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Effectiveness of Financial Incentives in a Worksite Diabetes Prevention Program

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Abstract

Purpose—To evaluate the effect of financial incentive in a diabetes prevention weight loss program at worksites.

Design—Group-level randomized intervention study.

Setting—Four long-term care facilities, randomly assigned to “incentive-IG” or “non incentive-NIG” groups.

Participants—Ninety-nine employees, all overweight or obese (BMI= mean 34.8±7.4 kg/m^2) and at risk for type 2 diabetes.

Intervention—A 16 week weight loss program (diabetes prevention program) with a 3 month follow up. IG could either choose a "standard incentive" to receive cash award when achieving the projected weight loss or to participate in a "standard plus deposit incentive" to get additional money matched with their deposit for projected weight loss. All of the participants received a one-hour consultation for a healthy weight loss at the beginning.

Measures—Weight-loss, diabetes risk score (DRS), and cardiovascular risk outcomes.

Analyses—Linear and logistic regressions for completed cases with adjustments for clustering effect at group level.

Results—IG lost on average more pounds (p=0.027), reduced BMI (p=0.04), and reduced in DRS (p=0.011) compared to NIG at week 16. At the 12-week follow-up period, those in IG plus deposit subgroup had twice the odds (OR=2.2, p=0.042) and those in the standard IG had three times the odds of achieving weight loss goals than NIG; those in the IG plus deposit group reduced DRS by 0.4 (p=0.045).

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CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

DISCLAIMER

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Conclusion—Monetary incentives appear to be effective in reducing weight and diabetes risk.

Keywords

Health promotion; obesity; health behavior; incentive; diabetes

INTRODUCTION

The total estimated cost attributed to diabetes in 2012 was $245 billion, including $176 billion for direct medical costs and loss of productivity [2]. Without prevention, the prevalence and $69 billion in cost of diabetes will continue to increase due to the large number of persons at high risk for developing type 2 diabetes [1, 3]. A number of large clinical trials have shown the effectiveness and cost-effectiveness of lifestyle changes (weight loss, improved diet, and increased physical activity) in preventing or delaying the onset of type 2 diabetes [4].

Employers often have strong incentives to implement wellness programs (lifestyle modifications for prevention of chronic diseases such as diabetes), because most employed individuals spend a significant amount of time at work on a regular basis. According to the 2008 National Worksite Health Promotion Survey, approximately 26% of worksites offered some type of workplace wellness program [5]. However, adherence to the programs offered by the worksite has been a major challenge, more specifically for the effectiveness of worksite weight-loss programs [6-8].

Many researchers have proposed using financial incentives to both increase program adherence and encourage weight loss. The rationale is that self-control problems might be a primary reason for people becoming overweight or obese. Financial incentives related to desire outcomes (for example, weight loss) could counteract some self-control problems [8, 9]. Empirical studies have shown that financial incentives are effective in weight-loss programs [8, 9]. However, many unanswered questions remain in this field. For example, answers to what are the best amounts for financial incentives, frequency of the incentives, and method of administration of the financial incentives (simple reward, self-imposed penalty such as depositing money beforehand for promising to achieve the health goal which would be forfeited if the person failed to meet the goal, or the combination of the two) are unclear. Most of the published studies we identified only used weight loss or body mass index (BMI) change as outcome measures, providing only limited information on the size of the risk reduction from weight loss on developing chronic diseases. In addition, only a few studies on the effectiveness of using financial incentives targeted lifestyle programs at worksites [10]. Effectiveness of financial incentives may vary between worksite weight-loss programs and in the community or trial setting, due to differences in financial status, time availability, culture among employees, and persons in the community or in the trials.

In 2010, an incentive program for diabetes prevention that focused on weight loss was implemented in four nursing home facilities, all belonging to a single corporation. The purpose of the program was to test:

1. The effectiveness of using financial incentives in a diabetes prevention program at the worksite
2. The effectiveness of different incentive structures (simple financial reward and self-imposed penalty) in the program
3. The effectiveness of reducing risks for developing diabetes and cardiovascular complications through an incentive-based diabetes prevention program.

In a previous study evaluating the overall cost-effectiveness of this program, we reported that the incentivized group lost more body weight than the group without the incentive [11]. However, in that study, we only compared the absolute weight loss of the whole incentivized group and the whole non-incentivized group at the end of the follow-up period. In the present study, we further analyzed the effectiveness of different structures of financial incentives, as well as a variety of additional outcome measures in addition to weight loss, such as the effect of the incentivized program on diabetes risk score and biological measures predicting cardiovascular risk.

