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Partner smoking characteristics: Associations with smoking and quitting among blue-collar apprentices

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Abstract

Background—Studies suggest that the social context of blue-collar workers contribute to their low smoking cessation rates. However, little is known on the effect of partner smoking and requests to quit on workers' cessation attempts.

Methods—Using data from a longitudinal smoking cessation intervention, multivariable logistic regression models were constructed to investigate the association of partner smoking characteristics with cessation among blue-collar apprentices.

Results—Smokers were more likely to have partners who smoke (OR 13.06; 95% CI 8.52-20.01). Partner's request to quit was associated with higher odds of smoking cessation at one month (OR 3.74; 95% CI 2.49-5.63) and six months (OR 1.90; 95% CI 1.06-3.41) post-intervention. Having a partner who smoked was associated with lower odds of smoking cessation at one month (OR 0.41; 95% CI 0.27-0.62), but not six months post-intervention.

Conclusions—Results suggest that smoking cessation interventions that include partner support might improve cessation among blue-collar smokers.

Keywords

smoking cessation; blue collar workers; social contextual model; spousal smoking; light and intermittent smoking; partner smoking

INTRODUCTION

Blue-collar workers in the United States continue to experience high smoking prevalence [Barbeau, et al. 2004, Giovino, et al. 2000, Lee, et al. 2007]. According to a study of smoking prevalence by occupation, which used data from the 1987 to 2004 National Health Interview Survey, only blue-collar occupations had smoking prevalence above 30% with the highest prevalence occurring among building trades construction workers [Lee, et al. 2007].

A key factor in the elevated prevalence of smoking among blue-collar workers is their continued low rates of smoking cessation compared to other workers [Barbeau, et al. 2004].

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Whereas there are no disparities in smoking cessation attempts by occupational grouping, disparities exist in success with smoking cessation whereby blue-collar workers are less likely to quit successfully [Barbeau, et al. 2004, Giovino, et al. 2000, Nelson, et al. 1994]. This persistent disparity, along with evidence that blue-collar workers are more likely to experience occupational exposure to other carcinogens [Meeker, et al. 2006, Oliver and Miracle-McMahill 2006, Rappaport, et al. 2003, Sorensen, et al. 1996], makes it necessary to identify elements of smoking cessation interventions that are efficacious for blue-collar workers.

While the social contextual model, which incorporates job experience and work conditions into health behavior interventions, has made a strong case for considering work-related factors in smoking cessation among blue-collar workers [Albertsen, et al. 2004, Sorensen, et al. 2002, Sorensen, et al. 1996], scant data exist on other non-work social factors that could influence smoking among blue collar workers. In particular, smoking cessation interventions targeting blue collar workers have not placed much emphasis on smoking by household members of the workers [Moher, et al. 2005]. There is evidence that living with a non-smoking partner is associated with lower prevalence of smoking [Homish and Leonard 2005] and higher intention to quit [Ruge, et al. 2008] while living with a partner who smokes is associated with decrease in smoking cessation [Dollar, et al. 2009]. However, most of the literature that have specifically examined partner support and smoking cessation have focused on partners of pregnant women. We could not find any study that has examined the potential influence of partners' smoking related behaviors on smoking or smoking cessation among blue-collar workers.

The main objective of this current investigation is to contextualize the social environment in which blue-collar workers attempt to quit smoking. Our study aims are two-fold. Using data from a longitudinal smoking cessation study, we describe the prevalence of smoking among the co-workers and household partners in the social context of building trades apprentices. Our hypothesis is that compared to non-smokers, smokers will be more likely to have a partner who smoke. In addition, we hypothesize that regardless of intervention group, blue-collar workers whose partners requested that they quit smoking would be more likely to quit smoking than those whose partners did not make a cessation request.

MATERIALS AND METHODS

Design

Our study sample participated in the MassBUILT study; a group randomized controlled smoking cessation intervention. A detailed description of the study design, sample and intervention results has been published elsewhere [Okechukwu, et al. 2009]. The MassBUILT study was implemented in collaboration with the Massachusetts Building Trades Council and included ten building trade apprenticeship training programs for individuals wishing to become unionized boilermakers, bricklayers, electricians, hoisting and portable engineers, ironworkers, painters, plumbers, pipefitters, sprinklerfitters, or refrigeration workers.

