



## Pilot survey of a novel incentive to promote healthy behavior among school children and their parents

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### ABSTRACT

Reversing the obesity epidemic has been a persistent global public health challenge, particularly among low socioeconomic status populations and racial/ethnic minorities. We developed a novel concept of community-based incentives to approach this problem in such communities. Applying this concept, we proposed a school intervention to promote obesity prevention in the U.S. We conducted a pilot survey to explore attitudes towards this future intervention. The survey was collected as a nonprobability sample ( $N = 137$  school-aged children (5–12 years)) in northern California in July 2013. We implemented multivariable logistic regression analyses where the dependent variable indicated the intention to participate in the future intervention. The covariates included the body mass index (BMI) based weight categories, demographics, and others. We found that the future intervention is expected to motivate generally-high-risk populations (such as children and parents who have never joined a past health-improvement program compared to those who have completed a past health-improvement program (the odds-ratio (OR) = 5.84,  $p < 0.05$ ) and children with an obese/overweight parent (OR = 2.72,  $p < 0.05$  compared to those without one)) to participate in future obesity-prevention activities. Our analyses also showed that some subgroups of high-risk populations, such as Hispanic children (OR = 0.27,  $p < 0.05$ ) and children eligible for a free or reduced price meal program (OR = 0.37,  $p < 0.06$ ), remain difficult to reach and need an intensive outreach activity for the future intervention. The survey indicated high interest in the future school intervention among high-risk parents who have never joined a past health-improvement program or are obese/overweight. These findings will help design and implement a future intervention.

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## 1. Introduction

### 1.1. Traditional financial incentive in obesity prevention

Obesity prevention has been a serious public health challenge in the past decades in both developing and developed countries (Ng et al., 2014). Although the increase in adult obesity in developed nations has slowed down since 2006, the obesity prevalence in the United States

(US) has been relatively higher than other developed nations (Ng et al., 2014). The obesity prevalence among adults is currently about 38% (Centers for Disease Control and Prevention (CDC), 2016; Committee on Accelerating Progress in Obesity Prevention, Food and Nutrition Board (FNB) & Institute of Medicine (IOM), 2012) and has increased from 5% to 18% among children in the past 30 years in the US (Centers for Disease Control and Prevention (CDC), 2016). These rates tend to be higher among ethnic minorities and low socioeconomic status (SES) populations (Committee on Accelerating Progress in Obesity Prevention, Food and Nutrition Board (FNB) & Institute of Medicine (IOM), 2012; Centers for Disease Control and Prevention (CDC), 2012; Centers for Disease Control and Prevention (CDC), 2015).

The obesity-related medical costs estimated to increase by \$48–66 billion per year in the US during 2010–2030 (Wang et al., 2011). Although childhood obesity alone accounts for \$14 billion in direct medical costs (Finkelstein et al., 2014), obese children are likely to become obese adults (Gordon-Larsen et al., 2004; Wang et al., 2008; Freedman et al., 2009; Freedman et al., 2005), significantly raising future obesity-related medical costs (Committee on Accelerating Progress in Obesity

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Prevention, Food and Nutrition Board (FNB) & Institute of Medicine (IOM), 2012; Ma & Frick, 2011). Obesity also imposes social costs through disability and lost productivity (Committee on Accelerating Progress in Obesity Prevention, Food and Nutrition Board (FNB) & Institute of Medicine (IOM), 2012; MacEwan et al., 2014).

Prior studies have evaluated various interventions to improve behaviors for obesity prevention such as school-based child obesity interventions (Wang et al., 2013; Waters et al., 2011; Oude Luttikhuis et al., 2009; Martin et al., 2014; Wyatt et al., 2013), family support (Epstein et al., 1990; Epstein et al., 1994; Kitzmann & Beech, 2006; Wrotniak et al., 2004; Drury et al., 2013; Epstein et al., 2014; Wilfley et al., 2007), peer support (McLean et al., 2003; Cohen et al., 1987; Jeffery et al., 1983; Osilla et al., 2012; Paul-Ebhohimhen & Avenell, 2009), competition/performance-based financial incentives (Martin et al., 2014; Wyatt et al., 2013; Drury et al., 2013; Jeffery et al., 1983; Volpp et al., 2008; Paul-Ebhohimhen & Avenell, 2008; You et al., 2012; Hersey et al., 2008; Hubbert et al., 2003; Sykes-Muskett et al., 2015; Mantzari et al., 2015; Purnell et al., 2014; Mayor, 2013; Mitchell et al., 2013; Burns et al., 2012; Kullgren et al., 2013; Crane et al., 2012; Finkelstein et al., 2013; Hunter et al., 2016; Ngo et al., 2014; Patel et al., 2016; Simpson et al., 2015; Finkelstein et al., 2016; Finkelstein et al., 2015; Hunter et al., 2015), donation to charity (Finkelstein et al., 2016; Finkelstein et al., 2015; Hunter et al., 2015), and a regulatory obesity policy in child care facilities (Wright et al., 2015). For instance, one study asked adults about their preferences for a hypothetical set of obesity prevention intervention incentives (You et al., 2012) which varied in the reward form, amount, and timing. For form and timing, consistent preferences were reported (Table 1). However, like other empirical studies, this study revealed the difficulty of interpreting preference for financial reward amount with a standard individual behavior theory in economics (You et al., 2012). The theory assumes that a higher financial incentive amount will proportionally increase respondents' intention to attend a behavioral change program, a perspective widely shared by other social science fields (Jeffery, 2012; Thorgeirsson & Kawachi, 2013; Bettinger, 2012). However, the mixed results of the literature in Table 1 indicate the need for a new theory explaining outwardly inconsistent behaviors.

