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Objective: To explore how changing incentive designs influence wellness participation and health outcomes. **Methods:** Aggregated retrospective data were evaluated using cluster analysis to group 174 companies into incentive design types. Numerous statistical models assessed between-group differences in wellness participation, earning incentives, and over-time differences in health outcomes. **Results:** Four incentive design groups based on requirements for earning incentives were identified. The groups varied in support for and participation in wellness initiatives within each company. All four design types were associated with improved low density lipoprotein (LDL) ($P < 0.01$), three with improved blood pressure ($P < 0.001$), and two with improved fasting glucose ($P < 0.03$). No incentive plan types were associated with improved body mass index (BMI), but designs predominantly focused on health outcomes (eg, Outcomes-Focused) exhibited a significant increase over time in BMI risk. **Conclusion:** Incentive design and organizational characteristics impact population-level participation and health outcomes.

Keywords: blood pressure, body mass index, cholesterol, glucose, health promotion, humans, incentives, motivation, occupational health, workplace

Employers invest in workplace health and well-being (HWB) initiatives to improve employee health, reduce health care costs, and improve productivity,[1] as well as to promote their brand as an ''employer of choice'' to attract the best employees.[2] One of the biggest challenges companies face in achieving such outcomes is engaging employees in components of these HWB initiatives.[3,4] Because a lack of incentives has been posited as a reason employees do not participate in programs[5] and the use of incentives has been linked to participation in HWB components,[6–8] many companies have responded by offering financial incentives to encourage employee participation and engagement in their health.

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Clinical Relevance: Incentive designs differed in their influence on population-level changes in blood pressure, BMI, LDL, and glucose. Organizations interested in improving health outcomes should thoughtfully consider the role of incentive design as part of their broader evidence-based strategy for optimizing health and well-being program performance and health outcomes.

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A representative survey of US companies found that most (53%) offered incentives, with larger employers being most likely to offer them (78%).[4] Research has shown an association between the use of financial incentives and participation in health assessment (HA) activities (eg, health risk assessment surveys, biometric health screenings), participation in health behavior interventions,[6–8] and short-term improvements in health behaviors, such as increased physical activity and reduced tobacco use.[9–14] These changes were typically made in association with participation in a health behavior change program,[15–18] and all of these studies focused on individual-level participation in HWB initiatives, behavior change, and health outcomes. There is a dearth of research examining the independent effect of incentives on population-level results.

Since companies continue to provide financial incentives in their HWB initiatives, it is important to increase our understanding of what types of incentive designs are effective[19] in increasing population-level participation rates and improving population-level health behaviors and clinical outcomes. A population focus is important because, even if a strategy is effective in producing substantial health improvements for some individuals, low participation rates could result in little value to the organization,[20] threatening stakeholder support, and funding for HWB initiatives.

Several factors complicate our understanding about the effectiveness of incentive strategies. Numerous studies indicate that incentive design matters,[6,8,19] as well as the amount of the incentive.[12,20–22] Organizational, environmental, and programmatic supports associated with incentives have also been shown to influence effectiveness.[6,21–24] Examples of organizational support include creating a health-supportive workplace culture, having comprehensive programs and communication strategies in place, and involving union leadership in discussions about incentives. Characteristics of the target population also plays a role in incentive effectiveness.[23–25] For example, age and sex of the employee population influence and sometimes interact with incentives to influence program participation and outcomes.[25] Companies may also change their incentive approaches over time, making real-world research even more challenging. For example, a 2018 study of large employers reported that incentive design changes often involve requirements for employee program enrollment or completion, progress towards a goal, and achievement of health outcomes.[26]

The current study addressed three research questions. The first question was how companies changed their financial incentive strategies over time as indicated by the amount of incentive offered and what was rewarded. The second question was how incentive design and changes influenced population-level participation in HA and health behavior change interventions. The third question was how changes in incentive design influenced population-level health outcomes, specifically blood pressure, BMI, glucose, and low density lipoprotein (LDL). For each research question, the influences of organizational characteristics and supports for HWB initiatives were also explored.

DATA AND METHODS

Sample

The Health Enhancement Research Organization (HERO) invited member organizations that provide HWB and incentive management services to companies to voluntarily share de-identified aggregate retrospective client data in support of the study. Three national suppliers of HWB incentive administration services (study data suppliers) volunteered to participate. No inducements were offered to the data suppliers other than to invite them to collaborate as members of the study team.

Study data suppliers provided data on the evolution over time of the incentive plans in their client companies, elements of their HWB initiatives, level of program participation, and health outcomes. Information was also provided about employee demographics, organizational characteristics, and the organizational and programmatic supports in place during the initial incentive implementation period. All data represented company-level aggregate statistics rather than individual employee data. Specifically, data suppliers were asked to provide data based on the following criteria:

1. Client organizations (ie, the clients of the data suppliers) permitted the use of de-identified, population-level data for research purposes.
2. Aggregate biometric health screening data of all individuals included for at least two points in time.
3. At least 1 year separated the baseline and a follow-up screening measurement period for all individuals.
4. Baseline implementation period occurred before substantial health interventions were offered.
5. The two study data points were separated by as many years as possible.
6. Calendar years represented in the data were specified.
7. Information was available on the organizational and programmatic supports in place when the first measurement year was implemented.
8. Data were provided for continuously enrolled employees (no spouses or dependents) who were all eligible for the same incentive plan.

