Boosting Workplace Wellness Programs With Financial Incentives

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ABSTRACT

OBJECTIVES: Using a large natural experiment among 39 employers, we examined the effect of adding financial incentives to workplace wellness programs.

STUDY DESIGN: The 39 study employers used the same national insurer to administer their wellness programs, allowing us to observe preventive and health-promoting behaviors before and after financial incentives were implemented. Fifteen treatment employers introduced financial incentives into their wellness programs over 3 years, providing variation in the start dates, whereas 24 employers did not introduce financial incentives. These incentives were attached to specific health actions, including annual preventive visits, biometric screening, and selected screening services for diabetes, heart disease, and cancer.

METHODS: Using multivariate regression, we examined employees and their adult dependents who had insurance coverage for at least 12 months and were offered a wellness program. Outcomes include utilization of annual preventive visits, low-density lipoprotein cholesterol testing, fasting blood sugar (FBS) testing, and breast, cervical, and colon cancer screens.

RESULTS: Financial incentives increased annual preventive visits by 7.7 percentage points, cholesterol testing by 7.9 percentage points, and FBS testing by 7.1 percentage points (P <.05 for each). Compared with baseline rates, these changes represent significant improvements of 21% to 29%. Increases for cancer screening were smaller: 2.7 percentage points for mammograms and 2.2 percentage points for colorectal cancer screening, which correspond to increases over baseline rates of 5.5% and 7.3%, respectively. We did not detect an impact on cervical cancer screening.

CONCLUSIONS: The addition of financial incentives to wellness programs increases their impact on selected preventive care services.

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Several strategies have been suggested to promote use of preventive services, including expanded incentives and greater involvement of employers.[1] Under the Affordable Care Act (ACA), new incentives were created to promote employer wellness programs and encourage employers and employees to support healthier workplaces. The law enables employers to offer financial rewards to employees who participate in wellness programs or meet certain health-related targets.[2] Increasingly, employers offering wellness programs are incorporating these financial incentives with the belief that they will boost the impact of their programs; however, little is known about the effectiveness of these incentive programs.

In 2015, 14% of all employers, half of employers with 200 or more employees, and two-thirds of employers with 1000 or more employees offered wellness programs.[3,4] These programs include health screenings that collect self-reported health risk information and biometric data from an in-person health examination conducted by a medical professional.[1] Many employers incorporate financial incentives into their wellness programs. Thirty-two percent of employers with biometric screening programs incorporate a financial incentive for employees who complete the biometric screens; among large employers (≥200 employees) with wellness programs, 56% do so.

The use of incentives in conjunction with wellness programs is largely driven by employers' beliefs that programs with incentives are somewhat (64% of employers who use incentives) or very effective (27%). Incentives are disbursed in a variety of ways, including premium discounts, waivers of cost sharing, or additional covered benefits. In practice, typical incentives range from $150 to $500, while the average annual premium for single coverage is $6251.[1]

Despite their widespread use, systematic evidence about the effectiveness of wellness programs with financial incentives is lacking. One literature review concluded that incentives were effective at increasing participation in self-reported health assessments, but was unable to assess their impact on the completion of preventive screenings.[5] In randomized controlled settings,

financial rewards not paired with wellness programs have been effective at increasing participation in health risk assessment completion,[6,7] smoking cessation,[8] weight loss,[9,10] and chronic disease management.[11-13] Randomized trials provide significant proof of concept that targeted financial incentives can be effective; however, as with all randomized trials in which participation requires an opt-in consent, it is difficult to assess generalizability, as many such trials only enroll 10% to 15% of potentially eligible individuals and participants likely differ from those who do not volunteer to participate on unmeasured characteristics, such as motivation.

TAKEAWAY POINTS

The addition of financial incentives to workplace wellness programs has a notable impact on whether individuals receive preventive care services. Modest financial incentive programs in workplace settings can be effective; however, individuals who did not receive services in the past year respond less than others. Because targeting financial incentives to selected subgroups is challenging within the Affordable Care Act framework, wellness programs may require additional outreach efforts.

The current study takes advantage of a sizeable natural experiment in which 39 large employers within the United States initially offered wellness programs without financial incentives. Over time, 15 of them added financial incentives and the remaining 24 did not. Financial incentives were attached to specific health actions, including annual preventive visits, biometric screening, and selected screening services for diabetes, heart disease, and cancer. Employees received personalized scorecards, both online and mailed to their home, to help them track their progress toward receiving incentives, which were awarded as premium reductions, cash, or gift cards. To our knowledge, ours is the largest study of wellness programs with financial incentives to date and includes over 1.4 million insured enrollees. A key strength of our design is the ability to examine pre-post effects of the introduction of incentives with a contemporaneous wellness program control group that did not introduce incentives.

In addition, we considered whether the financial incentive effect is greatest for nonregular users of preventive services or for users who had received the service in the prior year. The financial incentive program is designed to be broad-based rather than targeted. Nonetheless, a program is more economically efficient if it entices new or nonregular users of prevention services rather than rewarding individuals who likely would have received the services in any case.

METHODS

The Wellness Program

The wellness program we studied allows enrollees to earn dollars or points for adopting better health behaviors. Enrollees are provided a personalized scorecard, which includes health actions that were completed, as well as those that were not, as an aid to maintain or improve their health behaviors. The points earned for various activities can be converted into cash rewards, premium reductions, or gift cards in a manner set by the employer. We examined clinical screening outcomes that can be measured via claims data. The incentive for any given clinical screening was the same for all covered individuals within an employer, but could vary across employers. Incentive amounts ranged from $0 to $80 for preventive visits, $0 to $100 for low-density lipoprotein cholesterol (LDL-C) tests, $0 to $100 for blood sugar ascertainment with glycated hemoglobin, and $0 to $75 for cancer screening tests. The maximum annual award that an individual could earn for receiving all of these services ranged from $250 to $900 across employers. By contrast, employers without financial incentives in their wellness program promoted and measured the same outcomes, but employees did not receive an explicit financial reward.

Study Setting and Employers

All employers used the same insurer to administer their wellness programs, allowing us to observe preventive and health promoting behaviors before and after financial incentives were implemented. The 15 treatment employers introduced financial incentives into their wellness programs between 2010 and 2012, providing variation in the start dates. Individuals' outcomes were observed as long as they were covered by the insurer. In many cases, the insurer was the sole provider of coverage for the employers. The staggered implementation by employer is illustrated in the **Figure**. Our data span January 2009 through December 2013.

