

Financial Incentives and Employer-Sponsored Health Activities

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Objective: To understand how employer-sponsored incentives and participant-level characteristics drive health activity engagement. **Methods:** Multivariable hierarchical logistic regression models evaluated 283,365 individuals eligible for incentives through health savings accounts, health reimbursement accounts, health incentive accounts, gift cards, and other means, and estimated log odds of (1) completing a health survey; (2) participating in a biometric screening; (3) attaining a biometric target; (4) participating in a weight loss program; (5) breast, (6) colorectal, or (7) cervical cancer screening. **Results:** Larger incentives were associated with higher odds of participating in biometric screenings only (2% higher for every \$25). Obesity, tobacco use, and lack of primary care were associated with lower odds. **Conclusion:** Employers may wish to tailor incentive plans to the unique characteristics and needs of their populations to better drive participation in sponsored health activities.

Keywords: biometrics, cancer screening, employer, incentives, weight loss, wellness, worksite

Financial incentives are a frequent means by which employers in the United States aim to encourage healthy behavior among their employees,^{1,2} as well as improve employee health and reduce employer-based health care costs.² Recent estimates are that 75% of employer-based wellness programs offer incentives, either for participating in a health-related activity or for achieving a particular health outcome, with the majority of programs offering participation-based incentives.³ Incentives are one element of a comprehensive employer-sponsored engagement strategy that includes communications and workplace culture, as well as health program design and experience.⁴⁻⁶

Some,³ but not all,¹ evidence suggests that men and women respond differently to the same incentive, perhaps due to a greater sense of loss aversion among women.³ Employee age, race, income, and education have not been observed, in general, to be related to the effectiveness of incentives in promoting behavior change.¹ Incentives have been shown to be effective at promoting smoking cessation, physical activity, vaccination, and cancer screenings, suggesting that incentives are effective for “simple” behaviors, such as attendance for vaccination or screening, as well as “complex” ones, such as smoking cessation.² Incentives may also be effective in improving health risk appraisal completion,⁶ biometric screening participation,³ biometric outcomes,⁷ and weight loss.⁸

Incentives may be offered in multiple ways, such as cash, gift cards, or coupons. Recent evidence suggests that incorporating them into benefits design improves employer-sponsored health activity participation.⁶ Employers who offer employees and dependents consumer-driven health plans (CDHPs) may also offer incentives that allow recipients to use earned incentive to pay for future health care expenses. Such plans have grown in market share over the past few decades: the proportion of covered workers with employer-sponsored insurance in a CDHP rose from 4% in 2006 to 29% in 2016, and in 2016, 56% of covered workers were employed by a firm that offered a CDHP.⁹ CDHPs that allow for incentives include health savings accounts (HSAs), which are funded by the employer, employee, or others, are owned by the employee, and are portable between employers; health reimbursement accounts (HRAs) which are funded and owned by the employer and are not portable; and health incentive accounts (HIAs), which are funded, owned by the employer, are not portable, and are expressly for rewards tied to health activity completion.^{10,11}

While some evidence suggests that consumer-driven health plans may influence member behavior,¹²⁻¹⁵ and that incentives are important particularly for individuals in consumer-driven health plans,¹⁶ little is known about the impact on behavior of incentives delivered through these plan mechanisms. The impact of incentive value is also not clear: one recent study found that for every \$20 increase there was a rise in health risk assessment participation of 1.58%;⁶ however, a recent meta-analysis suggested that the impact of incentives on behavior diminishes as incentive value increases, although in this study incentive values were positively correlated with follow-up time, and thus may be confounded.²

The following study set out to better understand the relation between the design and value of financial incentives, individual participant characteristics, and engagement in employer-sponsored health activities. The hypothesis was that both incentive plan and individual-level characteristics—including, for instance, health and lifestyle habits—would influence likelihood of participation in employer-intensified activities.

METHODS

In 2014, Rally Health® (Washington, DC) (<https://www.rallyhealth.com>), a digital health company, began administering health surveys through employers to employees and dependents, and in 2015 began processing financial incentives for employers as a means to engage their employees and dependents.

Study Population

The current analysis began with 1.24 million employees and dependents from 226 clients of a health and wellness service provider (Optum, a division of UnitedHealth Group, Eden Prairie, MN) who participated in incentive plans which ended in 2018. Incentive plans began between March, 2017 and December, 2018 and ranged in length from 8 to 12 months. Individuals who registered for Rally® and answered the online health risk survey questions were included to understand the drivers of incentive plan participation. For the analysis, Individuals had to have completed a “baseline” survey prior to the start of their incentive plan period. Surveys were completed between December, 2016 and December,

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Clinical significance: Individuals at increased health risk may be less likely than healthy counterparts to participate in incentivized activities. Higher incentives can drive biometric screening participation; however, employers may wish to limit incentives for achieving biometric targets, participating in a weight loss program, re-taking a health survey, or completing a cancer screening.

