers home, which would itself only reduce energy intake if the leftovers displaced other foods that might have been consumed).

A smaller subset of studies measured acceptability, satisfaction, perceived value for money, and operational feasibility. Very few studies reported business-relevant outcomes such as impacts on sales patterns or implementation rates, which is a key evidence gap for OOH policy translation. One study, which recruited businesses, discussed the operational challenges and adherence to the portion-size protocol.

6. Synthesis

Across intervention types, the evidence most strongly supports interventions that change what is offered by default and make smaller portions easy to choose. When presented, smaller portions tended to be popular, especially when proportionately cheaper. Interpretation is complicated by differences between studies of snacks, individual meal components and complete meals, and by variation in whether changes were measured in calories, volume, or both. The principal threats to effectiveness are promotions or other value-related messages that encourage upsizing, opportunities for compensation through add-on items, and limited measurement of longer-term outcomes and commercial feasibility. For Scottish implementation, the most informative future evaluations should measure total energy purchased per transaction, including side dishes and additional items, and assess whether any immediate reductions are offset by compensatory intake later in the day. They should also prioritise business-relevant outcomes, including sales patterns, operational burden, customer acceptability, food waste, and the feasibility of proportionate price reductions. The current evidence is more immediately informative for guidance, piloting, and voluntary implementation in OOH settings than for mandatory policy, because studies remain heterogeneous and relatively few assess longer-term business feasibility in real-world conditions.

Two evidence gaps stand out. First, future studies should measure compensatory responses more completely, including additional purchases at the same eating occasion, later intake, and plate waste. Second, more evidence is needed on business feasibility, including operational burden, impacts on sales and customer satisfaction, and whether proportionate price reductions are commercially sustainable.

6.1 Direct physical portion reduction and portion standardisation

Across the included OOH evidence base, direct physical portion reduction and portion standardisation most consistently led to lower energy selected, purchased and/or consumed in the immediate eating occasion. Evidence for this comes from a mix of real-world interventions in cafeterias, restaurants and takeaway settings, alongside shorter laboratory studies. The real-world studies are particularly informative for implementation and feasibility, while the laboratory studies are useful for understanding the likely direction of effect and the potential for compensation.

Evidence relevant to feasibility and commercial viability is limited. Few studies reported revenue impact, repeat purchasing, or customer satisfaction, and where acceptability or value-for-money was measured it often depended on whether price changed in line with portion size. Across studies, dissatisfaction risk appeared more likely where portion size was reduced without a price reduction, whereas smaller portions could be acceptable when framed as a standard option, when quality was perceived to have been maintained, or when portion reduction was accompanied by changes that preserved perceived value. Smaller portions did tend to be popular and even a reduction in the size of a subset of dishes had average benefits for energy intake.

Reductions tended to range from 10% to 40%, with most studies showing a more modest reduction of 10-20% based on volume reduction. Overall, the evidence is currently insufficient to specify an 'optimal' reduction level across OOH settings because few studies jointly measure energy purchased, compensation, acceptability, and business outcomes over longer follow-up.

Where compensation was assessed, it occurred through additional items chosen at the same occasion (for example, taking an additional portion, or adding sides, snacks, desserts). This means that evaluations focusing only on a single target item or range of items may overstate effects on reduced calorie intake relative to those measuring total energy purchased per transaction or the total intake over a day. For interpretation and policy relevance, the most informative outcomes are therefore total calories purchased per transaction and any evidence on later compensation, not only portion size of the target dish.

However, in the studies that monitored additional purchases or choices, the overall energy consumed during the immediate eating occasion was still, on average, lower when participants were given smaller portions of the targeted foods. This was the case even when additional side dishes or desserts were chosen.

Practical implementation examples reflected in this evidence include:

- Reducing default portion sizes. Reductions can be modest (e.g., 10-15% calories by volume)
- Reducing unit sizes and using smaller and standardised utensils and container sizes
- Revising how meal components are bundled in meal deals to reduce the overall size or energy content of the meal.
- Engaging outlet owners, managers, or staff in the rationale for portion changes and supporting implementation through standardised serving approaches and promotion of smaller options.

6.2 Portion composition and meal design

Studies of portion composition and meal design suggest that the energy content of OOH meals can also be reduced without simply shrinking the visible size of the portion. These interventions typically reduced higher-energy meal components, increased lower-energy components, or combined modest portion reduction with replacement of higher-energy items. This may be relevant where preserving perceived value, meal completeness, or customer acceptability is important. However, the evidence base for these approaches is smaller and more heterogeneous than for direct physical portion reduction, and includes a mixture of real-world and controlled studies, making it harder to draw firm conclusions about feasibility and effect size across OOH settings. These approaches should therefore be considered a distinct but relevant strand of evidence rather than as equivalent to direct physical portion reduction.

