Process Evaluation of an Integrated Health Promotion/Occupational Health Model in WellWorks-2

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Disparities in chronic disease risk by occupation call for new approaches to health promotion. WellWorks-2 was a randomized, controlled study comparing the effectiveness of a health promotion/occupational health program (HP/OHS) with a standard intervention (HP). Interventions in both studies were based on the same theoretical foundations. Results from process evaluation revealed that a similar number of activities were offered in both conditions and that in the HP/OHS condition there were higher levels of worker participation using three measures: mean participation per activity (HP: 14.2% vs. HP/OHS: 21.2%), mean minutes of worker exposure to the intervention/site (HP: 14.9 vs. HP/OHS: 33.3), and overall mean participation per site (HP: 34.4% vs. HP/OHS: 45.8%). There were a greater number of contacts with management (HP: 8.8 vs. HP/OHS: 24.9) in the HP/OHS condition. Addressing occupational health may have contributed to higher levels of worker and management participation and smoking cessation among blue-collar workers.

Keywords: *process evaluation; work-site health promotion; occupational health*

Disparities in chronic disease risk by occupation call for new approaches to disease prevention and health promotion. Compared with other workers, blue-collar workers are

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more likely to be smokers (Covey, Zang, & Wydner, 1992; Giovino, Pederson, & Trosclair, 2000; Nelson et al., 1994), have less healthful dietary patterns (Kristal, Glanz, Tilley, & Li, 2000), and are more likely to be exposed to occupational hazards with their corresponding health risks (Leigh & Miller, 1997; Walsh, Jennings, Mangione, & Merrigan, 1991). At the same time, work-site health promotion programs have been least successful in attracting blue-collar workers (Glasgow, McCaul, & Fisher, 1993; Grosch, Alterman, Petersen, & Murphy, 1998; Niknian, Linnan, Lasater, & Carleton, 1991) and in influencing their personal health behaviors (Flay, 1986; Greenwald & Cullen, 1984).

We tested an integrated health promotion/occupational health intervention in the WellWorks-2 cancer prevention study. Work sites were randomly assigned to receive either an integrated health promotion/occupational health and safety (HP/OHS) intervention or a standard health promotion (HP) intervention. In work sites randomized to the HP/OHS condition, blue-collar smokers were twice as likely to quit smoking as their blue-collar counterparts employed in the work sites assigned to the HP condition (Sorensen, Stoddard, & Hunt, 1998).

In addition to the outcome data, we gathered process data in an effort to explore the mechanisms contributing to these observed differences (Dehar, Casswell, & Duigan, 1993; Flay, 1985; Hunt, Lederman, Stoddard, et al., 2000; Hunt et al., 2001; Israel et al., 1995; McGraw et al., 1994; Scheirer, Shediac, & Cassady, 1995) and to inform future studies (Flay, 1986; Helitzer et al., 1999). Effective process evaluation systems reflect the theoretical model on which the interventions are based (Israel et al., 1995; Scheirer, 1988), use multiple data collection methods, and incorporate perspectives of various groups involved in the study (Israel et al., 1995; McGraw et al., 1994). The theoretical basis for the WellWorks-2 process evaluation system reflects the socioecological model that was used to frame the intervention. That is, we collected data related to interventions targeting individual workers, organizational structures, and the work environment. We used multiple data collection methods and incorporated the perspectives of project intervention staff using the process evaluation system, and we obtained workers' perspectives from the final survey.

The purpose of this article is to report and compare the program awareness, extent of implementation (number of activities and contacts with management), and reach (participation) of the HP and HP/OHS interventions and explore relationships between these process data and outcomes.

METHOD

Study Design

WellWorks-2 was a randomized, controlled work-site intervention study designed to test the effectiveness of a standard HP intervention (eight work sites) compared with an integrated HP/OHS intervention (seven work sites) in increasing workers' consumption of fruits and vegetables and smoking cessation rates and in decreasing workers' consumption of fat and exposure to hazardous occupational materials (Sorensen, Stoddard, et al., 2002). Work sites were randomized within blocks: unionized versus nonunionized, single versus multiple buildings, and three work sites that were part of a single large company. The intervention delivery was tracked with a quantitative process evaluation system, results of which are presented here. In addition, we assessed workers' awareness of, and participation in, intervention activities on the final survey conducted at the conclusion of the intervention. This study received approval from the Institutional Review Board of the Dana-Farber Cancer Institute (DFCI).

