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Exploring the cost effectiveness of behavioural weight-management interventions based on the expected impact on mechanisms of action: A pre-trial health economic modelling study

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Abstract

Background When designing behavioural interventions, it is recommended that the content of the intervention and the mechanisms of action (MoA) targeted are clearly described. Pre-trial health economic modelling is conducted to establish the likelihood of cost-effectiveness on the basis of the expected intervention effect. We aimed to explore the practical feasibility of conducting pre-trial health economic modelling based on the content of the intervention and the expected effect on MoA.

Methods The School for Public Health Research (SPHR) microsimulation model was adapted to include three MoAs: dietary restraint, habit strength, and autonomous diet self-regulation. The SPHR model simulates individuals' metabolic trajectories, including body-mass index, and risk of health conditions including diabetes and cardiovascular disease. Lifetime costs and quality-adjusted life-years are calculated. In this study, treatment effect was based on demographic factors and change in the psychological MoAs. Pre-trial modelling was investigated by first exploring the feasibility of estimating intervention effect on a MoA on the basis of the behaviour change techniques used and, second, using hypothetical scenarios of small, medium, or large effect sizes on habit strength, dietary restraint, or autonomous self-regulation.

Findings Estimating change in a MoA on the basis of a behaviour change technique was restricted by the absence of quantitative evidence linking behaviour change techniques to MoA in the literature. Pre-trial modelling of 9 hypothetical interventions in which there were small, medium, and large effect size changes in of each of the MoA resulted in mean cost savings ranging from £425·89 (95% CI 98.34 - 892.01) for a small effect on autonomous motivation to £1700·27 (95% CI 879.67 - 2812.13) for a large effect on habit strength.

Interpretation Pre-trial modelling based on changes in habit strength, dietary restraint, and autonomous diet self-regulation can be useful and has the potential to inform the design of cost-effective interventions, including the behaviour change techniques included and factors that affect budgeting. One limitation of this study is the absence of data on the impact of interventions on MoAs. Hypothetical intervention effect sizes were used, which might not reflect achievable intervention scenarios and the effect of potential interventions on inequalities was not explored. More research on the relationships between behaviour change techniques, MoAs, and outcomes is needed to support pre-trial modelling.

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Contributors
SB conceptualised the study and drafted the abstract. PB developed the microsimulation model used in the study. SB adapted the model to include psychological variables. AB, PB, and PN supervised the project, which formed part of SB's PhD research.

Declaration of interests
We declare no competing interests.

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