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Effectiveness of health promotion programs in moderating medical costs in the USA

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SUMMARY

Although evidence from scientific evaluations of health promotion programs has demonstrated improvements in selected health outcomes, the relationship between participation in health programs and definitive economic returns in medical cost savings has been more difficult to establish. The purpose of this study is to evaluate the effect of employee participation in health promotion programs with selected medical cost outcomes. Program participation was operationalized as a summed participation score based on employee program participation data. Increasing levels of program participation were associated with increasingly higher medical costs but not with higher numbers of health risks. A Cost Change Model was developed to investigate the relationship between program participation and changes in cost status (high cost/low cost) over a 6-year time period. Program participation was highest among the high-cost employees. Participation patterns may have reflected the appeal of most health promotion programming to high-risk/high-cost employees. Over time those employees who participated in a comprehensive health promotion program, including intervention programs, experienced moderation in medical costs. In contrast, for those employees with participation primarily concentrated in health risk awareness and identification programs, medical costs continued to increase. These findings provide evidence for the effectiveness of a comprehensive health promotion program in moderating medical care costs.

Key words: health promotion; medical costs; participation

INTRODUCTION

Corporations' support for worksite health promotion has been stimulated by evidence that targeted programs can improve employee health resulting in increased productivity (Bowne *et al.*, 1984; Lynch *et al.*, 1990; Bertera, 1991; Yen *et al.*, 1992; Bertera, 1993; Knight *et al.*, 1994). An additional major rationale for the growing number of programs, however, is that health promotion programs will provide one strategy in the containment or reduction of escalating health care costs.

Since the initiation of comprehensive health promotion programs in the late 1970s and early 1980s, scientific research has attempted to establish a relationship between health risk behaviors and health care costs. Unfortunately, the continuing escalation in health care costs complicates the simple association of poor health behaviors and increased medical utilization. Aging demographics, demand for high technology and improving quality of medical care are some of the major contributing factors.

Although an individual's health risks cannot totally account for that person's health care costs, an intuitive causal relationship continues to drive corporate interest: healthy people should use fewer health services (Kaman and Loney, 1994). However, scientific evidence to support a reduction in health care costs as a direct outcome of participation in worksite health promotion programs continues to be inconclusive. Studies are often short term (Shephard *et al.*, 1982; Bowne *et al.*, 1984), ignore the highly skewed nature of medical costs (Shephard *et al.*, 1982; Bowne *et al.*, 1984; Gibbs *et al.*, 1985; Bly *et al.*, 1986) and produce contradictory conclusions (Lynch *et al.*, 1989; Sciacca *et al.*, 1993; Cousins and McDowell, 1995).

Shephard *et al.* (1982), in one of the earliest studies, compared medical cost trends between employees at a Canadian life insurance company in the initial year of participation in a fitness center and employees at a control company. Average medical care costs for both participants and non-participants at the test company did not change from the baseline averages while medical care costs at the control company increased. Because these authors could not demonstrate a direct relationship between short-term costs and participation levels, they concluded that the benefit at the test company arose not from the mechanics of participation in the fitness program but from an overall increment of health awareness at the company.

Bowne *et al.* (1984) compared prospective disability days and medical costs of fitness center participants with overall trends in an insurance company. After 1 year of participation in the fitness center, annual disability days for participants decreased by 20% and average medical costs decreased by 46%. There was no evidence from baseline medical costs that the participant group was physically healthier than the total population. In fact, using fitness testing to categorize fitness levels, an inverse relationship was demonstrated with consistent decreases in medical costs at every level of increased fitness after 1 year of participation in the fitness center.

Bly *et al.* (1986) compared the Johnson & Johnson Live for Life (LFL) program at two test worksites with a non-LFL control worksite in a 5-year study. The premise was that the change in the work environment would have an effect on both active participants and non-participants. LFL groups were reported to have significantly lower rates of increase for inpatient costs over time compared with the control group. There were no changes in outpatient costs. When average inpatient costs were compared by year, there were no differences among LFL and non-LFL sites for the first 3 years of the program. In the 4th and 5th years, however, non-LFL inpatient costs increased dramatically while LFL costs plateaued. These results seemed to indicate that the impact of a health promotion program was the result of a long-term commitment to the program by the company and its employees.

