A prospective study of household smoking bans and subsequent cessation related behaviour: the role of stage of change

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Objective: To assess the degree to which smokers living with a full household ban on smoking change their cessation related behaviour.

Design, setting, and participants: Prospective cohort study; follow up of a population based cohort of 1133 smokers, identified from a 1997 telephone survey of adult Oregonians. After a median of 21 months, 565 were located and reinterviewed.

Main outcome measures: Quit attempts, time until relapse, and smoking cessation, defined as seven day and 90 day sustained abstinence at follow up.

Results: A full ban at baseline was associated with a doubling of the odds of a subsequent quit attempt (odds ratio [OR] = 2.0, 95% confidence interval [CI], 1.0 to 3.9). Among respondents in the preparation stage at baseline (intention to quit in the next month with a quit attempt in the previous year), a full ban was associated with a lower relapse rate (hazard ratio = 0.5 (95% CI, 0.2 to 0.9)), while for those in precontemplation/contemplation (no intention to quit or intention to quit within the next six months, respectively), there was no significant association between full ban and relapse rate. For respondents in preparation, those with a full ban had over four times the odds of being in cessation for seven or more days before the follow up call (OR = 4.4 (1.1 to 18.7)), but for those in precontemplation/contemplation, full bans were unrelated to cessation.

Conclusions: Full household bans may facilitate cessation among smokers who are preparing to quit by increasing quit attempts. They may also prolong time to relapse among those smokers.

METHODS

Baseline survey
Between August and November 1997, a population based cross sectional telephone survey of 6199 adult English speaking Oregonians was carried out to provide information on smoking prevalence in the Oregon population and on knowledge and attitudes toward tobacco. Methods for the baseline study have been described previously.1

Follow up survey
In 1999, we conducted a follow up study of 1604 persons who were smokers or living in a household with at least one smoker, at the 1997 baseline survey. The median time to follow up was 21.3 months. A standardised questionnaire was administered by telephone and included questions on tobacco attitudes and practices. Average interview length was approximately 12 minutes. This analysis focused on 1133 respondents who were regular or occasional smokers at baseline. A smoker was defined as having smoked at least 100 cigarettes during their lifetime, and answering “every day” or “some days” to the question, “Do you now smoke cigarettes every day, some days or not at all?”.

Of the 1133 baseline smokers who were eligible for follow up (that is, who agreed to being recontacted and had information on home smoking bans), 583 completed interviews during two waves of call-backs—a response rate of 51.5%. The 48.5% loss to follow up was comprised of 10.2% refusals and 38.3% inability to locate the respondent. Of the 583 final cohort members, 18 were excluded from all analyses as they classified themselves as regular smokers at baseline and as never smokers at follow up.
Measures

We used data from the baseline survey to classify smokers according to their level of household smoking restriction using the following question: “Which of the following statements best describes the rules about smoking inside your home: (1) no one is allowed to smoke anywhere inside your home (full ban); (2) smoking is allowed in some places or at some times (partial ban); (3) smoking is permitted anywhere inside your home (no ban).”

We examined three outcomes: the occurrence of a quit attempt for at least one day before follow up; the time until relapse to smoking or follow up call; and cessation from smoking, defined as seven day and 90 day sustained abstinence at follow up.

We also conducted Cox proportional hazards regression to examine whether household bans influenced the duration of quit attempts. The outcome for the analysis was defined as days until relapse to smoking occurred, and data for quitters were censored at the follow up interview. Although the analysis was done for the entire follow up period, we present Kaplan–Meier survival curves truncated at six months (180 days) to display better the earlier period of follow up where relapses were more frequent.

In all analyses, we chose to combine the no ban and partial ban categories because it is most relevant to study the effect of a full ban on smoking behaviour (full bans have been shown to be associated with fewer days of indoor smoking12, and will probably more often be recommended as a public health measure). Also, in preliminary analyses, the pattern of association between partial bans and the outcomes under study was more similar to that of no ban than full ban.

RESULTS

We examined differences in baseline characteristics among respondents and non-respondents. We found that non-respondents were significantly younger, more likely to be unmarried, to have lower annual household incomes, and to lack health insurance, but were similar to respondents with regard to sex, education and employment status, amount smoked, intention to quit smoking, and proportion having a full household smoking ban at baseline.

Cohort characteristics by exposure group (partial or no ban v full ban)

Table 1 presents the baseline characteristics of final cohort members with full ban v those with no ban or a partial ban. Smoking respondents with a full ban were younger (p < 0.05), more likely to be non-white, to have higher incomes (p < 0.05) and more education, to be married, and to have children at home than the group of smokers with partial bans or no bans at all. They were also more likely to be in contemplation or preparation, and to be occasional smokers (p < 0.05 for both).

