RESEARCH
Review

A Systematic Review of Financial Incentives for Dietary Behavior Change

Jason Q. Purnell, PhD, MPH; Rebecca Gernes; Rick Stein, PhD; Margaret S. Sherraden, PhD; Amy Knoblock-Hahn, PhD, RD

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ABSTRACT

In light of the obesity epidemic, there is growing interest in the use of financial incentives for dietary behavior change. Previous reviews of the literature have focused on randomized controlled trials and found mixed results. The purpose of this systematic review is to update and expand on previous reviews by considering a broader range of study designs, including randomized controlled trials, quasi-experimental, observational, and simulation studies testing the use of financial incentives to change dietary behavior and to inform both dietetic practice and research. The review was guided by theoretical consideration of the type of incentive used based on the principles of operant conditioning. There was further examination of whether studies were carried out with an institutional focus. Studies published between 2006 and 2012 were selected for review, and data were extracted regarding study population, intervention design, outcome measures, study duration and follow-up, and key findings. Twelve studies meeting selection criteria were reviewed, with 11 finding a positive association between incentives and dietary behavior change in the short term. All studies pointed to more specific information on the type, timing, and magnitude of incentives needed to motivate individuals to change behavior, the types of incentives and disincentives most likely to affect the behavior of various socioeconomic groups, and promising approaches for potential policy and practice innovations. Limitations of the studies are noted, including the lack of theoretical guidance in the selection of incentive structures and the absence of basic experimental data. Future research should consider these factors, even as policy makers and practitioners continue to experiment with this potentially useful approach to addressing obesity.
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OBESITY IS A LEADING CAUSE OF MORBIDITY AND mortality in the United States, and its prevalence has increased in recent years.[1-4] In addition to diabetes,[5] it is associated with cardiovascular and cerebrovascular disease, hypertension, hyperlipidemia, sleep apnea, and certain cancers.[2,4] With current estimates standing at 35.7% of the adult population, the need for innovative interventions to address the obesity epidemic has never been greater. Researchers, practitioners, policy makers, and employers have increasingly considered financial incentives in order to influence weight loss and behaviors related to weight management as a potentially cost-effective means of treating or preventing obesity. Beyond weight management and obesity prevention, optimal dietary behavior is also concerned with the intake of healthful, nutritious foods like fresh fruits and vegetables and whole grains. This article is an updated review of studies using financial incentives to change a broad range of dietary behaviors that registered dietitian nutritionists (RDNs) address every day in their vital roles as health-promotion and disease-prevention specialists.

Previous reviews of the literature[6,7] on financial incentives for dietary behavior change have reported mixed results, finding incentives to be generally effective, but the effects are relatively short lived, with study participants typically returning to their baseline weight or behaviors when incentives are removed. Some have suggested that a financial motivation can actually undermine long-term weight maintenance.[8] Wall and colleagues[6] reviewed randomized controlled trials (RCTs) testing the effectiveness of monetary incentives for dietary behavior change. Of the four RCTs examined by Wall and colleagues, all showed a positive short-term effect for the incentive group on food purchases, consumption, and weight loss compared with controls. The types of incentive varied, including coupons for fruits and vegetables at farmers' markets, price reductions on low-fat snacks at vending machines, provision of free food, and direct cash payments.[9-13] Limitations of these studies included small sample sizes and limited follow-up. The studies that tested weight-loss interventions showed reversion to baseline weight and lack of effect after incentives were removed.[9-11] The small number of studies reviewed also made it impossible to answer questions about differential effects by socioeconomic status or racial/ethnic group and the optimal level of incentive needed for behavior change.[6]

Paul-Ebhohimhen and Avenell[7] conducted a systematic review with meta-analysis focused on financial incentives for

treatments of obesity and overweight only. Again, only RCTs were included in the review, with nine studies identified, seven of which were included in the meta-analysis. Incentives took the form of either direct payments or deposit contracts requiring that behavioral or weight-loss goals be met in order for participants to receive refunds on money committed for the purposes of the study. The meta-analysis showed no significant effect of incentives on weight-loss outcomes at 12 and 18 months and weight regain at 30 months, but did find modest trends in subanalyses for incentives: in amounts >1.2% of personal disposable income, for behavior change vs weight loss, for group-based performance vs individual performance, and delivered by nonpsychologists vs psychologists. As with the Wall and colleagues[6] review, data were insufficient to determine a differential impact of incentives for racial/ethnic minority or lower socioeconomic status populations. In contrast to Wall and colleagues,[6] the review by Paul-Ebhohimhen and Avenell[7] offers suggestions about the optimal magnitude of incentives. They suggested that discrete choice experiments were necessary to determine exactly what amount of monetary incentive would be sufficient to motivate study participants. Estimates from such experiments also could be included in cost-effectiveness analyses, which were missing from nearly all studies reviewed. Paul-Ebhohimhen and Avenell[7] also recommended that researchers in this area provide justification for their choice of incentive and that incentives be used as adjuvant to therapy rather than as a stand-in for therapeutic intervention.

