Financial Analysis

An Evaluation of the Well at Dell Health Management Program: Health Risk Change and Financial Return on Investment

Shirley Musich, PhD; Tre' McCalister, EdD; Sara Wang, PhD; Kevin Hawkins, PhD

Abstract

Purpose. *To investigate the effectiveness of the Well at Dell comprehensive health management program in delivering health care and productivity cost savings relative to program investment (i.e., return on investment).*

Design. *A quasi-experimental design was used to quantify the financial impact of the program and nonexperimental pre-post design to evaluate change in health risks.*

Setting. *Ongoing worksite health management program implemented across multiple U.S. locations.*

Subjects. *Subjects were 24,651 employees with continuous medical enrollment in 2010–2011 who were eligible for 2011 health management programming.*

Intervention. *Incentive-driven, outcomes-based multicomponent corporate health management program including health risk appraisal (HRA)/wellness, lifestyle management, and disease management coaching programs.*

Measures. *Medical, pharmacy, and short-term disability pre/post expenditure trends adjusted for demographics, health status, and baseline costs. Self-reported health risks from repeat HRA completers.*

Analysis. *Propensity score–weighted and multivariate regression–adjusted comparison of baseline to post trends in health care expenditures and productivity costs for program participants and nonparticipants (i.e., difference in difference) relative to programmatic investment.*

Results. *The Well at Dell program achieved an overall return on investment of 2.48 in 2011. Most of the savings were realized from the HRA/wellness component of the program. Cost savings were supported with high participation and significant health risk improvement.*

Conclusion. *An incentive-driven, well-managed comprehensive corporate health management program can continue to achieve significant health improvement while promoting health care and productivity cost savings in an employee population. (Am J Health Promot 2015;29[3]: 147–157.)*

Key Words: Return on Investment, Health Management Program, Wellness Evaluation, Prevention Research. Manuscript format: research; Research purpose: program evaluation; Study design: quasi-experimental; Outcome measure: health care expenditures, productivity; Setting: workplace; Health focus: health management program; Strategy: incentives, education, behavior change; Target population age: adults; Target population circumstances: workplace, employees

PURPOSE

Employers offer health management programs as a defined strategy to improve employee health, mitigate rising health care costs, enhance employee morale and satisfaction, and increase productivity.[1] A 2013 national employer survey by the Kaiser Foundation found that 77% of employers offering health care benefits also sponsored at least one wellness program.[2] Given their popularity, and the advent of lower-cost online wellness programs, health management programs have increasingly migrated to midsized and small employers.[3]

The value of health management programs to employers has been demonstrated in a long history of research that has consistently documented that health risks in a population are associated with increased health care costs[4–11] and that well-designed programs can reduce health risks and consequently improve the health of individuals.[12,13] Furthermore, as health risks change, health care costs tend to follow those changes—as health risks are reduced, health care costs are reduced, and as

Shirley Musich, PhD; Sara Wang, PhD; and Kevin Hawkins, PhD, are with Advanced Analytics, Optum, Ann Arbor, Michigan. At the time of the study, Tre' McCalister, EdD, was employed with Dell, Round Rock, Texas. Dr. McCalister is now with Total Health Management, Mercer, Austin, Texas.

Send reprint requests to Tre' McCalister, EdD, Total Health Management, Mercer, 4400 Comerica Bank Tower, 1717 Main Street, Dallas, TX 75201; Tre.McCalister@mercer.com.

This manuscript was submitted November 15, 2013; revisions were requested July 21, 2014; the manuscript was accepted for publication August 9, 2014.

0890-1171/15/$5.00 + 0
DOI: 10.4278/ajhp.131115-QUAN-582

health risks increase, health care costs increase.[14–23]

Although the general components of comprehensive health management programs have been well established, the design, implementation, engagement strategies, communications, worksite cultures, organizational environment, industry types, program management, and outcomes differ across corporations. Furthermore, no single program design can be expected to be effective across all organizations. Consequently, measurement and evaluation strategies are essential in documenting the specific success metrics associated with a given program so that program administrators can address any issues or concerns in a timely manner. Success metrics may differ because of organizational goals or management priorities, but metrics often include engagement goals, health outcomes, employee satisfaction, and/or more stringent medical and productivity cost outcomes. Return-on-investment (ROI) evaluations remain the gold standard in assessing the value and effectiveness of health management programs; however, only about 25% of midsized (50–999 employees) and 22% of large (1000+ employees) employers[1] actually perform these analytics. Among employers who report doing ROI analysis, varying levels of methodological rigor could include internal evaluations and health management vendor evaluations as well as third-party evaluations. Only about 9% of large (500+ employees) employers and 16% of jumbo (20,000+ employees) employers report employing impartial third-party vendors to complete their program ROI analyses.

Published ROI evaluations tend to focus on implementation and early years of corporate programs (e.g., years 1–4). Successful programs have typically achieved ROIs within a range of 1.65 to 4.72 within 2 to 4 years, that is, savings of $1.65 to $4.72 for each dollar invested in health management programs.[24–28] Fewer studies document ROIs for ongoing programs beyond the early years.[29] Despite several decades of research attempting to quantify the costs and benefits of health management programs, confusion about the economic benefit of these programs persists.[30] The scientific literature suffers from little standardization in terms of the program components tested, varying quality of methodological approaches, and inconsistent definitions of control groups.[31] Furthermore, because most studies are quasi-experimental, selection bias associated with program participation remains a key confounding factor often not addressed across research studies, thus limiting the generalizability of study results.

Dell implemented a comprehensive health management program called "Well at Dell" in 2004. From initiation, measurement and evaluation strategies were integrated into the program design. Annual updates of key outcome metrics of success were prioritized by Dell's health management strategy and design team to focus on program engagement, population health improvement, measures of program impact, and annual documentation of cost outcomes (i.e., ROI). In the present study, we focused on one specific year (2011) to demonstrate how Dell utilized their measurement and evaluation strategy within their ongoing program. Results with the most recent possible program outcomes were then leveraged to guide decision making in maintaining the continued effectiveness of the program.

