Long-Term Impact of Johnson & Johnson's Health & Wellness Program on Health Care Utilization and Expenditures

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The long-term impact of corporate health and wellness programs is largely unknown, because most evaluations focus on impact in just 1 or 2 years after program initiation. This project estimated the longer-term impact of the Johnson & Johnson Health & Wellness Program on medical care utilization and expenditures. Employees were followed for up to 5 years before and 4 years after Program implementation. Fixed-effects regression models were used to control for measurable and unmeasurable factors that may influence utilization and expenditures. Results indicated a large reduction in medical care expenditures (approximately $224.66 per employee per year) over the 4-year Program period. These benefits came from reduced inpatient use, fewer mental health visits, and fewer outpatient visits compared with the baseline period. Most benefits occurred in years 3 and 4 after Program initiation. We conclude that programs designed to better integrate occupational health, disability, wellness, and medical benefits may have substantial health and economic benefits in later years. (J Occup Environ Med. *2002;44:21–29*)

Comprehensive, multicomponent, worksite health promotion programs were first introduced in the United States in the late 1970s and early 1980s, with the goals of improving employee health, reducing health care expenditures, and demonstrating senior management's commitment to the health and well-being of workers. Johnson & Johnson, a pioneer in the field, first offered its LIVE FOR LIFE® worksite health promotion program in 1979, with the expressed aim of making "Johnson & Johnson employees the healthiest in the world."[1] The corporation subsequently spent several million dollars evaluating the program, examining, among other outcomes, its effects on health and risk factors, health care expenditures, absenteeism, and employee attitudes.[1–6] Because the initial studies of Johnson & Johnson's health promotion efforts were published in the late 1980s and early 1990s, very few investigations have focused on the long-term results of the Program and its adaptation over time.

Today, worksite health promotion programs vary tremendously in terms of their comprehensiveness, intensity, and duration of activities.[7] Health promotion programs have emerged as an important corporate strategy aimed at improving employee health and productivity.[8,9] Current configurations of worksite programs may include an integration of health promotion and disease prevention, medical benefits, occupational health, employee assistance

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programs (EAPs), disease management, work/life balance, workers' compensation, disability, and absence management.[10] Consequently, the focus of health promotion has broadened to include a variety of intervention categories and a consideration of various outcomes. To underscore the evolution of the field, Pelletier describes health promotion as ". . .(integrating) particular components (ie, smoking cessation, stress management, lipid reduction, etc) into a coherent, ongoing, program that is consistent with corporate objectives and includes program evaluation."[11]

From a public health perspective, worksite-based health promotion programs have been praised because of their ability to reach a relatively large and contained population and engage them in sustained health improvement efforts. Although a growing body of literature supports positive health and financial outcomes from these programs,[12] results may be limited if a minority of eligible employees participate, or if self-selection bias exists[13] because of the voluntary nature of participation in most worksite programs.[7]

Few studies have examined worksite-based programs over a long period of time; most studies have focused on short-term outcomes limited to 1 or 2 years.[12] Pelletier recommends that future studies focus on multiyear outcomes to determine the long-term consequences of risk factor modification on morbidity and mortality.[11]

Unlike most of the previously published literature, the study we report here reviews medical claims data for up to 9 years before and after the Johnson & Johnson Health & Wellness Program (H & W Program) began in 1995. The H & W Program was formulated as the next generation of the earlier LIVE FOR LIFE program. Employees were followed for up to 5 years before the program started and up to 4 years afterward. This approach allowed us to examine long-term health care trends and to produce a more accurate estimate of program impact.

Background

In this study, we analyze the financial impact of the Johnson & Johnson H & W Program. Johnson & Johnson is the largest and most diversified health care company in the world. It employs approximately 100,000 employees worldwide, approximately 40,000 of whom are based in the United States.

