Running title: Cigarette fire-related behaviours

Prevalence of behaviours related to cigarette-caused fires: A survey of Ontario smokers

IN PRESS: ***Injury Prevention***

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Word counts		
	Abstract	257
	Text	2762
	3 tables	
	1 figure	

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Abbreviations: RIP = reduced ignition propensity; RDD = random-digit-dialed; HSI = Heaviness of Smoking Index

Abstract

Objective: Identify the prevalence and correlates of behaviors related to the risk of cigarette-caused fires.

Design: Random-digit-dialed telephone survey.

Setting: Ontario, Canada, July-September, 2005.

Subjects: 596 current cigarette smokers.

Main Outcome Measurements: Prevalence of fire-risk events and behaviours such as burning clothing or objects in the home, leaving lit cigarettes unattended, dozing while smoking, and smoking in bed, and correlates of these behaviours. Respondents were also asked if they ever worry about cigarette-caused fires.

Results: One in four smokers admitted to leaving lit cigarettes unattended in the last 30 days, while 15% admitted to smoking while in bed. Leaving lit cigarettes unattended was independent of demographic, socioeconomic, or nicotine dependence indicators, but was related to worry about burning other persons with a cigarette (OR = 1.72, 95% CI: 1.04, 2.85) and smoking inside the home (OR = 2.98, 95% CI: 1.66, 5.35). Persons who were not white (OR = 3.97, 95% CI: 1.80, 8.80), aged 18-24 (OR 3.75, 95% CI: 1.41, 9.96), who had high nicotine dependence (OR = 9.13, 95% CI: 2.22, 37.52) and worried about burning objects in their home (OR = 2.43, 95% CI: 1.31, 4.52) were more likely to smoke in bed. Ten smokers (1.7%) reported having ever had a fire in their home started by a cigarette.

Conclusions: Smokers engage in behaviours such as smoking in bed and leaving lit cigarettes unattended that may place them at increased risk of cigarette-caused fires. As governments move to regulate cigarette ignition propensity, it is important to establish surveillance for behaviors related to fire risk.

KEYWORDS: fire-safe; cigarettes; survey; consumer perceptions

Prevalence of behaviours related to cigarette-caused fires: A survey of Ontario smokers

INTRODUCTION

Cigarette smoking is a leading cause of fires that cause injuries and deaths across the globe.[1] For example, in Canada between 1980 and 1999 there were 3,929 smoking-material fires, which resulted in 278 injuries and 67 deaths. This translates to 7.1 injuries and 1.7 deaths for every 100 smoking-material fires.[2;3] Therefore, the risks from smoking material fires represent a significant public health concern. In June 2004, New York State became the first jurisdiction in the world to regulate cigarette ignition propensity, requiring reduced ignition propensity (RIP) cigarettes in an effort to reduce the number of smoking material fires.[4] On October 1st 2005, Canada became the first country in the world to enact such regulations.[5;6] Early results from New York State RIP law evaluations show a reduction in cigarette-caused fires with little adverse effect on consumer smoking patterns or behaviours.[7-9]

Most cigarette-caused fires begin when a smoldering cigarette ignites a mattress or bedding.[10] Therefore, smoking while in bed is an identifiable risk factor for having a cigarette-related fire. Similarly, mishandling of lit cigarettes may also make ignition of a fuel source, such as upholstered furniture or carpets more likely, as traditional manufactured cigarettes continue to burn when left unattended.[11] Thus, previous incidents such as burning furniture or clothing might serve as markers of future fire risk.

The cigarette industry has argued that RIP regulations may cause a false sense of security amongst smokers, encouraging careless handling of cigarettes and perhaps unintentionally encouraging fire-risk behaviors like smoking in bed.[12] There are few empirical data to support such a claim and data on the extent of such fire risk behaviors are limited; nevertheless,

regulators have cited these concerns as a potential barrier to ignition-propensity legislation.[13] In 2006, Health Canada released results from their 2005 Canadian Tobacco Use Monitoring Survey which, for the first time, recorded fire-risk data. They reported that 12% of current smokers had smoked in bed in the past week, and 10% of smokers had fallen asleep with a lit cigarette at least once, 24% of these in the past year.[14] The present study was undertaken to explore these, as well as other cigarette-caused fire risk behaviours and events, and their correlates in a random sample of Ontario smokers before the Canadian RIP law was implemented.

