

RESEARCH PAPER

Effect of smoking regulations in local restaurants on smokers' anti-smoking attitudes and quitting behaviours

Alison B Albers, Michael Siegel, Debbie M Cheng, Lois Biener, Nancy A Rigotti

Tobacco Control 2007;16:101–106. doi: 10.1136/tc.2006.017426

See end of article for authors' affiliations

Correspondence to:
Dr A Albers, Social and Behavioral Sciences Department, Boston University School of Public Health, 715 Albany Street, TW2, Boston, MA 02118, USA; aalbers@bu.edu

Received 24 May 2006
Accepted 18 December 2006

Objective: To examine the effect of smoking regulations in local restaurants on anti-smoking attitudes and quitting behaviours among adult smokers.

Design: Hierarchical linear modelling (HLM) was used to assess the relationship between baseline strength of town-level restaurant smoking regulation and follow-up (1) perceptions of the social acceptability of smoking and (2) quitting behaviours.

Setting: Each of the 351 Massachusetts towns was classified as having strong (complete smoking ban) or weak (all other and no smoking restrictions) restaurant smoking regulations.

Subjects: 1712 adult smokers of Massachusetts aged ≥ 18 years at baseline who were interviewed via random-digit-dial telephone survey in 2001–2 and followed up 2 years later.

Main outcome measures: Perceived social acceptability of smoking in restaurants and bars, and making a quit attempt and quitting smoking.

Results: Among adult smokers who had made a quit attempt at baseline, living in a town with a strong regulation was associated with a threefold increase in the odds of making a quit attempt at follow-up (OR=3.12; 95% CI 1.51 to 6.44). Regulation was found to have no effect on cessation at follow-up. A notable, although marginal, effect of regulation was observed for perceiving smoking in bars as socially unacceptable only among smokers who reported at baseline that smoking in bars was socially unacceptable.

Conclusions: Although local restaurant smoking regulations did not increase smoking cessation rates, they did increase the likelihood of making a quit attempt among smokers who had previously tried to quit, and seem to reinforce anti-social smoking norms among smokers who already viewed smoking in bars as socially unacceptable.

Despite the proliferation of restaurant and bar smoking ordinances, very little is known about their specific effects on smokers' attitudes towards smoking in public places and actual quitting behaviours. The effect of clean indoor air ordinances on smokers is of particular interest given that these types of bans may discourage smoking by strengthening anti-smoking community norms and in turn influencing quitting behaviours. That is, the social unacceptability of smoking in restaurants and bars may be a potential mechanism in reducing smoking behaviours. Glantz has argued that the tobacco industry's opposition to restaurant and bar smoking bans is primarily due to the strong message that smoking is no longer socially acceptable.⁶ A recent cross-sectional study showed that strong local restaurant and bar regulations are associated with more negative attitudes towards the social acceptability of smoking in restaurants and bars among adults who eat out or go out primarily in their towns.⁷ It is known that public smoking restrictions limit smokers' opportunities to smoke, thus raising the costs of smoking (eg, having to go outside to smoke), which may reduce the perceived benefits of this behaviour (eg, social camaraderie and "pleasure" of smoking a cigarette after a meal).

Several studies have shown that smoking restrictions in the workplace encourage smokers to quit or cut back on cigarette consumption.^{8,9} According to a recent review of 26 studies on the effects of smoke-free workplaces across the US, Australia, Canada and Germany, completely smoke-free workplaces are associated with reductions in prevalence of smoking and fewer cigarettes smoked per continuing smoker.⁹ One study reported that strong local clean indoor air ordinances in California during 1990–1 were associated with an absolute quit rate (over the previous 6 months) 7.6% higher than in areas with no

workplace laws.¹⁰ Another study conducted in Canada during the same time period found a 21% reduction in the odds of being a smoker in areas with high coverage versus those with low coverage of smoking bylaws.¹¹ These worksite studies have generally found that completely smoke-free workplaces are associated with smoking cessation and reduction in cigarette consumption.