Household bans and quit attempts

Of 565 baseline smokers, 371 (67%) had quit for at least one day before follow up. This group comprised respondents who had quit but relapsed during the follow up period (n = 256) and those who were in cessation at follow up (n = 115). Table 2 shows that those living with a full ban had twice the odds of a quit attempt lasting at least one day compared with those with no ban or a partial ban (odds ratio (OR) = 2.0 (95% confidence interval (CI) 1.0 to 3.9)). We also conducted an analysis restricted to those smokers who had quit but relapsed, and observed a similar association between household ban and quit attempts (data not shown).
Household smoking bans and cessation behaviour

We found that the relation between ban status and sustained abstinence at follow up for at least seven and at least 90 days was modified by stage of change of the smoker at baseline (p = 0.05; table 3). Among persons in precontemplation or contemplation, a full ban had no significant association with seven day quits. Among those in preparation with a full ban in place, however, the odds of a seven day quit at follow up were over four times greater than those with no ban or a partial ban, after adjustment for demographics and baseline consumption (OR = 4.4 (95% CI 1.1 to 18.7)). Respondents who were in cessation for at least 90 days at follow up followed a similar pattern: among smokers in the preparation stage, those with a full ban also had over four times the odds of quitting compared with those with no ban or a partial ban (table 3).

DISCUSSION

In this population based longitudinal study we observed that a full ban on household smoking was associated with a subsequent quit attempt, and was related to successful cessation among smokers who were in the preparation stage of the stage of change. A full household smoking ban was also associated with longer quit attempts for these respondents. For those not in the preparation stage, a full ban was essentially unassociated with increased odds of cessation or with longer quit attempts.

The findings of this study are subject to several limitations. With only participants’ first name and baseline phone number, we were unable to trace many non-respondents and therefore had a substantial loss to follow up. However, the percentage of baseline respondents lost to follow up in this study is comparable to several of the population based longitudinal studies conducted by the US Census Bureau.23–25 Much of the attrition in those studies, as well as in ours, was caused by inability to locate respondents. This is an increasing problem owing to the high geographical mobility of the US population (16.5% of the population moved between March 1996 and March 1997).23 This mobility rate is consistent with our data—of the 45% lost to follow up, 10% refused, and 35% could not be located after a two year period.

The comparability between our follow up subjects and the baseline group depended on factors such as age, race, income, and marital status, as shown in other studies on non-response.21–24 For these reasons, we used these variables to reweight the data to correct for some degree of non-response. This technique, however, also introduced somewhat greater variability into our estimates.

We had no way of validating the exposure (household smoking restrictions) or the outcomes (smoking cessation and other smoking behaviours) in this study. Self report of quit status, however, has been shown to be generally accurate except in special populations not represented in this study.25 We have previously suggested that differential misclassification of household smoking restrictions may occur contingent upon smoking status of the respondent.13 This was not a problem at baseline in this study as all the respondents were smokers. However, if smokers with bans at baseline were more likely to indicate quitting at follow up than smokers without bans through a tendency to report a socially desirable response, a bias could occur.26 The prospective nature of this study, however, may mitigate against this bias.

Household bans and duration of quit attempts

We examined whether a household ban might be associated with a longer time until relapse for these quit attempts. We found that stage of change at baseline modified the relapse rate (p = 0.02). For respondents in preparation (n = 82), a full ban on smoking was significantly associated with a lower relapse rate (hazard ratio (HR) = 0.5 (95% CI 0.2 to 0.9)) compared with those with no ban or a partial ban on smoking (fig 1). For those in precontemplation or contemplation (n = 281), having a full ban was not significantly associated with the relapse rate (HR = 0.3 (95% CI 0.8 to 2.0)) (fig 2). Addition of potential confounders to this Cox model did not appreciably change these estimates.

Prevalence of sustained abstinence at follow up call

About one fifth of the cohort (n = 115) had been abstant from smoking for at least one day at the follow up call. A total of 2.4% had quit less than seven days before, 16.1% at least seven days but less than three months before, 19.4% at least three but less than six months before, 30.1% at least six but less than 12 months before, and 32.0% 12 months or more before the follow up call.