METHODS

Design

This was a randomized trial at the group level. We randomly assigned two worksites to control group (not receiving incentive money for lossing weight) and two worksites to incentive group (receiving incentive money for losing weight). All of the worksites were long-term nursing home facilities with similar work characteristics (number of employees, types of job, and organizational structure), all belonging to a single corporation. The staffs at each nursing home were then recruited to participate in the weight loss program in either an “incentive” group (IG) (two worksites, 51 participants), or a “no incentive” group (NIG) (two worksites, 48 participants). Within the IG, participants could choose one of two options: a “standard incentive” (simple financial reward) or a “standard plus deposit incentive” (simple financial reward plus self-imposed penalty). (Hereafter, the groups that chose the simple financial reward and the simple financial reward plus self-imposed penalty will be referred to, respectively, as the “standard” and “standard plus deposit” subgroups.) The NIG population served as the comparison group. The program was discussed with each of the center administrators, all of whom supported the program intervention. Participants were recruited through workplace announcements, newsletters, posters, and flyers. The University Institutional Review Board approved the project.

Study Population

We recruited overweight and obese employees with a BMI of ≥25kg/m^2, who were also at high risk for type 2 diabetes (diabetes risk score [DRS] of ≥8). The DRS test was used to evaluate an individual's risk based on BMI, waist circumference, age, physical activity, healthy diet, high blood pressure, and high blood glucose; this test has been validated in many studies [12-15]. A score of ≥8 points indicated that an individual was at high risk for diabetes. Scores from this test were used both to screen persons at high risk for type 2 diabetes, and to measure diabetes risk status after the intervention and follow-up. To be eligible, participants had to meet the following criteria:

1) Be a full- or part-time employee

2) Be aged ≥18 years

3) Be overweight or obese, as defined by national guidelines (BMI ≥25kg/m^2) [16]

4) Have a diabetes risk score ≥8

5) Not meet any of the following exclusion criteria:

a) Being pregnant or lactating

b) Having sustained weight loss of ≥20 pounds within the preceding six months

c) Having already been diagnosed with diabetes

d) Being on weight-loss medication

e) Having had cancer requiring chemotherapy or radiation in the previous five years

f) Having or planning to have weight-loss surgery during the study period

g) Answering "yes" to physical activity readiness questionnaire which listed conditions that the respondent may not be ready to start to be more physically active than they were, and not providing a signed consent form from a primary care doctor indicating that the person's current health condition would permit them to participate in the program

All participants signed an informed consent form as well as a contract committing to the entire program before enrolling in the study.

Measurements

Waist and hip measurements were performed by trained health educators. The waist was measured below the lowest rib and above the navel, which was the smallest circumference of the waist. Health educators would identify by touch the location of the hip bone and measure below this region in the widest area of the hips. For reliability and precision, health educators took at least 2 measurements per participant. The waist-hip ratio (WHR) has been used as a measurement of obesity, which in turn is a possible indicator of other more serious health conditions. Waist hip ratios were identified by dividing the waist by the hip; a ratio of 0.8 or higher for women, and 1.0 or higher for men marks central adiposity.

Blood pressure was recorded for each survey and weighin, in which a health educator was trained to perform. Participants whose blood pressure was hypertensive (systolic blood pressure above 140 mmHg and diastolic above 90 mmHg) were asked to consult with a doctor before starting the program.

Intervention

This was a 16-week program with a follow-up at 12 weeks beyond the conclusion of the intervention (a total of 28 weeks). Before starting the program, all participants (in both the

IG and the NIG) received personalized weight-loss consultation based on their self-reported physical activity level and dietary preferences [17-21]. The purpose of each consultation was to encourage each participant to adopt the physical activity that they enjoyed the most, to identify a support system to help them reduce weight, and to address barriers to weight loss. Participants were encouraged to keep daily calorie-intake and physical activity records. During this initial consultation for each participant, weekly weight-loss goals were set. All of the participants were provided participants with information on healthy weight loss based on the *Small Steps, Big Rewards* program (available at http://ndep.nih.gov/partners-communityorganization/campaigns/SmallStepsBigRewards.aspx). Participants were encouraged to lose 1 or 1.5 pounds per week and members of both IG subgroups were informed that they would not be additionally compensated for the extra weight loss if they lost weight faster than the recommended rate.

All of the participants signed a contract committing to the entire project. The pre-intervention contract indicated weekly and total weight-loss goals, based on the person's baseline BMI. The goal for those participants with BMI ≥ 30kg/m^2 (hereafter referred to as "obese") was to lose 1.5 pounds per week; for those with BMI ≥25kg/m^2, but <30kg/m^2 (hereafter referred to as "overweight"), the goal was to lose 1.0 pound per week [22]. A participant who met the total weight-loss goal at the end of the 16-week intervention was encouraged to maintain that weight through the 12-week follow-up period. A participant who did not meet his or her total weight-loss goal at week 16 was encouraged to continue losing one pound to one and half pound per week (dependent on BMI) per week (a total of 12-18 pounds) through the 12-week follow-up period.

