Workplace wellness program and short-term changes in health care expenditures

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\textbf{ABSTRACT}

Workplace wellness programs are commonly offered by employers with the expectation that they will reduce health care costs. We previously reported that Be Fit, a 10-week wellness program offered to employees of a large teaching hospital and geared towards improving nutrition and physical activity, led to improvements in weight, serum cholesterol, and blood pressure at program completion and 1-year follow-up. In the present study we assessed whether Be Fit participation was associated with reduced health expenditures by employing a difference-in-differences analysis of claims data for 289 employees who participated in Be Fit between 2010 and 2014 and 194 controls from the same parent company matched on sex, age, health risk score, and baseline health expenditures. We compared changes in expenditures from the year prior to Be Fit participation to the year after initiating participation. We did not observe any inflection in health care expenditures at the time of Be Fit participation for participants or matched controls. After adjusting for matching characteristics, changes in quarterly health expenditures were $236 lower for participants compared to controls (95% CI – $640 to $168). We similarly found no evidence of reduced health expenditures when expenditures were capped at the 99th percentile (excluding the impact of outliers) or limited to expenditures for cardiovascular disease or diabetes. Despite improvements in clinical risk factors, we find no evidence that Be Fit was associated with reduced health expenditures over 1-year follow-up. Reducing health expenditures may require a longer time horizon and programs targeting a broader set of risk factors.

1. Introduction

In the U.S., most non-elderly adults receive their health care through employment-based insurance. Employers have an incentive to promote workplace wellness programs in order to keep health care costs down and improve worker productivity. Many employers have implemented workplace wellness programs since 2009 when the Affordable Care Act (ACA) allowed insurers to charge lower premiums to workers participating in wellness programs (Centers for Medicare and Medicaid Services, 2012). However, research studying the economic impact of workplace wellness programs has yielded mixed results. Although large reviews have suggested interventions save money, (Baicker et al., 2010; Chapman, 2005) many studies included in these reviews compare program participants to non-participants and are vulnerable to significant selection bias. Most of the experimental and quasi-experimental studies are now > 20 years old (Aldana et al., 1993; Bly et al., 1986; Fries et al., 1994; Leigh et al., 1992; Ozminkowski et al., 2000; Shi, 1993), with a few more recent studies examining a heterogeneous set of interventions (health risk assessments [HRAs], smoking cessation, diet/exercise) without identifying which specific interventions lead to cost savings (Henke et al., 2011; Jones et al., 2018; Naydeck et al., 2008).

We previously demonstrated that Be Fit, a 10-week employee nutrition and exercise program at a large urban hospital, reduced the weight, serum cholesterol, and blood pressure of participating employees at the end of the program and one year follow-up (Thorndike et al., 2011; Thorndike et al., 2012). We hypothesized that these improvements in cardiovascular risk factors would be associated with reduced health care expenditures among employees who participated in the program compared to employees who did not participate. To account for selection bias (e.g., Be Fit participants are healthier at baseline), we conducted a rigorous matching of participants and non-participants by accounting for demographics, health conditions, and baseline healthcare expenditures.

2. Methods

2.1. Intervention

Research on the Be Fit program received approval from the Partners Healthcare Institutional Review Board in September 2007. Since December 2006, Massachusetts General Hospital (MGH), a teaching hospital in Boston, Massachusetts with over 26,000 employees, has offered a 10-week nutrition and physical activity program...
called “Be Fit” at no cost to employees. The details of this program have been previously described (Thorndike et al., 2011; Thorndike et al., 2012). During the study period (2010–2014), approximately 150 employees (6 teams) participated during each 10-week Be Fit program. The teams met weekly with a nutritionist and personal trainer. Teams competed on weekly weight loss, exercise, completion of food logs, and pedometer steps. Participants were taught behavior-change strategies including goal-setting, self-monitoring, and relapse prevention. During the 10-week program, participants received a free on-site gym membership and personal training sessions and were given a coupon for one healthy meal in the cafeteria per week. Weight, waist circumference, percentage body fat, blood pressure, pulse, and serum lipid profile were measured at baseline, 10 weeks, and 1 year follow-up, and the results were emailed to participants at each evaluation time-point. At baseline, approximately two-thirds of Be Fit participants were overweight or obese, and 17–19% had hypertension, 18–19% had hyperlipidemia, and 2–3% had diabetes (Thorndike et al., 2011; Thorndike et al., 2012).

