

Fires in Canada Originating from Smoking Materials

Analysis of Canadian Fire Incidents



Len Garis and Chris Biantoro

March 2019

Executive Summary

- A study was conducted of data from provincial/territorial annual fire reports, Canada's National Fire Information Database (NFID) and other sources to create an up-to-date picture of fires caused by smoker's materials, including cigarettes and e-cigarettes.
- Both the provincial annual reports and NFID data revealed declining numbers of structure fires related to smoking and/or open flames, although they remained a generally consistent proportion of overall structure fires. (The NFID data showed a decline in proportion but only 4.7% – from 6.8% to 6.3%).
- Except for in Ontario, most of the structures involved in smoking-related structural fires occurred in residential buildings. There is also a declining trend in the number of residential smoking fires, which make up on average 9% of all residential fires.
- Overall, numbers of outdoor fires, and those caused by smoker's materials, are also declining – with BC being the notable exception due to a spike of wildfires in 2015. About 11% of outdoor fires were caused by smoker's materials from 2012-2015, based on available NFID data.
- Cigarettes were the primary cause of fires in BC and Alberta, the only two provinces that reported on cigarettes as an ignition source. BC alone provided data on cigarette-caused structure fires in general, and reported that from 2012 to 2016, cigarettes were responsible for 66% of smoking material related structure fires and 55% of all related injuries and deaths.
- In terms of residential smoking fires, both Alberta and BC showed cigarettes to be the primary cause, with increasing trends in BC starting in 2014 and in Alberta starting in 2012. Cigarettes were also the main cause of outdoor smoking material fires in both provinces, causing 80% of all outdoor smoking material fires in BC and 50% in Alberta in 2015.
- Although there has been an overall decrease in actual numbers of smoking materials - related fires, there is still work to be done to reduce smoking materials as a cause of fires across the country, as evidenced by their significant casualty and economic toll. For example, residential smoking material fires were shown to cause approximately 85 injuries and 16 deaths each year across Ontario, BC, Alberta, Manitoba and Saskatchewan (representing 70% of Canada's population). As well, more than \$1.5 million in economic losses from outdoor smoking fires were reported to the NFID from 2012-2015, with BC reporting the highest loss (more than \$1 million in 2012).
- When considering cigarette-caused fires only, in BC, they caused more than \$259,400 in losses caused by outdoor fires from 2012-2015, making up 84% of all outdoor smoking fire losses in 2015. Over the same timeframe, Alberta experienced more than \$88,200 in cigarette-caused outdoor fire losses, representing 73% of its outdoor smoking fire losses in 2015.

- Although e-cigarette use has increased in recent years, there is not yet enough data available through statistic inference tests or surveys to form any conclusions about their impact as an ignition source.
- The analysis of the available data for this paper points to the need for more thorough and up-to-date data-collection and reporting across the country on the specific causes and impact of fires, including emerging trends.

Purpose of this Research

Research over time indicates that smoking materials continue to be a leading cause of residential fires in Canada. With newer data available through the NFID and provincial annual fire reports, this study intends to provide a more recent picture of fire risks related to smoking – including the potential impact of increased e-cigarette use in recent years.

Background

Smoking materials have long been associated with increased fire risk, although changes in the materials and standards have helped mitigate this risk. For example, the introduction of child-proof lighters in the early 1980s resulted in a dramatic reduction of fires associated with the misuse of lighters. As well, in October 2005, Canada became the first country to implement a nationwide cigarette fire-safety standard requiring that all cigarettes manufactured in or imported into Canada must burn their full length for no more than 25% of the time [1].

Nevertheless, according to a 2017 study of data from NFID, Statistics Canada determined that smoking materials/open flames were still the leading sources of ignition in residential fires from 2005 to 2014, second only to cooking equipment [2]. This finding is similar to results from the 2002 Annual Report of the Council of Canadian Fire Marshals and Fire Commissioners, in which smoking materials/open flames were the top source of ignition [3].

