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Relationship of worksite smoking policy to changes in employee tobacco use: findings from COMMIT

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Abstract

***Objective*—To report data on the impact of worksite smoking policies on employee smoking behaviour from a large and heterogeneous sample of smokers and worksites in 22 different communities across North America participating in the COMMIT trial.**

***Design and subjects*—Data from a population-based survey of 8271 employed adult smokers who completed surveys in 1988 and 1993. Surveys included questions on tobacco use behaviours, personal/demographic characteristics, and smoking policy and cessation resources at the workplace.**

***Results*—After controlling for potential confounding factors, regression analyses revealed that employees who worked in a smoke-free worksite were over 25% more likely to make a serious quit attempt between 1988 and 1993, and over 25% more likely to achieve cessation than those who worked in a worksite that permitted smoking. Among continuing smokers, employees in smoke-free worksites consumed an average of 2¾ fewer cigarettes per day compared with those who worked in places with a non-restrictive smoking policy. A smoke-free worksite policy was not associated with a greater likelihood of using smokeless tobacco.**

***Conclusion*—These data, from one of the largest and longest smoking cessation studies to date, add support to the conclusion that smoke-free worksite policies help employees to reduce or discontinue use of tobacco.**

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Keywords: smoke-free worksites; smoking cessation; worksite smoking policy

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Introduction

The primary rationale for worksite smoking policies is to protect employees from exposure to environmental tobacco smoking.[1–3] However, restricting smoking at work can also motivate smokers to change their smoking behaviours. The literature on the impact of worksite smoking policies on employee smoking behaviour has consistently shown that more restrictive policies reduce consumption, but few studies have documented an impact on smoking cessation rates.[4–6] Our search of the literature failed to identify any studies that have examined the effects of restrictive workplace smoking policies on increasing the use of smokeless tobacco, although this relationship might be predicted from a compensatory tobacco use model.[4]

Few studies have investigated behaviour changes associated with worksite policies in the longer term, or had a sufficiently large sample size to comprehensively address potential confounding variables in multivariable analysis. One of the few exceptions is a recent study of the impact of California workplace smoking policies by Patten *et al.*[7] This study found that workplace smoking policies may encourage changes in smoking behaviour.

We report data on changes in tobacco use behaviour and associated worksite smoking policies collected during the Community Intervention Trial for Smoking Cessation (COMMIT).[8,9] The COMMIT study followed a cohort of adult smokers for five years to document changes in tobacco use behaviours. Among those currently employed, information was collected on smoking policies at their workplace. The primary purpose of this study was to examine the relationship between workplace smoking restrictions and changes in the tobacco use behaviour of employed smokers. Specific goals were to examine the association of worksite smoking policies (collected in 1993 only) with: (a) quit attempts and rates of smoking cessation; (b) changes in consumption among continuing smokers; and (c) effects on smokeless tobacco use (among male baseline smokers).

Methods

The data analysed in this paper come from a longitudinal study involving 8271 cigarette smokers in 22 North American communities who were interviewed in 1988 and re-interviewed in 1993 as part of the COMMIT study. The overall trial design and primary outcomes have been described elsewhere.[8–11] Briefly, the COMMIT study was a randomised, controlled trial conducted at the community level to test the effectiveness of a multifaceted intervention to help adult smokers achieve and maintain cessation. Intervention focused on four primary channels, including encouraging worksites to strengthen their smoking policies and to make cessation resources accessible to their employees. The study involved 11 matched pairs of communities: 10 pairs in the United States and one pair in Canada.

DATA COLLECTION AND MEASURES

From January to May 1988, a telephone survey was conducted to identify cohorts of heavy and light to moderate smokers within each of the following communities: Bellingham and Longview/Kelso, Washington; Albany/Corvallis and Medford/Ashland, Oregon; Vallejo and Hayward, California; Santa Fe and Las Cruces, New Mexico; Cedar Rapids and Davenport, Iowa; Raleigh and Greensboro, North Carolina; Paterson and Trenton, New Jersey; Lowell and Fitchburg/Leominster, Massachusetts; Yonkers, New Rochelle, Utica, and Binghamton, New York; and Brantford and Peterboro, Ontario, Canada. The survey was conducted centrally using a modified, random-digit dialling technique and community-specific geographic screening to identify households within the targeted areas. The survey was implemented in two stages. The first stage involved identifying representative samples of approximately 5400 households within each community and gathering information on the age, gender, and smoking habits of all adults within selected households. In the second stage, approximately 550 light to moderate (<25 cigarettes per day) and 550 heavy (≥25 cigarettes/day) smokers in each community aged 25–64 years were selected for an extended interview that included questions about current and past smoking habits, employment status, worksite smoking policy, and sociodemographic characteristics. Current smokers were defined as persons who reported having smoked at least 100 cigarettes in their lifetime and who reported smoking at the time of interview.