Ten apprenticeship sites that met the eligibility criteria for the study and agreed to participate were matched according to size and randomly assigned to four intervention and six control sites. All apprentices in the study sites were eligible for the study. We collected data from the apprentices at three time periods. The baseline survey was administered to apprentices in both the intervention and control sites (time 1). Then, the apprentices in the intervention group received a multi-pronged smoking cessation intervention, which was conducted over four months. One month after the intervention (time 2), post-intervention surveys were administered at all sites. The last survey administration occurred six months

and up to nine months after the intervention (time 3). Data were collected at eight and nine months after the intervention at two intervention sites due to unavailability of apprentices as they had rigorous training schedules.

Of the 1,817 apprentices (93.6% response rate) who filled out the study survey at time 1, 1,502 apprentices (82.6% response rate) completed a follow-up survey at time 2. At time 3, we were able to match both baseline and time 2 surveys for 1,213 apprentices (67% response rate) and these 1,213 constituted our longitudinal cohort. We obtained informed consent for all survey periods. The Dana-Farber Cancer Institute's Institutional Review Board approved all methods and materials used in the study.

Measures

Smoking Characteristics—Following the Centers for Disease Control and Prevention guidelines, only those who have smoked at least 100 cigarettes and had smoked in the last 30 days were classified as smokers [CDC 1994]. At baseline, we assessed smoking intensity (number of cigarettes smoked per day in the past 30 days; response choices: 1 to 10 cigarettes, 11 to 20 cigarettes, 21 to 40 cigarettes or more than 40 cigarettes per day). We assessed smoking cessation at two time points: seven-day point prevalence abstinence post-intervention at time 2 and six-month prolonged abstinence at time 3.

Partner smoking attributes—All the partner smoking variables were assessed at baseline. We assessed partners' smoking status by asking: Do you have a partner/spouse/significant other who currently smokes (response choices: yes or no)? In addition, we asked the following questions: Does anyone who lives in the home currently smoke (response choices: yes, no, or live alone) and How many of your friends/co-workers smoke cigarettes (response choices: most/all, some, or few/none)? Among those who smoke, we assessed partner requests to stop smoking by asking: Has your partner/spouse/significant other asked you to quit smoking (response choices: yes, no or no partner/spouse/significant other)?

Sociodemographic variables—The apprentices self reported their gender and race/ethnicity. Those who reported that they belonged to the Hispanic or Latino ethnicity were classified as Hispanic. The remaining participants who were not Black/African-American, Hispanic/Latino or White, and who included American Indians, Hawaiians, Asians and persons of multiple races comprised approximately 3.8% of the study population, and were grouped into an "Other race/ethnicity" category. Due to the small number of apprentices who smoke reporting that they were of Hispanic ethnicity (n=8) in the follow up surveys, those of Hispanic origin were also included in the "Other race/ethnicity" category for data analyses.

Age was calculated for each participant based on his or her reported date of birth. Participants chose their educational attainment from less than high school, high school/GED, some college/2 yr degree, and 4 years or more. The less than high school and high school/GED categories were further collapsed into one category during data analysis due to very small numbers (n=7) in the less than high school category. We also collapsed household income from seven \$10,000 increments from under \$10,000 to \$75,000 or more into four categories (<\$25,000, \$25,000-\$49,999, \$50,000-\$74,999 and ≥\$75,000).

Data Analysis

Apprenticeship sites were the unit of randomization and intervention while individual apprentices were the unit of measurement and analysis. Only those who had smoked at least 100 cigarettes and smoked in the last 30 days were treated as smokers in the analysis. Using the intention to treat principle, we classified all apprentices in the intervention sites as part

of the intervention group regardless of their level of participation and compliance. To account for potential clustering by workplace, we controlled for the random effect of workplace and conducted all multivariable analyses in SAS version 9.2 using Glimmix for binary outcomes.