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2018. For those individuals who completed more than one prior to the start of the incentive period, responses from the survey completed most proximate to the start of the incentive period were used. Of those who completed the health survey, individuals who were offered a financial incentive of a specific dollar amount for one or more of the following seven health-related activities were evaluated: (1) completion of subsequent health surveys; (2) participation in a biometric screening or (3) attainment of a biometric target (such as a target blood pressure); (4) participation in the weight loss program (5) undergoing breast cancer screening, (6) colorectal cancer screening, or (7) cervical cancer screening. These activities were chosen as they were activities commonly tied to financial incentives. Individuals who were exposed to multiple incentive plans during this time were excluded in order to better understand the specific relationship between incentives and health activities (see Supplemental Digital Content 2, <http://links.lww.com/JOM/A800> for figure of study participant flow). The final study sample included 283,365 individuals, including 233,982 employees and 49,383 dependents from 90 employers.

Health Survey

The Health Survey is a self-administered online assessment of employee's and dependent's health and health habits, with additional questions on demographic characteristics. It ranges in number of questions from approximately 50 (short version) to 100 (long version), depending on employer request. In order to have the most complete picture of an individual's attributes, only those employers who offered employees and their dependents the long version were evaluated. Typically, after first registering on the health platform, a participant is directed immediately to the health survey. Participants may complete subsequent surveys at any time, and are frequently prompted to do so annually. Records are maintained of number of surveys completed. In our analysis of completion of subsequent or "follow-up" health surveys, baseline survey responses and financial incentives in relation to surveys completed subsequent to the baseline during the incentive plan period were evaluated between December, 2016 and December, 2018.

Biometrics

Biometric screenings are measures of an individual's physical characteristics such as body mass index or blood pressure that are used to benchmark and evaluate changes in individual health status over time.¹⁷ Many employers offer on-site testing to encourage adoption, but employees can have results measured off-site at a provider of their choice. Employees and their dependents completed biometric activities at all times between plan start and end and there was not any clustering of completion within a certain period of time, nor in relation to the month and year that the plan was offered.

Individuals were eligible for a biometric-related incentive by completing one to six different biometric activities: blood glucose screening, blood pressure screening, assessment of body mass index, measurement of blood cholesterol (total, LDL, and/or HDL), measurement of waist circumference, and measurement of hemoglobin A1c. For our analysis, the impact of financial incentives on completing any biometric activities was evaluated, given that the activities are generally done at the same time. If an individual was offered \$10 for a cholesterol screening, \$10 for a blood glucose screening, and \$10 for a blood pressure screening, then \$30 was entered into our analytic model. The impact of health, health habits, and financial incentive on participating in both outcomes-based biometric screening (where an incentive is earned for reaching a certain biometric target) and non-outcomes-based screenings was evaluated. Completion of the biometric activities or achievement of target was confirmed by the vendor and the data shared with the health platform partner.

Weight Loss Program

The 52-week digital weight loss program included online group sessions, coach support, nutrition and exercise trackers, educational content, and activities to help participants stay on track to their weight loss goals. Employers may choose to incentivize enrollment in the program or attendance of at least nine group sessions. For this analysis, the impact of incentives on attendance was evaluated.

Preventive Screenings

Colorectal cancer screening, breast cancer screening, and cervical cancer screening are recommended by the United States Preventive Services Task Force and incentivized by certain employers. As with completion of biometric activities, completion of the preventive screening is shared with the health platform partner.

Demographic Data, Personal Health History, and Health Habits

Self-reported employee and dependent health history, lifestyle habits, attitudes, and demographic data was obtained from the online digital platform's health survey (see Methods, Supplemental Digital Content 1, <http://links.lww.com/JOM/A800>, which includes specific question and answer pairs). Similar online health appraisals have been shown to have good correlations with relevant gold standard questionnaire measures, good internal consistency, and acceptable sensitivity and specificity when compared to gold standard risk stratification and high-risk classifications.¹⁸

Incentive Plan Design

The platform captures information on incentives from its employer clients and displays that information to employees and dependents. Information includes the way in which the financial incentive is delivered to individuals. The five delivery mechanisms included are: health savings account (HSA); health reimbursement account (HRA); health incentive account (HIA); gift cards; and "client fulfilled" in which clients determine specific rewards themselves (by offering, for example, bonuses, premium reductions, or paid time off). Other rewards not included in this analysis are points which users can redeem for dollars and virtual coins which can be redeemed in, for example, sweepstakes or for purchasing items in a digital marketplace. Employers who offer incentives as a percentage (ie, completion of an activity would allow an individual to earn a certain percent of the total incentive) were excluded because the dollar value of the reward is not available. Additional information includes the value, or amount, of the incentive and how many weeks or months later it is given to the employee or dependent after completing the required activity. Time between activity completion and incentive delivery depends on the employer, but could range from same day, in the instance of some gift cards, to several weeks, in the case of biometrics or cancer screenings. Incentives given through HSA, HRA, and HIA were provided as a single lump sum. Premium reduction incentives were split over several pay periods. Incentive plans offer a wide range of activities but capped the total amount that could be earned. Additional information included whether the incentivized activity was a "gatekeeper" to other activities (ie, whether one had to complete one activity before others) and if the individual could choose a particular incentivized activity from a group of choices.

