Factors Influencing Adoption of and Adherence to Indoor Smoking Bans Among Health Disparity Communities

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Objectives. We assessed current home smoking behaviors and secondhand smoke (SHS) levels among parents of children in low-income, racial/ethnic minority communities in Massachusetts.

Methods. We used a cross-sectional design to assess home smoking rules, smoking status, cigarettes smoked in the home, and barriers and benefits to attaining a smoke-free home among 138 caregivers (mean age = 30.0 years; 92% women) of children aged 0 to 6 years, between April 2010 and September 2012. Indoor SHS was assessed using a nicotine dosimeter.

Results. Households with no ban reported a higher weekly mean number of cigarettes smoked in the home (114 cigarettes/week) than homes with partial (71 cigarettes/week) or complete (30 cigarettes/week) bans ($P < .01$). Smoking occurred outside more than inside homes with partial or complete bans. Air nicotine levels were positively associated with no household smoking ban, current smoking by the caregiver, and smoking indoors.

Conclusions. Strategies to reduce home SHS should focus on a "complete" home smoking ban and smoking cessation. SHS mitigation strategies such as smoking outside were associated with lower SHS among participants unable to maintain a complete ban, and might enhance the likelihood of longer term success while immediately reducing home SHS. (*Am J Public Health.* 2014;104: 1928–1934. doi:10.2105/AJPH.2013.301735)

Secondhand smoke (SHS) exposure is associated with serious pediatric illnesses, yet is entirely preventable.[1] Children's exposure to SHS occurs chiefly in domestic environments, including the home and car.[2,3] SHS exposure varies by income, race, and parental education,[4] and the likelihood of exposure to SHS tends to be higher among African American and low socioeconomic status (SES) groups.[5] Children from low-income backgrounds are at greater risk for SHS exposure and share a disproportionate burden of disease.[6–8] Young children (aged 6 years and younger) from lower SES communities are 3 times more likely to be exposed to the highest levels of SHS in the home (≥ 4 days/week) as children from middle- and high-income groups.[9] Recent data indicate that the percentage of households with a voluntary smoke-free rule has risen nationwide.[3,10] In 1995, approximately 58% of homes in the United States were reportedly smoke-free, whereas more recent data suggest that this percentage now approaches 84%.[11] This figure may be higher in homes in which children are present.[10] Despite the increase in smoke-free homes, children's cotinine levels (an index of SHS exposure) have remained steady since 2000.[12] This may be explained, in part, by incomplete or diminishing adherence to self-imposed home smoking bans. However, little research has been conducted to understand the factors associated with implementation and adherence to home smoking bans, including facilitators and barriers to the maintenance of a smoke-free home.

Although efficacious interventions to help families establish smoke-free home rules have been widely reported,[13] strategies to tailor those interventions to the needs of low-income and minority race/ethnicity communities have so far been limited.[14,15] Complete home smoking bans are associated with lower SHS[16,17]; however, a better understanding is needed of current home smoking behaviors and attitudes among parents of young children in low-income minority communities. Such questions might appropriately be posed in Massachusetts—a state in which the prevalence of children's exposure to SHS in the home ranks well below the median of US states,[4] yet where public health efforts have so far failed to provide protection from SHS exposure for 4.3% (an estimated 61 000) of Massachusetts children.[4,18] Nevertheless, it is possible that microlevel changes directed at mitigating SHS exposure have occurred within homes that have not become completely smoke-free. Limiting the number of cigarettes smoked inside a home may directly reduce SHS,[17] which, in turn, may influence children's exposure to SHS.[8] Behavioral strategies intended to mitigate SHS exposure, such as smoking outdoors, may be an underinvestigated (albeit suboptimal)[19] strategy used in households where a ban has either not been implemented or successfully maintained.

To more fully understand home smoking practices among communities of low income and racial and ethnic diversity, we sought to identify who adopted and who adhered to a voluntary home smoking ban, the barriers and perceived benefits to adherence, and the impact of those bans on home smoking behaviors (including mitigation strategies), using a cross-sectional study design. In addition, the number of smokers in the household, their age, race and ethnicity, the number and location (within the home or attached external structure) of cigarettes smoked, and strategies employed to reduce SHS exposure were documented. Finally, indoor air quality was measured by nicotine levels to characterize factors associated with home SHS levels.

