The Healthy Worker Project: A Work-Site Intervention for Weight Control and Smoking Cessation

ABSTRACT

Objectives. A randomized trial was conducted to evaluate the effectiveness of a work-site health promotion program in reducing obesity and the prevalence of cigarette smoking.

Methods. Thirty-two work sites were randomized to treatment or no treatment for 2 years. Treatment consisted of health education classes combined with a payroll-based incentive system. Evaluation was based on cohort and cross-sectional surveys.

Results. Of 10 000 total employees in treatment work sites, 2041 and 270 participated in weight control and smoking cessation programs, respectively. Weight losses averaged 4.8 lbs, and 43% of smoking participants quit. Net 2-year reductions in smoking prevalence in treatment vs control work sites were 4.0% and 2.1% in cross-sectional and cohort surveys, respectively. No treatment effect was found for weight. Treatment effects for smoking prevalence and weight were both positively correlated with participation rates in the intervention programs ($r = .45$ for smoking and $r = .55$ for weight).

Conclusions. This work-site health promotion program was effective in reducing smoking prevalence at a cost that is believed to make the investment worthwhile. (*Am J Public Health.* 1993;83:395–401)

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Introduction

Work-site health programs have been discussed frequently in recent years as a means for promoting behavior change in the general population. Attractive features of these interventions include convenient access to populations in need, the opportunity to capitalize on the social support resources of work sites as communities, and the potential for cost recovery through reduced absenteeism and health care expenditures.[1,2] Despite these apparent strengths, empirical data on the effectiveness of work-site health programs are relatively sparse.

Evaluation of work-site health promotion programs is complicated by the fact that such programs vary widely in objectives, content, organization, cost, and setting. Some are simple and inexpensive (e.g., distribution of health information pamphlets),[3] while others are intensive (e.g., systematic risk factor screening and intensive follow-up counseling).[4,5] Some concentrate on a single risk factor such as obesity,[6,7] smoking,[8,9] or blood pressure,[10] while others target multiple behavioral objectives.[1–4,11–13] In addition, some focus on individual health behavior change (i.e., counseling of individuals at high risk),[8] while others address the social aspects of the work environment (e.g., work-site competitions)[6,14,15] or institutional health policies (e.g., smoke-free environments).[16–21]

Several methodological factors also make interpretation of work-site intervention data difficult.[3,8,22] Methodological problems include the following: studying few companies, which limits generalizability; not including control groups or not randomizing to intervention and control conditions; limiting outcome evaluation to program participants rather than evaluating intervention effects on the entire work force; evaluating effects over short time periods; and analyzing results using individuals as the unit of analysis, even though the work site is the unit of "assignment" and it is widely recognized that characteristics of work sites may have an important influence on results.[2]

Results of work-site interventions to date have been mixed. Recruitment to work-site smoking programs, for example, has ranged from 0% to 88%.[3] Dropout rates from work-site weight loss programs have ranged from 0.5%[3] to 80%.[3,23] Most important, the reported success of work-site interventions in changing health behavior has ranged from minimal[24] to very promising.[3,6,8,14,15,25] Clearly, additional studies involving strong research methodologies would be helpful.

The present paper reports the results of such a study, a large-scale randomized trial called the Healthy Worker Project that focused on two common health risk factors: obesity and cigarette smoking. These two risk factors were selected because of their high prevalence in the US population,[26,27] their important causal role in the development of disease,[28,29] the fact that most obese people and smokers want to

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change,[30,31] and the fact that traditional medical approaches have so far proved inadequate to the task of ameliorating these behaviors at the population level.[32,33]

Intervention methods for the trial were chosen on the basis of a careful review of existing work-site programs and were pilot tested extensively to establish their attractiveness to employees and their short-term efficacy.[25,34–36] An important strength of the trial was its research methodology. Work sites were recruited from a comprehensive enumeration of sites in a major metropolitan area. Sites were randomized to treatment or control conditions, and the effects of the intervention were evaluated over an extended time period at several levels of employee aggregation.

This report focuses on the primary outcomes of the Healthy Worker Project, namely changes in obesity and smoking. The primary hypotheses of the study were that the prevalence of smoking and mean body weight would be reduced among employees in treated work sites compared with those in control work sites. Results are reported for both cross-sectional and cohort designs.