Data and Study Variables

We used de-identified healthcare claims and health plan enrollment and wellness program data from the insurer. Outcome variables were obtained from claims data based on standard claims codes. These include utilization of annual preventive visits, LDL-C tests, fasting blood sugar tests, and breast, cervical, and colon cancer screens. Coding details are provided in **eAppendix Table 1** [eAppendices available at **ajmc.com**]. We were able to determine chronic conditions from claims, but not body mass index (BMI). From enrollment data, we obtained individual age, gender, dates and type of coverage, and whether the insured member was an employee or adult dependent. Insurance enrollment data typically have limited demographic information. However, through a vendor, the insurer obtained imputed information on race, ethnicity, and education of covered members, all potentially important factors that could influence an individual's propensity to seek preventive care.

FIGURE. Staggered Implementation by Employer

		2009	2010	2011	2012	2013
Wellness + Enhanced Financial Incentives	Employer 1	Standard wellness	Wellness + incentives	Wellness + incentives	Wellness + incentives	Wellness + incentives
	Employer 2	Standard wellness	Wellness + incentives	Wellness + incentives	Wellness + incentives	Wellness + incentives
	Employer 3		Standard wellness	Wellness + incentives	Wellness + incentives	Wellness + incentives
	Employer 4	Standard wellness	Standard wellness	Wellness + incentives	Wellness + incentives	Wellness + incentives
	Employer 5		Standard wellness	Wellness + incentives	Wellness + incentives	Wellness + incentives
	Employer 6	Standard wellness	Standard wellness	Standard wellness	Wellness + incentives	Wellness + incentives
	Employer 7		Standard wellness	Standard wellness	Wellness + incentives	Wellness + incentives
	Employer 8	Standard wellness	Standard wellness	Standard wellness	Wellness + incentives	Wellness + incentives
	Employer 9		Standard wellness	Standard wellness	Wellness + incentives	Wellness + incentives
	Employer 10		Standard wellness	Standard wellness	Wellness + incentives	Wellness + incentives
	Employer 11	Standard wellness	Standard wellness	Wellness + incentives	Wellness + incentives	Standard wellness
	Employer 12	Standard wellness	Standard wellness	Wellness + incentives	Wellness + incentives	
	Employer 13		Standard wellness	Standard wellness	Wellness + incentives	Standard wellness
	Employer 14		Standard wellness	Standard wellness	Wellness + incentives	
	Employer 15	Standard wellness	Standard wellness	Wellness + incentives		
Standard Wellness	24 employers	Standard wellness	Standard wellness	Standard wellness	Standard wellness	Standard wellness

Population

Our sample was restricted to adult (aged 18-64 years) employees who were covered by the insurer administering the wellness programs for at least 12 continuous months (1 full plan year). Spouses and domestic partners were included if they, in addition to the employee, were offered the wellness program. All sample members were included in models that examined annual preventive visits, LDL-C screening, and fasting blood sugar screening. Different subgroups were examined for each preventive screening (ie, women aged 40-64 years for breast cancer, women aged 18-64 years for cervical cancer, and men and women aged 50-64 years for colorectal cancer). Individuals older than 64 years were excluded because they were eligible for Medicare coverage. **eAppendix Figure 1** illustrates our sample construction.

Statistical Approach

Our study employed a panel-data difference-in-differences (DID) design in which 39 employers offered wellness programs without financial incentives at baseline, 15 employers added financial incentives and the remaining 24 comparison employers did not.[14] This is also commonly referred to as a stepped-wedge design. Because all employers used the same national insurer to administer their wellness programs, we observed preventive and health promoting behaviors before and after financial incentives were implemented based on common data collection.

The effect of the incentive is estimated for each preventive service outcome using variations on equation 1, which reflects a staggered DID or stepped-wedge regression model. Equation:

$$PrevServ_{it} = \beta_0 + \beta_1 Treatment_{it} + \beta_2 X_i + \beta_3 HealthPlan_{it} + \gamma_j Employer + \gamma_t Year + \varepsilon_{it}$$

The observations are at the individual-year level, where i denotes the individual and t denotes the year. The dependent variable, $PrevServ_{it}$, is an indicator variable that equals 1 if the relevant preventive service was received by individual i in year t. X represents a vector of individual covariates, including age; gender; imputed race, ethnicity, and education; whether the covered individual was an employee or dependent; whether the individual had asthma, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, diabetes, or hypertension; and whether the individual was offered a high-deductible health plan with a health savings account or health reimbursement arrangement. Year and employer indicators are also included. Including employer indicators allows us to control for the average differences across employers in any time-invariant observable or unobservable employer-level predictors. The error term is represented by ε.

Our key independent variable is represented in equation 1 by "*Treatment*." The variable *Treatment* is a binary variable that takes the value 1 in any year that the individual is offered a wellness plan with incentives and 0 in all other years. Controlling for individual and other plan characteristics, the coefficient on this variable is

interpreted as the average change across enrollees in employers with financial incentives relative to the average change for those with standard wellness programs. Standard errors were clustered by employer, and all reported *P* values were for 2-tailed statistical tests.

We estimated multivariate linear probability models to isolate the degree to which offering a wellness program with financial incentives in a given year influenced the probability of an employee receiving a selected preventive visit, cancer screening test, or blood test in that year relative to employees of employers that offered wellness programs without financial incentives. We selected linear probability models because their coefficients can be interpreted as marginal effects of treatment and because our treatment variable was binary.

In order to identify whether the program effect was greater for nonregular users of services versus users who had recently received the service, we repeated our models adding an indicator for receipt of the service in the prior year and its interaction with the incentive indicator. Although we used all years of data for each employer, we restricted the models to individuals present in the data for 24 continuous months. Introducing a lagged dependent variable (ie, prior receipt) could lead to bias if there is serial correlation in unobserved individual-level factors and it is greater or lesser at employers offering financial incentives.

