

Testing Novel Patient Financial Incentives to Increase Breast Cancer Screening

Elizabeth Levy Merrick, PhD, MSW; Dominic Hodgkin, PhD; Constance M. Horgan, ScD; Laura S. Lorenz, PhD; Lee Panas, MS; Grant A. Ritter, PhD; Paul Kasuba, MD; Debra Poskanzer, MD; and Renee Altman Nefussy, BA

The use of incentives to motivate individuals to engage in healthy behaviors and to utilize appropriate healthcare services is increasing. For example, a recent employer survey found that 61% of large employers offered financial rewards for individuals who participate in health management programs/activities.¹ Health plans and employers use various incentives, including gift cards, gym memberships, insurance premium reductions, symbolic items such as t-shirts, and recognition programs.² Incentives may be used to encourage a wide range of health behaviors, including preventive service utilization.

One possible target for incentives is breast cancer screening through routine mammography. Substantial numbers of eligible women do not get screened—even those with comprehensive private health insurance. According to the National Committee for Quality Assurance, in 2012, 70.3% of health maintenance organization (HMO) members aged 40 to 69 years and 66.5% of preferred provider organization (PPO) members aged 40 to 69 years in commercial plans met the criteria for the Healthcare Effectiveness Data and Information Set (HEDIS) breast cancer screening performance measure (mammogram within the past 2 years).³ At the time of this study, the American Cancer Society recommended yearly screening starting at age 40⁴ (recommendations have recently been modified in several respects). The US Preventive Services Task Force recommends biennial screening for women aged 50 to 74 years, with individualized decision making rather than routine screening for those aged 40 to 49 years.⁵

There are major knowledge gaps regarding the effectiveness of patient financial incentives for mammography. Prior studies often subsidized mammography costs, which is not applicable to women with insurance that covers screening with no cost sharing.⁶ Screening cost is even less relevant, currently given the requirement of the Affordable Care Act (ACA) that private health plans cover breast cancer screening mammography with no cost sharing for women 40 years or older.⁷

ABSTRACT

Objectives: To examine the effects of 3 types of low-cost financial incentives for patients, including a novel “person-centered” approach on breast cancer screening (mammogram) rates.

Study Design: Randomized controlled trial with 4 arms: 3 types of financial incentives (\$15 gift card, entry into lottery for \$250 gift card, and a person-centered incentive with choice of \$15 gift card or lottery) and a control group. Sample included privately insured Tufts Health Plan members in Massachusetts who were women aged 42 to 69 years with no mammogram claim in ≥ 2.6 years.

Methods: A sample of 4700 eligible members were randomized to 4 study arms. The control group received a standard reminder letter and the incentive groups received a reminder letter plus an incentive offer for obtaining a mammogram within the next 4 months. Bivariate tests and multivariate logistic regression were used to assess the incentives’ impact on mammogram receipt. Data were analyzed for 4427 members (after exclusions such as undeliverable mail).

Results: The percent of members receiving a mammogram during the study was 11.7% (gift card), 12.1% (lottery), 13.4% (person-centered/choice), and 11.9% (controls). Differences were not statistically significant in bivariate or multivariate full-sample analyses. In exploratory subgroup analyses of members with a mammogram during the most recent year prior to the study-defined gap, person-centered incentives were associated with a higher likelihood of mammogram receipt.

Conclusions: None of the low-cost incentives tested had a statistically significant effect on mammogram rates in the full sample. Exploratory findings for members who were more recently screened suggest that they may be more responsive to person-centered incentives.

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Take-Away Points

Financial incentives—especially “person-centered” (choice-based) incentives—might encourage breast cancer screening (mammograms). We examined the impact of 3 low-cost financial incentives for individuals (\$15 gift card; lottery for \$250 gift card; choice of \$15 gift card or lottery) on mammogram rates among women aged 42 to 69 years with no documented mammogram in the past 2.6 years.

- None of the incentives had a statistically significant effect on mammogram rates overall.
- Exploratory analyses suggest that person-centered incentives may be useful for certain subpopulations, or as part of multi-modal tailored interventions; further research is warranted.