In 1993, Johnson & Johnson developed a shared services concept, integrating employee health, wellness, disability management, employee assistance, and occupational medicine programs. These integrated services were recast as the Johnson & Johnson H & W Program in April 1995.[14] The Johnson & Johnson H & W Program placed even greater emphasis than previously on health promotion and disease prevention. Johnson & Johnson partnered with one of its operating companies, Johnson & Johnson Health Care Systems for health promotion and fitness services, including the delivery of the Insight Health Profile® and the Pathways to Change® risk management programs and the management of their 30 on-site fitness centers. It provided financial incentives ($500 in benefit credits) to employees who participated in the program and took advantage of its various offerings. Program managers also sought to permeate a prevention message across all major benefit programs and to integrate functions so that they ran more effectively and avoided duplication of services.

The program concentrated on changing individual behavioral and psychosocial risk factors instead of just focusing on symptom treatment. This integrated approach was expected to be more cost-effective than the prior program because of the broad use of health and wellness professionals, not only physicians or nurses. The Johnson & Johnson H & W Program also emphasized awareness among employees through health education, prevention activities, self-responsibility, and self-care. Because of financial incentives to participate and a corporate culture that supported health-promoting activities, approximately 90% of the domestic US employees participated in the program. This rate was a significant increase from the 26% participation rate recorded for its predecessor LIVE FOR LIFE program.

The H & W Program focused on providing appropriate intervention services before, during, and after major health-related events (eg, illness, accidents, or injuries) occur. Pre-event management consisted of eight major activities: (1) health risk assessment by means of the Johnson & Johnson *Insight* Health Risk Appraisal survey; (2) referral to high-risk intervention programs known as *Pathways to Change*, based on HRA responses; (3) preventive health services and screening programs, with appropriate coverage for such services included in the benefit plan design; (4) a focus on health education and self-responsibility; (5) health education/training; (6) ergonomics assessments/job conditioning; (7) medical surveillance and regulatory compliance; and (8) workplace drug and alcohol awareness training.

At-event management consisted of nine major activities: (1) emergency care, (2) limited nonoccupational care, (3) occupational injuries/illness care, (4) medical case management with a much stronger emphasis on managed care and increased enrollment in health maintenance organizations, (5) alternate/modified duty assessment if necessary, (6) health risk management programs, (7) critical incident response, (8) counseling and referrals through the EAP, and (9) substance abuse management and referrals.

Post-event management programs focused on five major activities: (1) functional assessments to monitor progress, (2) a return to wellness program, (3) substance abuse and

postrehabilitation program monitoring, (4) critical incident debriefing, and (5) alternate/modified duty monitoring.

Together, the pre-, at-, and post-event management activities spanned and coordinated corporate services among occupational medicine, disability, employee assistance, wellness, and medical benefit programs. The aim of the integrated approach was to maximize employee functioning and optimal return to work. The major impact of these efforts was expected to be optimizing health, resulting in a reduction in health care utilization and medical care expenditures. The analysis described here examined whether the decline in medical care expenditures was realized.

Methods

Sample

The analysis began with 19,105 domestic US employees who could be followed up for at least 1 year before and 1 year after the start of the Johnson & Johnson Health & Wellness Program at their company location. Start dates varied by location, but in most cases (84%), the program began in the first or second calendar quarter of 1995.

Once the eligible employee population was established, a medical claims database was built for these employees. All medical claims were first aggregated and then a series of exclusion criteria was applied to the database. Claims were excluded for services that were not expected to be influenced by the H & W Program. These included claims for maternity care, chemotherapy, transportation (ambulance use), preadmission testing, home health care, dialysis, spinal adjustment, and occupational, speech, or physical therapy. By excluding claims for these services, the eligible population was reduced. In addition, individuals below the age of 18 or over the age of 64 were excluded. As a result of these exclusions, the final sample size was 18,331.

TABLE 1
Sample Sizes by Year, Relative to the H & W Program Start Date*

Years Before/After Start of Program	Sample Size
5 years before	8,927
4 years before	10,798
3 years before	12,584
2 years before	12,908
1 year before	17,671
1 year after	18,331
2 years after	16,493
3 years after	13,703
4 years after	11,584

* H & W; Health & Wellness.

In this study, claims data were examined from services incurred between January 1, 1990, and June 30, 1999. The analyses were conducted with reference to each employee's H & W Program start date, and employees were followed for as many full calendar years as the data allowed before and after those dates. Partial years of data before or after the start of the H & W Program were dropped to avoid noise introduced by any annualizing processes.