The contract for participants in the IG also specified the formula by which the monetary compensation from the investigators would be calculated and the timing of payment. Money was paid out only at the end of the program, to make the timing of the payment the same for all participants. Weight loss and credits earned were computed, using the incentive calculator, and then were recorded, first weekly and then every two weeks, for each participant to track his or her progress. In the standard option, participants were rewarded $10 per 1.0 pound of weight loss for those who were overweight, or $10 per 1.5 pounds for those who were obese, for a possible total of $160 during the 16-week program. However, to be eligible to receive any money, a participant had to lose ≥11 pounds, for those who were overweight, or ≥14 pounds, for those who were obese. Therefore, those meeting the minimum weight-loss criteria would receive at least $110. A participant not achieving his or her weight-loss goal by the end of the 16-week intervention was paid $100 if he or she lost an additional 12 pounds during the 12-week follow-up period. A participant who met his or her weight-loss goal at week 16 received an additional $100 for maintaining his or her target weight during the follow-up period. The maximum payment a participant in the standard subgroup could receive through week 28 was $260.

For the standard plus deposit incentive option, a participant could deposit anywhere from $1 to $5 per pound (for overweight persons) or per pound and half (for obese persons) of targeted weight loss. Investigators would match that deposit a dollar-for-dollar if the participant met his or her total weight-loss goal. Therefore, if a participant who was overweight deposited $5 per pound of targeted weight loss, that deposit would total $80 ($5

× 16 pounds); if this participant lost 16 pounds by the end of the intervention at week 16, he or she would receive the $160 standard incentive, plus the $80 originally deposited, matched dollar-for-dollar by the investigators. Thus, a participant could receive up to $320 ($160+ $80+$80). As with a person in the standard subgroup, if the participant in the standard plus deposit subgroup continued to lose one pound per week or maintained the target weight loss at the 12-week follow-up, he or she would receive an additional $100. So the maximum total monetary reward for a participant in the standard plus deposit subgroup would be $420—a net $340, if not including the participant's initial deposit. (Monetary rewards would be the same for an obese person, although the total weight-loss goal for the follow-up period would be 18 pounds). Participants who failed to reach their weight-loss goals did not have their initial deposits returned and received no matching amount from the investigators. This money was instead given to the worksite health promotion program. Table **1** depicts the protocol for incentive options.

Dependent Measures and Analyses

There were three outcomes used to measure the changes between the baseline and week 16, and between the baseline and week 28:

1. Weight-change outcomes, including absolute weight, proportion of participants achieving their weight-loss goal, and two measures used to indicate overweight and obesity: BMI and waist-to-hip ratio.
2. Change in diabetes risk measures, including the total DRS and its two modifiable components other than weight—physical activity (engaging in at least 30 minute physical activity for five or more days each week) and healthy eating (eating vegetables and fruits every day), which was used to explore the pathways of reducing DRS through the program.
3. Changes in biological measures predicting cardiovascular risks, including both systolic and diastolic blood pressure.

Weight, waist-to-hip ratio, BMI, and blood pressure (both systolic and diastolic) were all measured at baseline (week 0), at week 16, and at week 28. DRS was calculated using the score sheet. Prior to the intervention, a standardized questionnaire was distributed to all participants to obtain demographic information and baseline information on physical activity habits and dietary patterns and preferences [17-25]. A truncated version of the survey was given at week 16 and repeated at week 28.

Analysis

We used a linear regression model for all the outcomes except whether the participant achieved his or her weight-loss goal, for which a logistic regression model was used. The independent variable was a dummy variable to indicate whether a participant was in the IG or the NIG. We also compared the difference in effects on weight loss between the two IG subgroups (standard versus standard plus deposit) by creating three dummy variables to indicate whether the participants were in the standard IG subgroup, the standard plus deposit subgroup, or the NIG. Student's t-test was used to test whether the regression coefficient was different from zero. We considered results with two-tailed p-values <0.05 to be significant.

We did not control for patient character-ristics such as age, sex, education, race, or initial weight because they were not significantly different between the IGs and NIG. And when adding these variables into the model, in general they were not significant and did not change the magnitude or direction of the estimates on independent variables.

As the interventions were implemented at the facility level, we took into account the clustering effect to calculate the robust standard errors in the regression analyses. All of the analyses were conducted using STATA software (version 10.1. StataCorp, College Station, Texas).

We also did intention-to-treat analysis to deal with dropout problem at week 16 and 28 (12 weeks follow-up), following “the last observation carries forward” principle.

RESULTS

Of the 99 employees who voluntarily participated in the program, 73 completed it: 19 of 30 in the standard subgroup; 16 of 21 in the standard plus deposit subgroup; and 38 of 48 in the NIG. There were no significant differences in age, sex, education, race, or body weight between those who dropped out of the program and those who continued. Participant demographic measures and baseline outcome variables are shown in Table **2**. The IG and NIG were not significantly different in all participant characteristics except for initial body weight, which was higher in the IG than in the NIG (p=0.03).