Data suppliers provided data for 174 unique employers. Data were integrated by HERO and de-identified so that the analysis was blinded to which records were provided by each data supplier. Additional data pertaining to the structure of the incentive program, employee participation in program activities, incentives earned, and health outcomes were provided both for the beginning (Time 1 or T_1) and end (Time 2 or T_2) of the study period. Each company included in the file had both a T_1 and a T_2 measurement, but T_1 and T_2 were not necessarily the same calendar year for different companies. Study years for companies ranged from 2008 through 2017.

Data on the size of the employer were available for 93 of the companies, with a minimum total number of employees of 95 and a maximum of 24,940. All companies provided data on the number of employees eligible for an incentive, with a mean of 1127 employees. Study eligibility, a measure that captures the number of people for whom screening data were available at the two time points, ranged from five to 11,514 employees, with a mean of 498. The sharp decrease from those eligible for the incentive to those included in the study can be attributed to employee turnover associated with elapsed time covered by the study, and to lack of biometric data for both periods of measurement. The lack of biometric data may have been due to initial biometric screening participants deciding not to participate in a repeat biometric screening assessment.

Of the study-eligible organizations, 39.1% were service industry companies, with manufacturing companies making up another 37.4% of the sample. Companies included in the sample varied considerably in employee sex and age distributions, with the company-level mean being 56.1% men and 44.8 years of age. Slightly less than half of all employees were study-eligible. The elapsed time covered by the study ranged from 1 year to 7 years, with a mean of 3.0 years.

Measures

Sets of items that addressed conceptually similar metrics were combined to create scale scores to support analysis. These measures, and the procedural rules used to create the scale scores, are as follows:

HWB Support Index

This measure is a composite scale created from seven items addressing the degree to which the employing organization provided a supportive environment for HWB during the baseline (T_1) incentive implementation period. It was not measured longitudinally since it was assumed that these supports did not change substantially during the study period. Data suppliers relied on documentation about each of their clients to provide data on the seven items. Four items addressed the effectiveness of program implementation, including strategic planning, organizational support, participation strategies (eg, communications about programs), and evaluation activities. Companies that were rated as either effective or very effective received one point on the index for each of these four aspects of their program implementation. Three items addressed core functionality of the HWB initiative: inclusion of follow-up and referrals for employees with abnormal biometric values, offering health behavior change programs to all individuals regardless of health status, and providing individually-targeted lifestyle behavior change programs based on elevated risk. Additional information about each of these elements was not requested because it was not available to all of the data suppliers. Companies received a point on the scale for each practice included in their HWB initiative. Accordingly, the Health & Well-Being Support Index (HWB support index) ranged from 0 to 7, with higher scores indicating a better supported and more comprehensive initiative. Item-total correlations for the index components ranged from 0.49 to 0.76, and Cronbach $\alpha = 0.75$. This level of internal consistency within the HWB support index and subsequent indices meets the requirements for preliminary research.[27,28]

Incentive Measurements

Three measures of incentive program structure were developed for the study, with each captured at both T_1 and T_2.

- Participation Requirements. This measure addressed the degree to which earning an incentive was predicated on participating in or completing an activity associated with the HWB initiative. Four activities were included in this index: (a) biometric screening, (b) health assessment questionnaires, (c) participating in a health intervention, and (d) completing a health intervention. Each participation requirement a company included in the incentive program increased the participation requirement index by one, yielding an index with a possible range of 0 to 4 at each of the two periods of measurement. Cronbach α for the T_1 index was 0.83, with item-total correlations ranging from 0.37 to 0.95; the T_2 Cronbach α was 0.79, with item-total correlations ranging from 0.61 to 0.88.
- Targeted Health Requirements. This measure addressed the degree to which earning an incentive was based on achieving targets or making improvements in health-related outcomes. The

targeted outcomes included: BMI, weight, blood pressure, cholesterol, tobacco use, glucose, and ''other'' non-specified targeted improvements. Including any of the potential targeted improvements as part of the incentive design increased the Targeted Health Requirements index by one, yielding an index with a possible range of 0 to 7 for each of the two measurement periods. Cronbach α for the T_1 index was 0.89, with item-total correlations ranging from 0.70 to 0.88. The T_2 Cronbach $\alpha = 0.86$, with item-total correlations ranging from 0.27 to 0.96.

- Incentive Available. This measure was the total dollar amount of the incentive.

Organizational Participation

Three measures that described employee participation in the HWB initiative were developed for the study. Each was measured at both T_1 and T_2; two were single-item indicators.

The participation index was based on the proportion of employees who participated in four aspects of the HWB initiative: biometric screening, health assessment, any degree of participation in the incentive program, and participation in the incentive program sufficient to earn at least a portion of the incentive. This index was calculated by averaging the four proportions. Cronbach α for the T_1 index was 0.95, with item-total correlations ranging from 0.82 to 0.96. The T_2 Cronbach α was 0.91, with item-total correlations ranging from 0.75 to 0.95.

A single item indicator of participation was the proportion of employees who engaged in a health intervention. The second single-item indicator was the dollar amount of the incentive earned.