Table 1  Baseline cohort characteristics by household smoking restriction status*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No ban or partial ban (n = 393)</th>
<th>Full ban (n = 172)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment status</td>
<td>Employed 60.4 63.4</td>
<td>Unemployed 59.9 73.0</td>
</tr>
<tr>
<td></td>
<td>Homemaker 7.7 4.7</td>
<td>Student 1.7 4.0</td>
</tr>
<tr>
<td></td>
<td>Retired 20.1 14.4</td>
<td>Unable to work 4.2 6.2</td>
</tr>
<tr>
<td>Education level</td>
<td>Less than high school 13.9 8.9</td>
<td>High school graduate 44.4 40.9</td>
</tr>
<tr>
<td></td>
<td>College 1 to 3 years 28.1 35.2</td>
<td>College 4+ years 13.6 15.0</td>
</tr>
<tr>
<td>Marital status</td>
<td>Married/living together 56.5 64.6</td>
<td>Divorced or separated 18.2 17.4</td>
</tr>
<tr>
<td></td>
<td>Widowed 11.8 4.1</td>
<td>Never married 13.5 13.9</td>
</tr>
<tr>
<td>Household smoking</td>
<td>Smokers only 61.3 51.4</td>
<td>Mixed 38.7 48.6</td>
</tr>
<tr>
<td>Age (years)</td>
<td>18 to 24 7.6 7.8</td>
<td>25 to 34 11.4 27.6</td>
</tr>
<tr>
<td></td>
<td>35 to 44 28.2 22.9</td>
<td>45 to 54 25.2 21.0</td>
</tr>
<tr>
<td></td>
<td>55 to 64 11.3 14.4</td>
<td>65+ 16.4 6.4</td>
</tr>
<tr>
<td>Race</td>
<td>White 93.7 87.5</td>
<td>Non-white 6.3 12.5</td>
</tr>
<tr>
<td>Sex</td>
<td>Male 48.7 53.3</td>
<td>Female 51.3 46.7</td>
</tr>
<tr>
<td>Annual household income</td>
<td>&lt; $20 000 23.5 8.7</td>
<td>$20 000 to 35 000 37.0 44.2</td>
</tr>
<tr>
<td></td>
<td>&gt; 35 000 39.6 47.2</td>
<td>Presence of children</td>
</tr>
<tr>
<td></td>
<td>Yes 35.4 48.5</td>
<td>Stage of change*</td>
</tr>
<tr>
<td></td>
<td>Precontemplation 45.6 25.9</td>
<td>Contemplation 38.0 55.1</td>
</tr>
<tr>
<td></td>
<td>Preparation 16.4 19.0</td>
<td>Baseline cigarette consumption*</td>
</tr>
<tr>
<td></td>
<td>Occasional smoker 11.1 35.1</td>
<td>Reg smoker, 1–10/day 15.3 21.0</td>
</tr>
<tr>
<td></td>
<td>Reg smoker, 11–20/day 14.3 14.3</td>
<td>Reg smoker, &gt; 20/day 59.3 29.7</td>
</tr>
</tbody>
</table>

*Percentages are from weighted analyses while counts are sample frequencies.
†p < 0.05.
Reg, regular.
Quit attempts, time until relapse, and smoking cessation

Only a few other reports—all cross sectional in design—have investigated whether smoking related outcomes were associated with household bans. Gilpin et al., using data from a population based California tobacco survey, found that home smoking restrictions increased the likelihood of a quit attempt, and that given an attempt, a ban appeared to prolong time to relapse. Farkas et al also documented a fourfold increase in odds of a quit attempt associated with full household restrictions. Norman et al observed that household bans were related to an interest in quitting and the number of quit attempts in the previous year. Though these findings are consistent with ours, no investigation has been prospective in nature or has addressed whether smokers’ stage of change might play a role in the relation between smoking restrictions and changes in smoking related behaviour.

Previous work has established the importance of the length of a quit attempt as a predictor of subsequent success in quitting, and we observed that a full ban tended to lengthen quit attempts for abstaining smokers. As noted, this finding was generally in agreement with Gilpin’s study, although she did not note a modifying effect of stage of change. Other studies on relapse have noted that exposure to a smoker acts as a “cue” and promotes relapse, and that a non-smoking environment aids abstinence. A smoke-free household limits exposure to smoking cues from household members and visitors who might be smokers.

