

Does the impact of calorie (energy) labelling on food purchased in worksite cafeterias differ by food category? A mega-analysis of field trials

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ABSTRACT

Calorie labels may help limit energy intake as part of policy efforts to prevent obesity. However, evidence on their effectiveness is mixed. We hypothesised this variability may relate to differences in responsiveness to labelling by food category, e.g., main meals vs. discretionary items (e.g. snacks). Systematic searches identified randomised field studies of calorie labelling that reported energy purchased (kcal) from targeted food and drink categories (main meals, discretionary foods, soft drinks). A mega-analysis (pooling raw data from multiple studies) used generalised linear mixed models (GLMM) to analyse aggregate study data on total energy (kcal) purchased within each food category per week. Three studies provided data from 22 worksite cafeterias for the mega-analysis. When calorie labels were present (versus absent) energy purchased per transaction for main meals increased (18kcal/transaction; 95%CI: 4,31). There was no evidence of differences in energy purchased per transaction from discretionary foods (−10 kcal/transaction; 95%CI: −24,3), or drinks (−2kcal/transaction; 95%CI: −15,12). Previous studies have reported no or small effects from calorie labels. The findings of this study suggest the impact of calorie labels in worksite cafeterias differs by food category, but there was no clear evidence that labels reduced energy purchased in any of the categories.

1. Introduction

Calorie labelling has been proposed to help reduce energy consumption and obesity and improve population health outcomes through enhanced information provision (UK Department of Health and Social Care, 2020). A Cochrane review suggests with high certainty that calorie labelling (i.e. labels showing the number of calorie contained within a meal or product – as opposed to labels warning of excess energy content) leads to small reductions in food selection and purchasing (Clarke et al., 2025). Online and controlled studies in research settings have shown PACE (physical activity calorie equivalent) and calorie labelling (Daley et al., 2020; Dowray et al., 2013; Masic et al., 2017) to be effective in reducing selection and/or consumption of energy, but studies in real-world settings have often shown no effect (Dumanovsky et al., 2011; Elbel et al., 2013; Reynolds et al., 2022; Vadiveloo et al., 2011; Vasiljevic et al., 2018, 2019), perhaps as a result of smaller

sample sizes making it harder to detect small effects. In addition, these effects may also have important moderators, with sub-group analyses observing different effects by population characteristics or across sites where labels have been introduced (Dumanovsky et al., 2011; Elbel et al., 2013; Reynolds et al., 2022; Vasiljevic et al., 2018, 2019).

One potential moderator is the type of food targeted – in particular, core meals/foods vs. discretionary items (i.e. items are “typically high in fat, sugar or salt, and provide little or no nutritional benefit necessary for a healthy diet”, such as confectionery, sweet biscuits or crisps (FSS, 2018)). Online studies with simulated marketplaces and controlled survey designs have found that when more prominent calorie labelling (e.g. front-of-package labelling or PACE labelling) is included it may have a greater impact on consumption and purchasing for discretionary food or drink than core meals/foods (Acton et al., 2019; Bleich et al., 2012; Hartley et al., 2018). Possible explanations for an increased impact of labelling for discretionary items include these being

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less substantial than a meal (making the risk of a less enjoyable switch less consequential), or that labelling may lead to these items not being purchased by a subgroup of the population (resulting in greater reductions in energy purchased than small switches might achieve). Studies in real-world settings examining energy labelling have often involved restaurants or cafeterias (Clarke et al., 2025), where main courses may account for the majority of energy selected or consumed, thus potentially contributing to the null findings for these studies.

The current study aimed to reanalyse data from studies in real-world settings to ascertain whether there is a differential effect of energy labelling depending on the specific food categories that were labelled. In particular, whether the impact varies according to whether the food is classed as a 'discretionary' item or a main course – predicting that when calorie labels are added to discretionary food items, there would be a decrease in energy purchased, but that no evidence of a change would be observed for main courses.

2. Method

2.1. Data

This study (pre-registered with the Open Science Framework: <https://osf.io/n2rzq/>) identified previously collected data from labelling studies for a mega-analysis, which pools raw data across multiple studies (Eisenhauer, 2021).

Data from three studies were obtained (see Supplementary Materials for search strategy) and included in the mega-analysis (Reynolds et al., 2022; Vasiljevic et al., 2018, 2019). Details of the individual studies are shown in Supplementary Table 1.

All three studies were randomised controlled trials with a stepped wedge design. Two of these studies (Vasiljevic et al., 2018, 2019) applied numeric calorie labels that indicated the number of kcal in a product, and the other study applied PACE labels to food and drink items (alongside calorie labels) (Reynolds et al., 2022).

Foods were categorised as either: main courses (including sandwiches and hot meals), discretionary foods, soft drinks (e.g. diet or sugary sodas, juice, water), breakfast items, or sides (e.g. rice, chips, portions of vegetables). Following the Food Standards Scotland classification, discretionary foods comprised confectionery, sweet biscuits, crisps, savoury snacks, cakes, sweet pastries and puddings. Foods that were unclear in their description, did not fit into one of these categories (e.g. condiments) or were purchased as part of a buffet were excluded from analysis (4.7%; 200/4283).