More basically, there appears to be a relationship between health risks and medical costs. High-risk people have been associated with higher medical costs compared with low-risk people (Yen *et al.*, 1991; Yen *et al.*, 1994; Goetzel *et al.*, 1998). Furthermore, those people who change risk status by improving their lifestyle behaviors have been shown to reduce their costs (Erfurt *et al.*, 1991; Foote and Erfurt, 1991; Edington and Yen, 1992; Leutzinger *et al.*, 1995; Edington *et al.*, 1997).

Traditionally, the goal of health promotion programs is risk reduction with high-risk and/or high-cost employees more likely to participate in these programs. The purpose of this study is to evaluate the effects of employee participation in health promotion programs at an insurance company by assessing the association of increasing program participation with selected medical cost outcomes. Specifically, program participation among high-cost employees is expected to be associated with medical cost moderation and/or reduction and program participation among low- and/or moderate-cost employees with continued low/moderate costs.

METHODS

This project was a case study of the long-term participation in the comprehensive health promotion program at The Progressive Corporation, a Cleveland-based insurance-holding company whose subsidiaries offer personal automobile and specialty property-casualty insurance, and related services throughout the USA and Canada. An integrated database was assembled which contained the following data elements for each year of the study period: personnel records (birth date, gender, job status, location and medical plan selection), health risk appraisals, medical claims and wellness program attendance records.

Subjects

The selected study population consisted of 1272 employees who met the following criteria for the 6-year study period: (i) continuously employed from 1990 to 1995; (ii) enrolled in an indemnity insurance plan; (iii) not pregnant during that period; and (iv) had participated in at least one health risk appraisal (HRA) during the 6-year time period. Non-pregnant employees were selected because the dramatic changes during pregnancy and resulting health care costs are clearly a separate category of medical usage and would need to be studied separately. A total of 290 pregnant women were excluded.

The availability of programs and program experiences were not uniform throughout the company; hence subjects were divided by location into two subgroups: headquarters (Comprehensive Program; n = 627) and other locations (Limited Program; n = 645). At headquarters, a comprehensive health promotion program was available, including an on-site fitness center (opened December 1994) and a health services department. In the other locations throughout the USA and Canada, some types of wellness programming, especially intervention programs, were less available.

The overall study population and the selected subgroups were characterized by the following demographic variables: age, gender, job status, medical plan selection and location. Study populations were compared to those populations excluded because of the HRA participation criterion: program participants without an HRA (n = 333) and non-participants (n = 244).

Health promotion participation

The mission of Progressive's Health Services Department is to 'educate, motivate and empower their people to achieve optimal health and well-being'. Programs are provided based on employee needs assessments, and as many programs as possible are made available to all employees. However, different numbers of programs and different types of programs were offered on a yearly basis to different locations within the company. In order to minimize the diversity of program participation experience among these employee populations, program participation was summed over the 6 years, 1990–1995, for the subgroups defined by location as Comprehensive Program and Limited Program.

Program participation was measured with employee program participation data. As a method of investigating the relative contributions of the different program components of the comprehensive health promotion program, all available programs were divided into four categories according to the nature of the programs (program-types): knowledge/education classes; screening programs; HRAs; and intervention/interactive classes. Typical programs within the categories included: knowledge/education series of classes (Parenting Pointers; Women's Wellness; and Baby, Maybe? prenatal classes); screening programs (biometric screening and mammography); HRAs (yearly health risk appraisals); and intervention/interactive classes (fitness center, workstation evaluations and Smart Eating nutritional program).

Program participation was then operationalized for analysis as a counted total participation score. Each program was given an equal weight in the total score, i.e. attendance at any given program was counted as 1 point. Several weighted scores were tested with nearly equal results. Thus, the total counted score for a given participant was the summed total of that employee's attendance of health promotion programs during the 6-year time period.