Data analysis began with descriptive statistics using chi-squares for categorical variables and t-tests for continuous variables to examine sociodemographic and smoking characteristics of the 1,817 apprentices who completed the baseline survey. Then, we compared their social demographic characteristics to that of the 1,213 for whom we had longitudinal data. We then built multivariable models by first adding sociodemographic variables in the model. We left variables in the model even when they did not have significant relationships with the outcome because sociodemographic characteristics have been shown to be associated with both smoking and smoking cessation [CDC 2005, CDC 2006, US-DHHS 1998]. Our multivariable logistic regression models controlled for smoking intensity since other studies have found that heavier smokers are less likely to quit relative to lighter smokers [Fiore, et al. 2000].

Due to the substantial number of study participants (18.6%) missing data on at least one key sociodemographic variable, we used the Amelia II program, a bootstrapping-based algorithm that imputes multiple missing data in cross-sectional or longitudinal settings, to create 10 multiple-imputed datasets [King, et al. 2001]. After which, we used the MIANALYZE procedure in SAS to combine results from modeling the multiple imputed datasets.

RESULTS

Table I shows the descriptive statistics for both the apprentices who filled out the baseline survey and for those for whom we have longitudinal data. We found a high prevalence of smoking in the work and home social contexts of the apprentices. Overall, 42.0% of the apprentices in the study were classified as current smokers because they met the criteria of smoking at least 100 cigarettes and smoking in the last 30 days. The average age at which the apprentices initiated smoking was 16.5 years. Only 7.8% of the apprentices reported that few or none of their friends and co-workers were regular smokers while 64.6% and 27.6% reported that some or most/all respectively of their friends and co-workers smoked. Half of the apprentices (50.6%) who smoke had someone in their household who also smoked; this other smoker was usually the partner for 41.7% of the apprentices. Among current smokers with partners, those whose partners smoke were less likely to report being asked to stop smoking compared to whose partners were nonsmokers (21.6% versus 39.4%; $p < .0001$).

In multivariable models, we found no differences in sociodemographic characteristics between apprentices whose partners smoke versus those whose partners do not smoke (results not shown). Further multivariable models revealed that controlling for age, gender, race, education and income (Table II), apprentices who smoked had a 13 times higher odds of reporting that their partners smoke compared to those who did not smoke (OR 13.06; 95% CI 8.52-20.01).

Further analyses examined the relationship between partner smoking characteristics at baseline and smoking cessation among the 1,213 apprentices for whom we had longitudinal data. Controlling for intervention group, those whose partners requested that they quit smoking had 3.74 higher odds of smoking cessation compared to those whose partners did not make a similar request (Table III; 95% CI 2.49-5.63). The positive relationship between partners' request to quit smoking and smoking cessation extended to prolonged cessation for six months. Those whose partners requested for them to quit smoking had almost double the

odds of reporting that they maintained smoking cessation for at least six months (OR 1.90; 95% CI 1.06-3.41). Having a partner who smoked was associated with lower odds of smoking cessation (OR 0.41; 95% CI 0.27-0.62), but the effect was not significant for prolonged smoking cessation for six months.

DISCUSSION

Using data from a longitudinal study of smoking cessation among blue-collar apprentices, our study found that partner smoking characteristics at baseline were highly associated with smoking and smoking cessation among blue-collar apprentices. Apprentices whose partners requested that they stop smoking had more than three and half times the odds of smoking cessation regardless of intervention status. Many of them maintained this smoking cessation six months later. They had almost twice the odds of maintaining smoking cessation for six months compared to those who reported that their partner had not asked them to stop smoking. In fact, partner request to quit smoking had a stronger and longer lasting effect than intervention group. Those whose partners smoked were less likely to achieve smoking cessation immediately after the intervention; however, the effect of partner smoking was not significantly related to prolonged smoking cessation for six months. Our results, which indicate that partner smoking status potentially has an effect on smoking cessation, is supported by findings from other studies [Dollar, et al. 2009, Osler and Prescott 1998].

In addition to a high prevalence of smoking among the blue-collar apprentices, there was a high prevalence of smoking among those in their work and home social context. The high prevalence of smoking in the work setting of blue-collar apprentices has been reported by other studies [Leigh 1996, Sorensen 2001, Sorensen, et al. 1996]. This study shows that there is also a high prevalence among the partners of blue-collar workers. Blue-collar apprentices who smoke had 13 times higher odds of having partners who smoke. This result does not necessarily imply a causal relationship between partner smoking status and smoking behavior of blue-collar workers because we know that smokers usually associate with friends and partners who smoke [de Leeuw, et al. 2009, Homish and Leonard 2005, Macken, et al. 2000]. However, our results contextualize the social situations in which blue-collar workers are trying to quit smoking.