Because the analyses centered around the employees' H & W Program start dates, the sample size decreased as one moved farther away from those dates. Table 1 shows the analytic sample sizes by year; these ranged from 8927 employees whose claims experience could be tracked for up to 5 years before their program start date, increasing to 18,331 at the start date, and then decreasing again to 11,584 employees whose claims could be tracked for up to 4 years after their H & W Program start date. The analytic procedures described below accounted for the different sample sizes in each year.

Data

Data for the health care utilization and expenditure analyses were obtained from Corporate Health Strategies, a Division of Ingenix. Detailed health plan enrollment data were not available for the entire study period, so enrollment status was imputed for each employee based on his or her employment start date and the existence of any medical claims during each study segment. An employee was assumed to be covered under the health plan from his or her employment date forward, with one exception. We allowed a maximum of 12 months without claims activity before the date the first claim was observed and 12 months after the last claim was observed to designate the employee as enrolled in the plan. Periods of no claims activity beyond either of those dates were assumed to indicate a lack of medical coverage. This process probably excluded some employees who were enrolled in the plan but never used any health care services during the study period. However, the culling process avoided counting employees who never enrolled in the medical benefit program.

Outcome Measures

The analysis sought to determine whether the Johnson & Johnson H & W Program influenced the following health care utilization measures: emergency department visits, outpatient department and doctors' office visits, mental health care visits, and inpatient hospital days. The study design called for an examination of these utilization measures for the period before and after each employee's participation in the Program. Utilization measures were assembled, by category, for each 12-month period before and after the employ-

ee's H & W Program start date. As noted earlier, start dates varied for employees at different Johnson & Johnson locations, but in most cases the Program began in early 1995.

The analysis focused on health care utilization measures instead of medical expenditures directly because approximately 25% of the analytic sample was enrolled in health maintenance organizations, and these health plans were unable to provide person-specific expenditure data. Consequently, utilization measures had to be translated into dollar equivalents. Program impact was estimated in terms of increases or decreases in utilization measures for each year after the program began, relative to the period before the start of the program. The impact estimates were then monetized by multiplying them by the average dollar value of the relevant service (ie, an emergency department visit, an office visit, etc) for the year of interest. Average dollar values for these utilization measures were derived from the noncapitated plans. Dollar estimates included expenditures for the services in question, plus expenditures for all related ancillary services. Dollar expenditures for any ancillary service not incurred in the emergency department or the hospital were assumed to pertain to outpatient care. All dollar values were cast in year-2000 terms to adjust for inflation.

Research Design

Because participation in the H & W Program was almost universal and all employees were exposed to various features of the Program at their worksites, no comparison group was available for statistical analyses. Thus, a pre–post evaluation design was used, incorporating multiple regression models to control for confounding variables. The details of the regression models are noted below.

Regression Analyses

The regression analyses were set up to estimate program impact for each year after the start of the H & W Program, relative to baseline defined as 4 or 5 years before the program began. Increases or decreases in utilization were monetized, which in turn allowed for the calculation of Program impact in dollars vis-à-vis the entire preprogram period. The impact formula was: impact/year = (dollar value of utilization in each year after the H & W Program began) − (average dollar value of utilization before it started), controlling for fixed person-level factors.

The nature of the data was such that outcomes of interest were observed annually for employees based on their program start dates, but some employees could be followed up for longer than others. Thus, there were nine annual observations from some employees, eight for others, and so forth. In the parlance of econometrics, these data represented an "unbalanced panel," because there may have been a different number of observations for each employee. Several analytic techniques have been developed especially for panel data. The technique selected for this analysis is known as "fixed-effects modeling." Specifically, negative binomial fixed-effects models for count data (such as numbers of emergency department visits, mental health visits, etc) were used in our analyses.