HRA participation

The HRA, offered on a yearly basis, was used as a measurement tool for health risk status but also was counted as a program in the program participation score. The HRA was originally developed by the Centers for Disease Control/Carter Center and modified by the University of Michigan Health Management Research Center (UM-HMRC) for the employer.

In addition to self-reported age and sex, 15 health-related factors were selected to establish health status (Edington *et al.*, 1997).

(i) Four psychological variables: stress, perception of physical health, life satisfaction and job satisfaction.
(ii) Six lifestyle variables: tobacco use, alcohol use, seatbelt use, drug/medication use, physical activity level and illness absence days
(iii) Five health/biological variables: Health Age Index, blood pressure, cholesterol, relative body weight and serious medical problems.

Each employee's most recent HRA was used to determine health risk status.

Medical claims costs

The yearly medical costs used in this study were calculated from the claims charged by the health providers. Charged costs rather than paid claims were used to account for the differences in the deductibles associated with the various health plan selections. The claims data were received on a per claim basis and then individual claims were aggregated to determine the total cost per employee per year. Total medical claims for each year were also summed by the 19 major diagnostic code categories (MDCs) (International Classification of Diseases, 1994). The yearly costs were adjusted to 1998 dollars using published medical inflation rates (US Bureau of Labor Statistics, 1998).

Cost Change Model

The Cost Change Model was developed to investigate the association between medical cost change over time and program participation. Medical cost status (high cost/low cost) during the first 3 years of the study period, 1990–1992, was compared with the medical cost status (high cost/low cost) during the second 3 years of the study period, 1993–1995. High cost status was defined as having medical costs within the top 30th percentile of costs for a given time period. Four categories of cost status change from time 1 to time 2 were defined: high cost to high cost (H–H); high cost to low cost (H–L); low cost to high cost (L–H); and low cost to low cost (L–L).

The association of program participation with changes in cost status was evaluated by separately comparing program participation intensity for each of the program-types (knowledge/education classes, screenings, HRAs and intervention/interactive classes) across the cost change groups (H–H; H–L; L–H; and L–L). Differences in program participation were tested using the ANOVA procedure with *post hoc* Tukey group comparisons.

Average medical cost change

Average medical cost change between the two 3-year periods was also investigated for the two location subgroups, Comprehensive Program and Limited Program. Average medical costs for the first 3 years were compared with average medical costs for the second 3 years. Statistical differences in average cost change between locations were tested using the analysis of covariance procedure, and within the locations with the non-parametric sign rank test.

RESULTS

Demographics comparing the study population with those employees who were excluded from the study are given in Table 1. Program participants without an HRA and non-participants were significantly more likely to be male, exempt status and in remote locations. The gender ratios and average age of the overall study group, however, were close to being representative of the long-term (6-year) non-pregnant employees of the company as a whole.

Participation quartiles were defined from the distribution of the counted participation score (total 6-year program participation excluding the HRA score component). The average levels

Table 1: Demographics: study population versus HRA non-participant groups

Demographic measures	Study population (%) (n = 1272)	Other programs, no HRA (%) (n = 333)	Non-participants (%) (n = 244)
Gender[a]			
Female	62	52	44
Male	38	48	56
Job status[a]			
Exempt	64	69	74
Non-exempt	36	31	26
Age group			
Under 35	43	43	43
35–44	37	35	36
45+	20	22	21
Average age	37.8	38.1	38.1
Location[a]			
Headquarters	49	50	46
Branch	25	10	8
Remote	26	40	46

[a]Chi-square $p < 0.001$.