Study Population

Work-site eligibility criteria included the following: (a) employ between 400 and 2,000 workers in manufacturing workplaces, (b) probable use of hazardous chemicals, and (c) turnover rate < 20% (to prevent excessive loss to follow-up). In addition, work sites agreed to (a) be randomly assigned to intervention condition, (b) allow completion of worker surveys on work time, and (c) participate in the Occupational Hazards Assessment at the time of the baseline and final surveys. The types of manufacturing conducted at the recruited work sites included adhesives, food, technology, jewelry, motor controls, paper products, newspaper, abrasives, automobile parts, and metal fabrication.

All workers were eligible to participate in the intervention. Workers were eligible to participate in the surveys if they were noncontractual workers employed on a permanent basis for 15 hours per week or more and worked on-site. More extensive descriptions of the study population are reported elsewhere (LaMontagne et al., in press; Sorensen, Stoddard, et al., 2002).

Intervention Methods

To avoid confounding due to the introduction of between-group differences unrelated to the incorporation of occupational health, we based interventions for both conditions on the same two theoretical foundations: a participatory model and a socioecological framework. In addition, we offered an equivalent number of intervention activities in each condition.

Participatory Model. We implemented a participatory model based on theories of community organization and community building. Several models of community involvement that employ a variety of strategies have been described in the literature (Hancock et al., 1997; Minkler & Wallerstein, 1997; Rothman, 1970; Rothman & Tropman, 1987). Whereas empowerment of the identified community members is central across models, the approach to participation of the intended audience varies. The nature of funding for research studies requires that the needs addressed by the research be defined by investigators, but it does not preclude participation of the intended audience in decision making regarding the planning and implementation of specific intervention methods. In WellWorks-2, we used a collaborative, capacity-building approach that strengthened the skills of employees and managers to deliver health programs; built leadership within the work site; and fostered critical awareness of both barriers and facilitators of healthful eating, tobacco control, and occupational exposures (Minkler & Wallerstein, 1997). Employee advisory boards (EABs) served as channels for worker and manager participation (Hunt, Lederman, Potter, et al., 2000; Sorensen et al., 1992). These boards consisted of an average of 7 to 10 employees who met for approximately 1 hour each month on work time. In both conditions, EAB members represented all employees (including workers and management) and a variety of departments. EABs in the HP/OHS condition also included health and safety representatives.

Socioecological Framework. We designed interventions based on a socioecological framework that approaches health as a product of interdependence between individuals and their social environment (e.g., family, community, culture, physical, social, and work environment) (Green, Richard, & Potrin, 1996; Institute of Medicine, 2000; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996; Stokols, Allen, & Bellingham, 1996). In keeping with this framework, we implemented interventions that addressed (a) organizational structures, (b) work environment (Eakin, 1997; Stokols, 1996), and (c) individual personal and cognitive factors (Bandura, 1986; Prochaska, DiClemente, Velicer, & Rossi, 1993).

Interventions Targeting Organizational Structures and Work Environment Through Contacts With Management. Following standard practice for work-site health promotion, the HP condition focused heavily on educational programs that addressed individual behavior change. In the HP group, intervention contacts with management focused on how to design, implement, and monitor smoke-free policies, food-catering policies that supported the inclusion of healthful food options at company meetings and events, and including healthful food options in vending machines. These policies supplemented the educational programming for individual workers.

In contrast, in the HP/OHS condition, the intervention placed primary emphasis on reducing work-related sources of ill health so that in addition to smoke-free and catering policies, the DFCI industrial hygienist conducted a walk-through assessment of potential worker exposures to occupational hazards and consulted with management and health and safety managers on strategies for reducing such exposures. These consultative contacts with management regarding occupational health were based on a model that posits a hierarchy of controls (Office of Technology Assessment, 1985); that is, the ideal choice is the substitution of safer for more hazardous substances. The next best choice is the use of engineering controls such as ventilation systems. The use of personal protective equipment is a last line of defense used in conjunction with engineering controls or when substitution and engineering controls are not possible. WellWorks-2 encouraged companies to adopt a proactive, preventive approach, going beyond compliance with standards set by the Occupational Safety and Health Act (OSHA). Project staff contacted upper and middle management; occupational health nurses; human resources, food service, and union representatives; and in the HP/OSH condition, health and safety representatives. Management contacts consisted of interactive one-to-one consultation and technical assistance, group education, and written educational communications.