The mean response rate for the household rostering portion of the survey was 83.7%. Of the eligible smokers identified from the household rostering, 91.5% completed the extended interview. The initial cohort identification survey gathered data on a total of 20 347 smokers aged 25–64 years who were then followed prospectively until 1993. Between 1989 and 1992, cohort participants were contacted yearly by either telephone or mail to assess their current smoking status and residency. Between January and May 1993, cohort members were asked to respond to a 20-minute telephone interview, which included questions about current smoking and employment as well as their worksite smoking policy and any worksite smoking cessation services or resources.

Overall, 65.9% of cohort members (n = 13 415) provided information on their smoking status at the final contact in 1993. Most of the cohort members who were classified as non-respondents were those who could not be located (29.8%, n = 6073); an additional 2.4% (n = 493) were reported deceased, and 1.5% (n = 315) refused to participate in the follow-up survey. Attrition was higher for younger, single, less-educated members of the cohort.[8] In addition, 5144 respondents who were not employed outside the home or did not know their worksite's smoking policy at the time of the follow-up interview (n = 67) were excluded, leaving 8271 subjects for the analysis.

WORKPLACE POLICY AND OTHER PREDICTOR VARIABLES

In the 1993 survey, respondents were asked if they were currently employed. Those that responded affirmatively were asked which of the following best described their worksite smoking policy: prohibited everywhere; allowed in designated areas only; or allowed everywhere. Workers were also asked if their worksite has distributed smoking cessation materials or offered smoking cessation programmes, contests, or lotteries in the last five years. Other predictor variables obtained from the baseline interview in 1988 include age, race, income, education, amount smoked, quit attempts in the year before 1988, desire to quit, and COMMIT intervention status.

OUTCOME MEASURES

Outcomes variables measured from the 1993 follow-up interview were quit attempts between 1988 and 1993, smoking status and amount smoked in 1993, and, for men, use of smokeless tobacco in 1993. A respondent is considered to have made a quit attempt between 1988 and 1993 if he/she indicated they had made a serious quit attempt during the follow-up period or if he/she is classified as a successful quitter in 1993. A quitter is defined as a cohort member who reported not smoking in the six months preceding the follow-up interview. Amount smoked is the average number of cigarettes smoked per day in 1993. A respondent is considered to use smokeless tobacco if he/she self-reported using smokeless tobacco regularly.

ANALYSES

Bivariate associations among the dependent variables and reported worksite smoking policies and cessation resources were examined using the χ^2 test. Standard logistic and multiple regression models were constructed to examine the role of the worksite's smoking policy while controlling for potential confounder variables (age, race, education, income, amount smoked, desire to quit, past quit attempts, and worksite cessation services and resources). These analyses were performed using SPSS.[12] To account for the clustered nature of the COMMIT data, the same models were also performed using SUDAAN.[13] Parameter standard errors obtained from SUDAAN are inflated to the extent that the responses from within a given community are correlated, hence, this approach yields more conservative results. However, the results from SUDAAN models were the same as those obtained using SPSS. As most people are familiar with SPSS, we have chosen to present only the results obtained using SPSS. The SUDAAN results are available from the authors.

Results

DESCRIPTIVE STATISTICS

As can be seen in table 1, the employed smokers in this cohort were a heterogeneous group of smokers. As would be expected given the selection procedures, the mean baseline

Table 1 Participant baseline characteristics: employed smokers in COMMIT surveys

Employee/worksite characteristics	Employed smokers n	Employed smokers %
Sex		
Male	4360	52.7
Female	3911	47.3
Race		
White	6243	75.5
Black	515	6.2
Asian	89	1.1
American Indian	65	0.8
Canadian	918	11.1
Hispanic	410	5.0
Other	24	0.3
Age (years)		
25–34	3058	37.0
35–44	3043	36.8
45–54	1682	20.3
55–64	488	5.9
Education (years)		
<12	1193	14.5
12	1864	22.6
13–15	3566	43.2
≥16	1633	19.8
Gross income (US$)		
<10 000	429	5.5
10 000–25 000	2261	29.0
25 001 40 000	2719	34.9
>40 000	2380	30.6
Cigarettes smoked daily in 1988		
<5	430	5.2
5–14	1520	18.4
15–24	2946	35.6
25–34	2102	25.4
≥35	1266	15.3
Desire to quit		
None	1258	15.3
A little	1285	15.6
Somewhat	2765	33.6
A lot	2922	35.5
Past quit attempts		
0	5108	61.9
1	1571	19.0
≥2	1577	19.1
COMMIT		
Intervention	4139	50.0
Comparison	4132	50.0

smoking rate was relatively high (22.8 per day, SD 12.1), and more than 40% of the sample smoked 25 or more cigarettes per day.