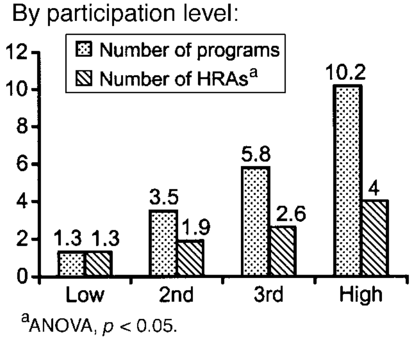


Fig. 1: Quartiles of participation.

of program participation were as follows: 1st quartile (low)—1.3 programs (range: 0–2); 2nd quartile—3.5 programs (range: 3–4); 3rd quartile—5.8 programs (range: 5–7); and 4th (high) quartile—10.2 programs (range: 8–21) (Figure 1). The number of HRAs completed significantly increased with increasing program participation (ANOVA; $p < 0.05$).

Highest quartile participants had significantly higher average 1993–1995 medical costs than lowest quartile participants [ANOVA (log costs); $p < 0.05$]. There were no significant differences in the average number of health risks across the quartiles [Figure 2(a) and (b)]. Highest quartile participants were also older, more likely to be female and more likely to be located at headquarters compared with the lowest quartile participants (not shown).

The Cost Change Model tracked changes in cost status (high cost/low cost) between time periods. The results of the model analysis are shown in Figure 3(a) and (b) for the Comprehensive Program and the Limited Program, respectively.

Although the number of those remaining at high cost (H–H) was similar in both Comprehensive Program and Limited Program subgroups, the numbers of employees in the two cost change categories (H–L and L–H) were clearly different. In the Comprehensive Program population, there was a net gain of 13 (+ 2.5%) low-cost employees. In contrast, in the Limited Program population, there were 10 (– 2.0%) fewer low-cost employees [Figure 3(a) and (b)]. These transitions in numbers of high-cost employees, although not statistically different (chi-square; $p = 0.176$), are representative of the cost changes within the two locations.

Program participation for the four cost change categories indicated that the associations of program participation were different for the two location subgroups [Figure 4(a) and (b)]. For the Comprehensive Program, there was significantly higher participation in intervention programs among the H–H group compared to the H–L or the L–L groups ($p < 0.001$). There were no significant differences among any of the other program-types in this subgroup. Contrary to expectations, there was no evidence of higher participation among the transition group, H–L, or among the lowest cost group, L–L.

For the Limited Program, there was significantly higher participation in knowledge/education classes and screening programs among the H–H group compared with most other groups ($p < 0.0001$). There was significantly higher participation in HRAs among the H–H group compared with the L–L group ($p < 0.0002$). There were no significant differences in intervention programs participation across any of the cost change groups.

In the Comprehensive Program, average medical costs in the H–H group had moderated,

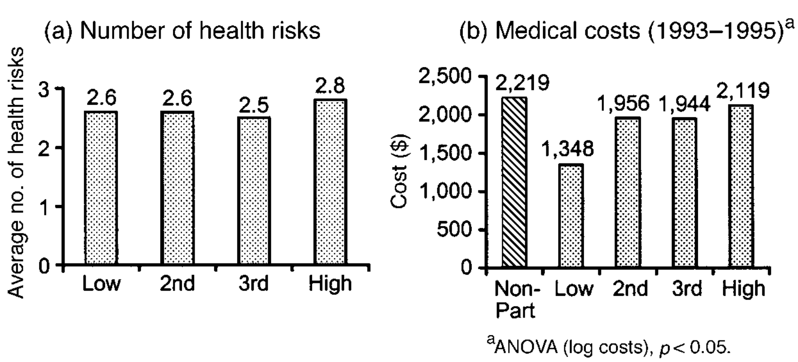


Fig. 2: Characteristics by participation quartiles.

