ARTICLE

Local Restaurant Smoking Regulations and the Adolescent Smoking Initiation Process

Results of a Multilevel Contextual Analysis Among Massachusetts Youth

Michael Siegel, MD, MPH; Alison B. Albers, PhD; Debbie M. Cheng, ScD; William L. Hamilton, PhD; Lois Biener, PhD

Objective: To assess whether smoke-free restaurant laws influence the progression from (1) never smoking to early experimentation and (2) early experimentation to established smoking.

Design: A longitudinal, 4-year, 3-wave study of a representative sample of Massachusetts youth.

Setting: A total of 301 Massachusetts communities.

Participants: Study participants were 3834 Massachusetts youths aged 12 to 17 years at baseline, from January 2, 2001, to June 18, 2002, of whom 2791 (72.8%) were reinterviewed after 2 years (from January 30, 2003, to July 31, 2004) and 2217 (57.8%) were reinterviewed after 4 years (from February 16, 2005, to March 26, 2006). Wave 3 respondents were recruited from both those who responded at wave 2 and those who did not.

Main Exposure: The primary predictor of interest is the strength of the local restaurant smoking regulation in the respondents' town of residence at the baseline of each transition period.

Main Outcome Measures: (1) Overall progression to established smoking (having smoked ≥100 cigarettes in one's lifetime), (2) transition from nonsmoking (never having puffed a cigarette) to experimentation, and (3) transition from experimentation to established smoking.

Results: Youths living in towns with a strong restaurant smoking regulation at baseline had significantly lower odds of progressing to established smoking (odds ratio, 0.60; 95% confidence interval, 0.42-0.85) compared with those living in towns with weak regulations. The observed association between strong restaurant smoking regulations and impeded progression to established smoking was entirely due to an effect on the transition from experimentation to established smoking (odds ratio, 0.53; 95% confidence interval, 0.33-0.86).

Conclusion: Local smoke-free restaurant laws may significantly lower youth smoking initiation by impeding the progression from cigarette experimentation to established smoking.

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Author Affiliations:
Departments of Social and Behavioral Sciences (Drs Siegel and Albers) and Biostatistics (Dr Cheng), Boston University School of Public Health, Boston; CNU Associates, Lincoln (Dr Hamilton); and Center for Survey Research, University of Massachusetts, Boston (Dr Biener), Massachusetts.

RECENT EVIDENCE SUGGESTS that laws that protect nonsmokers from secondhand smoke[1-3] by eliminating smoking in restaurants[3-6] may not only protect restaurant workers and customers from secondhand smoke[7,8] but also reduce adolescent smoking initiation[9] by changing the perceived prevalence and social acceptability of smoking among youth.[10] Existing evidence that smoke-free laws reduce youth smoking derives from cross-sectional studies.[11-16] However, the results of the first longitudinal investigation of the impact of local smoke-free restaurant laws on smoking initiation were recently reported.[9] During a 2-year follow-up, Massachusetts youth who lived in a town with a complete restaurant smoking ban had less than half the odds of progressing to established smoking. We report the final results of this study, which reflect the continued follow-up of more than 2000 youths for 4 years. In addition to the extended follow-up, which improves the validity and power of our analysis, this article adds to the literature by addressing a new research question: if smoke-free restaurant laws reduce smoking initiation, do they do so by inhibiting experimentation with cigarettes or by impeding the progression from experimentation to regular smoking?

Although an abundance of literature has examined risk factors for smoking initiation,[17-19] few studies[20] have differentiated factors that influence experimentation from those that influence the progression from experimentation to regular smoking. Yet understanding this difference is critical. It would allow us to determine the age and stage at which youths

are most sensitive to various types of interventions, thus enabling the more specific tailoring and more effective delivery of smoking prevention interventions.