However, of the 26 studies reviewed by Fichtenberg and Glantz, only two employed longitudinal data and none were specific to restaurants and bar regulations.⁹ The use of cross-sectional data prevents determination of whether the regulations caused the reduced smoking or whether states and towns with lower smoking rates are more likely to adopt such regulations. These studies are also limited by their failure to control for town-level factors that may confound the relationship between the presence of regulations and the observed levels of smoking. Furthermore, the few studies reviewed grouped together different smoking restriction sites (eg, work-sites, schools, restaurants, public places), and assessed only state-level rather than local laws.

Another limitation of current research is that none has investigated how restaurant smoking regulations influence smokers' attitudes and behaviours by existing attitudes towards smoking and smokers' quitting behaviour. Smoking regulations in restaurants may have a stronger effect on smokers who have begun to change their perception of the social unacceptability of smoking in public places and on smokers who are already motivated to quit. Most research efforts have assumed homogeneity in attitudes and behaviours by examining the effect of bans on all adults and all smokers. Prochaska *et al*^{12,13},

Abbreviation: HLM, hierarchical linear modelling

for example, have characterised quitting as a process, with smokers classified according to their stage of change from precontemplation (earliest stage) to maintenance (last stage). A large variation exists in the quitting process—smokers often do not exhibit a steady progression through this change sequence¹⁴ and achievement of successful cessation often includes regression to a previous stage.¹⁵ Additionally, two obvious reasons for the limited research are the small samples used in many studies and the lack of longitudinal data to support stratified analyses. These data allowed us to investigate in detail heterogeneity in smoking regulation effects across attitudes and quitting behaviours among a smoker cohort.

To help address the weaknesses of previous research, our study focused on the effect of smoking regulations over the 2-year follow-up period on two outcomes: (1) anti-smoking attitudes among smokers who did or did not report anti-smoking attitudes at baseline and (2) quitting behaviours among smokers who had or had not made a past year quit attempt at baseline. To our knowledge, this is the first longitudinal study to assess the effect of restaurant smoking restrictions on smokers' attitudes towards smoking in restaurants and bars, quit attempts and actual quitting behaviour.

METHODS

Sample

Between 1 January 2001 and 15 June 2002, the Center for Survey Research, University of Massachusetts Boston (Boston, Massachusetts, USA) obtained a probability sample of adults of Massachusetts by random digit dialling. One adult per household was interviewed, oversampling current smokers, recent quitters and young adults between 18 and 30 years of age. In

all, 66% of eligible households were successfully screened during the study period and interviews were completed with 70% of the eligible respondents, resulting in a sample of 6739 adults, 3081 of whom were smokers.

Between January 2003 and July 2004, an attempt was made to re-interview adults who, at baseline, were smokers, recent quitters and young adults between 18 and 30 years of age. The sample for this study consists of those baseline smokers who completed the follow-up interview ($n = 1728$; 56.1% retention rate). Of the completed interviews, 16 respondents were dropped because of inconsistencies in reported smoking status between baseline and wave 2, resulting in a sample size of 1712. Of the re-interviewed adults, 1391 (81.3%) were still smoking at follow-up.

The research protocol was approved by the institutional review boards of the University of Massachusetts Boston and Boston University Medical Center. All subjects gave informed consent, and a waiver of the requirement for written consent was obtained from both institutions.

Measures

Town of residence

Information regarding the town of residence at baseline and follow-up was obtained using the reported zip code. The majority (88.8%) of re-interviewed adult smokers lived in the same town at baseline and follow-up; 7.7% moved within Massachusetts and 3.5% moved out of state.

Strength of local restaurant smoking regulation

Local restaurant smoking regulations were acquired for each of the 351 cities and towns in Massachusetts that were in place in

Table 1 Unweighted baseline characteristics of Massachusetts adult smoker cohort by strength of local restaurant smoking regulation*

	Total (n = 1712)	Weak % (n = 1503)	Strong % (n = 209)	p Value
Individual-level variables				
Age at baseline, years				
18–30	478	28.1	26.8	NS
≥31	1232	71.9	73.2	
Sex				
Male	738	43.5	40.2	NS
Female	974	56.5	59.8	
Race/ethnicity				
Non-hispanic White	1494	87.4	93.8	0.008
Other	201	12.6	6.3	
Marital status				
Not married	946	57.3	47.8	0.010
Married	739	42.7	52.2	
Number of children				
None	1033	59.9	64.6	NS
1 or more	675	40.1	35.4	
Education				
Non-college graduate	1242	75.5	65.1	0.001
College graduate	432	24.5	34.9	
Household income (\$)				
≤\$50 000	740	50.6	41.1	0.016
>\$50 000	758	49.4	58.9	
Total smoking ban in the workplace				
No	256	28.1	21	NS
Yes	682	71.9	79	
Smoking history				
Highly dependent	579	34.9	25.8	0.009
Less dependent	1133	65.1	74.2	
Town-level variables				
Percentage of town "yes" vote on question 1 (mean)	48.3	47.4	54.6	0.0001
Percentage of town residents who are white (mean)	84.9	84.0	91.6	0.0001

