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Home Smoking Bans in an Urbanizing Community in China

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Abstract

Background—Secondhand smoke (SHS) is a major threat to public health worldwide. Previous studies have suggested that home smoking bans effectively reduce SHS exposure to nonsmokers in the home. In China, the world's largest tobacco producer and consumer, more than 540 million nonsmokers are exposed to SHS. However, to our knowledge, no published studies have examined the prevalence or correlates of home smoking bans in mainland China. This paper presents a quantitative study on home smoking bans in an urbanizing community in Shanghai, China.

Methods—In 2006, a cross-sectional survey based on probability sampling (N=243) was conducted in Changqiao, an urbanizing community in Shanghai, China. Interviews were conducted in person in Mandarin Chinese by trained interviewers. The behavioral ecologic model, which emphasizes the multilevel environmental contingencies of behavior, was applied as the theoretical model. Data were analyzed in 2008 using logistic regression to explore correlates of complete home smoking bans.

Results—In this community, only 26% of respondents reported having complete home smoking bans. Smoking respondents and families were less likely to have complete smoking bans in the home. Home smoking bans were positively associated with the perceived density of smoke-free homes in the community, and with the perceived likelihood of community reprimand for smoking in the home.

Conclusions—Home smoking bans were not widely adopted in this community in China. Future interventions should focus on the community and social environment in order to promote home smoking bans.

Introduction

Secondhand smoke (SHS; also known as environmental tobacco smoke) exposure can lead to a series of diseases,¹ including lung cancer and ischemic diseases,^{2,3} and is particularly hazardous to children.⁴ SHS has been declared a carcinogen by the U.S. Environmental Protection Agency (EPA).⁵ Exposure to SHS contributes to childhood asthma and other respiratory illnesses,^{6,7} childhood cancer,⁸ and sudden infant death syndrome.⁹ The primary location for SHS exposure for nonsmokers is in the home.^{10,11} Research in the U.S. and Australia has shown that home smoking bans (i.e., rules to restrict smoking in the household¹²) are effective in preventing smoking initiation,^{13,14} promoting quitting behaviors,^{15,16} and reducing nonsmokers' exposure to SHS.^{17–19}

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It is important to identify predictors of home smoking bans in order to develop interventions to increase the number of households with smoking bans.²⁰ Households are more likely to have complete home smoking bans if residents are nonsmokers,^{12,21–24} if residents are aware of the negative effects of SHS,^{22,25} and if children live in the home.^{20,25} In China, which is home to 350 million smokers,²⁶ more than 540 million nonsmokers are exposed to SHS, leading to 100,000 SHS-related deaths each year.²⁷ Despite the severity of the SHS epidemic in China,²⁸ there have been no studies designed to examine the prevalence or correlates of home smoking bans in China.

Ecologic models emphasize community-wide influences on health behavior.¹² The behavioral ecologic model (BEM) stems from respondent and operant principles of behavior. BEM emphasizes multilevel environmental factors that reinforce or suppress behavior.^{29,30} It is hypothesized that home smoking bans are more likely to be reinforced in an anti-smoking community environment and in homes with children or nonsmokers.

Methods

Study Design and Sampling

Located on the outskirts of Shanghai, Changqiao is an urbanizing district where traditional and modern culture coexist.³¹ Households from this district were selected to participate in the study using a multistage proportional random sampling design, based on residential addresses (subcommunity, street, building, unit). In each selected household, the adult (aged ≥ 18 years) whose birthday was closest to the interview date was invited to participate. The Changqiao Residents' Committee³² assisted investigators in contacting selected residents, scheduling interviews, and promoting voluntary participation with small financial incentives, which resulted in a high participation rate (90%). From April to June 2006, a total of 243 respondents completed face-to-face interviews in Mandarin Chinese. In 2007, the electronic survey database was transmitted from China with no information related to respondent identity. The San Diego State University IRB approved the protocol.