Covariates

Demographic questions included: age; gender; highest level of education; relationship status; living situation; and whether participant had children. A confidence question asked about confidence in ability to make healthy changes in one's life. Health habits, or behavior, questions included: hours of sleep per night; frequency

of waking refreshed; diet quality; daily servings of fruits and vegetables; frequency per week of at least 30 minutes of physical activity; frequency of feeling overwhelmed by stress; cigarette smoking habits; and use of other forms of tobacco or nicotine. Questions on health conditions and overall health included those about the presence of asthma, chronic obstructive pulmonary disease, heart disease or stroke, diabetes, and back problems. There was a question about the last time a cervical cancer screening was performed and the last time blood pressure measurement was taken. Body mass index was generated from self-reported height and weight. Overall physical and mental health were gathered from questions taken from a modified version of the Veteran's Rand-12^{19,20} (see Methods, Supplemental Digital Content 1, <http://links.lww.com/JOM/A800>, for additional details about survey and list of question and answer pairs).

Additional questions included whether the recipient of the incentive was an employee or dependent; self-report of whether the individual had a primary care doctor or clinic for usual care; focused digital platform online activity, measured by number of login days over the course of the incentive plan period; adjusted gross income from zip code using data from the Internal Revenue Service;²¹ and employer industry type. Given the importance of employer communication to driving employee engagement with health activities, a measure of the frequency that employers actively communicated to employees about the digital health platform on health and wellness topics in 2017 and 2018 was included. These inline platform advertisements or email communications were about not only incentives, but also other topics, such as virtual health care visits, preventive care, heart health, etc. and were client-initiated, though they could be sent out by the health plan, wellbeing partner, or the employer.

All the above covariates were included in the statistical models, except (1) in cases where the variance inflation factor was greater than 4 for a particular model: this occurred with living condition, industry, client campaign, and digital platform activity; or (2) where the covariate was not applicable or not inclusive of entire study population for a particular model: this occurred with gender and last cervical cancer screening (as some models included only women), "gatekeeper" status of an incentivized activity, whether prior surveys were taken, and whether an individual had the option to choose the incentivized activity (see Methods, Supplemental Digital Content 1, <http://links.lww.com/JOM/A800>, for additional details about model covariates).

Missing Data and Validation of Data

All employees or dependents who had incomplete surveys were excluded. Since the digital health company's platform prompts users to answer each question in order, there were no skipped questions. Because not every zip code had an income associated with it (17,054 individuals), individuals with this variable missing were given an unknown value for income. For cases in which the VR-12 physical component score (PCS) or mental component score (MCS), or BMI, were missing, the mean value for the population eligible for the specific incentivized activity (eg, biometric participation) was used.

Validation of biometric participation or attainment or biometric target or completion of a preventive screening were provided via screening partner or employer to the digital health company. Validation of weight loss program participation or completion of health survey were determined within the digital platform.

Statistical Approach

As incentive plans are set at an employer level, and individual-level participation within employers is highly correlated, multivariable hierarchical logistic regression models were built with individual participation as our outcome variable (participated: $y = 1$;

did not participate: $y = 0$) using a random intercept on the employer to account for this group effect. In this retrospective observational analysis, separate models were built to estimate the log odds of an individual accomplishing one of the following: (1) completion of subsequent health surveys; (2) participation in a biometric screening or (3) attainment of a biometric target (such as a target blood pressure); (4) participation in the weight loss program; (5) undergoing breast cancer screening, (6) colorectal cancer screening, or (7) cervical cancer screening. Odds ratios (OR) with 95% Confidence Intervals (CI) in parentheses following the odds ratio were generated and are reported for all covariates. Variables based on variance inflation factors were chosen and those with values greater than 4 were removed to remove the presence of multicollinearity. Z-score transformation was used to normalize continuous and discrete variables, including MCS, PCS, incentive value, and login days. Models met logistic model assumptions and fit was assessed model using binned residual plots and determining visually that 95% of binned residuals fell within the ± 2 standard error bounds. All analyses were performed in R, version 3.6.1.

