

Original investigation

# Smoking Restrictions in Homes After Implementation of a Smoking Ban in Public Places

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## Abstract

**Introduction:** This Canadian study examines the prevalence of smoking restrictions in homes before and after the implementation of a public smoking ban, and their relation to tobacco use and cessation among a cohort of smokers.

**Methods:** Data were from a longitudinal cohort study of 1,058 smokers in the province of Québec, Canada. Baseline data were collected through a population-based survey conducted 1 month before the implementation of the smoking ban with a representative sample of smokers. Follow-up data were collected 18 months after the ban with a response rate of 68%. Logistic regressions, paired *t* tests and chi-square statistics were used to examine the factors associated with smoking restrictions in homes, cigarette consumption, and quit attempts.

**Results:** Many smokers imposed partial or full smoking restrictions in their homes but proportions of smoke-free homes did not change significantly between baseline and follow-up. The presence of young children and nonsmokers significantly predicted full smoking restriction in the home. Knowledge about risks associated with exposure to secondhand smoke (SHS) and skepticism about the efficacy of methods to reduce exposure in the home also predicted maintenance of voluntary smoking restrictions in homes. The uptake of smoke-free homes was not associated with the quantity of cigarettes smoked or quit attempts.

**Conclusions:** No significant change in home smoking bans was found 18 months after implementation of a public smoking ban. There remains a need for efforts to better inform smokers about health risks from exposure to SHS in homes and the reality that strategies other than a total smoking ban inside the home are ineffective.

## Introduction

All Canadian provinces have banned smoking in most enclosed public places. In the province of Québec, where this study was conducted, smoking has been prohibited in restaurants and bars since

May 31, 2006. One anticipated effect of smoking regulations is the change they may beget in smoking behaviors in private locations.<sup>1</sup> In particular, it has been theorized that public smoking bans may lead to more voluntary restrictions and reduced smoking in private places,

or alternatively, produce an undesired effect, increasing smoking and exposure to secondhand smoke (SHS) inside the home.<sup>1-7</sup> This is the first Canadian study examining changes in smoking restrictions in homes among a cohort of smokers, before and after the implementation of a smoking ban in public places.

Previous literature, bar two exceptions,<sup>6,8</sup> has shown a stable increase in the prevalence of smoke-free homes and decrease of exposure to SHS following smoking bans in public places.<sup>2-5,9-16</sup> Adding to the strength of previous findings, recent longitudinal studies have revealed that smoke-free legislation has led smokers to institute total smoking bans in their homes.<sup>4,5,16</sup>

In a broader sense, one should acknowledge that changes in smoke-free legislation have occurred in a context of overall decline of smoking prevalence in Western societies and a rise in smoke-free homes.<sup>17-19</sup> In the province of Québec between 2005 and 2008, the proportion of nonsmoking households, as reported by nonsmokers, increased from 62.5% to 70%,<sup>20</sup> the proportion of daily smokers decreased from 18.7% to 15.6%, and the proportion of lifetime nonsmokers increased from 44.4% to 51.1%. Still, despite comprehensive legislation, 77.3% of the nonsmoking population aged 15 and over in Québec reported being exposed to SHS in public or private locations in 2008.<sup>20</sup> Monitoring data showed a significant decrease in exposure in indoor public places between 2005 and 2008 (from 64.7% to 28.3%)<sup>20</sup> particularly among younger and lighter smokers, those with higher income or level of education, and those who live with nonsmoking adults or a child at home.<sup>19,21-23</sup> However, exposure in outdoor public places increased (from 65.1% to 67.1%), and, in 2008, 37.6% of nonsmoking secondary school students still reported being exposed in the past month to SHS in their home.<sup>20</sup>

Even though smoke-free public places reduce exposure for a large portion of the population, continued exposure in homes is worrisome as people spend a significant amount of time there on a daily basis. Exposure generates health problems among nonsmokers and is associated with morbidity and mortality in children,<sup>24,25</sup> harming their respiratory systems and putting them at risk for severe and chronic diseases.<sup>26,27</sup> Alternatively, living in a smoke-free home is associated with several health benefits for smokers including increased cessation attempts, longer time to relapse, and lower consumption.<sup>19</sup> For younger household members, living in a smoke-free home tends to moderate the effect of friends' smoking on their smoking behavior, and increases their likelihoods of seeking smoke-free living quarters when leaving home.<sup>28</sup>

The interplay between changes along private/public pathways demands greater consideration if interventions in public areas are meant to serve as catalysts for favorable changes in primary private spaces such as homes. Using a longitudinal design, this study was conducted one month before and 18 months after a smoking ban was implemented in most public places in the province of Québec, including restaurants and bars. Using a cohort-study design, this research aimed to (a) examine changes in the prevalence of smoking restrictions in homes before and after the implementation of the ban, (b) explore sociodemographic determinants of change in restrictions in homes, and (c) assess associations between type of smoking restrictions in homes and tobacco use and smoking cessation.