6.3 Portion norms, social norms, and format manipulation

This suite of interventions includes approaches that did not necessarily remove larger portions, but aimed to shift selection of foods by altering defaults, presentation, or perceived norms. Across the studies, this was a common strategy and often overlapped with direct physical portion reduction.

Evidence from the broader synthesis literature supports the proposition that changing portion norms and related choice architecture can change selection and intake, and that sustained, system-level changes to the "size, availability and appeal" of larger portions are likely to be required to produce meaningful population-level effects. Much of the evidence in this category comes from short-duration laboratory or simulated ordering studies. These studies are useful for showing that portion norms and menu architecture can influence choice, but they provide less certainty about whether effects would be maintained over time and about implementation in routine OOH practice.

The most policy-relevant insight from this evidence family is that portion selection is not purely preference-driven. It is shaped by cues that signal what is normal or good value. Where smaller portions are made prominent, framed as a standard choice, or presented as the default, selection can shift towards smaller options. However, the evidence base for pure "format-only" changes (for example plateware size alone) is less consistent and often based on short-term or controlled settings. This reduces confidence that format manipulation alone will deliver reliable effects in high-throughput OOH environments.

Practical implementation examples from norms and behavioural interventions include:

- Increasing the prominence of smaller portions
- Using a variety of language to promote smaller portions to appeal to different audiences
- Re-framing smaller portions as the norm using visual cues to set expectations.
- Pairing smaller portions with proportionately lower prices where appropriate, so that smaller options do not appear to offer worse value for money.

6.4 Information, labelling, and communication

Across the included evidence, information-only effects were variable and typically appeared more plausible when paired with changes to what is offered. Much of the evidence in this category comes from menu-based or simulated ordering studies. Evidence from rapid evidence synthesis in the OOH context suggests calorie labelling can reduce calories ordered or consumed at population level, but average effects are modest and heterogeneity is substantial. Where information is provided in isolation, it relies on consumers noticing, understanding, and acting on it in the moment, which may be less likely in routine and time-pressured OOH decisions. This limits confidence that information-only approaches will have consistent impact in real-world OOH environments without accompanying structural changes.

For Scotland, a key point is that information provision often takes place in OOH settings where "on the go" choices are common and are shaped by price, promotions, and time constraints. In these contexts, pairing information with structural changes is likely to be more effective than information alone. In practice, this could mean using information strategies to support and legitimise portion reductions, for example by reinforcing that a smaller portion is a normal standard option, while ensuring that pricing and menu architecture do not undermine the message.

Practical implementation examples reflected in this evidence include:

- Pairing information with direct interventions to enhance impact.

7. Conclusion

Overall, the evidence base suggests that portion-related interventions in OOH settings can reduce energy purchased or consumed, particularly when they change the default offer, standardise smaller portions, or redesign meals so that lower-energy options are easier to choose and acceptable to consumers. Effects are typically modest, vary by context, and can be undermined by value-for-money offers that encourage upsizing or by compensatory purchasing or consumption later.

For Scotland's OOH sector, the current evidence is likely to be most useful in informing guidance, piloting, and voluntary implementation rather than immediate mandatory policy, because relatively few studies assess longer-term feasibility, business impacts, and implementation under routine OOH conditions. Within that context, the most implementable intervention approaches are likely to be those that make smaller portions the default and align pricing and promotions so that smaller options retain perceived value for money.

Current evidence is insufficient to specify a single optimal level of portion reduction across OOH settings, because few studies jointly assess energy purchased, compensation, acceptability, and business outcomes over longer follow-up. Approaches to making smaller portions the default could include offering a parallel smaller option, such as a 40% smaller meal for a 40% lower price, and making modest reductions in calories by volume, for example by reducing energy-dense components while offsetting the reduction with other foods to preserve the visual size of the meal.

Pricing and promotional strategies are also likely to matter, for example ensuring that smaller portions are proportionately cheaper than standard serving sizes. Alongside implementation, Scottish evaluations should embed monitoring of energy purchases using sales data, such as total calories sold, together with customer acceptability and waste outcomes. Further Scottish evaluations in OOH settings, with longer-term follow-up, including days for individuals and weeks for businesses, and with business outcomes included, are needed to establish feasible reduction magnitudes and to minimise unintended consequences such as increased burden on vendors or increased calorie consumption through snacking.