METHODS

"Breathe Free for Kids" is a community-based research program whose purpose is to evaluate the effectiveness of an intervention that uses motivational interviewing to promote the adoption and implementation of a home smoking ban. The study was conducted in 3 high health disparity geographic areas in

Massachusetts, based in the cities of Boston, Lawrence, and Worcester. We used a community-based participatory research paradigm[20] to collaborate with community health coalitions in each city to develop and evaluate the intervention. Baseline data from that study, collected from April 2010 to September 2012, are presented here. A community health worker (CHW) met with eligible participants to complete informed consent, conduct the survey, and place air nicotine monitors in the home. Nicotine monitors were retrieved by the CHW 1 week later. A $30 participation incentive was provided.

Participants

Participants were custodial parents or primary caregivers of young children. They were eligible for inclusion if there was a child younger than 6 years living in the home and the caregiver reported that smoking occurred in or around the home. Participant smoking was not an eligibility criterion.

Initial recruitment efforts were focused on enrollees in the state-funded Early Intervention and Healthy Families programs in each of the 3 cities. Potentially eligible participants were identified using a brief screening checklist by their case worker, and invited to receive further information about the study before enrollment. Participants were also recruited from the wider community by advertising with organizations such as Head Start and community health centers that served families with young children. In homes with more than 1 child, the "index child" was the one either enrolled in Early Intervention or Healthy Families programs, or the youngest child.

Measures

Demographics. We obtained participants' gender, age, race (Black, White, or "other," which included Asian, Native American, and mixed race) and ethnicity (Hispanic or non-Hispanic), highest educational level completed (a proxy for socioeconomic position),[21] and employment status using a structured survey.

Participant smoking history and home smoking behavior. We measured home smoking rules using the following definitions: complete ban (no smoking allowed anywhere at any time), partial ban (smoking allowed in a limited area and or on limited occasions), or no ban (smoking allowed anywhere, at any time). We obtained participants' current smoking status (self-reported smoking in the past 30 days) and self-reported number of cigarettes smoked in the past week. If at least 1 cigarette was reported, the location of smoking in the home, including attached external structures, such as a porch or front steps, was recorded. Participants also provided an estimate of the number of cigarettes and location of smoking in or around the home by other household members and visitors to the home. Finally, participants were asked about strategies used to reduce SHS. Such mitigation strategies included smoking on an attached structure such as a porch or balcony, smoking inside near a window, or using a fan to blow smoke outside. Smoking rules and behavior in cars were assessed among participants with a car in which the child regularly traveled.

Perceived barriers and benefits to a smoke-free home. Using a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree), participants rated 11 suggested benefits and barriers to making a smoke-free home. Items that addressed potential benefits included a no smoking rule in the home would be a good thing for my child's health; lessen risk of fires or accidental burns; feel less guilty and worried; help home feel cleaner and smell better; and a no smoking rule in the home would help smokers smoke less. Items that addressed barriers included it is a hassle to go outside to smoke, only 1 adult to watch children, embarrassing for smoker to smoke outside, cause conflict, and it would be disrespectful to ask others not to smoke inside. Survey questions on the barriers and benefits of making a smoke-free home were developed during the pilot testing phase of the study. Consultation with our partners in community health agencies produced an initial candidate list of items. The face validity of the final subset of 11 questions was confirmed using open-ended questions via 2 standardized qualitative interviews. Interviews were conducted by a trained interviewer with participant families who met study eligibility criteria.

Indoor air quality. We assessed indoor air quality using a measure of airborne nicotine concentration. Passive sampling dosimetry was found to be an effective and relatively unobtrusive means of gathering data about nicotine concentrations.[19,22] Passive diffusion monitors were used to collect vapor-phase nicotine onto a sodium bisulfate-treated filter. Nicotine levels were analyzed at the University of California, Berkeley, using gas chromatography/mass spectroscopy.[23] One passive nicotine monitor was placed in the living room and the identified child's bedroom of each household for 1 week immediately after baseline survey collection.