NS, not significant.

*Strength of local restaurant smoking regulation was defined as strong if smoking was banned completely in all restaurants with no variances, and as weak if otherwise.

the survey period from 1 January 2001 and 17 July 2002. Using the town of residence for each respondent, the strength of local regulation in effect in their town on their interview date was classified into one of two categories based on the stringency of smoking restriction in restaurants: (1) strong regulations: no smoking allowed in restaurants and no variances allowed; and (2) weak regulations: all other restrictions, including no smoking restrictions at all. Initial analyses examined the effect of a three-level coding system (weak, medium and strong) in which "medium" included smoking restricted to enclosed, separately ventilated areas only (see elsewhere).^{7 16 17} Because there were no observed differences in study outcomes between the medium and weak categories, the two groups were combined into a single category now referred to as weak.

Social unacceptability of smoking in town

Two dichotomous measures of the perception of the social unacceptability of smoking in restaurants and bars were assessed. Respondents were asked at baseline and follow-up, "In [TOWN] restaurants, do you think smoking should be allowed throughout the restaurant, only in special smoking areas or not at all?", and "In [TOWN] bars and nightclubs, do you think smoking should be allowed throughout the bar or club, only in special smoking areas or not at all?" Smokers were characterised as perceiving smoking as socially unacceptable in restaurants (bars) if they reported that smoking should not be allowed at all in restaurants (bars), and as socially acceptable if they reported that smoking should be allowed throughout restaurants (bars) or in special smoking areas.

Quitting behaviours

Two dichotomous outcomes related to a recent quit attempt and successful quitting were examined. A quit attempt was defined as a period of abstinence lasting at least 24 h in the past 12 months. The baseline and follow-up survey question was: "During the past 12 months, did you quit smoking intentionally for one day or longer...yes or no?". A "quitter" was defined as a respondent who was a current smoker at baseline and who indicated that he/she was not smoking at all in the past 12 months at the time of the follow-up interview. A quitter may or may not have made a quit attempt at baseline.

Potential individual-level confounding variables

In the models estimated below, the following variables were controlled for: education (<16 years; ≥16 years); marital status (married; non-married); children aged <18 years in the household (none; 1 or more); and sex. As a result of analyses revealing that younger adult smokers were less dependent on smoking than older adults, we dichotomised age into two groups (18–30 years; ≥31 years). Race and ethnicity were also combined to create two groups (white, non-Hispanic; non-white). Household income was obtained by asking respondents to select an income category that best described their total household income before taxes in the previous year. Family-level income was dichotomised into households with ≤\$50 000 and those with ≥\$50 001. The level of baseline smoking addiction was also controlled for in the analyses; smokers were classified as highly dependent if they reported having smoked 20 or more cigarettes per day and smoking the first cigarette within 30 min of waking, and as "less dependent" if they reported smoking fewer than 20 cigarettes per day and/or smoking the first cigarette more than 30 min after waking.¹⁸

Potential town-level confounding variables

The following town-level continuous variables were controlled for: (1) the percentage of each town's voters who voted "yes"

on question 1, a 1992 ballot initiative that increased the cigarette tax and created a state-wide tobacco control programme; and (2) the percentage of white, non-Hispanic residents in each town. Of a large number of town-level factors examined, these two were most strongly related to the strength of local restaurant smoking regulations in the towns of Massachusetts and were not highly correlated with one another.¹⁹ The percentage "yes" vote on question 1 served as a measure of the level of education in the town as well as the anti-smoking sentiment in the town that preceded the implementation of most restaurant smoking regulations in Massachusetts.²⁰ This variable came from the Elections Division in the office of the Massachusetts Secretary of State, and the percentage of white, non-Hispanic residents in each town was obtained from the 2000 US Census.²¹

