

Short-Term Effects of a Comprehensive, Statewide Smokefree Law on Perceived Opportunities to Smoke

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Background: The goal of this study was to assess the effects of Minnesota's comprehensive, statewide smokefree law on young adults' perceived opportunities to smoke in restaurants and bars.

Purpose: Differential effects of the law were examined for those living with and without previous local smokefree ordinances.

Methods: Telephone surveys were conducted 6–12 months prior, 0–6 months prior, and 0–6 months after Minnesota's statewide smokefree law went into effect. Participants included young adults from a population-based cohort in Minnesota ($n=1446$) and from four other Upper Midwest states that serve as a comparison ($n=238$).

Results: A greater proportion of Minnesota participants (regardless of previous law) reported it was very hard for an adult to find a place to smoke in both restaurants and bars/clubs after the statewide law, compared to the comparison group. Effects were greater among Minnesota participants who did not live with a local smokefree ordinance previously.

Conclusions: Within 6 months of Minnesota's statewide smokefree law, Minnesota young adults, even those who lived with a prior local smoking ordinance, believed it was more difficult for adults to find a place to smoke in restaurants and bars/clubs. Changing perceived opportunities to smoke in the state may be an initial step in changing social norms and smoking behaviors. These results suggest that statewide smokefree laws may provide additional barriers to smoking, beyond those obtained through local ordinances.

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Introduction

Smoking restrictions in public places, referred to as smokefree or clean indoor air laws, have become a focus of comprehensive tobacco control across the U.S.¹ Comprehensive smokefree laws prohibit smoking in indoor workplaces, including restaurants and bars. As of October, 2009, a total of 20 states and 361 municipalities have implemented comprehensive smokefree laws in the U.S.²

The primary goal of smokefree laws is to reduce exposure to environmental tobacco smoke. Smoking restrictions, however, may also reduce opportunities to smoke as well as make smoking less acceptable,^{3–5} and ultimately reduce the amount and/or prevalence of smoking.⁶ Although reduced opportunities to smoke may be the initial step in the pathway to reduced smoking, we are not aware of any studies that have examined the effects of smokefree laws on perceived opportunities to smoke.

Studies are also needed to examine how statewide smokefree laws affect those already living with local smokefree ordinances that prohibit smoking in the same locations. It is possible that a statewide law may not change perceived opportunities to smoke among young adults who have been living previously with comprehensive, local smoking ordinances since, essentially, the law did not change in these areas.

To address these gaps in the literature, the effects of Minnesota's comprehensive, statewide smokefree law on young adults' perceived opportunities to smoke

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were examined. Using data from a population-based cohort, a comparison was made of the proportion of young adults in Minnesota who indicated it would be very hard for an adult in their community to find a place to smoke in a restaurant and bar/club and that of the participants from four other Upper Midwest states in the study. An examination was also made of differential effects of the law for young adults living with and without a previous local ordinance prohibiting smoking in restaurants and bars.

Methods

Minnesota Adolescent Community Cohort Study Design

This study presents data from the Minnesota Adolescent Community Cohort (MACC) study. The MACC study is a prospective, population-based cohort study that began in 2000. Participants were aged 12–16 years at baseline in 2000. They included youth living in Minnesota ($n=3636$), as well as four other Upper Midwest states (North Dakota, South Dakota, Kansas, and the Upper Peninsula of Michigan) that served as a comparison ($n=605$). An additional 584 participants aged 12 years from Minnesota were recruited in 2001, for a total sample of 4825.

Prior to recruiting participants, the state of Minnesota was divided into 129 geopolitical units (GPUs) thought to reflect the local tobacco control environment, from which 60 were randomly selected. A combination of probability and quota sampling methods (to assure equal age distribution) was then used to recruit participants. Recruitment was conducted by telephone by Clearwater Research, Inc., using modified random digit dial (RDD) sampling. Households were called to identify those with at least one teenager aged 12–16 years, and within eligible households, respondents were selected at random from among age quota cells that were still open (response level: 58.5%).