In the HP/OHS group, educational programming for individual workers was part of an overall effort to create a healthy workplace as well as to promote worker health.

Interventions Targeting Individual Behavior Change. In both conditions, interventions designed to address individual health behavior incorporated strategies with demonstrated behavior change effectiveness (Bandura, 1986; Curry, Kristal, & Bowen, 1992; Heaney & Israel, 1997; Prochaska et al., 1993) using adult learning processes (Vella, 1995). These strategies included self-assessments with feedback, demonstrations, opportunities for goal setting and trial behaviors, and group discussion and were delivered in activities such as discussion groups, health fairs, demonstrations, and displays that are commonly used in standard work-site health promotion programs (Abrams et al., 1994). In the HP/OHS condition, we implemented interventions targeting single risk factors as well as integrated interventions that addressed both individual health behavior (smoking, nutrition) and exposure to hazardous substances. For example, in both conditions, health educators trained by the American Lung Association (ALA) delivered the standard ALA program. In the HP/OHS condition, however, a DFCI staff person attended the ALA sessions and discussed with participants the synergistic interactions that may occur between tobacco smoke and hazardous substances used in work processes. In addition to the smoking cessation group sessions, we addressed these possible synergistic interactions in other activities such as health fairs, demonstrations, displays, biometric assessments with feedback, and contests and games.

In addition to the interventions implemented in the HP condition, in the HP/OHS condition we included biometric assessments and contests that are not commonly included in standard health promotion programs and that lend themselves to addressing multiple risk factors. (Please see Table 2 for specific interventions provided in each condition.)

Data Collection and Measures

Data reported in this article were collected using two methods: (a) project staff documentation with a quantitative process evaluation system and (b) worker responses to questions included in the final survey.

Process Evaluation System

Data Collection. Project staff tracked the type and number of both management contacts (organizational/environmental interventions) and interventions targeting individual health behavior. Management contacts were documented using an environmental tracking form (ETF). Data recorded on the ETF included the number and type of management representatives attending, the risk factor(s) addressed, and the amount of time the contact took (see Figure 1).

Staff documented interventions implemented for individual workers on an intervention tracking form (ITF). Data recorded on this form included the type of intervention activities, the educational components that were part of the activity, the risk factor emphasis of the components, materials used, time contributions of work-site and non-work-site staff such as consultants, and whether that time was employer time or the managers' own time (Hunt, Lederman, Stoddard, et al., 2000).

We provided two 4-hour staff trainings on interpretation and translation of the process evaluation protocol. The trainings consisted of (a) overview of process evaluation design principles, (b) discussion of the process objectives of the study, (c) discussion of the purpose and procedures for completion of system forms, (d) definitions of terms used for documentation on the forms, and (e) practice completion of forms from a case study.

We reviewed the purposes of the process evaluation system, that is, to collect data on the extent of interventions implemented (number and type of activities), participation in those activities, and data to enable us to do an assessment of what it would cost a work site to implement the intervention. We articulated process objectives that delineated the time line for, and the extent of, implementation of each intervention activity. The content was guided by intervention protocol for each activity. For example, the process objective for the kickoff activity that introduced WellWorks-2 to the work site stated, "By month six of study year two, each intervention site will have conducted a project kickoff according to intervention protocol and measured by process tracking records."

Staff entered process data on paper forms designed for the system. These forms included the ITF and ETF described above; staff, EAB member, and worker time sheets; and a log for recording educational and promotional materials. Each form was reviewed and discussed with staff. The training manual contained a section of definitions for all terms used on the forms. During the training, these definitions were reviewed and dis-

Environmental Tracking Form (ETF)

Assigned ETF ID#: ____________ (DE staff fill in)

WORK-SITE NAME: ____________ **WORK-SITE ID:** ____________

FORM COMPLETED BY: ____________ (staff id#) **DATE OF ACTIVITY:** ____________ (mm/dd/yy)

CAMPAIGN: (circle one) kick off 2 3 4 5

GENERAL DESCRIPTION OF ACTIVITY: ____________

____

CONTACT
(circle all that apply)
A. Upper management
B. Middle management
C. Union officer
D. Union members
E. Health + Safety Dept. representative
F. Occupational health nurse
G. Human resources representative
H. Cafeteria representative
I. Vending Co. representative

CONTACT METHOD/ACTIVITY (circle all that apply)	**INITIATED BY**
A. Meeting	____
B. Presentation	____
C. Written intervention with contact	____
D. Phone intervention with contact	____
E. Other (please describe below)	____