Data analysis

Because respondents from the same town may be more similar than respondents from different towns, logistic regression models were fit using a hierarchical linear modelling (HLM) technique to assess the relationship between strength of the town-level restaurant smoking regulation at baseline and (1) perceptions of the social unacceptability of smoking and (2) quitting behaviours. HLM is a modelling approach used to account for the non-random clustering of respondents within particular towns.²² HLM takes into account the correlation of data within town clusters, which, if ignored, can lead to an increased frequency of type I errors.²³ Two-level HLM analyses were conducted using a computer program called HLM V.6.²⁴ In this model, level 1 corresponded to the individual level (including restaurant smoking regulations) and level 2 corresponded to the town-level factors. The model was unit-specific (ie, modelled the expected outcome for the level-1 unit conditional on a given set of random effects) and used robust standard errors. In addition, alternative analyses were run using the generalised estimating equation, which requires fewer assumptions about the distribution of the examined outcomes and variance structure, to compare results with the HLM analyses; the results were the same and are not reported here.

The analysis was divided into two stages. The first stage involved examining the impact of the strength of the restaurant smoking regulation on the social attitudes towards smoking in restaurants and bars among the smoker cohort. The analysis for each of the two outcomes measuring the perceived social unacceptability of smoking was stratified by baseline reported attitudes. For example, in examining the relationship between the strength of the town-level regulation and the social unacceptability of smoking in restaurants, the analysis was stratified by those who reported that it was socially acceptable to smoke in restaurants at baseline and those who reported that it was socially unacceptable to smoke in restaurants at baseline.

The second stage involved examining the effect of the strength of the restaurant smoking regulation on the odds of making a quit attempt and becoming a quitter. These analyses were stratified by whether a baseline quit attempt had been made for one day or longer.

The data were weighted using baseline sampling weights to adjust for the probability of selection, non-response and for the number of telephone lines in the household. 95% CIs for odds ratios (ORs) were calculated using standard errors (SEs) estimated by the Wald test.²⁵ We used indicator variables to create a category for missing values for each covariate so that the same subset of respondents was examined in each analysis.

RESULTS

Table 1 shows the baseline characteristics of the Massachusetts adult smoker cohort.

Table 2 Perceived social unacceptability of smoking at follow-up by strength of local restaurant smoking regulation and baseline attitudes among the Massachusetts adult smoker cohort

Baseline perceived social unacceptability of smoking	Strength of local regulation*		Unadjusted OR† (95% CI)	Adjusted OR‡ (95% CI)
	Weak	Strong		
(A)	% Socially unacceptable to smoke in town restaurants at follow-up§			
Socially acceptable (n = 1117)	23.9	27.6	1.21 (0.79 to 1.85)	1.23 (0.77 to 1.97)
Socially unacceptable (n = 554)	71.6	72.5	1.05 (0.50 to 2.23)	1.10 (0.54 to 2.26)
(B)	% Socially unacceptable to smoke in town bars at follow-up¶			
Socially acceptable (n = 1441)	13.0	15.1	1.09 (0.64 to 1.84)	1.07 (0.55 to 2.09)
Socially unacceptable (n = 145)	49.9	70.6	2.42 (0.89 to 6.59)	3.09 (0.78 to 12.21)

*Strength of local restaurant smoking regulation was defined as strong if it banned smoking completely in all restaurants with no variances, and as weak if otherwise.
 †Unadjusted odds ratio for perceived social unacceptability of smoking in restaurants and in bars. OR is derived from a random-effects logistic regression model that accounts for clustering of responses within towns. Data are weighted to account for baseline probability of respondent selection.
 ‡ORs are adjusted for all individual-level variables (age, sex, race/ethnicity, marital status, number of children, education of adult informant, household income, total smoking ban in workplace, smoking history) and town-level variables (percentage of town "yes" vote on question 1, and percentage of town residents who are white).
 §Personal attitude towards smoking in restaurants was defined as socially acceptable if a respondent indicated that smoking should be "allowed throughout the restaurant" or "only in special smoking areas", and as socially unacceptable if the respondent indicated that smoking should be allowed "not at all" in restaurants.
 ¶Personal attitude towards smoking in bars or clubs in town was defined as socially acceptable if a respondent indicated that smoking should be "allowed throughout the bar or club" or "only in special smoking areas" and as socially unacceptable if the respondent indicated that smoking should be allowed "not at all" in bars or clubs.

