

# Promoting Behavior Change Among Working-Class, Multiethnic Workers: Results of the Healthy Directions—Small Business Study

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Current epidemiological evidence links dietary patterns and physical inactivity to a wide range of cancers and other chronic diseases.<sup>1–6</sup> These risk-related behaviors are disproportionately concentrated among individuals of lower socioeconomic position and among certain racial and ethnic minorities.<sup>7–9</sup> Unfortunately, intervention approaches have not been designed for or sufficiently tested among working-class, ethnically diverse populations.<sup>10–12</sup> Within our increasingly multiethnic society, a particular need exists for effective cancer prevention interventions that can be implemented across ethnic groups.<sup>13</sup> In workplace settings, for example, individuals from many different ethnic groups may work alongside one another, and although they may not share a common cultural background, they likely share the day-to-day realities of a working-class social position. We report the results of a study of a worksite cancer prevention intervention to improve the dietary and physical-activity patterns of working-class individuals across multiple ethnic groups.

The Healthy Directions—Small Business Study was part of the Harvard Cancer Prevention Program Project, which developed and tested a common behavioral intervention model that could target multiple risk-related behaviors in a working-class, multiethnic population. The project consisted of interventions conducted through small businesses<sup>14</sup> and through health centers<sup>15</sup> and a policy model to estimate the potential population-based impact of the interventions. The interventions were based on a social-context framework<sup>13</sup> that describes pathways by which sociodemographic characteristic, such as income,<sup>11,16</sup> race/ethnicity,<sup>17</sup> and acculturation,<sup>18–21</sup> may influence health behaviors.

The interventions were designed to target selected social-context factors that influence

**Objectives.** We examined the efficacy of a cancer prevention intervention designed to improve health behaviors among working-class, multiethnic populations employed in small manufacturing businesses.

**Methods.** Worksites were randomly assigned to an intervention or minimal-intervention control condition. The intervention targeted fruit and vegetable consumption, red meat consumption, multivitamin use, and physical activity.

**Results.** Employees in the intervention group showed greater improvements for every outcome compared with employees in the control group. Differences in improvement were statistically significant for multivitamin use and physical activity. Intervention effects were larger among workers than among managers for fruit and vegetable consumption and for physical activity.

**Conclusions.** The social-context model holds promise for reducing disparities in health behaviors. Further research is needed to improve the effectiveness of the intervention. (*Am J Public Health*. 2005;95:1389–1395. doi:10.2105/AJPH.2004.038745)

behavior and that are amenable to change (e.g., social norms). The interventions were designed to be responsive to factors that could not be altered by the intervention but that are important determinants of behavior (e.g., individual income).<sup>13,22</sup> One example of social context is on-the-job exposures that workers face. In previous research, we found that blue-collar smokers employed at worksites receiving an intervention integrating health promotion and occupational health and safety were twice as likely to quit smoking as blue-collar workers at worksites receiving health promotion programming alone.<sup>23</sup>

We report on the efficacy of Healthy Directions—Small Business. These interventions were intended to reduce red meat consumption,<sup>24–30</sup> increase physical activity,<sup>9,31</sup> increase fruit and vegetable consumption,<sup>24</sup> and increase multivitamin use<sup>32,33</sup> among a working-class, multiethnic population of employees. The interventions were based on the assumptions that population characteristics such as occupational status, educational level, and ethnicity are not obstacles to behavior change and that it is necessary to understand and address the social-context factors associated with these characteristics.

Specifically, the analyses presented here tested the following hypotheses: (1) persons employed at worksites randomly assigned to the intervention condition are significantly more likely to change targeted health behaviors than persons employed at worksites randomly assigned to the control condition; (2) the intervention is at least as effective in changing targeted health behaviors among the following groups: workers compared with managers, the less-educated compared with more-educated persons, and persons near or below the federal poverty level compared with those above the level; (3) the intervention is at least as effective in changing targeted health behaviors among Blacks, Asians, and Hispanics compared with non-Hispanic Whites, and among immigrants and first-generation Americans compared with persons whose parents were born in the United States.