Elasticity Model

Across the incentive dollar value ranges in our study, a significant association with participating in a biometric screening was observed, and therefore an "elasticity" model was built which aimed to estimate population participation in a biometric screening event across different financial incentive values. The same multivariable hierarchical logistic regression model as above was employed to answer the specific question, "what would biometric screening participation be across the range of incentive values offered across all participants?" Prediction was generated without including the random intercepts over the range of incentives from \$10 to \$400. Estimates across all individual characteristics were pooled but with different extrapolated incentive values to arrive at a population-wide estimate at each dollar amount. Ninety five percentage CI were generated using a bootstrapping method, with \$20 increments, using the lme4 package in R.²²

RESULTS

In this study of 283,365 individuals from 90 employers, the mean age of employees and dependents was 45 (standard deviation 11) years and the majority (59%) were female (Table 1 and see Table, Supplemental Digital Content 3, <http://links.lww.com/JOM/A800>, for additional characteristics of study participants). The majority of members attended or completed college and/or pursued postgraduate studies (90%), were in a committed relationship or married (77%), had children (71%), and lived with their partner or spouse (74%). There was a broad range of incomes represented from less than \$25,000 per year to over \$200,000 per year, with the largest share of individuals in the \$50,000 to \$75,000 per year bracket (37%). The majority were confident in their ability to make healthy lifestyle changes (95%) and had a supportive network of peers (72%), but also reported often feeling stressed (76%). Most were overweight (mean BMI 29, SD 7) and reported never having smoked (76%). Most were free of chronic health conditions, including diabetes, heart disease, asthma, COPD, and had access to primary care and their blood pressure checked within the last year. Most employees and dependents were associated with the financial services/insurance/real estate industry (38%; see Table, Supplemental Digital Content 4, <http://links.lww.com/JOM/A800>, for employee and dependent industry association).

The largest median incentive was for achieving a biometric target (\$200); the smallest were for completing health surveys (\$25) (see Table, Supplemental Digital Content 5, <http://links.lww.com/JOM/A800> for incentive values). Incentives offered through an HSA or HRA were generally larger than those offered through other mechanisms. There was a wide range in incentives earned by those

TABLE 1. Characteristics of 283,365 Adults Eligible for Health Survey, Biometric Screening, Weight Loss Program, or Cancer Screening Incentives, by Mode of Incentive Delivery*

	Client Fulfilled n = 19,941	Health Incentive Account n = 120	Health Re-imbursment Account n = 36,393	Health Savings Account n = 110,188	Premium Reduction n = 65,4346	Gift Card n = 51,287
Age (yrs) (mean, SD)	44.6 (10.9)	41.9 (11.2)	48.5 (11.8)	45.5 (11.1)	44.0 (11.2)	43.1 (11.8)
Female (n, %)	9,940 (49.9%)	93 (77.5%)	21,522 (59.1%)	61,288 (55.6%)	42,016 (64.2%)	31,372 (61.2%)
BMI (mean, SD)	28.0 (6.0)	29.5 (6.2)	28.6 (6.6)	28.4 (6.7)	29.2 (7.3)	29.1 (6.8)
Cigarette use (n, %):						
Prior smoker	3,744 (18.78%)	33 (27.50%)	7,765 (21.34%)	20,374 (18.49%)	13,119 (20.05%)	9,202 (17.94%)
Smoke sometimes	307 (1.54%)	2 (1.67%)	672 (1.85%)	1,657 (1.50%)	1,220 (1.86%)	1,263 (2.46%)
Smoke daily	503 (2.52%)	1 (0.83%)	1,091 (3.00%)	2,786 (2.53%)	2,222 (3.40%)	1,924 (3.75%)
Prediabetes (n, %)	709 (3.56%)	7 (5.83%)	2,253 (6.19%)	4,521 (4.10%)	3,033 (4.63%)	2,396 (4.67%)
Diabetes (n, %)	858 (4.30%)	10 (8.33%)	2,546 (7.00%)	4,954 (4.50%)	3,588 (5.48%)	2,886 (5.63%)
Cardiac condition (n, %)	371 (1.86%)	6 (5.00%)	1,140 (3.13%)	2,190 (1.99%)	1,357 (2.07%)	1,039 (2.03%)
Blood pressure checked in past year (n, %)	19,235 (96.46%)	117 (97.50%)	34,407 (94.54%)	103,824 (94.22%)	61,512 (94.00%)	47,778 (93.16%)
Access to primary care (n, %)	17,959 (90.06%)	112 (93.33%)	33,240 (91.34%)	98,213 (89.13%)	58,363 (89.19%)	44,537 (86.84%)
Insurance status (n, %)						
Dependent	3,989 (20.00%)	1 (0.83%)	6,954 (19.11%)	22,922 (20.80%)	10,175 (15.55%)	5,342 (10.42%)
Subscriber	15,952 (80.00%)	119 (99.17%)	29,439 (80.89%)	87,266 (79.20%)	55,262 (84.45%)	45,944 (89.58%)

BMI, body mass index; SD, standard deviation.