However, the smoking environment continues to evolve. Fewer people are smoking [28] [29] [30], while some are swapping in their cigarettes for alternatives such as e-cigarettes, a battery-operated device that converts nicotine (or other options) into a mist for inhalation. While there is no flame associated with their use, their lithium-ion battery power source has been known to explode and, in some cases, cause fires. In fact, the US Fire Administration issued an advisory warning of this potential risk and noting a six-fold increase in their use from 2014 to 2016 [4].

Amid this changing environment, the NFID, provincial/territorial annual fire reports and other data provide an opportunity to take a closer look at the state of fires caused by smoking materials in Canada. New provincial data on cigarettes as an ignition source from British Columbia and Alberta will also help to illuminate their role in causing fires. Cigarettes are not reported consistently as an ignition source, so there has been limited related Canadian research since a review from the Canadian Association of Fire Chiefs in early 2000 [5].

Overall, this paper proposes to:

1. Develop a methodology to analyze the NFID and provincial/territorial annual fire reports to identify and frame retrospectively the cause of residential and structure fires.
2. Provide information on the causes of outdoor fires (wildland or vegetation fires). Information on these types of fires is more limited than what is available for structural fires.
3. Identify related casualties (injury and death) and economic loss.
4. Create projections based on a high-level analysis of aggregate data, applying population rates for reliability testing where information is missing or not reported.
5. Evaluate other sources of information, such as Stats Canada data and published reports.
6. Survey Canadian Fire Marshals/Commissioners and Fire Chiefs from large departments for intelligence around e-cigarette fires.

Methodology

The researchers reviewed data from the National Fire Information Database including 439,256 fire incident records from British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and New Brunswick collected over 10 years (205,332 classified as structural fires, with 126,773 classified as residential across all uses. There was also data on 15,326 casualties, including 10,337 casualties in the residential grouping, (1,418 deaths and 8,919 injuries).

The analysis of NFID data is limited on outdoor fires, structure fires and residential structures¹ with the source of ignition coded as smoker's materials. Those fires were only reported to the NFID by five jurisdictions which make up 70% of Canada's population (Ontario, British Columbia, Alberta, Saskatchewan, and Manitoba) excluding Canadian Armed Forces,. As a result, the population rates were applied to project the number of fires for the remaining jurisdictions. In addition, there is no data available for 2016, thus a data extrapolation based on the available numbers from previous years was performed for that year. Additional methodology about these projections is provided in that section.

Information was also reviewed from the annual fire reports produced by Canadian provinces and territories (referred to as provincial annual reports) on fire numbers, types and causes. One limitation with these reports is the consolidation of both smoker's materials and open flames as a single ignition source. Also, due to a restricted timeline, analysis was limited to information posted on the websites of the Office of Fire Marshals and Fire Commissioners in each province and territory, and from the Fire System access of the Office of the Fire Commissioner British Columbia (BCOFC).

The selection of the 2012-2016 time period was intended to align with the 2016 e-cigarette advisory issued by the US Fire Administration, and in particular, the reported significant rise in e-cigarette-related fire incidents and explosions from 2014-2016 [4]. To attempt to quantify the

¹ Classified as "Residential - row, garden, town housing, condominium", "Residential-apartment, tenement", "Residential - single detached", "Residential - duplex, 3-plex, 4-plex", "Camp site/RV park", "Residential - with business/mercantile, up to 3 stories".

impact of e-cigarettes as a cause of fires, statistical inference tests were conducted to determine if there are any differences in fire statistics between the two distinct time periods (pre-2014 and post-2014).

Surveys were also disseminated to all Canadian Fire Marshals/Commissioners and 15 Fire Chiefs of departments (those serving the largest populations) to identify if e-cigarettes were the known cause of any structure fires in each Canadian jurisdiction.

Trends from Provincial Annual Reports: Fires and Casualties

STRUCTURE FIRES CAUSED BY SMOKER’S MATERIALS / OPEN FLAMES

As mentioned above, there are limited publicly available reports in Canada on fires caused by smoking materials (referred to as smoking material fires). As a result, analysis was conducted on annual report data from five provinces (Ontario, BC, Alberta, Quebec, and Newfoundland and Labrador) and two territories (Yukon and Nunavut) showing fires ignited by either smoking materials or open flames.

