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## The Impact of Reduced Ignition Propensity Cigarette Regulation on Smoking Behavior in a Cohort of Ontario Smokers

Richard J. O'Connor<sup>1</sup>, Brian V. Fix<sup>1</sup>, David Hammond<sup>2</sup>, Gary A. Giovino<sup>3</sup>, Andrew Hyland<sup>1</sup>, Geoffrey T. Fong<sup>4,5</sup>, and K. Michael Cummings<sup>1</sup>

<sup>1</sup>Department of Health Behavior, Roswell Park Cancer Institute, Buffalo NY, USA

<sup>2</sup>Department of Health Studies and Gerontology, University of Waterloo, Waterloo ON, Canada

<sup>3</sup>Department of Health Behavior, University at Buffalo, Buffalo NY, USA

<sup>4</sup>Department of Psychology, University of Waterloo, Waterloo ON, Canada

<sup>5</sup>Ontario Institute for Cancer Research, Toronto ON, Canada

### Abstract

**Introduction**—This study examined the degree to which legislation intended to reduce the incidence of cigarette-caused fires influenced the behaviors of a cohort of smokers in Ontario, Canada. Evaluating the effectiveness of existing cigarette fire-safety has the potential to inform the development of similar standards in other jurisdictions.

**Methods**—A random digit dialed telephone survey of adult smokers residing in the Province of Ontario was conducted between July and September of 2005, ending one month prior to the RIP regulation's implementation date. A follow-up survey was conducted between August and November of 2006 to examine changes in engaging in fire risk behaviors, perceptions of changes to cigarettes, and behavioral changes in response to smoking reduced ignition propensity cigarettes. Of the baseline participants, 73.0% (n=435) completed the follow-up survey.

**Results**—The frequency of fire risk behaviors was similar across both surveys. At baseline, only 3.7% (95% CI: 2.20–5.76) of smokers interviewed reported that their cigarettes went out on their own 'often' while smoking. Following the implementation of the reduced ignition propensity legislation, this increased significantly to 14.7% (95% CI: 11.41–18.42).

**Discussion**—The results observed in this study suggest that the proportion of Ontario smokers who reported engaging in behavior such as leaving a cigarette burning unattended and smoking in bed actually declined, although these declines were not statistically significant across all measures of fire risk. As other nations look to implement RIP regulations, the Canadian experience thus far

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Corresponding Author: Brian V. Fix, MA, Department of Health Behavior, Roswell Park Cancer Institute, Buffalo NY 14263 USA, brian.fix@roswellpark.org, Phone: 716-845-1157, Fax: 716-845-8487.

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has revealed no risk compensatory behaviors that would offset the potential public health benefit of the regulations.

## Keywords

fires; policy; behavior

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## Introduction

Fires started by smokers' materials kill approximately 70 Canadians and cause 300 injuries each year [1]. On October 1, 2005, Canada became the first country to implement a nationwide cigarette ignition propensity standard. The standard requires that all cigarettes manufactured in or imported into Canada should self-extinguish prior to burning their full length at least 75% of the time when tested using ASTM International method E2187-04 (a standard method for measuring the ignition strength of cigarettes) [2]. The Canadian regulation is similar to those implemented in New York State in 2004 and subsequently in a number of other US states. Over the period 2004–2008, residential fires caused by smoking materials in Ontario have been relatively stable with some evidence of decline ( a decline of 3.4% between 2006 and 2008) [3].

The primary objective of the ignition propensity regulation is to reduce the likelihood that burning cigarettes will ignite upholstered furniture, in turn reducing the incidence of residential fires, other factors being equal. Cigarettes designed to comply with the ignition performance standard have been shown to be less likely to ignite upholstered furniture mockups [4]. Although there seems to be little debate about the harm reduction potential of regulating the ignition propensity of cigarettes, the tobacco industry has raised concerns that reducing cigarette ignition propensity would lead to a 'false sense of security' regarding fire-risk behaviors, such that smokers would become more careless in handling and disposing of cigarettes [5–7]. This is akin to the 'risk compensation' phenomenon described in the injury prevention literature [8]. The concept is that individuals adjust their behaviors in accordance with the perceived decrease in risk from the regulation, resulting in a less-than-expected change in population-level effects. The extent of compensation may vary by the specific intervention, data sources, and analysis methods used [8, 9]; however, overall evidence for risk compensation is mixed for most population interventions [10–12]. Compensation for cigarette fire standards would be particularly concerning given approximately one quarter of victims who died in smoking materials fires are not the smokers themselves [13].

The current study was designed to examine the degree to which legislation intended to reduce the incidence of cigarette-caused fires influenced the behaviors of a cohort of smokers in Ontario, Canada. In particular, we examined changes in fire risk behaviors, worry about fires, and awareness of cigarette changes that that might prompt changes in smoking behavior before and after the introduction of RIP regulations. Evaluating the effectiveness of existing cigarette fire-safety has the potential to inform the development of similar standards in other jurisdictions, such as the European Union.