METHODS

A random digit dialed (RDD) telephone survey of adult smokers living in the Province of Ontario, the most populous province in Canada (approximately 39% of the total population) was initiated.[15] The survey was conducted between 5 July and 3 September 2005 using an RDD list obtained from ASDE Survey Sampler (Gatineau, QC, Canada), a geographically stratified random sampling generated a sample of random numbers distributed across all eligible blocks in proportion to their density of listed telephone households (i.e., "Random B").[16] With a target N of 600, the survey was designed to have 87% power to examine change over time in key items, with an effect-size of eight percentage points. This translates to a relative odds ratio of 1.4 using McNemar's test (as the survey is designed for two waves, pre- and post-law).

Eligible participants were those aged 18 and over who had smoked 100 cigarettes in their lifetime and who were currently smoking everyday or on some days. Respondents were compensated $15 CAD in appreciation for their time completing the 15 minute survey. The protocol received ethics clearance from the Roswell Park Cancer Institute Institutional Review Board.

Participants & Response Rate Determination

The current paper examines 596 smokers recruited for the main survey. An additional 54 smokers were recruited from the same sampling frame for a test-retest evaluation of selected survey items (described below). Survey response rate was computed using the Response Rate 4 (RR4) methodology of the American Association for Public Opinion Research (AAPOR).[17] A total sample of 10,000 household phone numbers was used. There were 8,213 households categorized as ineligible (e.g., no smokers over 18; communication barriers; non-residential number), while 842 numbers were retired when a live person was not reached after repeated attempts. There were 295 refusals by eligible respondents. Of households with unknown eligibility, we assumed that 14.9%, or 125, would have contained eligible smokers. We arrived at 14.9% by selecting the midpoint between the prevalence of smoking in Ontario (19%)[14] and the percentage of smoking households found in the current RDD study (10.8%). Finally, 650 smokers completed surveys. Thus, response rate was 650 / (650 + 295 + 125), or 61%.

Survey items

The survey was designed to assess a range of tobacco use behaviours to establish a baseline from which to assess changes due to the introduction of RIP cigarettes in Canada. Validated survey items used in the International Tobacco Control Four Country Survey assessed smoking behaviours, purchasing patterns, and quitting behaviours.[18] A set of items (see Table 1) was developed for the current study to assess fire-risk behaviours based on the literature on cigarette-caused fires and was tested for understanding on a small group of smokers (n=11) prior to fielding the survey.

We performed a test-retest reliability check of our fire-risk measures among 54 Ontario smokers. These smokers completed the same baseline survey, and then two weeks later completed a shortened version featuring the key fire-risk related measures. Forty-five smokers completed both the initial survey and the two-week follow-up (83%). Overall, agreement (percentage giving the same answer at both interviews) and Phi coefficient values for selected items are shown in Table 1. Our incident measures (e.g., cigarettes go out, burned clothing or furniture, started a fire) showed high consistency across two weeks, with acceptable phi coefficient values.

Table 1. Agreement and Phi coefficient values for key survey items, RIP Survey test-retest evaluation, Ontario, Canada, 2005 (n=45).

Item[1]	**Agreement (%)**	**Phi**
Do you ever smoke inside your home?	91.1	0.81
Have you ever scorched or burned furniture with a cigarette?	93.3	0.84
Have you ever dozed off or fallen asleep while smoking a cigarette? [1]	95.6	0.83
Have you ever scorched or burned your clothes with a cigarette?	86.7	0.73
Has a cigarette ever started a fire in your home?	97.8	0.70
Have you ever smoked a cigarette in bed?	84.4	0.68
Do you ever worry about starting a fire with a cigarette?	80.0	0.40
Do you ever worry about burning yourself with a cigarette?	88.9	0.24
Do you ever worry about burning others around you with a cigarette?	84.4	0.44
Do you ever worry about burning objects in your home with a cigarette?	91.1	0.62

1. Combination of two items ('dozed off' and 'fell asleep') which had substantial overlap.

Data were analyzed using SPSS 13.0 (SPSS Inc., Chicago, IL) software. Statistical analyses include means and percentages to describe fire risk behaviours, and cross-tabulations and logistic regression to identify correlates of fire risk behaviours. For skewed dependent variables, nonparametric Wilcoxon and Kruskal-Wallis tests were used. We calculated post-stratification weights by age (3 categories) and gender (2 categories), based on the distributions

of Ontario smokers in the 2003 Canadian Community Health Survey,[19] and all analyses were performed on weighted data. (Results were similar when data were unweighted).