By 1993, 28% of the respondents reported that their worksite prohibited any indoor smoking; 54% reported that their employer permitted smoking only in designated areas, and 18% said that smoking was allowed everywhere in their worksite. A third of the employees reported that their worksite had distributed smoking cessation materials and 26% said that their employer had offered smoking cessation programmes at work during the past five years. Nineteen per cent of respondents reported their worksite offered both a programme on site and cessation materials.

Between 1988 and 1993, 72% of baseline smokers made a quit attempt, and 31% of these reported having quit for at least six months at the time of the follow-up assessment (23% quit rate overall). Of continuing smokers, 66% reported decreasing consumption between 1988 and 1993, whereas 21% reported an increase and 13% smoked at the same level.

BIVARIATE RELATIONS BETWEEN SMOKING POLICY AND EMPLOYEE OUTCOMES

As table 2 shows, there was a significant relationship between smoking policy stringency and employee quit attempts, probability of cessation, and reduction in amount smoked (among continuing smokers), but not smokeless tobacco use (among men). More stringent smoking policies were associated with higher rates of quit attempts, greater likelihood of quitting, reduction in number of cigarettes smoked, and, contrary to what some would expect, lowered rates of smokeless tobacco use.

MULTIPLE LOGISTIC REGRESSIONS

The above bivariate relationships, although informative, could also be due to confounding between various "third variables" such as different employee characteristics. A series of multiple logistic regressions were conducted, therefore, to control for these potential confounding variables. All of the variables listed in table 1 were entered along with smoking policy. This analysis removes effects due to the set of remaining variables when evaluating the significance of the odds ratio for each variable.

The results of these analyses are summarised in table 3. As can be seen, after controlling for the significant effects of gender, race, education, amount smoked, and provision of cessation resources and programmes at the worksite, smoking policy stringency was independently and positively associated with quit attempts, quit rates, and reduction in amount smoked. It is interesting that a ban seems to be required to impact quit rates, whereas a policy designating smoking areas shows a reduction in number of cigarettes smoked, compared with policies that do not restrict smoking.

Discussion

This study had three goals. The first was to determine if more stringent smoking policies were associated with increased probability of quit attempts and successful quitting among employees experiencing these policies. The answer to this question was clearly yes, from both bivariate and multivariable analyses. The second question was whether, among

Table 2 Bivariate relations between worksite smoking policy and employee smoking behaviour

Outcome	Sample size n	Worksite policy: Smoking allowed (%)	Worksite policy: Designated areas (%)	Worksite policy: Smoke-free policy (%)
Quit attempt from 1988 to 1993 (%)	8271	66.9	71.9	75.1
Quit from 1988 to 1993 (%)	8271	20.0	21.0	26.9
Average daily cigarette consumption in 1993*	5725	24.1	20.8	18.4
Use smokeless tobacco in 1993 (%)†	4358	2.6	2.8	2.0

*Among those employees who continued to smoke in 1993.
†Among male employees (smokeless use among females was negligible).

Table 3 Results from multiple linear (MR) and multiple logistic regressions (LR) to predict changes in employee smoking behaviour: relative risk estimates or beta weights and significance