Several studies have evaluated the effect of small gifts or retail/service discounts, with mixed results.^{6,8,9} A meta-analysis by Stone et al,¹⁰ which included 33 mammography studies, found that financial incentives were one of the most effective interventions; this included only 2 studies using financial incentives. Slater et al¹¹ tested an intervention of free mammography with a \$10 incentive versus without. Screening rates were extremely low but significantly higher with incentives. Preventive services rates were higher in a South African incentives program, including mammograms.⁹ Furthermore, no published studies have examined lottery-based incentives for mammography, although they can be effective for other health behaviors.¹²⁻¹⁴ Behavioral economics literature suggests that some individuals find lotteries more motivating than certain payments of equivalent value.⁴

Existing health incentive programs are frequently one-size-fits-all, offering, for example, all participants a certain type and value of gift card or a workplace team approach to improving physical activity. Yet, if an incentive program does not take into account individual variation in preferences and values, it will simply be based on what is believed to work on average. A framework has been developed on bringing principles of patient-centered care into the health incentives arena.¹⁵ “Person-centered” incentives offer individuals choice around the form of incentives. They could work better for several reasons: first, individuals could self-match to incentives that work best for them, based on preferences and self-knowledge unobservable in routine healthcare management. Also, having this choice could encourage target behaviors by engaging individuals more in decision making, calling attention to the issue, and/or increasing sense of self-efficacy. Person-centered incentives have not yet been studied in most health areas, including breast cancer screening.

In this study, we conducted a randomized controlled trial of 3 types of financial incentives—guaranteed gift card, lottery, and novel person-centered incentive (choice of guaranteed gift card or lottery)—to evaluate their impact on mammogram rates for routine breast cancer

screening among health plan members deemed overdue. We focused specifically on low-cost incentives that would be feasible for wide adoption if effective.

METHODS

Study Setting and Sample

The study was conducted at Tufts Health Plan, a New England health plan with commercial enrollment of about 650,000 mem-

bers. Tufts Health Plan is a network-model plan including HMO, PPO, and point-of-service (POS) products. Mammography was covered annually with no co-payment and with no referral required.

The sample was drawn from the population of privately insured female plan members in Massachusetts, aged 42 to 69 years at the time of the intervention, without a mammogram claim with the plan over the previous 2.6 years (the study-defined gap: January 2010 to August 2012). The sample selection starting point was members who had not met the criteria for the National Committee on Quality Assurance’s HEDIS performance measure for breast cancer screening (mammogram in past 2 years, eligible women aged 40 to 69 years).¹⁶ We further restricted the population to those in HMO, PPO, or POS products who maintained coverage and had no mammogram claim for an additional 7 months for sample selection. A sample of 4700 eligible members were then randomized to 4 study arms. The analytic sample totaled 4427 after accounting for undeliverable mail, mammogram receipt between sample selection and mailing of reminder letters, lack of coverage at time of mailing, or ineligibility based on claims not observed prior to selection.

Intervention

Members were randomized to 4 study arms: 3 intervention groups and a control group. All groups received a screening reminder letter from Tufts Health Plan, based on its standard practice, referencing American Cancer Society guidelines. The letter encouraged members to contact their provider with medical questions and to contact the plan for help finding a mammography facility. In the gift card group, the letter also informed members that if they obtained a mammogram within the following 4 months, they would receive a \$15 American Express gift card. Lottery group members were informed that if they obtained a mammogram within the following 4 months, they would be entered into a drawing for 1 of 5 \$250 gift cards. In the person-centered/choice group, members were informed

that if they obtained a mammogram within the following 4 months, they would receive their choice of a \$15 gift card or entry into the drawing for \$250 gift cards. For this group, a form was enclosed for members to indicate their preference. It stated that completing the form was not required; the default was random assignment to \$15 gift card or lottery. This was done to avoid creating a unique barrier for the person-centered/choice group. Incentives were mailed to intervention group members who received a mammogram, following claims observation (the only way the plan could easily verify utilization).