*Percentages are percent of participants in each incentive delivery mechanism category.

in our study population across the various delivery mechanisms, from 2%–12% earned for participating in the weight loss program, to 70%–85% earned for completing the health survey (see Table, Supplemental Digital Content 5, <http://links.lww.com/JOM/A800> for frequency of incentives earned). HSA was the most common mechanism for delivery of the incentive (see Table, Supplemental Digital Content 4, <http://links.lww.com/JOM/A800>, for frequency of incentive delivery mechanisms) and completing a health survey was the most common activity incentivized (see Table, Supplemental Digital Content 6, <http://links.lww.com/JOM/A800>, for frequency of incentivized activities).

There were patterns in the relationship between individual characteristics and incentive design across the incentivized health activities (Tables 2 and 3 and see Tables 1, 2 and 3 in Supplemental Digital Content 7, <http://links.lww.com/JOM/A800>, for additional results based on individual characteristics and incentive design features). Demographic attributes were associated with participation in incentivized activities. Older age was associated with lower odds of completing the health survey and biometric screening. Men had substantially lower weight loss program participation [OR 0.37, (0.32, 0.45)].

Health and health-related behaviors were associated with participation in incentivized activities. Obesity and diabetes were associated with significantly lower odds of participating in biometric screenings or achieving biometric goals. Current users of any form of tobacco were consistently and strongly associated with lower odds of completing biometrics, health survey, and cancer screening events. Having one’s blood pressure checked in the last year and access to primary care were both associated with higher odds of completing the health survey and biometrics, as well as completing a cancer screening event. Greater time spent on the digital health company’s platform was associated with higher odds of earning an incentive across all health activities.

Incentive design characteristics were associated with participation. HSA was the one incentive delivery mechanism, when compared to HRA, which was consistently associated with higher odds of participation, in biometrics (screening and outcome achievement), health survey, and the weight loss program. Gift cards were strongly associated with higher odds of completing the

health survey [OR 2.4 (1.70, 2.69)]. All delivery mechanisms, when compared to HRA (the reference group), were strongly associated with higher odds of participating in the weight loss program, while none of the incentive delivery mechanisms had a significant association with cancer screening participation. Offering individuals a choice in activities was associated with higher odds of completing the health survey, but lower odds of participating in biometric activities (Table 3). The impact of choice could not be evaluated in relation to completing cancer screenings as all of the screenings were part of plans which gave participants a choice of incentivized activities.

There was no significant association between the value, or amount, of the financial incentive and participation in most health activities, within the range of incentives studied in our analysis. Of all the health activities, the value of the incentive was only significantly associated with higher odds of participating in a biometrics screening event [OR per \$25 increment: 1.14 (1.12, 1.16)]. The elasticity model (Fig. 1) illustrates that at \$10, there was 11% (95% CI: 4.45–22.90) participation; at \$110, it was 16% (95% CI: 6.79% to 32.90%); \$210 it was 23% (95% CI: 11.60 to 42.50); \$310 it was 32% (95% CI: 16.39 to 56.00) and \$400 it was 42% (95% CI 24.40 to 62.80). For every \$25 rise in incentive, participation was higher by 2% points. Higher incentive amounts did not require a greater number of biometric activities to be completed (see Figure, Supplemental Digital Content 8, <http://links.lww.com/JOM/A800>, which shows number of biometric activities an individual needs to complete to earn incentive at various dollar amounts). In ad-hoc subgroup analyses based on findings above, the impact of financial incentives on individuals who were of a healthy BMI versus not, ever-smokers versus never-smokers, and those with access to primary care versus not were evaluated (see Figures 1, 2 and 3, Supplemental Digital Content 9, <http://links.lww.com/JOM/A800>, which shows predicted participation in biometric screening across a range of incentive values, stratified by BMI, smoking status, and access to primary care). There was higher participation in biometric activities at each financial reward level for individuals of healthy BMI, never-smokers, and those with primary care, compared to their counterparts, but similar rates of rise in participation across incentive values.

TABLE 2. Odds of Participation in Health Survey, Biometric Screening, Biometric Attainment, Weight Loss Program, or Cancer Screening, by Participants' Health, Health Habits, and Access to Care