## METHODS

### Study Design

The Healthy Directions—Small Business study was a randomized controlled trial, conducted between 1999 and 2003, in which the worksite was the unit of randomization

and intervention. Twenty-six worksites in the Greater Boston Metropolitan Area of Massachusetts were recruited and pair-matched on the basis of whether they were unionized or nonunionized; within each pair, sites were randomly assigned to the intervention or to a minimal-intervention control condition.

### Setting

We used the Dun and Bradstreet database<sup>34</sup> to identify worksites coded with standard industrial classification codes 20 through 39 (manufacturing industries) and with 50 to 150 employees. Additional inclusion criteria included (1) a multiethnic workforce (defined as one in which at least 25% of workers are first- or second-generation immigrants or people of color), (2) a turnover rate during the past year of less than 20%, and (3) the power to decide to participate in a study (if part of a national or international parent company). In addition, worksites agreed to be randomly assigned to the intervention or the control condition, to allow completion of surveys during paid work hours at baseline and follow-up, and to participate in baseline and follow-up assessments of occupational hazards.

A total of 131 companies met study eligibility criteria; of these, 26 agreed to participate.<sup>34</sup> The recruited worksites manufactured a range of products including medical equipment, dog food, specialty pumps, textiles for the automobile industry, and electronics; 3 provided laundry and printing services to other businesses. On the basis of our prerecruitment survey, we found no significant differences between participating and nonparticipating worksites.<sup>35</sup> Thirteen sites were randomly assigned to the intervention condition and 13 to the minimal-intervention control condition. Follow-up assessments were completed at 24 of the sites; 1 site was lost to follow-up from each condition.

### Intervention Conditions

The intervention strategies were based on (1) principles of employee participation<sup>36</sup> and (2) a social-context framework targeting multiple levels of influence on behaviors,<sup>13,14,37,38</sup> with special attention given to low literacy skills and the shared and unique features of culture across ethnic groups.<sup>14</sup> Because the

unit of intervention was the worksite, interventions were targeted to the worksite level rather than to individual workers. Over the 18-month intervention period, we delivered 1 monthly intervention activity focused on individual behavior change and made an average of 1 monthly contact with management regarding environmental support and organizational change at each of the 12 intervention worksites. Participation in the intervention activities was voluntary, and not all employees took part. Both the minimal-intervention control condition and the intervention condition received smoking cessation programs.

*Participatory strategies.* Joint worker–manager participation in program planning can help ensure that programs respond to worker needs and priorities.<sup>36,39</sup> We formed employee advisory boards in which workers, managers, health/safety and other departments, and the diverse cultural groups in the workplace were represented. These boards met monthly on company time to plan interventions; board members also participated in the delivery of intervention activities.

*Social-context approaches.* The intervention was designed to consider the social context's multiple levels of influence on individual health behaviors, both on and off the job.<sup>40–43</sup>

At the *individual/interpersonal* level, we provided opportunities for one-to-one interactions at table-top displays and demonstrations, small-group discussions, and worksite-wide events, such as health fairs, that included biometric and behavioral self-assessments with feedback. We offered both integrated interventions focused on nutrition, physical activity, and occupational health and activities focused on individual risk factors. Potential sources of social support for healthful behavior therefore included participation in intervention activities with coworkers, encouragement from managers, and educational materials for workers' families provided as a routine component of intervention activities.

At the *environmental/organizational* level, interventions aimed to create a workplace environment supportive of healthful eating and physical-activity patterns, tobacco control, and reduction of hazardous occupational exposures. Together, Healthy Directions study staff and workplace managers wrote and adopted policies aimed at offering healthful food op-

tions at company meetings and events, providing facilities and signs aimed at helping workers meet recommendations for physical activity, and maintaining a smoke-free worksite. To reduce occupational hazards, the study's staff industrial hygienist provided extensive consultation to management regarding proactive and systems-oriented approaches to improving occupational health.