Methods

Work Sites

The trial was conducted between fall 1987 and fall 1990 in the seven-county metropolitan area surrounding Minneapolis/St. Paul, Minn. The region has a population of approximately 2.5 million. Participating work sites were recruited from a listing purchased from Dun's Marketing Service. A site was defined as a physically contiguous location with a work force of primarily full-time employees. For design and logistical reasons, sites with between 400 and 900 employees were recruited. Prospective work sites were approached first with a letter describing the study, and then were followed up by phone. For sites with continued interest, a personal interview was scheduled after which the work sites either decided to participate or declined. Of the 154 sites approached, 36 were found to be ineligible, usually because site-size information was incorrect; 83 declined participation; 2 could not be reached by phone; and 1 was excluded by the investigators after completion of the baseline survey, but before randomization, as a result of poor response rate. Thus, 32 sites were included in the study (a 27% response rate). Preliminary analyses compared sites agreeing to participate with those refusing on a number of characteristics. Sites electing to participate were slightly larger (610 vs 545 employees, $P < .05$), had a lower average increase in number of employees over the previous 5 years (17% vs 67%, $P < .04$), and were more likely to be in the public sector (39% of participating vs 5% of refusing sites, $P < .0005$). The most common reasons given for refusing to participate were time, inconvenience, or disinterest (54%); specific conditions of the project, such as randomization (29%); conflicts with existing programs (18%); and general business conditions such as merger, expansion, or economic downturn (19%). Primary functions of sites included in the study included insurance, primary health care, financial services, manufacturing, education, electronic assembly, bulk mail distribution, research and development, and city, county, state, and federal government operations.

Research Design and Evaluation Surveys

Sites agreeing to participate in the study completed a baseline survey, were randomized to either intervention or no treatment for 2 years, and then were resurveyed. The baseline survey was given to 200 employees selected at random from each site. The same individuals were also contacted 2 years later at follow-up as a cohort sample. In addition, a new sample of 200 employees was selected at follow-up for a cross-sectional comparison. Sampling with replacement was used so that the cross-sectional surveys would be representative of all employees at each time point. Thus, an average of about one third of the employees in the second random sample were also included in the cohort. This design allowed evaluation of intervention effects both in those continuously employed, and thus exposed to intervention for 2 full years, and on the employee population as a whole, including attrition and replacement.

Evaluation surveys included assessment by questionnaire of demographic characteristics, smoking and weight loss histories, diet and exercise habits, job characteristics, health history, and job satisfaction. Direct measures were taken of height and weight. Expired air carbon monoxide was also assessed for all employees as a validation of reported smoking status.[37] Individuals who did not attend on-site survey sessions were contacted by telephone in 29 of the 32 sites (employee telephone numbers could not be obtained for 3 sites). Individuals in the cohort who had left employment with the site at follow-up were also surveyed by phone. The phone surveys included assessment by self-report of height, weight, and smoking status. Survey response rates at baseline averaged 75% (range = 61% to 90%) for the on-site surveys and 77% (range = 36% to 90%) for the telephone surveys, an average net total response rate of 92% (range = 61% to 99%). At follow-up, average completion rates for on-site surveys in the cross section and cohort were 77% (range = 50% to 93%) and 76% (range = 48% to 90%), respectively. Telephone follow-up completion rates averaged 87% (range = 62% to 100%) and 83% (range = 71% to 100%) and total response rates were 94% (range = 87% to 99%) and 93% (range = 49% to 100%) for the cross-section and cohort, respectively. Analysis of differences between individuals surveyed at work vs over the phone showed that the latter were older (38.5 vs 37.8 years, $P < .05$), had higher job status (46% vs 41% managerial, $P < .007$), were more likely to smoke (30.8% vs 23.0%, $P < .0001$), weighed less (relative weight: 1.19 vs 1.23; $P < .001$), and were more likely to report having had diabetes, hypertension, heart disease, or chronic obstructive lung disease (19% vs 16%, $P < .02$). Follow-up surveys were completed in all 32 sites. Net employee attrition between baseline and follow-up, defined as the percentage of employees in the baseline survey who were no longer employed at that site at follow-up, averaged 19% (range = 6% to 43%).

