

By John P. Caloyer, Hangsheng Liu, Ellen Exum, Megan Broderick, and Soeren Mattke

DOI: 10.1377/hlthaff.2013.0625
HEALTH AFFAIRS 33,
NO. 1 (2014): 124-131
©2014 Project HOPE—
The People-to-People Health
Foundation, Inc.

Managing Manifest Diseases, But Not Health Risks, Saved PepsiCo Money Over Seven Years

John P. Caloyer is a doctoral fellow at the Pardee RAND Graduate School and an assistant policy analyst at the RAND Corporation in Santa Monica, California.

Hangsheng Liu is a policy researcher at the RAND Corporation in Boston, Massachusetts.

Ellen Exum is the director of global wellness at PepsiCo, in Purchase, New York.

Megan Broderick is the senior director of health and welfare benefits at PepsiCo, in Purchase, New York.

Soeren Mattke (mattke@rand.org) is a senior scientist at the RAND Corporation and the managing director of RAND Health Advisory Services, RAND Health's consulting practice, in Boston, Massachusetts.

ABSTRACT Workplace wellness programs are increasingly popular. Employers expect them to improve employee health and well-being, lower medical costs, increase productivity, and reduce absenteeism. To test whether such expectations are warranted, we evaluated the cost impact of the lifestyle and disease management components of PepsiCo's wellness program, Healthy Living. We found that seven years of continuous participation in one or both components was associated with an average reduction of \$30 in health care cost per member per month. When we looked at each component individually, we found that the disease management component was associated with lower costs and that the lifestyle management component was not. We estimate disease management to reduce health care costs by \$136 per member per month, driven by a 29 percent reduction in hospital admissions. Workplace wellness programs may reduce health risks, delay or avoid the onset of chronic diseases, and lower health care costs for employees with manifest chronic disease. But employers and policy makers should not take for granted that the lifestyle management component of such programs can reduce health care costs or even lead to net savings.

Workplace health and wellness programs are becoming an increasingly common workplace benefit in the United States. The recently published RAND Workplace Wellness Programs Study found that about half of employers with at least 50 employees and more than 90 percent of those with more than 50,000 employees offered a wellness program in 2012.¹ In general, wellness programs screen employees and sometimes their dependents to identify health risks, provide interventions to address health risks and manifest disease, and promote healthy lifestyles. A wellness program's specific program components (for example, lifestyle management to promote healthy living habits or disease management to help employees manage a chronic condition or illness) and interventions (for in-

stance, on-site exercise classes) vary across employers, with larger employers more likely than smaller employers to offer more-elaborate programs that combine a variety of components and interventions.²

The popularity of wellness programs is driven by employers' expectation that the programs improve employee health and well-being, lower medical costs, increase productivity, and reduce absenteeism. For instance, a 2011 Automatic Data Processing (ADP) survey of employers with at least 1,000 employees found the four most commonly cited reasons for offering a wellness program to be "improve employee health," "control health care costs," "increase productivity," and "reduce absenteeism" (cited by 78 percent, 71 percent, 42 percent, and 43 percent of employers, respectively).³ Furthermore, 43 percent of employers responding to a 2012 Deloitte survey

said they believed that investments in wellness programs offered high levels of value to the overall health care system per dollar spent on them.⁴

The popularity of wellness programs is expected to continue to grow. A 2011 Aon Hewitt survey found that among employers without a health improvement or wellness program, 47 percent planned to add such a program in 2012, with an additional 47 percent reporting they may add such a program in the next three to five years.⁵ Employers with programs want to get more employees participating in them: 70 percent of employers in the Aon Hewitt survey identified increasing use of wellness programs as a top priority.⁵ The Affordable Care Act also has several provisions to promote workplace wellness. For example, section 4303 of the act establishes a technical assistance role for the Centers for Disease Control and Prevention to provide tools and resources to assist employers with planning, implementing, and evaluating wellness programs.

Employers' optimism regarding the benefits of wellness programs is driven by countless success stories in the popular press and trade publications and by studies in the peer-reviewed literature that have largely concluded that wellness programs save money and are a good bet for employers looking to lower health care costs.