*Addressing multiple cultures and low literacy levels.* Intervention activities and materials included strategies, images, messages, and vocabulary that were designed to be inclusive and nonstereotyping.<sup>44</sup> The intervention relied as little as possible on written materials so as to be accessible to participants with limited literacy—for example, by using photographs in addition to the written word. All materials were translated into Spanish, Portuguese, and Vietnamese. Additional details about the intervention are provided elsewhere.<sup>14,44</sup>

### Data Collection

Data were collected from individual employees through interviewer-administered surveys at baseline and follow-up. Eligibility criteria were (1) being a permanent employee working  $\geq 20$  hours per week on-site and (2) being able to complete the survey interview in English, Spanish, Portuguese, or Vietnamese. Interviews were administered on company time in the language preferred by respondents. Baseline and follow-up surveys were conducted at approximately the same time of year to avoid seasonal differences in eating and physical activity patterns. Participation in the follow-up survey was not contingent on participation in the intervention. The survey response rate among the 26 sites at baseline was 84% (range=70%–98%;  $n=1740$  among the 26 baseline sites and 1684 among the 24 sites completing the study). The response rate among the 24 sites at follow-up was 77% (range=54%–93%;  $n=1408$ ). Both baseline and follow-up surveys were completed by 974 participants.

### Measures

*Health behaviors.* We assessed *servings of fruits and vegetables* consumed each day with a screener developed for the National Cancer Institute's nine 5-A-Day for Better Health research studies.<sup>45</sup> Responses were recoded to equivalent servings and summed to obtain

total servings of fruits and vegetables per day, expressed as a dichotomous variable (“5 or more servings per day” or “fewer than 5 servings per day.”)<sup>24</sup>

We assessed *red meat consumption* with an abbreviated form of the semiquantitative food frequency questionnaire.<sup>46</sup> The responses were recoded to equivalent servings per week and summed for total servings of red meat per week, expressed as a dichotomous variable (“3 or fewer servings per week” or “more than 3 servings per week.”)<sup>24–30</sup>

We based our *physical activity* assessment on the questionnaire used in the Nurses’ Health Study,<sup>47</sup> adapting items to specific activities we had found were more common among our intended population (e.g., omitting tennis and adding dance). We asked respondents to indicate how often on average over the past 4 weeks they had engaged in 8 moderate-level or vigorous-level physical activities. In addition, we asked about usual walking pace. The responses were recoded to equivalent minutes per week and summed to yield total minutes of physical activity per week. Walking was included if usual walking pace was reported to be faster than “easy, casual.” Minutes of activity per week were collapsed into a dichotomous variable (150 minutes [2.5 hours] or more versus fewer than 150 minutes per week).<sup>9,31</sup>

We asked respondents how many days per week on average they took a *multivitamin*. Respondents were coded as using a multivitamin daily if they reported taking a multivitamin 6 or 7 days per week.<sup>32,33</sup>

**Sociodemographic characteristics.** Respondents were asked their date of birth, gender, and highest level of education completed. They were asked to identify all of the racial and ethnic groups to which they belonged. Participants who reported being of Hispanic or Latino origin were coded as Hispanic regardless of any other ethnic groups mentioned. For the rest, those who reported only 1 race were categorized accordingly (White, Black, Asian, or Native American; by definition, these groups did not include Hispanics); respondents who selected more than 1 group were classified as mixed ethnicity. Because of small numbers in some categories, we collapsed Blacks, Native Americans, and those of mixed heritage into a single category, Other.

Household income was assessed in \$10 000 increments, from less than \$10 000 per year to \$50 000 or more. We combined the responses to this item with the number of people supported by the income and the ages of household members to categorize respondents according to the federal poverty guidelines for food aid.<sup>48</sup> In 2001, the poverty threshold for a single person was \$9214 and the threshold for a family of 2 adults and 2 children was \$17 960. The threshold for eligibility for food stamps and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was 185% of the poverty threshold.