RESULTS

Respondent characteristics

Respondents were 596 current cigarette smokers residing in Ontario, Canada. The mean age of participants was 43.8 years (SD=14.3, range=18-82). Ninety one percent (n=542) were daily smokers. Other respondent characteristics are shown in Table 2.

Table 2. Demographic and smoking behavioral characteristics of respondents, RIP Survey, Ontario, Canada, 2005 (N=596). Percentages weighted to Ontario smoker population age and gender.

	N	%
Basic Demographics		
Sex (one refused)		
Male	283	54.9
Female	312	45.1
Age Category		
18-24	58	14.2
25-39	170	31.7
40-54	231	35.9
55+	137	18.2
Race/Ethnicity		
White	538	88.8
Other Race/Ethnicity	58	11.2
SES Indicators		
Level of Education		
Less than HS	81	13.7
HS grad	215	35.5
Some University/Technical	179	30.3
Univ. Grad +	121	20.5
Income (CAD$)		
<30,000	127	23.3
30,000-60,000	161	29.1
60,000-90,000	143	28.2

	N	%
Smoking Behaviours		
Cigarettes per Day		
1-10	189	32.5
11-20	248	41.3
21-30	119	19.5
31+	40	6.7
Minutes to First Cigarette		
0-5	128	20.8
6-30	233	38.5
31-60	126	21.3
>60	109	19.3
Smoking Behaviour At Home		
Never smoke inside	228	40.9
Sometimes smoke inside	169	28.6
Always smoke inside	199	30.6

>90,000	100	19.4
Refused	40	
Type of Residence		
House	455	76.6
Apartment	120	20.5
Other	18	2.9
Rent or Own		
Rent	202	35.2
Own	366	59.4
Other	26	5.5

Worry about fires

Of interviewed smokers, 22.3% expressed any worry about starting a fire with a cigarette, 12.7% worried about burning themselves with a lit cigarette, 22.7% worried about burning other people with a lit cigarette, and 19.0% expressed worry about burning objects in their home with a cigarette. Overall, 45.7% of smokers reported at least one of the worries, but only 1.6% reported that they worried about all four. Reporting at least one worry was associated with greater age ($p<.02$), greater alcohol use ($p<.03$), and fewer minutes to the first cigarette after waking ($p<.03$), but was not significantly associated with sex, race/ethnicity, education, income, or type of residence. Only 5 participants (0.8%) reported having no smoke detector in their home; 80.4% reported having 1-3 detectors in their home, while remainder (18.8%) reported having 4 or more detectors.

Cigarette-Caused Fires and Fire Events

Of the 596 Ontario resident smokers surveyed, 10 (1.7%, 95% CI: 0.8-2.3) reported 'Yes' to ever experiencing a fire in their home that was started by a cigarette. Of these 10, seven were able to put the fire out by themselves, and four reported the fire department came to their home because of the fire. None of the 10 reported having experienced multiple fires. None of these incidents had occurred in the past 30 days; two incidents had occurred in the past year, and eight

more than one year ago. We also examined what might be termed 'near-fire' events, that is burning clothes or furniture which, if not dealt with quickly, could have become fires. Burning clothes with a lit cigarette was reported by 48% of smokers in their lifetime, with 7.5% reporting such an event in the past 30 days. Burning furniture was less frequent, with lifetime prevalence of 29%, and 2.6% reporting burning furniture in the last 30 days. Because of the small number of fires and low rates of these fire-events, we lacked the statistical power to examine correlates.

Fire-risk Behaviours

Figure 1 shows the lifetime and 30-day prevalence of four fire-risk behaviours—leaving lit cigarettes unattended, dozing off while smoking, falling asleep while smoking, and smoking in bed. Leaving cigarettes unattended and smoking in bed were particularly common, especially in the 30 days preceding the survey, while smokers were less likely to admit to dozing off or falling asleep while smoking.