Table **3** presents regression coefficients for changes in weight loss, BMI, waist-to-hip ratio, DRS, physical activity, healthy eating, systolic blood pressure, and diastolic blood pressure measures at week 16. We describe only the statistically significant results in the text.

Participants in the two IG subgroups collectively lost an average of 5.05 pounds more (p=0.027) than those in the NIG at week 16. BMI decreased by an average of 1.73kg/m^2 more in IG than in NIG participants (p=0.043). DRS decreased by an average 1.26 points more (p=0.011) among persons in the IG than those in the NIG.

Participants in the standard plus deposit subgroup lost an average of 4.45 pounds more (p=0.042) than those in the NIG. Their odds of achieving weight-loss goals were 4.5 times those in the NIG (p=0.046). For persons in the standard plus deposit subgroup, on average, BMI decreased by 1.62kg/m^2 (p=0.042) and DRS decreased by 2.05 points more (p=0.001) than for those in the NIG. The likelihood for persons in the standard plus deposit subgroup of healthy eating increased by 47 percentage points more (p=0.011) than for those in the NIG group. At week 16, in the standard subgroup compared with the NIG group, the likelihood of healthy eating increased by 36 percentage points (p=0.020); there were no significant changes in the other outcome measures.

At week 28 (12 weeks follow-up), the likelihood of healthy eating, increased by 26 percentage points more (p=0.013) in the collective IG than in the NIG; this was the only significant change (Table **4**). For the standard plus deposit subgroup, the changes in weight loss, DRS, and likelihood of practicing healthy eating behaviors were significantly different from those in the NIG group. The odds of a person in the standard plus deposit subgroup

achieving his or her weight-loss goal were 2.71 times more (p=0.042) than for a person in the NIG. DRS was 0.40 lower (p=0.045) than for those in the NIG. The likelihood of healthy eating increased by 42 percentage points more (p=0.001) than in the NIG group.

For participants in the standard subgroup, weight loss outcomes were significant at the end of the 28 weeks. Participants in the standard subgroup lost an average of 5.11 pounds more (p=0.047) than those in the NIG. The odds of a person in the standard subgroup achieving his or her weight-loss goal were 2.89 times more (p=0.005) than for a person in the NIG.

The intention-to-treat results were very similar with the complete case analysis for both at week 16 completion of the program and at week 28 (12 weeks follow-up) (Table **5** and 6).

DISCUSSION

We found significant differences in weight loss, diabetes risk score, and likelihood of healthy eating between those who received incentives and those who did not, not only at the end of the program but also at the end of the follow-up period. These results support our hypothesis that financial incentives (both simple rewards and self-imposed penalties) are effective for successful weight loss and reducing the risk of type 2 diabetes when implemented at worksites [26-28].

Among the few previous studies conducted at a work place, Finkelstein *et al.* (2009) evaluated the effect of different levels of financial incentive on weight loss in overweight and obese employees [10]. Finkelstein included one group in which participants were offered no financial incentive and two other groups in which participants received financial incentives of varying amounts ($7 or $14) per percentage point of weight loss. The incentive program was designed for three months and the weight loss outcome was measured both at the end of three and six months. At the end of three months, the monetary amount was directly related to weight loss; the $7 per pound IG lost 1.0 pound more and the $14 per pound IG lost 2.7 pounds more body weight than the control group. However, at six months, weight loss among all three groups was similar.

In our study, we identified the target behavior as weight loss and the amount of monetary incentive participants were eligible to receive was linked to weight loss achieved. By the end of the 16 weeks, the incentive group (IG) had lost 5 more pounds than the comparison group. The amount of weight loss observed in our program was higher than that observed in the study by Finkelstein et al. It might have been because the size of the incentives provided by our group was relatively larger and the duration of the program was longer than in that study.

In a study by John *et al.* (2011), the effect of matched deposits as incentives was evaluated. They enrolled 66 obese participants from the Philadelphia Veterans Affairs Medical Center in a 24-week intervention with an 8-week follow-up. The control group received consultation and monthly weighins. Participants in the intervention group deposited their own money and, if weight loss was achieved, their deposits were returned with a matching amount from the investigators. If weight loss was not achieved, they lost their deposit. At 24 weeks, participants in the intervention group had lost more weight on average than did those

in the control group (8.70 pounds vs. 1.17 pounds). However, much of that weight lost in both groups was regained during the follow-up period, with a net weight loss for participants in the intervention group of 1.2 pounds and, for those in the control group of 0.27 pounds. John *et al.* (2011) concluded that, although the use of a financial incentive was effective for weight loss during the intervention, weight lost was regained after the intervention [29].