Data Analysis

We conducted analyses to (1) describe the characteristics of the sample, (2) describe the smoking behavior and the current home smoking rule (never, sometimes, always allowed), and (3) describe the multivariable predictors of SHS levels in the home. For conditions (1) and (2), we used bivariate analyses (*t*-test and likelihood ratio χ^2 test). We used the Pearson χ^2 test (G^2) when small cell sizes precluded use of the likelihood ratio test. For condition (3), we analyzed bivariate and multivariable models of household nicotine levels. We included variables with a $P < .1$ in the bivariate analyses in successive multivariable models. Data were analyzed using SYSTAT 13 (Systat Software, San Jose, CA). A 2-sided P value $< .05$ was considered statistically significant.

RESULTS

We obtained data from 138 parents or caregivers who enrolled in the Breathe Free for Kids study. Participants were mostly women (91%), and ethnically and racially diverse (32% Hispanic; 43% non-Hispanic or non-White). One third (36%) of participants were unemployed and looking for work, and 57% had a high school education or less. Parents or caregivers who were referred to the study through traditional early childhood agencies (n = 92) differed from self-referred participants (n = 46) in several ways: they were younger ($t[133] = 2.26$; $P = .025$), had younger children ($t[136] = 3.45$; $P = .001$), and were more likely to be Hispanic and less likely to be Black ($\chi^2_{(3)} = 12.76$; $P = .005$). There were no differences between agency and self-referred participants on other demographic characteristic variables (Table 1).

TABLE 1—Demographic Characteristics by Referral Source: Factors Influencing Adoption of and Adherence to Indoor Smoking Bans, Massachusetts, April 2010–September 2012

Characteristics	Agency Referred (n = 92), No. (%) or Mean ±SD (Range)	Self-Referred (n = 46), No. (%) or Mean ±SD (Range)	Total (n = 138), No. (%) or Mean ±SD (Range)
Participant age, y*	28.7 ±9.5	32.8 ±11.1	30.0 ±10.1
Child age, mo**	20.5 ±13.3 (1.8-59.6)	31.2 ±23.2 (2.5-73.0)	24.1 ±17.9 (1.8-73.0)
Female gender	85 (92.4)	40 (87.0)	125 (90.6)
Race/ethnicity*			
Hispanic	35 (38.0)	9 (19.6)	44 (31.9)
Non-Hispanic/White	25 (27.2)	10 (21.7)	35 (25.4)
Non-Hispanic/Black	15 (16.3)	20 (43.5)	35 (25.4)
Non-Hispanic/other	17 (18.5)	7 (15.2)	24 (17.4)
Language			
English	63 (68.5)	40 (87.0)	103 (74.6)
Spanish	15 (16.3)	3 (6.5)	18 (13.0)
English and Spanish	5 (5.4)	2 (4.3)	7 (5.1)
Other	9 (9.8)	1 (2.2)	10 (7.2)
Highest level of education			
< high school	21 (22.8)	9 (19.6)	30 (21.7)
High school/GED	35 (38.0)	14 (30.4)	49 (35.5)
Some college	27 (29.3)	20 (43.5)	47 (34.1)
College graduate	9 (9.8)	3 (6.5)	12 (8.7)
Employment status			
Not employed/not looking	32 (34.8)	9 (19.6)	41 (29.7)
Unemployed/looking	32 (34.8)	18 (39.1)	50 (36.2)
Part-time employed	22 (23.9)	12 (26.1)	34 (24.6)
Full-time employed	6 (6.5)	7 (15.2)	13 (9.4)
Household size			
< 3	41 (44.6)	21 (45.7)	62 (44.9)
3-4	27 (29.3)	17 (37.0)	44 (31.9)
5-6	21 (22.8)	6 (13.0)	27 (19.6)
> 6	3 (3.3)	2 (4.3)	5 (3.6)

Note. GED = general equivalency diploma.
*$P < .05$; **$P \leq .001$.

Home Smoking Behavior and Participant Smoking History

The current home smoking status of participants was categorized as no ban (9%), partial ban (55%), or complete ban (36%; Table 2). More than half of the participants (55%) were current smokers. Among current smokers, 71% smoked 10 or fewer cigarettes per day and 28% did not smoke daily. Seventy-one percent of smokers had made at least 1 quit attempt in the past 12 months, and 54% had made up to 3 quit attempts in the past year.