Intervention

Intervention was based on procedures developed in successful pilot studies.[25,34–36] These procedures consisted of a combination of on-site classes and an incentive system organized through payroll deduction. Four rounds were offered at each site during the 2 years of intervention, each round consisting of 11 biweekly sessions. Classes were held on site and on employee time, and multiple class times were offered to accommodate shift workers. Class content consisted of state-of-the-art interventions for smoking cessation[35] and weight loss[34] involving behavior modification principles. The interventions were led by professional health educators who were trained, supervised, and paid by the study. All employees were eligible for the weight program. All smokers were invited to participate in the smoking cessation program, as were ex-smokers concerned about remaining abstinent. Weight loss goals were selected by participants themselves, with a minimum of 0 lb and a maximum of 1% of body weight loss each week. Permanent cessation was the goal

for all smokers in the smoking program (i.e., reduction in smoking rate was not accepted as a personal goal). An incentive component was selected for use in this study because many of the most successful prior work-site studies had used incentive strategies.[38–41] Participants selected an amount of money to be deducted from each paycheck (a minimum of $5 biweekly). Employees in the weight program received a refund at each session if they had made progress toward their weight loss goals. Expired carbon monoxide level was measured for participants in the smoking cessation program. They received a refund of all money in their account at any session in which they had carbon monoxide values less than 8 ppm (no-smoking level). At the end of the program, all incentive funds that had not been returned to participants were used in a way negotiated at each site (they were usually given to charity).

Employees were recruited to intervention programs systematically. Before each round of intervention classes, all employees were contacted through company mail and invited to participate. Recruitment also included posters, word of mouth, cafeteria booths, and a variety of special promotional activities specific to sites.

Analysis Strategy

Analyses reported in this paper are based on all employees surveyed, whether in person or by phone and whether or not they were employed throughout the 2 years of the study. Body mass index (kg/mm^2) was used as the measure of obesity. The body mass indices of employees reporting their heights and weights by telephone were adjusted, on the basis of the observed relationship between self-reported and measured body mass index in the on-site sample, by means of gender-specific regression equations. The outcome variable related to smoking was site prevalence. When carbon monoxide measures were available, smoking was defined either as a self-report of smoking or as a self-report of nonsmoking with an expired air carbon monoxide value above 5 ppm after subtracting the work-site ambient carbon monoxide level.[42] Reports of smoking among those surveyed by phone were accepted at face value.

It is believed that these methods for dealing with self-report data are without significant bias. Several investigators who have explored the self-report bias for weight have noted that people tend to underreport their weight.[43,44] However, underreporting is no greater among those in treatment for weight loss than it is in the general population.[45,46] A recent review of the literature on the assessment of outcome in smoking cessation studies has similarly concluded that false reports of nonsmoking are generally low.[47] Others, however, have reported substantial discrepancies between self-reported quitting and biochemically validated cessation.[48] In this study, direct assessments of false reports of nonsmoking were available among those for whom carbon monoxide measures were taken. The false report rate, as defined above, averaged about 2%. These rates did not differ significantly at baseline and follow-up or between treatment and control work sites at either time point.

In addition to the analyses reported here, separate analyses restricted to subsets of the population (e.g., those surveyed in person or by phone only) were also performed. These analyses yielded similar estimates of both the direction and magnitude of treatment effects. Statistical power, however, tended to be reduced because the sample sizes per site are smaller and thus produce less stable estimates of company means (e.g., restricting analyses to those employees who had direct measurements only reduces the sample size per site in the cohort analyses by over 50% [from 175 to 80].

The analysis strategy used for this research is based on a conceptual framework that explicitly recognizes that both differences between individuals within work sites and differences in organizational characteristics between sites contribute to variance in health behavior. As described more fully elsewhere,[49] the selection of 32 sites and of 200 individuals per site in surveys represents an effort to balance these two factors. Analyses of study hypotheses used work site as the unit of analysis and were performed in two steps. First, adjusted mean body mass indices and adjusted prevalences of smoking were generated for each work site; age, gender, education, occupation, and marital status were used as covariates. Body mass index analyses were also adjusted for smoking. The second step in the analysis was to compare the company means by repeated-measures analysis of variance.