We combined information about the participants and their parents’ birthplaces into a 3-category measure of generational status: (1) participant born outside the United States, (2) participant born in the United States but 1 or both parents born outside the United States, and (3) both participant and parents born in the United States.<sup>49</sup> Occupational class (manager vs worker) was determined on the basis of whether employees managed or supervised others,<sup>16,50</sup> according to information provided by the worksites.

### Statistical Analysis

We conducted all analyses by incorporating the clustering of respondents in worksites through generalized linear mixed modeling methods; that is, we incorporated the group randomized design in the analyses by controlling for the worksite as the random effect. To assess the effectiveness of the intervention, we analyzed each outcome measure separately and in the binary scale. We computed a generalized linear model for each outcome behavior, with intervention condition and survey (baseline or follow-up) as fixed effects. The hypothesis of no difference in improvement in health behaviors between intervention and control conditions was tested by the intervention group × survey interaction effect. We computed a mixed-model logistic regression analysis with business included as a random effect.<sup>51</sup> For this analysis, we used baseline and follow-up data for respondents at the 24 worksites that completed the study. The embedded cohort of subjects who were surveyed at both time points was incorporated into the analysis as repeated measures.<sup>52</sup> We

computed adjusted percentages with the coefficients from the linear logistic regression model. To carry out the analyses, we used the GLIMMIX macro in the SAS statistical software package (SAS Institute Inc, Cary, NC). This macro uses iteratively reweighted likelihoods to fit a logistic regression model in which the workers are clustered in worksites, a process known as the random effect.<sup>53</sup>

To explore subgroup analyses, noted in hypotheses 2 and 3 as analyses by occupation and race/ethnicity, and to control for confounding owing to factors that may have been unbalanced despite randomization, we added covariates to the generalized linear mixed models. We also conducted an intention-to-treat analysis including the 2 worksites that dropped out of the study before the follow-up assessment. We imputed values for the employees in these 2 worksites using the assumption that no change in behavior occurred during the intervention period among these employees.

## RESULTS

### Demographic Characteristics

Table 1 presents the sociodemographic characteristics of the sample by intervention condition. Although there were fewer women than men in both groups, a significantly greater percentage of women was found at the intervention worksites than at the control worksites. For all other characteristics, no statistically significant differences were found between employees in the intervention and control worksites.

### Intervention Results

Table 2 presents the percentages of participants who reported the various health behaviors at each survey. After control for clustering of employees in worksites, employees at worksites randomized to the intervention improved more for every outcome than did employees at worksites randomized to the control condition. The difference in improvement was statistically significant only for multivitamin use. Given the differing gender distributions by condition, we repeated the analyses, this time controlling for gender; little change was observed in the point estimates or the *P* values (data not shown).

**TABLE 1—Selected Characteristics of Participants at Baseline (n = 1740), by Randomization Group: Healthy Directions–Small Business Study, 1999–2003**

	Control	Intervention	P <sup>a</sup>
Gender, no. (%) <sup>b</sup>			.03
Male	684 (75.4)	486 (56.0)	
Female	247 (24.6)	320 (44.0)	
Higher education, no. (%) <sup>b</sup>			.20
≤ 4 years of college	206 (20.3)	137 (14.8)	
> 4 years of college	717 (79.7)	657 (85.2)	
Race/ethnicity, no. (%) <sup>b</sup>			
Non-Hispanic White	676 (72.5)	538 (63.4)	.23 <sup>c</sup>
Hispanic	104 (9.1)	113 (11.3)	.87 <sup>d</sup>
Other	153 (18.4)	156 (25.3)	
Income, no. (%) <sup>b</sup>			.18
≥ 185% of poverty level	818 (90.5)	650 (83.5)	
< 185% of poverty level	107 (9.5)	148 (16.5)	
Birth country, no. (%) <sup>b</sup>			.24
Participant and parents born in United States	423 (42.6)	295 (33.4)	
Other	506 (57.4)	510 (66.6)	
Occupational class, no. (%) <sup>b</sup>			.45
Worker	787 (84.2)	665 (82.5)	
Manager	146 (15.8)	142 (17.5)	
Age, y, adjusted mean <sup>b</sup>	42.8	44.1	.38

<sup>a</sup>P for test of equality of group percentages after control for clustering of workers in worksites.