In addition, because the reports by Alberta, Newfoundland and Labrador, Nunavut and Yukon did not report the total number of smoking-related structure fires, for those jurisdictions the total number of all fires was used as a denominator to calculate the proportion of smoking-related fires to structure fires.

Based on this data, Table 1 presents the average number of fires from smoking materials and open flames and their proportion of all structure fires.

TABLE 1: PROPORTION OF FIRES FROM SMOKING MATERIALS/OPEN FLAMES TO ALL STRUCTURE FIRES

Province/Territory	Year	Smoking /Open Flame Fires	% of Structure Fires
See below*	2012	2001	8.1%
	2013	1950	8.0%
	2014	1766	7.2%
	2015	2014	8.1%
	2016	1066**	3.8%**

* Ontario, BC, Alberta, Quebec, Newfoundland and Labrador, Yukon and Nunavut

** Excluding Quebec

See **Appendix A** for a breakdown of information and sources. While actual numbers of smoking or open flame fires decreased and increased during the study period, they remained a generally consistent proportion of overall structure fires. (An average of 7.9% for 2012-2015; reporting for 2016 is incomplete due to missing data from Quebec.)

The key finding from this data is that overall, eight percent of structure fires from the seven jurisdictions were caused by smoking/open flames.

Casualties from Fires Caused by Smoking / Open Flames

Analysis of casualties (injuries and deaths) was conducted on annual report data from three provinces (Ontario, BC and Alberta) and two territories (Yukon and Nunavut).

See **Appendix B** for a breakdown of casualties by years and jurisdictions, the number of injuries and deaths, and the total economic loss in dollars (where available). For Alberta, the number of casualties in 2015 and 2016 was adjusted to reflect the 10-year average number of casualties.

While there are no consistent trends in the number of casualties caused by smoking/open flame fires across all the reporting jurisdictions, the following trends in individual jurisdictions were observed after 2014:

- BC shows a decrease in the number of injuries and deaths,
- Nunavut shows an increase in the number of injuries,
- Alberta shows an increase in economic loss, and
- Ontario shows an increase in the number of deaths.

BRITISH COLUMBIA STRUCTURE FIRES CAUSED BY CIGARETTES

Detailed data related to cigarette-caused structure fires was only available from BC, through the internal Fire System accessed by the Office of the Fire Commissioner. Table 2 shows the impact of cigarette-related structure fires in relation to overall smoking materials fires, in terms of injuries, deaths and losses.

TABLE 2: BC STRUCTURE FIRES, CASUALTIES AND LOSS (\$) WITH CIGARETTES AS SOURCE OF IGNITION, COMPARED TO OVERALL SMOKING FIRES

Year	Total Fires*	% Fires**	Total Injuries*	% Injuries**	Total Deaths*	% Deaths**	Total \$ Loss* (CAD)	% Loss**
2012	145	65.6%	13	76.5%	0	0.0%	3.2M	11.3%
2013	146	68.2%	23	71.9%	2	50.0%	8.97M	73.6%
2014	116	59.2%	12	50.0%	2	33.3%	3.7M	27.4%
2015	169	76.1%	16	72.7%	1	33.3%	27M	90.8%
2016	132	58.1%	10	58.8%	2	66.7%	13M	80.4%
Total	708	65.6%	74	66.1%	7	43.8%	56M	55.9%

* Structure fires caused by cigarettes only

** All smoking structure fires

Key findings:

- Overall, cigarettes were responsible for 66% of smoking material structure fires and related injuries in BC from 2012 to 2016. When both injuries and deaths are factored in, cigarettes were responsible for 55% of all casualties in BC caused by smoking material structure fires from 2012 to 2016.

- 2015 was a notable year, with cigarettes causing 76% of the fires, 73% of the injuries and 91% of the economic loss related to smoking fires.

Trends from the National Fire Information Database: Fires and Casualties

Data available for analysis from the NFID included overall structure fires, residential structure fires, outdoor fires, and related casualties between 2012 and 2015 from the following provinces: Ontario, BC, Alberta, Saskatchewan and Manitoba.