---INSERT FIGURE 1 ABOUT HERE---

Correlates of Fire-risk Behaviours

We examined demographic, socioeconomic, and smoking behaviour correlates of engaging in the two most commonly reported fire-risk behaviours: leaving lit cigarettes unattended and smoking in bed (see Table 3). We chose to examine correlates of engaging in these two behaviours in the last 30 days as this should be most reflective of current behaviour. Those who customarily smoked inside their home and those who worried about burning other people with a cigarette were more likely to admit to having left a cigarette unattended in the last 30 days. Leaving cigarettes unattended was not significantly related to demographics, socioeconomic status, alcohol use, worry about burning objects in the home, or indicators of

cigarette dependence. For smoking in bed, race/ethnicity, income, and age emerged as risk factors, with nonwhites, those with a yearly income of $30-60,000, and those aged 18-24 all nearly three times more likely to report smoking in bed in the last 30 days. Other income levels (i.e., <$30,000 and $60-90,000), while not achieving statistical significance, also showed elevated odds of smoking in bed relative to the highest income group, suggestive of an overall trend. At the same time, those with the highest Heaviness of Smoking Index (HSI; sum of categorized cigarettes per day and time to first cigarette) [20] scores (i.e., 5 or 6) had much higher odds of smoking in bed in the last 30 days. In contrast, reported worry about burning others with a cigarette was associated with lower odds of smoking in bed, while reported worry about burning objects was associated with significantly increased odds of smoking in bed. The two worry items did not show a significant interaction in a separate model ($p>.60$; data not shown). Smoking in the home was omitted from the "smoking in bed" model for logical reasons: of those who said they "Never" smoke inside their home, only 2.2% (n=5) reported smoking a cigarette in bed in the last 30 days, compared with 18.3% of those who "Sometimes" smoke inside their home, and 25.6% of those who "Always" smoke inside their home ($p<.001$).

Table 3. Demographic and Behavioural correlates of leaving cigarettes unattended and smoking in bed.

	Leaving Cigarette Unattended				Smoking in Bed			
	N	%	Adjusted OR*	95% CI†	N	%	Adjusted OR	95% CI
Age								
18-24	58	23.8	0.78	0.34, 1.79	58	29.4	**3.75**	1.41, 9.96
24-39	168	27.3	0.87	0.46, 1.66	170	12.7	1.59	0.68, 3.74
40-54	231	26.6	0.84	0.46, 1.51	231	14.6	1.42	0.64, 3.13
55+	136	28.7	REF		137	11.1	REF	
Sex								
Male	282	28.9	1.31	0.84, 2.05	283	16.6	0.95	0.55, 1.62
Female	310	24.3	REF		312	14.5	REF	
Race/Ethnicity								
White	536	25.9	REF		538	14.9	REF	
Other Race/Ethnicity	57	34.8	1.25	0.63, 2.51	58	20.9	**3.97**	1.80, 8.80
Education								
Less Than HS	80	24.7	1.08	0.54, 2.17	81	18.3	1.04	0.46, 2.35
HS Graduate	214	22.7	REF		215	18.5	REF	
More than HS	299	23.1	1.48	0.75, 2.94	300	18.5	1.12	0.49, 2.54
Income								
<$30K	126	35.0	1.24	0.60, 2.54	127	20.8	2.69	0.94, 7.68
30-60K	160	21.4	0.67	0.35, 1.28	161	19.2	**3.15**	1.20, 8.29
60-90K	142	22.3	0.56	0.30, 1.03	143	15.2	2.13	0.81, 5.60
>$90K	100	32.0	REF		100	6.8	REF	
Rent/Own								
Rent/Other	384	27.1	1.38	0.83, 2.31	385	12.5	0.91	0.51, 1.64
Own	206	26.7	REF		209	21.5	REF	
Alcohol Use Last 30 Days								
None	163	26.8	REF		164	16.7	REF	
Some days	363	28.4	1.31	0.79, 2.19	365	15.3	1.21	0.66, 2.20
Daily	55	21.4	0.72	0.31, 1.70	55	12.5	0.79	0.26, 2.35
HSI								
0	83	21.3	REF		85	11.0	REF	
1	63	21.0	1.01	0.40, 2.53	63	8.1	0.62	0.15, 2.65
2	123	24.6	1.36	0.62, 2.98	124	13.5	1.97	0.68, 5.69
3	136	26.0	1.29	0.59, 2.82	136	14.4	2.46	0.88, 6.88
4	100	34.0	1.56	0.68, 3.56	100	15.0	2.79	0.94, 8.22
5	65	36.5	1.65	0.66, 4.14	65	30.2	**6.19**	2.01, 19.05
6	23	22.7	0.69	0.18, 2.68	23	36.4	**9.13**	2.22, 37.52
Smoking in Home								
Never	227	20.7	REF		---	---	---	---
Sometimes	168	24.7	1.50	0.85, 2.63	---	---	---	---
All the Time	198	37.0	**2.98**	1.66, 5.35	---	---	---	---
Worry about Burning Other People								
Yes	135	36.3	**1.72**	1.04, 2.85	135	10.4	**0.36**	0.17, 0.76
No	457	24.1	REF		460	17.2	REF	
Worry about Burning Objects in Home								
Yes	113	39.8	1.56	0.92, 2.63	113	23.0	**2.43**	1.31, 4.52
No	481	23.9	REF		482	13.7	REF	