Nearly 40% of homes had 2 or 3 household smokers (including participants who were smokers). Partial or no home smoking bans tended to be more common in homes where the participant was a smoker (72%) compared with when the participant was a nonsmoker (53%), although the difference did not reach statistical significance ($P = .073$). Of participants with a car in which the child regularly traveled (n = 94), 32% allowed smoking in the car always or sometimes, and 26% reported smoking in the car while a child was present.

Of the participants who reported a complete ban, 43% occasionally or regularly deviated from the ban: 6.1% reported that the ban was broken "most days," 18.3% reported deviating from the ban "at least once a week," 8.2% "at least once a month," and 10.2% "less than once a month." The most cited exceptions to a complete ban were "smoking allowed in certain rooms" (28.4%), "smoking allowed when no children present" (26.6%), "smoking allowed if the weather makes it uncomfortable to go outside" (13.8%), "smoking allowed at certain times of the day" (10.1%), and "smoking allowed on special occasion" (9.1%). Fewer than 10% of participants had not previously considered implementing a smoking ban in the home. Participants who were referred from an agency were less likely to break a home smoking ban in the past 6 months than those who were self-referred ($\chi^2[1] = 5.1$; $P = .024$).

Participants from homes with no ban reported a significantly greater number of cigarettes smoked in the home by any person (114 cigarettes/week) compared with homes with a partial ban (71 cigarettes/week) and complete ban (30 cigarettes/week; $F[2,134] = 5.04$; $P = .008$). Participants from homes with a complete ban were less likely to be Black, and more likely to be Hispanic ($G^2[6] = 16.7$; $P = .01$). Participants from homes with no ban were also more likely to have no rule about smoking in the car ($\chi^2[2] = 8.8$; $P = .012$), and participants from homes with partial or no home smoking bans were more likely to smoke in the car with a child present than participants with a complete home smoking ban ($\chi^2[2] = 28.7$; $P < .01$; Table 2).

Perceived Barriers and Benefits to a Smoke-Free Home

Participants offered limited endorsement (disagreed or neither agreed nor disagreed) for suggested barriers to establishing a smoke-free home. Agreement with 2 suggested barriers differed according to participants' home smoking ban status. These items, "a hassle to smoke outside" ($F[2,134] = 4.56$; $P = .012$) and "no one to watch child" ($F[2,133] = 3.91$; $P = .022$) were cited as a bigger concern among homes with a partial ban. By contrast, participants endorsed (agreed or strongly agreed with) all 5 of the suggested benefits of a smoke-free home, with "child's health" as the highest rated benefit, followed by "home would smell better." No differences in agreement or disagreement were observed among the suggested benefits based on the home smoking rule.

TABLE 2—Home Smoking Rules: Factors Influencing Adoption of and Adherence to Indoor Smoking Bans, Massachusetts, April 2010–September 2012

Variable	No Ban, No. (%) or Mean ±SE	Partial Ban, No. (%) or Mean ±SE	Complete Ban, No. (%) or Mean ±SE	Total, No. (%) or Mean ±SE
Group total	12 (8.8)	75 (54.7)	50 (36.5)	137 (100)
Current smoker				
Yes	7 (58.3)	47 (62.7)	21 (42.0)	75 (54.7)
No	5 (41.7)	28 (37.3)	29 (58.0)	62 (45.3)
Race/ethnicity*				
Hispanic	4 (33.3)	17 (22.7)	22 (44.0)	43 (31.4)
Non-Hispanic White	3 (25.0)	18 (24.0)	14 (28.0)	35 (25.5)
Non-Hispanic Black	4 (33.3)	27 (36.0)	4 (8.0)	35 (25.5)
Non-Hispanic other	1 (8.3)	13 (17.3)	10 (20.0)	24 (17.5)
Other household members smoke				
Yes	9 (75.0)	30 (40.0)	22 (44.0)	61 (44.5)
No	3 (25.0)	45 (60.0)	28 (56.0)	76 (55.5)
Rule about smoking in car*				
Yes	2 (16.7)	38 (50.7)	24 (48.0)	64 (68.1)
No	6 (50.0)	18 (24.0)	6 (12.0)	30 (31.9)
Smoke in car with child**				
Yes	6 (50.0)	18 (24.0)	4 (8.0)	28 (29.8)
No	2 (16.7)	38 (50.7)	26 (52.0)	66 (70.2)
Cigarettes/wk smoked by anyone**	113.8 ± 38.5	71.4 ± 12.3	29.5 ± 8.2	59.5 ± 8.3

Note. The sample size was n = 137.
*$P < .05$; **$P < .01$.