Of note:

- The outdoor and structure fires were identified by excluding vehicle and person types of fire incidents.
- There are differences in how the various jurisdictions report the ignition source for smoking material fires. Ontario, Manitoba and Saskatchewan used a broader code that includes cigarettes, pipes, cigars, matches and/or lighters. However, BC, Alberta and New Brunswick used more specific codes – such as cigarettes or lighters – allowing for greater insight from the data.
- New Brunswick was not included in the analysis because of significant discrepancies (over 50%) between numbers reported in its annual reports and the NFID, and because it did not report the structure and residential fires.
- Ontario did not report its 2015 smoking material fires to the NFID.

STRUCTURE FIRES AND SMOKER'S MATERIALS

Based on the above data, Table 3 shows the number of structure fires ignited by smoking materials and their proportion to the overall number of structure fires in Ontario, BC, Alberta, Saskatchewan and Manitoba from 2012-2015 (with the exception of Ontario in 2015). See **Appendix C** for a breakdown by jurisdiction.

TABLE 3: NUMBER OF STRUCTURE FIRES AND SMOKING MATERIAL FIRES REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Structure Fires	Total Smoking Structure Fires	% Smoking Structure Fires
See below*	2012	19,256	1,301	6.8%
	2013	18,171	1,188	6.5%
	2014	18,249	1,159	6.4%
	2015	9,514**	600**	6.3%**

* Ontario, BC, Alberta, Saskatchewan and Manitoba

** Excluding Ontario

Key findings:

- In general, the available data shows a declining trend of smoking material -related structure fires from 2012 to 2015 across the jurisdictions (noting Ontario's absence from 2015). The proportion of smoking material fires relative to structure fires also decreased during this period, from 6.8% to 6.3%.
- Among the five jurisdictions, Saskatchewan appears to have the lowest proportion of smoking material fires, although that may be related to its reporting of ignition sources (most are reported as unknown).

Residential Fires and Smoking Materials

Key findings about fire locations provided by the NFID data:

- Overall, approximately 60% of the reported smoking fires occurred in a residential structure.
- Among the individual jurisdictions, 70% to 90% of smoking material fires occurred in residential buildings. The exception was Ontario, which had the lowest percentage (approximately 30%).

See **Appendix D** for the breakdown.

Proportion of Residential Fires Involving Smoking Materials

Key findings about residential smoking material fires provided by the NFID data:

- Overall, there is a declining trend in residential smoking fires, which make up on average 9% of total residential fires.
- There is variation among the five jurisdictions however, with the highest percentage in Ontario (14%) and the lowest in Manitoba (4%).

See **Appendix E** for the breakdown.

Casualties and Loss Related to Residential Smoking Material Fires

Data about injuries, deaths and loss was extracted from the NFID for analysis. Due to differences in reporting, Alberta's total loss figure only includes economic loss, while the other four jurisdictions include both property and economic loss.

Key findings:

- Across the five jurisdictions, there is no consistent trend in casualty numbers, although Manitoba shows a steady decline in the number of injuries.
- Alberta has the highest economic loss among the provinces in 2015.

- Ontario has the lowest economic loss among the provinces (Ontario experienced a significant drop in economic loss from 2009 onwards).

See **Appendix F** for the breakdown.

BRITISH COLUMBIA AND ALBERTA RESIDENTIAL FIRES AND CIGARETTES

Only BC and Alberta consistently reported cigarette-related residential fires to the NFID from 2012 to 2015 (2016 data was not available). Although New Brunswick has also identified cigarettes as an ignition source, it was not considered for the analysis due to reporting inconsistencies.

The following table shows the number of residential fires caused by cigarettes, their proportion to residential smoking material fires, and associated casualties and loss.