2.2. Data source and control subjects

For this analysis, we used health care claims data obtained from Truven Analytics. The data were available for program participants over the period January 2010 through September 2014, provided the participants consented to claims data follow-up. For each such Be Fit participant, two other employees of the parent institution (Partners HealthCare) who did not participate in Be Fit were identified to serve as control subjects, matched to the study participant on age, sex, and Diagnostic Cost Group (DCG) risk score, which are scores commonly used for insurance risk adjustment (Zhao et al., 2005). To ensure that control subjects’ privacy was protected, matched Be Fit/control triads were deidentified and only the matching characteristics were retained; no other covariates were available for analysis.

Data on control subjects were obtained for the enrollment intervals of the participants to whom they were matched, and control subjects were assigned their match’s participation start date. We restricted the study population to those with a minimum of 12 months insurance enrollment both before and after the start of Be Fit participation.

Preliminary analyses determined that control subjects were poorly matched to participants on pre-participation health care expenditures, so we revised the matching scheme. Each Be Fit participant was matched with one control subject from the initial matching exercise based on age (± 5 years), sex, and DCG risk score (± 5 or ± 10%, whichever is larger), as well as health care expenditures (± $50 or ± 10%, whichever is larger) over any continuous 12-month period, so long as the control subject had a further 12 months of data to use as post-intervention follow-up. Control subjects were sampled with replacement. The matched control subjects’ “start date” was defined as the end of the period on which the baseline health care expenditures match was defined.

2.3. Outcomes

Our outcomes of interest were changes in health care expenditures, comparing Be Fit participants with the matched control group. Expenditures were defined as paid, adjudicated claims, including employees’ out-of-pocket spending (co-pays, coinsurance, deductibles). All dollar amounts were adjusted to 2016 US$ using the all-items Consumer Price Index. We excluded pregnancy-related expenditures in our analyses due to significant differences between participants in the Be Fit program and the control group, and the fact that such expenditures were unlikely to be related to participation in Be Fit. Expenditures were examined in aggregate, as well as in subcategories defined by type of care (outpatient care, inpatient care, and prescription drugs) and the primary diagnosis attached to a claim (cardiovascular disease, diabetes care, mental health care, cancer care, and all other care; see Table S1 for coding used to determine diagnoses). Sensitivity analyses were performed where expenditures in any given quarter were capped at the 99th percentile for all expenses above that threshold to assess the impact of extreme values. These caps were defined and applied separately for analyses focusing on specific care types and diagnoses.

2.4. Analysis strategy and statistics

Outcomes analysis employed a difference-in-differences approach where changes in health care expenditures for study subjects over 12 months before program participation (intervention) to the 12 months after initiating the program were compared to changes for control subjects. We estimated the difference-in-differences using generalized least squares models including random effects for matched intervention/control subject pairs and for individual subjects to adjust for clustering within each of those nested levels of hierarchy. We modeled quarterly health care expenditures as a function of indicators for intervention/control, baseline/follow-up, and their interaction. The coefficient on the interaction term was the difference-in-difference estimator. Additional control variables included age category, sex, and the risk score quintile.

While alternative models have been proposed for estimating health expenditure outcomes to accommodate the large numbers of individuals/periods with no health expenditures as well as the potentially outsized influence of those with very high health expenditures, sensitivity analyses reveal that the generalized least squares approach provides similar estimates in terms of effect size and statistical significance while being easier to interpret and more computationally efficient.

All analyses were conducted using Stata 15.1 (College Station, TX).

3. Results

We obtained claims data for 775 Be Fit participants who enrolled in the program from January 2010 through September 2014 and 1550 control subjects from the same time period. After applying the inclusion criteria defined by minimum baseline and follow-up data and identifying controls using the revised matching scheme, we had an analytic sample of 289 Be Fit participants matched to 194 control subjects.