____

____

EMPHASIS OF CONTACT
(circle all that apply)
0. WellWorks
1. Smoking
2. Nutrition
3. OH, Substitution
4. OH, Engineering controls
5. OH, Personal protective equipment
6. OH, Education
7. OH, Other
8. Physical activity
9. Integration theory

PROMOTION METHOD OF OH IMPROVEMENTS TO EMPLOYEES
(circle all that apply)
A. Bulletin board
B. Newsletter article
C. E-mail announcement
D. Flyers/stuffers/memos via mail
E. Other (please describe below)

____

____

Figure 1. Environmental tracking form.
NOTE: OH = occupational health.

cussed. For example, the definition for a campaign on the ITF was, “A campaign is an orchestrated set of intervention activities arranged around a theme for a duration of more than one day.” At the end of the training, staff members worked in small groups and filled out tracking forms that they then discussed with the large group. In addition, staff engaged in weekly group meetings to ensure consistent coding of process evaluation data and to discuss other project issues.

Measures. The number of management contacts and behavior change interventions were documented and summed for each work site. To enhance the reliability of participation results, we used two measures from data collected with the process evaluation system. To obtain participation rates per site, totals for each site were divided by the work-site-specific number of employees. To obtain the mean number of minutes of exposure per site, we multiplied the number of people who attended each activity by the average number of minutes participants attended and calculated mean person minutes of intervention exposure for each activity. We then summed mean person minutes for all activities to get a total of person minutes of exposure per work site.

Employee Survey

Sample. All employees on all shifts were eligible to take part in the intervention, and workers were eligible to participate in the surveys if they were noncontractual workers employed on a permanent basis for 15 hours per week or more. The exclusion criteria included having job responsibilities that required working off-site and being away from the work site on leave of absence, disability, or maternity leave of more than 90 days. These criteria were aimed at excluding workers who would not be adequately exposed to the intervention.

Data Collection. The final employee survey was conducted at the conclusion of the intervention in 1999 (Sorensen, Stoddard, et al., 2002). The survey was administered to a census of all workers. The surveys were conducted in group settings in combination with work-site distributions in 7 of the 15 sites and solely through work-site channels in the remaining sites. In the HP condition, there were a total of 3,710 respondents to the final survey (mean response rate = 64%; range = 31% to 89%); and in the HP/OHS condition, there were 3,617 respondents (mean response rate = 67%; range = 55% to 78%).

Measures. On the final survey we assessed sociodemographic variables; measures of tobacco use; fruit and vegetable consumption; perceived exposure to occupational hazards; and measures of employee awareness of, and participation in, project activities.

Work-Site-Wide Program Awareness. We measured program recognition using the item, “Over the past 2 years, have any of the following health promotion programs been offered at your workplace?” Names of four possible programs, including WellWorks, were provided, and the percentage of employees who answered yes to the WellWorks choice was computed for each work site. To determine awareness of specific programs, we asked, “Over the past 2 years, are you aware of any workplace programs or activities that address the following health-related topics?” Response categories included “quitting smoking,” “healthy eating or nutrition,” “workplace health and safety,” “programs combining all of the above,” and “none of the above.” The percentage of employees who responded to each activity was computed for each work site. Program awareness was measured as the proportion of employees in each work site reporting awareness of the program.

Work-Site-Wide Program Participation. We measured program participation using the question, “Over the past 2 years, did you participate in any workplace programs or activities that addressed the following health-related topics?” Response categories included “quitting smoking,” “healthy eating or nutrition,” “workplace health and safety,” “programs combining all of the above,” and “none of the above.” Respondents could answer affirmatively to the options that applied to them. We computed the percentage of workers who participated in one or more of the choices.

Smoking Cessation Among Blue-Collar Workers. Smoking cessation rates were measured among the cohort of blue-collar workers who responded both to the baseline and final surveys. Our measure of blue-collar occupation included those workers who reported that they were paid by the hour. Smoking cessation was assessed by self-reported abstinence for the 6 months prior to the final survey. The work-site-specific cessation rate was computed as the proportion of workers who were abstinent for at least 6 months among those who were smoking at baseline.