A description of the fixed-effects approach can be found in the publication by Kennedy.[15] Negative binomial fixed-effects models for count data are described in the works by Hausmanet al[16] and in Cameron and Trivedi.[17] The fixed-effects technique is particularly useful because it allows the researcher to control for person-level characteristics that are fixed over time (ie, they do not change in a meaningful way during the period when observations are collected), regardless of whether these can be measured directly. Examples of "fixed effects" include gender, race, and educational level. If the observation period for an individual is not too long, fixed effects might also include marital status, motivation to change health-related behaviors, type of health care coverage, health plan, job type, region of residence, and real (inflation-adjusted) income. Thus, this technique can be used to help control for a host of factors not normally present in claims data, even if these factors cannot be measured directly. The statistical methods used with panel data in the fixed-effects models allow the researcher to "sweep out" the impact of the fixed person-level factors, thereby mathematically controlling for these potentially confounding factors. As a result, the researcher is left with a more accurate estimate of the program's impact on health care utilization.

The fixed-effects models were specified as follows in our analyses. The dependent variables were the counts of the utilization outcome measures noted above, which were tallied for each employee for each year before and after the start of the H & W Program at his or her company site. A separate fixed-effects regression model was estimated for each outcome measure. Independent variables in these models included binary (yes or no) measures reflecting the time when each observation was obtained, relative to the start of the H & W Program at the employee's site. These independent variables denoted whether the observation was obtained 1 year before the start of the program, 2 years before, etc. Another indicator was added in each model to differentiate between observations obtained from later years (1997 onward) versus those obtained from earlier years. Although the selection of 1997 was arbitrary, the intent of this indicator was to account for recent trends upward or downward in health care utilization that had nothing to do with the H & W Program. Such trends might result from increased health- or drug-related advertising in recent years or other external factors.

Monetizing the Impact Estimates

The regression analyses described above produced estimates of the impact of the H & W Programs on health care utilization, controlling for several fixed, person-level characteristics and for the impact of external time-related factors. Impacts were estimated for each year after the program began, and these were monetized. For example, suppose the program was associated with a 0.5-visit decline in mental health visits per person in the first program year. If the inflation-adjusted average cost of a mental health visit was $145 for that year, savings related to mental health services would total $72.5 per person for that year (ie, $0.5 \times 145 = 72.5$).

Suppose that the program was also associated with a 0.55-visit decline in mental health visits in the second year after it began, a 0.60-visit decline in the third year, and a 0.75-visit decline in year 4. These impact estimates would be monetized in the same way, by multiplying these declines by their associated average payments for mental health services in each year.

Once the multiplication was carried out to put the impact estimates into inflation-adjusted dollar terms, the dollar values in years 1 to 4 were discounted by 3% per year to adjust for the changing value of a dollar over time not already accounted for by the inflation adjustment.

The need to discount program benefits over time is universally accepted by economists[18] and can be easily understood by considering a typical investment. Most people agree that investing $1 today will yield more than $1 next year, even after adjusting for inflation, as long as the investment is not foolish. Suppose that $1 invested today yields $1.03 next year, after adjusting for inflation. If this is true, then one of today's dollars must be more valuable than a dollar received next year. The difference in their value is known as the discount rate. The size of the discount rate to use in a program savings analysis has been debated, but current thinking is that a 3% discount rate is appropriate, and that is what we used in our analyses.[19] Discounting by 3% per year in our example would mean that the inflation-adjusted dollar value of the mental health visit declines noted above would be further divided by 1.03 for year 1, by 1.03-squared (ie, 1.0609) in year 2, by 1.03-cubed (1.0927) in year 3, and by 1.04 raised to the fourth power (1.1255) in year 4. We used this process in our analyses to put all of the dollar savings values on the same level playing field.

Generating an Overall Average Impact Estimate

Finally, we noted earlier that dollar savings were calculated for each year after the program started and that the sample size of employees used in the analyses varied by year. It is reasonable to assume that savings associated with larger numbers of employees should carry more weight than savings based on analyses with smaller numbers of employees. Thus, we weighted the savings figures by the associated sample sizes noted in Table 1 and produced a weighted average of savings per employee per year in our final calculations.