TABLE 1—Baseline Comparison of Treatment and Control Work Sites

	Treatment (n = 16)		Control (n = 16)		
	Mean	SD	Mean	SD	*P*
No. of employees	596.8	163.6	645.1	208.0	.471
Private sector sites, %	68.8	47.9	56.3	51.2	.481
Age, y	38.1	3.5	37.9	3.9	.916
Female, %	55.0	16.9	52.9	16.7	.718
Job category, %					
Professional	45.6	20.1	36.5	21.6	.229
Clerical	36.7	19.6	44.6	18.4	.249
Blue collar	17.5	20.5	18.8	22.7	.871
Education, %					
High school or less	21.8	13.5	22.4	12.3	.894
Some college	34.3	10.0	39.2	12.1	.217
College	25.2	12.0	23.7	11.9	.726
Beyond college	18.7	14.0	14.6	13.5	.405
Body mass index, kg/m^2					
Men	25.58	0.81	25.80	0.99	.493
Women	24.52	0.89	24.65	1.05	.710
Current smokers, %	24.4	8.5	24.7	7.1	.925
Never smokers, %	50.7	8.2	50.0	9.7	.813

Note. Entries are the means and standard deviations of site means.

Results

Selected characteristics of employees and work sites involved in this trial are shown in Table 1. Sites averaged about 600 employees each; 12 were public sector and 20 private sector. Employees averaged 38 years of age, and slightly over half were women. About 40% identified themselves as having professional or managerial job titles, a similar proportion identified themselves as having clerical or sales positions, and slightly less than 20% were blue-collar workers (i.e., laborers, skilled production workers, craftspeople, etc.). Both men and women had mean body mass indices that were about 10% above actuarial ideals.[50] Between 24% and 25% reported being cur-

TABLE 2—Participation in Work-Site Behavior Change Programs

	Round of Intervention				
	1	2	3	4	Total
Smoking program					
No. of participants	140	46	42	42	270
Mean per site	8.8	2.9	2.6	2.6	16.9
Eligible smokers, %[a]	6.4	2.1	1.9	2.0	12.4
Age, y	39.9	41.2	36.4	39.2	39.5
Women, %	75	51	70	62	67
Job category, %					
Professional	43	61	52	41	47
Clerical	34	26	36	45	35
Blue collar	23	13	12	14	18
Quit smoking, %[b]	49	46	38	26	43
Weight program					
No. of participants	937	432	339	333	2041
Mean per site	58.6	27.0	21.2	20.8	127.6
Age, y	41.1	42.0	41.4	42.4	41.5
Women, %	83	80	83	85	83
Job category, %					
Professional	40	46	48	40	43
Clerical	45	41	41	52	45
Blue collar	15	13	11	9	13
Mean weight loss, lb[c]	5.9	4.3	3.6	3.7	4.8

[a]Denominators estimated from baseline prevalence per site.
[b]Defined as carbon monoxide ≤ 8 ppm as of the last session attended.
[c]Defined as weight change at the last session attended.

rent smokers. Treatment and control sites did not differ significantly.

Table 2 summarizes participation rates and results of the smoking cessation and weight loss classes held in the intervention work sites. In the 2 years of intervention, 270 and 2041 employees participated in the smoking and weight programs, respectively. Fifteen people enrolled in the smoking program more than once, as did 465 people who enrolled in the weight program. Over the 2 years, about 12% of all smokers participated in the smoking program. Sixteen percent of all employees, and 36% of obese employees (obesity was defined as ≥120% of the actuarially defined "ideal" weight[50]) participated in the weight program over 2 years. Participation was highest the first time the programs were offered. Subsequent enrollment fell quickly and stabilized at about a third of that achieved in the first round. Analyses of participation patterns showed that women were more likely to participate than men, that professional and clerical/sales personnel were about 1.6 times as likely as blue-collar workers to participate in the weight program, and that professionals were 2.6 times as likely as either clerical/sales or blue-collar workers to participate in the smoking program.[48] Across the entire 2-year intervention period, 43% of smokers quit (defined as having a carbon monoxide level of 8 ppm or less at the last session attended), and the average per-person weight loss was 4.8 lbs. Short-term smoking cessation rates and mean weight losses were best in round 1, suggesting, perhaps, that employees participating in later rounds tended to be more recalcitrant cases.