Participants completed a telephone survey at each round that included questions about smoking-related attitudes and behavior. The interview lasted 10 to 20 minutes, depending on the smoking status of the respondent. The interview was structured so that spoken responses would not be revealing to anyone overhearing the respondent.

Present Study

Minnesota's statewide smokefree law went into effect October 1, 2007. The present study includes three rounds of data: two collected prior to Minnesota's statewide smokefree law (Round 13: October 2006 to March 2007; Round 14: April 2007 to September 2007) and one round collected continuously for 6 months after the law went into effect (Round 15: October 2007 to March 2008). Cumulative response rates were 73.1%, 69.7%, and 60.5%, respectively. Participants who were young adults (aged 18–24 years), not in high school, and participated in all three rounds of data collection were included in the analysis for a final sample of 1684 (Minnesota=1446; comparison=238). Participants received \$15 for completion of each survey. The University of Minnesota IRB approved this study.

Outcome Variables

Opportunities to smoke in public places. Participants indicated how difficult it was for an adult in their community to find a place to smoke in a restaurant and a bar/club. Response options ranged from "1" (not at all hard) to "5" (very hard). Each variable was coded as a dichotomous variable for analysis purposes, in which "1" denotes "very hard" and "0" denotes all other response options. This dichotomy was selected because it is the most stringent criteria for assessing the effect of the law.

Predictor Variables

Demographic characteristics. Demographic information, including gender, race/ethnicity, and age were collected at baseline. Race/ethnicity was coded as a dichotomous variable (1=non-Hispanic white, 0=other race/ethnicity) due to the limited racial and ethnic diversity in the cohort. Age is a continuous variable based on the respondent's date of birth (age range: 18–22 years).

Parent education. Parent education is a three-level variable indicating the highest level of education obtained by either parent (1=less than high school education or high school graduate/GED, 2=some college or associate degree, and 3=college graduate or graduate degree).

Friend smoking. Participants indicated the number of their four best friends who smoke (0–4). This variable was recoded into a dichotomous variable where "1" denotes having one or more friends who smoke and "0" indicates having no friends who smoke.

Respondent's educational status. Respondents indicated their current educational enrollment and highest degree obtained. Based on responses to these items, three groups were created: (1) not enrolled in college and has not obtained college degree; (2) enrolled in a technical college or obtained a 2-year degree; and (3) enrolled in college or obtained a college degree.

Bar and restaurant employment. Participants indicated if they worked at a bar or restaurant in two of the three rounds of data included in the present study (0–6 months pre- and post-intervention). A dichotomous variable was created where "1" denotes the respondent worked in a bar or restaurant at either round and "0" if the respondent did not work at a bar or restaurant at either round.

Past 30-day smoking. Participants indicated how many days they smoked a cigarette (even a puff or two) in the past 30 days. This variable was recoded into a dichotomous variable where "1" denotes the respondent smoked in the past 30 days and "0" if the respondent did not smoke in the past 30 days.

Previous local smoking ordinances. Existence of a previous local ordinance prohibiting smoking in restaurants and bars was coded for each participant based on city of residence. The following three groups were created for analysis purposes: (1) Minnesota participants living with a local ordinance prior to the statewide law; (2) Minnesota participants living without a local ordinance prior to the statewide law; and (3) participants living in one of the four comparison states who had neither a local or statewide law during the study. Among the 1446 Minnesota participants, 465 (32%) were living with a local smoking ordinance at the time the statewide law went into effect.