The evidence for the prevailing wisdom today—that wellness programs can reduce health care costs and absenteeism in excess of program costs—has been established by several reviews.^{6,7} Those reviews' findings were further reinforced by a recent meta-analysis by Katherine Baicker and colleagues that stated that health care costs fall by \$3.27 and absenteeism costs fall by \$2.73 for every dollar invested in a wellness program.⁸

By contrast, the recently released RAND Workplace Wellness Programs Study, which pooled 362,136 employees from five employers, found that lifestyle management programs can achieve improvements in risk factors, such as reductions in smoking, and increases in healthy behavior, such as exercise. The study, however, did not find that lifestyle management programs achieve statistically significant reductions in health care costs.¹ Although a 2012 three-year evaluation of the University of Minnesota's wellness program also found no evidence that lifestyle management lowers health care costs, the study did find the disease management component of the program to do so.⁹ Neither lifestyle management nor disease management were found to reduce absenteeism.⁹

Reconciling these seemingly contradictory findings requires not only asking, "Do wellness programs work?" but also, "Which program components have which effects under which condi-

tions?" Such an approach is particularly important given the heterogeneity of offerings that can be subsumed under the label "workplace wellness" and the variety of settings in which these programs are implemented.

Against this background, we assess the impact of two common wellness program components—disease management to support employees with chronic conditions and lifestyle management to reduce employees' health risks—on health care cost, use, and absenteeism by individual component and for both components together.

Our study uses two baseline years and seven program years of data from PepsiCo's Healthy Living program and builds upon two prior evaluations at three years into the program that showed the overall program, but not its lifestyle management component, was associated with lower health care costs.^{10,11}

We undertook our current study to determine whether overall cost reductions were sustainable over a longer time period and whether the lifestyle management component would begin to contribute to the savings. To our knowledge, our study is one of the longest evaluations of a comprehensive wellness program to date in the published literature.

Study Data And Methods

THE PEPSICO PROGRAM PepsiCo introduced in 2003 what evolved into their Healthy Living program. Healthy Living is a wellness program made up of numerous components that include health risk assessments, on-site wellness events, lifestyle management, disease management, complex care management, a 24/7 nurse advice line, and maternity management. All PepsiCo employees and their dependents can participate in the Healthy Living program, except for the fewer than 10 percent of employees who are enrolled in a health maintenance organization or receive their health coverage through their union.

Health risk assessments help employees and their dependents understand their health status and health risks, directing those with risks, such as obesity and smoking, to lifestyle management interventions consisting of mailed educational materials, online programs, and telephonic coaching for those with higher risk levels. In 2011 there were five distinct lifestyle management programs: weight management, nutrition management, fitness, stress management, and smoking cessation. Completion of a telephonic lifestyle management program involves a series of calls with a wellness coach over a six-month period.

Disease management is offered to employees with at least one of ten chronic conditions and

focuses on improving medication adherence and patient self-care knowledge and abilities. The ten conditions covered by the disease management program were asthma, coronary artery disease, atrial fibrillation, congestive heart failure, stroke, hyperlipidemia, hypertension, diabetes, low back pain, and chronic obstructive pulmonary disease. Completion of a disease management program typically requires six to nine months, during which participants have a series of calls with a nurse that average fifteen to twenty-five minutes per call. Completion of a program occurs when the participant is successfully managing his or her condition.

STUDY SAMPLE We selected our sample from a pool of 67,541 unique members who were eligible for disease management or lifestyle management, or both, representing 400,657 member-years of data. We required participants to have at least two full years of health plan and program data as well as one year of data prior to participation. Our sample consists of 14,555 participants in disease management, 22,880 in lifestyle management, and 9,324 in both disease management and lifestyle management, among whom 2,610, 17,432, and 2,162 were successfully matched to a similar eligible nonparticipant, respectively. There are a total of 22,204 matched pairs, representing 238,724 member years. The matched pairs in the final analytic sample have on average 6.4 years of data.

DATA We combined PepsiCo's health and pharmacy plan claims data with Healthy Living eligibility and participation data for all employees and dependents for the period between September 2002 and August 2011. These data cover two baseline years (September 2002 to August 2004) and seven program years (September 2004 to August 2011) for the lifestyle management program and one baseline year (September 2002 to August 2003) and eight program years (September 2003 to August 2011) for the disease management program. Our analytic sample was restricted to employees and dependents ages 18–64 with at least two full years of enrollment in a PepsiCo health plan and one full year of data prior to the year in which they first participated. Following common practice, we removed program years involving pregnancy-related care¹² as well as individuals eligible for complex care management, which targets complex, high-cost conditions, such as terminal cancer and organ transplants, because the course of such conditions cannot be expected to be influenced by lifestyle or disease management.

Program costs include the vendor's per participant per year fees for lifestyle and disease management and the health risk assessment fee per completed survey.