Results

Sample Characteristics

Because the number of employees included in the analyses differed over time, we calculated sample averages over the entire study period (1990 to 1999). Over that period, the average age of employees in the sample was 40.6 years. Approximately half (51.5%) of the employees were women. Approximately half (49.5%) lived in the northeastern census region of the United States; approximately one-third (33.5%) lived in the south, and the rest lived in the north-central or western regions. Almost all (92.1%) of the employees were nonunionized and in salaried positions (90.9%). Approximately half (52.6%) had family health care coverage, 26.3% had single coverage, and the rest had single and spouse-only coverage. A little over two-fifths (43.4%) were covered in a point-of-service health care plan, approximately one-fourth (24.7%) used health maintenance organizations, about one-fifth (19.6%) had indemnity coverage, and the rest were enrolled in a preferred provider organization or were provided other coverage.

Regression Results

Table 2 presents the results from the negative binomial fixed-effects regression analyses. Because the reference category used in the regression analyses was experience before 3 years before the start of the H & W Program, the table shows the impact of other years relative to that reference period. The results are shown as odds ratios for easier interpretation. Actual regression coefficients would simply be the natural logarithm of the odds ratio figures, but viewing the results in terms of odds ratios is easier. For example, the first number shown in Table 2 is the odds ratio of 0.873 for the period 3 years before program implementation. This value suggests that the average number of emergency department visits 3 years before the program began was only 0.873 times as high as it was in the reference period. Values less than 1.0 in the odds ratio column indicate lower utilization, and values greater than 1.0 indicate increases in utilization, relative to the reference period.

The regression analyses were set up to examine utilization patterns over time when compared with a relatively short reference period—4 and 5 years before the Program was started (as opposed to using the whole pre-Program period as the reference). This approach allowed us to make maximum use of the available data. By breaking up the pre-Program period into discernible units, we avoided having to make the

TABLE 2
Results From Negative Binomial Fixed-Effects Regression Models of Health Care Utilization*

	No. of ED Visits		Outpatient/Doctor's Office Visits		No. of Mental Health Visits		No. of Inpatient Days	
Explanatory Variables	**OR**	**SE**	**OR**	**SE**	**OR**	**SE**	**OR**	**SE**
Indicator for 3 years pre–H & W	0.873†	0.029	1.021	0.017	1.016	0.037	0.907	0.054
Indicator for 2 years pre–H & W	0.870†	0.028	1.063†	0.018	1.068	0.037	0.801†	0.049
Indicator for 1 year pre–H & W	0.740†	0.025	0.936†	0.015	1.019	0.035	0.647†	0.040
Indicator for 1 year post–H & W	0.893†	0.028	1.194†	0.018	1.105†	0.037	0.693†	0.042
Indicator for 2 years post–H & W	0.818†	0.028	1.245†	0.020	1.099†	0.038	0.724†	0.046
Indicator for 3 years post–H & W	0.562†	0.033	0.804†	0.024	1.033	0.047	0.561†	0.053
Indicator for 4 years post–H & W	0.503†	0.037	0.796†	0.027	0.973	0.058	0.568†	0.068
Indicator for other time-related impacts independent of H & W	1.281†	0.076	1.829†	0.051	1.189†	0.055	1.519†	0.149
Regression log likelihood	−21377.710		−89514.484		−41337.853		−9896.604	

* ED, emergency department; OR, odds ratio; SE, standard error; H & W, Health and Wellness Program. Reference category for H & W variables is 4 or 5 years before the start of the program.
† $P \leq 0.05$.

TABLE 3
Savings per Employee per Year After Start of the Health & Wellness Program

Type of Care	1 Year After Start ($)	2 Years After Start ($)	3 Years After Start ($)	4 Years After Start ($)	Weighted Average Per Employee Per Year ($)
Overall savings	91.99	131.02	355.54	413.10	224.66
ED visits	−12.15	−14.43	−7.27	−8.06	−10.87
Outpatient/doctors' office visits	−35.04	−3.85	146.60	121.93	45.17
Mental health visits	78.42	55.05	51.49	103.43	70.69
Inpatient days	60.76	94.25	164.72	195.80	119.67

assumption that utilization would be constant in the entire pre-Program period, which did not seem realistic. The variability in the regression coefficients in the pre-Program period lent support to the expectation that utilization patterns varied over time, even in the pre-Program period. If utilization had been constant in the pre-Program period, one would have expected those coefficients to be identical.