Table 1. Respondents who indicated it was “very hard” to find a place to smoke^a

Characteristic	Restaurants				Bars and clubs			Sig M, I ^b
	6–12 months prior	0–6 months prior	0–6 months post	Chi-square sig M, I ^b	6–12 months prior	0–6 months prior	0–6 months post	
Gender	—	—	—	ns	—	—	—	ns
Male (n=812)	18.6	24.8	59.1	—	11.6	15.5	50.6	—
Female (n=872)	21.3	26.4	61.3	—	13.6	15.8	50.4	—
Race	—	—	—	ns	—	—	—	I
White (n=1533)	19.7	25.3	60.4	—	12.0	15.1	50.9	—
Other race (n=151)	22.5	28.7	58.7	—	19.3	21.1	46.7	—
Age (years)	—	—	—	M	—	—	—	M
18 (n=201)	15.5	18.9	49.8	—	7.0	10.9	36.7	—
19 (n=411)	17.6	21.6	54.1	—	10.4	12.3	42.4	—
20 (n=387)	18.1	26.4	58.4	—	12.5	16.2	51.4	—
21 (n=358)	22.6	28.2	64.8	—	12.6	16.2	53.5	—
22 (n=327)	25.1	31.1	71.7	—	19.0	21.5	64.7	—
Parent education	—	—	—	ns	—	—	—	ns
≤High school (n=312)	20.5	21.2	60.8	—	10.3	13.8	57.0	—
Associate's degree, some college (n=431)	18.1	26.1	60.8	—	13.4	16.3	52.3	—
≥College graduate (n=923)	21.0	27.0	60.0	—	12.9	15.9	47.8	—
Close friends smoke	—	—	—	M, I	—	—	—	M, I
Yes (1+; n=1043)	20.4	26.4	64.0	—	13.5	16.3	55.6	—
No (0; n=641)	19.3	24.4	54.1	—	11.2	14.6	42.2	—
Education	—	—	—	M, I	—	—	—	M, I
Not in school (n=429)	22.2	28.2	67.8	—	13.7	17.6	59.7	—
Technical school (n=208)	21.6	22.6	72.6	—	14.6	14.1	65.7	—
College (n=1047)	18.7	25.2	54.7	—	11.8	15.1	43.8	—
Employed in restaurant or bar	—	—	—	M	—	—	—	M
Yes (n=266)	26.1	31.3	65.2	—	16.2	16.9	53.4	—
No (n=1418)	18.8	24.6	59.3	—	11.9	15.4	50.0	—
Smoked past 30 days	—	—	—	M	—	—	—	M
Yes (n=438)	25.6	33.3	72.0	—	15.6	20.7	63.8	—
No (n=1216)	17.9	23.0	56.0	—	11.5	13.9	45.7	—

^aIncludes Minnesota and comparison youth^bM, main effect; I, covariate–time interaction. Letter included in significance column if $p < 0.05$; ns=not significant, indicated if neither the main effect nor interaction were significant.

Data Analytic Strategy

First, an examination was made of whether the proportion of young adults who thought it was very hard for an adult to find a place to smoke changed across the three time points and whether perceived opportunities to smoke were associated with living with a previous local smoking ordinance. Next, an examination was

made of potential confounders of the relationship between the statewide smokefree law and opportunities to smoke (Table 1). Each characteristic was examined individually, with models including both main effects for the sociodemographic characteristic and the statewide law (modeled as the three time points), and the interaction between the sociodemographic characteristic and the

statewide law. Finally, an assessment was made of the relationship between the statewide smokefree law and perceived opportunities to smoke in restaurants and bars/clubs (examined separately), controlling for potential confounders (all significant main effects and interactions from Table 1). Generalized linear mixed-effects models were used, modeling the dichotomous outcome using a binary distribution and logit link function. A random effect was included to control for potential effects due to the nesting of participants within GPUs. The final models included main effects for the statewide smokefree law (modeled as the three time points) and presence of a previous smokefree ordinance, the interaction of the two variables, and potential confounders. The interaction effect was designed to examine differential effects of the statewide law by previous local ordinance. All analyses were conducted in SAS version 9.1.3. PROC GLIMMIX was used to estimate the regression models.