Risk-Related Outcomes

The final set of measures included four composite indices, each of which addressed different health outcomes in the employee population and were universally available across the data suppliers contributing data to the study. Outcomes measured included: cholesterol, as measured by LDL levels; blood pressure, as measured by systolic and diastolic blood pressure levels; body mass and obesity, as measured by BMI; and fasting glucose levels. Each of these measures was captured for both T_1 and T_2.

Two classes of measures were calculated for each outcome. The first class was the organizational-level mean score. The second class of measures was the proportion of the employee population that fell into each of several ordinally-ranked categories ranging from commonly accepted biometric targets to high or extremely high risk, with the sum of the proportions across the categories equaling 1.00. For both classes of measures, data suppliers were asked to exclude individuals with out-of-range biometric values from their calculations.(Out of range values were defined as: BMI less than 15 or greater than 70; systolic blood pressure less than 70 or greater than 220; diastolic blood pressure less than 40 or greater than 130; glucose less than 45 mg/dL or greater than 500 mg/dL; LDL less than 30 mg/dL or greater than 350 mg/dL)

To improve the sensitivity of the outcome measures used in the analysis, weighted composite scales were created. Each outcome reflected the degree to which the employee population deviated from accepted biometric targets, with higher scores indicating a greater degree of risk.

The first step in creating outcome indices was to avoid unintentionally weighting the arithmetic averages to a greater degree than all the other measures within each outcome area. The categorical proportion measures were necessarily bounded by 0 to 1, and further constrained to sum across the categories to 1. In contrast, the arithmetic averages were all substantially larger, varying from the relatively small averages associated with BMI to the larger values associated with systolic blood pressure or LDL measurements. To avoid unintentionally allowing the average-based measures from dominating a resulting scale score, the raw averages were transformed to a scale of 0 to 1 by using the observed minimum and maximum values across the two time periods for each measure.

The second step in creating the indices was to combine the several proportions for each outcome measure into a composite scale that reflected the goal of measuring deviation from the desired biometric target, that is, increased risk. This was accomplished by selecting weighting functions ω_i for each of the component measures, with larger values of ω_i assigned to the categories that deviated more substantially from desired biometric readings. The weights were chosen based on professional judgment. For each outcome, $\Sigma\omega_i = 1.0$.

LDL cholesterol risk (LDL risk) specified as its targeted outcome category the proportion of the study-eligible employee population that achieved LDL levels less than 100 mg/dL. As the low-risk category, this proportion was weighted at 0.00 for index creation. The moderate category for LDL measurements specified the proportion of employees with LDL readings in the 100 to 129 mg/dL range; this proportion was weighted at 0.15 for index creation. The high category for LDL measurements specified the proportion of employees with LDL readings in the 130 to 159 mg/dL range; this proportion was weighted at 0.20 for index creation. The very high category for LDL measurements specified the proportion of employees with LDL readings 160 mg/dL and above; this proportion was weighted at 0.25 for index creation. Finally, the company average LDL reading was transformed to a 0 to 1 range and weighted at 0.40 in creating the composite index. The different LDL risk indicators were all multiplied by their respective weights, summed, and multiplied by 100 to create the final LDL risk index for each of the two measurement periods.

Body mass index risk (BMI risk) specified as the target category the proportion of employees with BMI readings in the 18.5 to 24.9 category ($\omega_0 = 0.00$). The moderate category for BMI measurements specified the proportion of employees with BMI in the 25 to 29.9 range ($\omega_1 = 0.20$). The high category for BMI was specified as the proportion of employees with BMI 30 or higher ($\omega_2 = 0.40$). The company average BMI reading was transformed to a 0 to 1 range with $\omega_3 = 0.40$ in creating the composite index. The four different BMI measures were all multiplied by their respective weights, summed, and multiplied by 100 to create the final BMI risk index for each of the two measurement periods.

For the glucose risk index the three proportional categorical readings included the target (less than 100 mg/dL; $\omega_0 = 0.00$), moderate (100 to 125 mg/dL; $\omega_1 = 0.20$), and high categories (126+ mg/dL; $\omega_2 = 0.40$). The company average glucose reading was transformed to a 0 to 1 range with $\omega_3 = 0.40$ for creating the composite index. The four different glucose measures were all multiplied by their respective weights, summed, and multiplied by 100 to create the final glucose risk index for each of the two measurement periods.

The blood pressure risk index included six measures, four of which represented proportions of the employee population that fell into biometric categorical outcome classes and two arithmetic averages. The target category with $\omega_0 = 0.00$ was the proportion of the employee population with systolic blood pressure reading less than 120 combined with a diastolic reading less than 80. The moderate category with $\omega_1 = 0.15$ was the proportion of the employee population with systolic blood pressure in the 120 to 139 range or diastolic blood pressure in the 80 to 89 range. Systolic blood pressure in the 140 to 159 range or diastolic blood pressure in the 90 to 99 range fell into the high category with $\omega_2 = 0.20$. The very high category with $\omega_3 = 0.25$ included the proportion of employees with systolic blood pressure of 160 or higher or diastolic blood pressure of 100 or more. If any individual employee did not neatly fall into one of the categories with systolic reading in one category and diastolic pressure in a different category, that individual was counted in the higher risk category, for example, blood