Table 3 shows the adjusted smoking prevalence at baseline and follow-up for each of the control and treatment work sites in the trial. Table 4 shows comparable data with respect to body mass index. Table means are adjusted for age, sex, education, occupation, and marital status. Body mass index means are also adjusted for smoking status. In the cross-sectional samples, smoking prevalence increased by an average of one percentage point between baseline and follow-up in the control companies (range = −4.88% to 12.25%). Smoking prevalence in the treated sites decreased by approximately three percentage points (range = −10.84% to 4.28%), F (1, 30) 3.73, P = .0581. In the cohort, smoking prevalence decreased by approximately one percentage point in the control sites (range = −5.53% to 2.59%) and decreased by three percentage points in the treatment sites (range = −10.05% to 0.44%), a net difference of approximately two percentage points, F (1, 30) 5.19, P = .030. These results supported the hypothesis that the program would have a beneficial effect on employee smoking rates.

The likelihood that the smoking results in the study were caused by the presence of treatment is supported by the observation that the percentage of smokers participating in the smoking program in each of the treatment companies and the company-specific decrease in smoking prevalence were significantly correlated (r = .45, P < .08). Higher participation was associated with greater reductions in smoking prevalence. Additional subgroup analyses also revealed that the treatment effect for smoking was present in long-term as well as short-term employees and in those surveyed in person or by phone. (Analyses restricted only to individuals for whom biochemical validation of smoking was obtained yielded similar estimates of the direction and magnitude of treatment effects for smoking, although power was reduced as a result of smaller sample sizes. In cross-sectional analysis, the net difference between treatment and control work sites was 4.06 percentage points, P = .08. In cohort analysis, the difference was 1.38 percentage points, P = .29.)

Unfortunately, little change was observed in either treatment or control sites in body mass index over the 2 years of this study. In the cross-sectional survey, employees in both the treatment and control sites had slightly lower body mass indice's at follow-up than at baseline. In the cohort, the control sites showed a very slight weight gain and the treatment sites a very slight weight loss. In neither case were the treatment and control differences sufficient to approach conventional levels of statistical significance (all Ps > .50). Thus, these results provide little support for the hypothesis that this work-site health promotion program was beneficial in promoting companywide weight control. An interesting additional observation, however, was that even though there was no main effect of treatment on body mass index, rates of participation in weight control programs in treatment sites were positively correlated with change in body mass index (r = .55, P < .03). Higher participation was associated with greater weight loss. (Analyses restricted only to individuals whose weights were directly assessed produced similar results. Change in body mass index in treatment sites averaged −0.15 and 0.05 in the cross-sectional and cohort samples, respectively. Corresponding changes observed in control sites were −0.11 and 0.15, respectively. Differences between treat-

ment and control sites did not approach conventional levels of statistical significance in either case.)

Discussion

This project evaluated the effects of work-site health promotion interventions for weight loss and smoking cessation over a period of 2 years. In comparison with previous studies in this area, it had a number of methodologic strengths. Work sites participating in the project were recruited from a population enumeration of sites, thus avoiding, to some extent, bias due to the use of convenience samples. Also, work sites were randomized to treatment and control conditions. Interventions were applied systematically over an extended time period, and the study design allowed analysis at several levels of employee aggregation. Finally, sites rather than individuals were used as the unit of analysis. Thus, it is believed that this trial provides a robust statement about the efficacy of one approach to work-site health promotion.

The experience of this study in recruiting sites provides information about the enthusiasm of employers for work-site health promotion. At the outset, we believed that this project would be attractive to employers, since it offered a 50-50 chance of receiving free weight loss and smoking cessation programs in exchange for the modest cost of completing two employee surveys. Nevertheless, a majority of sites that were eligible to participate declined (72%). These results suggest that the overall receptiveness of employers to work-site health promotion may be more modest than some advocates have suggested.

Findings regarding the participation and short-term results of the Healthy Worker Project intervention activities are also instructive. In the case of smoking cessation, participation rates were relatively low, totaling only 12% of smokers in a 2-year period. The low rates contrast strikingly with our own pilot work[25] and with some previous studies in which up to 88% participation has been reported.[3] A 12% recruitment rate, however, should not be viewed as entirely negative. Other community programs for smoking cessation (e.g., smoking contests[42] and correspondence courses[51]) have fared less well. The short-term smoking cessation rates of 43% in this study also compare favorably with other programs available in the community.[52]