Adherence to Home Smoking Rules and Location of Smoking

Self-reported location of smoking was examined by smoking ban status (Table 3). Participants from homes with partial or no bans were more likely to report smoking "everywhere," and more likely to report smoking in internal locations, such as the living or family room and bedrooms, than in external locations ($G^2[4] = 26.7$; $P < .001$). In homes with a complete ban, participants, household members, or visitors were more likely to smoke on external structures, such as a porch or the exterior front or back steps compared with interior locations. Among households with a partial ban, smoking occurred with similar frequency in internal and external locations.

Participants used multiple strategies to reduce secondhand exposure, including restricting smoking to certain rooms or areas (22%) or smoking only when children were not present (21%). A smaller proportion of participants reported that smoking was permitted for special occasions (8%) or when smokers visited (7%).

Indoor Air Quality

Nicotine dosimeter measurement revealed low-to-moderate levels of SHS in the living room, with lower mean levels detected in the index child's bedroom. For both living room and child's bedroom, bivariate analyses revealed that several variables predicted household nicotine levels, including number of cigarettes smoked weekly, number of smokers, home smoking rule, smoking status of the parent, place of smoking (inside or outside), and race/ethnicity. Of these predictors, multiple regression analyses revealed that 3 variables independently predicted household nicotine levels: home smoking rule, smoking status of the participant, and location of smoking ($P < .01$). The separate models for nicotine levels in the living room and the child's bedroom were similar. Table 4 shows results of bivariate and multiple regression analyses of dosimeter data from each room.

DISCUSSION

The data revealed a detailed picture of cigarette use in the domestic environments of young children from racially and ethnically diverse, low-income communities. Almost half of the households had at least 2 smokers, and a mean of 60 cigarettes was smoked across all households per week. Almost half of the participants reported having previously attempted, without success, to implement a smoke-free home rule. A further one quarter of participants reported a desire to attain a smoke-free home, but had not made a previous attempt. Of participants who had a car, almost one third did not have a car no-smoking rule, and a similar proportion reported smoking in the car while the child was present.

Several factors were negatively associated with efforts to establish a smoke-free home, including smoking status, race, and ethnicity. Caregivers who were current smokers were less likely to have tried to establish a smoking ban, more likely to have a partial ban or no ban, and more likely to have 2 or 3 other smokers as household members. Black participants were less likely, and Hispanic participants more likely, to report a complete smoking ban. Home smoking ban status was associated with several outcomes that were likely to increase children's exposure to SHS in other locations. Participants with a partial ban were more likely than participants with a complete ban to allow smoking in the car and to smoke in a car in which a child was present. Self-reported number of cigarettes smoked in the home per week was greatest among homes with no ban and least among homes with a complete ban. Further, a smoking rule was independently associated with the living room and the child's bedroom air nicotine levels, with the highest levels seen among homes with no ban.

In previous research, home smoking bans were assessed by asking whether smoking was allowed always, sometimes, or never.[16] It was critical to the understanding of the true home smoking behavior in this study to include detailed questions about when smoking bans were not followed and locations of smoking. The data revealed that 43% of the participants who reported having a complete ban were not always able to adhere to the ban. Although

TABLE 3—Number and Percent of All Persons Who Smoked by Location: Factors Influencing Adoption of and Adherence to Indoor Smoking Bans, Massachusetts, April 2010–September 2012