The present study overcomes several important limitations of the existing research. First, most previous research has not included community-level influences on smoking initiation.[21] We are not aware of any previous studies that have examined the impact of smoke-free laws on smoking stage transitions among youths. Second, although most previous community intervention studies have been based on a few communities, we have access to data representing individuals from more than 300 different towns. Third, much of the previous literature is based on cross-sectional designs or on longitudinal designs with only 2 successive observations for each individual (and usually for only a 1- to 2-year period). Our study is a longitudinal analysis that follows up a cohort of youths during a 4-year period, with 3 successive observations for each individual. In summary, our study design provides a unique opportunity to examine not only predictors of overall progression to established smoking but also the specific predictors of transitioning from never smoking to experimentation and from experimentation to established smoking using an integrated multilevel model of adolescent smoking trajectories that incorporates both individual and contextual (community-level) forces.[20-22]

METHODS

SAMPLE

Between January 2, 2001, and June 18, 2002, the Center for Survey Research, University of Massachusetts, obtained a probability sample of 3834 Massachusetts youths, aged 12 to 17 years, by random-digit dialing.[7-10] Of households in which screening interviews were completed, parental permission was obtained to interview 75.9% of eligible youths, and interviews were completed with 84.7% of those.

Between January 30, 2003, and July 31, 2004, we attempted to reinterview all 3834 of the youths in the baseline sample. Interviews were completed with 2791 individuals, for a follow-up rate of 72.8%. Between February 16, 2005, and March 26, 2006, we attempted to reinterview all 2791 youths who were successfully followed up to wave 2 and all youths lost to follow-up at wave 2. Of the former group, 2045 youths were successfully reinterviewed, and of the latter group, 172 youths were successfully reinterviewed, for a total wave 3 sample size of 2217 (57.8% of the baseline sample). The research protocol was approved by the institutional review boards of the University of Massachusetts and Boston University Medical Center.

MAIN OUTCOME MEASURES

Town of Residence

Town of residence at each wave was obtained using the reported zip code. Most (95.6%) of the reinterviewed youths at wave 2 lived in the same town at baseline and 2-year follow-up; 2.7% moved within Massachusetts, and 1.7% moved out of state. Of youths interviewed at wave 3, 91.4% lived in the same town at baseline, 5.6% had moved within Massachusetts, and 3.0% had moved out of state.

Strength of Local Restaurant Smoking Regulation

The strength of the local restaurant regulation in effect in each respondent's town of residence on the date of his or her baseline interview was categorized[23] as follows: (1) strong regulations, no smoking allowed in restaurants and no variances allowed; (2) medium regulations, smoking restricted to enclosed separately ventilated areas or no smoking allowed but variances allowed; and (3) weak regulations, smoking restricted to designated areas or not restricted.

Stages of Smoking Initiation

According to the work of Pierce et al,[24] we defined progression to established smoking as having smoked 100 or more cigarettes in one's lifetime. This measure has been formally validated[25-27] and used in previous studies.[24-31] The experimentation stage of smoking was then defined as the period from trying a cigarette until becoming an established smoker. Thus, the 3 stages of smoking initiation were (1) nonsmoking, (2) experimentation (having tried a cigarette but not smoked 100 cigarettes), and (3) established smoking (having smoked ≥100 cigarettes).

In the first set of analyses, we model overall progression to established smoking (from either nonsmoking or experimentation). In a second set of analyses, we model each of the 2 possible transitions in smoking stages: (1) from nonsmoking to experimentation and (2) from experimentation to established smoking.