Prior to discussing possible implications of our results, it is necessary to examine the limitations and strengths of the study. The study utilized self reported measures for both the predictors and outcomes in the study. We made sure that all variables were collected using the same method at all study periods and we used validated scales where available. We could not implement biochemical or respiratory verification of smoking status in this study. Drug testing is routine at the workplaces. As a result, our collaborators advised us that any biological tests would likely lead to deep mistrust of study staff because they would likely be misinterpreted by workers as a drug test. To ensure that the apprentices reported accurate smoking status, the survey assistants stressed that the study needed truthful reporting of smoking status in order to develop effective smoking cessation interventions for the apprentices. They also reminded participants that confidentiality of results would be maintained. Besides, the need for such validation of smoking cessation in population based studies has been questioned [Murray, et al. 2002, Velicer, et al. 1995].

The strengths of our study include our prospective longitudinal design, which allowed us to establish temporal precedence. We were able to gather information on the exposures at baseline and then match it with follow up information from the apprentices. In addition, we used data from an intervention that did not focus on partner support; as a result, there is little risk that the study influenced the answers that we got regarding partner smoking

characteristics. The partner questions were included in a multitude of other questions related to work and home environment that were contained in the study survey.

Our study found that there was high amount of smoking in the work and social context of the blue collar workers in the study. Evidence suggests that the disparity in smoking cessation between occupational groups has widened over the years [Barbeau, et al. 2004, Brackbill, et al. 1988, Giovino, et al. 2000, Leigh 1996, Nelson, et al. 1994]. In concert with this disturbing trend, smoking cessation interventions targeting blue-collar workers have not yielded promising results in achieving prolonged smoking cessation [Campbell, et al. 2002, Moher, et al. 2005, Willemsen, et al. 1998]. This study suggests that incorporating intervention strategies that address partner smoking into smoking cessation interventions might potentially resonate with this group of smokers. Partner requests to stop smoking and partner smoking had stronger effects on smoking cessation than the smoking cessation intervention.

Our study implies that partner smoking characteristics has a strong relationship with both smoking and smoking cessation among blue-collar workers. However, we recognize that addressing partner smoking characteristics is not necessarily a magic bullet for addressing smoking cessation in this group of workers. We also recognize that partner request to stop smoking as operationalized in our study could be a proxy for social support for smoking cessation, which in some cases has been shown to increase smoking cessation [Park, et al. 2002, Roski, et al. 1996]. Further studies are needed to understand the best way to operationalize the findings from this study in smoking cessation interventions. A meta-analysis of randomized control trials of interventions aimed at improving partner support among smokers found that the evidence does not suggest a significant improvement in cessation rates though live-in partners may have some influence [Park, et al. 2004].

While partner smoking characteristics might not be the remedy for combating smoking among blue-collar workers, our results show that partner smoking characteristics warrant closer examination. Currently, partners of blue-collar workers who smoke have not been a target of smoking cessation studies targeting this population. In fact, the smoking cessation intervention whose data was used for this study collected but did not report data on partner smoking characteristics [Okechukwu, et al. 2009]. The workers in the study had the option of taking home literature on how partners/friends could help workers who were trying to quit but the partners were not explicitly targeted for smoking cessation. The intervention succeeded in getting more workers in the intervention group to quit; however, there was significant relapse so that there were no differences between the intervention and control groups in maintenance of smoking cessation for six months. It is possible that addressing partner smoking could have decreased the high relapse rate that occurred among these workers given that partner smoking characteristics had a stronger effect than intervention group.