Measures

The survey instrument was designed in English by the authors and translated into Mandarin Chinese by investigators at Fudan University, China; it was back-translated by native Chinese speakers who were not involved in the English-to-Chinese translation. Interview questions included those related to sociodemographic characteristics; smoking behaviors; and individual, family, friend, and community influences on smoking.

Home smoking bans—The level of ban imposed in a home was measured by asking respondents which of the following statements they most agreed with: (1) *Smoking is always allowed anytime in the home*; (2) *Smoking is only allowed under certain conditions in the home*; or (3) *Smoking is not allowed anytime in the home*. Previous research suggests that complete home smoking bans, rather than partial bans, are more effective in preventing SHS in the home.^{33,34} Therefore, respondents' answers were dichotomized into complete home smoking bans if respondents chose statement (3) and partial/no home smoking bans if they chose statement (1) or (2). For the respondents with complete bans, questions were asked about how the bans were implemented and how often the bans were broken.

Smoking and SHS exposure—Respondents were classified as current smokers if they had smoked >100 cigarettes in their lifetime and currently smoked. Respondents were also asked to estimate the number of cigarettes they were exposed to at home on a typical day.

Household characteristics—Respondents reported the number of residents in the household and each resident's age, gender, relationship to the respondent, and smoking status. The total number of smokers in the household was calculated.

Influence of friends—The influence of friends on household smoking bans was measured by respondents' answers to the questions: *How many of your friends smoke—most, some, or few? and How many times have you received smoking-related gifts, such as cigarettes, lighters, or ashtrays?* Both variables were recoded dichotomously because of the skewness of the data.

Community influence—Two questions were asked to assess community influence on household smoking bans: *How many families in this community are smoke-free—none, few, some, most, or all? and In this community, how likely is someone to be reprimanded for smoking at home—very likely, somewhat likely, or not likely at all?* The first question was designed to measure the perceived density of smoke-free homes; the second was designed to measure the perceived likelihood of being reprimanded by the community for smoking at home. Answers were dichotomized into the two categories of very likely/likely and not likely at all because of the skewness of the data.

Data Analysis

Data were analyzed in 2008 using SPSS, version 14.0. Chi-square tests were performed to estimate the bivariate associations between home smoking bans and each variable of interest. Variables with $p < 0.15$ in bivariate analysis, and theoretically important variables (gender, children living in the home), were included in multiple logistic regression analyses. The following interactions were separately tested in logistic regression analysis: smoking status by children living in the home, smoking status by friend smoking, smoking status by reprimand, children living in the home by friend smoking, and children living in the home by reprimand.

Results

Sample Characteristics

The study sample ($N=243$) included 51% men and 49% women. The average age was 49 ± 14 years; 81% were married. Some 34% had a middle school education or lower, 49% had a high school diploma, and 17% had at least some higher education. About 40% were retired, 45% were employed, and 15% were unemployed. The average number of residents per household was 3 ± 1 . Nearly 28% of the respondents' monthly family incomes were below 1500 CNY (about US\$200); 45% were between 1500 CNY and 3000 CNY; and 27% were above 3000 CNY. The demographic characteristics of this sample resembled that of a previous representative sample ($N=1500$) in the same community.³¹

Seventy-five (61%) male respondents were smokers, including 57 (46%) current smokers and 18 (15%) former smokers. The average daily number of cigarettes smoked for current smokers was 15 ± 12 , based on 7-day recall. In contrast, only four (3%) female respondents reported having ever smoked, and 0% were current smokers. The differential prevalence was similar to national statistics (66% for men, 3% for women).²⁶

Home Smoking Bans

Descriptive statistics—Only 26% of the respondents had complete home smoking bans ($n=63$). Among them, 68% reported the bans were often/sometimes broken ($n=43$). The most frequently used methods for ban implementation were nonverbal family agreement (28.6%); verbal communication of bans (27.0%); and verbal communication of residents' health concerns (25.4%). Families with complete home smoking bans were less likely to report SHS exposure in the home ($p < 0.001$).