<sup>b</sup>Percentages and means were adjusted for clustering of workers in worksites. For adjustment procedures, see Methods section.

<sup>c</sup>P for test of equality of percentage Non-Hispanic White vs Hispanic and Other.

<sup>d</sup>P for test of equality of percentage Hispanic vs Other.

For each outcome, we tested for confounding and for differential intervention effects by occupation and race/ethnicity, as we hypothesized.

**Fruit and vegetable consumption.** Differential intervention effects were observed for gender, race/ethnicity, and occupational class subgroups. The intervention was less effective among Whites than among all other ethnic groups, and it was more effective among women than among men and among workers than among managers. Table 3 presents the adjusted percentages of participants who reported consuming 5 or more servings of fruits and vegetables per day, stratified by occupational class (because the intervention was aimed primarily at workers, as opposed to managers). When we controlled for occupational class, the differential intervention effects owing to gender and ethnicity were no longer evident. No significant differences were observed in the effectiveness of the intervention according to poverty status, educa-

tional level, or whether the respondent or his or her parents were immigrants.

**Red meat consumption.** For red meat consumption, differential intervention effects were observed for gender and education subgroups. The intervention effects were larger among women than among men, and among workers with less education than among workers with more education (Table 4). No effect modification was observed for the other covariates.

**Physical activity.** When we controlled for poverty status, the percentage of employees at intervention worksites who reported being active at least 2.5 hours per week increased from 64% to 72%, whereas the corresponding percentages in control worksites decreased from 76% to 66% ( $P=.02$ ). A modest effect modification was observed for occupational class and physical activity ( $P=.09$ ; Table 3), indicating that the intervention effects were somewhat larger among workers than among managers after control

for poverty status. This result held when we controlled for gender. No effect modification was observed for the other covariates.

**Multivitamin use.** No significant effect modification was observed for these covariates for multivitamin use. This result held when we controlled for gender.

### Intention-to-Treat Analyses

As noted, 2 worksites dropped out of the study before the follow-up assessment. We imputed values for the employees at these 2 worksites on the assumption that no change in behavior occurred during the intervention period among employees at these worksites. We found that the results were almost identical to the results reported in this section.

## DISCUSSION

We examined 3 hypotheses. First, we tested the hypothesis that persons employed at worksites randomly assigned to the intervention condition would be significantly more likely than persons employed at worksites randomly assigned to the control condition to change targeted health behaviors. For every outcome, workers at worksites randomized to the intervention showed greater improvements than workers at worksites randomized to the control condition. The difference was statistically significant for physical activity and multivitamin use, findings that have important implications for potential colorectal cancer risk reduction at the population level.

Second, we hypothesized that the intervention would be at least as effective in changing targeted health behaviors among working-class individuals (defined as having nonmanagerial jobs, low levels of education, and income at or near the poverty level) compared with managers. Larger intervention effects were observed among workers than among managers for fruit and vegetable consumption. At follow-up, 22% of workers at intervention worksites were eating 5 servings of fruits and vegetables per day, compared with between 12% and 15% of workers and managers at control worksites. This change was equivalent to an average increase of 0.3 serving per day among workers at intervention worksites and managers at control worksites, compared with



**TABLE 2—Adjusted<sup>a</sup> Percentage of Participants Reporting Each Health Behavior at Baseline and Follow-Up, by Intervention Group: Healthy Directions—Small Business Study, 1999–2003**