In our study, higher total weight loss was observed in the IG compared to the NIG, similar to findings in John *et al.* (2011). Contrary to findings from John et al., our data showed sustained weight loss in both IG subgroups (standard and standard plus deposit) at the 12-week follow-up. This might be explained by a substantial difference between our program and the John et al. program—participants in the IG were eligible to receive an additional $100 if they maintained the weight lost or lost more weight, while the program studied by John et al. did not provide such an incentive for the follow-up period. Our study results suggested that using financial incentives might be a good strategy for maintaining weight loss.

Theoretically, the standard plus deposit option (with self-imposed penalty for failure to achieve weight-loss goal) should have been more effective in encouraging weight loss than the standard incentive (simple reward), because the people who chose to make the deposit had more intrinsic motivation to lose weight. When they deposited the money, they knew that they would lose the money if they did not achieve the weight loss goal. The fact that they chose to make the deposit indicated that they were confident that they would lose weight. On the other hand, the simple financial reward could be considered extrinsic motivation; the participant may not necessarily have been self-motivated to lose weight. However, in our study, we did not find enough evidence to support an observation that the standard plus deposit subgroup had better outcomes than the standard subgroup, although more statistically significant results were observed in the standard plus deposit subgroup. This deficit in evidence might have been due to lack of adequate sample size. The main purpose of the study was to find out whether financial incentives were effective at worksites. The calculation of the sample size was based on this purpose, not on comparing the effectiveness between the two IG subgroups, which would have required a much larger sample size. Future studies are needed to evaluate whether the addition of a self-imposed penalty would improve outcomes over a simple financial reward system.

The program described in this article is a diabetes prevention program. In a diabetes prevention program, the ultimate purpose of weight loss is to reduce the risk of developing diabetes and cardiovascular complications that are closely related to being overweight or obese. However, many studies only focused on weight loss and ignored other important outcomes included in our study directly measuring the risk of the diseases. In our study, DRS was based on questions about lifestyle behaviors and practices, such as participation in regular physical activity, eating practices, BMI, waist circumference, and whether or not the person had a history of hypertension or high glucose levels. A diabetes risk score was calculated based on the person's responses to these questions. We found significant reductions in DRS for the standard plus deposit subgroup at week 16 ($p=0.001$) and at week 28 ($p=0.045$). This reflects a lower risk for type 2 diabetes based on losing a targeted amount of weight and increasing healthy eating behaviors. This finding may have major implications

related to preventing type 2 diabetes in overweight and obese individuals, because of the demonstrated effectiveness of weight loss for preventing or delaying the development of type 2 diabetes, especially in people already at high risk [30-34].

Several of the limitations of the study are worth noting. First, the causality between the weight loss and the financial incentive is not clear, because other aspects such as self-motivation, documenting weight, goal setting, and – in particular – commitment and consistency may have been more important. Second, almost half of the participants did not respond at the end of the 16-week program and almost one third of the participants did not respond at the end of the 12-week follow-up period. During the study time, there was a major economic downturn and all of these workplaces went under reorganization. Many of the employees were fired or relocated. We followed up with those who dropped out of the study and almost all except two individual who got pregnant during the study were either fired or relocated to another location. However, the intention-to-treat analyses showed similar results as the complete case analyses Therefore we concluded that the dropouts were not study-related.

CONCLUSION

The costs associated with being overweight or obese and related chronic conditions affect both employers and employees [35, 36]. Worksite weight-loss programs using monetary incentives appear promising. The present study evaluated the effectiveness of a diabetes prevention program in a group of individuals who were at risk for type 2 diabetes and overweight and obese. The ultimate purpose of weight loss was to reduce the risk of developing diabetes risk and cardiovascular complications that are closely related to being overweight or obese. Many studies only focused on weight loss and ignored other important outcomes included in our study. In our study, DRS was based on questions about lifestyle behaviors and practices, such as participation in regular physical activity, eating practices, BMI, waist circumference, and whether or not the person had a history of hypertension or high glucose levels. The DRS significantly reduced in IG group, and those in IG reported better eating habits and more physical activities. Additionally, the use of financial incentives resulted in greater weight loss compare to previous studies in persons at high risk for type 2 diabetes [11, 28, 37, 38]. The strategy was also effective in maintaining the weight loss in longer-term and in reducing diabetes risk score.

Future research might involve evaluating this approach by increasing the sample size and the length of the program to better evaluate the sustainability of weight loss and the level of program adherence over time. For this study, we made no environmental changes in the workplace, although environment may play a major role in an employee’s lifestyle behavior. Having options for healthy food, job flexibility for the opportunity to participate in physical activity, and organizational support for participating in the weight-loss program without being penalized are all examples of related environmental factors. Furthermore, future research might study the effect of workplace environmental and organizational changes, combined with an incentive program, and how these changes may help employees lose weight, maintain weight loss, and adopt healthy lifestyle changes to prevent type 2 diabetes.

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Table 1

Money Received as Incentive for Weight Loss.