TABLE 1. Measures Used in the Study

Conceptual Area	Measure	Observed Range	Average	Std. Dev.
Background characteristics	Service industry	0–1	0.391	0.489
	Manufacturing industry	0–1	0.374	0.485
	Proportion male	0–0.95	0.561	0.256
	Average age	32.9–53.3	44.769	3.328
	Proportion study eligible	0.07–1	0.449	0.180
	Elapsed time covered by data	1–7	2.983	1.526
Organizational support	HWB support index	0–7	4.253	2.127
Incentives design	T_1 participation requirements	0–4	1.569	1.507
	T_2 participation requirements	0–4	1.483	1.409
	T_1 targeted health requirements	0–7	3.069	2.525
	T_2 targeted health requirements	0–7	4.839	2.081
	T_1 incentive available ($)	$50–$5,200	$857.56	$751.82
	T_2 incentive available ($)	$0–$6366.62	$988.50	$879.06
Organizational participation	T_1 participation index	0.09–1.00	0.728	0.193
	T_2 participation index	0.00–0.98	0.703	0.184
	T_1 health intervention	0.00–0.99	0.120	0.258
	T_2 health intervention	0.00–0.96	0.104	0.242
	T_1 incentive earned ($)	$0–$7,474	$885.66	$1083.57
	T_2 incentive earned ($)	$0–$9,784	$872.04	$1074.04
Risk-related outcomes	T_1 LDL risk index	6.00–53.36	31.341	7.888
	T_2 LDL risk index	15.02–56.67	29.149	6.030
	T_1 blood pressure risk index	0.43–54.68	26.152	6.754
	T_2 blood pressure risk index	5.55–45.70	24.291	5.998
	T_1 BMI risk index	8.00–66.56	41.591	8.923
	T_2 BMI risk index	15.40–69.52	43.687	8.952
	T_1 glucose risk index	0.00–60.00	25.567	7.904
	T_2 glucose risk index	10.17–42.13	23.844	6.627

pressure of 145/85 was in the high category rather than the moderate category. Finally, the 0 to 1 transformed average systolic blood pressure ($\omega_4 = 0.20$) and diastolic blood pressure ($\omega_5 = 0.20$) readings were also used in creating the blood pressure risk index. These six blood pressure measures were all multiplied by their respective weights, summed, and multiplied by 100 to create the final blood pressure risk index for each of the two measurement periods.

Analysis

The data analysis plan had three distinct steps. In the first step, the sample-wide characteristics for all the measures included in the study were reviewed to provide a baseline context for the subsequent analyses.

In the second step, the question of how companies evolved their incentive plans over time was addressed by using a two-stage cluster analysis model. In the first stage, Ward's hierarchical clustering model[29,30] was applied to the incentive design measures to answer the question of how many clusters—or types—effectively described the ways in which companies evolved their incentive plan designs over time. Because hierarchical clustering methods are known to be susceptible to creating elongated chains when joining objects, the second stage of clustering used the number of clusters determined in the first stage and applied iterative centroid k-means clustering methods[31] to finalize the assignment of companies to the appropriate incentive plan type.

The third step of the analysis considered the association between the type and evolution of incentive plan and participation in the HWB initiative, earning of incentives, and health outcomes. This was addressed by estimating the average scores within each of the incentive types on the different measures and comparing those averages across the different groups. The over-time effectiveness of the plans was determined from the estimated marginal means derived from type-specific causal models(a total of 16 different causal models were estimated. The detailed results of these models are available upon request. This manuscript focuses on the outcomes of those analyses) where the focus was on the within-group over-time differences in the predicted scores from those models, effectively controlling for the type of plan that was implemented and other characteristics that may have influenced the measured biometric outcomes. Data analyses were executed using SAS 9.4 (SAS Institute, Inc., Cary, NC) and Stata 16.1 (StatCorp, LLC, College Station, TX).

RESULTS

Table 1 presents the averages, standard deviations, and observed ranges for all of the company-level measures included in the study. On average, companies demonstrated substantial organizational support for their HWB initiative and associated incentive plans. They were generally mid-range in their participation requirements, with a slight drop over time. Targeted health requirements were also mid-range at T_1 and increased substantially by T_2. The average amount of the incentive that was available increased from $858 at T_1 to $989 at T_2. The amount of the available incentive was highly skewed, with a T_1 median of $600 and a T_2 median of $676.

T_1 participation in health assessment and the incentive program was quite robust with a slight, non-significant decrease over time. Participation in health interventions was minimal at T_1, and it too declined over time. The amount of the earned incentive stayed relatively consistent over time, with average earned incentives approaching $900.(For some organizational-level data the reported incentive earned exceeded the total incentive that was supposedly available. The data were accepted as provided by the data suppliers) The data for the amount of the incentive that was earned were also highly skewed, with a T_1 median of $529 and a T_2 median of $530.

Three of the four risk index outcome measures (LDL, blood pressure, and fasting glucose) indicated slight decreased risk over time. The exception was BMI risk, where risk increased by more than two points on the index.