We addressed observable differences between treatment and comparison employers with treatment-on-the-treated propensity score weighting. Our outcome models were weighted using inverse probability weights obtained from a series of propensity score models. The weighting models were estimated using boosted regression, as implemented in the "Toolkit for Weighting and Analysis of Nonequivalent Groups" package in R,[15] which predicted the probability of being a treated observation in the year before those employers added financial incentives based on on age, gender, race and ethnicity, Census region, urban location, chronic conditions, and offer of high-deductible coverage with a health savings or health reimbursement account. Because the study used a DID comparison design, we weighted both treatment and control observations for each year to match the baseline year for the treatment group in order to balance the distribution of covariates both over time for each treatment group and between the treatment groups.[16] This allowed us to control for any compositional changes over time in the treatment or comparison group as well as provide appropriate weights to observations in the control group. Separate weighting models were run for each treatment group by year combination. The high-deductible health plan variable was not balanced by weighting in all years and was removed from 6 of the 11 propensity score models, but was included in all outcome models. Weighting models were re-estimated for each of the cancer screening eligibility subgroups defined by age and gender. The propensity score weights were applied in calculating all reported results except sample sizes.

RESULTS

Study Population and Covariate Balance

The characteristics of individuals in the treated employers were substantively similar to those in the control employers in the baseline year after weighting (**Table 1**). Baseline rates for receiving a full biometric tests and breast cancer screening were 3 to 5 percentage points lower in the employers that did not introduce incentives. Thus, introducing financial incentives does not appear to be a selected response by employers to low baseline rates of targeted services. Covariate balance from propensity score weighting is typically measured by standardized mean differences (**eAppendix Figure 2**). The balance was successful; among 365 comparisons, all were below 0.12 and only 4 were greater than 0.10.

Preventive Visits and Blood Tests for Disease Screening

Baseline rates for preventive visits were an average 36.1% in the treatment group. In years when employers offered a wellness program with financial incentives, members were 7.7 percentage points more likely to have wellness visits ($P < .05$) (**Table 2**), a 21.3% increase. They were also 7.9 percentage points more likely to have cholesterol screenings and 7.1 percentage points more likely to have blood sugar tests for diabetes ($P < .05$). Results for the blood sugar and LDL-C tests were similar, and 95% of members who received the LDL-C test also received a blood sugar screening test. When considered as a set, the financial incentives resulted in 8.1% more individuals having all 3 biometric components (ie, a preventive visit and the 2 blood screenings) over a baseline rate of 19.0%, a 42.6% increase over baseline. Full regression results are shown in **eAppendix Table 2**.

Cancer Screening Tests

The wellness program with financial incentives was associated with smaller increases in cancer screening rates (Table 2). Financial incentives were associated with a 2.7 percentage-point increase in mammography ($P < .05$) and a 2.2 percentage-point increase in colorectal cancer screening ($P < .01$). Relative to baseline rates in the treatment group, these changes represent 5% to 7% improvements in screening rates. No differences were detected for cervical cancer screening rates over time in employers who offered incentives compared with those who did not.

Differences by Prior Service Use

Individuals who sought services in a given year were 17% to 30% more likely than others to receive them in the following year, controlling for other characteristics (**Table 3**). Estimates of the incentive program's effect by prior receipt of service are mixed, but 2 results emerge. The program had a significantly greater impact on receiving the full biometric screen for those who had previously had one, by 6.1 percentage points ($P < .05$). In contrast, for the cervical and breast cancer screening tests, the program had a

TABLE 1. Descriptive Characteristics for Full Sample at Baseline

	Comparison Employers: Wellness Only (weighted mean[a])	Treatment Employers: Wellness and Financial Incentives (mean)	Residual Standard Deviation	Standardized Difference
Number of observations, unweighted	241,947	160,789		
Age, years	44.1	44.3	10.52	0.009
Female (%)	49.3	49.9	0.50	0.011
Education (%)				
Missing	2.7	2.6	0.16	−0.004
High school or less	26.3	25.5	0.44	−0.018
Some college	52.0	51.6	0.50	−0.009
College or higher	19.0	20.2	0.40	0.032
Offered high-deductible insurance plan (%)	69.7	70.4	0.46	0.015
Race/ethnicity (%)				
Missing[b]	6.8	6.9	0.25	0.004
African American	8.2	7.9	0.27	−0.013
Hispanic	9.0	8.7	0.28	−0.011
Asian	4.8	5.2	0.22	0.020
European	71.2	71.3	0.46	0.002
Chronic conditions (%)				
Asthma	3.6	3.5	0.19	−0.003
Coronary artery disease	2.4	2.3	0.15	−0.004
Chronic heart failure	0.43	0.41	0.06	−0.004
COPD	0.93	0.90	0.10	−0.003
Diabetes	7.6	7.5	0.26	−0.003
Levels of outcomes at baseline (%)				
Preventive visit	31.9	36.2	0.47	0.090
LDL-C test	29.7	33.0	0.46	0.071
Blood sugar test	35.1	37.5	0.48	0.050
Full biometric: preventive visit, LDL-C test, and blood sugar test	15.7	19.0	0.38	0.086
Cervical cancer screening	38.2	42.3	0.49	0.084
Breast cancer screening	44.5	49.4	0.50	0.098
Colorectal cancer screening	29.4	30.1	0.46	0.014

COPD indicates chronic obstructive pulmonary disease; LDL-C, low-density lipoprotein cholesterol.
[a]Reweighted to the treated group.
[b]Includes a small number of Native Americans.

greater effect on individuals who did not receive screening in the prior year, meaning that here the incentives had a stronger effect on nonregular service users. The effect of the incentive on nonregular users was 3.1% (P <.01) for cervical cancer and 4.6% (P <.01) for breast cancer. We did not detect different impacts of incentives on colorectal cancer screening by prior year receipt.

For all preventive tests, we found a strong association between having the test in the prior year and repeating it, independent of the incentive. Although federal screening recommendations do not support annual cancer screens for all individuals, we note that our data include a mix of individuals for whom an annual cancer screen would not be recommended and others who may have had positive results in the past and for whom annual exams are recommended.[17-19]

DISCUSSION

Within a single national insurer, workplace wellness programs paired with financial incentives were associated with increased utilization of targeted preventive services relative to worksite

TABLE 2. Treatment Effect of Wellness Program With Incentives on Receiving Services[a,b]

	Preventive Visit	Cholesterol Test	Blood Sugar Test	Full Biometric: Preventive Visit and Blood Tests	Cervical Cancer Screen	Mammogram	Colorectal Cancer Screen
Wellness with incentives	0.077** (0.024)	0.079** (0.028)	0.071* (0.024)	0.081** (0.025)	0.014 (0.009)	0.027* (0.010)	0.022** (0.006)
Effect as % of treatment group baseline rate	21.3	23.9	18.9	42.6	3.3	5.5	7.3
Observations	1,592,958	1,592,958	1,592,958	1,592,958	886,778	641,478	564,139

"*" indicates $P < .05$; "**" indicates $P < .01$; "***" indicates $P < .001$.
[a]Coefficient of wellness with incentive indicator in multivariate linear models (propensity score weighted) controlling for age, gender, imputed race/ethnicity and education, chronic condition (asthma, diabetes, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, and hypertension), employee versus dependent status, employer, and calendar year.
[b]Standard errors clustered at the employer level and shown in parentheses.