Employers' optimism regarding the benefits of wellness programs is driven by countless success stories.

ANALYTIC APPROACH Our analytic sample consisted of all employees and dependents who were invited to participate in the lifestyle or disease management components of Healthy Living. We used those who decided to join the program as the intervention group and those who declined as the comparison group. Differential changes between the groups over time were used to estimate program impact, a so-called difference-in-differences design.

To adjust for differences between participants and nonparticipants, we used propensity score matching based on baseline data to balance observable variables. Propensity scores were generated based on a multinomial probit model, using the first year of data available for each member. The dependent variable was participation in lifestyle management or disease management, or both, and the independent variables included age, sex, being an employee, geographic region, calendar year, health plan enrollment tenure, total health care costs, emergency department visits, hospital admissions, and comorbidities.¹³

One-to-one propensity score matching was conducted with replacement, because there were fewer nonparticipants than participants, and was stratified by year and by program eligibility for lifestyle management or disease management, or both. After matching, regression models were used to estimate the effects of participation in difference-in-differences on the outcomes of interest. The models included lagged variables of program participation, adjustments for time-varying covariates as appropriate (age, geographic region, calendar year, and comorbidities) and individual-level fixed effects to control for unobservable characteristics.

MEASURES Program eligibility represented whether an employee was eligible and invited for a program via a telephone invitation and mailed letters during a given program year. Participation represented whether the eligible employee subsequently chose to participate, as reflected in a monthly participation status indi-

cator variable. We used two approaches to define program participation. Aggregate participation was specified as an indicator for any participation in lifestyle management or disease management, or both. Component-specific participation indicators were used to capture the individual impact of the lifestyle management and disease management components on our outcomes. Our outcomes of interest were defined as health care cost per member per month, adjusted to 2012 US dollars using the Consumer Price Index¹⁴ and hospital admissions and emergency department visits per 1,000 employee-years. Absenteeism was measured based on individuals' answers to a question on the health risk assessment about work days lost because of illness or injuries for the preceding twelve months. Work days lost was monetized by multiplying hours lost by the average hourly wage for private, goods-producing industries (\$34.14) from the Bureau of Labor Statistics.¹⁵

Return on investment (ROI) was calculated as the ratio of estimated reductions of health care and absenteeism costs to program costs as outlined above over the entire seven-year intervention period.

LIMITATIONS As with all observational designs, our study may have produced results that suffer from bias because of unobservable differences between intervention- and comparison-group members. These may include differential motivation to improve health, health plan or wellness program literacy, or work schedule issues that make participation difficult. To minimize potential bias, we used propensity score matching to account for observable differences between nonparticipants and participants, such as age, sex, comorbidities, and prior health care use. We included individual-level fixed effects in our regression analyses to account for unobservable differences that are constant over time. Thus, to attribute our estimates to bias, one would have to assume the existence of unobservable characteristics that vary over time and are associated with our endpoints.

Because of a limited pool of nonparticipants, particularly among people eligible for disease management and those eligible for both disease management and lifestyle management, our propensity score matching did not balance all member characteristics between our participant and nonparticipant groups (Appendix Exhibit 1A).¹⁶ However, we controlled for such unbalanced differences in our regression models.

PepsiCo is a large employer, and its experience with disease management and lifestyle management programs might not be generalizable to other organizations, particularly smaller ones. Employers considering adopting a wellness pro-

gram should proceed with caution. Even if the program they implement is very similar to PepsiCo's lifestyle management and disease management components, key differences in program implementation, design, and promotion to employees may affect results. For example, differences in program design and implementation might affect participation and dropout rates and intervention effects.

We did not examine health behavior outcomes, such as exercise frequency or medication adherence. We also did not investigate program effects on more granular endpoints, such as wellness-sensitive hospitalizations, as proposed by Gautam Gowrisankaran and colleagues, which may capture program effects with greater accuracy.¹⁷

