Smoking restrictions in bars and bartender smoking in the US, 1992–2007

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ABSTRACT

Objective The present work is an analysis of whether adoption of state clean indoor air laws (SCIALs) covering bars reduces the proportion of bartenders who smoke primarily by reducing smoking among people already employed as bartenders when restrictions are adopted or by changing the composition of the bartender workforce with respect to smoking behaviours.

Methods Logistic regressions were estimated for a variety of smoking outcomes, controlling for individual demographic characteristics, state economic characteristics, and state, year, and month fixed effects, using data on 1380 bartenders from the 1992–2007 Tobacco Use Supplement to the Current Population Survey combined with data on SCIALs from ImpacTeen.

Results State restrictions on smoking in bars are negatively associated with whether a bartender smokes, with a 1-point increase in restrictiveness (on a scale of 0–3) associated with a 5.3% reduction in the odds of smoking. Bar SCIALs are positively associated with the likelihood a bartender reports never having smoked cigarettes but not with the likelihood a bartender reports having been a former smoker.

Conclusion State clean indoor air laws covering bars appear to reduce smoking among bartenders primarily by changing the composition of the bartender workforce with respect to smoking rather than by reducing smoking among people already employed as bartenders when restrictions are adopted. Such laws may nonetheless be an important public health tool for reducing secondhand smoke.

Bartenders have some of the highest rates of smoking and exposure to secondhand smoke (SHS) of any occupational group.[1] Research has also shown that bartenders and other food service workers are significantly less likely to report that their workplace restricts smoking than individuals in other occupations.[2] These patterns are consistent with the possibility that smoking restrictions in bars would significantly improve the health of bartenders. Indeed, recent research suggests that adoption of state clean indoor air laws (SCIALs) covering bars in the US over the period 1992–2007 was associated with significant increases in workplace smoking restrictions and significant decreases in smoking rates among bartenders.[3] These results are consistent with panel data evaluations of smoke-free legislation in Ireland and Norway that showed significant declines in smoking among samples of bar employees.[4 5]

Laws restricting smoking in bars could reduce the proportion of bartenders and other bar employees who smoke via several distinct mechanisms that the literature has discussed but not directly tested. First, adoption of bar smoking restrictions may reduce smoking among those already employed at bars ('preadoption bar employees') by making it more difficult for them to smoke or by increasing the overall social disapproval of bar-related smoking. Support for this mechanism has been documented in other contexts using different types of workers[6] but has not been demonstrated for bartenders. Second, bar smoking restrictions may change the composition of the bar workforce. For example, bars may close. Alternatively, bartenders and other bar employees who smoke may leave the labour force, move to a different jurisdiction that does not restrict smoking in bars, or choose different occupations or industries in response to smoking restrictions in bars. If bartenders who smoke disproportionately leave the occupation of bartending after restrictions are adopted, the resulting bartender workforce will consist of a higher share of non-smokers. If bartenders who smoke are systematically replaced by non-smokers who find bartending jobs relatively more attractive after bar SCIALs are adopted, this would also result in a higher share of non-smoking bartenders associated with SCIALs covering bars. Any of these mechanisms would produce the observed negative association between laws restricting smoking in bars and the proportion of bar employees who smoke.

Understanding which of these mechanisms primarily underlies the observed negative association between SCIAL adoption and smoking among bartenders is important because they carry very different policy implications. If the mechanism driving the relationship is reduced smoking among preadoption bartenders, such restrictions would unambiguously improve the health of bartenders through reduced own-smoking rates and potentially the health of the general population through reduced SHS exposure. This might support further restricting smoking in bars. In contrast, if the mechanism is changes in the composition of the bartender workforce through either disproportionately reduced bar employment of smokers or replacement of smoking bartenders with non-smoking bartenders, then the public health benefits of such laws might include reduced SHS exposure at bars but not necessarily reductions in smoking among a high-prevalence group.

Previous research has not directly tested which of these mechanisms underlies the effect of smoke-free legislation on smoking among bartenders. The two studies that evaluated national smoke-free legislation in Ireland and Norway used surveys of the same bar workers before and after policy adoption; those studies found reductions in

smoking prevalence after policy adoption, which suggests that clean indoor air laws reduce smoking among preadoption bar workers.[4 5] Unfortunately, both studies had substantial sample attrition; if smoking status is associated with attrition, this complicates the interpretation of the observed smoking reduction among the remaining sample participants. Moreover, these studies contained evidence consistent with the alternative hypothesis of changes in the composition of bar workers: job instability was a key factor associated with attrition in the Norway study, and 15% of the original bar workers who could be tracked in both waves of the Ireland study were no longer bar workers a year later. Finally, Norway and Ireland are unique in that those countries banned all indoor smoking in bars, restaurants and workplaces. This limits the applicability of these findings to the US, where there is no national ban on indoor smoking and there is a great deal of variation over space and time in the specific venues (eg, bars vs restaurants) covered by clean indoor air laws. We make use of this substantial variation in our empirical work described below.