TABLE 3. Impact of a Wellness Program With Incentives on Receiving Services, by Receiving Service in Prior Year or Not[a,b]

	Preventive Visit	Cholesterol Test	Blood Sugar Test	Full Biometric Preventive Visit & Blood Tests	Cervical Cancer Screen	Mammogram	Colorectal Cancer Screen
Received service in prior year	0.293*** (0.008)	0.291*** (0.012)	0.292*** (0.011)	0.252*** (0.012)	0.284*** (0.008)	0.305*** (0.004)	0.166*** (0.009)
Incentive program	0.061 (0.036)	0.066 (0.043)	0.061 (0.037)	0.061 (0.037)	0.031** (0.011)	0.046** (0.013)	0.014 (0.007)
Incentive program, received service in prior year	0.011 (0.010)	0.019 (0.011)	0.011 (0.009)	0.061*** (0.014)	−0.029** (0.009)	−0.036*** (0.010)	−0.009 (0.010)
Observations	842,447	842,447	842,447	842,447	513,130	403,411	367,337

"*" indicates $P < .05$; "**" indicates $P < .01$; "***" indicates $P < .001$.
[a]Coefficients of indicators for receipt of service in prior year, wellness with incentives, and the interaction of receipt of service and wellness with incentives in multivariate linear models (propensity score weighted) controlling for age, gender, imputed race/ethnicity and education, chronic condition (asthma, diabetes, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, and hypertension), employee versus dependent status, employer, and calendar year. Observations with no prior year of data are excluded.
[b]Standard errors clustered at the employer level and shown in parentheses.

wellness programs without incentives. Increases ranged from 3% to 42% over baseline rates. The largest impacts were seen for receiving a full biometric screen (ie, preventive visit and 2 lab tests), as our study found that adding financial incentives to wellness programs nearly doubled the number of individuals receiving a full biometric screening exam. These results represent the first national data on the impact of adding financial incentives to wellness programs affecting all employees within a set of employers. Although data from randomized trials show significant impacts of financial incentives on health behaviors for self-selected populations of participants, these data speak to the impact across entire employer populations of implementing wellness programs with financial incentives geared toward increasing prevention and screening.

Efficiency and equity are potential challenges in wellness programs with financial incentives. Rewarding individuals who would receive services regardless of a financial reward is not an efficient use of resources, yet under the ACA, wellness programs implemented in employer settings are required to apply to all "similarly situated" employees and therefore do not allow programs to target just those individuals who would otherwise be unlikely to get a given program. Given this, it is interesting that we found that the incentive effect was similar for individuals who did or did not receive preventive visits, screening blood tests, and colorectal cancer screens in the past year and that it was more effective for individuals receiving prior-year services for the full biometric test. Thus, the financial incentives were not more systematically effective at bringing in "new" or infrequent users than "prior" or more frequent users for these services. This was not the case for cervical and breast cancer, where those who had not received screening in the prior year were more likely to be impacted by the reward.

Limitations

Our study has several limitations. First, we evaluated the incentive programs as they were implemented, which resulted in a limited range of incentive values. We cannot assess the impact of larger incentives. Second, we have taken several steps to mitigate potential selection bias on observed characteristics, yet we cannot rule out bias on unobserved characteristics that would occur if

the trends in targeted service use systematically differed for the treatment versus comparison groups for reasons other than the addition of financial incentives. We were, however, able to rule out that employers with lower baseline use of targeted services were more likely to add financial incentives to their wellness programs. Third, because our analysis required at least 12 months of continuous enrollment, we lost members to attrition. If sicker employees were more likely to leave one set of employers than the other, this could bias our results. We addressed this issue partially through the use of propensity score weighting. Fourth, claims data have been found to underreport preventive services relative to medical records.[20] Because our sample was composed of privately insured, continuously enrolled individuals, we believe this problem is attenuated. Moreover, any measurement error caused by our claims data should not differ systematically across the treatment and comparison employers or bias our results. Despite being the largest of its kind, the current study is limited to 15 intervention and 24 comparison employers, limiting the generalizability of the results. Finally, we were not able to assess impacts on health outcomes, as these were not included in the claims data.

CONCLUSIONS

We find that the addition of financial incentives to workplace wellness programs has a statistically significant impact on the receipt of targeted preventive care services. Although the magnitude of the incentives evaluated in this study were well below the federally determined maximum of 30% of premiums for outcomes-based incentives, the effectiveness of these programs signals that modest financial incentive programs in workplace settings can drive health behavior in desired directions. Because targeting financial incentives to particular groups, such as individuals who have not had preventive services in the past year, is challenging within the ACA framework, wellness programs may need to rely on other outreach efforts. Overall, our results highlight the potential promise of ACA-induced movement toward greater use of wellness programs in employment-based settings when they are paired with financial incentives. ■