## Methods

The study was conducted between May 2006 and December 2007. It obtained ethics approval from the Public Health Ethics committee

for the baseline survey and from the Concordia University Ethics board for the follow-up.

## Sample

### Baseline Survey

A first telephone survey was conducted over the course of 1 month before a smoking ban in public places went into effect, May 2006, with 2,736 adult smokers and ex-smokers who quit smoking no more than 2 years prior to the survey. Participants were recruited using a multistage sampling design (i.e., census areas, households, persons), and a random digit dialing (RDD) method to select households in various census areas. Computer-assisted telephone interviews (CATI) were conducted. In total, 75% (13,754/18,467) accepted to participate in the survey and 79% of eligible participants (2,736/3,448) completed the survey.

### Follow-Up Survey

Of the participants who gave their consent at baseline to be contacted for a follow-up ( $N = 1,975$ ), 1,337 participated in the survey for a response rate of 68%. The final sample analyzed in this study consisted of all smokers at baseline ( $N = 1,058$ ) including quitters ( $n = 142$ ) and continuing smokers ( $n = 916$ ) at follow-up.

## Measures

### Sociodemographic Variables

We collected at baseline information on age (18–24 years, 25–44 years, 45–64 years, 65+ years), gender (male, female), and level of education (primary school, secondary school, college, university). Household characteristics were assessed through annual household income (less than \$20,000, \$20,000–\$49,999, \$50,000–\$79,999, \$80,000 and more, refusal), household composition (smokers only, smokers and nonsmokers, living alone), and the presence of children at home and their age (no children, 0–12 years, 13–17 years).

The following variables were measured at baseline and at follow-up: smoking status, cigarette consumption, nicotine dependence, quit attempts, and smoking restrictions at home.

**Smoking Status** Baseline smokers were those who reported smoking every day or occasionally at baseline (“At the present time, do you smoke cigarettes every day, occasionally, or never?”). Those who reported smoking at both baseline and follow-up were labeled continuing smokers.

**Cigarette Consumption** Respondents reported the typical total number of cigarettes they smoke on a daily basis, or on smoking days for occasional smokers. We estimated the total number of cigarettes smoked daily by occasional smokers by dividing the number of cigarettes they smoke by the number of days on which they smoked in the past month. The total number of cigarettes smoked daily in homes was averaged from the total number of cigarettes smoked inside the home during weekdays and weekends.

**Nicotine Dependence** The score of Heaviness of Smoking Index (HSI)<sup>29,30</sup> was computed based on (a) elapsed time to first cigarette after waking up (3 = in the first five minutes, 2 = between 6 and 30 minutes afterwards, 1 = between 31 and 60 minutes afterwards, 0 = more than 60 minutes afterwards) and (b) the number of cigarettes smoked daily (0 = less than 10 cigarettes, 1 = 11–20

*cigarettes*, 2 = 21–30 cigarettes, 3 = 31 cigarettes or more). The HSI values range from 0 to 6, with higher scores indicating greater nicotine dependence.

**Quit Attempts** Smokers reported the number of quit attempts they initiated from the time of the baseline survey to the follow-up survey (i.e., between May 2006 and December 2007). The variable was dichotomized to capture the report of any quit attempt between baseline and follow-up.

**Smoking Restrictions in Homes** Participants reported whether smoking was permitted inside their homes (yes; no). Combining responses obtained at baseline and follow-up, we derived a typology of restrictions in homes: (a) “remained smoke-free homes” where it was not permitted to smoke inside at baseline and at follow-up, (b) “stable smoking homes” where smoking was permitted inside the home at baseline and at follow-up, (c) “adopted smoke-free homes” where smoking was allowed inside the home at baseline only, and (d) “regressing to smoking homes” where smoking was permitted at follow-up only.