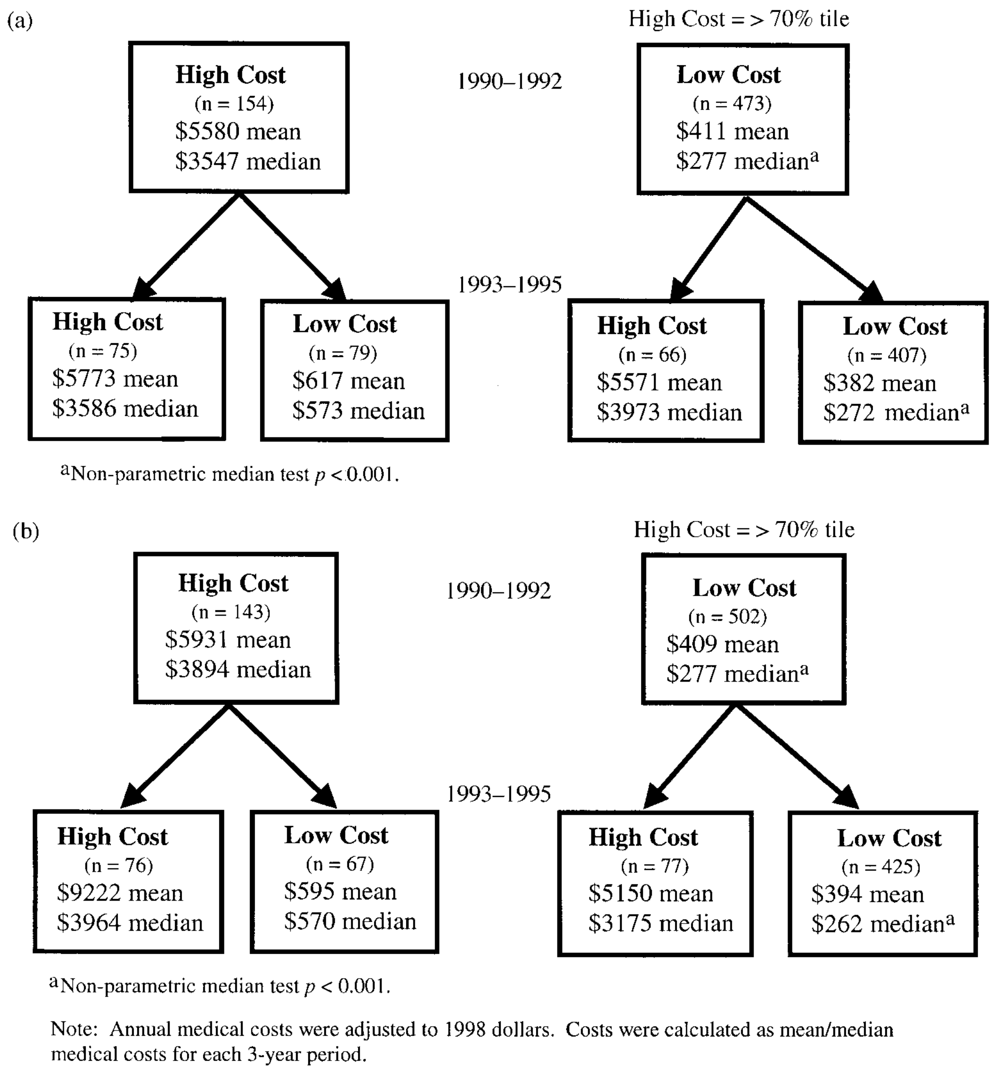
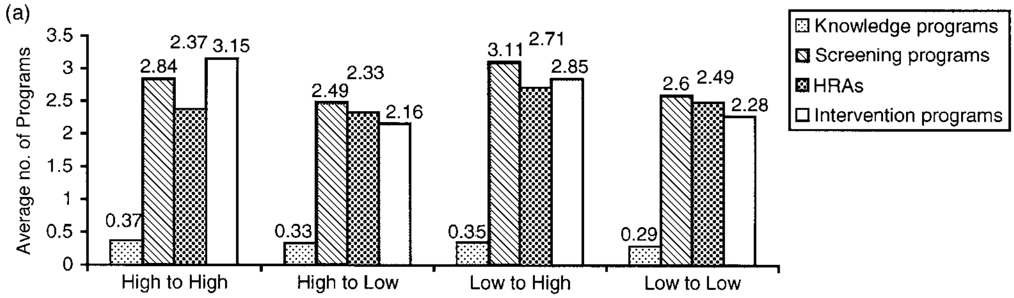


Fig. 3: Cost status change by location. (a) Comprehensive Program. (b) Limited Program.