Bivariate analyses—The following variables showed significant bivariate associations with complete home smoking bans (Table 1): respondent's age, respondent's smoking status, the number of smokers in the household, the proportion of friends who smoked, receipt of smoking-related gifts, community reprimands for smoking at home, and perceived density of smoke-free homes in the community.

Logistic regression analysis—The final logistic regression model (Table 2) had an overall Nagelkerke $R^2=0.55$, and an adequate goodness-of-fit, based on Hosmer and Lemeshow's goodness-of-fit test (chi-square=2.77, df=8, $p=0.948$). After adjusting for other variables in the model, older age was slightly but significantly associated with fewer complete home smoking bans (OR=0.94, 95% CI=0.91, 0.97). Current smokers were much less likely to have complete home smoking bans (OR=0.13, 95% CI=0.03, 0.58). The more smokers there were living in a home, the less likely that household was to have a complete home smoking ban (OR=0.15, 95% CI=0.05, 0.42). Respondents who reported community reprimands for smoking in the home were more likely to have complete home smoking bans (OR=3.92, 95% CI=1.35, 11.38). Perceived density of smoke-free homes in the community was positively associated with complete home smoking bans (OR=2.00, 95% CI=1.53, 2.64). Respondents who had not received smoking-related gifts, had children living in the home, or had few friends who smoked were marginally ($0.05 < p < 0.15$) more likely to have complete home smoking bans. None of the interactions was significant.

Discussion

In Changqiao, an urbanizing area in Shanghai, the prevalence of complete home smoking bans was 26%, much lower than the prevalence among Chinese Americans.²² An association was found between smoking status and home smoking bans, replicating previous findings in other populations.^{12,21,25} According to the BEM, household characteristics, such as the number of residents who smoke, exert proximal influence on home smoking bans through social reinforcement or punishment from residents in the home.

Previous studies in various ethnic groups in the U.S. found that households with children were more likely to have home smoking bans.^{12,25,35} In the current sample in China, this association was only marginally significant. Possible explanations are lack of parental awareness or concern about the negative effects of SHS on children, less-established social norms for protecting children from SHS, and a traditional Chinese culture that reinforces obedience and prevents children from disagreeing with or complaining to parents about smoking in the home.

The significant association between having friends who smoke and home smoking bans has provided partial confirmation of the BEM, in which smoking behavior among friends serves as both a prompt and reinforcement for an individual's smoking behavior. This finding replicates previous findings from the U.S.^{35,36}

Two variables related to community environment—perceived likelihood of community reprimand and perceived density of smoke-free homes—were significantly associated with home smoking bans. Previous studies found that social reprimand/criticism of smoking was associated with low smoking prevalence among Mexican and Korean-American populations.^{12,37} According to the BEM, community reprimands serve as a marker for probable socially punitive consequences that occur when an individual is smoking. It is plausible to suggest that reprimands for smoking in the home may lead to decreased smoking in the home, and eventually to complete home smoking bans. Reprimands can also be seen or heard by family visitors, and be modeled. The health and social benefits for those who adopt home smoking bans may prompt others to do the same. Overall, social consequences can exert cumulative effects on social norms regarding smoking in the community. Future studies should examine

such hypothetical cumulative relationships and the specific impact of reprimands from various sources, such as family members, friends, and strangers.

In this study, the enforcement of home smoking bans was assessed. Various methods were used by responding families to implement home smoking bans, but none resulted in complete enforcement. A ban that is often broken cannot be effective, so future studies should examine correlates of home smoking ban enforcement.

This study could be improved by adding objective measures of SHS in homes. It has been found that 12% of families in the U.S. provided inconsistent reports of home smoking bans,³⁸ implying that individuals within one household might have differing opinions about smoking bans in the home. This finding could also be true in China and may have affected the results of the current study. Future studies should include reports from more than one resident in the home, and use objective measures of SHS levels (e.g., air dosimeter readings) when resources permit.