TABLE 3—Change in Smoking Prevalence in Treatment and Control Sites

Identification No.	Cross-sectional Survey			Cohort Survey		
	Baseline[a]	2 Years	Change	Baseline[a]	2 Years	Change
Control sites						
1	16.09	19.97	3.88	16.50	18.02	1.51
3	29.10	26.63	−2.46	29.60	29.68	0.08
6	26.02	23.96	−2.06	24.80	19.27	−5.53
7	32.13	30.20	−1.92	31.11	27.35	−3.75
8	26.99	25.49	−1.49	26.65	23.70	−2.95
9	17.80	25.03	7.22	16.66	17.73	1.06
14	28.70	26.52	−2.17	28.06	25.74	−2.31
15	12.67	24.92	12.25	9.85	12.44	2.59
16	21.96	21.40	−0.56	20.37	15.64	−4.72
19	27.71	33.65	5.94	26.66	28.76	2.09
23	28.59	26.84	−1.75	28.13	27.35	−0.77
24	29.64	31.78	2.14	26.85	26.39	−0.46
25	29.07	24.18	−4.88	25.71	25.15	−0.55
26	24.57	22.57	−2.00	24.09	24.16	0.06
30	22.34	28.23	5.88	23.25	25.13	1.88
31	22.34	20.80	−1.53	21.87	18.64	−3.22
Mean	24.73	25.76	1.02	23.76	22.82	−0.93
SD	5.47	3.84	4.68	5.59	5.13	2.53
Treatment sites						
2	27.83	26.54	−1.29	28.61	24.34	−4.26
4	30.84	26.51	−4.33	27.56	27.71	0.15
5	33.02	27.62	−5.40	32.21	22.15	−10.05
10	25.13	25.77	0.63	25.22	21.33	−3.88
11	27.97	25.44	−2.53	26.44	23.76	−2.67
12	30.68	22.65	−8.02	28.93	28.93	0.00
13	22.93	18.92	−4.00	22.26	16.39	−5.87
17	31.70	20.85	−10.84	29.55	26.15	−3.40
18	22.61	17.18	−5.42	22.67	19.70	−2.97
20	25.99	25.49	−0.49	25.78	19.54	−6.23
21	15.60	19.88	4.28	15.41	13.49	−1.92
22	28.31	22.28	−6.03	28.03	28.47	0.44
27	24.20	22.11	−2.09	23.90	21.52	−2.38
28	15.02	18.80	3.77	15.82	13.99	−1.82
29	22.32	21.01	−1.31	19.09	16.84	−2.25
32	23.34	18.43	−4.91	24.51	23.02	−1.48
Mean	25.47	22.47	−3.00	24.75	21.71	−3.04
SD	5.22	3.36	3.99	4.78	4.86	2.67

Note. Entries are adjusted for age, sex, education, occupation, and marital status.
[a]Baseline values differ between cross-sectional and cohort surveys as a result of different missing values in the two data sets.

Participation rates for the weight loss program were better than for the smoking program, confirming previous findings that people are less likely to seek professional help for smoking cessation than they are for weight loss.[51] Mean weight losses achieved by participants were modest, however, and lower than in many studies. This may, in part, have been due to the fact that employees did not have to be overweight to participate in the program and chose their own weight loss goals.

Despite low participation, the prevalence of smoking in treatment work sites decreased significantly in relation to control sites, a finding that supports the value of work-site health promotion for reducing smoking rates. Results in the cohort sample suggest nearly a tripling of spontaneous quit rates in the intervention work sites, and the cross-sectional results were quantatively larger. Two points regarding the findings deserve emphasis. The first is that the intervention effect cannot be accounted for solely by the people quitting as a direct result of being in classes. The 4% net reduction in cross-sectional smoking prevalence and 2% net reduction in cohort prevalence translates into 255 and 127 quitters, respectively. Since only 116 smokers quit while participating in the treatment program and some of them surely relapsed, it seems likely that the presence of the intervention program stimulated some employees to quit on their own, even though they did not enroll in classes. The second point is that the