**Knowledge About Health Risks Associated With Exposure to SHS** This measure was adapted from the Canadian Community Health Survey.<sup>31</sup> At follow-up, respondents indicated whether they thought exposure to SHS is a cause of the following health problems: (a) lung cancer in nonsmokers, (b) heart disease in nonsmokers, (c) breast cancer in nonsmokers, (d) chest problems in children, and (e) ear infections in children (yes; no). Responses were summed for total scores ranging from 0 to 5.<sup>32</sup>

**Perceived Effectiveness of Strategies Preventing Exposure of Nonsmokers to SHS in Homes** We assessed the perceived effectiveness of five strategies known to be ineffective to eliminate SHS<sup>33</sup>: (a) smoking only in certain rooms, (b) opening doors or windows to smoke, (c) waiting for 1 hr before using a room that someone has been smoking in, (d) blowing smoke directly out a window or door, and (e) smoking under a stove fan (very effective, quite effective, moderately effective, not very effective, not at all effective). Responses were recoded into three categories (effective, moderately effective, not effective) by regrouping the first two responses (very effective and quite effective) and the last two (not very effective and not at all effective).

## Analyses

Two-sample  $z$  tests for difference of proportions ( $\alpha = .05$ ) were performed to assess variations in home smoking restrictions between baseline and follow-up among smokers. Sample weights were generated to ensure representativeness of both baseline and follow-up samples at the provincial level. Post-stratification techniques were used to ensure that all sample subgroups were represented in proportions similar to those found in the general population on age and gender based on data from the 2003 Canadian Community Health Survey (CCHS).<sup>34</sup> Weighting procedures for the follow-up survey consisted of redistributing the baseline weights with a calibration method accounting for gender, age, and smoking status of respondents.

Separate logistic regressions were performed to assess predictors of change in smoking restrictions in homes (i.e., homes that remained smoke-free, homes that became smoke-free, smoke-free homes that

regressed to allowing smoking, and homes that continued to allow smoking). Smoking status at follow-up (continuing smoker or quitter) was entered as a covariate in all models. Explanatory power was approximated with the Nagelkerke pseudo  $R^2$  statistic.<sup>35</sup> All regression results are presented with 95% confidence intervals.

Paired  $t$  tests were performed to assess differences between baseline and follow-up in the number of cigarettes smoked by continuing smokers both overall and inside the home. Chi-squared tests were conducted to assess associations between change in smoking restrictions and quit attempts. Baseline and follow-up samples were comparable on gender, age, and smoking status, but levels of education and income were higher among the follow-up sample.

Preliminary analyses did not reveal differences between weighted and unweighted findings. Thus, unweighted estimates are presented. Most categorical variables used in this study had less than 5% missing data, with the exception of perceived effectiveness of “waiting an hour before entering a room where somebody smoked” to reduce exposure to SHS in homes (5.8% nonresponse). Listwise deletion was used to manage missing data during the analyses; as a result sample sizes may differ across tables. All analyses were performed using SPSS 19.0.<sup>36</sup>

## Results

Of the sample, 187 were classified as remained smoke-free homes, 711 as stable smoking homes, 96 as adopted smoke-free homes, and 64 regressing to smoking homes.

### Smoking Restrictions in Homes Among Smokers

There were no significant changes in smoking restrictions in homes between pre- and post-ban periods (Table 1). For baseline smokers, including continuing smokers and quitters, the proportion of homes with a total smoking ban changed by approximately 3%. For continuing smokers, the proportion of households with partial smoking restrictions increased by 0.7%, and the proportion of smoke-free homes remained stable at 21.9%.

### Predictors of Change in Smoking Restrictions in Homes

The analyses revealed that several individual and household characteristics were significantly associated with types of smoking restrictions in homes at baseline and follow-up. People living in households where smoking was prohibited before and after the ban were more likely to be lighter smokers, males, with a university education (Table 2). They were more likely to be living with nonsmokers or with a child or a teenager. At follow-up, they were aware of health risks associated with exposure to SHS and considered strategies to reduce exposure to SHS (such as opening door and windows or blowing smoke by door and windows) to be moderately effective or ineffective.

Conversely, smokers who permitted smoking inside their homes at baseline and follow-up reported higher scores on dependence to nicotine, reported a more modest income, and were living alone or with other smokers. They were more likely to consider strategies preventing exposure to SHS to be effective such as blowing smoke by doors and windows, opening doors and windows, and smoking under the kitchen fan. They were less knowledgeable about health risks associated with smoking. The youngest respondents (18–24 years) were also less likely to live in homes that continued to allow smoking.