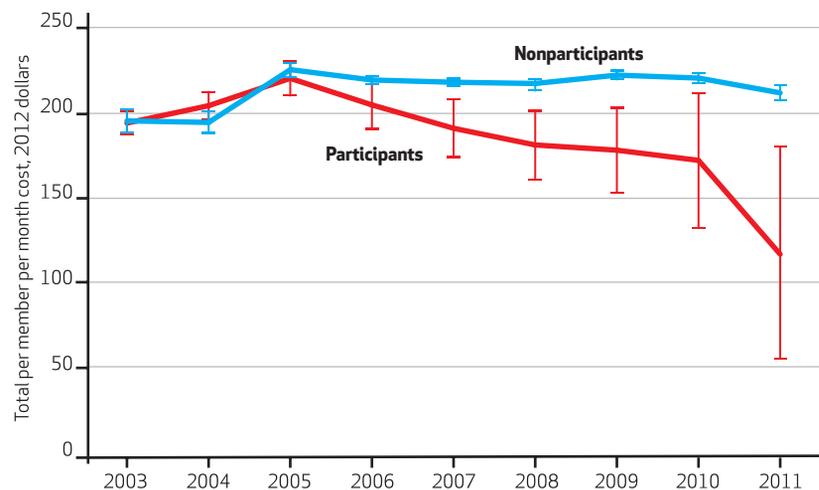
Lastly, we may have overstated the true ROI because our estimates of program component costs were confined to vendor fees. Specifically, we did not have information for the following cost items that affect ROI: the cost of PepsiCo's program staff, the cost of employees' time required for program participation, and any costs generated by false positives through extended screening.

Study Results

Looking at the lifestyle management and disease management components as a whole, we found participation to be associated with lower health care costs. Exhibit 1 compares the cost trends of

EXHIBIT 1

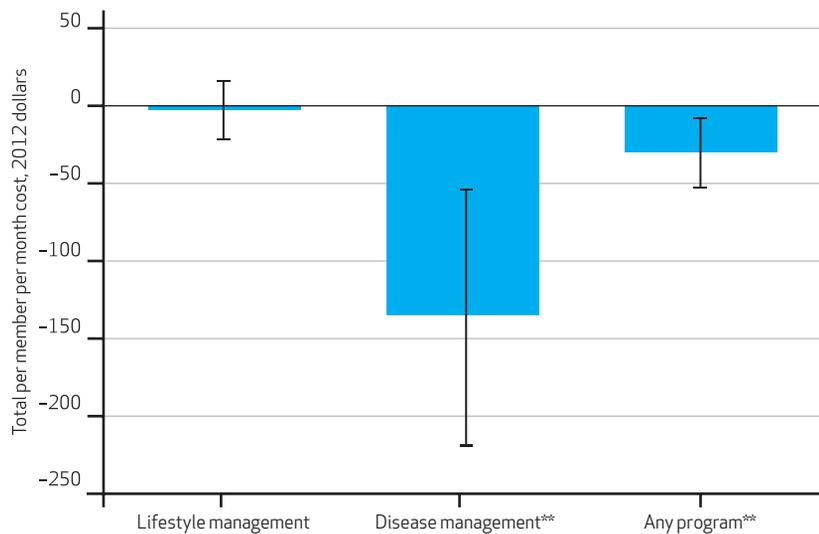
Aggregate Impact Of Lifestyle Management And Disease Management On Per Member Per Month Health Care Costs At PepsiCo, 2004-11



SOURCE Authors' analysis of PepsiCo health plan and Healthy Living program data. **NOTES** Cost estimates are adjusted by demographics, comorbidities, and calendar years based on propensity score matching and regression analyses. This exhibit assumes that members participated continuously during 2004-11; 2003 is the baseline year.

EXHIBIT 2

Per Member Per Month Cost Savings At PepsiCo, By Healthy Living Program Component, 2004-11

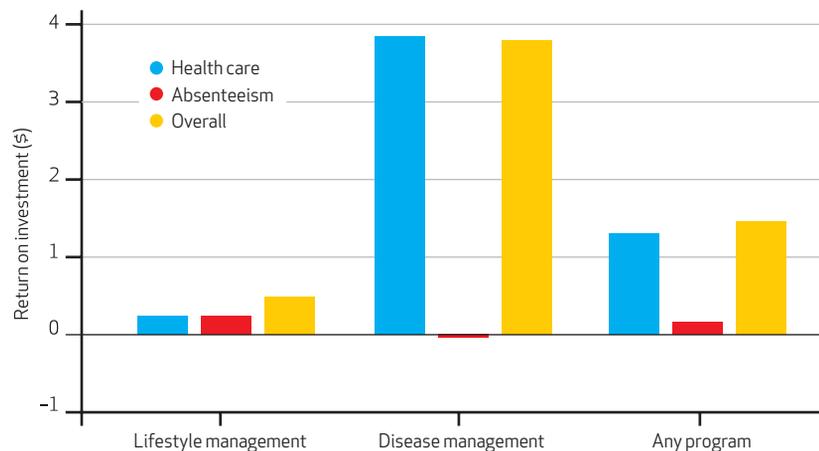


SOURCE Authors' analysis of PepsiCo health plan and Healthy Living program data. **NOTE** All savings are difference-in-differences estimates. "Lifestyle management" is the lifestyle management component; "disease management" is the disease management component; "any program" represents our measure of aggregate participation (participation in either lifestyle management or disease management, or both). Intervals for each estimate represent 95 percent confidence intervals. ** $p < 0.05$