TABLE 4—Change in Mean Body Mass Index in Treatment and Control Sites

Identification No.	Cross-sectional Survey			Cohort Survey		
	Baseline[a]	2 Years	Change	Baseline[a]	2 Years	Change
Control sites						
1	26.50	26.06	−0.45	26.53	27.57	1.03
3	26.07	26.40	0.33	25.93	25.72	−0.20
6	25.37	25.53	0.16	25.27	25.16	−0.11
7	27.41	26.28	−1.13	27.19	27.29	0.10
8	25.39	25.29	−0.11	25.48	25.67	0.19
9	25.40	25.69	0.29	25.30	25.43	0.12
14	25.79	26.12	0.33	25.65	25.99	0.34
15	26.34	26.24	−0.10	26.58	26.85	0.28
16	26.52	26.53	0.02	26.26	26.25	−0.01
19	26.08	26.37	0.29	26.21	26.33	0.12
23	26.45	26.22	−0.23	26.27	26.53	0.26
24	25.90	26.42	0.52	25.76	25.54	−0.22
25	25.51	25.57	0.07	25.84	25.54	−0.30
26	25.67	24.94	−0.72	25.78	25.68	−0.10
30	25.44	25.95	0.51	25.48	25.48	0.00
31	27.04	26.47	−0.57	26.91	26.69	−0.22
Mean	26.06	26.01	−0.05	26.03	26.11	0.08
SD	0.62	0.47	0.47	0.57	0.71	0.32
Treatment sites						
2	25.97	26.02	0.06	25.94	25.61	−0.32
4	25.64	25.87	0.23	25.67	25.71	0.04
5	25.12	25.02	−0.10	25.18	25.06	−0.12
10	25.57	25.46	−0.10	25.53	25.56	0.04
11	26.09	25.70	−0.39	25.86	26.22	0.35
12	26.17	26.10	−0.07	26.07	25.97	−0.09
13	25.92	26.24	0.32	25.96	26.01	0.05
17	25.68	26.57	0.89	25.72	25.60	−0.12
18	25.07	24.57	−0.51	24.94	24.97	0.02
20	25.70	25.18	−0.53	25.74	25.65	−0.09
21	26.61	26.84	0.23	26.76	27.10	0.34
22	26.34	26.31	0.03	26.37	26.23	−0.14
27	26.34	26.22	−0.12	26.33	26.11	−0.22
28	25.70	25.61	−0.10	25.80	26.04	0.24
29	26.30	26.42	0.12	26.34	26.21	0.13
32	25.84	25.16	−0.67	25.83	25.65	−0.18
Mean	25.88	25.83	−0.05	25.88	25.86	−0.02
SD	0.43	0.63	0.38	0.45	0.50	0.19

Note. Entries are adjusted for age, sex, education, occupation, marital status, and smoking. One body mass index unit is equal to approximately 3 kg.
[a]Baseline values differ between cross-sectional and cohort surveys as a result of different missing values in the two data sets.

popularity of a program should not be confused with its health effects. Our weight loss programs were far more popular than our smoking programs, but the smoking program would clearly be a better investment for an employer interested in health outcomes. It has been estimated that a smoking employee costs an employer several hundred dollars per year more than a nonsmoking employee.[53] We estimate that the cost of providing our smoking program for 2 years was approximately $1500 ($30 per session in instructor time plus cost of materials) per intervention site and that the number of quitters produced per site was between 8 and 16. Thus, this program appears to be justified on purely economic grounds.

The failure of the weight loss program to produce positive results in the employee population as a whole, despite high participation rates and a dose–response relationship with mean company weight loss, invites further discussion. One possible explanation is that the Healthy Worker Project weight loss program did work, but only in people who would have lost weight anyway. In other words, our work-site program may have given employees a new option for weight control, but it did not enhance interest in weight control above that already existing. The plausibility of this explanation is strengthened somewhat by previously published data on dieting behaviors in this same study population.[54] Lifetime prevalence of participation in formal weight loss programs was 13% in men and 26% in women at baseline, and rates of informal dieting to lose weight were much higher. It is thus likely that many of these individuals would have spontaneously tried to lose weight during the 2 years of this study, whether or not a work-site program was available.

In summary, we conclude that work-site intervention programs for smoking cessation of the type evaluated here are effective in reducing the prevalence of smoking in employee populations. Although we observed considerable site-to-site variation in employee participation and in overall treatment effectiveness, we believe that, on average, the effects per site are sufficient to justify an investment in such programs in work sites of this size or larger, even when absolute rates of participation are relatively low. The longer term potential of such programs for accelerating downward trends in smoking rates merits additional research attention. Another important research issue in this area from a public health perspective is how to induce more work sites to invest in such programs and how to increase employee participation to maximize their potential. In contrast to smoking, this study provides no support for the beneficial effects of work-site weight control programs. Their popularity suggests that they may meet a perceived need of employees and, thus, may be good for employee morale. Their effect on health risks, however, may be limited. □

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