Individual-Level Predictor Variables

We examined the effect of the following individual-level baseline variables: (1) age group (12-14, 15-17, and 18-21 years), (2) sex, (3) race (non-Hispanic white vs other), (4) presence of at least 1 adult smoker in the household, (5) presence of at least 1 close friend who smokes, (6) education level of household informant (college graduate or not), (7) annual household income (≤$50 000 vs >$50 000), (8) exposure to antismoking messages at school (yes or no), and (9) self-reported baseline smoking status (nonsusceptible nonsmoker, susceptible nonsmoker, puffer, experimenter, or current smoker). Although none of the study participants included in the analysis had smoked 100 cigarettes at baseline, some had experimented with cigarettes. We controlled for individuals' baseline predisposition to smoking by including in the analysis a set of indicator variables that reflect 5 categories of baseline smoking status: nonsusceptible nonsmoker, susceptible nonsmoker, puffer, experimenter, and current smoker. For this purpose, *nonsmokers* were defined as respondents who had never puffed on a cigarette, *puffers* as those who had puffed but not smoked a whole cigarette, *experimenters* as those who had smoked at least 1 whole cigarette but none within the past 30 days, and *current smokers* as those who had smoked at least 1 cigarette, including 1 or more within the past 30 days. Nonsmokers were further classified based on a measure of susceptibility to smoking that has been shown to reliably predict progression to established smoking.[24-27,29] Nonsmokers were classified as nonsusceptible to smoking if they answered no to the question, "Do you think that you will try a cigarette soon?" and definitely not to the questions, "If one of your best friends were to offer you a cigarette, would you smoke it?" and "At any time during the next year do you think you will smoke a cigarette?"

Town-Level Predictor Variables

We examined the effect of the following town-level variables (included as continuous variables except where noted): (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 statewide tobacco control program; (2) the percentage of white residents in each town; (3) the percentage of youths (aged < 18 years) in each town; and (4) town population (< 20 000, 20 000-50 000, and > 50 000). Of many town-level factors examined, these were most strongly related to the strength of local restaurant smoking regulations in Massachusetts towns.[32] The percentage of yes votes on question 1 served as a measure of the baseline level of antismoking sentiment in each town before the proliferation of local restaurant smoking regulations, which correlates with the level of education in the town.[33] All town-level variables were obtained from the 2000 US Census, except for the question 1 vote, which was obtained from the Division of Elections within the Massachusetts office of the secretary of state.

DATA ANALYSIS

Our data set has clustering at 2 levels. First, observations are clustered within individual respondents. Each respondent may contribute up to 2 observations in the data set. Second, respondents are clustered within towns. Because observations among individuals and respondents from the same town may be more similar than observations across respondents or respondents from different towns, we used a multilevel (hierarchical) logistic regression model to examine the relationship between strength of town restaurant smoking regulations at baseline and smoking progression. This procedure accounts for correlation of data within individuals and within town "clusters," reducing the probability of a type I error that could be introduced if this correlation were ignored.[22,34]

All town-level variables were time-independent and assessed at the start of the study (modeled at level 3), except strength of restaurant smoking regulation, which was modeled as a time-varying variable (at level 1), updated at each time point (based on the strength of local restaurant smoking regulation on the interview date). Time-independent individual-level variables (entered at level 2) were sex, race, informant education level, and household income. The following individual-level variables were modeled as time varying (at level 1): age group, presence of a household smoker, presence of a close friend who smokes, exposure to school-based antismoking messages, and baseline smoking status.

Three separate models were fit. The first model assessed overall progression to established smoking (from either nonsmoking or experimentation). The second model assessed progression to experimentation from a nonsmoking stage. The third model assessed progression to established smoking only from experimentation. Additional exploratory analyses stratified by baseline age were conducted to assess whether age moderates the influence of smoke-free restaurant laws on smoking initiation. All analyses were conducted using 2-sided tests and a significance level of .05. Analyses were conducted using HLM statistical software, version 6.0 (Scientific Software International Inc, Lincolnwood, Illinois).

For the baseline sample, survey weights were computed that adjusted for the number of telephones per household and, hence, for the probability of selection, and for nonresponse. The most important differences between respondents who were followed up successfully and those who were lost to attrition were as follows: respondents who followed up were more likely to be younger, to not have a smoker in the household, to have higher household income, to have more highly educated parents, to be never smokers, to not be black or Hispanic, and to not have a close friend who smokes. We created adjustments to the baseline weights by using an iterative ranking procedure[35] that yielded distributions on age, race, smoking status, parental smoking, and parental educational level that either were identical to those at baseline or differed by at most 1 percentage point.