We also interviewed a small subset of members ($n = 23$) regarding their perspective on the incentives, using a semi-structured qualitative interviewing approach. Study members were mailed invitations to participate in telephone interviews, following informed consent. We incorporate some of their commentary as relevant into the Discussion section below.

The Brandeis University Committee for the Protection of Human Subjects approved this study.

Data and Measures

Data sources included health plan claims and eligibility data and, for the person-centered/choice group, preference forms. The outcome was mammogram receipt during the 4-month intervention period, determined by claims according to HEDIS specifications. We utilized claims data to calculate Charlson comorbidity index (CCI) scores for the 12 months prior to the study, using the mapping of Quan et al, from *International Classification of Diseases, Ninth Revision, Clinical Modification* codes.¹⁷ We identified the date of most recent mammogram claim prior to study, and depression diagnosis on claims within the past 12 months. Depression diagnosis was included in light of prior studies suggesting that it reduces the likelihood of mammography receipt.^{18,19} Eligibility data provided information on age, months of plan enrollment, product type, and 3-digit zip code of residence. We used Census data to construct proxy measures of education (percent of residents in 3-digit zip code with college completion) and mean annual household income, as well as density of in-network mammography facilities (number of facilities per 100,000 population).

Statistical Analysis

Chi-square tests and t tests were utilized to determine the significance of bivariate differences across study arms. Logistic regression was used to estimate the effect of incentive group assignment on mammogram receipt during the study, controlling for patient and 3-digit zip code

area characteristics. Covariates included age (50-59 years, 60-69 years, 40-49 years [reference group]); Massachusetts region of residence (reference group = Boston); prior mammogram (claim in 2009 [the most recent year before study-defined gap], prior mammogram before 2009, no prior mammogram claim [reference group]); whether the member was enrolled for only part of the intervention period; CCI score (1, 2 or greater, 0 [reference group]); proportion of residents in 3-digit zip code with college education; mammography facility density in 3-digit zip code; number of months enrolled in plan; any depression diagnosis on claims in the previous 12 months; and product type (PPO, POS, HMO [reference group]). Education and income variables were highly correlated; we describe both, but included only education in regression models.

RESULTS

Sample Description

Almost two-thirds of sample members were aged 50 to 69 years, and the mean age was 53 years (Table 1). Boston accounted for the largest number of members in a region. Mean annual household income in 3-digit zip code of residence was relatively high (over \$70,000). On average, across the zip code areas where these members live, more than 40% of residents had some college education. About 38% overall had a prior mammogram claim, and 22.5% of the entire sample had a mammogram claim in the most recent year prior to the study-defined gap (2009). This was a generally healthy sample, with low CCI scores (mean = 0.4, of maximum 29). However, 11% had a depression diagnosis on claims during the prior 12 months. In general, the sample had been enrolled in the plan for a lengthy period (median = 83 months). The only statistically significant difference across study groups was in months of enrollment (the mean ranged from 96.2 in the person-centered/choice group to 104.3 months in the control group; $P < .05$).

Mammogram Receipt, Bivariate Analyses

The percent of members receiving a mammogram during the study varied significantly by several characteristics (Table 2), including age, ranging from 10.3% of members aged 60 to 69 years to 14.3% of those aged 40 to 49 years ($P < .001$). Mammography rates were significantly higher for members in 3-digit zip codes where the mean annual household income was \$70,000 or higher ($P < .05$).

Prior mammogram history was significantly associated with receipt of mammogram during the study ($P < .001$). About 23% of members with a mammogram claim in the