The ultimate purpose of the regression modeling was to allow comparisons of health care utilization before versus after the H & W Program began. This approach was complicated, because there were several years in the pre- and post-Program periods. Nonetheless, an examination of the data in Table 2 shows that odds ratios in the early years of the post-Program period were higher than odds ratios in most of the pre-Program period years, suggesting early increases in utilization after the program began. This was true for all of the utilization categories except inpatient days, which showed a steady decline in utilization over the entire study period. However, in the later post-Program years, large decreases in the odds ratios are shown, suggesting large reductions in utilization, which in turn resulted in significant savings in medical expenditures.

Financial Impact of the H & W Program

Table 3 shows the financial impact of the H & W Program. Overall, the program was associated with a slight increase in emergency department expenditures per employee per year ($10.87). This finding was offset by much larger decreases in expenditures for outpatient and doctors' office visits ($45.17), mental health visits ($70.69), and inpatient hospital days ($119.67). Combined savings across all outcome categories totaled $224.66 per employee per year.

Table 3 also shows trends over time in savings estimates for each of the four outcome categories. As shown, savings increased substantially in years 3 and 4 after Program implementation for outpatient and doctors' office visits and for inpatient days. The small annual losses related to emergency department services were fairly constant over time, whereas savings in mental health visits were most pronounced in the fourth year post-Program.

Discussion

Johnson & Johnson was a pioneer in the development of worksite-based health promotion and disease

prevention programs. In the early years, Johnson & Johnson invested significant resources to develop a program that was designed to achieve high participation among employees, improve health-related behaviors, reduce the prevalence of risk factors, reduce health care costs, improve absenteeism, improve employee attitudes and, ultimately, create a healthy corporate culture. Johnson & Johnson's efforts proved to be quite successful, as evidenced by the high participation rate noted earlier and by the publication of results obtained by independent researchers in scientific journals.[3–5]

As the corporation evolved in its thinking about how to best deliver its health care products and services to its customers, so did the corporate LIVE FOR LIFE program. The LIVE FOR LIFE program was reengineered into an integrated health, demand and disease management program that encompassed a full range of health and productivity management initiatives. An important component of the resulting H & W Program was the integration of employee health, occupational medicine, EAP, disability management, and health promotion into one synergistic organization. A significant incentive of $500 was provided for employees who participated in various aspects of the program, and almost all participated.

Results from the evaluation of the new H & W Program indicated substantial savings. After adjusting for potential confounders, the Program was estimated to save the company an average of $224.66 per employee per year for the 4 years examined after program introduction. These savings came from reductions in hospital inpatient use ($119.67), mental health visits ($70.69), and outpatient service use ($45.17). Savings were offset somewhat by a very small increase in emergency department use ($10.87 per employee per year). Most of the savings occurred in years 3 and 4 after program initiation.

The evaluation of the H & W Program focused on a longer period than is typical with other worksite health promotion evaluations. Up to 5 years of data were available from the time before the program began, allowing underlying trends to be better identified, as opposed to using just 1 or 2 years of pre-Program data as the basis for outcome assessment. In addition, up to 4 years of data became available after the Program began, allowing for longer-term outcomes to be measured. These factors led to a more accurate assessment of program impact than would otherwise have occurred.

Another unique characteristic of this evaluation was the use of fixed-effects regression models, which were developed for situations such as these in which several observations are available over time for each subject. These models allowed us to account for factors that did not change over time but still influenced trends in health care utilization. Fixed-effects models also allowed us to control for many factors that were not normally resident in claims data. These control variables may extend well beyond age and gender to include education, race, real income, health status, marital status, motivation to change health practices, and other important variables, depending on the length of the observation period for each individual.

Limitations

Although this study followed employees for much longer than is typical and the fixed-effects models helped control for several person-level factors, several limitations are important to consider. First among these is the lack of a comparison group, making it more difficult to assess whether reductions in utilization were caused by external factors. This might be more problematic for inpatient care, which has been decreasing in the health care industry in general. Thus, there may be other reasons not counted here for some of the inpatient utilization declines we observed. Typically, however, inpatient utilization declines are associated with increases in outpatient use, which were not observed here. Therefore, it seems plausible that the declines we observed were due to better preventive care, not simply to a change in the venue in which services were provided.