2.2. Analysis

The primary outcome was energy purchased by food category, aggregated to a weekly level. For the mega-analysis, generalised linear mixed models (GLMM) were used to analyse the impact of calorie labels on total energy (kcal) purchased within each category per week, controlling for weekly transactions. To control for the number of transactions in a given week, the primary outcome measure used was total energy (kcal) purchased per transaction. Models also adjusted for time trends (due to staggered intervention implementation), and included random effects for worksite, nested within study groups. Time trends were adjusted by applying an intervention and week number variable (added as a factor variable) in the GLMM. Models looked at the interaction between calorie labelling and food type, varying the reference group in order to isolate the main effect of calorie labelling in each food category group.

R 4.1.3 was used for all analyses. See supplementary materials for further details on food categorisation and specific considerations for individual studies.

3. Results

3.1. Impact of calorie labels within each food category

For main courses, adding calorie labels increased energy purchased by 18kcal/transaction (95%CI: 4, 31). There was no clear evidence of changes in energy purchased following calorie labelling in any of the other food categories, or in a combined analysis across all categories (see Table 1, and Supplementary Tables 2–4 for all coefficients from models). The largest reduction was for discretionary items, with a (non-significant) 10 kcal (95%CI: –24, 3) reduction per transaction.

3.2. Differential impact of calorie labels by food type

Compared to the impact of calorie labels on main courses, there were significant interaction effects between food type and calorie labels, for breakfast foods (–20kcal/transaction; 95%CI: –36, –5), discretionary items (–28kcal/transaction; 95%CI: –43, –12), and drinks (–19kcal/transaction; 95%CI: –35, –4). Sides did not have a significant interaction effect (–15kcal/transaction; 95%CI: –31, 1) (see Supplementary Table 2 for all model coefficients). Fig. 1 shows the mean energy purchased in each food category before and after calorie labelling was implemented.

4. Discussion

The results provide some evidence that the effectiveness of menu calorie labelling on energy purchased in worksite cafeterias varies depending on which categories of food receive the labels, with significant differences found between main courses and other food categories (with the exception of sides). There was a significant increase in energy purchased in one category (main courses), with no significant differences seen in other categories.

Calorie labelling policies have already been implemented in several settings, including in Australia in 2012, the United States in 2018, and the UK in 2022 (Department of Health and Social Care, 2022; NSW Food Authority, 2013; Obesity Evidence Hub, 2021; Petimar et al., 2021). The Cochrane review on calorie labelling suggests a small effect (equating to an 11 kcal reduction for a 600 kcal meal (Clarke et al., 2025), which means that any individual studies are likely to be underpowered (Adams et al., 2026). While this analysis combined data across studies, the inconclusive decreases in the energy content of purchases found in most categories are consistent with the review's findings (with the reduction of 10 kcal in the discretionary category [albeit with wide confidence intervals] potentially reflecting a larger effect size, given the energy per transaction for discretionary items is likely lower than 600 kcal on average), and may still reflect underpowering. Moreover, the results here suggest that some of the heterogeneity in results from calorie labelling studies may be explained by differences in product portfolios.

The increase in energy purchased for main courses found here is, however, at odds with the overall effect found in the Cochrane review and other research that found that energy from main course items decreased with the addition of calorie labels (Cawley et al., 2020; Ellison et al., 2013; Van Epps et al., 2016). This requires further investigation, but could represent demographic differences, e.g. customers in the

Table 1
Main effects of calorie labels by food category.

	Impact of calorie labels (kcal/transaction)
Main courses	17.6 (95%CI: 4.0, 31.3)
Breakfast	–2.8 (95%CI: –16.8, 11.1)
Discretionary	–10.3 (95%CI: –24.0, 3.3)
Sides	2.8 (95%CI: –11.2, 16.9)
Drinks	–1.8 (95%CI: –15.4, 11.9)
All categories	2.5 (95% CI: –8.2, 13.2)