Of the 1712 adults in the sample, 1503 (87.8%) lived in a town with a weak restaurant smoking regulation at baseline, and only 209 (12.2%) lived in a town with a strong restaurant smoking regulation.

Table 2 shows the impact of the strength of the restaurant smoking regulation on the odds of perceiving smoking to be socially unacceptable in town restaurants and bars by baseline attitudes among smokers.

There was no statistically significant effect of a strong smoking regulation on the social unacceptability of smoking in restaurants among either smokers who reported it was socially acceptable or smokers who said it was unacceptable to smoke in restaurants at the baseline.

A marginally significant effect of strong restaurant regulations was observed on the perception that smoking in town bars is socially unacceptable at the 2-year follow-up for smokers who reported that it was socially unacceptable to smoke in town bars at baseline. Among this group, strong restaurant smoking regulations was associated with a threefold increase (OR = 3.09; 95% CI 0.78 to 12.21) in the odds of reporting that it was socially unacceptable to smoke in bars at follow-up. No significant effect was found among smokers who reported that it was socially acceptable to smoke in bars at baseline.

Table 3 examines the effect of strong restaurant regulations on the odds of making a quit attempt and becoming a quitter by baseline quitting behaviour over the 2-year follow-up period.

Among smokers who reported a quit attempt at baseline, living in a town with a strong smoking regulation was associated with a threefold increase in the odds of making a quit attempt by follow-up (OR = 3.12; 95% CI 1.51 to 6.44). This effect was not found among smokers who had not made a quit attempt at baseline.

There was no significant effect of a strong restaurant regulation on becoming a quitter at follow-up in the unadjusted and adjusted models.

DISCUSSION

To our knowledge, this is the first longitudinal study to assess the effect of restaurant smoking regulations on smoking-related attitudes and quitting behaviours among smokers. It provides new evidence that restaurant smoking regulations (1) encourage new quit attempts among smokers who have previously tried to quit and (2) seem to reinforce anti-smoking social norms among smokers who already view smoking as socially unacceptable in bars. However, during this short period

Table 3 Quitting smoking behaviours at follow-up by strength of local restaurant smoking regulation and baseline behaviours among the Massachusetts adult smoker cohort

Baseline quitting behaviours	Strength of local regulation*		Unadjusted OR† (95% CI)	Adjusted OR‡ (95% CI)
	Weak	Strong		
(A)	% Quit smoking for 1 day or longer in the previous year at follow-up§			
No: quit attempt at baseline (n = 868)	42.5	44.2	1.06 (0.64 to 1.76)	1.05 (0.61 to 1.81)
Yes: quit attempt at baseline (n = 690)	70.0	86.4	2.98 (1.57 to 5.66)	2.97 (1.47 to 5.98)
(B)	% Became a quitter at follow-up¶			
No: quit attempt at baseline (n = 937)	17.1	20.8	1.14 (0.56 to 2.31)	1.05 (0.48 to 2.33)
Yes: quit attempt at baseline (n = 770)	19.3	23.7	1.31 (0.75 to 2.28)	0.94 (0.53 to 1.68)

*Strength of local restaurant smoking regulation was defined as strong if it banned smoking completely in all restaurants with no variances, and weak if otherwise.
 †Unadjusted OR for making a quit attempt in the past year at follow-up and becoming a quitter at follow-up. OR is derived from a random-effects logistic regression model that accounts for clustering of responses within towns. Data are weighted to account for baseline probability of respondent selection.
 ‡ORs are adjusted for all individual-level variables (age, sex, race/ethnicity, marital status, number of children, education of adult informant, household income, total smoking ban in workplace, smoking history) and town-level variables (percentage of town "yes" vote on question 1, and percentage of town residents who are white).
 §A quit attempt is defined as a period of abstinence lasting for at least 24 h in the past 12 months.
 ¶A "quitter" is defined as a respondent who was a current smoker at baseline and who indicated that he/she was not smoking at all in the past 12 months at the time of the follow-up interview.

of time, there was no effect of a strong smoking regulation on smokers' actual likelihood of quitting over 2 years.