**Table 1.** Home Smoking Restrictions Among Smokers, Prelegislation (Pre-Ban) in May 2006 and Postlegislation (Post-Ban) in December 2007 (in %)

		Pre-ban, May 2006	Post-ban, December 2007	<i>p</i>
Home smoking restrictions among baseline smokers	<i>N</i> = 1,058			
	% of homes with full smoking restrictions	23.7 (21.2–26.3)	26.7 (24.1–29.4)	.109
	% of homes with partial restrictions	29.9 (27.1–32.6)	29.8 (27.0–32.5)	.962
	% of homes with no restrictions	46.4 (43.4–49.4)	43.5 (40.5–46.5)	.175
Home smoking restrictions among continuing smokers	<i>N</i> = 916			
	% of homes with full smoking restrictions	21.9 (19.3–24.6)	21.9 (19.3–24.6)	–
	% of homes with partial restrictions	30.6 (27.6–33.6)	31.3 (28.3–34.3)	.724
	% of homes with no restrictions	47.5 (44.3–50.7)	46.7 (43.5–50.0)	.743

### Effect of Smoke-Free Restrictions on Smoking Cessation

Continuing smokers who made their homes smoke-free between the pre- and post-ban periods significantly decreased the number of cigarettes they smoked inside their home between baseline and follow-up (Table 3). Still, continuing smokers who continued to allow smoking in their home between baseline and follow-up reported smoking fewer cigarettes per day in general between the two time points. However, changes in smoking restrictions in homes did not affect smoking cessation among continuing smokers.

### Discussion

This study followed a cohort of smokers 1 month before the implementation of a smoking ban in all public places in Québec and 18 months after. The general objective of the study was to examine voluntary smoking restrictions in homes before and after the implementation of the public smoking ban, the predictors of these in-home restrictions, and their relation to tobacco use and cessation. This study revealed that the proportion of smoke-free homes did not change significantly between baseline and follow-up among smokers. Results for the current study differed from previous findings. For example, a study by Cheng et al.<sup>4</sup> found strong clean indoor air laws to be associated with large increases in voluntary smokefree-home policies both in the homes with and without smokers. There are several factors that could explain the differences between the two studies. First, the nature of the ban is different in both studies. In Quebec, legislation restricting workplace smoking had already been in effect for a year before public smoking bans were undertaken. Second, in terms of the study design, the current study is a cohort study that followed the same individuals before and after the ban whereas the Cheng et al.<sup>4</sup> study compared data from repeated cross-sectional studies. Thus, this study is mostly an analysis of trajectories of groups whereas the Cheng et al.<sup>4</sup> study is an analysis of trends of aggregated data. Finally, the two studies took place during different periods of time, which could be a source of variation. For instance, the current study took place between 2006 and 2008 whereas the Cheng et al.<sup>4</sup> study report on the Tobacco Use Supplement of the Current Population Survey (TUS-CPS) comparing data between 1992 and 2007. Consequently, comparisons between the two studies should be done with caution.

Results also showed that adopting smoke-free homes occurred in specific groups, mostly among lighter smokers and those of younger age, in contrast with heavier, middle-aged smokers. Overall, around 75% of households allowed smoking inside the home with or without partial restrictions. This result may be an indication that significant changes in smoking restrictions in homes occurred among quitters. Contextual factors related to the household's composition also explained the adoption of smoke-free rules at home. For instance, living with nonsmokers or with young children was associated with a greater probability of adopting a smoking ban in the household. This result may suggest that personal reconfiguration of private locations is a complex process in which individual and collective characteristics and actions are associated.

Beyond social-structural factors, beliefs about health risks associated with exposure to SHS and the efficiency of strategies to counter them are also key predictors of a change in smoking restrictions in homes. For instance, smokers who continued to allow smoking in their homes exhibited a poor knowledge of health risks associated with exposure to SHS and a stronger belief in the efficiency of various strategies, other than a total smoking ban inside the home, known to be ineffective in reducing exposure to SHS in the home. The influence of attitudes and beliefs on actions nicely articulate the *theory of reasoned action*<sup>37</sup> and emphasizes the need for preventive efforts informing smokers about health risks associated with exposure to SHS, and preempting misperceptions that strategies other than a total smoking ban inside the home are effective ways to reduce exposure to SHS in homes.

Various limitations of this study should be acknowledged. It is possible that had the follow-up period been longer the decrease in smoke free homes would have become significant. It should be noted however that previous studies with similar or even shorter follow-up times have found significant results when analyzing similar outcomes.<sup>3,11</sup> Furthermore, changes due to the ban would have been difficult to disentangle from other factors that occur over time as changes in smoking restrictions do not occur in a social and cultural vacuum but rather are embedded in an ever-changing socio-cultural and normative context. The implementation of a smoking ban in public places was one of several governmental actions aiming to protect nonsmokers from exposure to SHS, prevent smoking initiation among youth, and support smokers wishing to quit.<sup>38</sup> These simultaneous changes complicate the estimation of the influence of