This study provides new evidence on these mechanisms using large and recent samples of data from the 1992–2007 Tobacco Use Supplement to the Current Population Survey (TUS-CPS).[7] These data provide detailed information on respondent smoking behaviour as well as occupation and industry, which allows us to identify 1380 bartenders pooled across the various waves of the TUS-CPS. A key contribution of our study is that we examine a variety of smoking measures for each respondent. This allows us to determine whether SCIALs covering bars have different effects on smoking participation, smoking intensity, the likelihood an individual reports never having smoked cigarettes and the likelihood an individual reports having formerly smoked cigarettes. Examining several smoking outcomes allows us to disentangle whether bar smoking restrictions reduce smoking among the preadoption bartender workforce or change the composition of the bartender workforce. Specifically, we would expect SCIALs covering bars to increase the proportion of individuals reporting that they are former smokers but leave the share who have never smoked unchanged if SCIAL adoption reduces bartender smoking rates primarily by reducing smoking among preadoption bartenders. In contrast, we would expect SCIALs covering bars to increase the proportion of individuals reporting that they have never smoked if SCIALs reduce bartender smoking rates primarily by changing the composition of the bartender workforce. Finally, we directly test whether SCIALs covering bars affect bar employment by examining the likelihood an individual reports being a bartender.

METHODS

Data

The TUS-CPS has been carried out periodically since 1992 and contains detailed information about smoking, demographic characteristics and employment. We focused on bartenders (defined using CPS occupation codes) who report working in eating and drinking places (defined using CPS industry codes) as individuals who should be disproportionately targeted by SCIALs covering bars. In the subset of years where we could separately identify drinking places from eating places in the TUS-CPS (2003–2007), 'bartender' was the most common occupation (49% of workers) in 'drinking places'. In addition, 37% of bartenders worked at drinking places (as opposed to eating places) in those years, according to the TUS-CPS.

We used the TUS-CPS to create several variables that measure smoking-related outcomes. We classified an individual aged 18 or older as a smoker if he/she reported currently smoking every day or some days. To disentangle whether adoption of SCIALs was associated with reductions in smoking among preadoption bartenders or changes in the composition of bartenders with respect to smoking, we created two other indicator variables for 'never smoker' and 'former smoker'. Specifically, 'never smoker' is an indicator equal to 1 if the respondent reported not having smoked 100 cigarettes in his/her lifetime, while 'former smoker' is an indicator equal to 1 if the respondent reported not being a current smoker but having smoked 100 cigarettes in his/her lifetime. We measured current smoking intensity among smokers using information on the number of days in the past 30 days a respondent reported smoking multiplied by the average daily number of cigarettes he/she reported smoking on those days. We used the natural log of this value as the dependent variable in smoking intensity models. All of our models restrict attention to CPS self-respondents who work indoors and are not self-employed (the sample who were asked questions about smoking and workplace smoking restrictions).

Our data on SCIALs came from Robert Wood Johnson's ImpacTeen database.[8] These data are a consistent coding of each state's clean indoor air restrictions in bars and 11 other venues (such as private workplaces, government workplaces and restaurants). The laws are strength rated to indicate the relative restrictiveness of each venue-specific policy on a scale of 0–3 or 0–5. The exact coding varies across venues but for most venues (including bars) a rating of 0 indicates no restriction, a rating of 1 indicates a restriction that allows a separate designated smoking area, a rating of 2 indicates a restriction that requires a separately ventilated area and a rating of 3 indicates a complete ban on smoking. For ratings on a 0–5 scale, higher numbers indicate greater prevalence of restrictions across venues or stronger restrictions.

