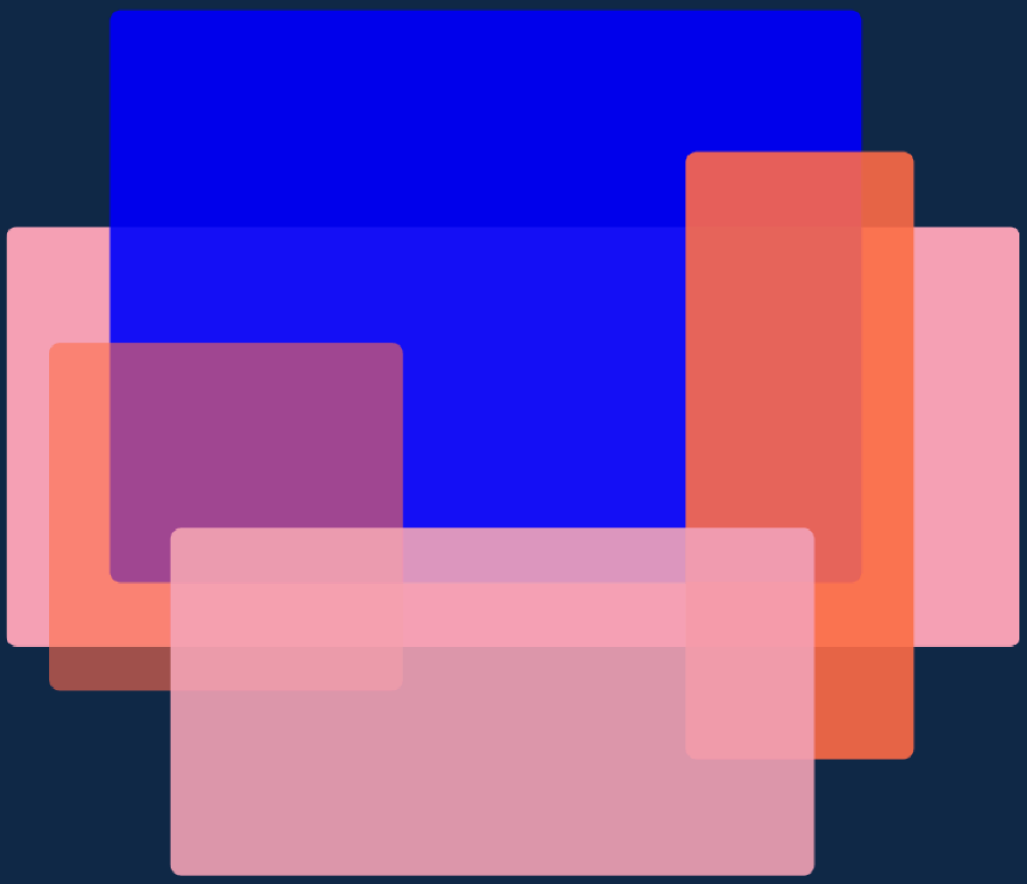
Blueprint
by nesta

Blueprint for halving obesity: rapid review

The effect on obesity-related outcomes of providing financial incentives to individuals to improve dietary behaviour



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Summary table

Title	Effectiveness of incentives for improving diabetes-related health indicators in chronic disease lifestyle modification programs: a systematic review and meta-analysis
Author and year	Hulbert et al. (2022)
Type of study	Systematic review and meta-analysis
Outcome variable	Bodyweight (kg) BMI kg/m2
Treatment	Financial incentive
Control	Treatment as usual
Magnitude of effect (Adults)	Compared to controls, the incentive group had significant reductions in weight (-1.85kg; 95% CI: -2.40 to -1.29) and BMI (-0.47kg/m2; 95% CI: -0.71 to -0.22) Publication bias was detected and effect size adjusted Adjusted estimate for weight loss = -1.20 (CI: -1.80, -0,06) Adjusted BMI effect = -0.34 kg/m2 (CI: -0.62, -0.06)
Magnitude of effect (Children)	n/a

Rapid umbrella review

Background

Obesity is a public health crisis and rates have nearly doubled in recent decades; it is estimated nearly 2 billion people are living with obesity worldwide. Excess weight is a significant risk factor for premature death from non-communicable diseases. Despite these figures, policies exist that could prevent a further rise in obesity prevalence.

Many behaviours that contribute to adverse health outcomes, such as smoking, excessive alcohol use, poor diet, and sedentary lifestyles, can be challenging to alter, even when individuals are aware of their risk factors and highly motivated to change. Evidence from psychology and behavioural economics indicates that alternative and healthier target behaviours can be motivated by incentives and rewards, financial and otherwise.