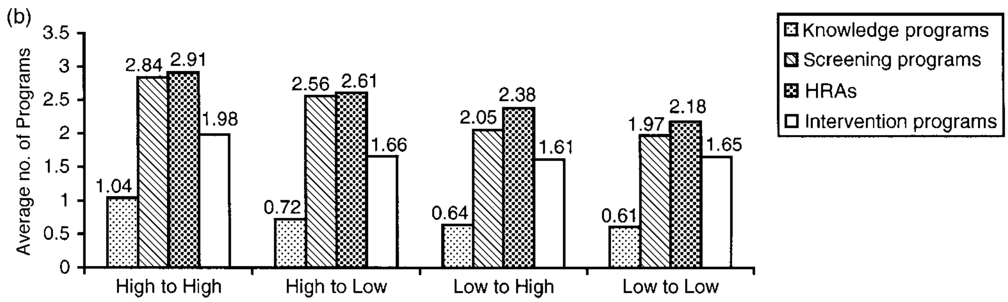
increasing from $5580 to $5773 (3.5% increase across 3 years). This moderation was associated with a significantly higher participation in intervention programs. Furthermore, although there were no significant differences in program participation for either of the cost status change categories (H–L and L–H groups), the net gain in low-cost employees in the second time period was further evidence that the medical costs had moderated at the Comprehensive Program location.

In the Limited Program, average medical costs in the H–H group had increased dramatically from $5931 to $9222 (55.5% increase across 3 years). Furthermore, there was a net loss in low-cost employees in the second time period. The H–H group was associated with increased participation in knowledge/education classes, screening programs and number of HRAs. Although these programs encouraged participation of those employees who had experienced increased medical care usage (higher-cost employees), that participation was not associated with moderating costs.

The average medical cost change, adjusted for age and gender, comparing the Comprehensive



Note: Intervention programs (ANOVA $p < 0.001$): H–H group different than H–L and L–L groups.



Note: Knowledge/education programs (ANOVA, $p < 0.0001$): H–H group different than H–L, L–H and L–L. Screening programs (ANOVA, $p < 0.0001$): H–H group different than L–H and L–L groups; H–L different than L–L group. HRA program (ANOVA, $p < 0.0002$): H–H different than L–L group.

Fig. 4: Program participation among cost change groups. (a) Comprehensive Program. (b) Limited Program.

Table 2: Average medical cost change by location

Population group	Comprehensive program		Limited program		Analysis of covariance[a] *p*-value
	Adj. cost change[b] ($)	Sign rank[a] *p*-value	Adj. cost change[b] ($)	Sign rank[a] *p*-value	
Study group (n = 1272)	–96	0.1328	+408	NS	0.0732
Cost change group					
High cost to high cost (n = 151)	–993	0.0575	+2300	NS	0.0839

[a]The sign rank test was used to compare the cost changes (positive or negative) within each cost change group. Analysis of covariance tested differences in cost change averages between the Comprehensive Program and the Limited Program.
[b]Medical cost change equals (1993–1995 average medical cost) minus (1990–1992 average medical cost) adjusted for age and gender.

Program and Limited Program subgroups, was significantly different at the $p < 0.10$ level (Table 2). For the Comprehensive Program, the average medical cost change was a decrease of $96, while in the Limited Program locations, the average medical cost change was an increase of $408. Within the cost change groups, the high-cost to high-cost group (H–H) for the Comprehensive Program and the Limited Program indicated the same trends as above, i.e. costs had moderated for the Comprehensive Program (average decrease of $993) while Limited Program costs had continued to increase (average increase of $2300).