TABLE 2. Key Incentive Design Types

	Total Sample	Participation-to-Outcomes	Combination	Outcomes-Focused	Participation-Focused	Explained Variation
Sample size	174	42	29	76	27	
Percentage	100%	24%	17%	44%	16%	
Average scores on incentive design dimensions						
T_1 participation requirements (0–4)	1.569	2.905	2.724	0.066	2.481	0.784
T_2 participation requirements (0–4)	1.483	2.667	2.586	0.105	2.333	0.751
T_1 targeted health requirements (0–7)	3.069	0.048	5.828	4.553	0.630	0.845
T_2 targeted health requirements (0–7)	4.839	6.000	5.828	5.474	0.185	0.934

Participation requirements measure the degree to which earning an incentive was predicated on participating in or completing an activity associated with the HWB initiative. Targeted health requirements measure the degree to which earning an incentive was based on achieving targets or making improvements in health-related outcomes.

Cluster Analysis

The cluster analysis of these data used the four measures of requirements—T_1 and T_2 measures for both participation and targeted health requirements—as the basis for deriving the typology of incentive plans. These measures were selected because they defined the context of expectations placed upon employees to earn the available incentive.

These four requirements measures were all standardized to $\bar{x} = 50$ and $\sigma = 10$ so that no measure would disproportionately influence the results due to having greater variability. The results from the Ward's hierarchical clustering indicated a peak in the cubic clustering criterion at either four or five clusters. Both the pseudo F statistic and the pseudo t-squared statistic indicated four clusters. Based on this evidence, we specified the number of clusters/types as equal to four and applied the convergent k-means algorithm for final cluster assignment, estimating the four cluster centroids as determined from the Ward's analysis. K-means quickly converged yielding the four-cluster solution presented in Table 2, which describes how the types differed in the incentive plan requirements placed upon employees. For comparative purposes, the total sample averages for these measures are also presented.

The first incentive design group was labeled Participation-to-Outcomes. It included 42 companies, or 24% of the total sample. At both T_1 and T_2 this incentive design type was characterized by strong participation requirements. Initially, this group did not impose targeted health requirements. By T_2, however, this type had added the most targeted health requirements on average of any of the four types of incentive plans.

The second type, Combination, included 29 companies or 17% of the sample. These companies were characterized by "staying-the-course" throughout the study period, with substantial requirements for both participation and achieving targeted health outcomes at both T_1 and T_2.

Outcomes-Focused companies ($n = 76$; 44%) were also consistent with their requirements over time. Participation was not mandated or incented; earning incentives was based on achieving targeted health-related outcomes and the requirements became more stringent over time.

The final type of incentive plan represented companies that were Participation-Focused ($n = 27$; 16%). This group had reasonably strong and stable requirements for participation in health assessment and intervention activities, but few requirements for achieving targeted health outcomes.

Cluster Impact

Table 3 presents the mean scores by type for all the remaining study variables. For most background organizational characteristics, there were no statistically significant differences among the different incentive design types. The average age of employees in the different companies approached the traditional criterion for statistical significance. This was largely due to the slightly younger employee distribution in the Outcomes-Focused type. The elapsed time covered for the data collection period varied substantially across the types. Participation-Focused companies represented the shortest implemented incentive period ($\bar{x} = 1.9$ years), while Outcomes-Focused companies had the longest timeframe for incentive plan implementation ($\bar{x} = 3.6$ years).

The HWB support index varied significantly among incentive types. Combination companies had the highest scores on the HWB support index ($\bar{x} = 5.4$), while Outcomes-Focused companies had the lowest average scores on this index ($= 3.5$). The incentive available at T_1 and T_2 also varied significantly by type. Outcomes-Focused companies offered by far the highest incentive amounts, followed by Combination companies. Participation-to-Outcomes and Participation-Focused companies offered incentives of approximately equal value.

Outcomes-Focused companies had the highest scores on the participation index, reflecting participation in the incentive program, but they had the lowest scores on participation in health interventions. Reflecting the high incentive made available to employees, the average earned incentive for this group was also the highest.

Companies in the Combination type had the second highest score on the participation index, and it increased slightly over time. Participation in health interventions was relatively high at T_1 compared with the other types but decreased over time. The average incentive earned was the third-most of any of the types, and it increased slightly over time.

Participation-to-Outcomes companies nearly matched Combination companies on the participation index but showed a slight decrease over time. Participation in health interventions was the highest for this group at T_1, and it remained stable over time. The average incentive earned by this group was the second highest of any of the different types.

Companies in the Participation-Focused type had the lowest scores on the participation index. Participation in health interventions exceeded only the lowest scoring Outcomes-Focused group, while the amount of the incentive earned was the lowest of any group at T_1 but increased over time.

None of the between-group differences on the four outcome measures were statistically significant. For three of the four measures, all groups registered an over-time decrease in risks. The BMI risk index increased somewhat for each of the groups.

Table 4 presents the estimated marginal means for the four outcome measures at T_1 and T_2, controlling for all other measures in the multiple group structural equation models that were estimated.