Number of smoke detectors (continuous)	---	---	0.95	0.79, 1.15	---	---	0.83	0.65, 1.05

* Odds Ratio. ORs adjusted for all covariates listed in the table.
† 95% Confidence Interval

DISCUSSION

Cigarette smoking is an important cause of fire related injuries and deaths in Canada.[2,8] However, there have been few studies of fire risk behaviours among smokers. The current study describes the results of a random-digit-dialed telephone survey of current smokers in Ontario, Canada just prior to the implementation of Canada's RIP law. The results suggest that smokers in Ontario are not particularly worried about cigarette-related fires, although many smokers admit to engaging in behaviours that may increase the occurrence of cigarette caused fires, such as burning furniture or clothing, falling asleep while smoking, smoking while in bed, or leaving lit cigarettes unattended. The latter two behaviours were particularly prevalent in the last 30 days, suggesting they these behaviours are fairly common among smokers.

Of those surveyed, only 10 (1.7%) reported having had experienced a fire in their home started by a cigarette, with the majority of these fires not generating a response from the fire department. This low rate is consistent with larger national surveys assessing fire risks, such as the British Crime Survey.[21] Many cigarette-caused fires appear to go unreported to fire departments, and thus may not be reflected in official fire statistics. One might infer that the effect of the Canadian RIP law could be greater than fire department statistics suggest, if those statistics reflect only a portion of actual fires.

Leaving lit cigarettes unattended was the most commonly reported fire-risk behaviour, with nearly half of smokers admitting to leaving lit cigarettes unattended, and one in four doing so in the last 30 days. Those who worried about cigarette fires were actually significantly more likely to engage in the behaviour, suggesting that the behaviour may be driving the worry, rather

than vice versa. Leaving lit cigarettes unattended seemed to be independent of socio-demographic and smoking behaviour covariates, with the exception of rules about smoking in the home. Those who reported 'always' smoking in the home were three times as likely to leave cigarettes unattended. These findings may be indicative of a "self-exempting" belief that a cigarette fire "won't happen to me," akin to smokers' beliefs that they will not suffer from lung cancer or other smoking related illnesses.[22;23]

Smoking in bed was strongly associated with heaviness of smoking, suggesting that this behaviour could be a marker of nicotine dependence. Indeed, one of the items on the Fagerstrom Test for Nicotine Dependence is "Do you smoke if you are so ill you are in bed all day?"[24] Smoking in bed is particularly dangerous from the standpoint of fire ignition, in that bedding and mattresses are often the first materials ignited in fires.[10;25] Why racial/ethnic minorities, younger people, and those with lower incomes were more likely to report smoking in bed is unknown and could represent an avenue of future investigation, as well as potential targets for public health or fire safety interventions.

Intuitively, one might expect education, living situation and/or alcohol use to be related to fire risk behaviours, as they do predict actual fire risk.[11;25;26] However, the data suggest that, at least in this sample, there is no significant relationship between these indicators of socioeconomic status and fire risk behaviours.