## Methods

A random digit dialed (RDD) telephone survey of adult smokers residing in the Province of Ontario was conducted between July and September of 2005, ending one month prior to the introduction of RIP regulation. Eligible participants (N=596) included Ontario residents aged 18 years or older who had smoked at least 100 cigarettes in their lifetime, and who currently reported smoking every day or on some days. The protocol and survey were reviewed and approved by the Roswell Park Cancer Institute Institutional Review Board and participant characteristics and baseline data have been reported elsewhere [14].

A follow-up survey was conducted between August and November of 2006 to examine behavioral changes in response to smoking reduced ignition propensity cigarettes. Data were analyzed using SPSS 15.0 (SPSS Inc., Chicago, IL). Statistical analyses include descriptive statistics, multivariate logistic regression, and McNemar tests. All statistical analyses were performed on the cohort participants (i.e., those who completed both the baseline and the follow-up surveys, n=435).

## Results

### Participant Characteristics

Of the baseline participants, 73.0% (n=435) completed the follow-up survey, and of these, 82.5% (n=359) were continuing smokers. The mean age of participants at the time of the follow-up survey was 46.4 (SD 13.9, range 18–84) years. A comparison between the demographic characteristics of baseline respondents who did and did not complete the follow-up suggests that completers were more likely to be over 40 years of age (65.5% vs. 51.5%,  $p=.002$ ).

### Changes in smoking behavior

We found no significant change in the number of cigarettes smoked per day (CPD) by continuing smokers. At baseline, participants averaged 16.8 cigarettes (95% CI: 16.0–17.7), compared to 16.1 cigarettes (95% CI: 15.2–16.9) at follow-up. CPD at follow-up was not influenced by noticing changes in usual brand or reporting cigarettes went out often, controlling for baseline CPD. Forty-four participants (10.1%, 95% CI: 7.6–13.2) who completed the follow-up survey reported that they had quit prior to completing the follow-up, consistent with other pre-law Canadian surveys [15]. Of the respondents who reported quitting smoking prior to the follow-up survey, 93.5% (95% CI: 83.6–98.1) reported that the changes to their usual brand played no role in their decision to quit smoking.

### Fire risk behaviors

Figure 1 depicts the proportion of respondents reporting seven different cigarette fire risk behaviors in the 30 days prior to being surveyed in 2005 and in 2006. These behaviors included burning clothing with a lit cigarette, burning furniture with a lit cigarette, whether they had left a cigarette burning unattended, dozed off while smoking a cigarette, fallen asleep while smoking a cigarette, and whether they had smoked a cigarette in bed. The frequency of these behaviors was similar across both surveys. McNemar tests (exact, 2-

tailed), indicated statistically significant differences on the measure of leaving cigarettes burning unattended ( $p < .05$ ), but no statistically significant differences were observed on the measure of smoking in bed. ( $p = .349$ ).

### Worry about fires

Of the smokers interviewed at baseline and follow-up, 21.1% (95% CI: 17.3–25.4) expressed concern about starting a fire with a cigarette during the follow-up interview, a slight reduction from the 23.1% (95% CI: 19.3–27.2) who reported this same concern at the time of the baseline survey. At baseline, 11.5% (95% CI: 8.8–14.7) of respondents worried about burning themselves with a cigarette. This dropped to 10.0% (95% CI: 7.3–13.3) at the time of the follow-up survey. Similar trends were observed when respondents were asked about worry about burning others [22.1% (95% CI: 18.4–26.2) baseline/20.3% (95% CI: 16.54–24.52) follow-up] and burning objects [19.5% (95% CI: 16.0–23.5) baseline/18.5% (95% CI: 14.9–22.6) follow-up] with a cigarette. McNemar tests (exact, 2-tailed) indicated no significant differences between the responses at baseline and the follow-up responses to any of the questions that assessed worry about fires or burning caused by lit cigarettes, nor aggregates of these measures.