TABLE 3. Company Characteristics by Incentive Design Type

Characteristic Averages	Participation-to-Outcomes	Combination	Outcomes-Focused	Participation-Focused	Significance of Differences Across Types*
Service industry	0.357	0.379	0.434	0.333	NS
Manufacturing industry	0.381	0.483	0.342	0.333	NS
Proportion male	0.563	0.572	0.551	0.572	NS
Average age	45.092	45.123	44.051	45.903	0.059
Proportion study eligible	0.419	0.497	0.446	0.453	NS
Elapsed time covered by data	2.833	2.690	3.579	1.852	<0.001
HWB support index	4.643	5.379	3.513	4.519	<0.001
T_1 incentive available ($)	$420.54	$696.07	$1,341.92	$457.04	<0.001
T_2 incentive available ($)	$538.05	$753.31	$1,526.01	$448.63	<0.001
T_1 participation index	0.670	0.672	0.818	0.627	<0.001
T_2 participation index	0.624	0.707	0.772	0.630	<0.001
T_1 health intervention	0.249	0.238	0.003	0.116	<0.001
T_2 health intervention	0.252	0.155	0.003	0.095	< 0.001
T_1 incentive earned ($)	$413.33	$443.85	$1,629.09	$430.37	<0.001
T_2 incentive earned ($)	$436.28	$514.16	$1,434.57	$444.22	<0.001
T_1 LDL risk index	29.913	34.095	31.347	30.589	NS
T_2 LDL risk index	28.088	29.735	29.523	29.115	NS
T_1 blood pressure risk index	24.428	27.689	26.086	27.370	NS
T_2 blood pressure risk index	22.663	25.532	24.272	25.542	NS
T_1 BMI risk index	41.441	43.106	41.241	41.182	NS
T_2 BMI risk index	42.292	44.331	44.538	42.771	NS
T_1 glucose risk index	26.810	24.770	25.162	25.631	NS
T_2 glucose risk index	23.748	23.095	24.164	23.897	NS

*Data reported represent the simple within-group mean scores on all measures without controlling for any other measures in the models. Specific tests of significance between each type were not conducted to avoid making more comparisons than justified given the degrees of freedom associated with the independent variable.

For all four groups, LDL risk decreased significantly, with the greatest decrease in the Combination group.

Three of the four groups registered statistically significant decreases in blood pressure risk, with the largest decrease again found in companies using the Combination type of incentive plan. Participation-Focused companies registered a slight, non-significant decrease in blood pressure risk.

None of the different types of incentives plans showed decreases for the BMI risk index. For three of the four groups, the increase in BMI risk was not statistically significant. However, the increase in BMI risk was statistically significant for the Outcomes-Focused group.

For glucose risk, the Participation-to-Outcomes group and the Combination group showed significant decreases in risk, with a greater reduction seen in the Participation-to-Outcomes type. The Participation-Focus group achieved risk reduction that bordered on statistical significance, while the Outcomes-Focused group achieved a small, non-significant reduction in glucose risk.

TABLE 4. Estimated Marginal Means for Outcome Measures*

Outcome Measure	Statistic	Participation-to-Outcomes	Combination	Outcomes-Focused	Participation-Focused
LDL risk index	T_1 marginal mean	30.030	33.933	32.019	30.561
	T_2 marginal mean	28.060	29.612	28.666	29.304
	Over-time *t*-test	5.482	7.359	8.170	2.767
	Probability	0.000	0.000	0.000	0.010
Blood pressure risk index	T_1 marginal mean	24.250	27.934	26.314	26.678
	T_2 marginal mean	22.427	25.273	24.219	25.505
	Over-time *t* test	5.199	5.028	4.322	1.239
	Probability	0.000	0.000	0.000	NS
BMI risk index	T_1 marginal mean	41.225	43.233	42.174	41.653
	T_2 marginal mean	42.437	44.153	44.521	42.449
	Over-time *t* test	−0.999	−0.753	−2.661	−0.524
	Probability	NS	NS	0.010	NS
Glucose risk index	T_1 marginal mean	26.305	24.540	24.705	25.680
	T_2 marginal mean	24.042	23.193	24.154	23.893
	Over-time *t* test	2.715	2.301	0.881	1.854
	Probability	0.010	0.029	NS	0.075

*Estimated marginal means were derived from the predicted scores from structural equation models predicting outcomes. As such other significant predictors in the model (eg, industry, the amount of the available incentive, etc) were statistically controlled and adjusted in these estimates.

DISCUSSION

This study found that incentive designs associated with employer HWB initiatives generally fell into one of four distinct types, with three types remaining relatively stable and the fourth type evolving substantially over the study period. The three stable types were incentive designs focused on participation, outcomes, and a combination of participation and outcomes, respectively. The fourth type of incentive design evolved over time toward a slightly reduced focus on participation and a substantially increased focus on outcomes. The three stable types accounted for about three-quarters of all companies in the study, with the Outcomes-Focused type representing the largest single category at 44% of all companies in the sample. While organizations in the stable incentive types maintained the same general approach throughout the study period, companies made modest changes in the overall incentive amount, dollar values associated with each incentive requirement, and the number of requirements associated with an incentive. The general pattern was to increase the size of the incentive and to require participants to do more to earn it.