Results

The proportion of young adults who reported it was very hard for an adult to find a place to smoke in restaurants ($F(2,4964)=62.71$, $p<0.0001$) and bars/clubs ($F(2,4953)=82.21$, $p<0.0001$) in their community changed across the three time points. Perceived opportunities to smoke also varied by previous local policy (Minnesota—local smoking ordinance previously, Minnesota—no local smoking ordinance previously, and the comparison group) for both restaurants ($F(2,4964)=29.73$, $p<0.0001$) and bars/clubs ($F(2,4953)=19.86$, $p<0.0001$). Figures 1 and 2 show the proportion of respondents who indicated it was very hard for adults to find a place to smoke in restaurants and bars/clubs across the three time points by previous local policy.

The comparison group showed no significant change in perceived difficulty finding a places to smoke in restaurants ($F(2,684)=0.70$, ns) or bars/clubs ($F(2,682)=2.90$, ns) across the three time points. Minnesota participants, however, showed an increase in the proportion of young adults who reported it was very hard for an adult to find a place to smoke in a restaurant and bar/club after the statewide law went into effect, regardless of the previous local policy in their area. Prior to the law, approximately 20% of young adults in Minnesota who were not living with a smokefree law and 45% of those living with a previous smokefree law thought it was very hard for adults in their community to find a place to smoke in a restaurant. Regardless of the previous local law in their area, approximately 65% of young adults in Minnesota thought it was very hard for an adult to find a place to smoke in a restaurant after the statewide law went into effect. A similar increase was observed in the proportion of young adults who thought it was very hard for an adult to find a place to smoke in a bar.

Several of the sociodemographic characteristics examined were associated with changes in perceived opportunities to smoke in restaurants and bars/clubs over time

(Table 1). Significant covariate–time interactions were found for friend smoking and education for both restaurants and bars/clubs. Increases in perceived difficulty finding a place to smoke were higher after the statewide law was enacted among those who had close friends who smoked and participants not in college. A significant interaction was also found for race, with greater increases in the proportion of white participants reporting it being very hard for an adult to find a place to smoke in bars/clubs following implementation of the law.

Table 2 shows the results of the multivariate models examining the relationship between Minnesota's statewide smokefree law and the perception that it is very difficult for an adult to find a place to smoke in restaurants and bars, after controlling for potential confounders. Overall, similar proportions of participants, regardless of previous local policy, reported it was very hard for an adult to find a place to smoke in a restaurant and bar/club during the two time points prior to the statewide law (6–12 months prior and 0–6 months prior). After the statewide law, a greater proportion of Minnesota participants reported it was very hard for adults to find places to smoke in restaurants and bars/clubs.

Minnesota participants living without a previous local ordinance had over ten times the odds of reporting it being difficult for an adult in their community to find a place to smoke after the law in restaurants (OR=16.40, 95% CI=11.54, 23.29) and bars/clubs (OR=12.49, 95% CI=8.63, 18.07) compared to 6–12 months prior to the statewide law. After the statewide law, Minnesota participants living with a previous local ordinance had approximately two times the odds of reporting it was very hard for an adult in their community to find a place to smoke in restaurants (OR=2.71, 95% CI=2.09, 3.51) and bars/clubs (OR=2.55, 95% CI=1.78, 3.67), compared to 6–12 months before the statewide law. The increase in the proportion of Minnesota participants who reported it was very hard for an adult to find a place to smoke was greater among those participants who did not live with a local smokefree law previously, compared to those who did live with a policy prior to the statewide law for both restaurants ($F(2,4902)=28.87$, $p<0.0001$) and bars ($F(2,4888)=27.03$, $p<0.0001$). In contrast, the comparison group showed no change in the proportion of young adults reporting it was very hard for adults to find a place to smoke in their community before and after the statewide smokefree law was implemented.