Limitations are the same as for any cross-sectional telephone survey. Although we attempted to obtain a truly random sample of smokers, some biases in response to telephone surveys inevitably occur. Our sample reflects the bias toward participation of women in telephone surveys,[16] and is somewhat older and had less minority participation. Also, as a caveat, behaviours of Ontario smokers may not necessarily be reflective of Canadians in general.

Although most of our measures showed acceptable to good test-retest reliability in our small reliability study, the items require further validation. Our response rate, while only 61%, is typical of current telephone survey work, which is experiencing diminishing cooperation and response rates. [27;28] This proportion was also a function of the short survey field time (approximately 8 weeks), owing to the need to finish collecting any baseline data several weeks before the law came into effect (to account for the possible early introduction of complaint cigarettes to the market).

The current data show that smokers in Ontario, Canada engage in behaviours that place them at increased risk of cigarette fires, such as leaving cigarettes unattended or smoking in bed, with surprising frequency. As more governments implement laws aimed at reducing the ignition propensity of cigarettes,[29] it is important to establish surveillance of such behaviours so that behavioural changes in response to regulations might be evaluated. Indeed, Health Canada is assessing smoking in bed and leaving cigarettes unattended in its evaluation of the Canadian RIP law, and our findings are generally consistent with their baseline estimates. A follow-up survey of this cohort, underway as of this writing, will help to examine the effect of the ignition propensity standards on fire-risk behaviours and outcomes among Ontario smokers.

Implications for Prevention

Cigarette-caused fires represent a significant proportion of fire-related deaths and injuries, so much so that Canada and many U.S. states (New York, Vermont, California, Illinois, New Hampshire) have enacted laws regulating the ignition propensity of cigarettes. In addition, the U.S. Fire Administration had issued a report on mitigating behavioral antecedents of cigarette-caused fires, focusing on consumer messages.[25] They recommend messages related to

types of ashtrays, favoring RIP cigarettes, not smoking in homes with oxygen tanks, checking furniture for discarded butts, and making sure butts are truly extinguished when finished smoking. The findings of this study, however, suggest that messages discouraging smoking while in bed and leaving lit cigarettes unattended may be more important, as significant numbers (15-26%) of smokers engage in these behaviors in the last 30 days. As governments move to adopt ignition propensity regulations and/or enact educational campaigns around the issue of cigarette-caused fire prevention,[25;29] it may be important to establish surveillance of fire-risk behaviors to evaluate the impact of these programs on smoker behavior.

KEY POINTS

- Approximately 25% of smokers admitted to leaving lit cigarettes unattended in the last 30 days.
- Approximately 15% of smokers admitted to smoking while in bed in the last 30 days.
- Leaving lit cigarettes unattended was independent of demographic, socioeconomic, or nicotine dependence indicators, but was related to worry about fires and smoking inside the home.
- Persons who were younger, not white, and who had high nicotine dependence were more likely to smoke in bed.
- Significant numbers of smokers in Ontario, Canada engage in behaviours that may place them at increased risk of cigarette fires.
- As governments move to regulate cigarette ignition propensity, it is important to establish surveillance for behaviors related to fire risk.

ACKNOWLEDGEMENTS

Survey work was conducted by the Survey Research and Data Acquisition Resource, Roswell Park Cancer Institute. Amy VanDeusen and Denise Wieczorek supervised survey administration, and Rayne Thoman compiled the dataset. Thanks to Judy Snider and Murray Kaiserman for their input on the survey instrument. Portions of this work were presented at the NYS Tobacco Control Program Annual Meeting, Albany NY (September 2005) and the First World Conference on Fire Safer Cigarettes, Boston MA (December 2005).

COMPETING INTERESTS

We have no competing interests to declare.

FUNDING

This work was supported by grants from the US National Cancer Institute (Roswell Park Cancer Institute Transdisciplinary Tobacco Use Research Center 1 P50 CA111236, and 1 R01 CA117108), and the Robert Wood Johnson Foundation (#045734).

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Figure Legend

Figure 1. Lifetime and 30-day prevalence of fire-risk events among current smokers, Ontario, Canada, 2005. Percentages weighted to Ontario smoker population age and gender.