The type of incentive strategy companies used had a substantial influence on the size of the incentive offered and the amount of HWB support provided to employees. Companies focusing their incentives on achieving health outcomes offered substantially larger incentives than any of the other three incentive types. At Time 1, for example, the $1342 average incentive offered by the Outcomes-Focused group was nearly double the next highest incentive type (Combination, $696) and about three times the amount offered in the other two groups. Conversely, the Outcomes-Focused companies scored more than a full point lower than companies in any of the other incentive types on the HWB support index (3.5 out of 7 possible points vs 4.5 to 5.4). This pattern suggests the Outcomes-Focused companies relied primarily on the incentive per se to drive improvements in health outcomes, rather than viewing the incentive as a tool within the context of a supportive HWB initiative and organizational culture.

The primary reliance of the Outcomes-Focused companies on incentives did not necessarily translate into higher levels of health risk change. On three of the four outcome measures—cholesterol, blood pressure, and blood glucose—statistically significant reductions in risk were seen for the companies with Participation-to-Outcomes and Combination incentive plan designs. The Outcomes-Focused group achieved decreases in risk for only cholesterol and blood pressure. However, the BMI risk index score increased about twice as much in Outcomes-Focused companies compared with the other three groups. Overall, despite offering much greater financial incentives for health improvement than other groups, the Outcomes-Focused companies achieved less overall improvement across the four health outcome measures.

While nearly 40% of study companies started the study period with a greater focus on participation requirements, approximately 84% ended the study period with a greater focus on targeted health requirements. Such shifts toward rewarding outcomes may have been influenced by the Patient Protection and Affordable Care Act (ACA) of 2010,[32] since all but four of the study companies had baseline (T_1) data in 2010 or later. The ACA enacted into statute and broadened 2006 HIPAA regulations governing the use of health plan incentives as part of company-sponsored wellness programs. This statutory protection and widespread media coverage of early adopters of Outcomes-Focused approaches may have encouraged this shift among companies toward offering incentives linked to health improvements. Baseline study years for companies ranged from 2008 through 2015 (70% began in 2012 to 2014) with follow-up (T_2) study years ranging from 2014 through 2017 (98% ended in 2015 and 2016).

Since the enactment of ACA, the research literature on employer considerations for incentive designs has focused on other sources of influence. Jenkins et al[33] suggest that companies use employee feedback to inform development of incentive designs, while Barleen et al[24] suggest employer decisions may be influenced by guidance from third-party benefit consultants or HWB vendor partners. Such factors influencing employer decisions about incentive design in the post-ACA era is an area ripe for future research.

The current study may be among the first to examine the use of HWB support practices in association with incentive design differences. It is unclear why companies using an Outcomes-Focused approach provided fewer HWB support strategies to help employees achieve those outcomes. Perhaps Outcomes-Focused companies had cultures encouraging high levels of employee accountability for job-related outcomes and this incentive design was merely an extension of that core value. A detailed review of HWB supports implemented by Outcomes-Focused companies reveals they had the lowest scores for HWB strategic planning effectiveness, organizational support effectiveness, participation strategies (e.g., communications) effectiveness, and follow-up and referral for elevated biometric screening values, all of which contributed to the lowest HWB support index score (3.5). These lower scores across multiple core HWB support dimensions also suggests that these organizations may have had less mature HWB strategies or were less aware of the kinds of supports essential to achieve healthy population change.

Similar to other research, the current study observed population-level improvements in cholesterol, blood pressure and glucose, but BMI trended upward. This may be attributed to the relative complexity of lifestyle behavior changes involved in losing weight. Population-level changes in BMI are difficult without substantial intervention, and participation in health interventions was low among study companies. Additionally, blood pressure, LDL, and glucose levels are more readily influenced by pharmaceutical interventions, and it is likely that elevated biometric screening results resulted in referrals to clinical care. Indeed, analysis of the component items of the HWB support index indicates that more than half of the companies in the current study implemented follow-up and referrals for employees with elevated health risk measures. However, many physicians may be unlikely to have the resources, skills, or time to successfully manage overweight/obesity in their practice in accordance with US Preventive Services Task Force recommendations.[34–36]

As a whole, the current study findings suggest that incentives designs vary in their influence on participation and health outcomes. Participation-Focused incentive designs were associated with lower participation index scores and with improvements in only one of the four health outcomes (LDL). The Outcomes-Focused incentive design was associated with higher participation scores for health assessment but not for health interventions, and with improvement in blood pressure and LDL risk. However, both incentive designs using a combination of participation and health outcomes linkages were associated with higher health intervention participation rates and improvements in LDL, blood pressure, and fasting glucose outcomes. The use of combination approaches to improve individual-level health outcomes is supported by at least one other study, which found changing an incentive structure from one focused only on participation to one that linked a portion of the incentive to participation and a portion to achievement of biometric targets resulted in individual-level improvements in hemoglobin HA1c and weight management outcomes.[18] However, this finding was not supported in a study by Barleen et al,[24] which compared the influence of four incentive designs (participation-based, hybrid, outcome-based, and no incentive) on health behavior program participation and achievement of several health improvement targets, including BMI, blood pressure, and non-high density lipoprotein cholesterol. That study found no between-group differences in program participation or the achievement of health improvement

targets after controlling for potential confounders, such as employee demographics, communications, culture, and incentive amounts/characteristics. At least some of the variation in findings between these studies may be attributable to uncontrolled confounding variables, despite attempts to control the influence of HWB support, program communication quality, and other possible confounders.