**Table 2.** Predictors of the Evolution of Smoking Restrictions in Homes of Quitters and Continuing Smokers Between May 2006 and December 2007

	Households that remained smoke-free ( <i>n</i> = 175)	Households that became smoke-free ( <i>n</i> = 86)	Households that regressed to allowing smoking ( <i>n</i> = 57)	Households that remained smoking ( <i>n</i> = 628)
OR (95% CI)				
<b>Individual characteristics</b>				
Age (years) (ref. 18–24 years)				
65+ years	0.23 (0.05–1.01)	0.72 (0.20–2.56)	0.49 (0.12–2.06)	3.33 (1.17–9.47)*
45–64 years	0.39 (0.20–0.77)**	0.36 (0.16–0.81)*	0.39 (0.17–0.87)*	5.32 (2.84–9.97)***
25–44 years	0.58 (0.29–1.13)	0.75 (0.34–1.64)	0.29 (0.13–0.68)**	3.12 (1.67–5.83)***
Gender (ref. female)				
Male	2.21 (1.43–3.41)***	1.12 (0.68–1.86)	0.95 (0.54–1.69)	0.61 (0.42–0.87)**
Education (ref. university)				
Primary school	0.33 (0.14–0.75)**	1.29 (0.52–3.19)	0.69 (0.23–2.03)	2.20 (1.15–4.22)*
Secondary school	0.53 (0.30–0.95)*	1.71 (0.83–3.51)	1.09 (0.50–2.40)	1.17 (0.71–1.92)
College	0.81 (0.45–1.45)	0.86 (0.39–1.87)	0.75 (0.31–1.81)	1.42 (0.85–2.39)
<b>Household characteristics</b>				
Annual household income (ref. \$80,000 and more)				
Less than \$20,000	1.29 (0.57–2.91)	0.67 (0.26–1.76)	0.41 (0.12–1.37)	1.72 (0.85–3.49)
\$20,000–\$49,999	0.87 (0.47–1.62)	0.68 (0.30–1.54)	0.69 (0.29–1.62)	1.81 (1.05–3.11)*
\$50,000–\$79,999	0.80 (0.43–1.48)	1.29 (0.60–2.77)	0.48 (0.19–1.21)	1.49 (0.85–2.59)
Refusal	0.55 (0.25–1.19)	1.42 (0.58–3.49)	1.63 (0.69–3.81)	1.10 (0.58–2.08)
Household composition (ref. mixed)				
Living alone	0.21 (0.11–0.41)***	1.79 (0.91–3.53)	0.77 (0.35–1.71)	2.22 (1.37–3.58)**
Smoking household	0.45 (0.26–0.80)**	1.25 (0.66–2.37)	0.60 (0.26–1.37)	1.95 (1.23–3.09)**
Age of youngest child in household (ref. no children)				
0–12 years	2.38 (1.36–4.15)**	0.40 (0.19–0.85)*	1.31 (0.60–2.86)	0.67 (0.42–1.08)
13–17 years	2.22 (1.26–3.90)**	0.78 (0.40–1.54)	0.94 (0.42–2.10)	0.65 (0.40–1.04)
<b>Perceived effectiveness of strategies to reduce exposure to SHS in homes (ref. effective)</b>				
Smoking only in certain rooms				
Moderately effective	0.72 (0.31–1.65)	1.57 (0.54–4.51)	0.69 (0.29–1.64)	1.13 (0.61–2.08)
Not effective	1.90 (0.82–4.42)	2.04 (0.69–5.99)	0.58 (0.22–1.50)	0.56 (0.30–1.05)
Opening doors or windows				
Moderately effective	1.55 (0.77–3.15)	2.07 (0.84–5.09)	0.61 (0.29–1.30)	0.84 (0.51–1.38)
Not effective	3.78 (1.62–8.79)**	2.77 (0.96–8.03)	0.67 (0.23–1.90)	0.31 (0.16–0.59)***
Blowing smoke by door or window				
Moderately effective	2.29 (1.11–4.73)*	1.28 (0.57–2.86)	2.16 (0.92–5.05)	0.45 (0.27–0.76)**
Not effective	2.10 (0.88–5.00)	1.58 (0.58–4.31)	1.30 (0.42–4.09)	0.50 (0.25–0.99)*
Waiting an hour before entering a room where somebody smoked				
Moderately effective	0.69 (0.35–1.36)	1.67 (0.67–4.17)	0.97 (0.40–2.32)	0.97 (0.55–1.71)
Not effective	0.59 (0.29–1.20)	1.20 (0.47–3.08)	1.08 (0.42–2.75)	1.29 (0.71–2.36)
Smoking under the kitchen fan				
Moderately effective	1.64 (0.90–3.02)	1.20 (0.58–2.50)	0.95 (0.46–1.99)	0.75 (0.47–1.19)
Not effective	3.09 (1.53–6.23)**	1.33 (0.56–3.16)	1.86 (0.77–4.48)	0.34 (0.19–0.59)***
<b>Knowledge of health risks associated with exposure to SHS</b>				
Scale of knowledge (ref. 4–5)				
0–1	0.21 (0.11–0.43)***	0.80 (0.40–1.62)	0.78 (0.34–1.79)	2.94 (1.74–4.96)***
2–3	0.84 (0.53–1.32)	0.78 (0.45–1.38)	1.08 (0.57–2.06)	1.23 (0.83–1.81)
<b>Nicotine dependence</b>				
Heaviness of smoking index (ref. 5–6)				
0–1	7.74 (3.23–18.54)***	1.09 (0.45–2.67)	3.20 (0.91–11.30)	0.18 (0.09–0.35)***
2–4	2.12 (0.88–5.09)	1.43 (0.62–3.29)	2.27 (0.66–7.81)	0.44 (0.23–0.82)*
Nagelkerke R <sup>2</sup>	0.463	0.243	0.119	0.475