Location	No Ban (n = 12), No. (%)	Partial Ban (n = 75), No. (%)	Complete Ban (n = 50), No. (%)	Total (n = 137), No. (%)
Everywhere	6 (50.0)	5 (6.7)	0 (0)	11 (8.0)
Internal				
Living/family room	6 (50.0)	21 (28.0)	2 (4.0)	29 (21.2)
Kitchen	6 (50.0)	23 (30.7)	3 (6.0)	32 (23.4)
Participant's bedroom	6 (50.0)	18 (24.0)	1 (2.0)	25 (18.2)
Child's bedroom	0 (0)	0 (0)	0 (0)	0 (0.0)
Other bedroom	2 (16.7)	8 (10.7)	1 (2.0)	11 (8.0)
Bathroom	3 (25.0)	29 (38.7)	7 (14.0)	39 (28.5)
Dining room	0 (0)	8 (10.7)	2 (4.0)	10 (7.3)
Basement	0 (0)	2 (2.7)	5 (10.0)	7 (5.1)
External				
Attached porch	2 (16.7)	26 (34.7)	24 (48.0)	52 (38.0)
Attached patio	0 (0)	4 (5.3)	2 (4.0)	6 (4.4)
Attached garage	0 (0)	0 (0)	0 (0)	0 (0.0)
Attached balcony	0 (0)	3 (4.0)	3 (6.0)	6 (4.4)
Front/back exterior steps	0 (0)	19 (25.3)	18 (36.0)	37 (27.0)
Hallway outside apartment	0 (0)	11 (14.7)	7 (14.0)	18 (13.1)
Building stairwell	0 (0)	7 (9.3)	5 (10.0)	12 (8.8)
Building lobby	0 (0)	2 (2.7)	1 (2.0)	3 (2.2)
Other	0 (0)	13 (17.3)	7 (14.0)	20 (14.6)

those with a complete ban were more likely to report smoking outside, in or around attached structures, they also reported smoking in the kitchen, bedroom, and bathroom when probed for additional details of smoking locations.

Although these data revealed a significant public health problem, low-income minority household caregivers had nonetheless taken several important self-initiated steps to reduce SHS in their homes. A substantial proportion of participants reported smoking on an external structure attached to the home, such as a porch or balcony, front or back steps, and hallway or entryway. However, evidence suggested that smoking immediately outside the home might continue to allow SHS exposure through reintroduction or infiltration of SHS.[19] Participants with a complete ban were more likely to smoke outside the home, such as in or around external structures, than participants with partial or no bans. The most cited locations inside the home were the living or family room, parent's bedroom, kitchen, and bathroom. Although there were no reports of active smoking in the child's bedroom, nicotine dosimeter analysis revealed detectable levels, which might have been attributable to infiltration of SHS from other rooms or outside.

Three factors were independently associated with household air nicotine level, which was a critical pathway in children's exposure to SHS.[19,24,25] Adoption of a complete ban, participant nonsmoking status, and smoking outside were associated with lower air nicotine levels. These factors were all suitable targets for behavioral or motivational interventions. Thus, 3 primary goals should be considered in interventions seeking to assist parents in reducing household SHS: (1) establish a complete ban, (2) encourage and facilitate smoking cessation, and (3) ensure that smoking only occurs outside. Although smoking in any location anywhere close to the home allows the potential for SHS to enter the child's environment,[19] the present data suggest that there might be a benefit in encouraging parents to smoke on external structures rather than inside, in cases where a complete ban could not be accomplished.

Study Limitations

Our conclusions from this study were tempered by several limitations in the research design and methods. In particular, our cross-sectional design limited conclusions on the direction of reported relationships, such as between home smoking rules and associated factors. Although our study sample was drawn from 3 discrete urban locations, participants might have self-selected based on their interest in receiving an intervention to help establish a smoke-free home. Investigation among a non–treatment-seeking sample might have revealed a somewhat different picture of home smoking rules and behaviors. It was possible that frequency and intensity of indoor smoking behavior was even greater among families who had not considered establishing smoke-free rules. Finally, children's SHS exposure, as indexed by cotinine, might have provided the most informative data on the impact of smoke-free homes rules, but data were not available for the present analyses.