Data Analysis. The unit of analysis for this article was the work site. For process evaluation data, the unit of measurement was the activities. For the survey data, the unit of measurement was the employee. For each worker characteristic, we computed the average or the percentage of that characteristic for each work site. For example, for gender, we computed the percentage of employees who were men at each work site. Similarly, for the process evaluation, we computed the average across all activities at a work site to get a work-site-level measure.

To compare the work sites in the two intervention groups, we computed means and standard deviations of the work-site-specific measures across the work sites in each condition. Means and standard deviations of the work-site-specific measures were computed for each intervention condition. Differences were tested by the student's *t* test. All analyses were carried out using the personal computer version of SAS statistical software (SAS Institute, 1999-2000).

On the basis of the results of the work-site-level analyses, we explored the association between self-reported participation in the intervention with smoking cessation using the individual worker data. For this analysis, we investigated the association between intervention participation and smoking cessation among workers who reported being current smokers at baseline. We used the mixed-effects logistic regression analysis with intervention condition and blue-collar status as fixed effects and work site as a random effect. We tested whether the association between participation and smoking cessation was statistically significant controlling for intervention condition and blue-collar status. The linear logistic regression analysis was computed iteratively using reweighted likelihoods (Wolfinger & O'Connell, 1993).

RESULTS

Sociodemographic characteristics of workers including gender, education, and ethnicity and characteristics of work sites such as the percentage of hourly and salaried workers, number of employees, and percentage having shift work between the two conditions were not significantly different.

Extent of Intervention Implementation (Number of Activities) and Reach (Participation) of Interventions Targeting Individual Behavior Change—Process Evaluation Data

The number of activities targeting individual health behavior was similar in both conditions, as documented with the process evaluation system. In both conditions, there were higher participation rates in work-site-wide activities than in traditional group discussions. Here, work-site-wide activities refer to those interventions that were presented over several hours of the day so that workers could participate as their job responsibilities allowed. Often these hours spanned the lunch hour and break times. Discussion groups were held at specified times during the workday and lasted from 30 to 60 minutes. Mean participation in work-site-wide activities, group discussions, and resource centers were higher in the HP/OHS condition, as was mean minutes of worker exposure to the intervention (see Table 1).

Table 1. Mean (and Standard Deviation) of Indicators of Extent of Intervention Implementation (Number of Activities) and Reach (Participation) of Interventions Targeting Individual Behavior Change From the Process Evaluation System by Intervention Condition

Indicator	HP *M (SD)* (*n* = 8)	HP/OHS *M (SD)* (*n* = 7)
Extent of intervention implementation		
Mean number of work-site-wide activities/site	21.1 (6.7)	20.1 (4.0)
Mean number of specific work-site-wide activity/site		
Kickoff	1.0	1.0
Displays	4.1	3.0
Biometric assessments	—	2.4
Health fairs	1.0	—
Contests	—	1.8
Mean number of group discussions/site	14.0	9.9
Mean number of resource centers/site	1.0	2.0
Reach		
Mean % participation/work-site-wide activities/site[a]	14.2	21.2
Mean % participation/specific work-site-wide activity/site		
Kickoff	24.5	44.0
Displays	6.7	16.8
Biometric assessments	—	13.5
Health fairs	11.4	—
Contests	—	10.5
Mean % participation/group discussion/site	1.5	1.9
Mean % participation/resource center/site	0.1	0.3
Mean number of minutes of worker exposure to intervention/site[a]	14.9 (6.5)	33.3 (21.2)

NOTE: HP = standard health promotion intervention; HP/OHS = integrated health promotion/occupational health and safety intervention.
a. Means significantly different by *t* test ($p < .05$).

At the organizational/environmental level, the number of contacts with management representatives was significantly higher in the HP/OHS condition. As expected, contacts with health and safety managers is greater in the HP/OHS sites. In addition, contacts with upper and middle managers and human resource managers were greater in the integrated condition (see Table 2).

Employee Reports of Awareness of, and Participation in, WellWorks Intervention Activities—Survey Data

There was greater awareness of the presence of WellWorks in the HP/OHS than in the HP sites. Awareness of, and participation in, programs, including those addressing healthy eating or nutrition; integrated programs combining quitting smoking, healthy eating and nutrition, and workplace health and safety; and any programs were greater in the HP/OHS than in the HP condition. Participation in the usual company-initiated health and safety programs was not significantly different between conditions (see Table 3).