The objective of this review is to systematically search available evidence on the effectiveness of providing financial incentives to improve dietary intake and subsequent obesity-related outcomes. The decision to include financial incentives in the Blueprint is influenced by the commissioning of pilot studies to test the effectiveness of an intervention that rewards healthy behaviours through a novel app. Wolverhampton was chosen as the region to pilot the intervention, but if successful, it is a viable policy option to extend the scheme to a greater number of local authorities in order to reduce obesity prevalence. The evaluation of the pilot is being coordinated by the Office for Health Improvement and Disparities (OHID), in partnership with the Behavioural Insights Team (BIT). To our knowledge, the findings will be published after the planned publication date of the Blueprint tool. Subsequently, we cannot use these findings as direct evidence of effectiveness in the first iteration of Blueprint. In lieu of this data we will conduct a rapid review of the existing evidence for the effectiveness of financial incentive schemes on weight-related outcomes.

Methods

Eligibility criteria

Types of study. We regarded studies that compare behavioural economic incentive programmes on changes in obesity-related outcomes as eligible. Specifically, eligible studies included:

1. Systematic reviews of experimental or quasi-experimental studies.
2. Primary experimental or quasi-experimental studies.
3. Reports published by government and non-government organisations that evaluate the effect of financial incentives on obesity-related outcomes.

Intervention. We defined the intervention as the provision of an economic incentive to improve diet. These incentives could take various forms including standard monetary rewards, lottery-based incentives (where participants are entered into a lottery with the potential for monetary or equivalent rewards), price incentives, or regret lotteries (where participants face the potential for a monetary or equivalent loss). Eligible studies will measure obesity-related outcomes including clinical (eg, weight loss, BMI change) or behavioural (eg, dietary change, calories consumed, products purchased).

Comparator. The comparator was no intervention or minimal intervention (eg, active or passive control group).

Information sources and article selection

We applied search methods proposed in Godin et al., a peer reviewed publication that describes methods for conducting rigorous and systematic grey literature searches. We engaged in the following steps in the first instance: (1) grey literature database searches (2) Google and Google Scholar search, (3) targeted website search. Following screening and the identification of a single paper, (4) we consulted with members of the Expert Advisory Group (EAG) who have particular expertise in this area. We asked experts for their feedback on the article selection and requested that they suggest alternative articles if they believe there is higher quality evidence beyond the article selected. We discussed internally and externally

the suitability of the articles and made a selection based on (a) suitability to the research question and (b) support from the EAG.

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 full texts and discussed uncertainties with the Blueprint EAG.

Assessment of methodological quality

We do not expect that the search will result in multiple high quality studies that will require comparison. We will be led first by the suitability of the study to our research question. If there are multiple relevant studies/reviews identified, we will select the best available evidence according to our expert consultation with members of the advisory group.

Results

The most recent review and quantitative synthesis of the impact of financial incentives on behaviours and outcomes related to obesity is by Boonmanunt et al. (2023). This was a systematic review and network meta-analysis of published randomised control trials on financial incentive interventions. The authors were interested, not only in the general efficacy of financial incentives but in which types of incentivisation programmes would be most effective for changing diet, weight loss and physical activity. The pooled effect sizes produced in the Boonmanunt analysis however provide estimates of the probability of achieving a target weight loss goal only, and not the magnitude of how much weight loss was achieved.

To derive an effect size for the Blueprint model for the potential impact of financial incentives on population obesity, we selected a review and meta-analysis by Hulbert et al. (2022), which reported effect sizes for weight loss in kg and in BMI change.

Hulbert et al. (2022) aimed to assess whether the inclusion of incentives (financial and non financial) **enhances the effectiveness of lifestyle modification programmes** aimed at improving diabetes-related health indicators, such as weight loss and physical activity in at-risk individuals.

What studies did the review include?

Included studies:

- were randomised controlled trials (RCTs)
- provided incentives (cash or non-financial) to participants
- reported on diabetes-related health indicators (weight, BMI, blood pressure, HbA1C, cholesterol)
- included adults ≥18
- conducted in high-income countries
- lifestyle management programme incorporated at least two of the following components: nutrition, physical activity, and health education
- published in English peer-reviewed journals.

What were the systematic review methods?

This review and meta-analysis was conducted according to PRISMA Guidelines. A comprehensive search was conducted in Medline, Embase, PsychINFO and Cochrane databases for RCTs published between 2008 and 2020. Two reviewers assessed studies for inclusion and exclusion with any conflicts resolved through discussion amongst all authors. Data extraction software was used to extract data on study characteristics, population, incentive domains and diabetes health indicators (including body weight in kg, BI, blood pressure, cholesterol). They also extracted data on six domains for the incentive programme (whether it was financial or non-financial, monetary value, recipient, frequency of provision, how likely they were to receive it and the incentive payment schedule).