None of the incentive designs in this study were associated with improvements in BMI. While some research links the use of incentives with individual-level increases in physical activity, this often does not translate into weight loss at the population level.[11,13,37] It is likely that behavioral strategies beyond incentives must be employed to sustain behavior change over time for a sufficient portion of a population to achieve population-level health outcomes.

Despite some interesting differences in effectiveness emerging among the four incentive design groups, the current study reinforces past research demonstrating the need for substantial HWB support beyond incentives to produce population-level health outcomes. Accordingly, we encourage future research to focus on better understanding the role of incentives within the context of a broader HWB initiative. Many researchers familiar with incentives and health behavior change research exhort employers to invest in the use of evidence-based interventions that support sustainable behavior change and to embed those interventions into a comprehensive HWB strategy that includes a population-based approach, strategic planning with measurable objectives, leadership support, organizational commitment, comprehensive communications, and a workplace environment that supports such change.[23,38-40]

Study Limitations and Future Research

Several limitations of the current study call for caution in applying the findings to decisions about how to design effective incentive strategies. Many records provided by data suppliers did not include information about the total number of employees represented by a given client. This is because some data suppliers were engaged by clients to administer incentives plans for only the subset of the employee population enrolled in a particular health plan. As such, the results might be subject to a selection effect manifesting as sampling bias, with systematic error due to a nonrandom sample of a population.[41] Therefore, these findings may not be generalizable to all companies. In particular, the distribution of incentive strategies (eg, Outcomes-Focused strategies representing 44% of organizations) and changes to those strategies may be influenced by the fact that data for this study was supplied by organizations that manage incentives as part of their HWB services.

Similarly, selection bias may be at play in some of the longitudinal findings. Companies in this study were required to have data available during two timeframes. That requirement may have selected organizations that had been successful in achieving their employee HWB goals related to participation and/or risk outcomes. Companies that were unsuccessful or that lacked consistent leadership support may have been less likely to maintain such a contract and would have, therefore, been excluded from this study. This raises another possible limitation: there is no control group in this study, that is, companies that offered no incentives at all or that had no HWB initiatives.

The length of time between T_1 and T_2 measures emerged as a significant predictor in study models and differed across the various incentive groups. For example, Outcomes-Focused companies represented the longest length of time between measurement periods (mean of 3.6 years) while Participation-Focused companies represented the shortest length of time (mean of 1.9 years). Such differences complicate the interpretation of study findings. While we considered limiting the study to a specific length of time, we chose not to do so to maintain a sufficient sample size and to explore the role of elapsed time on study outcomes. Study companies had varying durations between measures and this may have been related to the observed changes in BMI. In the US adult population, obesity increased from 34.9% to 42.4% between 2011 to 2012 and 2017 to 2018.[42] Within the context of the current study, a 7-year duration between biometric measures with a 4-percentage point increase in obesity might be interpreted as a success, while the same outcome over a 2-year period could be judged as ineffective. Given the importance of study duration, this should be accounted for in future studies of this nature.

Another limitation of the current study was the small sample size within each of the incentive plan design types. While the differences observed between the groups were statistically significant, the small samples necessarily limit confidence in the stability of these estimates.

The use of the HWB support index was a unique feature of the current study and some interesting differences were identified across the incentive types. However, the use of such measures could be improved upon in future research. For this study, elements of the HWB support index were based on information data suppliers had about each of their clients. Given their role in implementing HWB initiatives for their clients, some of the elements (eg, use of referrals and follow-up for out-of-range biometric values) were readily known by the data supplier. Other elements (eg, ratings of organizational support for HWB) were more subjective and may have been more accurately measured by asking the company/client to provide this information. Data suppliers were not asked to request information from clients to reduce the burden associated with data collection, but future research might opt to gather such information from the employer using a validated measurement tool such as the HERO Health and Well-being Best Practices Scorecard in Collaboration with Mercer(c) (HERO Scorecard)[40] to assess HWB support.

The definition of participation in health interventions in this study was quite broad. Participation was defined as ''active participation in at least one interactive component of a health behavior change intervention in the study year.'' A component was ''interactive'' if a bi-directional communication occurred between an HWB professional or expert system and an eligible individual as part of health education, health coaching, or technology-supported intervention. Participation in health interventions was very low in the current study sample and little information was available on the nature of behavior change interventions provided by study companies. Future research should consider more robust measures and inclusion criteria in exploring the influence of incentive design on intervention participation.

Given these limitations, the current study findings should be interpreted with caution and considered exploratory. Even so, the study forges new ground by including measures that have not been examined previously. Measures of change in incentive designs over time, use of HWB support practices, time between measurement periods, and population-level health outcomes are not well represented in published research studies and merit further examination. As such, this study provides several promising new directions for future research on incentives as well as broader HWB issues.

CONCLUSION

The current study identified four general types of incentives designs used in real-world settings, which distinguishes it from more narrowly controlled studies of a single incentive design. It also examined population-level rather than individual-level health outcomes, which may be more meaningful for companies investing in HWB initiatives. Incentive designs varied in their influence on population-level participation and health outcomes, with no one design being clearly superior to others. This suggests the need for more research on the influence of different incentive designs on outcomes of interest to employers.

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