participants with those of statistically matched nonparticipants over seven years. After the third year of participation, differences in health care costs become statistically significant. We found that seven years of continuous participation was associated with an average reduction of \$30 per member per month, or \$360 annually ($p < 0.01$)

EXHIBIT 3

Return On Investment For PepsiCo's Healthy Living Program, By Program Component, 2011



SOURCE Authors' analysis of PepsiCo health plan and Healthy Living program data. **NOTES** Program effects are difference-in-differences estimates based on 2004-11 participation data; program costs represent those incurred in 2011. Return on investment denotes savings for each dollar spent. For descriptions of program components, see Exhibit 2 notes.

(Exhibit 2).

However, when we broke down the effect on health care cost by program component, we found disease management but not lifestyle management to be associated with lower costs (Exhibit 2). We estimate disease management to reduce costs among participants by \$136 per member per month, or \$1,632 annually, driven by a 29 percent reduction in hospital admissions ($p < 0.01$).

When looking at the subset of participants that had joined both the lifestyle management and the disease management components of the program, we estimate a reduction in health care costs of \$160 per member per month, or about \$1,920 per year ($p < 0.01$), and a 66 percent reduction in hospital admissions ($p < 0.05$).

Looking again at the lifestyle management and disease management components as a whole, we found participation to be associated with a reduction in self-reported absenteeism of 0.1 day, or forty-eight minutes (in an eight-hour work-day), per year ($p < 0.01$). This effect is driven by lifestyle management participation, which is associated with a reduction of 0.13 day, or sixty-two minutes (in an eight-hour work day), per year ($p < 0.01$). The monetized impact of 0.10 and 0.13 day is estimated to be \$28 and \$35, respectively. No significant effect on absenteeism was observed among disease management participants.

Based on our analyses, we estimate that the lifestyle management and disease management components returned an average of \$0.48 and \$3.78, respectively, for every dollar invested when both health care and absenteeism impacts were included (Exhibit 3). Together, they returned \$1.46 for every dollar invested. As shown in Exhibit 3, the main driver of the positive ROI is the reduction in health care costs associated with disease management participation.

Discussion

We estimate the impact of a disease and lifestyle management program and find that disease management is associated with decreased health care costs and net savings after seven years—a result that confirms our previous analysis of this program after three years.¹⁰ Participation in lifestyle management interventions is associated with a small decrease in absenteeism but has no statistically significant effect on health care costs. These findings are not necessarily surprising: As with any preventive intervention, it is often easier to achieve cost savings in people with higher baseline spending, as we found to be the case among disease management participants. Interestingly, the disease management

participants who also joined the lifestyle management program experienced significantly higher savings, which suggests that proper targeting can improve the financial performance of lifestyle management programs.

Our findings are consistent with two recent publications. The RAND Workplace Wellness Programs Study, which is the largest evaluation of workplace wellness programs conducted to date, found lifestyle management participation to produce no statistically significant reduction in health care costs.¹ A 2012 evaluation conducted by John Nyman and colleagues of the lifestyle management and disease management components of the University of Minnesota's wellness program used an approach similar to that of our study and found the two components together to generate an overall ROI of 1.76—quite similar to our ROI of 1.46.⁹ Additionally, the authors found the savings to be driven entirely by the program's disease management component, with none generated by the lifestyle management component, further mirroring our results.⁹ Collectively, these findings cast doubt on the widely held belief in a strong business case for lifestyle management that is often supported by the above meta-analysis of Baicker and colleagues.⁸

To investigate why several recent studies came to a different conclusion than those of the wellness programs meta-analysis, we closely reviewed the seven papers that Baicker and colleagues analyzed. First, five papers looked at programs that operated more than twenty years ago,^{18–22} a time in which smoking was permitted in offices²³ and statins were just emerging.²⁴ These factors make it likely that the gains from lifestyle management interventions were higher twenty years ago than they are today. Second, the studies have a variety of methodological weaknesses, such as a lack of statistical controls for health status,^{18–22,25} a lack of adjustment for concomitant participation in disease management;²⁶ and data limitations, such as imputation of costs from self-reported use.²² Lastly, the included populations are not easily generalizable—one study was of retirees²¹ and another was of 1,000 small-town city employees.¹⁸