Another set of limitations relates to the use of the fixed-effects approach. Although these models have some key advantages as noted above, they are not perfect. First, fixed-effects models cannot adjust for the impact of factors that change over time. The longer employees were observed, the more variable expenditure-influencing factors may become, and these factors may still leave some bias in the program impact estimates. Second, the theory and methods involved in fixed-effects modeling preclude generalizations beyond the analytic sample used in the analysis. Because we began with the universe of domestic Johnson & Johnson employees who had at least a year of experience before and after the H & W Program began, the issue of generalizing beyond this population was moot in our case. In other studies, the desire to generalize may prompt the search for other analytic techniques, which may have advantages and disadvantages of their own.

Third, utilization impact estimates were monetized in this study by multiplying them by the average payments taken from the subset of observations coming from noncapitated plans. This process implicitly assumes that the cost-structures under which the capitated plans operated were similar to those of the noncapitated plans. If operating cost processes differed substantially by plan type, then applying noncapitated payment figures to estimate the cost of capitated services may have induced some bias. However, we believe that the amount of this bias would be preferable to restricting analyses to noncapitated plans, which clearly would have produced

an incomplete program impact estimate.

Fourth, the savings estimates reported here may be imperfect, because we counted all dollars for ancillary services not applied in the hospital or in the emergency department as being associated with outpatient/doctors' office care for physical health problems. This approach means that no ancillary dollars were associated with mental health care. We made this simplifying assumption because it would be very difficult to accurately apportion ancillary dollars to either mental health or physical health-related care, for those who used both types of services close in time to each other. As a result, we probably overestimated outpatient savings, but underestimated savings associated with mental health treatment.

Finally, the H & W Program began in concert with a shift to managed care. Thus, one might wonder whether all or some of the savings were attributable to the typical gatekeeping, utilization review, and capitation arrangements associated with managed care, as opposed to all of the other features of the H & W Program mentioned earlier. Because managed care and the H & W Program began at approximately the same time (1995), there was no way to separate their influences empirically, and both may have indeed worked together to produce the savings noted above.

We doubt that managed care was the sole reason for the large savings we estimated, however. In other analyses that we conducted, we focused on the subset of employees who were invited to participate in the Health & Wellness *Pathways to Change* high-risk program. Some of the employees in these analyses accepted the invitation to participate in *Pathways to Change* and some did not, but all were participants in managed care. A regression-based comparison of these two groups showed savings of $389.87 in medical expenditures per *Pathways to Change* participant per year, compared with nonparticipants. Because both groups were subject to managed care, and the only major difference between groups was *Pathways to Change* participation, managed care could not have produced those savings. More likely, participation in *Pathways to Change* (a H & W Program component) led to those savings. Although this finding does not prove that the H & W Program produced the $224.66 savings we estimated for all participants in the H&W Program (those at both high and low risk), the *Pathways to Change* results are consistent with the notion that managed care cannot account for all of the savings observed.

Despite the limitations noted above, the program impact estimates we reported may be conservative, because the analyses did not consider the impact of the H & W Program on disability program use, workers compensation program use, occupational health care utilization, or utilization of the company EAP. Moreover, we were unable to estimate the impact of the program on productivity at work. In general, one might argue that the use of some of these services (eg, EAP or occupational health) may have to increase to observe savings elsewhere (eg, in medical or disability program use, or in better productivity at work). Nevertheless, the limited literature suggests that expanding analyses beyond medical claims or utilization data would have increased the total program savings.[20]

Conclusion

This study demonstrates that a well-conceived health and wellness program that focuses on prevention, self-care, risk factor reduction, and disease management can produce substantial benefits for employers and their employees. Utilization and expenditures may be reduced by better coordination of existing health and productivity management programs, with many of these benefits occurring in later years.