The model was also used to directly examine whether perceptions among the comparison group differed from each Minnesota group (living with and without a previous local smokefree ordinance) before and after the statewide law went into effect (data not shown). Before the statewide law was implemented, a similar proportion of comparison

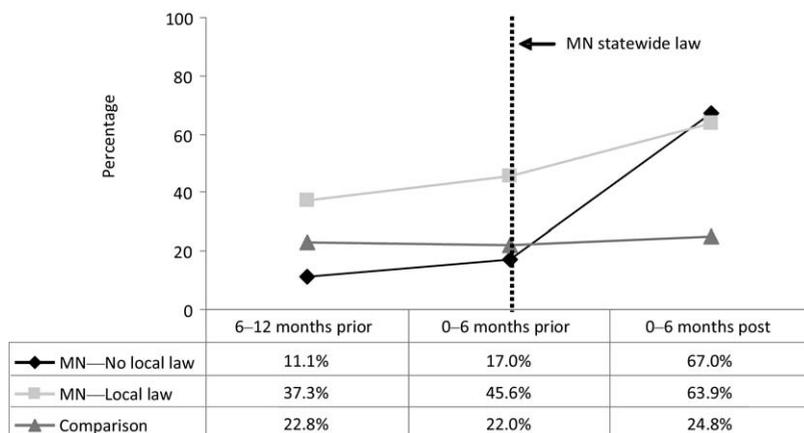


Figure 1. Proportion of participants who reported that it was very hard for an adult to find a place to smoke in a restaurant, by time and previous policy type MN, Minnesota

and Minnesota participants living without a previous local smoking ordinance reported it was very hard for adults to find a place to smoke. However, these groups differed significantly after the statewide law went into effect. After the statewide law, Minnesota participants living without a local smoking ordinance previously had 7.35 times the odds of thinking it was very hard for an adult to find a place to smoke in restaurants (95% CI=3.62, 14.93) and 15.50 times the odds for bars/clubs than participants in the comparison states (95% CI=9.33, 25.75). A greater proportion of Minnesota participants living with a local smoking ordinance previously, compared to the comparison states, indicated that it was very hard for adults in their community to find a place to smoke in restaurants and bars/clubs before and after the Minnesota statewide smokefree law was implemented.

their community to find places to smoke in restaurants and bars increased significantly. Reduced opportunities to smoke may be an initial step in changing norms and reducing smoking. Research on worksite smoking restrictions has consistently shown increases in the number of employees quitting or reducing the number of cigarettes smoked per day as a result of these laws.^{7,8} These findings suggest that smokers do not compensate for the cigarettes they would have smoked if smoking restrictions did not exist. Future research should directly examine whether reductions in perceived opportunities to smoke result in changes in actual smoking behavior.

Another goal of this study was to examine differential effects of Minnesota’s comprehensive smokefree law for those living with and without a previous local

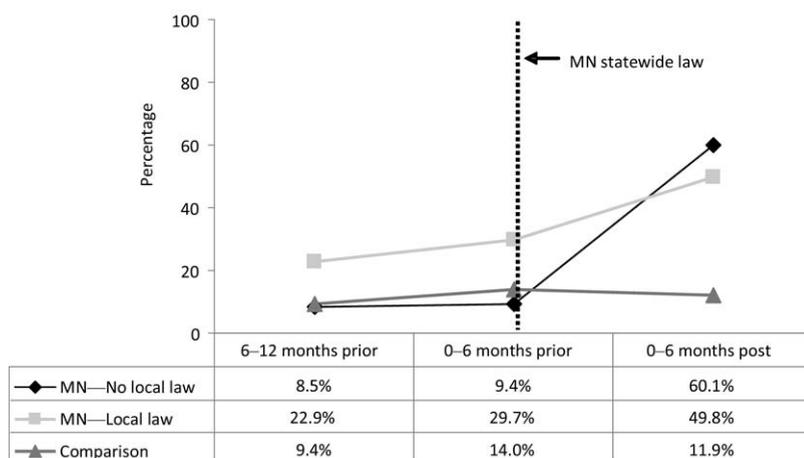


Figure 2. Proportion of participants who reported that it was very hard for an adult to find a place to smoke in a bar/club, by time and previous policy type MN, Minnesota