RESULTS

Our study sample consisted of 2791 unique individuals, contributing 4596 observations. Analysis of overall progression to established smoking was based on all 4596 observations (wave 1 to wave 2: 2623; wave 2 to wave 3: 1818; and wave 1 to wave 3: 155). Analyses of separate smoking stage transitions were based on 4491 observations (wave 1 to wave 2: 2572; wave 2 to wave 3: 1768; and wave 1 to wave 3: 151). Sample sizes for the analyses of separate smoking stage transitions were slightly smaller than for overall progression to established smoking because of missing or inconsistent data on smoking stage for some individuals.

BASELINE CHARACTERISTICS OF THE SAMPLE

Of our total sample of 4596 observations (transitions or nontransitions from nonsmoking or experimentation to established smoking), the overall rate of progression to established smoking during the follow-up periods was 9.3%, and it varied from 9.6% and 9.8% for youths living in towns with weak and medium regulations, respectively, to 7.9% for youths living in towns with strong local restaurant smoking regulations (**Table 1**).

PREDICTORS OF OVERALL PROGRESSION TO ESTABLISHED SMOKING

No association was found between medium restaurant smoking regulations and progression to established smoking (odds ratio [OR], 0.93; 95% confidence interval [CI], 0.67-1.30) (**Table 2**). However, youths living in towns with a strong restaurant smoking regulation at baseline had significantly lower odds of progressing to established smoking (OR, 0.60; 95% CI, 0.42-0.85) compared with those living in towns with weak regulations.

Other significant predictors of increased odds of progression to established smoking included older age group (OR, 2.02; 95% CI, 1.16-3.51 [for youths aged 18-21 years at baseline]), previous experimentation with cigarettes, presence of an adult smoker in the household (OR, 1.54; 95% CI, 1.20-1.99), presence of a close friend who smokes (OR, 1.91; 95% CI, 1.45-2.53), being male (OR, 0.66; 95% CI, 0.51-0.85 [for females]), and living in a town with more white residents (Table 2).

The association between strong restaurant smoking regulations and overall progression to established smoking seemed to differ by age of the respondent at baseline. The association was present for young (aged 12-14 years) individuals (OR, 0.63) and middle-aged (aged 15-17 years) individuals (OR, 0.52), but not for older (aged 18-21 years) individuals (OR, 1.17).

PREDICTORS OF TRANSITION FROM NONSMOKING TO EXPERIMENTATION

The strength of the local restaurant smoking regulation was not significantly associated with the transition from nonsmoking to experimentation (OR, 1.18; 95% CI, 0.94-1.49 [for strong regulations]) (Table 2). Important pre-

Table 1. Baseline Characteristics of Cohort and Progression to Established Smoking by Individual and Contextual Variables

Variable	Total, No. (%)[a,b]	Progression to Established Smoking, %[a,c]
Total	4596	9.3
Main predictor variable (level 1)		
Strength of local restaurant smoking regulation		
Weak	2529 (55.2)	9.6
Medium	1049 (22.8)	9.8
Strong	1018 (22.0)	7.9
Individual-level time-varying covariates (level 1)		
Age group, y		
12-14	1832 (40.5)	5.7
15-17	2303 (49.6)	11.2
18-21	461 (9.9)	14.1
Baseline smoking status		
Nonsusceptible never smoker	2664 (58.3)	2.7
Susceptible never smoker	769 (16.8)	7.1
Puffed	557 (12.0)	13.5
Smoked whole cigarette	406 (8.8)	30.0
Smoked in past 30 d	200 (4.1)	53.9
Presence of adult smoker in household		
No	3243 (70.4)	7.4
Yes	1353 (29.6)	13.7
Presence of close friend who smokes		
No	3240 (71.0)	5.1
Yes	1356 (29.0)	19.5
Exposure to school-based antismoking messages		
No	1331 (32.2)	9.7
Yes	2795 (67.8)	8.6
4-y Follow-up period (wave 1 to wave 3)		
No	4441 (96.6)	8.9
Yes	155 (3.4)	20.1
Individual-level covariates (level 2)		
Sex		
Male	2318 (50.9)	10.1
Female	2278 (49.1)	8.4
Race/ethnicity		
Non-Hispanic white	3788 (82.3)	9.3
Other	775 (17.7)	8.4
Informant education level		
Not college graduate	2342 (52.9)	10.3
College graduate	2173 (47.1)	8.2
Annual household income, $		
≤50 000	945 (26.4)	9.6
>50 000	2813 (73.6)	8.9
Town-level covariates (level 3)		
Yes vote on question 1, %[d]		
≤50	2390 (53.1)	9.2
>50	2206 (46.9)	9.3
Residents who are white, %[d]		
≤90	1645 (35.8)	7.7
>90	2951 (64.2)	10.1
Residents who are youths, %[d]		
≤25	2317 (50.8)	9.5
>25	2279 (49.2)	9.0
Town population		
<20 000	1833 (39.2)	10.6
20 000-50 000	1656 (36.6)	8.8
>50 000	1107 (24.3)	7.7