Table 2. Number and Type of Management Contacts Documented With the Process Evaluation System by Intervention Condition

Indicator	HP *M (SD)* (*n* = 8)	HP/OHS *M (SD)* (*n* = 7)
Management contacts (number/site)[a]	8.8 (4.0)	24.9 (9.0)
Risk factor addressed in management contacts (number/site)		
Nutrition	4.7	2.0
Smoking	2.0	3.0
Occupational health	—	18.0
Number of types of managers contacted/site		
Upper/middle management	3.9	8.4
Occupational health nurse	0.1	1.4
Human resources	2.1	4.9
Food service	2.4	0.4
Unions	0.3	0.9
Health and safety	—	8.9

NOTE: HP = standard health promotion intervention; HP/OHS = integrated health promotion/occupational health and safety intervention.
a. Means significantly different by *t* test ($p < .05$).

Table 3. Mean (and Standard Deviation) of Worker Reports of Awareness of, and Participation in, Programs Targeting Individual Behavior Change on the Final Survey and Smoking Cessation Rates of Hourly Workers by Intervention Condition

Variable	HP *M % (SD)* (*n* = 8)	HP/OHS *M % (SD)* (*n* = 7)
Awareness of the WellWorks Program[a]	59.9 (15.4)	78.5 (7.5)
Awareness of programs or activities addressing:		
Quitting smoking	55.2 (8.4)	67.8 (12.2)
Healthy eating or nutrition[a]	52.4 (9.7)	65.8 (6.8)
Company workplace health and safety	52.3 (13.8)	69.9 (9.7)
Programs combining all of the above[b]	23.6 (8.1)	37.6 (7.3)
Participation in programs or activities addressing:		
Quitting smoking	3.2 (2.0)	5.9 (3.5)
Healthy eating or nutrition[a]	16.6 (4.1)	22.7 (4.3)
Company workplace health and safety	21.6 (10.5)	28.0 (10.0)
Programs combining all of the above[a]	3.1 (2.2)	6.2 (2.9)
Any of the above programs[b]	34.4 (9.6)	45.8 (9.5)
Smoking cessation rates among hourly workers[a]	15.1 (7.3)	30.8 (11.8)

NOTE: HP = standard health promotion intervention; HP/OHS = integrated health promotion/occupational health and safety intervention.
a. Means significantly different by *t* test ($p < .05$).
b. Means significantly different by *t* test ($p < .01$).

Smoking Cessation Among Blue-Collar Workers—Survey Data

Smoking quit rates among blue-collar workers in the HP/OHS condition were more than double those in the HP condition (11.8% vs. 5.9%, $p = .04$) (Sorensen, Stoddard, et al., 2002). To understand this difference, we examined the association between participation in any project intervention activities and smoking cessation among those smoking at baseline. As noted in the Data Analysis section, the individual worker was the unit of measurement for these analyses. The association between participation and smoking cessation was not statistically significant. Among salaried smokers, the odds ratio of quitting for participants versus nonparticipants was 1.37; among hourly workers, the odds ratio was 0.93.

DISCUSSION

In an evaluation of the primary outcomes of this study, we found that the integrated HP/OHS intervention resulted in significantly higher smoking cessation rates among blue-collar workers, relative to the HP condition (Sorensen, Stoddard, et al., 2002). In an evaluation of the extent of intervention implementation and participation, we found that although the number of intervention activities targeting individual health behaviors was similar in the two conditions, awareness of the project and three measures of participation in intervention activities were significantly greater in the HP/OHS condition. Direct measures of participation included the percentage of workers participating in work-site-wide activities targeting individual health behavior change documented with the process evaluation system and worker reports of participation in project activities on the final survey. Greater worker participation is also a factor in the measure of mean minutes of worker exposure to the intervention. This triangulation provides stronger evidence for validity of the measurement than the use of one item. We were able to provide an average of more than one half hour of intervention exposure per worker and reach nearly one half of workers in these large work sites through integrated program activities compared with 15 minutes of intervention exposure per worker and a reach of one third of workers in the HP condition. We did further analyses to determine if those smokers who quit had participated in more WellWorks-2 intervention activities than smokers who did not quit. We found no difference in participation between the two groups of smokers.

Levels of awareness of, and participation in, intervention activities serve as milestones on a continuum that may lead to behavior change (Glasgow et al., 1993; Jacobs et al., 1986). That is, workers must first be aware of a program so they can participate and learn skills for engaging in behavior change. Methods for increasing participation were particularly important in this study because traditional work-site health promotion programs have been least successful in attracting blue-collar workers (Glasgow et al., 1993; Grosch et al., 1998; Niknian et al., 1991).