Analytical methods

To identify the effects of SCIALs covering bars on smoking outcomes among bartenders, we estimated logistic regression models for the dichotomous outcomes; for the smoking intensity models we estimated regression models using ordinary least squares on the sample of current smokers.[9] All regressions included state and year fixed effects. This approach compares changes over time in outcomes for bartenders in states that adopted SCIALs covering bars with the analogous changes in outcomes for bartenders in states that did not change their policies. These models took the general form:

$$Y_{ist} = \alpha + \beta_1 X_{ist} + \beta_2 Z_{st} + \beta_3 (BarSCIAL)_{st} + S_s + T_t + \varepsilon_{ist} \quad (1)$$

where Y_{ist} are our various outcomes of interest for bartender i in state s at time t; X_{ist} is a vector of individual demographic characteristics and includes sex, age and its square, marital status dummies, education dummies, race/ethnicity dummies, a dummy variable indicating residence outside a metropolitan statistical area and dummy variables for family income; Z_{st} is a vector of time-varying state characteristics and policies measured annually that includes the state unemployment rate, state employment growth rate, percentage of population below the poverty line and the real (inflation adjusted) value of the state excise tax on a pack of cigarettes; S_s is a full set of state fixed effects and captures all time-invariant state characteristics that may impact outcomes, such as being a tobacco-producing state; and T_t is a full set of survey year and month dummies that accounts for seasonality and secular changes in outcomes common to everyone in the sample in each year or month. All models used the TUS-CPS self-response weights, and standard

errors were clustered at the state level.[10] (Details on the data and methods are available on request from the corresponding author.)

Bar SCIAL$_{st}$ is the ImpacTeen rating (from 0–3) for the extensiveness of state-level smoking restrictions covering bars. Though not reported, our models also control for each of the other 11 venue-specific restrictions, which also vary at the state/year level. In previous work we addressed concerns about multicolinearity of the venue-specific policies and showed that they are not severe for studying bartenders.[3] This is in part because several states strengthened restrictions on smoking in bars in recent years without strengthening restrictions on smoking in other venues (ie, there is substantial independent variation in the *Bar SCIAL Rating* variable).

RESULTS

Descriptive statistics

Descriptive statistics for our key outcome variables over the 1992–2007 period are reported in table 1. In column 1 we report variable means and SDs for our main sample of interest, bartenders who work in eating and drinking places. For purposes of comparison, in column 2 we report information for all workers who work in eating and drinking places (including bartenders), and in column 3 we report information for all private sector workers. Consistent with previous descriptive research on bartenders and food service staff in the US and elsewhere, we found that bartenders were much less likely to work in a place that restricts smoking (42.6%) than either all workers in eating and drinking places (76.6%) or all private sector workers (85.1%). Bartenders were also much more likely to be current smokers (50.7%) than either all workers in eating and drinking places (34.1%) or all private sector workers (22.8%). Differences in the number of cigarettes smoked conditional on smoking were smaller in proportional terms compared to the differences in the probability of being a smoker. Not surprisingly, bartenders were much less likely to be never smokers (35.8%) than either all workers in eating and drinking places (54.4%) or all private sector workers (59%). Finally, there were much smaller differences in the likelihood of being a former smoker across the three groups of workers.

Regression results

The regression results on the effects of bar SCIALs are given in table 2. Each column in the table represents a different outcome, and each entry is from a separate estimation of equation (1) with all the controls (including state and year fixed effects), but where we report only the adjusted OR on the *Bar SCIAL* variable. The results in column 1 show that bar SCIALs are associated with a statistically significant increase in the odds a bartender reports that his/her workplace officially restricts smoking (OR 1.999, 95% CI 1.312 to 3.043). This corresponds to a marginal increase of 0.108 if the *Bar SCIAL* variable increases by 1 (if it is less than 3). This result confirms that our bar SCIALs variable can be used to examine how clean air public policies affect smoking outcomes among bartenders via workplace smoking restrictions at their place of employment.

The results for current smoking in column 2 indicate that bar SCIALs are associated with a significant reduction in the odds a bartender reports being a current smoker (OR 0.776, 95% CI 0.640 to 0.941). This would yield a marginal effect of −0.053 if the *Bar SCIAL* variable increases by 1. The result for smoking intensity among the sample of current smokers in column 3 suggests bar SCIALs do not affect smoking intensity for bartenders: the relevant estimate is small and statistically insignificant, although the small sample size means that we cannot rule out non-trivial negative or positive effects on smoking intensity among bartenders. These results thus suggest that bar SCIALs reduce the odds of smoking, but not smoking intensity among smokers.