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REFERENCES

1. Fineberg HV. The paradox of disease prevention: celebrated in principle, resisted in practice. *JAMA*. 2013;310(1):85-90. doi: 10.1001/jama.2013.7518.
2. Madison K, Schmidt H, Volpp KG. Smoking, obesity, health insurance, and health incentives in the Affordable Care Act. *JAMA*. 2013;310(2):143-144. doi: 10.1001/jama.2013.7617.
3. 2015 Employer Health Benefits Survey. section twelve: health risk assessment, biometrics screening and wellness programs. Kaiser Family Foundation website. kff.org/report-section/ehbs-2015-section-twelve-health-risk-assessment-biometrics-screening-and-wellness-programs/. Published September 22, 2015. Accessed September 20, 2017.
4. Full report: Towers Watson/NGBH 2013/2014 Employer Survey on Purchasing Value in Health Care. the new health care imperative: driving performance, connecting to value. Willis Towers Watson website. towerswatson.com/en-US/Insights/IC-Types/Survey-Research-Results/2014/05/full-report-towers-watson-nbgh-2013-2014-employer-survey-on-purchasing-value-in-health-care. Published May 2014. Accessed September 20, 2017.
5. Mattke S, Liu H, Caloyeras JP, et al. Workplace wellness programs study: final report. Department of Labor website. dol.gov/sites/default/files/ebsa/researchers/analysis/health-and-welfare/workplacewellnessstudyfinal.pdf. Published 2013. Accessed September 2017.
6. Haisley EC, Volpp KG, Pellathy T, Loewenstein G. The impact of alternative incentive schemes on completion of health risk assessments. *Am J Health Promot*. 2012;26(3):184-188. doi: 10.4278/ajhp.100729-ARB-257.
7. Volpp KG, Troxel AB, Pauly MV, et al. A randomized, controlled trial of financial incentives for smoking cessation. *N Engl J Med*. 2009;360(7):699-709. doi: 10.1056/NEJMsa0806819.
8. Halpern SD, French B, Small DS, et al. Randomized trial of four financial-incentive programs for smoking cessation. *N Engl J Med*. 2015;372(22):2108-2117. doi: 10.1056/NEJMoa1414293.
9. Jeffery RW. Financial incentives and weight control. *Prev Med*. 2012;55(suppl):S61-S67. doi: 10.1016/j.ypmed.2011.12.024.
10. Volpp KG, John LK, Troxel AB, Norton L, Fassbender J, Loewenstein G. Financial incentive-based approaches for weight loss: a randomized trial. *JAMA*. 2008;300(22):2631-2637. doi: 10.1001/jama.2008.804.
11. Sen AP, Sewell TB, Riley EB, et al. Financial incentives for home-based health monitoring: a randomized controlled trial. *J Gen Intern Med*. 2014;29(5):770-777. doi: 10.1007/s11606-014-2778-0.
12. Volpp KG, Loewenstein G, Troxel AB, et al. A test of financial incentives to improve warfarin adherence. *BMC Health Serv Res*. 2008;8:272. doi: 10.1186/1472-6963-8-272.
13. Francisco VT, Paine AL, Fawcett SB, Johnston J, Banks D. An experimental evaluation of an incentive program to reduce serum cholesterol levels among health fair participants. *Arch Fam Med*. 1994;3(3):246-251.
14. Cameron AC, Trivedi PK. Chapter 21. Linear panel models: basics. In: Cameron AC, Trivedi PK. *Microeconometrics: Methods and Applications*. New York, NY: Cambridge University Press; 2005:697-740.
15. Toolkit for Weighting and Analysis of Nonequivalent Groups (TWANG). RAND Corporation website. rand.org/statistics/twang. Published 2014. Accessed September 2017.
16. Stuart EA, Huskamp HA, Duckworth K, et al. Using propensity scores in difference-in-differences models to estimate the effects of a policy change. *Health Serv Outcomes Res Methodol*. 2014;14(4):166-182. doi: 10.1007/s10742-014-0123-z.
17. Final recommendation statement: breast cancer: screening. US Preventive Service Task Force website. www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/breast-cancer-screening1. Published 2016. Accessed September 2017.
18. Final recommendation statement: colorectal cancer: screening. US Preventive Service Task Force website. www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/colorectal-cancer-screening. Published October 2008. Accessed September 2017.
19. Final recommendation statement: cervical cancer: screening. US Preventive Service Task Force website. www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/cervical-cancer-screening. Published March 2012. Accessed September 2017.
20. Naessens JM, Ruud KL, Tulledge-Scheitel SM, Stroebel RJ, Cabanela RL. Comparison of provider claims data versus medical records review for assessing provision of adult preventive services. *J Ambul Care Manage*. 2008;31(2):178-186. doi: 10.1097/01.JAC.0000314708.65289.3b.

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eAppendix

eAppendix Table 1. Claim Codes to Define Patient Groups

Measure	Population	CPT, Diagnosis, and Revenue Codes
Preventive Visit		
Numerator	Enrolled Sample	99381-99397, 99401-99404, 99411, 99412, 99461, G0402, G0438, G0439, G0445, S0610, S0612, S0613
Denominator	Enrolled Sample	
Cholesterol		
Numerator	Enrolled Sample	80061, 83721, 82465, 3011F
Denominator	Enrolled Sample	
Blood Sugar		
Numerator	Enrolled Sample	80048, 80050, 80053, 80069, 80422, 82947, 83036
Cervical Cancer Screen		
numerator	Female, Age 24-64	88141, 88142, 88143, 88147, 88148, 88150, 88151, 88152, 88153, 88154, 88155, 88164, 88165, 88166, 88167, 88174, 88175, 87620, 87621, 87622, G0101, G0123, G0124, G0141, G0143, G0143, G0144, G0145, G0147, G0148, Q0091, P3000, P3001, V70.0, V72.31, V72.32, V76.2
		Excluded Codes (hysterectomy)
Denominator	Female, Age 24-64	685, 51925, 56308, 57540, 57545, 57550, 57555, 57556, 58150, 58152, 58200, 58210, 58240, 58260, 58262, 58263, 58267, 58270, 58275, 58280, 58285, 58290-58294, 58548, 58550-58554, 58570, 58571, 58572, 58573, 58951, 58953, 58954, 58956, 59135, V88.01, V88.03, V67.01, V76.47, 75243, 68510, 68610, 6871, 6841, 688, 6185, 6869, 686, 6879, 687, 6849, 684, 58150, 6859
Mammogram		
Numerator	Female, Age 40-64	77051-77059, 8736, G0202, G0204, G0206, 403
		Excluded Codes (mastectomy)
Denominator	Female, Age 40-64	50, 8542, 8544, 8546, 8548, 09950, 19180, 19200, 19220, 19240, 19303-10307
Colorectal Cancer Screen		
Numerator	Age 51-64	44388-44394, 44397, 45392, 44393, 44394, 4522, 4524, 45300, 45302, 45303, 45305, 45307, 45308, 45309, 45315, 45317, 45321, 45327, 45330-45342, 45345, 45355, 45378-45387, 45391, 45392, 4542, 4543, 4522, 74261-74263, 82270-82274, 88304, 88305, G0104, G0105, G0106, G0120, G0121, G0122, G0328, V16, V18.51, V18.59, V70, V76.41, V76.50, V76.51
		Excluded Codes (cancer, colectomy)
Denominator	Age 51-64	V10.05, 153.0-153.9, 154.0, 154.1, 154.8, 4581-4583, 44150-44158, 44210-44212
Pregnant		V22, V22.0, V22.1, V22.2, V23, V23.0, V23.1, V23.2, V23.3, V23.4, V23.41, V23.42, V23.49, V23.5, V23.7, V23.8, V23.81, V23.82, V23.83, V23.84, V23.85, V23.86, V23.87, V23.89, V23.9, V91, V91.0, V91.00, V91.01, V91.02, V91.03, V91.09, V91.1, V91.10, V91.11, V91.12, V91.19, V91.2, V91.20, V91.21, V91.22, V91.29, V91.9, V91.90, V91.91, V91.92, V91.99