To address this need, we developed a novel concept of a community-based incentive. This approach assumes that a proportion of people have a stronger incentive to maintain healthy behaviors when their efforts contribute to their own community rather than to individual-based rewards. This concept is expected to fill gaps in the knowledge on motivating individuals to change health behaviors and could be applicable to broad areas of behavior change outside of obesity prevention, like smoking cessation.

**Table 1**

Gaps in literature on the financial incentive effectiveness to motivate behavioral changes for obesity prevention (Martin et al., 2014; Wyatt et al., 2013; Drury et al., 2013; Jeffery et al., 1983; Volpp et al., 2008; Paul-Ebhohimhen & Avenell, 2008; You et al., 2012; Hersey et al., 2008; Hubbert et al., 2003; Sykes-Muskett et al., 2015; Mantzari et al., 2015; Purnell et al., 2014; Mayor, 2013; Mitchell et al., 2013; Burns et al., 2012; Kullgren et al., 2013; Crane et al., 2012; Finkelstein et al., 2013; Hunter et al., 2016; Ngo et al., 2014; Patel et al., 2016; Simpson et al., 2015; Finkelstein et al., 2016; Finkelstein et al., 2015; Hunter et al., 2015).

| Incentive features      | What was reported   | Gaps: What should be explored                   |
|-------------------------|---|---|
| Overall effectiveness   | Mixed: Some incentive is better than no incentive                               | Underlying motivation to respond to incentive   |
| Effectiveness magnitude | Mixed: Not proportional to incentive amount                                     | Optimal incentive amount to maximize motivation |
| Effectiveness period    | Mixed: at best, short-period (during a payment period only or less than 1 year) | How to maintain long-term motivation            |
| Reward form             | Cash or cash-equivalent (gift card) is preferred                                | Optimal incentive form                          |
| Reward timing           | "Pay at each weigh-in" is preferred to "Pay at the final weigh-in"              | Optimal timing                                  |

To test this concept's validity, we proposed a school intervention to offer educational classes encouraging healthy diet and physical activity among elementary school students and their parents in low SES areas in northern California. The intervention would create a "virtuous circle" between individual healthy behavior and community environments. Each time participating students and/or their parents achieve an intervention goal (like attending an educational class or achieving a 2% weight loss), they will donate a monetary gift from the intervention funds to their school. These gifts will further improve physical activity among students – leading to additional gifts for their school.

## 1.2. Concept of novel community-based incentive

### 1.2.1. How our incentive challenges the current paradigm on behavioral change

Obesity prevention through behavioral change is especially important in low-income populations due to their high obesity prevalence (Committee on Accelerating Progress in Obesity Prevention, Food and Nutrition Board (FNB) & Institute of Medicine (IOM), 2012) and limited access to clinical treatments, which are often expensive (Newacheck et al., 1996) and uncertain in effectiveness (Neovius & Narbro, 2008; Padwal et al., 2011; Picot et al., 2009). These individuals also tend to live in unfavorable community environments with limited access to healthy food and space for exercise (Committee on Accelerating Progress in Obesity Prevention, Food and Nutrition Board (FNB) & Institute of Medicine (IOM), 2012).

To overcome such adverse environments, our innovative incentive scheme enables community members to make financial contributions to their community by improving their health behaviors. Our incentive scheme uniquely assumes the behavior change motivation to be reinforced by a seemingly different motivation for community contribution (i.e., altruism) among low-income populations. This idea was derived from two empirical studies. One study, analyzing the US nationally-representative Consumer Expenditure Survey, indicates potentially stronger altruism within a low-income population, compared to a middle-income population and even a high-income population (James & Sharpe, 2007). Specifically, the lowest-level income (<\$10,000) households spent 4.8% of their household income on charity. Lower-level income (<\$30,000) households spent a 1.3–3.4 times higher percentage of their income on charity than middle-level income (\$30,000–\$100,000) households (Appendix Fig. 1, available only for peer-reviewers). This pattern is consistent for both religious and non-religious gifts.

The other study implies that altruism (contributing to a community) could be stronger than self-interest (individual reward) with robust empirical results (Gneezy & Rustichini, 2000). This research involved 180 students, doing volunteer work to collect donations, who were randomly assigned into three groups. The students in group (a) did not receive any payment. The students in group (b) were promised to be paid 1% of the total donation amount collected. The students in group (c) were promised to be paid 10% of the total amount collected. It was made clear that the payment was financed by a research team, not by the collected donations. Unexpectedly, the highest collected donation was achieved by group (a). The average amounts of donation collected by group (a) and group (c) were higher than group (b) by 60% and 40%, respectively.

These findings could help explain the mixed and seemingly paradoxical results reported in the literature. For instance, the outcome (participation in a weight reduction program) did not necessarily improve in proportion to the increased financial incentive amount (You et al., 2012; Mantzari et al., 2015). When focusing on only one aspect of the motivation mechanism (groups (b) and (c)), a larger financial incentive appears to lead to greater motivation to collect donations. The current research paradigm on behavior change (Table 1) tends to focus only on a comparison between groups (b) and (c) with individual reward, paying little attention to another important motivating factor,

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