Table 1. Description of Sample

Variable	Number of Members	% of Members in Sample
Number in analytic sample	4427	100.0
Incentives group assignment		
\$15 gift card	1100	24.8
Lottery	1118	25.3
Choice of \$15 gift card or lottery	1107	25.0
Control group	1102	24.9
Demographics		
Age, years		
40-49	1600	36.1
50-59	1918	43.3
60-69	909	20.5
Mean (SD) years of age	53.0 (6.71)	
Region of Massachusetts		
West	351	7.9
Central	741	16.7
Northeast	917	20.7
Southeast	1035	23.4
Boston	1383	31.2
Household income (in zip code of residence)		
Mean	\$70,829	
Median	\$68,235	
Education (mean percentage in zip code of residence)		
College	1785	40.3
High school completion only	2227	50.3
Less than high school	415	9.4
Health/medical care		
Mammogram receipt		
Had mammogram during 4-month intervention period	543	12.3
Had any prior mammogram claim with health plan	1689	38.2
Had mammogram claim in most recent year, prior to study-defined gap (2009)	998	22.5
Had prior mammogram claim, but only 2008 or earlier	691	15.6
No prior mammogram claims	2738	61.8
Health status		
Charlson comorbidity index score: mean (SD) ^a	0.4 (1.1)	
Depression diagnosis in claims, past 12 months	485	11.0
Health plan variables		
Months enrolled with THP: mean (SD)	100.6 (62.4)	
Months enrolled with THP: median	82.7	
Product type		
HMO	2472	55.8
PPO	1714	38.7
POS	241	5.4
Mammography facility density: mean number of facilities per 100,000 population (SD)	1.2 (0.5)	
Enrolled throughout study	4269	96.4

HMO indicates health maintenance organization; POS, point-of-service; PPO, preferred provider organization; THP, Tufts Health Plan.
^aIndex ranges from 0 to 29; higher score = greater comorbidity.

■ **Table 2.** Rates of Mammogram Receipt During Intervention Period, by Member and Plan Characteristics

Variable	Percent of Members Who Received Mammogram During Study	P ^a
Incentive group assignment		.63
\$15 gift card	11.7	
Lottery	12.1	
Choice of \$15 gift card or lottery	13.4	
Control group	11.9	
Demographics		
Age, years		.001
40-49	14.3	
50-59	11.5	
60-69	10.3	
Region of Massachusetts		.05
West	8.3	
Central	14.4	
Northeast	11.7	
Southeast	11.9	
Boston	12.8	
Household mean annual income (in 3-digit zip code)		<.05
Below \$70,000	11.3	
At least \$70,000	13.3	
College (proportion in 3-digit zip code)		.06
<40% in zip code completed college	11.7	
≥40% in zip code completed college	13.9	

(continued)

most recent year prior to study-defined gap (2009) received a mammogram during the study. By contrast, the mammogram receipt rate was 17% among those with a prior mammogram recorded only in 2008 or earlier, and 7% among those with no prior mammogram claim. Product type, density of mammography facilities, and enrollment throughout study were not significantly associated with mammogram receipt.

Multivariate Analyses

Table 3 shows the results of logistic regression analysis predicting mammogram receipt, for the full sample. Incentive group variables are not significant predictors, nor are there significant differences among them, given that their 95% confidence intervals overlap. Older age group coefficients are significant and negative (odds ratios [ORs], 0.75 and 0.71; $P < .01$), relative to sample members aged 40 to 49 years. Having a mammogram in the most recent year (2009) before the screening gap was strongly predictive of mammogram receipt during the study (OR, 4.04; $P < .0001$).

Having a prior mammogram, but only before 2009, was also a positive predictor (OR, 2.82; $P < .0001$). Longer plan enrollment was negatively associated with mammogram receipt (OR, 0.998; $P < .05$).

In an exploratory subgroup analysis, we estimated separate regression models for members with, versus without, prior mammogram in the most recent year (2009) before the screening gap (data not shown). This was to allow for the possibility that independent variables could have a different effect on the recently screened subgroup possibly most likely to be amenable to mammogram receipt. Among members with a recent prior mammogram (2009), those in the person-centered/choice group had a significantly higher predicted probability of mammogram receipt during the study relative to controls (26.7% vs 18.9%; $P < .05$). There was no significant difference in predicted probability of mammogram receipt for \$15 gift card and lottery group members relative to controls. Among members without a recent prior mammogram, none of the incentive groups had signifi-

Table 2. Rates of Mammogram Receipt During Intervention Period, by Member and Plan Characteristics (continued)