Only one of the above studies investigated an association between household bans and smoking cessation. Farkas et al., using data from the Current Population Survey, found that persons living in households with a full ban were almost twice as likely to have quit smoking in the previous year than those without a ban. Our results confirmed this association, but only within the subgroup of respondents who were in the preparation phase of the stage of change. The stage of change model has been used to match different types of interventions to smokers at different stages, thus more efficiently targeting groups susceptible to change. For example, the Clinical Practice Guidelines for Treatment of Tobacco Use and Dependence published by the US Public Health Service recommend assessment of every smoker for willingness to make a quit attempt in the next 30 days, and stage matched intervention. Under the guidelines, a provider employs pharmacotherapy and behavioural counselling for a patient in the preparation stage, and uses motivational intervention for a patient in the precontemplation or contemplation stages. Some telephone quit lines also screen callers for readiness to quit to deliver appropriate interventions. Our finding that the association between a household smoking ban and quitting is most pronounced among smokers in preparation could be useful in either of these settings if further research points toward a causal relation between bans and quitting.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Adjusted odds ratios for full household bans and one or more attempts to quit smoking between baseline and follow up†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No attempts to quit</td>
</tr>
<tr>
<td>No ban or partial ban</td>
<td>n</td>
</tr>
<tr>
<td>Full ban</td>
<td>146</td>
</tr>
<tr>
<td></td>
<td>42</td>
</tr>
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</table>

*Percentages are from weighted analyses while counts are sample frequencies.
†Six smokers had missing information on quit attempts, and five were excluded because of missing information on covariates.
‡Adjusted for age, employment status, and baseline consumption.
CI, confidence interval; OR, odds ratio.

Figure 1 Kaplan–Meier survival curves for days to relapse to smoking by household ban status among 82 respondents in the preparation stage at baseline who had quit for at least one day during follow up. The analysis contains all smokers with a quit attempt; however, survival curves are truncated at six months to illustrate earlier, more frequent relapses better. One respondent had missing information on length of quit attempt. The difference between the curves is significant (p = 0.02).

Figure 2 Kaplan–Meier survival curves for days to relapse to smoking by household ban status among 281 respondents in the precontemplation or contemplation stage at baseline who had quit for at least one day during follow up. The analysis contains all smokers with a quit attempt; however, survival curves are truncated at six months to illustrate earlier, more frequent relapses better. Seven respondents had missing information on length of quit attempt. The difference between the curves is not significant (p = 0.95).
We do not know from this study whether the home restrictions facilitated movement into the preparation phase or vice versa, as information on both of these variables was collected from the cross-sectional baseline survey. On the one hand, household restrictions may lead to preparation by decreasing the convenience of smoking; on the other, those in preparation and already thinking of quitting may be more inclined to establish a household restriction. Although further studies might clarify the direction of this association for purposes of public health interventions, the fact remains that in either event the combination of the ban and preparation was more highly associated with cessation than the preparation stage alone.

Conclusions
We found that household smoking bans were associated with increased quit attempts. Furthermore, full bans were associated with a longer duration of those attempts and more frequent sustained abstinence at follow up, as long as the smoker intended to quit in the short run. Further research on this link is important because of potential applicability in both client focused settings and population based approaches. In clinical and help-line settings where smokers are screened for readiness to quit, health care based approaches. In clinical and help-line settings where smokers are screened for readiness to quit, health care based approaches.

Table 3  Odds ratios for full household ban and smoking cessation for at least seven and at least 90 days, within strata of stage of change*

<table>
<thead>
<tr>
<th></th>
<th>Did not quit</th>
<th>Quit at least 7 days</th>
<th>Did not quit</th>
<th>Quit at least 7 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>No ban or partial ban</td>
<td>284</td>
<td>82.1</td>
<td>48</td>
<td>17.9</td>
</tr>
<tr>
<td>Full ban</td>
<td>99</td>
<td>83.8</td>
<td>27</td>
<td>16.2</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>No ban or partial ban</td>
<td>288</td>
<td>83.2</td>
<td>44</td>
<td>16.8</td>
</tr>
<tr>
<td>Full ban</td>
<td>100</td>
<td>84.7</td>
<td>26</td>
<td>15.4</td>
</tr>
</tbody>
</table>

*Percentages are from weighted analyses while counts are sample frequencies.
†All estimates adjusted for age, race, educational status, and baseline cigarette consumption. For the seven day analysis, eight respondents were excluded for missing data on covariates, and seven were excluded as they had quit for less than seven days. For the 90 day analysis, eight respondents were excluded for missing data, and 23 were excluded as they had quit for less than 90 days.
††Interaction for 90 day quits, p = 0.08.
††Interaction for seven day quits, p = 0.05.

Also, if further studies confirm the relation, mass media messages that target smokers and non-smokers alike could emphasise both the secondhand smoke protection message and the possibility that restrictions might assist the smoker in the long process of successfully becoming a non-smoker.

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REFERENCES