The purpose of this present study was to evaluate the overall Well at Dell program with an emphasis on the financial impact (i.e., ROI) of the Dell program components: health risk appraisal (HRA)/wellness, lifestyle management (LM) coaching, and disease management (DM) coaching. In addition, participation rates and health risk changes over time were examined.

METHODS

Design

This quasi-experimental study focused on calculating the financial impact associated with an ongoing corporate health management program relative to programmatic investment (i.e., ROI). A difference-in-difference (DID) design compared pre to post combined medical, pharmacy and short-term disability cost trends for HRA/wellness, LM health coaching, and DM coaching program participants compared to respective eligible but nonparticipant subgroups by program. Although Dell offers program opportunities to spouses and domestic partners, this evaluation focused on employees only. Employees have the most direct exposure to the programmatic and communications opportunities provided by the program design and thus are the truest test of the financial outcomes potentially associated with the program.

Participants included employees who completed an HRA, those enrolled in LM coaching, and those enrolled in DM coaching programs. Nonparticipant subgroups included, respectively, employees who did not complete the HRA, those who met health risk criteria for health coaching (LM) but did not enroll, and those who met chronic condition criteria for DM programs (e.g., diabetes, cardiovascular artery disease [CAD], congestive heart failure [CHF], or back pain) but did not enroll. Separate evaluations were performed for each of these programs.

Net medical, pharmacy, and short-term disability expenditures included payments by Dell for its self-insured medical plans and disability programs. Short-term disability expenditures accounted for about 5% of total Dell medical/pharmacy/disability payments. Consequently, a total medical/pharmacy/disability expenditure outcome was utilized because disability payments were too low to be analyzed separately. Expenditures for employee copayments and deductibles were not included because these expenditures were not directly relevant to the corporate ROI focus on this evaluation.

A secondary study utilized a nonexperimental pre-post evaluation of health risk changes over time among repeat HRA participants. Health outcomes for 12 health risks as well as overall health status changes were measured for those employees who completed at least two HRAs over a 4-year period (2009–2012) with no additional control group.

Sample

The primary study population focused on 24,651 Dell employees with at least 6 months of continuous medical

enrollment in the pre period and at least 6 months of continuous medical enrollment post–program participation. Additionally, employees must have been eligible for the Well at Dell health management programs during the 2011 program year, nonpregnant, and between the ages of 18 and 64 years. Outliers were removed at the 99th percentile to provide equalized distributions of medical expenditures for program participant and nonparticipant subgroups.

Of those employees meeting the eligibility criteria, 49% (N = 12,037) participated in the HRA program that included additional wellness activities. Of those completing an HRA, 28% (N = 6869) met health risk criteria for LM coaching (70% enrolled; N = 4818). For DM, 16% (N = 4003) of employees met chronic condition criteria for diabetes, CAD, CHF, or back pain and were eligible for DM coaching (21% enrolled; N = 850). An integrated database was created for the purposes of the financial impact analyses utilizing medical plan eligibility, medical and pharmacy claims, short-term disability claims, completed HRA surveys, LM eligibility and enrollment files, and DM eligibility and enrollment files.

A secondary study population consisted of repeat HRA completers to provide supporting information on changes in 12 individual health risks and overall health status over time. This sample consisted of 19,662 repeat HRA completers between the year 2009 (initiation of current outcomes-based incentive program) to 2012 (the last year in which data were available). Employees had to have been active employees for a minimum of 6 months of benefits eligibility within each calendar year and had to have completed at least two HRAs during the 4-year period. Evidence of health improvement during this general time period was used as a supporting mechanism for measured financial outcomes.

Measures

Determinants of Health Care and Short-Term Disability Costs. Health care expenditures were calculated in U.S. dollars for each eligible employee, including all inpatient, outpatient, professional, and pharmacy costs, for at least 6 months and up to 12 months prior to the participation index date and for at least 6 months and up to 12 months after the participation index date. Short-term disability expenditures were treated similarly. All costs were adjusted to 2011 dollars using the medical care services component in the Consumer Price Index.

Covariates. Covariates were included to adjust for other factors that may influence the selection bias often associated with participation. These covariates included measures of demographics, health status, and other characteristics taken from health plan eligibility and claims files. Demographic variables included measures of the participant's age category, gender, and location. Region of the United States was based on zip codes and assigned as South or Other. Employee tenure (in years) was included to control for years of exposure to the Dell health management programs (i.e., long-term employees vs. newly hired/acquired employees). Insurance plan type was classified as preferred provider organization or other. Participation in other programs during 2011 and program participation in the 2010 pre period were also included as control variables (i.e., HRA/wellness, LM, or DM), as was the number of available months in the pre period.

Health status covariates were measured from claims data and included the calculated Charlson Comorbidity Index[32] (CCI), Psychiatric Diagnostic Group (PDG) score,[33] and the annual number of emergency room visits and inpatient admissions. The CCI is a measure of the risk of 1-year all-cause mortality attributable to selected comorbidities that has also been shown to be highly predictive of morbidity and health care expenditures. The PDG score includes validated PDGs analogous to major diagnostic groups in the diagnostic-related group system but provides better classification of individuals with substance abuse and/or mental health disorders. Differences in covariates between participants and nonparticipants were tested with χ^2 tests for categorical variables or Student's *t*-tests for continuous variables.

Health Risks and Health Status. As supporting evidence to the 2011 ROI calculations, health risk changes (by individual health risks and overall health status) were measured using repeat HRA completers from 2009 to 2012. The validated HRA survey (internal documentation) was administered annually online and included 234 questions about lifestyle and behavioral health risks, biometric factors, chronic conditions, and stages of behavioral change. All survey responses were self-reported; however, values from biometric screenings were utilized if measured, as occurred in about 10% of respondents. Twelve health risks were categorized as high risk or low risk: alcohol (>7 drinks/wk), blood pressure (≥120/80 mm Hg), cholesterol (≥200 mg/dL), depression (symptoms or self-reported), glucose (>100 mg/dL, fasting), high density lipoprotein cholesterol (<40 mg/dL), nutrition (<4 servings fruits/vegetables or ≥2 servings fat), health perception (fair or poor), physical activity (<3 times/wk), stress (self-reported impact on health), tobacco (current smoker), and weight (body mass index ≥25). Of note, those considered high risk for the risk change evaluation included both moderate and high severity categories for each individual health risk. Based on the number of risk factors where the respondent was at high health risk, individuals were subsequently grouped into the following overall risk status levels: high risk (five or more health risks), medium risk (three to four health risks), and low risk (zero to two health risks).