Variable and Survey	Control	Intervention	<i>P</i> <sup>b</sup>
<b>≥ 5 servings of fruits and vegetables/day, no. (%)</b>			
Baseline	869 (11.9)	754 (15.4)	
Follow-up	770 (13.7)	635 (20.8)	
% Change	+1.7	+5.4	0.41
<b>≤ 3 servings of red meat/wk, no. (%)</b>			
Baseline	870 (29.5)	756 (32.3)	
Follow-up	767 (32.5)	631 (36.4)	
% Change	+3.0	+4.1	0.72
<b>≥ 2.5 hours of physical activity/week, no. (%)</b>			
Baseline	805 (75.2)	719 (69.6)	
Follow-up	734 (74.3)	571 (75.0)	
% Change	-0.9	+5.4	0.23
<b>Multivitamins ≥ 6 days/week, no. (%)</b>			
Baseline	870 (24.8)	760 (27.1)	
Follow-up	769 (27.3)	633 (36.8)	
% Change	+2.5	+9.7	0.03

Note. The study included 3092 workers at 24 worksites.

<sup>a</sup>Adjusted for clustering of workers in worksites. For adjustment procedures, see Methods section.

<sup>b</sup>*P* value is for the test of the intervention × survey interaction.

**TABLE 3—Adjusted Percentage of Participants Reporting 5 or More Servings of Fruits and Vegetables per Day or 2.5 Hours or More of Physical Activity per Week, by Occupational Class, Intervention Condition, and Survey: Healthy Directions—Small Business Study, 1999–2003**

	Control, Adjusted <sup>a</sup> % (n)	Intervention, Adjusted <sup>a</sup> % (n)
<b>≥ 5 servings of fruits and vegetables per day<sup>b</sup></b>		
<b>Managers</b>		
Baseline	8.2 (12)	20.1 (28)
Follow-up	11.8 (11)	14.6 (14)
% Change	+3.6	-5.5
<b>Workers</b>		
Baseline	12.7 (91)	14.3 (92)
Follow-up	13.8 (95)	21.8 (115)
% Change	+1.1	+7.5
<b>≥ 2.5 hours of physical activity per week<sup>c,d</sup></b>		
<b>Managers</b>		
Baseline	78.4 (105)	79.6 (101)
Follow-up	82.1 (84)	77.6 (72)
% Change	+3.7	-2.0
<b>Workers</b>		
Baseline	71.7 (502)	64.6 (397)
Follow-up	69.6 (451)	71.7 (353)
% Change	-2.1	+7.1

<sup>a</sup>Adjusted for clustering of workers in worksites. For adjustment procedures, see Methods section.

<sup>b</sup>*P* = .048 for difference between intervention and control condition for both managers and workers.

<sup>c</sup>After control for poverty status.

<sup>d</sup>*P* = .09 for difference between intervention and control condition for both managers and workers.

negligible change among workers at control worksites. The intervention effects for red meat consumption were also larger for less educated than for highly educated workers, although the largest increase in meeting intervention objectives was observed among college-educated workers at control worksites. The intervention effect for multivitamin use was comparable across all indicators of socioeconomic position. These findings suggest that the intervention was particularly effective in influencing behavior change among working-class individuals.

Third, we tested the hypothesis that the intervention would be at least as effective in changing targeted health behaviors among Blacks, Asians, and Hispanic compared with non-Hispanic White workers, and among immigrants and first-generation Americans compared with persons whose parents were born in the United States. In no case was the intervention more effective among Whites or persons whose parents were born in the United States. The intervention was more effective in increasing fruit and vegetable consumption among Asians, Blacks, and Hispanics than among Whites.

The physical-activity levels reported by participants were higher than estimates from previous research.<sup>54</sup> We conducted a validation study in which we compared self-reported minutes of physical activity with minutes of physical activity measured with a CSA monitor (Computer Science and Applications Inc, Fort Walton Beach, Fla.). Participants reported fewer minutes of moderate activity and more minutes of vigorous activity per week than were measured on the monitor. When moderate activity and vigorous activity were added together, the estimates of total activity were very similar for the 2 methods. Within the context of a randomized controlled trial, the fact that baseline physical activity levels were relatively high among both intervention and control conditions did not influence our ability to examine between-group differences in behavior change. Physical activity for at least 2.5 hours per week was significantly associated with being a manager, having more education, and having been born in the United States. Despite these 3 differences, the intervention was somewhat more successful in increasing physical activity among workers than among managers.