	Health Survey	Biometric Screening	Biometric Outcome	Breast Cancer Screening	Cervical Cancer Screening	Colorectal Cancer Screening	Weight Loss Program
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Access to primary care	1.07 (1.03–1.11)	1.09 (1.05–1.13)	1.15 (1.10–1.19)	1.76 (1.58–1.96)	1.13 (1.03–1.24)	1.54 (1.34–1.77)	0.89 (0.70–1.14)
Overweight*	0.97 (0.95–1.00)	0.82 (0.80–0.85)	0.37 (0.36–0.38)	0.98 (0.93–1.04)	0.91 (0.86–0.96)	0.93 (0.88–0.98)	Reference
Obese*	0.99 (0.97–1.02)	0.70 (0.68–0.72)	0.17 (0.16–0.17)	0.98 (0.92–1.04)	0.79 (0.74–0.84)	0.94 (0.88–1.01)	1.79 (1.52–2.10)
Prediabetes†	1.03 (0.98–1.08)	1.04 (0.99–1.10)	1.05 (0.99–1.11)	1.12 (1.02–1.23)	0.99 (0.89–1.10)	1.06 (0.96–1.17)	1.25 (0.92–1.69)
Diabetes‡	0.98 (0.94–1.03)	0.90 (0.86–0.94)	0.89 (0.85–0.94)	0.97 (0.88–1.07)	0.79 (0.70–0.89)	0.98 (0.90–1.08)	1.08 (0.78–1.50)
Cigarette use							
Never				Reference			
Prior	0.96 (0.94–0.99)	0.88 (0.86–0.91)	0.94 (0.91–0.96)	0.93 (0.88–0.98)	0.89 (0.83–0.95)	0.96 (0.91–1.02)	0.94 (0.78–1.14)
Occasional	0.79 (0.74–0.85)	0.60 (0.55–0.65)	0.55 (0.50–0.61)	0.66 (0.56–0.78)	0.81 (0.66–1.00)	0.75 (0.60–0.92)	0.69 (0.40–1.19)
Daily	0.78 (0.74–0.83)	0.62 (0.58–0.66)	0.63 (0.59–0.68)	0.66 (0.57–0.76)	0.74 (0.62–0.89)	0.86 (0.72–1.02)	0.62 (0.39–0.99)
Last blood pressure check							
Never	1.07 (0.94–1.21)	1.05 (0.90–1.22)	1.13 (0.95–1.34)	0.99 (0.68–1.42)	1.21 (0.86–1.70)	1.06 (0.65–1.71)	1.98 (0.88–4.44)
Three or more years ago	1.01 (0.91–1.12)	1.12 (0.99–1.26)	1.21 (1.05–1.39)	1.22 (0.95–1.57)	1.03 (0.77–1.37)	1.24 (0.95–1.62)	1.14 (0.53–2.43)
One to three years ago				Reference			
Past year	1.24 (1.18–1.30)	1.84 (1.74–1.94)	1.99 (1.87–2.12)	1.44 (1.26–1.64)	1.21 (1.05–1.39)	1.21 (1.03–1.42)	0.94 (0.65–1.36)

CI, confidence interval; OR, odds ratio.

*Reference group for body mass index is normal/healthy body mass index, except for weight loss program in which it is overweight.

†Reference group for prediabetes and diabetes is neither.

DISCUSSION

In this large study of nearly 300,000 individuals and over 90 employers, participation in health-related incentivized activities depended on incentive design and characteristics of the eligible individual. Interestingly, greater employer-sponsored financial incentives were associated with higher odds of participation in biometric screening events, but not in other activities. Obesity,

tobacco use, and lack of access to primary care were all associated with lower odds of participation.

Prior research has found that incentivizing single-episode activities—such as completing a health survey or participating in a biometric screening event—may be more successful than incentivizing multiple-episode activities—such as attending a weight loss coaching program—as financial incentives may not enhance

TABLE 3. Odds of Participation in Health Survey, Biometric Screening, Biometric Attainment, Weight Loss Program, or Cancer Screening, by Incentive Plan Features

	Health Survey	Biometric Screening	Biometric Outcome	Breast Cancer Screening	Cervical Cancer Screening	Colorectal Cancer Screening	Weight Loss Program
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Incentive type							
Client fulfilled	0.62 (0.39–0.99)	1.05 (0.37–2.96)	0.54 (0.13–2.21)	1.90 (0.57–6.35)	1.01 (0.49–2.09)	N/A	5.97 (2.08–17.08)
HIA	0.65 (0.42–1.01)	1.27 (0.81–1.96)	N/A	N/A	N/A	N/A	N/A
HRA				Reference			
HSA	1.54 (1.48–1.61)	1.35 (1.23–1.49)	1.30 (1.25–1.37)	1.07 (1.00–1.15)	1.04 (0.97–1.11)	0.95 (0.89–1.01)	2.59 (1.25–5.36)
Premium reduction	1.21 (1.14–1.29)	0.97 (0.88–1.08)	1.03 (0.97–1.09)	1.78 (0.91–3.49)	N/A	0.96 (0.50–1.84)	4.08 (1.42–11.68)
Gift card	2.62 (2.21–3.10)	1.35 (1.12–1.62)	0.04 (0.00–0.35)	1.89 (1.51–2.35)	0.93 (0.72–1.22)	1.36 (1.05–1.75)	3.18 (1.29–7.87)
Insurance status							
Dependent				Reference			
Subscriber	1.37 (1.33–1.41)	1.21 (1.17–1.25)	1.07 (1.03–1.10)	1.05 (0.99–1.11)	1.10 (1.03–1.16)	1.01 (0.95–1.07)	1.62 (1.21–2.18)
Insurance coverage (per month)	1.25 (1.25–1.26)	1.25 (1.24–1.25)	1.23 (1.22–1.24)	1.23 (1.21–1.24)	1.15 (1.14–1.17)	1.15 (1.13–1.17)	1.21 (1.15–1.27)
Option to choose activity	1.49 (1.36–1.64)	0.25 (0.19–0.31)	0.74 (0.08–7.06)	N/A	N/A	N/A	N/A
Incentive amount (per \$25)	1.01 (0.99–1.03)	1.14 (1.12–1.16)	1.01 (1.00–1.02)	1.05 (0.91–1.18)	1.02 (0.99–1.05)	1.19 (0.98–1.22)	1.02 (0.94–1.11)