Table 3: Overall change[a] in average medical costs by participation level

	Non-participants $ (n = 244)	Quartile 1 $ (n = 361)	Quartile 2 $ (n = 295)	Quartile 3 $ (n = 338)	Quartile 4 $ (n = 278)
1990–1992 Average costs	1413	1168	1692	1576	2353
1993–1995 Average costs	2219	1348	1956	1944	2119
Cost change	807	180	264	368	–233
Adjusted cost change[b]	839	280	398	340	–501

[a]n = 1272.
[b]Analysis of covariance adjusting for age and gender; p = 0.0842.

Table 4: Change in average MDC category costs

MDC category	Adj. mean $ change				
	Non-participants (n = 244)	Quartile 1 (n = 361)	Quartile 2 (n = 295)	Quartile 3 (n = 338)	Quartile 4 (n = 278)
Infectious and parasitic	4	–4[a]	88	0	–33
Neoplasms[b]	455	172	201	34	–154
Endocrine, nutritional and metabolic	21	–22	51	5	–27
Blood and blood-forming organs	27	2	3	1	–9[a]
Mental disorders	–4	–38	10	–41	–46
Nervous system	38	40	59[a]	78	–22
Circulatory system	–25	34	61[a]	–38	83
Respiratory system	4	55	22	37	–27
Digestive system[b]	67	81	–132[a]	1	–196
Genito-urinary system	22	–46	–70	98	–77
Pregnancy	1	–2	0	0	0
Skin diseases	–30	–1	–6	–12[a]	–30
Musculoskeletal system	92	54	216	83	–81
Congenital anomalies	–49	1	–17	–9	5
Prenatal conditions	0	0	0	0	0
Ill-defined conditions	57	–22	–1	60[a]	9
Injury, poisoning	98[a]	–37[a]	–116[a]	1[a]	10[a]
Health services (V codes)	8	1	24	22[a]	52[a]
External causes of injury, poisoning (E codes)	6[a]	1	3	2[a]	1

[a]Sign rank test; $p < 0.05$.
[b]Analysis of covariance adjusting for age and gender; $p < 0.05$. For neoplasms, non-participants different than highest quartile; for digestive system, lowest quartile different than highest quartile.

A non-parametric testing procedure was used to confirm the conclusions of the analysis of covariance procedure. Average medical cost change by the individuals within each cost change group was tested for a significant direction (positive or negative) of cost change. The results from the sign rank test were consistent with the previous conclusions. The cost change subgroup of high cost to high cost (H–H) for the Comprehensive Program had significantly more employees who decreased their medical costs between the two time periods than those who had increased their costs ($p < 0.05$, Table 2).

The overall changes in average medical costs for the different participation levels, non-participant and for each of the four quartiles are presented in Table 3. Differences tested with analysis of covariance, adjusting for age and gender, were statistically significant at the $p < 0.10$ level. Further examination of medical cost changes by major diagnostic categories (MDCs) indicated an association of program participation with medical costs of specific disease categories (Table 4). Health services costs (V codes) increased significantly in the top two quartiles indicating an increasing emphasis on preventive/supplementary health care (sign rank test; $p < 0.05$). Among the highest quartile of participation, medical costs decreased significantly for neoplasms and digestive systems (analysis of covariance; $p < 0.05$), and for blood and blood-forming organs (sign rank test; $p < 0.05$).

DISCUSSION

Progressive's Health Services Department bases its annual program offerings on the assessment of diverse employee needs, health care data and health risk appraisal summary reports. High-risk employees are encouraged to participate; however, programs are made available to as many employees as possible given the company's diverse locations. The observation that the average number of health risks did not appear to increase with increased program participation was consistent with participation among both high-risk and low-risk employees. In contrast to health risks, higher medical costs were associated with higher program participation. This is consistent with the traditional risk reduction goals of most health promotion programs. More high-cost employees participated in risk reduction programs.

Knowledge/education, screening and HRA programs were the predominant programs in the Limited Program population with intervention programs less available. These types of programs were clearly important for health risk awareness and identification. At headquarters, a full comprehensive health promotion program was offered with more risk-specific intervention programs in addition to the other program-types that could potentially have attracted more high-risk employees. Nevertheless, when levels of participation were examined by quartiles, increased program participation was associated with higher cost employees but not with higher numbers of health risks.