Intervention

The Well at Dell program is a comprehensive health management program with core components of HRA/year-round health promotion and wellness campaigns and LM and DM coaching. The HRA program included the online survey designed to accurately assess health status and provide feedback and associated online resources, health promotion tailored messaging, and quarterly wellness campaigns to promote and maintain healthy behaviors. Other wellness activities were also available across work locations: biometric and other health screenings, on-site flu shots, on-site fitness centers at selected locations, personalized wellness communications, and on-site health chal-

lenges. Lifestyle coaching was provided for all participants and targeted for those who met preselected health risk criteria (about 30% of HRA participants). Incentives encouraged enrollment and completion of the 12-month program.

DM programs targeted those who self-reported diabetes, heart disease, and/or back pain on the HRA, as well as those who were identified from high-cost medical/pharmacy claims or predictive modeling for those at risk to develop high costs for these conditions. Those enrolled in DM programs were encouraged to improve management of their respective conditions as well as associated lifestyle behaviors. The DM program design promoted continued participation across years with periodic telephonic contacts. Dell encouraged sustained participant engagement in the health management programs through a comprehensive communications strategy employing year-round, multichannel communications as well as campaigns in their physical facilities to encourage physical activity and promotion of healthy eating choices throughout all cafes, vending, and catering menus.

Participants were asked to receive an annual physical or attend on-site annual health screenings to "know their numbers" and input their biometric numbers when completing the HRA. Depending on the results of their survey and current risk status, eligible participants fell into three categories. These included (1) those who met Dell's annual health goals for weight, blood pressure, tobacco use, and physical activity and thus qualified for reduced medical premiums; (2) those who missed the goals and were subsequently invited to work with an on-site or telephonic health coach and to demonstrate progress toward the health goal(s) they missed to qualify for reduced medical premiums; and (3) those who chose not to engage in programs and paid higher medical premiums.

Over recent years, Dell has experienced significant growth, largely because of multiple geographically diverse acquisitions. The impact on the company's population health has been significant with new populations joining Dell, often bringing with them unidentified or unmanaged health risks and higher demographic risk factors (age, gender, and family size). Program strategies to engage newly acquired employees and spouses have been key to maintaining stable program outcomes over time, further emphasizing the need for annual evaluations that track progress on programmatic processes (e.g., engagement rates of subgroups, health improvement of new participants, or monitoring population health).

Analysis

Propensity Score Weighting. Propensity score weighting was used to adjust for potential selection bias often associated with participation in health management programs to enhance the generalizability of these findings to the broader Dell employee population. The propensity score adjustment process utilized available information about the demographic, socioeconomic, and health status variables described above that could potentially influence program participation. This information was used to estimate the underlying probability of HRA/wellness, LM, or DM participation for each individual, and then used that estimated probability to create a weighting variable applied to the data from those who chose not to participate in those respective programs, to make them better resemble all eligible employees. The utility of propensity score models to adjust for external validity threats is described elsewhere.[34,35]

Regression Modeling. Weighting was used to eliminate most of the statistical differences between program participants and nonparticipants. However, any remaining differences in demographic, socioeconomic, and health status variables were adjusted for using exponential conditional mean regression models as a final adjustment prior to the comparison of the cost trends from pre to post for participants and nonparticipants.[36] Differences in the weighted health care/disability cost trends between participants and nonparticipants (i.e., DID) were then calculated.

Program Costs. Program costs associated with the Well at Dell health management program included the following categories: vendors (HRA/online resources, LM coaching programs, and DM coaching program), on-site programming (e.g., biometric screening and health challenges), and annual program evaluation. Biometric screening, on-site vendor staff time, and other wellness communications costs were included with the HRA program (i.e., wellness). Per-participant program costs associated with each programmatic area were calculated by distributing expenditures across the number of unique participants (e.g., HRA/wellness, LM or DM coaching) or eligible employees (e.g., online communications or program evaluation). Total per-participant costs for the HRA/wellness, LM, and DM programs included direct vendor costs plus a share of communications and annual evaluation costs. Incentives have been integrated into Dell's benefit design and were cost neutral so were not included as part of program costs.

Calculating ROI Ratios. Propensity score–weighted, regression-adjusted differences in average per member per year (pmpy) pre/post cost trends between participants and nonparticipants were calculated for HRA/wellness, LM, and DM programs separately. Total savings/losses were then calculated by multiplying pmpy DIDs by the number of available years of post–index-date follow-up.

For the program cost denominator of the ROI ratio, per-participant costs for each respective program were multiplied by the number of participants in the ROI analysis to provide the total program cost denominator for the HRA/wellness, LM, and DM programs. Overall, the Well at Dell program ROI was calculated by combining annual cost savings/losses for the three programs divided by the combined program costs.

Changes in Health Risks Over Time. Changes in individual health risks as well as movement between the low (zero to two health risks), medium (three to four health risks), or high (five or more health risks) risk status categories over time were measured among repeat HRA participants. Changes in the percentages of high health risks and/or health status were documented from the initial HRA to

Table 1
Unweighted and Propensity Score–Weighted HRA/Wellness Participants and Nonparticipants*