Because of the long latency between reduction of risk factors and avoided onset of chronic disease, it is possible that longer follow-up is required to detect savings, but it appears unlikely that the lifestyle management component of Healthy Living will ever be able to fully offset its cost, particularly when all net program costs incurred to date are considered. A recent analysis by Howard Bolnick and colleagues estimated that lowering modifiable risk factors to their theoretical minima would reduce health care

costs of an average working-age adult by 18.4 percent.²⁷ In other words, under perfect conditions, a lifestyle management program could save \$876 per person per year, on average, using the 2012 average cost of coverage in the United States.^{28–30} However, even effective programs obviously cannot achieve the complete elimination of avoidable health risks. As data from the RAND Workplace Wellness Programs Study show, programs managed to keep a quarter of smokers off nicotine and increased the share of normal-weight participants from 21 percent to 33 percent after three years.¹ From these numbers, we estimate that programs can realize about 10–25 percent of the theoretically possible cost savings, or \$88–\$219 per year and participant, which roughly corresponds to the \$157 average annual savings estimate from the RAND study. Average annual cost per lifestyle management program participant for PepsiCo's program was in line with the \$144 reported by Baicker and colleagues.^{1,8} Together, these estimates suggest that well-executed lifestyle management programs may be approximately cost-neutral.

A lack of financial return does not imply that lifestyle management cannot create value. Our study finds a significant effect on absenteeism, and both the RAND Workplace Wellness Programs Study and a recent systematic review showed statistically significant and clinically meaningful improvements in certain health risks among program participants, even though one needs to caution that most of the evidence so far has been generated from a limited set of committed employers and may have limited generalizability.³¹ At the same time, wellness programs may have unintended consequences in the form of overdiagnosis and overtreatment.^{32–34}

Further, ADP employer survey data suggest that economic outcomes are not the only reason employers offer wellness programs: The most common reason is to improve employee health, with “attract and retain talent” and “maintain or increase benefit offerings” also offered as key reasons.³

Our and other recent results have several implications for employers, researchers, and policy makers. First, the current evidence suggests that blanket claims of “wellness saves money” are not warranted, and it underscores that any program evaluation needs to be scrutinized to understand its results. Readers should ask which features the program offered, what their respective contribution to the outcomes was, whether an appropriate comparison strategy was used, and how the results should be interpreted in light of the comparison strategy. For example, the most recent evaluation of Johnson & Johnson's Live for Life program compared the medical cost experience

\$1.46

Return on investment

Together, the lifestyle management and disease management components of Healthy Living returned an average of \$1.46 for every dollar invested.

of Johnson & Johnson employees with the experience of statistically matched employees in similar firms and found annual increases to be 3.7 percent lower among Johnson & Johnson employees.¹² This evaluation's design does imply that Johnson & Johnson's overall health and wellness strategy is successful, but its comparison strategy compares Johnson & Johnson employees to similar employees in other firms. In contrast to our analysis, which compares program participants and statistically matched non-participants within one firm, the Johnson & Johnson evaluation cannot parse out whether individual components of the company's wellness program or other company characteristics, or both, such as benefits design, hiring, workplace policies,^{35,36} and corporate culture, are driving the results, which makes it difficult for readers to use such results for wellness program decision making.

Second, employers need to align program configuration with their objectives. If the primary objective is cost control, they should focus on interventions for higher-risk employees, such as those with multiple risk factors or manifest chronic disease. Conversely, if the objective is to improve workforce health, investment in evidence-based lifestyle management programs may be warranted.¹

Third, employers need to carefully consider the total cost of a program before deciding what to offer and which vendor to use. For example, the Centers for Disease Control and Prevention is advocating greater use of awareness campaigns and wellness events as more cost-effective approaches than individual coaching.³⁷ Recently issued federal rules³⁸ allow employers to tie substantial incentives to wellness program partici-

Employers need to carefully consider the total cost of a program before deciding what to offer and which vendor to use.

pation and control of risk factors.³⁹ Given their magnitude, such incentives can quickly change an employer's cost-benefit calculation. As a matter of public policy, we will need to understand what proportions of the savings to employers stem from true improvements in health and what proportions are the result of cost shifting to employees with health risks.⁴⁰

Conclusion

Workplace wellness programs have the potential to reduce health risks and to delay or avoid the onset of chronic diseases as well as to reduce health care cost in employees with manifest chronic disease. But employers and policy makers should not take for granted that the lifestyle management component of such programs can reduce health care costs or even lead to net savings. ■

The findings in this article were previously presented at the AcademyHealth 2013 Annual Research Meeting, Baltimore, Maryland, June 23–25, 2013. Funding was provided by PepsiCo.