The Cost Change Model was used to investigate the association between health promotion participation and medical care costs over time. Health promotion programs were statistically associated with medical cost moderation. Specifically, in the Comprehensive Program location, increased participation in intervention programs was associated with medical cost moderation in the highest cost group and with fewer employees becoming high cost in the second time period. In contrast, for the Limited Program locations, although knowledge/education, screening and HRA programs attracted participation by higher-cost employees, medical cost moderation was not evident within this population.

Contrary to expectations, participation was highest among the high-cost groups. It was anticipated that higher program participation would be associated with the transition cost category, H–L, reflecting a program effect of cost reduction. Likewise, high participation was expected among the lowest cost group, L–L, with a program effect of low-cost maintenance. The participation results are perhaps a reflection of the nature and availability of the majority of health promotion programming, i.e. directed towards the needs of the high-risk/high-cost employees. Because fewer low-risk programs are available, there are fewer low-cost employees recruited into programs. One strategy would be to increase the number of low-risk programs and to market the importance of participation in maintaining low-risk/low-cost status.

The association of intervention programming with medical cost moderation indicates an important positive program effect for a comprehensive health promotion program. Moderating medical costs could be the result of decreased health risks that would result in an impact on medical costs. However, a direct effect on medical costs resulting from program participation cannot be ruled out. Resolution of the two mechanisms of medical cost change would require analyses on an individual program level. There was some evidence from the MDC category charges across the program participation quartiles to suggest that the motivation to become involved in programs in this population was frequently related to non-chronic disease medical charges (Musich, 1998). This could support the importance of a direct association between program participation and medical costs. In a previous publication, the flu vaccination program was shown to have a direct effect of reducing medical costs, especially in the older age groups (Musich *et al.*, 1996).

Medical cost changes revealed possible relationships of program participation with medical costs of specific MDC disease categories. In a comprehensive health promotion program, however, attributing disease cost changes to specific programs may not be possible. This is consistent with the concept that the benefits of health promotion programs are holistic rather than limited to a preconceived set of modifiable medical cost categories. The benefits of program participation regarding specific disease categories will need to be studied in greater depth, possibly stratifying by age and gender. Such an investigation would require a larger study population than was available for this study.

There were several limitations to this study. The study population was limited to those employees who were long term, in an indemnity plan, not pregnant and had completed at least one HRA. Because of the selection criteria, the sample size was limited to 1272 employees. This employee study group was, however, comparable to the average age of other long-term employees and the gender ratios were close to being representative of the company.

The HRA requirement could possibly bias the population toward employees who are more likely to participate. The excluded employee group was more likely to be male, exempt status and in remote locations. Because the HRA participation rate among the long-term employees was almost 70%, the bias of self-selection should be minimal.

The numbers of programs available to the employees in the different locations posed a difficulty in the analyses. The decision to divide the population into headquarters and other locations and to sum 6 years of participation attempted to address the differences in the availability of programming in any given year and in those organizational factors limiting the ability of employees to participate.

The focus of health promotion programs on effective risk reduction is certainly a worthy goal. However, the importance of encouraging low-risk employees to participate is demonstrated by the fact that many initially low-risk employees become high risk and often high cost over time. A wider focus in program development promoting the involvement of the low-risk/healthy population is critical to keeping these employees healthy (Musich *et al*., 1999).

The mission statement of the Progressive Corporation focuses on educating, motivating and empowering its employees to achieve optimal health and well-being. In achieving this mission, quality health promotion programs are provided to both high-risk/high-cost and low-risk/low-cost employees. The evidence from this project indicates the power of the comprehensive health promotion program in moderating medical costs. In those locations in the company where fewer intervention programs were available, attendance for other program-types (knowledge/education, screening and HRAs) was highest among the highest cost groups. However, those types of programs that promote health risk awareness or identify individual risks without the benefit of intervention programs did not appear to be as effective in moderating medical costs.

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