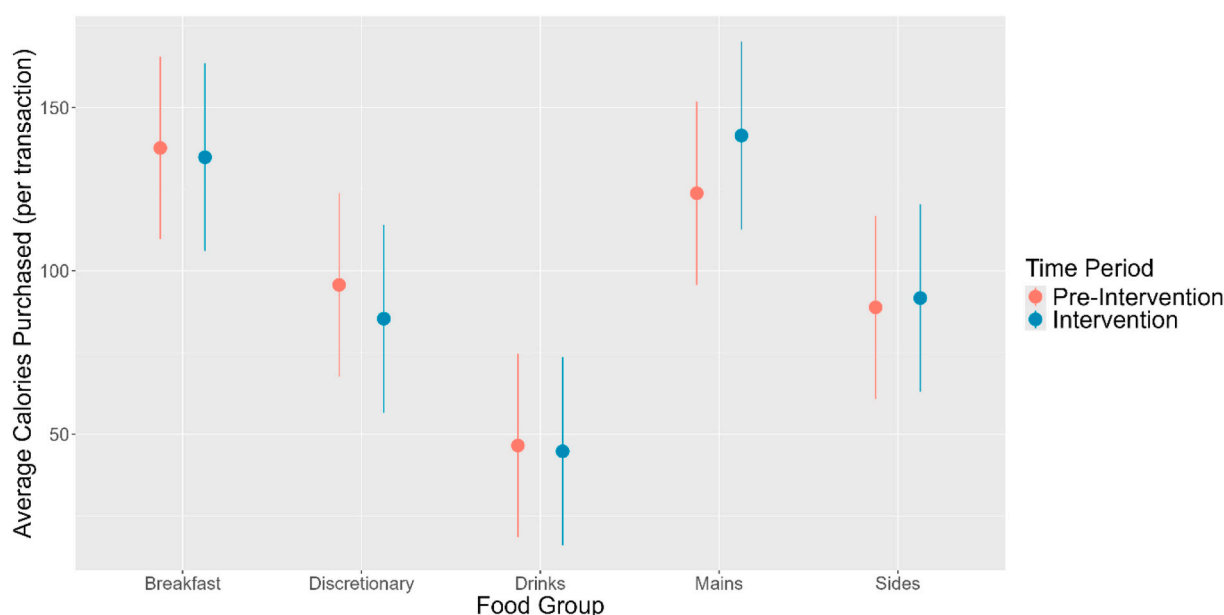


Fig. 1. Estimated marginal means plot of average calories purchased per transaction before and after calorie labels were implemented in worksite cafeterias.

worksite cafeteria settings responding to calorie labelling by seeking meals perceived to provide sufficient energy for their work requirements. Behaviours in worksite cafeterias may not be representative of how the population would respond to calorie labels in other settings, such as restaurants (Ellison et al., 2013). Van Epps et al. (2016) also took place in a worksite cafeteria, but looked at online ordering in advance via an app, so the relative salience of the labels vs. the dishes is likely to be substantially different, despite the similar settings. Further research should consider how these effects may vary in other settings to establish the generalisability of these findings.

This mega-analysis used data from three different studies that took place in worksite cafeterias in the UK, increasing both the number of sites and observations included. The consistency of the context is both a strength, in that it is able to clearly represent behaviour in this context; and a limitation in that the generalisability to other contexts is unclear. Most of these worksite cafeterias have a small number of meal options on a given day, which could lead to limited scope for customers to make a different choice. Worksite cafeterias may also reflect a habitual environment, often characterised by fast-paced purchasing due to short lunch breaks, with studies in this context reporting that customers were unlikely to notice even highly salient messaging (Çoker et al., 2025). These studies were all run by the same research group, and while researchers from other studies were contacted for their data, the data either were not available, there was no response, or the data did not comply with the criteria for inclusion in this study. Another challenge is the relatively short-term implementation period for calorie labels in the included studies, which allowed for an analysis of the immediate response to label introduction, but may not have been sufficient to observe if there were any time trends following the intervention, as has been observed elsewhere (Obesity Evidence Hub, 2021).

5. Conclusion

As a policy option, calorie labels – providing information to help inform and guide choice – are known to have a small impact on behaviour. Our results raise the possibility that labels may be differentially effective in reducing energy purchased and consumed by food category, with the potential to increase as well as decrease energy purchased from some food groups in particular settings. Further evidence generated in different contexts has the potential to optimise the behavioural impact of calorie-labelling on which its health benefits are predicated.

CRediT authorship contribution statement

Madison Luick: Writing – original draft, Formal analysis, Conceptualization. **Natasha Clarke:** Writing – review & editing, Investigation, Conceptualization. **Gareth J. Hollands:** Writing – review & editing, Investigation, Conceptualization. **Susan A. Jebb:** Writing – review & editing, Conceptualization. **Theresa M. Marteau:** Writing – review & editing, Conceptualization. **Emily Pechey:** Writing – review & editing, Investigation, Conceptualization. **James P. Reynolds:** Writing – review & editing, Conceptualization. **Rachel Pechey:** Writing – review & editing, Investigation, Conceptualization.

Ethics declaration

The authors have NOT obtained informed consent from participants or their legal representatives. Each cafeteria manager provided consent to participate on behalf of their site in the primary studies.

This study was performed in compliance with relevant laws, regulatory frameworks and guidelines where the research took place. Ethics committee approval was not required under relevant laws and institutional guidelines. This study only involves secondary data analyses, so ethical approval was not necessary. Each primary research study included had obtained ethics approval.

Ethics approval and consent to participate

This study only involves secondary data analyses, so ethical approval was not necessary.

Consent for publication

Not applicable.

Availability of data and materials

The data used in these analyses are commercially sensitive and not publicly available. The lead author has full access to the data.

Statement for studies with human participants

N/A (Secondary data analysis)

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Declaration of competing interests

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Rachel Pechey reports financial support was provided by National Institute for Health and Care Research (NIHR) Oxford Health Biomedical Research Centre. Susan Jebb reports financial support was provided by NIHR Oxford Biomedical Research Centre. Madison Luick and Susan Jebb reports financial support was provided by NIHR Applied Research Collaboration for Oxford and Thames Valley. Rachel Pechey reports financial support was provided by Wellcome Trust. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2026.108757>.

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