CPT indicates Current Procedural Terminology.

eAppendix Table 2. Full Regression Results for Table 2 (in main article): Impact of Wellness Program with Incentives on Receiving Services

	Preventive Visit	**Cholesterol**	**Blood Sugar**	**Full Biometric: Preventive Visit & Blood Tests**	**Cervical Cancer Screen**	**Mammogram**	**Colorectal Cancer**
	b/se	b/se	b/se	b/se	b/se	b/se	b/se
Incentive program	0.077**	0.079**	0.071**	0.080**	0.014	0.027*	0.022***
	(0.024)	(0.028)	(0.024)	(0.025)	(0.009)	(0.010)	(0.006)
Age 18-30	Omitted	Omitted	Omitted	Omitted	Omitted	-	-
Age 31-40	0.013	0.057***	0.054***	0.038***	-0.043***	Omitted	-
	(0.007)	(0.003)	(0.004)	(0.003)	(0.005)		
Age 41-50	0.026*	0.121***	0.111***	0.081***	-0.078***	0.209***	-
	(0.009)	(0.004)	(0.004)	(0.006)	(0.007)	(0.005)	
Age 51-60	0.029*	0.169***	0.152***	0.110***	-0.141***	0.255***	Omitted
	(0.010)	(0.005)	(0.005)	(0.006)	(0.008)	(0.006)	
Age 61-64	0.031**	0.190***	0.171***	0.119***	-0.181***	0.283***	0.017***
	(0.010)	(0.006)	(0.006)	(0.007)	(0.008)	(0.007)	(0.003)
Female	0.303***	0.026***	0.058***	0.070***	-	-	0.063***
	(0.011)	(0.003)	(0.002)	(0.004)			(0.004)
Employee	0.005	-0.001	-0.003	0.002	0.013	-0.005	-0.005

(dependent omitted)							
	(0.006)	(0.007)	(0.005)	(0.005)	(0.007)	(0.007)	(0.004)
Education missing	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
High school or less	-0.006	0.034	0.032	0.004	0.001	0.035	-0.018
	(0.017)	(0.025)	(0.028)	(0.014)	(0.018)	(0.019)	(0.013)
Some college	0.052**	0.073**	0.069*	0.046**	0.051**	0.092***	0.021
	(0.016)	(0.026)	(0.028)	(0.014)	(0.017)	(0.019)	(0.014)
College degree	0.116***	0.108***	0.102**	0.089***	0.103***	0.151***	0.075***
	(0.020)	(0.027)	(0.030)	(0.017)	(0.017)	(0.021)	(0.015)
Hispanic	-0.029***	0.025***	0.022***	0.006	0.002	-0.019*	-0.034***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.008)
African American	-0.029***	-0.017**	-0.017***	-0.006	-0.027***	-0.032***	-0.034***
	(0.006)	(0.006)	(0.004)	(0.006)	(0.007)	(0.005)	(0.009)
Asian	0.018*	0.080***	0.053***	0.059***	-0.030	-0.011	-0.035***
	(0.008)	(0.011)	(0.010)	(0.011)	(0.015)	(0.014)	(0.007)
Missing race/ ethnicity	-0.001	0.013*	0.010	0.008*	-0.007	-0.009	-0.008

	(0.005)	(0.006)	(0.006)	(0.004)	(0.005)	(0.007)	(0.010)
Offered high-deductible insurance plan	0.003	-0.005	-0.010	0.000	-0.024**	-0.007	-0.006
	(0.016)	(0.018)	(0.017)	(0.017)	(0.009)	(0.009)	(0.005)
Asthma	0.034***	0.058***	0.092***	0.028***	0.021**	0.040***	0.051**
	(0.004)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.014)
CAD	-0.029***	0.093***	0.070***	-0.030***	-0.011	-0.021**	0.046***
	(0.006)	(0.008)	(0.010)	(0.004)	(0.009)	(0.007)	(0.005)
CHF	-0.103***	-0.103***	-0.012	-0.090***	-0.091***	-0.096***	0.013
	(0.007)	(0.010)	(0.023)	(0.009)	(0.015)	(0.016)	(0.009)
COPD	-0.079***	0.001	0.051***	-0.056***	-0.074***	-0.070***	0.046***
	(0.007)	(0.007)	(0.009)	(0.008)	(0.014)	(0.009)	(0.008)
Diabetes	-0.014**	0.255***	0.312***	0.042***	-0.022***	0.002	0.011**
	(0.004)	(0.007)	(0.006)	(0.004)	(0.004)	(0.006)	(0.004)
Hypertension	0.035***	0.254***	0.280***	0.068***	-0.001	0.062***	0.066***
	(0.003)	(0.008)	(0.007)	(0.004)	(0.004)	(0.005)	(0.002)
2009	omitted	Omitted	Omitted	Omitted	Omitted	omitted	-
2010	-0.007	-0.007	0.000	-0.005	-0.017	-0.011	-0.003
	(0.015)	(0.017)	(0.015)	(0.015)	(0.009)	(0.009)	(0.007)

2011	0.012	0.002	0.013	0.012	-0.021*	-0.005	-0.005
	(0.016)	(0.017)	(0.016)	(0.016)	(0.010)	(0.012)	(0.008)
2012	0.025	-0.006	0.006	0.020	-0.039**	-0.013	-0.010
	(0.019)	(0.020)	(0.018)	(0.019)	(0.013)	(0.014)	(0.009)
2013	0.028	0.000	0.012	0.027	-0.069***	-0.006	-0.016*
	(0.015)	(0.016)	(0.015)	(0.013)	(0.014)	(0.014)	(0.007)
N	1,592,958	1,592,958	1,592,958	1,592,958	886,778	641,478	564,139

CAD indicates coronary artery disease; CHF congestive heart failure; COPD chronic obstructive pulmonary disease.