Incentive Group	**At Week 16** ***Max weight loss allowed was 16-24 Ibs dependent upon BMI.***	**At Week 28** ***Max weight loss allowed was 12-18 Ibs dependent upon BMI.***	**Max Incentive Money Received.**
Standard	*$10 per one Ib of weight loss per week (if BMI between 25-30) or $10 per 1.5 lbs of weight loss per week (if BMI >30).*	*$100 (Max), if lost more weight or maintained the weight loss goal achieved at week 16.*	*$260 ($160+$ 100)*
Standard Plus	*Could deposit between $1-$5 of own money per 1-1.5 lbs of weight loss to a maximum of $80 (16X$5). Any amount of deposited money was matched by the study and returned with deposit at the end of the program if weight loss goal was achieved.*	*$100 (Max) If lost more weight or maintained the weight loss goal.*	*$320($160+$80+$100), plus $80 deposit (If achieved weight loss goal and deposited max amount of $80).*

Table 2

Demographics of Participants in the Intervention and Comparison Groups, Based on Responses to Pre-intervention Survey*.

Demographic	Information Requested	Groups			
		NIG [a] (n= 38)	IG		
			Collective (n= 35)	Standard Plus Deposit (n= 16)	Standard (n= 19)
Gender	Male	10.80%	8.80%	6.3%	10.5%
	Female	89.20%	91.20% (p=0.83)	93.8%	89.5% (p=0.61)
Education	Less than high school diploma				
	High school diploma	41.70%	57.20%	43.8%	68.4%
	College/Professional	55.50%	37.10%	50.0%	26.3%
	Post-graduate	2.80%	5.70% (p=0.49)	6.3%	5.3% (p=0.21)
Biometrics (Mean ± SD)	Age (years)	48.98 ± 11.23	45.14 ± 11.27 (p=0.10)	46.47 ± 13.01	42.29 ± 9.14 (p=0.08)
	Height (inches)	63.95 ± 2.71	64.57 ± 3.26 (p=0.31)	65.10 ± 3.31	64.32 ± 3.48 (p=0.36)
	Weight (pounds)	195.81 ± 41.13	212.76 ± 45.07 (p=0.03)	217.63 ± 45.38	221.34 ± 44.88 (p=0.01)
	BMI	33.92 ± 5.75	36.66 ± 7.67 (p=0.12)	36.93 ± 8.25	38.49 ± 7.24 (p=0.07)
	Waist-hip ratio	0.90±0.06	0.91±0.07 (p=0.44)	0.91±0.07	0.91±0.07 (p=0.82)
	Systolic BP	123.54±15.57	127.37±17.02 (p=0.37)	128.29±16.32	124.14±15.12 (p=0.52)
	Diastolic BP	76.46±12.00	77.29±12.26 (p=0.69)	77.48±11.61	77.59±11.46 (p=0.84)
	Diabetes risk score	11.56±2.72	12.37±3.07 (p=0.22)	12.57±3.30	12.32±3.09 (p=0.43)
Lifestyle	Physical activity ≥30 minutes ≥5 days a week	25.0%	25.6% (p=0.95)	23.8%	27.3% (p=0.97)
	Eat fruits and vegetables every day	59.1%	37.2% (p=0.04)	42.9%	31.8% (p=0.10)
Race (participant's choice[s] from options on survey; choices were mutually exclusive)	Hispanic (answered "yes")	6.30%	2.90%	--	5.3%
	Non-Hispanic white	55.3%	40.0%	43.8%	36.8%
	Non-Hispanic black	34.20%	54.30%	56.3%	52.6%
	Asian	–	–	–	–
	AI/AN	2.6%	–	–	–
	NH/PI	–	–	–	–
	Prefer not to respond	–	2.9% (p=0.16)	–	5.3% (p=0.40)
Job Title	Administration/Clerical	10.50%	–	–	–
	CNA/GNA	26.30%	45.70%	43.8%	47.4%
	CMA	–	–	–	–

Demographic	Information Requested	Groups			
		NIG [a] (n= 38)	IG		
			Collective (n= 35)	Standard Plus Deposit (n= 16)	Standard (n= 19)
	LPN	18.4%	11.40%	6.3%	15.8%
	RN	18.40%	5.70%	6.3%	5.3%
	Housekeeping/Laundry	7.90%	–	–	–
	Dietary	2.60%	11.40%	12.5%	10.5%
	OT/PT	–	5.70%	12.5%	–
	Recreation	5.30%	2.90%	--	5.3%
	Social work	–	2.90%	6.3%	–
	Other	7.90%	14.30% (p=0.65)	12.5%	15.8% (p=0.67)

AI/AN American Indian/Native Alaskan; BMI body mass index; CNA/GNA certified nursing assistant/ geriatric nursing assistant; CMA certified medical assistant; IG incentive group; LPN licensed practical nurse; NH/PI Native Hawaiian/Pacific Islander; NIG non-incentive group; OT/PT occupational therapist/physical therapist; RN registered nurse; SE standard error

[*] P value is provided for the comparison between the NIG and the collective incentive group, and among the NIG, standard plus deposit group, and standard incentive group.