	Unweighted			Propensity Score–Weighted		
	Participant (n = 12,037) Mean or %	Nonparticipant (n = 12,614) Mean or %	*p*	Participant (n = 12,037) Mean or %	Nonparticipant (n = 12,614) Mean or %	*p*
Age, mean, y	41.9	41.3	<0.0001	41.7	41.4	0.07
18–34, %	23.3	27.0	<0.0001	25.4	25.8	0.92
35–44, %	38.3	36.0		37.0	36.8	
45–54, %	28.9	26.9		27.8	27.7	
55–64, %	9.6	10.1		9.8	9.7	
Gender, %						
Female	27.6	25.7	0.001	26.6	27.0	0.48
Location, %						
South	78.6	68.4	<0.0001	73.5	73.6	0.89
Health plan, %						
UHC	75.4	64.6	<0.0001	72.2	68.1	<0.0001
Plan type, %						
PPO	99.6	97.9	<0.0001	99.5	98.3	<0.0001
Follow-up period, mean, mo						
Pre period	11.98	11.13	<0.0001	11.98	11.21	<0.0001
Post period	10.85	10.78	<0.0001	10.84	10.79	<0.0001
Charlson Comorbidity Index, %	0.21	0.18	<0.0001	0.20	0.19	0.55
0	85.8	87.8	<0.0001	86.8	86.9	0.83
≥1	14.2	12.2	<0.0001	13.2	13.1	0.83
Psychiatric Diagnostic Group, %	0.05	0.05	0.05	0.05	0.05	0.81
No (score = 0)	95.5	95.0	0.09	95.2	95.2	0.99
Yes (score ≥ 1)	4.6	5.0	0.09	4.8	4.8	0.99
IP admissions, %	2.0	1.8	0.19	1.9	1.9	0.92
ER visits, %	9.0	9.8	0.04	9.5	9.4	0.81
Other program participation, %						
HRA	100.0	0.0	<0.0001	100.0	0.0	<0.0001
LM	30.2	13.7	<0.0001	24.8	19.1	<0.0001
DM	4.9	2.4	<0.0001	3.8	3.7	0.77
Previous year (2010) participation, %						
HRA	90.9	0.0	<0.0001	90.1	0.0	<0.0001
LM	15.6	2.8	<0.0001	9.1	9.2	0.74
DM	3.7	1.4	<0.0001	2.6	2.6	0.76
Years of tenure	7.85	6.02	<0.0001	7.61	6.14	<0.0001
Baseline costs (pmpy), $	2772.48	2228.76	<0.0001	2557.92	2449.32	0.17

* HRA indicates health risk appraisal; UHC, UnitedHealthcare health plan; PPO, preferred provider organization; IP, inpatient admission; ER, emergency room visit; LM, lifestyle coaching; DM, disease management coaching; and pmpy, per member per year.

the latest HRA from 2009 to 2012. The significance of changes in health risks or health status over time was tested using McNemar's χ^2 test.

RESULTS

Tables 1, 2, and 3 provide the descriptive statistics for the HRA/wellness, LM coaching, and DM coaching participant and eligible nonparticipant subgroups. Participant and nonparticipant comparisons for each covariate are presented as unweighted and then propensity score–weighted results. Most of the statistical differences were eliminated or minimized with the propensity score weighting for each of the programs. Subsequent regression adjustments of pre/post cost trends of participants and nonparticipants controlled for any remaining statistical differences prior to calculating differences in the trends. Overall, the ROI study sample of 24,651 represented over 70% of Dell's 2011 active employee population. Employees were on average 73% male, with an average age of 42 years. Most (73%) lived in the South region of the United States and

Table 2
Unweighted and Propensity Score–Weighted Lifestyle Management Participants and Nonparticipants*

	Unweighted			Propensity Score–Weighted		
	Mean or %			Mean or %		
	Participant (n = 4818)	Nonparticipant (n = 2051)	*p*	Participant (n = 4818)	Nonparticipant (n = 2051)	*p*
Age, mean, y	41.5	42.3	0.004	41.6	41.4	0.40
18–34, %	24.5	24.3	<0.0001	24.9	25.2	0.99
35–44, %	39.0	35.5		38.4	38.4	
45–54, %	27.3	27.5		26.8	26.4	
55–64, %	9.2	12.8		10.0	10.0	
Gender, %						
Female	27.3	29.0	0.17	28.3	29.0	0.55
Location, %						
South	75.8	77.3	0.18	76.3	76.7	0.78
Health plan, %						
UHC	71.3	73.8	0.03	71.6	73.7	0.07
Plan type, %						
PPO	99.1	98.8	0.25	99.2	98.9	0.25
Follow-up period, mean, mo						
Pre period	11.6	11.5	0.83	11.6	11.6	0.83
Post period	10.7	10.9	<0.0001	10.7	10.9	<0.0001
Charlson Comorbidity Index, %	0.16	0.52	<0.0001	0.24	0.27	0.09
=0	88.9	66.0	<0.0001	83.0	82.3	0.48
≥1	11.1	34.0	<0.0001	17.1	17.8	0.48
Psychiatric Diagnostic Group, %	0.05	0.06	0.13	0.05	0.05	0.88
No (score = 0)	95.3	94.4	0.13	94.7	94.9	0.78
Yes (score ≥ 1)	4.7	5.6	0.13	5.3	5.1	0.78
IP admissions, %	1.9	3.8	<0.0001	2.6	2.6	0.95
ER visits, %	9.4	12.3	<0.0001	10.4	10.5	0.94
Other program participation, %						
HRA	72.8	74.8	0.08	71.9	76.3	<0.0001
LM	100.0	0.0		100.0	0.0	
DM	2.6	18.5	<0.0001	5.2	8.6	<0.0001
Previous year participation (2010), %						
HRA	63.8	60.5	0.01	62.3	62.7	0.79
LM	44.4	0.0		44.0	0.0	
DM	1.8	13.8	<0.0001	4.4	5.2	0.17
Years of tenure	6.96	7.10	0.30	6.99	7.01	0.89
Baseline costs (pmpy), $	2627.76	4482.96	<0.0001	3084.72	3298.32	0.31

* UHC indicates UnitedHealthcare health plan; PPO, preferred provider organization; IP, inpatient admission; ER, emergency room visit; HRA, health risk appraisal; LM, lifestyle coaching; DM, disease management coaching; and pmpy, per member per year.

were enrolled in a health plan provided by UnitedHealthcare insurance company (70%).

Table 4 provides the results of the descriptive propensity score weighted and the regression-adjusted propensity score weighted pmpy DIDs by program component. The HRA/wellness component generated a significant $483.84 pmpy medical/disability savings ($p <$ .0001). The LM and DM coaching programs realized losses ($75.96 pmpy and $1163.88 pmpy, respectively) but those differences were not statistically significant ($p = .78$ and $p = .24$, respectively).