Conclusions

These findings suggest that attainment of a smoke-free home presents a considerable challenge, and that programs of assistance are needed in communities such as the low-income minority race/ethnicity communities in our study. In contrast to the smoking cessation field, there were no readily available data that might have informed us as to what factors predicted a successful outcome of smoke-free home interventions. To provide better interventions in the future, it will be important to gain a better understanding of factors that lead to "relapse" of smoke-free rules and to develop appropriate relapse prevention[26] strategies. The observation of 3 distinct categories of home smoking rules, with associated implications for smoking behavior and indoor air quality, might also provide an opportunity to tailor future interventions. The fact that a substantial proportion of parents attempted to establish a smoke-free home, and only a small minority (< 10%) of parents had never previously considered a smoke-free home rule is encouraging. Future research should determine whether interventions designed to enhance motivation to change are more suited to families with a no smoking ban, whereas specific skills-based relapse prevention strategies might be appropriate

TABLE 4—Predictors of Household Air Nicotine Levels: Factors Influencing Adoption of and Adherence to Indoor Smoking Bans, Massachusetts, April 2010–September 2012

Characteristic	Bivariate *P*	Multivariable Model[a] *P*	Multivariable Model[a] Mean (95% CI)
Living room			
Total cigarettes smoked/wk (all)	< .01		
Total smokers in household (range = 0–3)	< .01		
Home smoking rule	< .01		
No ban			0.69 (0.22, 2.20)
Partial ban			0.12 (0.06, 0.23)
Complete ban			0.11 (0.06, 0.19)
Current smoker	< .01	< .01	
No			0.12 (0.06, 0.23)
Yes			0.35 (0.19, 0.67)
Location of smoking	< .01	< .01	
No smoking			0.07 (0.02, 0.23)
Outside only			0.20 (0.10, 0.41)
Indoors (with or without outdoor locations)			0.69 (0.44, 1.09)
Participant age, y	.16		
Age of child, mo	.46		
Household size	.09		
Education level[b]	.09		
Race/ethnicity[c]	.05		
Child had ≥ 1 health problem in past 6 mo (yes or no)	.24		
Child's bedroom			
Total cigarettes smoked/wk (all)	< .01		
Total smokers in household (range = 0–3)	< .01		
Home smoking rule	< .01	< .01	
No ban			0.38 (0.13, 1.10)
Partial ban			0.08 (0.04, 0.14)
Complete ban			0.08 (0.05, 0.13)
Current smoker	< .01	< .01	
No			0.07 (0.04, 0.12)
Yes			0.27 (0.15, 0.48)
Location of smoking	< .01	< .01	
No smoking			0.06 (0.02, 0.17)
Outside only			0.13 (0.07, 0.24)
Indoors (with or without outdoor locations)			0.32 (0.21, 0.48)
Participant age, y	.02		
Age of child, mo	.04		
Household size	.26		
Education level[b]	.13		
Race/ethnicity[c]	.01		
Child had ≥ 1 health problem in past 6 mo (yes or no)	.77		

Note. CI = confidence interval; GED = general equivalency diploma.
[a]For the living room multivariable model, $R^2 = 0.33$; for the child's bedroom multivariable model, $R^2 = 0.34$.
[b]Educational level (a proxy for socioeconomic position) was categorized as less than high school, high school or general equivalency diploma, some college, and undergraduate degree or higher.
[c]Race/ethnicity was categorized as Hispanic, non-Hispanic White, non-Hispanic Black, or non-Hispanic other.

for families with a complete smoking ban (but have not achieved sustained success). Assessment of indoor smoking practices of families with children should therefore include questions about failure to adhere to complete or partial voluntary smoking bans. The data also pointed to the value of assessing smoking by other household members and visitors, as well as a detailed assessment by smoking location, including external locations. The national reach of home visitation programs such as Early Intervention and Healthy Families provides an ideal platform for identifying families for whom a smoke-free home intervention might provide valuable preventive health measures for young children. ■

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Contributors

V. W. Rees led the development of the article and was the primary author. All authors contributed to the conceptualization of the project and drafting critical revisions. Collaborative analyses of data were led by V. W. Rees and A. C. Geller. Community engagement was led by R. R. Keske, K. Blaine, D. Aronstein, E. Gandelman, V. Lora, and C. Savage. Funding was obtained by V. W. Rees and A. C. Geller.

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