OR = odds ratio; CI = confidence interval; SHS = secondhand smoke. Smoking status in December 2007 (continuing smoker vs. quitter) was included in all models as covariate.

\**p* < .05; \*\**p* < .01; \*\*\**p* < .001.

the smoking ban. For instance, the prevalence of tobacco use in the general population aged 15 years and older has been decreasing consistently from 40% in 1987 to 27% in 2003, and stabilizing since 2005 at approximately 25%.<sup>31</sup> During this same period, comprehensive tobacco control interventions included prohibition of tobacco

promotion and display in points of sale in 2008, a 62% decrease in the number of tobacco points of sale within the province from 19,500 in 2003 to 7,500 in 2008, provincial prevention media campaigns, and free access to cessation counseling services including free pharmaceutical aids.<sup>39,40</sup>

**Table 3.** Number of Cigarettes Smoked per Day and Quit Attempts Between May 2006 and December 2007 Among Continuing Smokers, According to the Evolution of Smoking Restrictions at Home

	May 2006	December 2007	Paired <i>t</i> test
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	
Cigarettes smoked per day among continuing smokers ( <i>n</i> = 900)	15.70 (9.54)	15.06 (9.04)	2.80**
In households that remained smoke-free ( <i>n</i> = 141)	10.61 (9.79)	10.12 (8.10)	0.92
In households that became smoke-free ( <i>n</i> = 53)	11.91 (7.84)	10.35 (7.70)	1.90
In households that regressed to allowing smoking ( <i>n</i> = 53)	12.04 (9.94)	12.84 (9.04)	0.91
In households that remained smoking ( <i>n</i> = 653)	17.41 (9.02)	16.69 (8.78)	2.58*
Cigarettes smoked per day inside the home among continuing smokers ( <i>n</i> = 695)	12.18 (8.14)	11.45 (8.41)	2.71**
In households that remained smoke-free ( <i>n</i> = 142)	<sup>a</sup>	0.50 (2.04)	–
In households that became smoke-free ( <i>n</i> = 53)	6.63 (6.25)	1.43 (3.64)	6.25***
In households that regressed to allowing smoking ( <i>n</i> = 50)	<sup>a</sup>	7.18 (5.92)	–
In households that remained smoking ( <i>n</i> = 642)	12.63 (8.12)	12.28 (8.15)	1.29
	% (95% CI)		$\chi^2$
Cessation attempt between May 2006 and December 2007			4.86
Households that remained smoke-free ( <i>n</i> = 146)	37.7 (29.8–45.5)		
Households that became smoke-free ( <i>n</i> = 54)	44.4 (31.2–57.7)		
Households that regressed to allowing smoking ( <i>n</i> = 54)	35.2 <sup>b</sup> (22.7–49.4)		
Households that remained smoking ( <i>n</i> = 659)	31.9 (28.3–35.4)		

<sup>a</sup>Respondents who indicated having a total smoking ban enforced at home in May 2006 were not asked how many cigarettes they smoked inside their home on a daily basis.

<sup>b</sup>Marginal estimate (coefficient of variation > 16.6%).

\**p* < .05; \*\**p* < .01; \*\*\**p* < .001.

Despite the above-mentioned limitations, a number of households decided to become smoke-free following the smoking ban. The changes in smoking restrictions in homes did not occur equally across various subgroups of smokers, and as such, trigger the reflection on the need for customized intervention studies to address homes that remain smoking in particular groups and to reach out to high-risk populations where changes are less pronounced.