[a] NIG is the comparison population.

Table 3

Regression coefficients * for the association between incentive and the outcomes at end of intervention (score at week 16 minus score at baseline [week 0]) (N=50) NIG was the reference.

Outcome measure	Collective IG	p-value	Standard Plus Deposit IG	p-value	Standard IG	p-value
Weight related outcomes						
Change in weight (pounds)	−5.05 (−1.08, −9.02)	0.027	−4.45 (−10.24, 1.33)	0.092	−5.92 (−12.6, 0.78)	0.067
Odds ratio of achieving weight loss goals	3.07 (0.74, 12.69)	0.122	4.50 (1.02, 19.78)	0.046	4.26 (0.94, 19.35)	0.060
Change in BMI (kg/m^2)	−1.73 (−3.35, −0.10)	0.043	−1.62 (−3.12, −0.11)	0.042	−1.89 (−3.82, 0.04)	0.052
Change in waist-hip ratio	−0.007 (−0.06, 0.04)	0.69	−0.014 (−0.093, 0.065)	0.608	0.0035 (−0.064, 0.072)	0.879
Diabetes risk factors						
Change in DRS	−1.26 (−1.97, −0.55)	0.011	−2.05 (−2.60, −1.50)	0.001	−0.10 (−0.81, 0.60)	0.674
Change in probability of being physically active (at least 30 minutes in most days)	0.08 (−0.10, 0.25)	0.248	0.21 (−0.04, 0.46)	0.076	−0.10 (−0.29, 0.09)	0.190
Change in probability of healthy eating (eating vegetable and fruits every day)	0.42 (0.17, 0.68)	0.013	0.47 (0.20, 0.73)	0.011	0.36 (0.11, 0.62)	0.020
Cardiovascular risk factors						
Change in Systolic BP	3.6 (−9.88, 17.09)	0.458	4.27 (−14.65, 23.19)	0.524	2.69 (−5.61, 10.99)	0.378
Change in Diastolic BP	1.78 (−8.56, 12.11)	0.622	−0.18 (−13.87, 13.51)	0.970	4.45 (−0.44, 9.34)	0.063

BMI body mass index; BP blood pressure; DRS diabetes risk score; IG incentive group; NIG non-incentive group

* Each row shows the regression coefficients from a regression model using the outcome measure shown on the same row; the numbers in the parentheses were 95% of confidence intervals of the regression coefficients

Table 4

Regression coefficients* on the association between incentive and the outcomes at 12-week follow-up (score at week 28 minus score at baseline [week 0]) (N=73) NIG was the reference.

Outcome measure	Collective IG	p-value	Standard Plus Deposit IG	p-value	Standard IG	p-value
Weight related outcomes						
Change in weight (pounds)	−5.17 (−10.48, 1.34)	0.053	−5.24 (−10.96, 0.48)	0.062	−5.11 (−10.12, −10.62)	0.047
Odds ratio of achieving weight loss goals	1.75 (0.97, 3.14)	0.061	2.17 (1.03,4.57)	0.042	2.89 (1.37, 6.10)	0.005
Change in BMI(kg/m^2)	−1.05 (−3.80, 1.69)	0.308	−1.71 (−5.50, 2.08)	0.246	−0.50 (−2.73, 1.72)	0.524
Change in waist-hip ratio	−0.018 (−0.057, 0.021)	0.24	−0.023 (−0.10, 0.053)	0.414	−0.014 (−0.044, 0.016)	0.231
Diabetes risk factors						
Change in DRS	0.11 (−0.72, 0.94)	0.703	−0.40 (−0.77, −0.02)	0.045	0.54 (−0.97, 2.04)	0.341
Change in probability of being physically active (at least 30 minutes in most days)	0.04 (−0.30, 0.37)	0.751	0.16 (−0.23, 0.55)	0.286	−0.07 (−0.52, 0.39)	0.670
Change in probability of healthy eating (eating vegetable and fruits every day)	0.26 (0.11, 0.42)	0.013	0.42 (0.33, 0.50)	0.001	0.13 (−0.19, 0.45)	0.293
Cardiovascular risk factors						
Change in Systolic BP	−2.02 (−20.86, 16.81)	0.755	−4.78 (−24.66, 15.10)	0.500	0.30 (−24.66, 15.10)	0.97
Change in Diastolic BP	−0.99 (−7.91, 5.92)	0.679	−2.41 (−13.09, 8.28)	0.525	0.20 (−4.68, 5.08)	0.905

BMI body mass index; BP blood pressure; DRS diabetes risk score; IG incentive group; NIG non-incentive group

*Each row shows the regression coefficients from a regression model using the outcome measure shown on the same row; the numbers in the parentheses were 95% of confidence intervals of the regression coefficients

Table 5

Intention-to-Treat Regression coefficients * for the association between incentive and the outcomes at end of intervention (score at week 16 minus score at baseline [week 0]) (N=99) NIG was the reference.