Completely smoke-free restaurant regulations seemed to have an effect on perceived social acceptability of smoking in bars over the 2-year follow-up only among smokers who reported it was socially unacceptable to smoke in bars at baseline. This finding was consistent with the overall adult sample (analyses not shown), which suggests that smokers are not impervious to larger trends in social norms related to smoking in restaurants and bars. More time may be needed to assess whether restaurant smoking bans discourage smoking—particularly among the subset of smokers who already view smoking as socially unacceptable in bars—by strengthening anti-smoking community norms and, in turn, influencing quitting behaviours.

Because we did not find an effect of strong smoking restaurant regulations on perceptions of social acceptability of smoking in restaurants either among those who reported smoking as socially unacceptable or among those who reported it as acceptable at baseline, this effect may be seen as backsliding or no movement, in which clean indoor air laws seem to have reached their maximum potential in altering views on smoking in public places. From this perspective, we found less backsliding at follow-up among those who live in towns with strong restaurant regulations. This finding is of critical importance because it shows the great need for strong smoking restaurant regulations to be in place to maintain and continually reinforce social norms around smoking in public places. Progress in this tobacco control measure may be accompanied by periods of no movement and backsliding, but without strong regulations in place, rapid erosion of their positive effects on anti-smoking attitudes would probably follow.

Our findings also suggest that restaurant and bar smoking bans promote further cessation efforts among adult smokers who were already engaged in the process of quitting. These regulations may not affect smokers who are not already motivated to quit, or more time may be necessary to observe an effect of moving smokers along the continuum of stages of change towards smoking cessation. Given that there was a relatively short period of time between baseline and follow-up, and particularly because quitting smoking is a lengthy process in which relapse is common, it is not surprising that strong restaurant regulations did not produce more smoking cessation over a 2-year period. Again, it is likely that more time is needed between baseline and follow-up to observe an effect on successful quitting.

We believe that these findings represent a true effect of restaurant smoking regulations, rather than an effect of bias or confounding. The observed associations are not explained by a wide range of potential individual-, household-, and town-level confounding factors, including age, education, household income, workplace smoking bans, the percentage of town voters who voted for a 1992 cigarette tax initiative, a measure that controls for the baseline anti-smoking sentiment in a town, and likely reflects baseline levels of education and smoking prevalence as well.¹⁹

This analysis also involves some important limitations. One limitation is that these smoking regulations were in effect for a short period of time; the majority were in effect for <2 years. A related limitation is the length of follow-up and, as noted, more time may be needed to observe an effect on these outcomes, particularly with respect to quitting behaviours.

These findings have important public health implications. They suggest that adoption of local smoke-free regulations, while primarily intended to protect non-smokers from second-hand smoke exposure, may have the potential to encourage

What this paper adds

- Despite the proliferation of restaurant and bar smoking ordinances, very little is known about their specific effects on smokers' attitudes towards smoking in public places and actual quitting behaviours.
- The effect of clean indoor air ordinances on smokers is of particular interest given that these types of bans may discourage smoking by strengthening anti-smoking community norms and in turn influence quitting behaviours.
- To our knowledge, this is the first longitudinal study to assess the effect of restaurant smoking restrictions on smokers' attitudes towards smoking in restaurants and bars, quit attempts and actual quitting behaviour.
- As the study controlled for a wide range of potential individual- and town level confounding factors, we believe it provides new evidence that restaurant smoking regulations encourage new quit attempts among smokers who have previously tried to quit, and reinforce anti-smoking social norms among smokers who already view smoking as socially unacceptable in bars.
- It suggests that adoption of local smoke-free regulations may have the potential to encourage anti-smoking social norms and adult cessation efforts, particularly among a subset of smokers who already view smoking as socially unacceptable in public places and among smokers who are engaged in the process of quitting smoking.
- To protect patrons and employees from the health consequences of exposure to secondhand smoke, including cancer, heart disease and respiratory illness, many communities have adopted local regulations that require restaurants and bars to be completely smoke-free.¹⁻³
- Currently, more than 200 cities and 11 states have adopted laws that specifically prohibit smoking in restaurants.^{4 5}

anti-smoking social norms and adult cessation efforts, particularly among a subset of smokers who already view smoking as socially unacceptable in public places and among smokers who are engaged in the process of quitting smoking. This study provides further justification for state and local efforts to enact clean indoor air policies, and for state tobacco control programmes to include a substantial focus on supporting local secondhand smoke policy efforts.