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## Declaration of Interests

None declared.

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## References

- Borland R, Yong HH, Cummings KM, Hyland A, Anderson S, Fong GT. Determinants and consequences of smoke-free homes: findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control*. 2006;15(suppl 3):iii42–iii50.
- Akhtar PC, Currie DB, Currie CE, Haw SJ. Changes in child exposure to environmental tobacco smoke (CHETS) study after implementation of smoke-free legislation in Scotland: national cross sectional survey. *Brit Med J*. 2007;335:545.
- Akhtar PC, Haw SJ, Currie DB, Zachary R, Currie CE. Smoking restrictions in the home and secondhand smoke exposure among primary schoolchildren before and after introduction of the Scottish smoke-free legislation. *Tob Control*. 2009;18:409–415.
- Cheng KW, Glantz SA, Lightwood JM. Association between smokefree laws and voluntary smokefree-home rules. *Am J Prev Med*. 2011;41:566–572.
- Cheng KW, Okechukwu CA, McMillen R, Glantz SA. Association between clean indoor air laws and voluntary smokefree rules in homes and cars [published online ahead of print 2013]. *Tob Control*. Advance online publication. doi:10.1136/tobaccocontrol-2013-051121.
- Ho SY, Wang MP, Lo WS, et al. Comprehensive smoke-free legislation and displacement of smoking into the homes of young children in Hong Kong. *Tob Control*. 2010;19:129–133.
- Nazar GP, Lee JT, Glantz SA, Arora M, Pearce N, Millett C. Association between being employed in a smoke-free workplace and living in a smoke-free home: evidence from 15 low and middle income countries. *Prev Med*. 2014;59:47–53.
- Adda J, Cornaglia F. The effect of bans and taxes on passive smoking. *Am Econ J Appl Econ*. 2010;2:1–32.
- Biener L, Garrett CA, Skeer M, Siegel M, Connolly G. The effects on smokers of Boston's smoke-free bar ordinance: a longitudinal analysis of changes in compliance, patronage, policy support, and smoking at home. *J Public Health Manag Pract*. 2007;13:630–636.
- Callinan JE, Clarke A, Doherty K, Kelleher C. Legislative smoking bans for reducing secondhand smoke exposure, smoking prevalence and tobacco consumption. *Cochrane Database Syst Rev*. 2010;(4):CD005992. doi:10.1002/14651858.CD005992.pub2.
- Fong GT, Hyland A, Borland R, et al. Reductions in tobacco smoke pollution and increases in support for smoke-free public places following the implementation of comprehensive smoke-free workplace legislation in the Republic of Ireland: findings from the ITC Ireland/UK Survey. *Tob Control*. 2006;15(suppl 3):iii51–iii58.
- Haw SJ, Gruer L. Changes in exposure of adult non-smokers to secondhand smoke after implementation of smoke-free legislation in Scotland: national cross sectional survey. *Brit Med J*. 2007;335:549.
- Holliday JC, Moore GF, Moore LA. Changes in child exposure to secondhand smoke after implementation of smoke-free legislation in Wales: a repeated cross-sectional study. *BMC Public Health*. 2009;9:430.