Building on the critique of a lack of justification for the type of incentive used in these studies, a more recent review by Burns and colleagues[14] is explicitly theoretical in its orientation. The authors classified the 27 studies in their systematic review using a taxonomy informed by the principles of operant conditioning.[15] In general, the theory proposes that behaviors that elicit rewards are repeated (reinforcement), while behaviors that elicit punishments are not. Aspects of operant conditioning also are included in contemporary theories of behavior change concerned with reward, contingency management, and outcome expectations. Because most incentive schemes involve reinforcement, the authors focus on only this portion of the theory. Reinforcement can be classified as either positive (reward) or negative (removal of noxious stimuli). It can also vary by the schedule of reinforcement, which, in this context, generally includes either fixed-ratio (consequence after every nth behavior) or variable-ratio (unpredictable schedule of consequences that occur on average every nth time) schedules.[15] The authors also note that the short-lived effects in several of the studies previously reviewed could be explained theoretically by the concept of extinction,[15,16] or the cessation of behavior once reinforcement is removed.[14] They suggest that habituation, or a decrease in responsiveness to rewarding stimuli, is a potential mechanism by which extinction occurs in the context of obesity interventions.[14]

Their broader discussion of the role of motivation also highlighted the tension between extrinsic motivation (eg, external rewards like financial incentives) and intrinsic, autonomous motivation in line with the principles of self-determination theory.[17,18] Where self-determination theory suggests that human beings have fundamental needs for competence and autonomy, the authors suggest that monetary incentives could help to spur those who are not intrinsically motivated but could still benefit from dietary behavior change and weight-loss interventions. In other words, incentives can act as a catalyst for the initiation of behavior change that might then become more intrinsically motivating once individuals begin to engage in the behavior.

This review expands this list of considerations to include the institutional vs individual administration of incentives. Individuals interact with incentives put in place by institutions on a daily basis, and their ubiquity might mitigate the need for strong intrinsic motivation. For instance, the federal tax code has been used to incentivize everything from home purchases to energy-efficient appliances to retirement savings. Additional prominent institutions with which individuals come into regular contact include schools and employment settings. RDNs also recognize the importance of institutional contexts for shaping the dietary choices that individuals make. An incentive administered within the context of institutions can have additional motivational power because of the social norms attached to institutions, and this might further account for the relative success of group-based interventions noted in previous reviews of this area. To the extent that incentives can be "institutionalized," they can exploit social and psychological forces related to what researchers in behavioral economics call *default options*.[19] Individuals very often rely on the perceived expertise of the designers of choices and then have a strong tendency toward inertia once an option has been chosen. This places RDNs with responsibility for foodservice management and other institutionally based nutritional services in a unique position to shape the environments in which dietary choices are made, including administering incentives.

PURPOSE OF CURRENT REVIEW

As Wall and colleagues[6] and Paul-Ebhohimen and Avenell[7] note, randomized controlled studies of financial incentives and dietary behavior change in adults have been inconclusive, often with limited follow-up and only short-term effects. In addition, the use of incentives for dietary behavior change has been examined in fields other than health, and through means other than RCTs. The purpose of the current review is both to update and expand on previous reviews, including new developments in economics, policy, and study design for dietary behavior change. The objective is to provide updated information on RCT, observational, and simulation studies examining the use of financial incentives (eg, direct cash payment, taxes, subsidies, coupons) to influence dietary behavior and anthropometric outcomes among community-dwelling adults. Updated information on how incentives are being tested and their effect on dietary behavior will inform future interventions.

METHODS

This systematic review of published reports of RCTs and observational and simulation studies of financial incentives for dietary behavior change, including interventions for weight loss, was conducted based on established protocols for such reviews, particularly those established by Cochrane Reviews and the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement.[20,21]