CI, confidence interval; HIA, health incentive account; HRA, health reimbursement account; HSA, health savings account; OR, odds ratio.

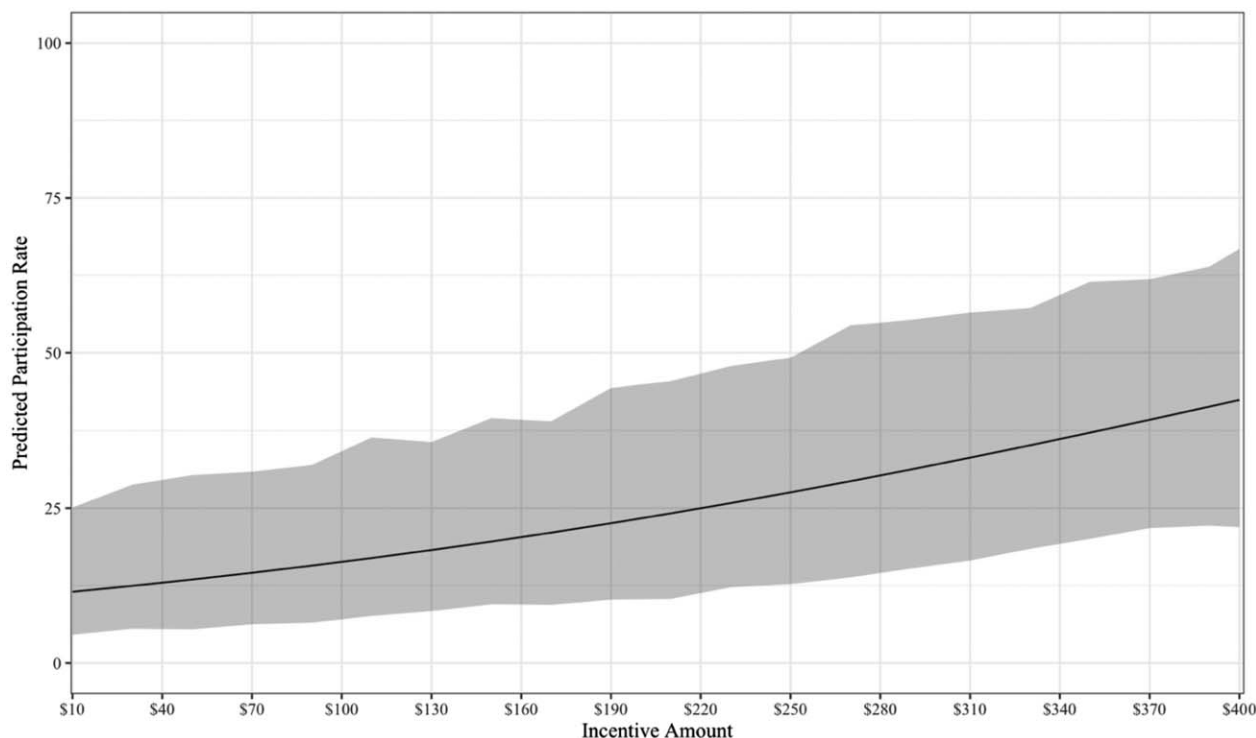


FIGURE 1. Predicted participation in biometric screening activity across range of financial incentive values. (Prediction generated using a fixed effect model over the range of incentives from \$10 to \$390. Confidence intervals (95% CIs) were generated using a bootstrapping method, with \$20 increments.)