### Smokers' perceptions of changes to cigarettes

At baseline, only 3.7% (95% CI: 2.2–5.8) of smokers interviewed reported that their cigarettes went out on their own 'often' while smoking. Following the implementation of the reduced ignition propensity legislation, this significantly increased to 14.7% (95% CI: 11.4–18.4) ( $p < .001$ ). Similar observations occurred when smokers were asked if they noticed any changes to their brand during the 12 months prior to the survey. In 2005, 14.3% (95% CI: 11.0–18.0) of smokers reported that they had noticed changes to their brand during the past 12 months, compared to 26.1% (95% CI: 21.7–30.9) of smokers reported noticing changes at follow-up ( $p < .001$ ). Of those reporting that they had noticed a change at follow-up, 30.8% reported their cigarettes went out often, compared to 9.3% of those who reported they had not noticed a change [ $p < .001$  by Fisher's Exact Test]. When asked at follow-up what they customarily did when a cigarette self-extinguished during smoking, 76.8% reported immediately relighting the cigarette. In 2005, 36.4% of smokers reported that the lit end of their cigarette had ever fallen off the end of their cigarette, compared with 31.3% at follow-up. Of those who reported this event, 13.5% reported that this was a frequent occurrence at baseline, while 11.5% did so at the time of the follow-up survey.

### Discussion

Few studies have examined fire-risk behaviors prior to and following the implementation of cigarette ignition propensity legislation. The results observed in this study suggest that the proportion of Ontario smokers who reported engaging in behavior such as leaving a cigarette burning unattended and smoking in bed actually declined, although these declines were not statistically significant across all measures of fire risk behavior. Moreover, adverse outcomes—burned clothes and burned furniture—both declined, although not significantly. Smokers also did not express increased worry about starting fires, suggesting awareness of the issue was not increased.

Complying with the RIP standard generally consists of adding bands or low porosity regions to the cigarette paper that cause the cigarette to self extinguish if not actively puffed.[16] Significant differences were observed in the percentage of respondents who reported noticing a change to their cigarettes, as measured by the frequency with which their cigarettes go out often and by whether smokers noticed any changes in their usual brand, following the implementation of the ignition propensity standard. This suggests that respondents became aware of the changes that were made to the design of their usual brand of cigarettes in order to comply with the ignition propensity standard. However, respondents showed no changes in actual smoking behaviors such as number smoked per day (as most smokers reported relighting cigarettes that had gone out), nor did we find evidence for increased quitting due to the changes. Reports of coal drop-off were found to be stable and even slightly lower, post-law.

Overall, no evidence for behavioral risk compensation was found in this cohort of smokers following the implementation of RIP laws. In fact, the pattern of findings demonstrated, if anything, the opposite pattern: behaviors were less “risky” with respect to cigarette-caused fires after the regulations were introduced.

The findings from this study should thus serve to allay common concerns about RIP regulations. Even with a relatively small sample in the current survey, the data suggest no increase in fire risk behaviors occurred after the regulation was implemented. As the European Union, Australia, and other nations look to implement RIP regulations, the Canadian experience thus far has revealed no risk compensatory behaviors that would offset the potential public health benefit of the regulations.

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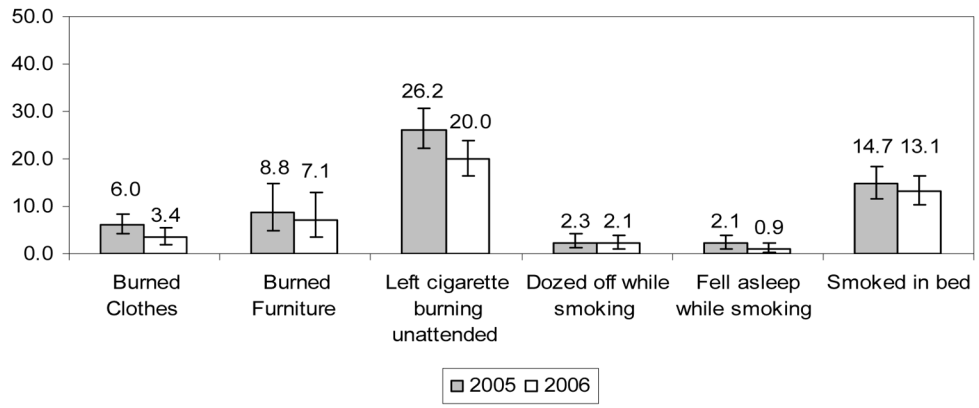
### Key Messages

#### What is already known on this subject?

- The primary objective of the reduced ignition propensity regulation is to reduce the likelihood that burning cigarettes will ignite upholstered furniture, in turn reducing the incidence of residential fires, other factors being equal.
- Although there seems to be little debate about the harm reduction potential of regulating the ignition propensity of cigarettes, the tobacco industry raised concerns that that reducing cigarette ignition propensity would lead to a ‘false sense of security’ regarding fire-risk behaviors, such that smokers would become more careless in handling and disposing of cigarettes

#### What this study adds

- The findings from this study should serve to allay common concerns about RIP regulations.
- As other nations look to implement RIP regulations, the Canadian experience thus far has revealed no risk compensatory behaviors that would offset the potential public health benefit of the regulations.



**Figure 1.** Prevalence of Fire-Risk Events in the Last 30 Days, 2005 (Pre-law) and 2006 (Post-law).

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