Noting the overall higher participation rates in the HP/OHS condition, we were interested in whether quitters had participated in more intervention activities than smokers who did not quit. Across conditions among workers who were smokers at baseline, there was no association between participation in project activities and smoking cessation when intervention condition and the clustering of workers in work sites were controlled. These findings indicate that the integrated intervention may have created work-site-wide social norms and social support for being smoke-free and played an important role in promoting smoking cessation among blue-collar workers (Eakin, 1997). This finding is especially important from a public health perspective. When the national prevalence of a health behavior such as smoking among blue-collar workers is high, it is not feasible to reach each individual with smoking cessation messages. We need to find effective population-based strategies such as the integrated work-site program tested in WellWorks-2 if we are going to reduce morbidity and mortality from cancer and other chronic diseases.

A variety of factors may have contributed to the supportive environment of the HP/OHS work sites. Investigators have proposed several possible pathways for the potential efficacy of integrated programs. First, workers may have the perception that exposure to hazardous occupational substances poses greater health risks than behavioral risks. Addressing these potential occupational risks is, therefore, an important component of work-site health programming (Hedberg, Jacobsson, Janlert, & Langedoen, 1993; Korelitz et al., 1993; Sorensen, Stoddard, & Hunt, 1998; Sorensen et al., 1995). Indeed, the risk communication literature indicates that risks are perceived as higher when they are characterized as involuntary, undetectable, outside personal control, and unfair (Baker, 1990), characteristics that may be typical of exposure to hazards on the job. Second, awareness of the presence of hazardous exposures at work may increase workers' perceptions of their own vulnerability and, thus, increase the likelihood that they will engage in efforts to reduce their personal risk (Sloan, 1987; Sorensen, Stoddard, Hammond, Hebert, & Ocklene, 1996). Third, acknowledging and addressing hazardous exposures in work-site health promotion programs may be required to gain credibility with blue-collar audiences and may contribute to increased participation and enhanced receptivity to health messages about behavioral risks (Green, 1988; Office of Technology Assessment, 1985). Fourth, workers have expressed a sense of futility in attending to their own health behaviors when they are exposed to hazardous substances at work (Green, 1988). Thus, if management's efforts to reduce hazardous occupational exposures are apparent to workers, they may be more likely to attend to improving their own personal health behaviors. Finally, management controls decisions related to improvements in occupational health (Green, 1988; Sorensen et al., 1996). Access to management is crucial to the effectiveness of any work-site health program (Glasgow et al., 1993; Sorensen et al., 1995; Sorensen, Stoddard, & Hunt, 1998). Because of the nature of management decision making related to occupational health, integrated work-site health programs naturally require a greater level of interaction with management representatives than do programs primarily focused on individual health behavior.

A perception that management is concerned about reducing employees' health risks might also have mitigated the fatalism that can arise from workers' sense of lack of control over their occupational exposures. The increased interaction with upper and middle management and human resources managers might not only garner management support for occupational health but also serve a "gatekeeper" function for matters related to health promotion.

There are limitations to the interpretation of the data reported here. Sources of both process evaluation and survey data were self-report. Self-report methods commonly are used in epidemiological research because of feasibility in the "real-world" settings (i.e., work sites) in which they are conducted. Although these methods can introduce reporting bias, measures can be taken to moderate the possible effects of this bias. To mitigate the effect of the possible bias in the process evaluation data reported here, we used the following strategies: (a) We solicited data from the perspectives of both the deliverers and receivers of the intervention; (b) we used different data collection methods, that is, documentation by project staff on process evaluation forms and a survey of workers; and (c) we provided extensive and ongoing training of project staff on using the process evaluation system to increase the likelihood of consistency and validity. Another possible source of response bias was the range in survey response rates. In controlled studies, however, reporting error affects the two groups similarly.

There is growing recognition among investigators of the need for effectiveness trials that are defined as a test of whether a "program does more good than harm when delivered under real-world conditions" (Flay, 1986). Effective prevention and health promotion interventions need to be translated from research to practice if we are to have an impact on cancer morbidity and mortality (Glasgow, Lichtenstein, & Marcus, 2003; Oldenburg, Sallis, French, & Owen, 1999; Shediac-Rizkallah & Bone, 1998). The benefits of conducting research that is adapted to the demands of real-world settings may offset the limitations introduced by possible response bias if these biases are acknowledged and controlled. Generalizability of these process evaluation results is limited to relatively large manufacturing workplaces.