The main outcomes of interest were body weight, BMI, blood pressure, cholesterol and HbA1C. They also generated a standardised mean effect size to estimate an overall effect of the intervention.

They conducted a random effects meta-analysis to extract pre- and post-intervention effects for the outcome measures of interest – where the effect size was the mean difference between mean, pre- to post-changes between intervention and control groups. They also performed moderator analyses using fixed effects models to examine if effects on outcomes were moderated by the monetary value of the incentives, attainment certainty, the incentive type (cash or not) and

payment schedule. Categorical binary variables were used for the moderator analysis.

Bias assessment

The authors used The Guide to Community Preventive Services assessment tool to assess the quality of included studies – according to study description, sampling, measurement, analysis interpretation of results. All included studies were rated as FAIR.

The authors utilised suitable methods to assess heterogeneity and publication bias. According to an assessment using the JBI checklist this study could be rated as having a low risk of bias.

What did the review find?

This is a non-exhaustive summary of the review findings; please see the original article for more details.

The authors identified 19 RCTs that met their inclusion criteria. All the included studies measured body weight pre and post, and seven studies measured BMI. The majority of studies were conducted in the USA (n=14) and the remainder were in Australia (n=2), SIngapore, Scotland and South Korea. The total included participants in the meta-analysis was 5,291. Participants were all adults and the most frequent setting for delivery was through internet-based lifestyle modification programmes. The programme duration ranged from 12 weeks to 24 months. The reviewers reported variability in the quality of included studies. Most were rated as fair (13) and four were rated good, and two were reported to be of limited quality. In 14/19 studies intervention and control groups received the same lifestyle modification interventions, with the incentive being the only difference.

Incentive types:

Among the 19 RCTs, the most common incentive type was cash (n=15). The other studies provided gift cards or vouchers (n=3). Most studies reported a monetary value greater than or equal to the median of $270 (n=9). Moderator analyses were performed to explore effects for high (≥ $270) versus low reward (< $270). Most studies used a criteria-based guaranteed approach to attain the reward (n=15). Thirteen studies distributed the incentive to participants on a variable schedule.

Moderator analyses examined whether certainty of reward influenced effects. Incentives were usually distributed multiple times over the course of the included programmes (n=16). No information was provided on whether incentives were lottery or deposit as was done in Boonmanunt et al.

The meta-analysis found that there was a significant overall mean effect of financial incentives in lifestyle modification for body weight and BMI.

- **Weight**. The pooled mean difference for weight was -1.85kg (95% CI, -2.40 to -1.29; Z= -6.53, *p*< .001), indicating that the incentive group lost more weight (-1.85kg or 4.1lb) than the control group.
- **BMI**. The pooled mean difference for BMI was -0.47kg/m2 (95% CI, -0.71 to -0.22; Z = -3.76, *p*< .001), meaning the incentive group decreased their BMI by 0.47kg/m2 more than the control group.

Subgroup and moderator analyses

Value of incentive: The pooled effects for both high (mean diff -2.04kg) and low (-2.01kg) incentives were significant. Although the effect size was slightly larger in studies where the reward was at least $270, the difference between the two groups was non-significant (Q = 0.00, *p* = .95). The effects for BMI were also significant for both high (mean diff = -.65kg/m2) and low incentives (mean diff = -.50kg/m2) and the difference between them was not statistically significant.

Reward certainty: The certainty of getting a reward did make a difference. Both subgroups had a significant impact on weight loss, although the contrast between them was significant, suggesting that the subgroup employing a criteria-based guaranteed approach might yield a more substantial effect on weight loss (-2.20kg) compared to other attainment criteria (-1.15kg). However, although the effect of each group was significant for BMI, there was no significant difference between them.

Limitations

The funnel plots and Egger's test indicated there was a likelihood of publication bias. The authors adjustments using Trim and Fill indicated nine potential missing studies with the body weight outcome due to publication bias. An adjusted effect to account for this bias would reduce the estimate for weight to -1.20kg (CI: -1.80, -0,06). An estimated three studies were missing from the BMI estimate. When

adjusted, the effect size decreased to -0.34 kg/m2 (CI: -0.62, -0.06). Both remained significant.

Conclusions

The combined results of both these reviews indicate that financial incentives are an effective approach to increase the effectiveness of lifestyle modification programmes for weight loss and BMI reduction when compared to no incentives. The results also indicate that deposit based incentives, which capitalise on loss aversion biases in decision making, may be twice as effective than other incentives. There was insufficient evidence on the mechanism for weight loss in these studies. Only one study reported an outcome related to dietary modification. Finally, all included participants were selected because of risk markers for including BMI above cut offs for overweight and obesity (18/19 studies) so may not be fully representative of the population.