[a] Percentages in table are weighted to reflect initial probability of participant selection into sample.
[b] Total number of observations (individuals may have ≤2 follow-up observations).
[c] Progression to established smoking is defined as having smoked 100 cigarettes in one's lifetime.
[d] Modeled as continuous variables in analysis.

dictors of transition to experimentation included age (OR, 2.04 [for youths aged 15-17 years] and 2.67 [for youths aged 18-21 years]), susceptibility to smoking (OR, 2.78 for susceptible youths), presence of an adult smoker in the household (OR, 1.47), presence of a close friend who smokes (OR, 1.63), and parental education level (OR, 0.80 for college graduates) (Table 2). No effect was found of sex or the proportion of white residents in the respondent's town.

PREDICTORS OF TRANSITION FROM EXPERIMENTATION TO ESTABLISHED SMOKING

Although living in a town with a medium-strength restaurant smoking regulation had no significant association with the transition from experimentation to established smoking, youths living in towns with strong regulations had significantly lower odds of making this transition (OR, 0.53; 95% CI, 0.33-0.86) (Table 2). Other important predictors of transition from experimentation to established smoking included age (OR, 2.47 for youths aged 18-21 years at baseline), more advanced experimentation, presence of a close friend who smokes (OR, 1.85), sex (OR, 0.61 for females), and percentage of white residents in one's town (OR, 1.38 for each 10–percentage point increase). The presence of an adult smoker in the household had no significant effect on this transition. Informant education level was also not a significant predictor of the transition from experimentation to established smoking.

The association between strong restaurant smoking regulations and progression from experimentation to established smoking seemed to differ by age of the respondent at baseline. The association was present for young (aged 12-14 years) individuals (OR, 0.57) and middle-aged (aged 15-17 years) individuals (OR, 0.60) but not for older (aged 18-21 years) individuals (OR, 0.99).

COMMENT

To our knowledge, this is the first study to examine the effect of restaurant smoking laws on different stages of the smoking initiation process. Using a hierarchical repeated-measures model that examined individual and contextual factors that influence smoking initiation, we found not only that strong restaurant smoking regulations were associated with a significant decrease in the odds of progression to established smoking among youths but also that this association was specific to the transition from experimentation to established smoking. In addition, the effects of the smoking regulations seemed to be stronger for young and middle-aged youths (aged 12-17 years).

The analysis did not directly examine the mechanisms by which smoking bans might reduce smoking initiation. Nevertheless, the findings are consistent with the conceptual hypothesis, from a previous study,[7] that restaurant smoking bans affect smoking initiation by (1) reducing youths' exposure to smokers in public places, which lowers their perception of smoking prevalence, and (2) changing the perceived social acceptability of smoking. Both of these effects would be expected to influence

Table 2. Data for Overall Progression to Established Smoking, Transition From Nonsmoking to Experimentation, and Transition From Experimentation to Established Smoking