ACKNOWLEDGEMENTS

This work was supported by grants from the National Cancer Institute, State and Community Tobacco Control Interventions Research Grant Program (grant number 5 R01 CA86257-04) and the Flight Attendant Medical Research Institute (FAMRI).

Authors' affiliations

Alison B Albers, Michael Siegel, Social and Behavioral Sciences Department, Boston University School of Public Health, Boston, Massachusetts, USA

Debbie M Cheng, Biostatistics Department, Boston University School of Public Health, Boston, Massachusetts, USA

Lois Biener, Center for Survey Research, University of Massachusetts Boston, Boston, Massachusetts, USA

Nancy A Rigotti, General Medicine Division and Tobacco Research and Treatment Center, Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts, USA

Competing interests: None.

Ethical approval: This research was approved by the institutional review boards at the University of Massachusetts, Boston, and the Boston University Medical Center, Boston, Massachusetts, USA.

REFERENCES

- 1 **US Department of Health and Human Services.** *Health effects of exposure to environmental tobacco smoke: the report of the California Environmental Protection Agency, Smoking and tobacco control monograph 10.* Bethesda, MD: National Cancer Institute, 1999.
- 2 **International Agency for Research on Cancer** *Involuntary smoking: summary of data reported and evaluation.* Lyon, France: IARC 2002.
- 3 **US Environmental Protection Agency, Office of Health and Environmental Assessment.** *Respiratory health effects of passive smoking: lung cancer and other disorders.* Washington, DC: US EPA, 1992, EPA publication 600/6-90/006F.
- 4 **American Nonsmokers' Rights Foundation.** *Municipalities with local 100% smokefree laws: cumulative number effective by year 1990–2004.* Berkeley, CA: American Nonsmokers' Rights Foundation, 2004, <http://www.no-smoke.org/100ordgraph.pdf>.
- 5 **American Nonsmokers' Rights Foundation.** *States and municipalities with local 100% smokefree laws in workplaces, restaurants or bars: currently in effect as of April 17, 2006.* Berkeley, CA: American Nonsmokers' Rights Foundation, 2006, <http://www.no-smoke.org/pdf/100ordlist.pdf> (accessed 13 Feb 2007).
- 6 **Glantz SA.** Smoke-free restaurant ordinances do not affect restaurant business. *Period. J Public Health Manage Pract* 1999;**5**:vi–ix.
- 7 **Albers AB, Siegel M, Cheng DM, et al.** Relation between local restaurant smoking regulations and attitudes towards the prevalence and social acceptability of smoking: a study of youths and adults who eat out predominantly at restaurants in their town. *Tob Control* 2004;**13**:347–55.
- 8 **Chapman S, Borland R, Scollo M.** The impact of smoke-free workplaces on declining cigarette consumption in Australia and the United States. *Am J Public Health* 1999;**89**:1018–23.
- 9 **Fichtenberg CM, Glantz SA.** Effect of smoke-free workplaces on smoking behaviour: systematic review. *BMJ* 2002;**325**:188.
- 10 **Moskowitz JM, Lin Z, Hudes ED.** The impact of workplace smoking ordinances in California on smoking cessation. *Am J Public Health* 2000;**90**:757–61.
- 11 **Stephens T, Pederson LL, Koval JJ, et al.** The relationship of cigarette prices and no-smoking bylaws to the prevalence of smoking in Canada. *Am J Public Health* 1997;**87**:1519–21.
- 12 **Prochaska JO, DiClemente CC.** Stages and processes of self-change in smoking: towards an integrative model of change. *J Consult Clin Psychol* 1983;**51**:390–5.
- 13 **DiClemente CC, Prochaska JO, Fairhurst SK, et al.** The process of smoking cessation: an analysis of precontemplation, contemplation and preparation stages of change. *J Consult Clin Psychol* 1991;**59**:295–304.
- 14 **Sutton S.** Can "stages of change" provide guidance in the treatment of addictions? A critical examination of Prochaska and DiClemente's model. In: Edwards G, Dare C, eds. *Psychotherapy, psychological treatments and the addictions.* Cambridge: Cambridge University Press, 1996:189–205.
- 15 **Pierce JP, Farkas AJ, Gilpin EA.** Beyond stages of change: the quitting continuum measures progress towards successful smoking cessation. *Addiction* 1998;**93**:277–86.
- 16 **Albers AB, Siegel M, Cheng DM, et al.** Effects of restaurant and bar smoking regulations on exposure to environmental tobacco smoke among Massachusetts adults. *Am J Public Health* 2004;**94**:1959–64.
- 17 **Siegel M, Albers AB, Cheng DM, et al.** Effect of local restaurant smoking regulations on environmental tobacco smoke exposure among youths. *Am J Public Health* 2004;**94**:321–5.
- 18 **Biener L, Thorndike A, Rigotti NA.** *Impact of NRT on the general population: a prospective analysis of relapse.* Poster presented at the Society for Research on Nicotine and Tobacco, Prague, CZ, 2005.
- 19 **Skeer M, George S, Hamilton WL, et al.** Town-level characteristics and smoking policy adoption in Massachusetts: are local restaurant smoking regulations fostering disparities in health protection? *Am J Public Health* 2004;**94**:286–92.
- 20 **Hamilton WL, Biener L, Rodger CN.** Who supports tobacco excise taxes? Factors associated with towns' and individuals' support in Massachusetts. *J Public Health Manage Pract* 2006;**12**:3 (in press).
- 21 **US Bureau of the Census.** *Census of population and housing, 2000: summary tape file 3A.* Washington, DC: US Bureau of the Census, 2002.
- 22 **Greenfield L, Finkbinder R, Bishop S.** *The effect of substance abuse treatment on high risk behaviors in the National Treatment Evaluation Study (NTIES),* Center for Substance Abuse Treatment. 2000.
- 23 **Hedeker D, Gibbons RD, Flay BR.** Random-effects regression models for clustered data: with an example from smoking prevention research. *J Consult Clin Psychol* 1994;**62**:757–65.
- 24 **Raudenbush SW, Bryk AS, Cheong YF, et al.** *HLM 6: Hierarchical Linear and Nonlinear Modeling.* Chicago: Scientific Software International, 2004.
- 25 **Hosmer DW, Lemeshow S.** *Applied logistic regression.* New York: John Wiley & Sons, 1989.