Table 5 shows the ROI calculations for each of the program components. The overall ROI of the program was calculated as the sum of total savings/losses for the three program components ($4.0 million) divided by the total program costs ($1.6 million) to give an overall program ROI of 2.48. On a per-employee basis, average overall annual program medical and disability savings were $226.63 from an overall program investment of $91.46 per participant.

Table 3
Unweighted and Propensity Score–Weighted Disease Management Participants and Nonparticipants*

	Unweighted			Propensity Score–Weighted		
	Mean or %			Mean or %		
	Participant (n = 850)	Nonparticipant (n = 4818)	*p*	Participant (n = 850)	Nonparticipant (n = 4818)	*p*
Age, mean, y	47.1	43.4	<0.0001	44.4	44.2	0.57
18–34	10.1	15.7	<0.0001	13.5	14.5	0.87
35–44	29.1	40.3		39.2	38.0	
45–54	35.9	33.5		33.7	34.0	
55–64	24.9	10.5		13.6	13.5	
Gender, %						
Female	29.7	28.2	0.40	28.8	28.6	0.92
Location, %						
South	72.9	82.3	<0.0001	80.0	80.6	0.73
Health plan, %						
UHC	70.9	76.2	0.002	75.8	74.6	0.48
Plan type, %						
PPO	99.5	99.5	0.89	99.2	99.5	0.18
Follow-up period, mean, mo						
Pre period	11.85	11.88	0.40	11.85	11.87	0.56
Post period	11.28	11.52	<0.0001	11.35	11.49	<0.0001
Charlson Comorbidity Index, %	0.94	0.35	<0.0001	0.46	0.48	0.58
=0	38.5	76.3	<0.0001	68.3	68.3	0.98
≥1	61.5	23.7	<0.0001	31.7	31.8	0.98
Psychiatric Diagnostic Group, %	0.04	0.05	0.04	0.05	0.05	0.70
No (score = 0)	96.5	94.9	0.05	95.7	95.2	0.54
Yes (score ≥ 1)	3.5	5.1	0.05	4.3	4.8	0.54
IP admissions, %	5.8	3.7	0.008	4.9	4.3	0.48
ER visits, %	16.9	12.8	0.002	14.1	14.2	0.96
Comorbidities (DM only), %						
CAD	14.4	3.2	<0.0001	5.5	5.6	0.94
Chronic back pain	26.0	26.2	0.92	31.8	25.9	0.001
Diabetes	52.6	13.3	<0.0001	27.3	17.2	<0.0001
Other program participation, %						
HRA	67.3	55.4	<0.0001	54.3	57.3	0.11
LM	13.4	18.3	0.001	17.5	18.2	0.62
DM	100.0	0.0		100.0	0.0	
Program participation in previous year (2010), %						
HRA	62.0	50.1	<0.0001	48.7	52.4	0.06
LM	7.4	8.7	0.25	9.1	8.6	0.64
DM	71.5	0.0		71.4	0.0	
Years of tenure	7.67	8.94	<0.0001	8.36	8.65	0.15
Baseline costs (pmpy), $	7241.04	4382.76	<0.0001	5211.24	5064.48	0.72

* UHC indicates UnitedHealthcare health plan; PPO, Preferred provider organization; IP, inpatient admission; ER, emergency room visit; CAD, cardiovascular artery disease; HRA, health risk appraisal; LM, lifestyle coaching; DM, disease management coaching; and pmpy, per member per year.

Health risk changes are shown in Table 6. Nine of 12 health risks tracked demonstrated significant improvements (i.e., reduction in the number of those at high risk) over time. The two most improved health risks were physical activity and nutrition. The "Know Your Numbers" campaign resulted in most employees' being able to report their blood pressure and cholesterol values but also in an increase of those at risk for hypertension. The focus on improvements in levels of physical activity and nutrition was associated with decreases in those at risk for

Table 4
Descriptive Propensity Score (PS)–Weighted and Regression-Adjusted PS-Weighted Pre to Post Cost Trend Differences Between Participants and Nonparticipants*

Regression-Adjusted PS-Weighted	HRA/Wellness		Lifestyle Management		Disease Management	
	Participant (n = 12,037)	Nonparticipant (n = 12,614)	Participant (n = 4818)	Nonparticipant (n = 2051)	Participant (n = 850)	Nonparticipant (n =3153)
Total cost trend, $						
Pre period (pmpy)	2549.28	2417.64	3191.76	3337.56	5323.92	4985.16
Post period (pmpy)	2509.92	2862.12	3251.28	3321.12	6177.12	4674.48
Post minus pre changes (pmpy)	−39.36	444.48	59.52	−16.44	853.20	−310.68
	DID	***p***	**DID**	***p***	**DID**	***p***
Program savings (pmpy), $	483.84	<0.0001	−75.96	0.78	−1163.88	0.24

* DID indicates difference-in-difference; HRA, health risk appraisal; and pmpy, per member per year.

weight. The percentage of smokers decreased over time given Dell's aggressive smoking cessation program, tobacco-free discounts, and smoke-free campus. Overall, those at low risk status significantly increased by 7 percentage points with a subsequent decrease in those at high risk status by 4 percentage points.

DISCUSSION

Overall, the 2011 Well at Dell program achieved an ROI of 2.48 (i.e., $226.63 medical and disability savings from a $91.46 program investment per participant) with associated high participation and significant health improvement over the time period. Documented risk reduction and low risk maintenance provided a mechanism for the estimated program savings.[13,22,23] These results confirm that a well-managed, long-running health management program (8 years since inception) can continue to augment population health and to generate medical and disability cost savings among program participants. The Well at Dell program incorporated measurement and evaluation into their program design from the initiation of the program, and Dell continues to leverage annually updated results to maximize the effectiveness and efficiency of their program in a proactive manner.