Variable	Percent of Members Who Received Mammogram During Study	P ^a
Health/medical care		
Mammogram receipt prior to study		<.001
Had mammogram claim in most recent year, prior to study-defined gap (2009)	23.0	
Had mammogram claim, but only 2008 or earlier	16.8	
No prior mammogram claim	7.2	
Health status		
Charlson comorbidity index score ^b		.41
0	12.0	
1	14.1	
≥2	7.6	
Depression status		
Had depression diagnosis in claims, past 12 months	13.2	.51
No depression diagnosis in claims, past 12 months	12.2	
Health plan variables		
Product type		.30
HMO	12.9	
PPO	11.4	
POS	11.6	
Mammography facility density (facilities per 100,000 population)		
<1.2 facilities per 100,000 in zip code	12.2	.82
≥1.2 facilities per 100,000 in zip code	12.4	
Enrollment status		
Enrolled throughout study	12.4	.07
Not enrolled throughout study	7.6	
Months enrolled with THP during study:		
<80 months enrolled	12.5	.62
≥80 months enrolled	12.0	

HMO indicates health maintenance organization; POS, point of service; PPO, preferred provider organization; THP, Tufts Health Plan.
^aChi-square or *t* tests conducted as appropriate for each variable. Sample size = 4427.
^bHigher score indicates greater comorbidity.

cantly different predicted probabilities of mammogram receipt, compared with controls.

Incentive Preferences in Person-Centered/Choice Group

Among all members in the person-centered/choice group, only 8% completed and returned the preference forms; 6% preferred the \$15 gift card and 2% preferred the lottery (data not shown). However, among the subset who actually received a mammogram during the study, a much larger percentage (38%) returned the preference form: 33% preferred the \$15 gift card and 5% preferred the lottery.

DISCUSSION

This study found that none of the 3 low-cost incentive approaches were effective overall in increasing screening mammogram receipt among eligible women aged 42 to 69 years who had not had a mammogram in the prior 2.6 years. However, in exploratory analyses, person-centered (choice-based) incentives did have a positive impact on screening among the subset with a mammogram during the most recent year prior to the study-defined screening gap. The \$15 gift card and the lottery approach did not have an impact even in this subgroup.

■ **Table 3.** Results of Logistic Regression Analysis Predicting Mammogram Receipt: Full Sample

Independent Variable	Estimate	Odds Ratio	95% CI	P
Intercept	-2.36			<.0001
Study group (reference = control group)				
\$15 gift card	-0.04	0.96	0.74-1.26	.78
Lottery	-0.05	0.95	0.73-1.24	.73
Choice of \$15 gift card or lottery	0.13	1.14	0.88-1.48	.32
Age, years (reference = 40-49)				
50-59	-0.29	0.75	0.61-0.92	.01
60-69	-0.34	0.71	0.54-0.93	.01
Massachusetts region of residence (reference = Boston)				
West	-0.32	0.73	0.47-1.13	.16
Central	0.14	1.15	0.88-1.51	.30
Northeast	-0.05	0.95	0.71-1.27	.72
Southeast	-0.01	0.99	0.75-1.29	.93
Prior mammogram receipt (reference = none in claims)				
Prior mammogram in most recent year, before study-defined gap (2009)	1.40	4.04	3.27-4.99	<.0001
Prior mammogram, before 2009	1.04	2.82	2.19-3.64	<.0001
Enrolled for only part of study period	-0.50	0.61	0.33-1.12	.11
Charlson comorbidity index score (reference = 0) ^a				
1	0.15	1.17	0.89-1.52	.24
≥2	-0.09	0.91	0.64-1.31	.57
Proportion of residents in zip code with college education	0.54	1.72	0.80-3.72	.17
Mammography facility density	-0.01	0.99	0.81-1.21	.94
Months enrolled in plan	-0.002	0.998	0.996-1.00	.02
Depression diagnosis (recorded on claim, previous 12 months)	-0.05	0.95	0.71-1.28	.74
Product type (reference = HMO)				
PPO	-0.13	0.88	0.72-1.08	.21
POS	0.03	1.03	0.67-1.58	.90

HMO indicates health maintenance organization; POS, point-of-service; PPO, preferred provider organization.
^aHigher score indicates greater comorbidity.