ELECTRONIC PAGES

Tobacco Control Online: www.tobaccocontrol.com

The following electronic only article is published in conjunction with this issue of Tobacco Control.

Sociodemographic and psychosocial correlates of smoking-induced deprivation and its effect on quitting: findings from the International Tobacco Control Policy Evaluation Survey

Mohammad Siahpush, Ron Borland, Hua-Hie Yong

Aims: To determine the prevalence and characteristics of smokers who experience smoking-induced deprivation (SID), and to examine its effect on quit attempts, relapse and cessation.

Methods: Waves 2 and 3 (2003–5) of the International Tobacco Control Policy Evaluation Survey were used, which is a prospective study of a cohort of smokers in the US, Canada, UK and Australia. SID was measured with the question "In the last six months, have you spent money on cigarettes that you knew would be better spent on household essentials like food?" A

total of 7802 smokers participated in the survey in wave 2, of whom 5408 were also interviewed in wave 3.

Findings: The proportion of smokers who reported SID was highest in Australia (33%) and lowest in the UK (20%). Younger age, minority status and low income were associated with a higher probability of SID. Some of the other factors related to a higher probability of SID were higher level of nicotine dependence, having an intention to quit and smoking to help one socialise or control weight. The relationship between SID and quit attempt was mediated by having an intention to quit and worrying that smoking would damage health and reduce the quality of life. The relationship between SID and relapse was mediated by perceived stress. SID was not associated with successful cessation.

Conclusions: Many smokers experience deprivation that is the result of their smoking. Strategies to reduce the prevalence of smoking probably effect a general improvement in standards of living and reduction in deprivation.

(*Tobacco Control* 2007;**16**:e2) www.tobaccocontrol.com/cgi/content/full/16/2/e2