The quantitative data reported here provide one possible explanation for the increased participation and significant smoking cessation rates of blue-collar workers in the HP/OHS condition. In future studies, we might employ the tools of qualitative research, such as focus groups and one-to-one key informant and life history interviews and observation, to give us further insight into the reasons for the increased participation and smoking cessation rates seen in the HP/OHS condition. These methods are well suited to exploring research questions that ask the why and how of study findings (Grbich, 1999).

Implications for Research

Follow-up studies are needed to elucidate the causal pathways to WellWorks-2 blue-collar smoking cessation results and explore ways in which integrated programs might be effective in addressing other risk factor areas, such as eating and physical activity patterns. Also, studies are needed to test mechanisms that facilitate the translation of research findings to the practice community.

Explorations of the sustainability of tobacco control activities following the end of study funding have been reported. Using a series of focus groups with former project volunteers 12 to 16 months following the Community Intervention Trial for Heavy Smokers (COMMIT), investigators found that in 9 of the 11 intervention communities, tobacco control boards and other structures were still operating and had dedicated funding for tobacco control; and in 10 communities, there was some level of paid staff focusing on smoking control. In addition, they found substantial activity in three of the channels COMMIT used to deliver interventions, that is, the work site, public education, and cessation resources (Lichtenstein, Glasgow, Lando, Ossip-Klein, & Boles, 1996). On the basis of interviews with personnel directors in the 83 work sites participating in the Working Well Trial, investigators found that although intervention activities increased significantly in the intervention sites during the study period, they were not sustained 2 years following the conclusion of the intervention. Intervention sites were, however, more likely than control sites to initiate and maintain infrastructures such as assigning responsibility for health promotion to a committee and providing a budget for health-promoting activities (Biener et al., 1999). Both COMMIT and Working Well investigators concluded that research focused on sustaining and disseminating programs is needed (Lichtenstein et al., 1996; Sorensen, Stoddard, Hunt, et al., 1998). With the two WellWorks studies demonstrating an association between HP/OHS health programs and smoking cessation in blue-collar workers, it is now time to examine the disseminability of such a program in a broader range of work sites in a real-world setting.

Implications for Practice

Addressing issues related to occupational health in work-site health promotion programs, as described here, requires interdisciplinary collaboration of health educators and occupational health professionals and guidance on how to translate the program from research to practice.

The training programs for these two disciplines share little in terms of curricula and intervention methodology (Israel, Baker, Goldenhar, Heaney, & Schurman, 1996). Joint training and continuing education opportunities for health and safety specialists and health educators might advance a shared vision of worker and workplace health (Sorensen, 2001; Sorensen, Barbeau, Hunt, & Emmons, 2004).

The need to learn more about ways in which evidence-based interventions can be translated to the practice community has become widely recognized among scientists and funding agencies such as the National Cancer Institute and the Centers for Disease Control and Prevention (Glasgow et al., 2003; U.S. Department of Health and Human Services, 2000). Durability and dissemination research is needed to identify ways to sustain interventions and maximize their impact through wide-scale adoption (Sorensen, Stoddard, Hunt, Herbert, et al., 1998). Future research might test ways in which WellWorks-2 program characteristics essential to its effectiveness can be preserved while at the same time adapting intervention protocol to new settings in the real world. These protocols that guide planning and implementation of intervention activities might be tested in a dissemination study that would provide more structure and guidance than is currently available at the conclusion of funded research projects such as COMMIT and Working Well. At the same time, a dissemination study would need to be structured so that it relied on the host organization rather than health professionals from outside the organization to sustain and institutionalize the program.

Conclusion

The process evaluation findings reported here add to the evidence that integrated HP/OHS work-site interventions may create a workplace environment that encourages participation in intervention activities and supports blue-collar workers in their efforts to quit smoking. These results were achieved even though blue-collar workers are more likely to experience social influences supporting smoking and discouraging quitting (Sorensen, Emmons, Stoddard, Linnan, & Avrunin, 2002). The persistently high rate of tobacco use among blue-collar workers underscores the necessity for developing innovative interventions that can leverage the complex influences in the workplace setting for improved worker and workplace health. Work-site health promotion programs that concomitantly address conditions of the workplace may result not only in increased program awareness and participation among employees but also enhanced interaction with management and improved effectiveness in achieving an impact on health behavior change.

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