	Outcome variables			
Predictor variable	*Smoking quit attempt (LR)*	*Quit smoking (LR)*	*Amount smoked in 1993 (MR)*	*Smokeless tobacco use† (LR)*
Sex				
Male	Referent	Referent	Referent	NA
Female	0.97	0.82	0.04	NA
Race				
White	Referent	Referent	Referent	Referent
Black	0.85	0.97	−0.95	0.00
Asian	0.80	0.69	−0.57	0.45
American Indian	0.96	1.11	1.20	0.00
Other	1.46	1.31	0.85	3.57
Canadian	1.09	0.91	−0.65	0.51
Hispanic	0.87	1.00	−1.71*	0.59
Age (years)				
25–34	Referent	Referent	Referent	Referent
35–44	0.91	1.03	0.15	0.88
45–54	0.80*	1.13	−0.65	0.77
55–64	0.80	1.36*	−2.33*	0.45
Education (years)				
<12	Referent	Referent	Referent	Referent
12	0.99	1.23*	−0.47	1.81
13–15	0.95	1.12	−0.96*	1.26
≥16	0.96	1.17	−1.74*	0.87
Gross income (US$)				
<10 000	Referent	Referent	Referent	Referent
10 000–25 000	0.81	1.01	−0.71	0.86
25 001–40 000	0.93	1.13	−0.78	0.83
>40 000	0.94	1.22	−1.70*	0.48
Cigarettes smoked daily in 1988			0.54*	
<5	Referent	Referent	(continuous variable)	Referent
5–14	0.66*	0.62*		0.57
15–24	0.57*	0.34*		0.47
25–34	0.54*	0.29*		0.39*
≥35	0.58*	0.26*		0.35*
Desire to quit in 1988				
None	Referent	Referent	Referent	Referent
A little	1.30*	1.17	−0.41	0.94
Somewhat	1.97*	1.12	−0.63	1.06
A lot	3.09*	1.26*	−1.28*	1.30
Past quit attempts				
0	Referent	Referent	Referent	Referent
1	2.73*	1.10	−0.30	1.23
≥2	3.61*	1.17*	−1.21*	1.23
Worksite smoking policy				
Allowed everywhere	Referent	Referent	Referent	Referent
Designated areas	1.16*	1.00	−1.17*	1.23
Smoking prohibited	1.27*	1.27*	−2.78*	0.91
Worksite services and resources				
Offer none	Referent	Referent	Referent	Referent
Offer services or materials	1.34*	0.99	0.21	0.86
Offer both	1.21*	1.04	−0.60	0.72
COMMIT status				
Comparison	Referent	Referent	Referent	Referent
Intervention	1.07	1.08	−0.42	0.86

†For male employees only.
*P<0.05.
NA = not applicable.

continuing smokers, more stringent policies were associated with reduced consumption—for example, fewer total cigarettes per day. This was also answered affirmatively.

Because of concern that smokers might "compensate" by increasing use of smokeless/spitting tobacco when faced with a worksite smoking ban, we specifically addressed this issue also. The results indicate a non-significant reduction in the use of smokeless/spitting tobacco among employees at smoke-free workplaces, rather than an increase. Thus, it appears that worksite smoking restrictions are not associated with increases in smokeless/spitting tobacco use.

This investigation has both methodological strengths and limitations. The large number and heterogeneity of employees and worksites studied throughout North America is an important strength, as is the long timeframe of the study. The multivariate analyses and control for potential confounding factors, and for intraclass correlations via SUDAAN, also lend confidence to the conclusions above. On the negative side, we did rely on self-reports of changes in smoking behaviour. We feel justified in this, given that both COMMIT data[8 9] and other large-scale community-based studies have shown that rates of falsely reporting abstinence in such community intervention and non-demand assessment conditions are low, and do not show treatment *vs* control condition biases.[14 15]

Another potential weakness is that, unlike the study by Patten *et al*,[7] the design was not prospective in nature, as smoking policy information was collected only in 1993. It is possible that employees who were studied switched worksites between 1988 and 1993 to avoid smoking bans. However, this scenario seems unlikely as other studies have failed to find evidence that smokers quit working at a

location because of restrictions on smoking.[16 17] Unfortunately, in this study it was not possible to determine whether those who quit smoking did so before or after a smoke-free policy was established. Therefore, we cannot directly examine the effect of banning smoking at the worksite on the cigarette smoking behaviour of employees. A final consideration is that we measured employee perception of their worksite's smoking policy rather than the actual policy. Some might argue that this, however, is a strength rather than a weakness, as other studies have documented discrepancies between what a written policy says and how it is actually implemented.[18]

Our findings, when considered with results from other large-scale studies of worksite smoking restrictions,[1 7] may explain why the tobacco industry fights so hard to oppose clean indoor air laws. Smoking restrictions in the worksite result in less tobacco consumption, which means fewer cigarettes sold and lower profits for cigarette companies. Based on the results of this study, we estimate that if all worksites in the United States were to implement a smoke-free policy, an additional 178 000 smokers would stop smoking and, among those who continued to smoke, they would consume 10 billion fewer cigarettes per year.

The financial implications of a smoke-free worksite policy may help explain why cigarette manufacturers have invested heavily in developing new products that attempt to reduce secondhand smoke. For example, RJ Reynolds recently introduced a new cigarette-like product (Eclipse) that heats rather than burns tobacco thereby reducing secondhand smoke. Eclipse seems to be intended for smokers concerned about secondhand smoke. In Sweden, RJ Reynolds is marketing this "reduced smoke" product under the name "Inside".[19]

In summary, together with recent evidence from California[20] and other studies,[1 4 20] these findings argue for the benefit of smoke-free worksite policies for smokers, as well as the more direct effects of reducing environmental tobacco smoke exposure.[3 21] Future prospective studies are recommended to further investigate the long-term impact of worksite smoking bans and cessation resource combinations, and to see if these programmes have greater effects on some smokers than others—for example, heavy *vs* light smokers).

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