Discussion

The primary goal of this study was to assess the short-term effects of Minnesota’s comprehensive, statewide smokefree law on young adults’ perceived opportunities to smoke in restaurants and bars/clubs. Within 6 months of the implementation of the law, the proportion of young adults who believed it was very hard for adults in

their community to find a place to smoke increased among not only those living without a local smoking ordinance previously, but also those living previously with local smoking ordinances. It is notable that the question specifically asked about the difficulty adults in their community would have finding a place to smoke, and not adults in general. Thus, a greater pro-

portion of young adults indicated that adults in their community would find it very hard to find a place to smoke after the statewide law was implemented, although the law was essentially unchanged in their community.

There are several possible explanations for this finding. First, this may be the result of changes in smoking-related norms across the state due to the statewide law.^{5,9} Another possible explanation is that young adults became more aware of the law when the statewide law was implemented. Finally, adults in communities with local smokefree ordinances may frequent restaurants and bars/clubs in nearby communities that do not have local laws prohibiting smoking.¹⁰ In this case, actual opportunities to smoke may decrease as a result of the statewide smokefree law. Overall, the results suggest that it may be beneficial for a state to implement a comprehensive, statewide smokefree law, even if cities and counties within the state have passed local ordinances. These results suggest that a statewide smokefree law may provide additional benefits in communities with existing local laws. Future research may examine how the effects of statewide smokefree laws vary based on the percentage of the population previously covered by local smoking ordinances.

This study has several limitations that need to be considered when interpreting the results. First, the effects of a statewide smokefree law were examined within only a single Midwestern state, Minnesota. Thus, the effects may not be generalizable to other states. The sample was primarily white. While this matches the demographics of the state of Minnesota, the effects found in this study may not generalize to states with a different racial and ethnic composition. Another potential limitation is that while the cohort was designed to be representative of youth in Minnesota at its inception, the cohort may no longer be representative due to attrition that occurred during the 8-year study period. However, a large

Table 2. Multivariate results models examining relationship between Minnesota's law and difficulty finding a place to smoke^a

Time × previous local policy	Restaurants	Bars and clubs
	OR (95% CI)	OR (95% CI)
Minnesota—previous local ordinance	—	—
6–12 months prior	ref	ref
0–6 months prior	1.15 (0.90, 1.47)	1.11 (0.82, 1.50)
0–6 months post	2.71 (2.09, 3.51)	2.55 (1.78, 3.66)
Minnesota—no local ordinance	—	—
6–12 months prior	ref	ref
0–6 months prior	1.37 (1.04, 1.80)	0.86 (0.60, 1.23)
0–6 months post	16.40 (11.54, 23.29)	12.49 (8.63, 18.07)
Comparison	—	—
6–12 months prior	ref	ref
0–6 months prior	0.81 (0.67, 1.00)	1.29 (0.75, 2.22)
0–6 months post	0.96 (0.71, 1.31)	0.87 (0.40, 1.88)

^aModels included time and controlled for all significant main effects and interactions found in the bivariate analyses (shown in Table 1).

and diverse sample of young adults was drawn from a population-based cohort, which likely provides a more accurate assessment of the effect of the law than would have been obtained from other sampling methods.

Conclusion

This study suggests that a comprehensive, statewide smokefree law decreases young adults' perceived opportunities to smoke in restaurants and bars. Results show that perceived opportunities to smoke changed even among participants who were living with previous local smokefree ordinances that prohibited smoking in restaurants and bars. These findings suggest that statewide smokefree laws may provide additional benefits in communities with previous local laws. Thus, states with local smokefree ordinances may consider enacting comprehensive, statewide smokefree laws.

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