In our analysis, most of the savings were realized from HRA/wellness participants. The annual DID savings of $483.84 for this program were within range of a similar analysis of an HRA/wellness program that achieved $727.80 annual DID medical savings in the second year of a comprehensive health management program.[28] Overall annual savings of $226.63 per participant for the Dell program were generally in agreement with other published ROI studies with updated statistical methodologies for comprehensive health management programs provided by larger employers.[24,25,27,28] Although none of the methodologies were identical and timelines differed, the results achieved were relatively stable and within a general range of $176 (average over 4 years)[25] to $397 (average over 2 years)[24] savings per participant for comprehensive wellness programs (i.e., no DM) and $452 (year 3)[26] to $968 (year 2)[28] savings per participant for programs with wellness and DM components. Dell's overall program savings may have been somewhat lower than other published programs because of program maturity involving longer-term employee health management, influx of newly acquired employees over this time period, or losses associated with LM and DM components.

Of common program components, perhaps the most variable across employers is the DM coaching program. The Dell program included diabetes, CAD/CHF, and back pain and did not achieve short-term savings—a result of increased pharmacy utilization that may be considered an indicator of higher medication adherence and better management of chronic conditions. In addition, the Dell DM participants

Table 5
Return on Investment Calculations for Well at Dell Program Components and Overall*

Program	No. Participants	Total Savings/Losses, $	Total Program Costs	ROI
HRA/wellness	12,037	5,267,792	565,739	9.31
Lifestyle management	4,818	−325,627	703,428	−0.46
Disease management	850	−929,610	350,200	−2.65
Total		4,012,555	1,619,367	2.48

* ROI indicates return on investment; and HRA, health risk appraisal.

Table 6
Health Risk Change Over Time 2009–2012 (N = 19,662)†

Health Risk: High Risk Criteria	First HRA High Risk %	Second HRA High Risk %	Difference
Alcohol: >7 drinks/wk	28.5	27.6	−0.9***
Blood pressure: ≥120/80 mmHg	44.0	57.3	13.3*
Cholesterol: ≥200 mg/dL	23.6	21.0	−2.6*
Depression: symptoms or self-reported depressed	15.6	11.7	−3.9*
Glucose: >100 mg/dL (fasting)	5.2	6.7	1.5*
HDL cholesterol: <40 mg/dL	11.2	11.6	0.4
Nutrition: <4 servings fruits/vegetables or ≥2 servings fat	40.2	29.3	−10.9*
Health perception: fair or poor	6.9	6.2	−0.7**
Physical activity: <3 times/wk	36.0	19.7	−16.3*
Stress: self-reported impact on health	22.5	17.0	−5.6*
Tobacco: current smoker	2.5	1.6	−0.8*
Weight: body mass index ≥ 25	58.3	56.5	−1.9*
Summary	**First HRA %**	**Second HRA %**	**Difference**
Low risk (0–2 risks)	44.0	51.0	7.0*
Medium risk (3–4 risks)	38.0	35.7	−2.3*
High risk (5+ risks)	18.0	14.0	−4.0*

† HRA indicates health risk appraisal.
* McNemar's χ^2 test $p < 0.0001$.
** McNemar's χ^2 test $p < 0.001$.
*** McNemar's χ^2 test $p < 0.01$.

demonstrated health improvements (from repeat HRAs; data not shown) that over time should lead to better managed health status among those with chronic conditions. Nevertheless, other studies have reported significant savings associated with DM coaching.[27,28,37,38] These programs include a more diverse selection of managed conditions including asthma, arthritis, back pain, diabetes, CAD, CHF, hyperlipidemia, hypertension, stroke, chronic obstructive pulmonary disease, depression, osteoporosis, and migraine headaches.[27,28,37,38] Without direct comparison of programs with similar managed conditions, it is not possible to determine if these programs achieved savings because of the combination of conditions managed, because of differences in the health status or demographics of participants, or as a result of differences in analytic methodologies.

LM coaching programs are generally delivered more consistently across employers identifying high risk, eligible individuals from the HRA. Although the Dell LM program demonstrated health improvements, the program achieved small losses consistent with other published programs.[37,38]

Managing program costs is essential in achieving a positive ROI. Dell's program costs averaged $91 per employee. Incentives were not included in the program costs because incentive strategies were integrated into benefit designs with rewards applied to premium reductions. Program costs in the literature for comprehensive health management programs range from a low[24] of $84 to a midrange[25] of $140 to a high[28] of $187 per employee per year, although the broader review of the literature by Baicker et al.[26] indicated average program spending of about $144 per employee per year. Of note, larger employers often negotiate volume discount rates for programs, therefore increasing their likelihood of being able to demonstrate a positive ROI on a comprehensive health management initiative.

Although recent program designs are relatively consistent with, at a minimum, HRA/wellness, LM, and DM components, some researchers have concluded that key elements of the "comprehensiveness" of the various programs have been less well documented. The Well at Dell program prioritizes integration of programs, targeted health communications, coordinated vendor activities, leadership support, and a corporate environment conducive to health. In a 2004 National Worksite Health Promotion Survey, key linkages to related programs, supportive social and physical environments, integration of the program into organizational structure, health education, and worksite screenings were highlighted from the *Healthy People 2010* recommendations as critical to comprehensive program success.[39] These more intangible differences across programs may provide the defining differences between successful and unsuccessful programs even given similar program designs.

Dell operationalized the results of this evaluation by augmenting the HRA/wellness with additional biometric screening opportunities, placing a priority on measured biometric values. In addition, to encourage effective management of chronic conditions, a value-based insurance design program was implemented. As the employee population continued to change over time, reflecting dynamic corporate environments, the Well at Dell team emphasized the engagement of new employees (new hires and newly acquired) with program modifications to

reflect changing employee demographics.

LIMITATIONS AND STRENGTHS

Our ROI methodologies included propensity score weighting and regression adjustments to account for participant selection bias. However, although we used numerous covariates in our adjustments, no statistical approaches can completely remove selection bias. Thus, even with our adjustments, selection bias may have influenced the results. Dell has a relatively young, mostly male, highly educated workforce in the technology sector; thus, results of their health management program may not generalize to other workforces in different employer sectors. HRA results used to define health risks and health risk improvement were self-reported, although numerous studies have documented that self-reported HRA data are sufficiently accurate to categorize individuals to an appropriate risk status for interventions (e.g., low vs. high risk).[40] That said, in the present study, health risks were linked to annual medical and disability costs in an attempt to verify self-reported risk status (i.e., higher risk associated with higher costs and lower risk with lower costs).[4–11]

A strength of the study included the rigorous ROI methodology (i.e., DID) adapted to effectively measure annual ROIs by program component. This year-over-year approach best served Dell's rapidly changing business environments. The 2009 and 2010 ROIs using these methods were 2.55 and 2.11, respectively, demonstrating that a well-managed health management program can achieve relatively consistent ROIs over time. The DID approach requires a pre/post timeline and thus may reduce sample size (i.e., 10%–20% in these analyses) but provides a robust analytic approach to also serve to minimize participant selection bias.