There are several possible factors contributing to the lack of overall effect. First, it may be that higher-cost incentives are required, especially in a relatively high-income population. This privately insured group lived in zip codes with relatively high income and education levels. Second, targeting incentives only to members who had not been screened in 2.6 years likely represents a harder-to-influence group than, for instance, offering the incentive to everyone eligible. Furthermore, updated and sometimes conflicting guidelines have been issued regarding mammography for breast cancer screening.²⁰ The media has widely covered this controversy, especially relating to women in their forties. This backdrop of confusion, anxiety, and strong feelings^{20,21} might reduce responsiveness to incentives.

The finding that the person-centered/choice incentive did increase likelihood of screening among women with a more recent mammogram is thought-provoking, though only exploratory in nature. Members of this group may have been procrastinating or simply not getting around to being screened, rather than having strong attitudinal or other barriers. The offer of a small incentive might have gotten their attention. Indeed, several members commented along these lines in qualitative interviews. For example, one member stated, "I knew I had to get it [a mammogram] anyway, then I said, 'Oh, okay, this is it. I'm just gonna make the appointment.'" Another member commented regarding the incentive amount, "It was negligible... It [that an incentive was offered] was more the point."

The fact that in the subgroup with more recent screening history, only the person-centered/choice approach had an impact provides partial support for the hypothesis that this approach may be more effective than one-size-fits-all incentives. This would of course need to be confirmed in future studies. The difference in findings for the overall sample and more recently screened members underlines possible advantages of tailoring incentives. This is consistent with previous findings that screening barriers vary by prior screening status and interventions should be tailored accordingly.²² However, this must be done consistent with ACA requirements, which may restrict ability to incentivize only a subgroup of screening-eligible members based on screening history. In any case, many organizations would be concerned about “rewarding” only individuals who had not regularly obtained screening—including concerns about perverse incentives—and would prefer to incentivize all eligible members. One possibility might be to offer incentives to all eligible members (to include a broader segment of members who might be most amenable to modest incentives), while adding other types of interventions for those without a recent history of screening. These additional interventions might include personal phone calls, educational interventions, or personal physician-signed letters.²³⁻²⁶ This stepped approach (“incentives plus”) could be a focus of future research.

Among those offered a choice, the gift card was considerably more popular than the lottery option, and many did not express a preference. In future research, it would be valuable to examine person-centered incentives in different contexts and populations, identifying the most appealing choice of incentives within budget and administrative constraints.

Limitations

Study limitations include the fact that the HEDIS mammography measure includes some mammograms performed for diagnostic rather than screening purposes. Mammography rates could therefore be somewhat overstated, but this would be true across study arms. Also, we could only observe screening through claims data at this health plan, not elsewhere. Another limitation is that immediate incentive delivery was infeasible because screening was ascertained through claims. Behavioral economics emphasizes that incentives are more salient, thus more effective, when paid very soon after completion of targeted behavior. However, when adherence monitoring relies on administrative data, rapid payment may be infeasible. The same approach taken here might have more impact if incentives were delivered within organizations that could

promptly identify screening (eg, mammography facilities, medical groups with electronic health records).

CONCLUSIONS

Study results indicate that, at least in this privately insured sample, very low-cost financial incentives may not be effective overall for health plan members overdue for mammograms. However, exploratory analyses found that for a recently screened subgroup likely to be more amenable to screening, person-centered (choice-based) incentives did have an impact. Further research is indicated regarding higher-value incentives, testing modest incentives in a lower-income population, and further exploring person-centered incentives.

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Author Affiliations: Brandeis University, Institute for Behavioral Health, Heller School for Social Policy and Management (ELM [formerly at Brandeis University], DH, CMH, LL, LP, GR), Waltham, MA; Tufts Health Plan (PK, DP, RAN), Watertown, MA.

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Address correspondence to: Dominic Hodgkin, PhD, Brandeis University, Institute for Behavioral Health, Heller School for Social Policy and Management, 415 South St, Mailstop 035, Waltham, MA 02454-9110. E-mail: hodgkin@brandeis.edu.

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