Previous studies have suggested different correlates of home smoking bans for smokers and nonsmokers.³⁵ Theoretically, smoking bans for nonsmokers' and smokers' families have different functions: for the former, bans are established for visitors; for the latter, bans are for both residents and visitors. In the current study, few families with smokers had smoking bans; the lack of variance made stratified analysis impossible. Future studies with larger samples are recommended.

The current study was the first to explore correlates of home smoking bans in mainland China. The prevalence of home smoking bans was low, especially among families with smokers. Home smoking bans should be promoted in order to reduce and eliminate SHS among 540 million exposed Chinese nonsmokers.

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Table 1

Complete home smoking bans by selected characteristics (N=243)

Characteristic	Complete bans <i>n</i> ^a (%)	<i>p</i> ^b
Age (years)		0.005
18–39	55 (41.8)	
40–59	125 (24.0)	
60–79	63 (15.9)	
Marital status		0.446
Married	196 (25.5)	
Single/divorced/widowed	47 (27.7)	
Gender		0.161
Male	123 (22.8)	
Female	120 (29.2)	
Educational level		0.711
Middle school or lower	83 (25.3)	
High school or equivalent	118 (24.6)	
Higher education	42 (31.0)	
Monthly family income (CNY)		0.178
0–1499	68 (26.5)	
1500–2999	108 (30.6)	
3000+	67 (17.9)	
Employment status		0.937
Retired	97 (24.7)	
Currently employed	108 (26.9)	
Unemployed	36 (25.0)	
Children (aged <18 years) living in home		0.168
Yes	90 (30.0)	
No	153 (23.5)	
Currently smokes		<0.001
Yes	59 (5.1)	
No	184 (32.6)	
Number of smokers in the household		<0.001
0	159 (34.0)	
1	73 (11.0)	
2+	11 (9.1)	
Friends smoke		<0.001
Most friends	62 (9.7)	
Some/few friends	177 (31.6)	
Receives smoking-related gifts^c		0.005
Yes	75 (14.7)	
No	168 (31.0)	
Community reprimand for smoking in the home		0.002
Very likely/likely	175 (30.9)	

Characteristic	Complete bans <i>n</i> ^a (%)	<i>p</i> ^b
Not likely	64 (12.5)	
Density of smoke-free homes in the community		<0.001
None/few	81 (7.5)	
Some	38 (34.2)	
Many	120 (50.6)	

^a Some variables do not total 243 because of missing values.

^b Based on chi-square test

^c Includes cigarettes, lighters, ashtrays, and all other smoking-related items

Table 2

Associations of selected characteristics with complete home smoking bans in logistic regression (N=235)

Characteristic	Standardized β	OR (95% CI) ^a	p
Age (years)^b	-0.059	0.94 (0.91, 0.97)	<0.001
Gender			0.558
Male		ref	
Female	0.287	1.33 (0.51, 3.48)	
Currently smokes			0.008
Yes	-2.067	0.13 (0.03, 0.58)	
No		ref	
Number of smokers at home^b	-1.912	0.15 (0.05, 0.42)	<0.001
Children living in home			0.107
Yes	0.680	1.98 (0.86, 4.51)	
No		ref	
Friends smoke			0.072
Most friends	-1.090	0.34 (0.10, 1.10)	
Some/few friends		ref	
Receives smoking-related gifts			0.072
Yes	-0.940	0.39 (0.14, 1.09)	
No		ref	
Community reprimand for smoking in the home			<0.001
Very likely/likely	1.366	3.92 (1.35, 11.38)	
Not likely		ref	
Density of smoke-free homes in the community^b	0.698	2.00 (1.53, 2.64)	<0.001

^a OR and 95% CI for complete home smoking ban, adjusted for other variables in table^b Participant age, number of smokers at home, and density of smoke-free homes in the community were analyzed as continuous variables in the model.