*P <.05; **P <.01; ***P <.001.

Standard errors in parentheses.

eAppendix Table 2 (continued). Full Regression Results for Table 3 (in main article): Impact of Wellness Program with Incentives on Receiving Services, by Prior Use

	Preventive Visit	**Cholesterol**	**Blood Sugar**	**Full Biometric: Preventive Visit & Blood Tests**	**Cervical Cancer Screen**	**Mammogram**	**Colorectal Cancer**
Incentive Program	0.064	0.066	0.061	0.059	0.031**	0.046**	0.014
	(0.037)	(0.043)	(0.037)	(0.037)	(0.011)	(0.013)	(0.007)
Incentive Program * Received Service in Prior Year	0.007	0.019	0.011	0.061***	-0.029**	-0.036***	-0.009
	(0.010)	(0.011)	(0.009)	(0.014)	(0.009)	(0.010)	(0.010)
Received Service in Prior Year	0.292***	0.291***	0.292***	0.252***	0.284***	0.305***	0.166***
	(0.008)	(0.012)	(0.011)	(0.012)	(0.008)	(0.004)	(0.009)
Age 18-30	Omitted	Omitted	Omitted	Omitted	Omitted	-	-
	.	.	.	.	.		
Age 31-40	0.014**	0.035***	0.032***	0.025***	-0.028***	-	-
	(0.005)	(0.003)	(0.006)	(0.004)	(0.005)		
Age 41-50	0.024**	0.078***	0.071***	0.056***	-0.054***	Omitted	-

	(0.007)	(0.005)	(0.006)	(0.006)	(0.006)		
Age 51-60	0.023**	0.106***	0.093***	0.076***	-0.105***	0.025***	Omitted
	(0.007)	(0.007)	(0.007)	(0.005)	(0.007)	(0.003)	
Age 61-64	0.025***	0.115***	0.103***	0.084***	-0.139***	0.041***	0.008**
	(0.006)	(0.007)	(0.007)	(0.005)	(0.007)	(0.004)	(0.002)
Female	0.211***	0.019***	0.040***	0.051***	-	-	0.051***
	(0.014)	(0.002)	(0.002)	(0.004)			(0.005)
Employee (dependent omitted)	0.003	-0.002	-0.004	-0.001	0.013*	0.005	-0.003
	(0.006)	(0.005)	(0.004)	(0.005)	(0.006)	(0.004)	(0.004)
Education missing	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
High school or less	0.014	0.053	0.053	0.018	0.015	0.054*	-0.005
	(0.016)	(0.028)	(0.031)	(0.015)	(0.016)	(0.020)	(0.010)
Some college	0.052**	0.081**	0.082*	0.050**	0.043*	0.092***	0.027**
	(0.015)	(0.029)	(0.032)	(0.016)	(0.016)	(0.021)	(0.008)
College degree	0.100***	0.112***	0.111**	0.086***	0.079***	0.137***	0.074***
	(0.019)	(0.030)	(0.032)	(0.019)	(0.016)	(0.021)	(0.010)

Hispanic	-0.016***	0.013*	0.008	0.005	0.009	-0.009	-0.029***
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
African American	-0.023***	-0.016*	-0.016**	-0.006	-0.018**	-0.017***	-0.024
	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.004)	(0.012)
Asian	0.017*	0.050***	0.034***	0.047***	-0.009	-0.005	-0.017*
	(0.006)	(0.007)	(0.008)	(0.007)	(0.014)	(0.008)	(0.008)
Missing race/ ethnicity	-0.002	0.014***	0.012***	0.007	-0.008	-0.012**	-0.005
	(0.006)	(0.004)	(0.003)	(0.004)	(0.007)	(0.004)	(0.007)
Offered high-deductible insurance plan	0.003	-0.002	-0.005	0.003	-0.025*	-0.014*	-0.008
	(0.012)	(0.012)	(0.012)	(0.011)	(0.009)	(0.005)	(0.004)
Asthma	0.031***	0.049***	0.071***	0.026***	0.010	0.032***	0.053***
	(0.005)	(0.007)	(0.007)	(0.005)	(0.007)	(0.006)	(0.011)
CAD	-0.026***	0.067***	0.049***	-0.023***	-0.011	-0.021**	0.045***
	(0.004)	(0.007)	(0.008)	(0.005)	(0.007)	(0.006)	(0.007)
CHF	-0.093***	-0.085***	-0.025	-0.078***	-0.065***	-0.076***	0.010
	(0.005)	(0.012)	(0.022)	(0.009)	(0.016)	(0.014)	(0.012)
COPD	-0.047***	0.000	0.037**	-0.040***	-0.052***	-0.053***	0.033***
	(0.006)	(0.006)	(0.011)	(0.008)	(0.011)	(0.010)	(0.009)