CONCLUSION

The study adds to the literature in that most ROI studies focus on implementation and early years of a specific program providing measures of program effectiveness. The ROI methodologies used in this study have been developed to accurately measure the financial impact of programs in subsequent years applying an annual year-over-year approach. ROI metrics thus can be utilized by program managers as additional evaluation metrics to guide programmatic decisions. Our updated methodological approaches included propensity score weighting and regression adjustments to remove participant selection bias. Continuing to enhance and eventually standardize ROI methods will be important to the industry as health management programs continue to expand into mid-sized and small employer environments. These results confirm that a well-designed, well-managed health management program can continue to achieve high participation and significant health improvement as well as documented medical and productivity cost savings.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

As an increasing number of small, medium and large employers incorporate health management programs, monitoring and evaluation strategies that document success measures are essential in assessing how a specific program is functioning. Return-on-investment evaluations remain an essential success metric at all stages of activity, not just newly implemented programs.

What does this article add?

This article focuses on the monitoring and evaluation of a long-running program. Continuing to monitor program efficiency and outcomes, at least annually, using data-driven decision making that enhances program design and delivery is essential to successful management of ongoing programs.

What are the implications for health promotion practice or research?

Health promotion practitioners must consider numerous metrics of success, including program design, participant engagement and health and cost outcomes, in evaluating their programs. Ongoing measurement and evaluation strategies (ideally conducted by third-party evaluators) are essential to effective program management.

Acknowledgment

The authors thank Frank G. Bottone, Jr, PhD, for his medical writing assistance.

References

1. ADP Research Institute. Why you should care about wellness programs. Roseland, NJ: ADP Research Institute; 2012. Available at: http://www.adp.com/tools-and-resources/adp-research-institute/research-and-trends/~/media/RI/whitepapers/Why-You-Should-Care-About-Wellness-Programs.ashx. Accessed February 5, 2014.
2. Kaiser Family Foundation and Health Research & Educational Trust. Employer health benefits 2013 annual survey. Available at: http://kaiserfamilyfoundation.files.wordpress.com/2013/08/8465-employer-health-benefits-2013.pdf. Accessed February 5, 2014.
3. Mercer Health & Benefits LLC. Mercer's national survey of employer-sponsored health plans, New York; 2012. Available at: http://benefitcommunications.com/upload/downloads/2011MercerSurvey.pdf. Accessed February 5, 2014.
4. Anderson D, Whitmer R, Goetzel R, et al. The relationship between modifiable health risks and group-level health care expenditures. *Am J Health Promot.* 2000;15:45–52.
5. Kowlesar, NM, Goetzel RZ, Carls GS, et al. The relationship between 11 health risk and medical and productivity costs for a large employer. *J Occup Environ Med.* 2011;53:468–477.
6. Goetzel RZ, Carls GS, Wang S, et al. The relationship between modifiable health risk factors and medical expenditures, absenteeism, short-term disability, and presenteeism among employees at Novartis. *J Occup Environ Med.* 2009;51:487–499.
7. Yen L, Schultz, A, Schnueringer E, Edington D. Financial costs due to excess health risks among active employees of a utility company. *J Occup Environ Med.* 2006;48:896–905.
8. Goetzel RZ, Anderson DR, Whitmer RW, et al. The relationship between modifiable health risks and health care expenditures. An analysis of the multi-employer HERO health risk and cost database. *J Occup Environ Med.* 1998;40:843–854.
9. Pronk NP, Goodman MJ, O'Connor PJ, Martinson BC. Relationship between modifiable health risks and short-term health care charges. *JAMA.* 1999;282:2235–2239.
10. Goetzel RZ, Pei X, Tabrizi MJ, et al. Ten modifiable health risk factors are linked to more than one-fifth of employer-employee health care spending. *Health Aff.* 2012;31:2472–2484.
11. White J, Hartley SK, Musich S, et al. A more generalizable method to evaluate the association between commonly reported health risks and healthcare expenditures among employers of all