Outcome measure	Collective IG	p-value	Standard Plus Deposit IG	p-value	Standard IG	p-value
Weight related outcomes						
Change in weight (pounds)	−5.63 (−9.44, −1.81)	0.018	−7.01 (−10.16, 3.88)	0.006	−4.65 (−8.35, −0.96)	0.028
Odds ratio of achieving weight loss goals	3.07 (0.74, 12.69)	0.122	3.84 (1.02, 19.78)	0.060	4.26 (0.94, 15.59)	0.224
Change in BMI (kg/m^2)	−0.94 (−1.47, −0.41)	0.011	−1.37 (−2.96, −0.23)	0.072	−0.64 (−1.33, 0.05)	0.060
Change in waist-hip ratio	−0.005 (−0.03, 0.02)	0.609	−0.020 (−0.06, 0.02)	0.215	0.005 (−0.02, 0.03)	0.590
Diabetes risk factors						
Change in DRS	−0.68 (−0.97, −0.39)	0.005	−1.64 (−2.54, −0.74)	0.010	−0.01 (−0.28, 0.27)	0.929
Change in probability of being physically active (at least 30 minutes in most days)	0.05 (−0.03, 0.13)	0.102	0.20 (−0.13, 0.53)	0.146	−0.05 (−0.16, 0.06)	0.257
Change in probability of healthy eating (eating vegetable and fruits every day)	0.21 (0.09, 0.34)	0.011	0.33 (0.06, 0.61)	0.030	0.13 (−0.07, 0.62)	0.340
Cardiovascular risk factors						
Change in Systolic BP	1.75 (−5.15, 8.65)	0.479	2.38 (−9.90, 14.65)	0.582	1.31 (−2.51, 5.13)	0.356
Change in Diastolic BP	0.94 (−4.71, 6.58)	0.635	0.09 (−9.09, 9.23)	0.978	1.53 (−2.40, 5.46)	0.304

BMI body mass index; BP blood pressure; DRS diabetes risk score; IG incentive group; NIG non-incentive group

* Each row shows the regression coefficients from a regression model using the outcome measure shown on the same row; the numbers in the parentheses were 95% of confidence intervals of the regression coefficients

Table 6

Intention-to-Treat Regression Coefficients* on the Association between Incentive and the Outcomes at 12-Week Follow-up (Score at Week 28 Minus Score at Baseline [Week 0]) (N=99) NIG was the Reference.

Outcome measure	Collective IG	p-value [a]	Standard Plus Deposit IG	p-value	Standard IG	p-value [a]
Weight related outcomes						
Change in weight (pounds)	−5.58 (−10.48, 1.34)	0.032	−6.74 (−10.69, −2.79)	0.012	−4.78 (−9.19, −0.36)	0.041
Odds ratio of achieving weight loss goals	1.75 (0.97, 3.14)	0.061	1.83 (1.00,3.37)	0.051	1.69 (0.95, 3.03)	0.076
Change in BMI(kg/m^2)	−0.63 (−2.66, 1.40)	0.394	−1.34 (−5.00, 2.32)	0.327	−0.14 (−1.68, 1.40)	0.797
Change in waist-hip ratio	−0.01 (−0.05, 0.02)	0.377	−0.02 (−0.06, 0.03)	0.294	−0.006 (−0.04, 0.02)	0.568
Diabetes risk factors						
Change in DRS	0.01 (−0.68, 0.66)	0.966	−0.64 (−1.29, 0.007)	0.051	0.43 (−0.62, 1.49)	0.281
Change in probability of being physically active (at least 30 minutes in most days)	0.006 (−0.26, 0.27)	0.946	−0.15 (−0.12, 0.43)	0.176	−0.10 (−0.41, 0.22)	0.407
Change in probability of healthy eating (eating vegetable and fruits every day)	0.17 (0.04, 0.31)	0.027	0.32 (0.12, 0.51)	0.014	0.07 (−0.12, 0.26)	0.328
Cardiovascular risk factors						
Change in Systolic BP	−6.62 (−13.11, 11.87)	0.885	−2.77 (−18.18, 12.65)	0.608	0.89 (−13.54, 15.31)	0.857
Change in Diastolic BP	−0.38 (−5.80, 5.03)	0.836	−1.26 (−11.38, 8.87)	0.719	0.23 (−3.18, 3.63)	0.847

BMI body mass index; BP blood pressure; DRS diabetes risk score; IG incentive group; NIG non-incentive group

*Each row shows the regression coefficients from a regression model using the outcome measure shown on the same row; the numbers in the parentheses were 95% of confidence intervals of the regression coefficients