long-term behavior change.^{23,24} Notably, some research suggests that financial incentives may be effective when multiple-episode activities are viewed as multiple single-episode activities (such as attending tobacco cessation classes).² Prior work has shown incentives be effective, when compared to usual care or no incentive, at improving health risk assessment completion,⁶ biometric screening participation,^{3,25} biometric outcomes,⁷ and weight loss,⁸ as well as cancer screenings.²⁶ There is evidence from a recent meta-analysis that the impact of incentives on behavior change may decrease as incentive values increase,² perhaps because larger incentive values may be interpreted by recipients as reflecting that the incentivized behavior is “risky” and a payment is thus needed to offset the risk.²⁷ Interestingly, one recent study found a rise in health risk assessment participation (1.58% for every \$20) similar to that which we observed for biometric screening (2% for every \$25).⁶ That we did not observe a similar pattern with the health survey in our analysis may be explained by the fact that we were studying not the first survey taken by an individual but subsequent ones, and that our model adjusted for a host of individual-level characteristics while theirs adjusted for more employer attributes (eg, workplace culture and communication strategy).⁶ Our current analysis builds on this evidence base by finding that, outside of biometric screenings, higher incentive values do not appear to drive greater participation in select employer-sponsored health activities.

That there was not greater participation across most activities as incentive values rose outside of biometric screenings suggests that employers may wish to limit incentive dollars spent trying to motivate employees and their dependents to achieve specific biometric outcomes, participate in a weight loss program, re-take a health survey, or complete a cancer screening. Offering

individuals a choice in activities—which may be tied with a “reward cap”—was also not found to be associated with greater odds of completing biometrics, perhaps because individuals choose activities that may be considered easier to complete, such as the health survey, which were observed to have the highest participation rates. As such, providing an easy or convenient, as well as personalized (eg, based on a cohort of employee or dependents’ health habits or history) but limited, scope of incentives may drive greater participation.

Of note, completing a cancer screening may be considered a multiple-step activity, requiring actions such as requesting time off from work, transportation to the screening site, undertaking the procedure, and following up results. As such, financial incentives may not be of high enough value to change cancer screening behaviors. It may also be that financial incentives are not enough to overcome personal and emotional issues related to cancer. Carefully crafted communications in combination with screening incentives may be required to increase participation.

Employees and dependents at increased health risk were less likely in this study to participate in employer-incentivized health activities. Prior research has shown that healthier employees are more likely to participate in wellness programs providing premium discounts for undergoing biometric screenings and reaching targets.²⁸ Our finding also builds on earlier work showing that most people who quit smoking would have quit for less than the incentive offered them, while most non-quitters reported that even large incentives would not have motivated them to quit.²⁹ As such, strategies beyond financial incentives, such as those that aim to build self-efficacy among individuals,³⁰ may provide benefit. Given our finding on the positive relation between primary care access and completion of health activities, fostering access to primary care

among employees and their dependents may drive important health benefits. Similarly, given that smoking was inversely associated with all health activities, prioritizing tobacco cessation among employees and their dependents may lead to higher downstream participation in other health-related activities. That poor health habits cluster and may be tied with depression, bi-directionally, screening for and addressing depression, and working to improve several health habits at once, may also be of value.^{31,32} Future research may also wish to evaluate the impact of incentivizing primary care visits and tobacco cessation, especially among those with low participation in the activities evaluated here, including men and adults who smoked, were overweight, or had poor sleep and low levels of physical activity.

Our finding that HSA contributions drive participation with incentivized activities are in alignment with earlier work showing that incentives tied to reducing patient-level health care expenditures may be more motivating than a cash incentive.³ It may also be that the structure of the HSA, allowing for portability and flexibility of use, for example, provides motivation to earn the incentive.

Our study has notable strengths and limitations. The study has a large sample size, from employers across a range of industries, and includes individuals with a breadth of different demographic, health, and behaviors. The depth of the health survey adjusts for a host of different potential confounders, permitting us to more closely identify the impact of incentive amount and type on participation in employer-sponsored activities. Limitations include that our study population was largely healthy, motivated, with strong social networks, and associated with large employers. There was an absence of information on race or ethnicity; however, the analysis included a host of other demographic and socio-economic characteristics, and there is no strong evidence at this point that race is a strong determinant of participating in incentivized activities. The analysis did not account fully for organizations' culture of health, communication strategy, and leadership, all of which are known to impact employee health. However, incorporation of the random effect for each employer in our hierarchical models allowed for variability and thus mitigated some of the impact of differences in employers' environments. Importantly, we did not look at individuals who were not offered any incentives, and therefore we cannot compare the impact of high or low incentives versus none on health activity participation. Without an experimental design and control, causality between incentives and participation in health-related activities cannot be concluded.

In conclusion, the likelihood of participation in employer-sponsored health activities depends on both the design of the incentive plan itself and the health and behaviors of eligible individuals. Higher incentive values may help drive participation in biometric screenings. Individuals who are obese, use tobacco, and lack access to primary care may be less likely to participate in employer-incentivized activities, and thus additional approaches may be needed to positively impact their health. To have the broadest impact on the health, employers should tailor their health-promotion activities to the unique characteristics of their population.

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