sizes. *J Occup Environ Med.* 2013;55:1179–1185.
12. Soler RE, Leeks KD, Razi S, et al. A systematic review of selected interventions for worksite health promotion. *Am J Prev Med.* 2010;38:S237–S262.
13. Loeppke R, Edington DW, Beg S. Impact of the Prevention Plan on employee health risk reduction. *Popul Health Manag.* 2010;13:275–284.
14. Schultz AB, Edington DW. The association between changes in metabolic syndrome and changes in cost in a workplace population. *J Occup Environ Med.* 2009;51:771–779.
15. Martinson BC, Crain AL, Pronk NP, et al. Changes in physical activity and short term changes in health care charges: a prospective cohort study of older adults. *Prev Med.* 2003;37:319–326.
16. Finkelstein EA, Linnan LA, Tate DF, Leese PJ. A longitudinal study on the relationship between weight loss, medical expenditures, and absenteeism among overweight employees in the WAY to Health study. *J Occup Environ Med.* 2009;51:1367–1379.
17. Edington DW, Yen LT, Witting P. The financial impact of changes in person health practices. *J Occup Environ Med.* 1997;39:1037–1046.
18. Carls GS, Goetzel RZ, Henke RM, et al. The impact of weight gain or loss on health care costs for employees at Johnson & Johnson family of companies. *J Occup Environ Med.* 2011;53:8–16.
19. Nyce S, Grossmeier J, Anderson DR, et al. Association between changes in health risk status and changes in future health care costs. *J Occup Environ Med.* 2012;54:1364–1373.
20. Elmer PJ, Brown JB, Nichols GA, Oster G. Effects of weight gain on medical costs. *Int J Obes.* 2004;28:1365–1375.
21. Haynes G, Dunnagan T. Comparing changes in health risk factors and medical costs over time. *Am J Health Promot.* 2002;17:112–121.
22. Edington DW. Emerging research: a view from one research center. *Am J Health Promot.* 2001;15:341–349.
23. Musich S, White J, Hardley SK, et al. A more generalizable method to evaluate changes in healthcare costs with changes in health risks among employers of all sizes. *Popul Health Manag.* 2014;17:297–305.
24. Ozminkowski RJ, Dunn RL, Goetzel RZ, et al. A return on investment evaluation of the Citibank, N.A. health management program. *Am J Health Promot.* 1999;14:31–43.
25. Naydeck BL, Person JA, Ozminkowski RJ, et al. The impact of the Highmark employee wellness programs on 4-year health care costs. *J Occup Environ Med.* 2008;50:146–156.
26. Baicker K, Cutler D, Song Z. Workplace wellness programs can generate savings. *Health Aff.* 2010;29:1–8.
27. Serxner S, Alberti A, Weinberger S. Medical cost savings for participants and nonparticipants in health risk assessments, lifestyle management, disease management, depression management and nurseline in a large financial services corporation. *Am J Health Promot.* 2012;26:245–252.
28. Grossmeier, J, Seaverson ELD, Mangen DJ, et al. Impact of a comprehensive population health management program on health care costs. *J Occup Environ Med.* 2013;55:634–643.
29. Henke RM, Goetzel RZ, McHugh J, Isaac F. Recent experience in health promotion at Johnson & Johnson: lower health spending, strong return on investment. *Health Aff.* 2011;30:490–499.
30. Lerner D, Rodday AM, Cohen JT, Rogers WH. A systematic review of the evidence concerning the economic impact of employee-focused health promotion and wellness programs. *J Occup Environ Med.* 2013;55:209–222.
31. Baxter S, Sanderson K, Venn AJ, et al. The relationship between return on investment and quality of study methodology in workplace health promotion programs. *Am J Health Promot.* 2014;28:347–363.
32. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis.* 1987;40:373–383.
33. Ashcraft MLF, Fries BE, Nerenz ER, et al. A psychiatric patient classification system: an alternative to diagnosis-related groups. *Med Care.* 1989;27:543–557.
34. Fairies DEL, Haro, JM, Obenchain RL, Leon AC. *Analysis of Observational Healthcare Data Using SAS.* Cary, NC: SAS Institute Inc; 2010.
35. Seeger JD, Williams PL, Walker AM. An application of propensity score matching using claims data. *Pharmacoepidemiol Drug Saf.* 2005;14:465–476.
36. Diehr P, Yanez D, Ash A, Hornbrook M, Lin DY. Methods for analyzing health care utilization and costs. *Annu Rev Public Health.* 1999;20:125–144.
37. Caloyeras JP, Liu H, Exum E, et al. Managing manifest diseases, but not health risks, saved PepsiCo money over seven years. *Health Aff.* 2014;33:124–131.
38. Nyman JA, Abraham JM, Jeffery MM, Barleen NA. The effectiveness of a health promotion program after 3 years. *Med Care.* 2012;50:772–778.
39. Linnan L, Bowling M, Childress J, et al. Results of the 2004 National Worksite Health Promotion Survey. *Am J Public Health.* 2008;98:1503–1509.
40. Short ME, Goetzel RZ, Pei X, et al. How accurate are self-reports? Analysis of self-reported health care utilization and absence when compared with administrative data. *J Occup Environ Med.* 2009;51:786–796.

AMERICAN JOURNAL *of* *Health Promotion*

The Wisdom of Practice and the Rigor of Research

"The American Journal of Health Promotion provides a forum for that rare commodity — practical and intellectual exchange between researchers and practitioners."

Kenneth E. Warner, PhD
Dean and Avedis Donabedian Distinguished University Professor of Public Health
School of Public Health, University of Michigan

"The contents of the American Journal of Health Promotion are timely, relevant, and most important, written and reviewed by the most respected researchers in our field."

David R. Anderson, PhD, LP
Senior Vice President & Chief Health Officer, StayWell Health Management

Be the first to know.

onlineFirst

Available exclusively to ONLINE SUBSCRIBERS

The *American Journal of Health Promotion* is now publishing all articles online, ahead of print. Articles are available as a PDF document for download as soon as they have completed the review process. This means you can access the very latest papers in the field of health promotion – in some cases up to a year before they appear in print.

Subscribe Today.

6 Issues/Year

ISSN 0890-1171 (PRINT)
ISSN 2168-6602 (ONLINE)

Subscribe Online at www.HealthPromotionJournal.com
CUSTOMER SERVICE (US only) or 785-865-9402

ANNUAL SUBSCRIPTION RATES (Effective 1-1-2015 through 12-31-2015)

SUBSCRIPTION	USA	CANADA/ MEXICO	OTHER COUNTRIES
Individual Print & Online*	$145	$154	$163
Institutional Print Only**	$191	$200	$209
Tier 1: Institutional Print & Online	$373	$382	$391
Institutional Online Only	$373	$373	$373
Tier 2: Institutional Print & Online	$477	$486	$495
Institutional Online Only	$477	$477	$477
Tier 3: Institutional Print & Online	$581	$590	$599
Institutional Online Only	$581	$581	$581
University w/Archive Posting Privileges***	$895	$904	$913

*Individual Subscriptions must be set up in the name of a single individual and mailed to a residential address.
** Print subscriptions are one print copy per issue. For multi-site institutions wishing to have a copy sent to each location, additional subscriptions are required.
Tier 1 — Most Employers and Corporations except Health Organizations, Libraries and Schools
Tier 2 — Health Organizations including Hospitals, Clinics, Health Promotion Providers, Insurance Companies and Voluntary Health Agencies
Tier 3 — Libraries, Colleges and Universities
***University w.Archive Posting Privileges** — Allows an unlimited number of faculty, students and staff to post an unlimited number of typeset accepted manuscripts on the school's internal archive website. Includes print and online.

*Kwame Owusu-Edusei, Jr. is serving in his personal capacity. The views expressed are his own and do not necessarily represent the views of the Centers for Disease Control and Prevention or the United States Government.