NOTES

- 1 Mattke S, Liu H, Caloyeras JP, Huang CY, Van Busum KR, Khodyakov D, et al. Workplace Wellness Programs Study. Santa Monica (CA): RAND Corporation; 2013. (Pub. No. RR-254-DOL).
- 2 Program components can include health promotional materials, health screening or biometric testing, smoking cessation or weight loss interventions, access to a nurse help line, and web-based health coaching.
- 3 ADP Research Institute. Why you should care about wellness programs

[Internet]. Roseland (NJ): ADP Research Institute; 2012 [cited 2013 Dec 11]. Available from: <http://www.adp.com/tools-and-resources/case-studies-white-papers/~media/White%20Papers/WellnessFinal22112.ashx>

- 4 Deloitte Center for Health Solutions, Deloitte Consulting. 2012 Deloitte survey of US employers: opinions about the US health care system and plans for employee health benefits [Internet]. New York (NY): Deloitte; 2012 Jul [cited 2013 Dec 11]. Avail-

able from: http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/us_dchs_employee_survey_072512.pdf

- 5 Aon Hewitt. 2012 health care survey [Internet]. Chicago (IL): Aon Hewitt; 2012 [cited 2013 Dec 11]. Available from: http://www.aon.com/attachments/human-capital-consulting/2012_Health_Care_Survey_final.pdf
- 6 Chapman LS. Meta-evaluation of worksite health promotion economic return studies: 2005 update. Am J