Column 4 presents results on the odds of being a former smoker, defined as an individual who currently does not smoke but has smoked at least 100 cigarettes in his/her lifetime. If the reduction in the proportion of bartenders who smoke shown in column 2 was due to reductions in smoking among preadoption bartenders, we would expect bar SCIALs to be positively associated with the likelihood an individual reports being a former smoker. We do not find evidence consistent with bartenders quitting smoking in response to bar SCIALs. Instead, if anything, an increase in bar SCIALs appears to be more likely to reduce the odds of being a former smoker for bartenders, although the estimated coefficient is not statistically significantly different from 0. Thus, we do not find evidence that bar SCIALs reduce smoking among preadoption bartenders in terms of either decreased smoking intensity or increased quits.

Column 5 presents evidence on the relationship between bar SCIALs and whether an individual is a never smoker, defined as an individual who reported not having smoked 100 cigarettes in his/her lifetime. If smoke-free laws covering bars reduce the proportion of bartenders who smoke primarily through changes in the composition of the bartender workforce, we would expect a positive association between bar SCIALs and the likelihood an individual never smoked. Indeed, this is what we found. The estimate in column 5 suggests that a 1-point increase in bar SCIALs is associated with a significant increase in the odds of

Table 1 Descriptive statistics, Tobacco Use Supplement to the Current Population Survey (TUS-CPS), 1992–2007

	Bartenders in eating and drinking places	All workers in eating and drinking places	All private sector workers
Workplace restricts smoking	0.426 (0.495)	0.766 (0.423)	0.851 (0.356)
Current smoker	0.507 (0.500)	0.341 (0.474)	0.228 (0.419)
Number of cigarettes last 30 days among current smokers	501 (339)	435 (299)	445 (307)
Former smoker	0.135 (0.342)	0.115 (0.319)	0.183 (0.386)
Never smoked	0.358 (0.479)	0.544 (0.498)	0.590 (0.492)
N	1380	25085	404989

Shown are proportions (weighted sample means, with SDs in parentheses) among indoor workers from the 1992–2007 TUS-CPS with valid responses to the question about workplace smoking restrictions. Bartenders are identified by occupation codes; only bartenders in eating and drinking places are included here. Eating and drinking place workers are defined by industry codes. Private sector workers are defined by class of worker codes.

Table 2 Estimated relationships between bar state clean indoor air laws (SCIALs) and smoking-related outcomes among bartenders

Outcome:	Workplace restricts smoking (0/1)	Current smoker (0/1)	Log cigarettes smoked among smokers	Former smoker (0/1)	Never smoker (0/1)	Bartender (0/1)
Sample	Bartenders	Bartenders	Bartenders	Bartenders	Bartenders	All workers
Bar SCIALs	1.999† (0.429)	0.776† (0.076)	0.038 (0.097)	0.736 (0.155)	1.468† (0.192)	0.958 (0.049)
N	1375	1380	717	1309	1375	404989

Shown are adjusted ORs from logistic regressions except for column 3, which is ordinary least squares regression. Each entry is from a separate model. Robust standard errors clustered at the state level are in parentheses. Observations are weighted with the Tobacco Use Supplement to the Current Population Survey (TUS-CPS) self-response supplement weight. Additional controls (not reported but available upon request from the authors) include: survey month, year, and state fixed effects, the real excise tax on a pack of cigarettes, SCIALs at 11 other venues, and the individual and state demographic characteristics described in the text.
†Significant at 1%.

reporting never having smoked cigarettes among bartenders (OR 1.468, 95% CI 1.137 to 1.897).

Our results thus far are most consistent with the possibility that the reduction in smoking among bartenders in response to bar SCIALs is due to changes in the composition of the bartender workforce rather than to reductions in smoking among preadoption bartenders. There are, however, multiple ways the bartender workforce could have changed. First, bar employment could have gone down in response to bar SCIALs,[11] and smoking bartenders may have been more likely to be employed at establishments that closed or reduced their workforce (with the remaining bartenders disproportionately composed of never smokers). Second, bar employment could have stayed relatively constant but smoking bartenders may have been replaced with non-smoking bartenders (who find the jobs in the covered areas more attractive because of bar SCIALs), perhaps because the former group selected out of the jurisdiction or out of the occupation and industry entirely. We tested for the possibility that bar employment fell by estimating equation (1) with the dependent variable equal to 1 if an individual reports being a bartender.