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Table I

Demographic characteristics of building trades apprentices in the baseline (N=1,817) and longitudinal samples (N=1,213).^a

	Baseline		Longitudinal	
	N	%	N	%
Gender				
Male	1679	92.4	1126	92.8
Female	88	4.8	58	4.8
Race				
Other Race/Ethnicity	114	6.3	73	6
Black	125	6.9	76	6.3
Hispanic/Latino	65	3.6	36	2.9
White	1389	76.4	954	78.6
Education				
Less than HS	22	1.2	10	0.8
High School or GED	872	48	572	47.2
Some college or 2yr degree	674	37.1	451	37.2
College or more	155	8.5	118	9.7
Income				
Less than \$25,000	104	5.7	70	5.8
\$25,000 to \$49,999,	571	31.4	394	32.5
\$50,000 to \$75,000	390	21.5	249	20.5
More than \$75,000	474	26.1	315	25.9
Age categories				
18-25	707	38.9	497	40.97
26-35	809	44.5	510	42
36+	246	16.7	206	16.98
Number of friend/coworkers who smoke				
Most or all	369	20.3	237	19.5
Some	1132	62.3	768	63.3
Few/none	258	14.2	173	14.3
Presence of smoker in household				
Partner smokes	492	27.1	321	26.5
Current smoker	763	42.0	490	40.4
Partner's request to quit smoking (current smokers only)				
Yes	385	51.3	244	50.6
No	243	32.4	165	34.2
Does not have partner/spouse	122	16.3	73	15.2
	Mean	SD	Mean	SD
Age	28.4	6.6	28.4	6.7
Age of smoking initiation	16.5	3.7	16.5	3.5

^aTotals do not add up to the same number b/c values were calculated prior to imputing missing covariates

Table II

The relationship between partner smoking and smoking at baseline among building trades apprentices participating in the MassBUILT study (n=1,817).

	OR (95% CI)
Partner smoking	13.06 (8.52,20.01)
Age (continuous)	1.03 (1.00,1.06)
Gender	
Women	0.36 (0.14,0.91)
Men (reference)	
Race	
Other Race/ethnicity	1.84 (1.01,3.36)
Black	2.16 (1.07,4.37)
White (reference)	
Education	
High School or less	0.70 (0.38,1.31)
Some college or 2yr degree	0.51 (0.27,0.98)
College degree or more (reference)	
Income	
<\$25,000	0.69 (0.34,1.40)
\$25,000-\$49,999	0.73 (0.49,1.10)
\$50,000-\$74,999	0.73 (0.47,1.14)
\$75,000 or more (reference)	

Table III

The relationship between partner request to stop smoking and partner smoking with smoking abstinence at 1-month and 6-month post intervention follow up (n=1,213).

Parameter	One-Month Post Intervention OR (95% CI)	Six-Month Prolonged Cessation OR (95% CI)
Partner cessation request	3.74 (2.49,5.63)	1.98 (1.11,3.55)
Partner smoking	0.41 (0.27,0.62)	0.75 (0.38,1.46)
Intervention group	1.44 (0.98,2.11)	0.86 (0.49,1.50)
Age(continuous)	1.04 (1.01,1.07)	1.08 (1.03,1.14)
Gender		
Women	0.71 (0.23,2.18)	1.19 (0.25,5.80)
Men (reference)		
Race/Ethnicity		
Other Race/ethnicity	1.60 (0.83,3.10)	0.80 (0.24,2.66)
Black	0.91 (0.42,1.99)	0.79 (0.26,2.39)
White (reference)		
Education		
High School or less	0.48 (0.22,1.02)	0.68 (0.22,2.14)
Some college or 2yr degree	0.49 (0.23,1.06)	0.89 (0.31,2.55)
College or more (reference)		
Income		
<\$25,000	0.65 (0.29,1.44)	0.44 (0.12,1.68)
\$25,000-\$49,999	0.66 (0.42,1.04)	0.66 (0.33,1.32)
\$50,000-\$74,999	0.84 (0.51,1.37)	0.73 (0.31,1.72)
\$75,000 or more (reference)		
Smoking quantity (per day)		
41 or more cigarettes	0.12 (0.03,0.61)	0.23 (0.02,2.25)
21 to 40 cigarettes	0.19 (0.10,0.36)	0.18 (0.06,0.58)
11 to 20 cigarettes	0.18 (0.11,0.29)	0.15 (0.06,0.36)
1 to 10 cigarettes (reference)		