Study participants in these cost analyses were representative of Be Fit participants in age, gender, and cardiometabolic risk factors (obesity, hypertension, hyperlipidemia, and diabetes) and were generally representative of the population of hospital employees (Thorndike et al., 2011; Thorndike et al., 2012). Be Fit participants and control subjects were perfectly matched on sex (by design); 82% were women. Participants and controls were generally well-matched on covariates and 12-month baseline expenditures with standardized differences all 0.21 standard deviations in absolute value or less, and generally much less (results not shown). Differences in covariates and baseline health expenditures were not statistically significant except for baseline ambulatory care expenditures, where Be Fit participants had higher expenditures than control subjects ($4177 vs. $3934, p < 0.001).

Fig. 1 illustrates the overall mean expenditures by quarter for the year before and after participation in Be Fit. Panel A shows that uncapped expenditures increased for both participants and control subjects over time, beginning prior to the Be Fit initiation point. Panel B shows that when expenditures were capped at the 99th percentile, there were no observable differences between the groups.

Table 1 shows the results of the difference-in-differences analyses comparing average within-subject changes in expenditures for Be Fit participants relative to control participants. In the models evaluating uncapped outcomes, Be Fit participants had lower quarterly expenditures after Be Fit participation but there was no evidence that this difference was significantly different from 0 (−$236, 95% CI $ − 640 to $168). There were no statistically significant changes in capped or uncapped expenditures by type of care or diagnosis.
4. Discussion

Although the Be Fit worksite exercise and nutrition program demonstrated improvements in cardiovascular risk factors, we found no evidence for reduction in healthcare costs of participants one year after the program. In this study, we conducted a rigorous matching process to identify a control group of employees that was similar to Be Fit participants in demographics, health conditions, and baseline healthcare expenditures. These negative findings are in contrast to our hypotheses and expectations of healthcare savings from employer sponsored wellness programs but are likely a reality of prevention-based programs that may take several years to accrue financial benefits.

Not only did overall expenditures appear constant over the study period, but expenditures for key diagnostic categories – CVD and diabetes care – were also unchanged in association with program participation. We also considered whether program participation would have a salutary effect on mental health care utilization/expenditures and found no differences. Although it is important to recognize that our sample size was relatively small, our quasi-experimental study design was a strength and visual inspection of trends in spending across each category revealed no evidence of an inflection in overall spending, nor spending in any category over the course of Be Fit participation.

Improvements in bio-markers and risk factors should reduce the effect of CVD and diabetes care on healthcare costs.
risks of chronic disease and significant health events such as myocardial infarctions, strokes, and the complications of diabetes, but the benefits of health behavior change may take years to accrue. Studies of workplace wellness programs conducted in the early 1990s found reductions in health expenditures within 12–18 months of program initiation (Fries et al., 1994; Leight et al., 1992; Shi, 1993), however, among more recent rigorous studies, such programs showed very little effect in the first year and it was only 3 to 4 years after program initiation that statistically significant reductions in health expenditures emerged (Henke et al., 2011; Jones et al., 2018; Naydeck et al., 2008).

Reductions in health expenditures stemming from wellness programs may also be more likely to occur as a result of improved management of existing illnesses rather than through primary prevention. The diminished point estimates observed in our capped expenditure analysis are consistent with this hypothesis. A recent study at a Fortune 100 employer found that 87% of program savings came from disease management rather than lifestyle management (Mattke et al., 2013). Nevertheless, employers continue to embrace lifestyle management programs, in part to attract and retain healthy employees and to bolster productivity (Miller, 2015; The Society for Human Resource Management, 2018).

In addition to our study’s sample size, our results should be considered in light of additional limitations. The diagnoses we ascribe to employees are based on billing data rather than clinical records. Also, while we used a strong quasi-experimental matched difference in differences design, there remains the possibility of unobserved confounding.

In conclusion, our results do not demonstrate healthcare savings of an employee exercise and nutrition program at one year, despite evidence for reduction in weight and other cardiovascular risk factors. Employers should be aware that prevention programs are not likely to provide a quick return on investment based on health expenditures. Maximally effective workplace wellness programs may need to target a more comprehensive set of risk factors over a longer period of time to show reductions in health care expenditures. Wellness programs are more likely to provide long-term benefits if they are accessible to all employees and are reinforced by worksite environmental, social, and cultural support for healthy lifestyle.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2018.12.019.

Conflicts of interest

The authors declare there is no conflict of interest.

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