- Health Promot. 2005;19(6):1-11.
- 7 Pelletier KR. A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: update VIII 2008 to 2010. *J Occup Environ Med.* 2011;53(11):1310-31.
 - 8 Baicker K, Cutler D, Song Z. Workplace wellness programs can generate savings. *Health Aff (Millwood).* 2010;29(2):304-11.
 - 9 Nyman JA, Abraham JM, Jeffery MM, Barleen NA. The effectiveness of a health promotion program after 3 years: evidence from the University of Minnesota. *Med Care.* 2012; 50(9):772-8.
 - 10 Liu H, Mattke S, Harris K, Weinberger S, Serxner S, Caloyeras JP, et al. Do workplace wellness programs reduce medical costs? Evidence from a Fortune 500 company. *Inquiry.* Forthcoming 2014.
 - 11 Liu H, Harris KM, Weinberger S, Serxner S, Mattke S, Exum E. Effect of an employer-sponsored health and wellness program on medical cost and utilization. *Popul Health Manag.* 2013;16(1):1-6.
 - 12 Henke RM, Goetzl RZ, McHugh J, Isaac F. Recent experience in health promotion at Johnson & Johnson: lower health spending, strong return on investment. *Health Aff (Millwood).* 2011;30(3):490-9.
 - 13 Elixhauser A, Steiner C, Harris DR, Coffey RM. Comorbidity measures for use with administrative data. *Med Care.* 1998;36(1):8-27.
 - 14 Bureau of Labor Statistics. Consumer Price Index. Washington (DC): BLS; 2013 Mar.
 - 15 Bureau of Labor Statistics. Employer costs for employee compensation summary. Washington (DC): BLS; 2013 Mar 12.
 - 16 To access the Appendix, click on the Appendix link to the right of the article online.
 - 17 Gowrisankaran G, Norberg K, Kymes S, Chernew ME, Stwalley D, Kemper L, et al. A hospital system's wellness program linked to health plan enrollment cut hospitalizations but not overall costs. *Health Aff (Millwood).* 2013;32(3):477-85.
 - 18 Aldana SG, Jacobson BH, Harris CJ, Kelley PL, Stone WJ. Influence of a mobile worksite health promotion program on health care costs. *Am J Prev Med.* 1993;9(6):378-83.
 - 19 Bly JL, Jones RC, Richardson JE. Impact of worksite health promotion on health care costs and utilization. Evaluation of Johnson & Johnson's Live for Life program. *JAMA.* 1986; 256(23):3235-40.
 - 20 Fries JF, Harrington H, Edwards R, Kent LA, Richardson N. Randomized controlled trial of cost reductions from a health education program: the California Public Employees' Retirement System (PERS) study. *Am J Health Promot.* 1994;8(3): 216-23.
 - 21 Leigh JP, Richardson N, Beck R, Kerr C, Harrington H, Parcell CL, et al. Randomized controlled study of a retiree health promotion program: the Bank of America study. *Arch Intern Med.* 1992;152(6):1201.
 - 22 Shi L. Health promotion, medical care use, and costs in a sample of worksite employees. *Eval Rev.* 1993;17(5):475-87.
 - 23 The first state restriction on smoking in the workplace was enacted by California in 1994 as Assembly Bill 13 and became law in 1995 (Labor Code 6404.5).
 - 24 The first statin (lovastatin) for the lowering of cholesterol was approved by the Food and Drug Administration in 1987.
 - 25 Ozminkowski RJ, Dunn RL, Goetzl RZ, Cantor RI, Murnane J, Harrison M. A return on investment evaluation of the Citibank, N.A., health management program. *Am J Health Promot.* 1999;14(1):31-43.
 - 26 Naydeck BL, Pearson JA, Ozminkowski RJ, Day BT, Goetzl RZ. The impact of the Highmark employee wellness programs on 4-year healthcare costs. *J Occup Environ Med.* 2008;50(2):146-56.
 - 27 Bolnick H, Millard F, Dugas JP. Medical care savings from workplace wellness programs: what is a realistic savings potential? *J Occup Environ Med.* 2013;55(1):4-9.
 - 28 The minimum medical loss ratio allowed by the Affordable Care Act, section 158.210, is 0.85.
 - 29 Kaiser Family Foundation. Employer health benefits: 2012 annual survey [Internet]. Menlo Park (CA): KFF; 2012 [cited 2013 Dec 11]. Available from: <http://kaiserfamilyfoundation.files.wordpress.com/2013/03/8345-employer-health-benefits-annual-survey-full-report-0912.pdf>
 - 30 Obtained by applying the 18.4 percent savings estimate and the minimum medical loss ratio of 85 percent permitted by the Affordable Care Act for the large-group market to the average annual premium for single coverage in employer-sponsored health insurance (\$5,615).
 - 31 Osilla KC, Van Busum K, Schnyer C, Larkin JW, Eibner C, Mattke S. Systematic review of the impact of worksite wellness programs. *Am J Manag Care.* 2012;18(2):e68-81.
 - 32 Cassels A. Seeking sickness: medical screening and the misguided hunt for disease. Vancouver (BC): Greystone Books; 2012.
 - 33 Krogsbøll LT, Jørgensen KJ, Gøtzsche PC. General health checks in adults for reducing morbidity and mortality from disease. *JAMA.* 2013;309(23):2489-90.
 - 34 Sox HC. The health checkup: was it ever effective? Could it be effective? *JAMA.* 2013;309(23):2496-7.
 - 35 Asch DA, Muller RW, Volpp KG. Conflicts and compromises in not hiring smokers. *N Engl J Med.* 2013;368(15):1371-3.
 - 36 Schmidt H, Voigt K, Emanuel EJ. The ethics of not hiring smokers. *N Engl J Med.* 2013;368(15):1369-71.
 - 37 Centers for Disease Control and Prevention. Workplace health promotion: workplace health model [Internet]. Atlanta (GA): CDC; [cited 2013 Dec 11]. Available from: <http://www.cdc.gov/workplacehealthpromotion/model/index.html>
 - 38 Department of Health and Human Services. Incentives for nondiscriminatory wellness programs in group health plans; final rule. *Federal Register* [serial on the Internet]. 2013;78(106):33157-92. Available from: <http://www.gpo.gov/fdsys/pkg/FR-2013-06-03/pdf/2013-12916.pdf>
 - 39 Health-contingent wellness programs may use incentives up to 30 percent of the cost of employee-only coverage or up to 50 percent if the program is designed to prevent or reduce tobacco use. Using the average annual premium for single coverage, employer-sponsored health insurance (\$5,615), the maximum average incentive allowed under the Affordable Care Act is about \$1,680, or \$2,800 if also targeting tobacco use.
 - 40 Horwitz JR, Kelly BD, DiNardo JE. Wellness incentives in the workplace: cost savings through cost shifting to unhealthy workers. *Health Aff (Millwood).* 2013;32(3): 468-76.