14. Hyland A, Hassan LM, Higbee C, et al. The impact of smokefree legislation in Scotland: Results from the Scottish ITC: Scotland/UK longitudinal surveys. *Eur J Public Health*. 2009;19:198–205.
15. Jarvis MJ, Sims M, Gilmore A, Mindell J. Impact of smoke-free legislation on children's exposure to secondhand smoke: cotinine data from the Health Survey for England. *Tob Control*. 2011;21:18–23.
16. Mons U, Nagelhout GE, Allwright S, Guignard R, van den Putte B, Willemsen MC.... & Breitling LP. Impact of national smoke-free legislation on home smoking bans: findings from the International Tobacco Control Policy Evaluation Project Europe Surveys. *Tob Control*. 2013;22:e2–e9.
17. Hyland A, Higbee C, Travers MJ, et al. Smoke-free homes and smoking cessation and relapse in a longitudinal population of adults. *Nicotine Tob Res*. 2009;6:614–618.
18. Levy DT, Romano E, Mumford EA. Recent trends in home and work smoking bans. *Tob Control*. 2004;13:258–263.
19. Mills AL, Messer K, Gilpin EA, Pierce JP. The effect of smoke-free homes on adult smoking behavior: a review. *Nicotine Tob Res*. 2009;11:1131–1141.
20. Lasnier B, Leclerc B-S. *Monitoring du Plan québécois de lutte contre le tabagisme 2012 [Monitoring of the Quebec plan against smoking 2012]. Direction du développement des individus et des communautés*. Montréal, QC: Institut National de Santé Publique du Québec; 2012.
21. Bolte G, Fromme H. Socioeconomic determinants of children's environmental tobacco smoke exposure and family's home smoking policy. *Eur J Public Health*. 2009;19:52–58.
22. Farkas AJ, Gilpin EA, White MM, Pierce JP. Association between household and workplace smoking restrictions and adolescent smoking. *JAMA*. 2000;284:717–722.
23. Soliman S, Pollack HA, Warner KE. Decrease in the prevalence of environmental tobacco smoke exposure in the home during the 1990s in families with children. *Am J Public Health*. 2004;94:314–320.
24. DiFranza JR, Lew RA. Morbidity and mortality in children associated with the use of tobacco products by other people. *Pediatrics*. 1996;97:560–568.
25. U.S. Department of Health and Human Services. *The health consequences of involuntary exposure to tobacco smoke: a report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2006.
26. Cheraghi M, Salvi S. Environmental tobacco smoke (ETS) and respiratory health in children. *Eur J Pediatr*. 2009;168:897–905.
27. Royal College of Physicians. *Passive smoking and children: a report by the Tobacco Advisory Group of the Royal College of Physicians*. London, UK: Royal College of Physicians: External Affairs; 2010.
28. Albers AB, Biener L, Siegel M, Cheng DM, Rigotti NA. Impact of parental home smoking policies on policy choices of independently living young adults. *Tob Control*. 2009;18:245–248.
29. Borland R, Yong HH, O'Connor RJ, Hyland A, Thompson ME. The reliability and predictive validity of the Heaviness of Smoking Index and its two components: findings from the International Tobacco Control Four Country study. *Nicotine Tob Res*. 2010;12(suppl 1):S45–S50.
30. Heatherton TF, Kozlowski LT, Frecker RC, Rickert W, Robinson J. Measuring the heaviness of smoking: using self-reported time to the first cigarette of the day and number of cigarettes smoked per day. *Brit J Addict*. 1989;84:791–799.
31. Statistics Canada. *Canadian Community Health Survey, 2007–2008*. Ottawa, Canada; 2009. [www23.statcan.gc.ca/imdb-bmdi/instrument/3226\\_Q1\\_V4-eng.pdf](http://www23.statcan.gc.ca/imdb-bmdi/instrument/3226_Q1_V4-eng.pdf).
32. Ontario Tobacco Research Unit. *A national study on environmental tobacco smoke in the home, dataset user's guide*. Toronto, ON: Institute for Social Research, York University; 2002.
33. Ferrence R, Timmerman T, Ashley M, et al. *Second hand smoke in Ontario homes: findings from a national study*. Toronto, ON: Ontario Tobacco Research Unit Special Report Series; 2005.
34. Statistics Canada. *Canadian Community Health Survey 2003*. Ottawa, Canada; 2004. [www23.statcan.gc.ca/imdb-bmdi/pub/instrument/5015\\_Q1\\_V1-eng.pdf](http://www23.statcan.gc.ca/imdb-bmdi/pub/instrument/5015_Q1_V1-eng.pdf).
35. Long JS. *Regression models for categorical and limited dependent variables*. Vol 7. Thousand Oaks, CA: Thousand Oaks, CA: Sage; 1997.
36. IBM Corp. *SPSS Statistics (version 19.0)*. Armonk, NY: IBM Corp; 2010.
37. Fishbein M, Ajzen I. *Predicting and changing behavior: the reasoned action approach*. New York, NY: Psychology Press; 2010.
38. Ministère de la Santé et des Services sociaux. *Plan québécois de lutte contre le tabagisme 2001–2005 [Quebec plan against smoking 2001–2005]*. 2006. <http://msssa4.msss.gouv.qc.ca/fr/document/publication.nsf/4b1768b3f849519c852568fd0061480d/947e4c5373fbb3e785257179005b2104?OpenDocument>. Accessed July 10, 2013.
39. Ministère de la Santé et des Services sociaux. *Rapport sur la mise en oeuvre de la Loi sur le tabac 2005–2010*. 2010. <http://publications.msss.gouv.qc.ca/acrobat/fr/documentation/2010/10-006-07.pdf>. Accessed July 10, 2013.
40. Tremblay M, Payette Y, Montreuil A. Use and reimbursement costs of smoking cessation medication under the Quebec public drug insurance plan. *Can J Public Health*. 2009;100:417–420.