Variable	Overall Progression to Established Smoking[a,b]	Transition From Nonsmoking to Experimentation[a,c]	Transition From Experimentation to Established Smoking[a,d]
Main predictor variable (level 1)			
Strength of local restaurant smoking regulation			
Weak	1 [Reference]	1 [Reference]	1 [Reference]
Medium	0.93 (0.67-1.30)	1.01 (0.78-1.31)	0.78 (0.47-1.30)
Strong	0.60 (0.42-0.85)	1.18 (0.94-1.49)	0.53 (0.33-0.86)
Individual-level time-varying covariates (level 1)			
Age group, y			
12-14	1 [Reference]	1 [Reference]	1 [Reference]
15-17	1.22 (0.90-1.64)	2.04 (1.63-2.54)	1.09 (0.65-1.82)
18-21	2.02 (1.16-3.51)	2.67 (1.51-4.72)	2.47 (1.04-5.86)
Baseline smoking status			
Nonsusceptible never smoker	1 [Reference]	1 [Reference]	1 [Reference]
Susceptible never smoker	2.84 (1.85-4.36)	2.78 (2.11-3.66)	NA
Puffed	4.65 (3.16-6.84)	NA	NA
Smoked whole cigarette	14.60 (9.84-21.7)	NA	3.14 (2.07-4.76)
Smoked in past 30 d	45.80 (29.10-72.20)	NA	11.50 (7.36-18.10)
Presence of adult smoker in household			
No	1 [Reference]	1 [Reference]	1 [Reference]
Yes	1.54 (1.20-1.99)	1.47 (1.16-1.87)	1.31 (0.87-1.99)
Presence of close friend who smokes			
No	1 [Reference]	1 [Reference]	1 [Reference]
Yes	1.91 (1.45-2.53)	1.63 (1.25-2.13)	1.85 (1.24-2.77)
Exposure to school-based antismoking messages			
No	1 [Reference]	1 [Reference]	1 [Reference]
Yes	0.76 (0.56-1.04)	0.94 (0.75-1.18)	0.74 (0.47-1.16)
4-y Follow-up period (wave 1 to wave 3)			
No	1 [Reference]	1 [Reference]	1 [Reference]
Yes	2.92 (1.58-5.41)	1.82 (1.14-2.92)	3.88 (1.42-10.60)
Individual-level covariates (level 2)			
Sex			
Male	1 [Reference]	1 [Reference]	1 [Reference]
Female	0.66 (0.51-0.85)	0.97 (0.78-1.21)	0.61 (0.42-0.90)
Race/ethnicity			
Non-Hispanic white	1 [Reference]	1 [Reference]	1 [Reference]
Other	1.09 (0.66-1.78)	0.91 (0.67-1.23)	1.33 (0.77-2.30)
Informant education level			
Not college graduate	1 [Reference]	1 [Reference]	1 [Reference]
College graduate	0.90 (0.68-1.18)	0.80 (0.65-0.99)	0.79 (0.53-1.18)
Annual household income, $			
≤50 000	1 [Reference]	1 [Reference]	1 [Reference]
>50 000	1.03 (0.74-1.43)	1.08 (0.80-1.47)	1.07 (0.60-1.90)
Town-level covariates (level 3)			
Percentage yes vote on question 1[e]	0.93 (0.80-1.08)	1.13 (0.99-1.29)	0.87 (0.69-1.11)
Percentage of residents who are white[e]	1.24 (1.05-1.46)	1.10 (0.96-1.27)	1.38 (1.13-1.69)
Percentage of residents who are youths[e]	0.91 (0.62-1.33)	0.76 (0.58-0.99)	0.89 (0.51-1.58)
Town population			
<20 000	1 [Reference]	1 [Reference]	1 [Reference]
20 000-50 000	0.86 (0.61-1.21)	0.83 (0.64-1.08)	0.83 (0.49-1.40)
>50 000	0.91 (0.56-1.49)	1.03 (0.68-1.56)	0.81 (0.39-1.71)

Abbreviation: NA, data not applicable.
[a] Data are given as odds ratio (95% confidence interval).
[b] Progression to established smoking is defined as having smoked 100 cigarettes in one's lifetime. Analyses based on 2791 individuals living in 301 towns, contributing 4596 observations.
[c] Analyses based on 2091 individuals living in 286 towns, contributing 3301 observations.
[d] Analyses based on 808 individuals living in 240 towns, contributing 1059 observations.
[e] The odds ratios were associated with each 10–percentage point increase in variable.

the transition from experimentation to established smoking but not experimentation in the first place.