Worksite health promotion programs have generally been least successful in attracting blue-collar workers<sup>55–57</sup> and influencing their health behaviors.<sup>58</sup> We previously demonstrated the efficacy of an intervention model promoting both smoking cessation and organizational changes to protect workers from job-related hazards.<sup>22,23,59</sup> This model incorporates consideration of health and safety conditions, which are key features of the social-context environment in which workers make behavioral choices. Our results suggest that a social-context intervention model holds promise for reducing other cancer risk-related behaviors among workers of diverse racial/ethnic backgrounds.

**TABLE 4—Adjusted Percentages of Participants Reporting 3 Servings of Red Meat or Fewer per Week, by Education, Intervention Condition, and Survey: Healthy Directions–Small Business Study, 1999–2003**

Education and Survey	Control, Adjusted <sup>a</sup> % (n)	Intervention, Adjusted <sup>a</sup> % (n)
High school or less		
Baseline	27.7 (107)	32.7 (123)
Follow-up	32.7 (112)	39.7 (130)
% Change	+5.0	+7.0
Some post-high school		
Baseline	28.9 (84)	26.5 (61)
Follow-up	26.3 (64)	31.6(60)
% Change	-2.6	+5.1
College degree or more		
Baseline	31.6 (58)	38.2 (44)
Follow-up	42.1 (72)	32.3 (30)
% Change	+10.5	-5.9

Note.  $P = .02$  for difference between intervention and control condition for all education levels.

<sup>a</sup>Adjusted for clustering of workers in worksites. For adjustment procedures, see Methods section.

Our study had numerous strengths, including the randomized controlled design, the high rates of response to both the baseline and follow-up surveys, and representation of working-class, multiethnic groups. We measured the study outcomes in terms of the percentage of a population meeting overall recommended levels for each risk-related behavior, thereby providing a conservative estimate of intervention effectiveness at the population level. Although these behavioral outcomes were selected on the basis of their link to cancer, these findings have implications for other health outcomes associated with these health behaviors. Study outcomes were measured by self-report; we used validated measures following a standardized protocol to reduce the potential for reporting bias. This study targeted small manufacturing businesses in New England; accordingly, the results are not readily generalizable to other worksites.

Our study was statistically powerful enough to detect differences between intervention and control conditions; it was not powerful enough to detect differences among subgroups. Results of tests for effect modification by indicators of socioeconomic position and race/ethnicity must therefore be interpreted with caution. As with other worksite interventions, the effectiveness of

this intervention may have been limited by features inherent in the worksite setting; for example, at-work time was not universally available for workers to participate in the intervention, and in some cases management was hesitant to commit resources to changing the work environment to support workers' health.

This study addresses the increasing disparities in cancer risk by socioeconomic position and race/ethnicity in the United States.<sup>12</sup> As part of the Harvard Cancer Prevention Program Project, the Healthy Directions–Small Business Study tested the efficacy of a cancer prevention intervention specifically designed for working-class, multiethnic populations. We found that an intervention that responds to the social context and daily realities in the lives of working-class individuals across ethnic categories holds promise for improving cancer-related risk behaviors. ■

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#### Contributors

G. Sorensen originated the study, supervised all aspects of its implementation, and took the lead in writing the article. E. Barbeau assisted in overall study design and analysis and contributed to writing. A.M. Stoddard managed the analyses and wrote the sections describing analyses. M.K. Hunt assisted with the intervention and the process evaluation design and contributed to writing. K. Kaphingst contributed to literature searches and writing. L. Wallace managed the conduct of the study in the field. All authors helped to conceptualize ideas, interpret findings, and review drafts.

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