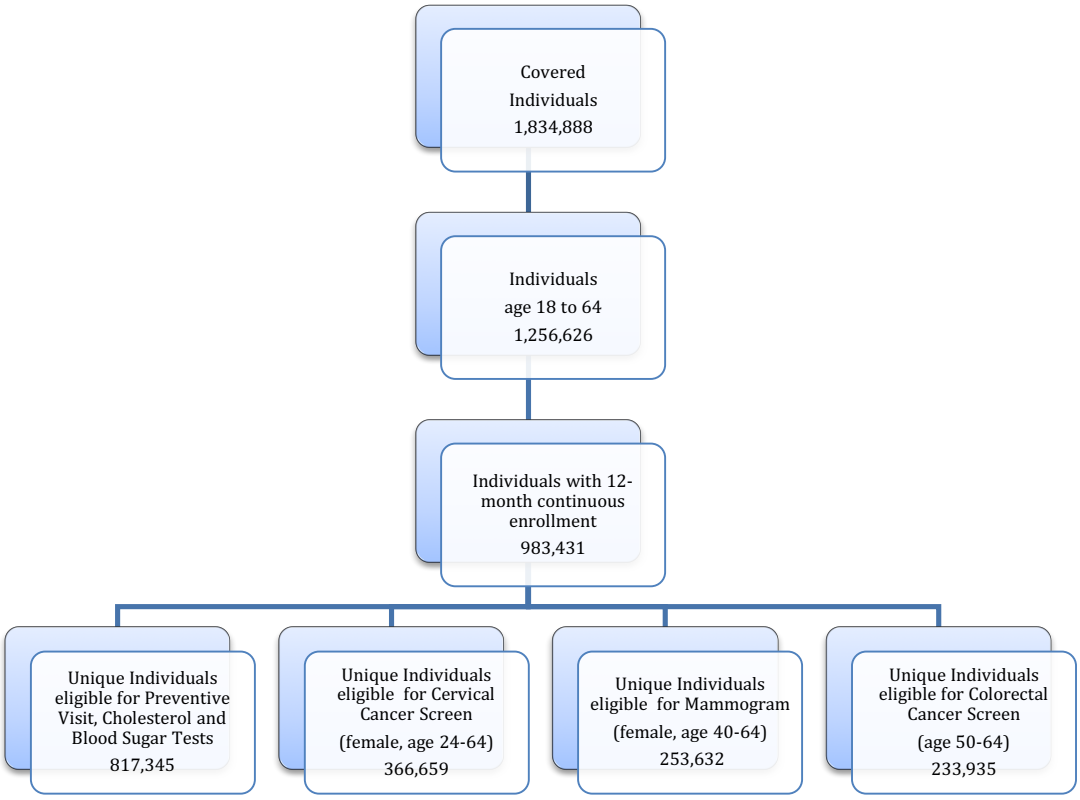
Diabetes	-0.006	0.191***	0.231***	0.033***	-0.011**	0.008*	0.008*
	(0.005)	(0.009)	(0.008)	(0.005)	(0.004)	(0.004)	(0.003)
Hypertension	0.036***	0.201***	0.221***	0.061***	-0.002	0.044***	0.055***
	(0.003)	(0.009)	(0.008)	(0.004)	(0.003)	(0.003)	(0.004)
2010	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
2011	0.002	-0.004	-0.002	-0.000	-0.005	-0.001	-0.008*
	(0.008)	(0.007)	(0.006)	(0.007)	(0.008)	(0.008)	(0.003)
2012	0.016*	-0.007	-0.004	0.010	-0.019*	-0.007	-0.010*
	(0.008)	(0.006)	(0.006)	(0.006)	(0.008)	(0.008)	(0.005)
2013	0.016	-0.006	-0.003	0.010*	-0.045***	-0.007	-0.015**
	(0.010)	(0.005)	(0.005)	(0.004)	(0.009)	(0.006)	(0.005)
N	842,447	842,447	842,447	842,447	513,130	403,411	367,337

Standard errors in parentheses.

CAD indicates coronary artery disease; CHF congestive heart failure; COPD chronic obstructive pulmonary disease.

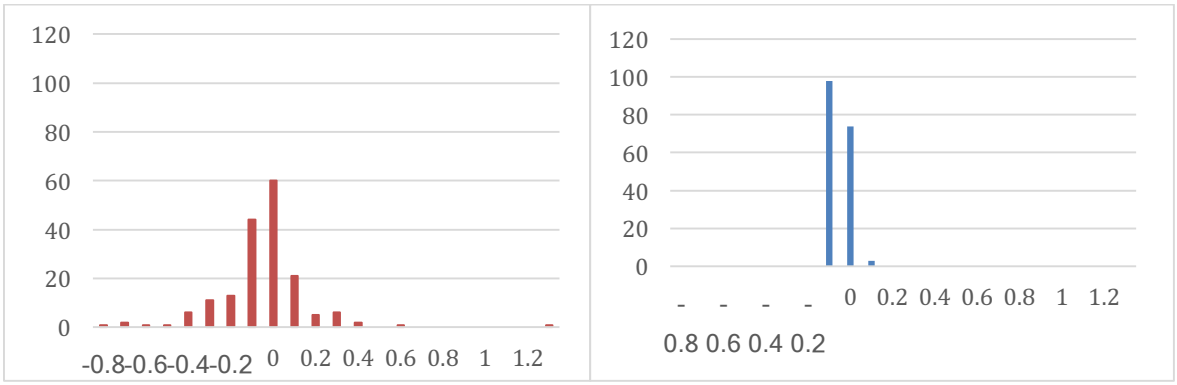
**P* <.05; ***P* <.01; ****P* <.001.

eAppendix Figure 1.



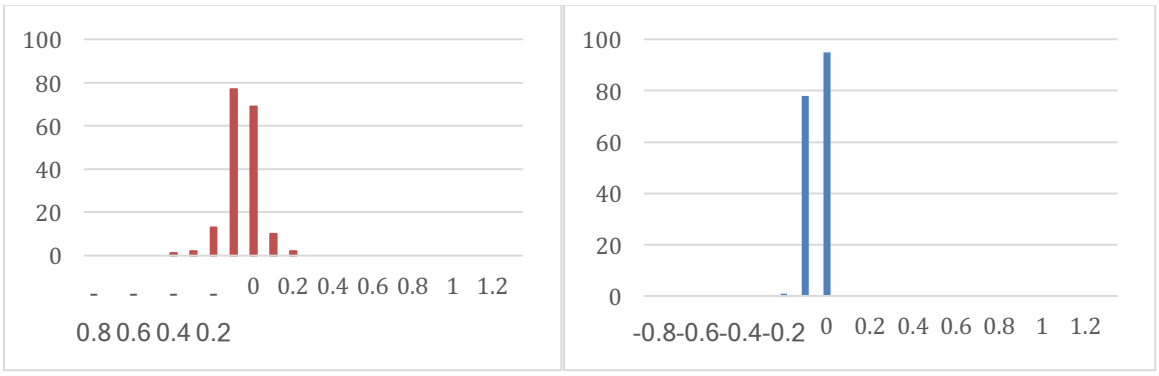
eAppendix Figure 2. Distribution of Standardized Differences in Means for all Variables

a. Treatment Employers: Distribution of Standardized Differences in Means for all Variables Comparing Non-Baseline Years to the Baseline Year, Unweighted and Weighted



Unweighted **Weighted**

b. Comparison Employers: Distribution of Standardized Differences in Means for All Variables Comparing Each Year to the Baseline Year for the Treated Employers, Unweighted and Weighted



Unweighted **Weighted**