In general, our results are consistent with the finding from earlier studies[17,20,28,36-46] that purely individual-level factors are more important in influencing smoking experimentation, whereas community-level factors mainly exert an influence on the transition from experimentation to regular cigarette use. The major community-

level factor we examined—smoke-free restaurant policies—exerted an effect only on the transition to regular use. Parental smoking and parental education level, however, were significant predictors only for cigarette experimentation.

These results have a number of important public health policy implications. First, they suggest that local smoke-free restaurant laws may decrease youth smoking initiation. These results extend the follow-up period of our preliminary study[9] to 4 years and improve the overall power of our analysis. If it represents a true effect, the observed 40% reduction in the odds of progression to established smoking in towns with local restaurant smoking bans would suggest that smoke-free policies may be the most effective intervention available to reduce youth smoking.

Second, these findings demonstrate the importance of considering individual-level and contextual factors and of separating the effects of each on various stages of the smoking initiation process. We found, for example, that parental smoking is a strong factor in predicting which youths will experiment with cigarettes. However, once that experimentation has taken place, parental smoking was no longer a factor in the progression to regular cigarette use. This suggests that although interventions that address the role of parents in putting youths at risk for smoking may be effective in deterring experimentation, they are unlikely to succeed in halting the progression to regular smoking among youths who have already tried cigarettes.

Third, our results suggest that the early and middle periods of adolescence are critical times of susceptibility to public policy interventions. Smoke-free restaurant regulations seemed to be less effective for youths older than 18 years.

The primary potential threat to the validity of our findings is the relatively high rate of loss to follow-up in the study. Although not unusual for a telephone survey following up individuals for 4 years, the follow-up rates of 72.8% at wave 2 and 57.8% at wave 3 introduce the possibility of a differential loss to follow-up bias. However, we believe loss to follow-up is an unlikely explanation of our results because loss to follow-up was lower among youths living in towns with strong regulations than among youths living in towns with weak regulations, and those lost to follow-up are more likely to be smokers. At wave 2, for example, only 23.9% of youths living in towns with strong regulations at wave 1 were lost to follow-up compared with 29.0% of youths living in towns with weak regulations. In addition, we expect that those lost to follow-up are more likely to be smokers because follow-up was higher for households with a higher education level and income and for youths who were never smokers without household smokers or close friends who smoked. This combination would bias the results toward the null and result in an underestimate of the effect of smoking regulations because it would produce differentially fewer smokers at follow-up among respondents living in towns with weak regulations. Also, sampling weights were used to yield a study sample that was identical to the full baseline sample in terms of age, race, smoking status, and parental smoking and education level.

A second limitation of this research is that it is not clear whether the results are generalizable to other populations. Local clean indoor air regulations in Massachusetts were adopted under a broad and aggressive statewide antismoking campaign that included a state-of-the-art media campaign that aimed to denormalize smoking and educate the public about the hazards of secondhand smoke. It is not clear whether restaurant smoking laws would have similar effects on youth smoking behavior in states where widespread antismoking programs are not present.

Despite these limitations, the evidence presented in this article suggests that local smoke-free restaurant laws, if they are strong enough (ie, complete smoking bans), may significantly lower youth smoking initiation by impeding the progression from cigarette experimentation to regular or established smoking. Further research is needed to examine the effect of local restaurant smoking regulations in other states, especially in the absence of statewide antismoking programs, and to explore potential mediating factors between restaurant smoking bans and youth smoking behavior.

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Correspondence: Michael Siegel, MD, MPH, Departments of Social and Behavioral Sciences, Boston University School of Public Health, 715 Albany St, TW2, Boston, MA 02118 (mbsiegel@bu.edu).
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