References

1. Bly J, Jones RC, Richardson JE. Impact of worksite health promotion on health care costs and utilization: evaluation of Johnson & Johnson's LIVE FOR LIFE® programs. *JAMA*. 1986;256:235–240.
2. Holzbach RL, Piscerchia PV, McFadden DW, et al. Effect of a comprehensive health promotion program on employee attitudes. *J Occup Med*. 1990;32:973–978.
3. Blair SN, Piserchia PV, Wilbur CS, et al. A public health intervention model for worksite health promotion: impact on exercise and physical fitness in a health promotion plan after 24 months. *JAMA*. 1986;255:921–926.
4. Jones R, Bly J, Richardson J. A study of a work site health promotion program and absenteeism. *J Occup Med*. 1990;32: 95–99.
5. Shipley RH, Orleans CT, Wilbur CS, et al. Effect of the Johnson & Johnson LIVE FOR LIFE® program on employee smoking. *Prev Med*. 1988;17:25–34.
6. Breslow L, Fielding J, Herrman A, Wilbur C. Worksite health promotion: its evolution and the Johnson & Johnson experience. *Prev Med*. 1990;19:13–21.
7. Heaney CA, Goetzel RZ. A review of health-related outcomes of multi-component worksite health promotion programs. *Am J Health Prom*. 1998;11:290–307.
8. Goetzel RZ, Ozminkowski RJ. Health and productivity management: emerging opportunities for health promotion professionals for the 21st century. *Am J Health Prom*. 2000;14:211–214.
9. Goetzel RZ, Dunn RL, Ozminkowski RJ, et al. Differences between descriptive and multivariate estimates of the impact of Chevron Corporation's Health Quest Program on medical expenditures. *J Occup Environ Med*. 1998;40:538–545.
10. Goetzel RZ, Guindon AM, Turshen IJ, Ozminkowski RJ. Health and productivity management: establishing key performance measures, benchmarks, and best practices. *J Occup Environ Med*. 2000; 43:10–17.
11. Pelletier KR. A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: 1995–1998 update (IV). *Am J Health Prom*. 1999;13:333–345.
12. Aldana SG. Financial impact of health promotion programs: A comprehensive review of the literature. *Am J Health Prom*. 2001;15:296–320.
13. Ozminkowski RJ, Goetzel RZ. Getting closer to the truth: overcoming research challenges when estimating the financial

impact of worksite health promotion programs. *Am J Health Prom*. 2001;15:289–295.
14. Isaac F, Flynn P. Johnson & Johnson LIVE FOR LIFE® Program. Now and then. *Am J Health Prom*. 2001;15:365–367.
15. Kennedy P. *A Guide to Econometrics*. 2nd ed. Cambridge, MA: The MIT Press; 1985.
16. Hausman J, Hall BH, Griliches Z. Econometric models for count data with an application to the patents-R&D relationship. *Econometrica*. 1984;52:909–938.
17. Cameron AC, Trivedi PK, *Regression Analysis of Count Data*. Cambridge, UK: Cambridge University Press; 1998.
18. Krahn M, Gafni A. Discounting in the economic evaluation of health care interventions. *Med Care*. 1993;31:403–418.
19. Weinstein MC, Siegel JE, Gold MR, Kamlet MS, Russell LB. Recommendations of the Panel on Cost-Effectiveness in Health and Medicine. *JAMA*. 1996; 276:1253–1258.
20. Kessler RC, Greenberg PE, Mickelson KD, Meneades LM, Wang PS. The effects of chronic medical conditions on work loss and work cutback. *J Occup Environ Med*. 2001;43:218–225.

Your Wallet is a Bioharzard

Does our money need to be laundered? Peter Ender, Chief of Infectious Diseases at Dayton's Wright-Patterson Air Force Base, thinks so. He collected 69 $1 bills from businesses in Dayton and found that five had bacteria (*Staphylococcus aureus* and *Klebsiella pneumoniae*) that could infect healthy people if the bills touched the mouth or an open cut. Another 59 bills had a variety of germs that "have been known to cause significant infecitions in those with depressed immune systems," says Ender. He presented his findings to the American Society of Microbiology meeting in Orlando in May.

—Blank D. Up front. *Business Week*, June 18 2001, p 16.