These results are shown in column 6 of table 2, in which the sample was all private-sector workers. ORs for the bar SCIAL variable are given from a model with state and year fixed effects and the other controls described above. The results for the odds of being a bartender give no evidence that bartender employment fell significantly when stronger laws restricting smoking at bars were adopted. The fact that the OR is very close to 1 suggests that the changing composition of the bartender workforce is more likely to reflect job transitions, with non-smoking bartenders disproportionately replacing smoking bartenders, than a simple exit of bartenders who are disproportionately smokers. This pattern suggests that bar SCIALs did not significantly reduce bartender employment, leaving the replacement of smoking bartenders with non-smoking bartenders as the most likely candidate explanation for the reduction in bartender smoking rates associated with bar SCIALs.

DISCUSSION

This study revisits the observed negative relationship between public policies that restrict smoking in bars and the proportion of bartenders who smoke. Specifically, we aimed to shed light on two distinct mechanisms that may produce the observed relationship: first, adoption of smoking restrictions in bars may reduce smoking among preadoption bartenders; and second, restrictions on smoking in bars may change the composition of the bartender workforce with respect to smoking. Based on models of a variety of smoking outcomes and variation across states and over time in state clean indoor air laws covering bars in the US, we found strong evidence that bar SCIALs primarily reduced the proportion of bartenders who smoke by changing the composition of the bartender workforce. Specifically, we found that bar SCIALs were associated with significantly lower odds of being a current smoker but not with smoking intensity conditional on smoking among bartenders. More importantly, we found that the reduction in smoking participation was driven primarily by a large and statistically significant increase in the likelihood a bartender reports never having smoked cigarettes. We also found no evidence that bar SCIALs were associated with an increase in the likelihood a bartender reports being a former smoker, as would be expected if the restrictions reduced smoking among preadoption bartenders. Finally, we found no evidence that employment of bartenders fell significantly when states restricted smoking in bars. This suggests that the most likely compositional change in bartending associated with bar SCIALs was that smoking bartenders were replaced with non-smoking bartenders. Consistent with this, we also found no evidence that bar SCIALs are significantly related to whether a bartender who currently smokes tried to quit within the last 12 months or plans to quit within the next 6 months or the next 30 days.

An important consideration is whether the relationships between bar SCIALs and smoking behaviours among bartenders simply reflect changes in smoking behaviours among the general population. A lower prevalence of smoking among the general

What this paper adds

- Recent research shows that state clean indoor air laws (SCIALs) covering bars reduce the proportion of bartenders who smoke. This research did not investigate the mechanism that accounted for the decline in smoking among bartenders.
- This study investigates whether it appears that bartenders quit smoking or that more non-smokers become bartenders in response to state-level restrictions on smoking in bars. The answer to this question may help assess the public health impact of restrictions on smoking in public venues.
- The results suggest that the proportion of bartenders who smoke falls after states restrict smoking in bars because of changes in the composition of bartenders with respect to smoking behaviours. The proportion of bartenders who are never smokers is positively associated with bar SCIALs while the proportion who are former smokers is not.
- The results suggest that bar SCIALs may not lead bartenders, a group with relatively high smoking rates, to quit. Nonetheless, the laws may have other important public health benefits.

population might lead to SCIAL adoption and fewer bartenders who smoke. The results shown here are robust to including state-specific linear time trends or controlling for the state-level percentage of adults who smoke. This suggests that it is not the broader trends in smoking driving our results.

Limitations

There are several limitations to our analysis. The data here are a synthetic panel of bartenders over time and do not follow individuals over time. We are therefore unable to directly observe how smoking behaviours change among a fixed group of individuals when bar SCIALs are adopted. We are also unable to directly observe whether smokers are more likely to leave bartending, either voluntarily or not, than non-smokers when states restrict smoking in bars. The fact that bartending is a high-turnover occupation[12] combined with the result found here that bar SCIALs do not reduce the overall odds of being a bartender suggests that some smokers leave bartending and are replaced with non-smokers in response to bar SCIALs. Panel data on workers at covered establishments would provide clearer insight into how these transitions occur and among which groups of workers, and therefore is an important area for future research. However, studies using panel data need to carefully consider whether attrition differs between smokers and non-smokers. Studies using synthetic panels, such as ours, and those using true panel data can both offer insight into the effects of restrictions on smoking behaviours.

Conclusions

Our study uses the largest and most up-to-date nationally representative sample of bartenders in the US with information on smoking behaviour to show that adoption of SCIALs covering bars primarily reduced the proportion of bartenders who smoke by changing the composition of the bartender workforce rather than reducing smoking among preadoption bartenders. This suggests that the consequences of strengthening restrictions on smoking in bars are more complicated than previously thought. Nonetheless, the results are consistent with reductions in SHS exposure due to laws restricting smoking at bars.

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