TABLE 4: RESIDENTIAL FIRES CAUSED BY CIGARETTES IN BC AND ALBERTA: 2012-2015

Province	Year	Residential Fires Caused by Cigarettes	% of Residential Smoking Fires	Injuries	Injury Rate*	Deaths	Death Rate*	Total Loss** (\$ CAD)	% Loss**
British Columbia	2012	129	74.1%	11	8.5	0	0.0	2.72M	1.7%
	2013	116	67.4%	22	18.9	2	1.7	7.87M	5.4%
	2014	95	60.5%	11	11.6	1	1.0	2.72M	1.8%
	2015	131	74.4%	15	11.5	1	0.8	24.8M	13.9%
Alberta	2012	151	76.2%	12	7.9	2	1.3	13.1M	4.5%
	2013	207	78.4%	13	6.3	3	1.5	17.4M	7.8%
	2014	237	86.4%	7	2.9	1	0.4	10.4M	5.0%
	2015	228	83.5%	15	6.6	0	0.0	39.2M	13.2%

* Injury and death rates have been calculated to reflect the rate of casualties per 100 incidents.

** All residential fires.

Key findings:

- Cigarettes are the primary cause of residential smoking material fires, with increasing trends in BC starting in 2014 and in Alberta starting in 2012.
- Alberta has a lower related injury rate than BC, but both provinces have similar death rates.
- There is a rising trend in losses in residential structures for both provinces, increasing in BC from 1.7% to 13.9% and in Alberta from 4.5% to 13.2% between 2012 to 2015.

OUTDOOR FIRES CAUSED BY SMOKING MATERIALS

Ontario, BC, Alberta, Manitoba and Saskatchewan reported outdoor fires to the NFID from 2012-2015 – excluding the Canadian Armed Forces [2] – although Saskatchewan did not report which fires were ignited by smoking materials.

The table below shows the number of outdoor fires from 2012-2015 caused by smoking materials across the five jurisdictions.

TABLE 5: NUMBER OF OUTDOOR FIRES CAUSED BY SMOKING MATERIALS REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Outdoor Fires	Total Outdoor Smoking Fires	% Outdoor Smoking Fires
See below*	2012	6,737	538	8.0%
	2013	4,715	508	10.8%
	2014	4,570	460	10.1%
	2015	4,542**	774**	17%**

* Ontario, BC, Alberta, Saskatchewan and Manitoba

** Excluding Ontario

See **Appendix G** for a breakdown by jurisdiction. Key findings from the data:

- Overall, an average of 11% of outdoor fires were caused by smoking materials, with the highest percentage (17%) in 2015.
- Among the jurisdictions, BC has the highest percentage of outdoor fires caused by smoking materials (average 19.5%), peaking in 2015 at more than 25%. Manitoba has the lowest percentage (about 1.4%).

Casualties and Economic Loss from Outdoor Fires Caused by Smoking Materials

The table below shows the number of casualties and economic loss related to outdoor fires from 2012-2015 caused by smoking materials, across the five jurisdictions.

TABLE 6: CASUALTIES AND ECONOMIC LOSS FROM OUTDOOR FIRES CAUSED BY SMOKING MATERIALS REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Injuries from Outdoor Smoking Fires	Total Deaths from Outdoor Smoking Fires	Economic Loss (\$ CAD)
See below*	2012	10	0	1,098,792
	2013	3	0	199,049
	2014	0	0	83,149
	2015	1**	0**	202,037

* Ontario, BC, Alberta, Saskatchewan and Manitoba

** Excluding Ontario

See **Appendix H** for a breakdown by jurisdiction. Key findings from the data:

- Across the five jurisdictions, outdoor smoking material fires led to 14 injuries from 2012-2015, with Ontario reporting the highest figure (eight injuries in 2012) and Manitoba reporting none.
- No fatalities related to outdoor smoking material fires were reported during the study period.

- More than \$1.5 million in economic losses from outdoor smoking fires were reported across the five jurisdictions from 2012-2015, with BC reporting the highest loss (more than \$1 million in 2012).

BRITISH COLUMBIA AND ALBERTA RESIDENTIAL FIRES AND CIGARETTES

Only BC and Alberta consistently reported cigarette-related outdoor fires to the NFID from 2012 to 2015 (2016 data was not available).

The following table shows the number of outdoor fires caused by cigarettes, their proportion to all outdoor smoking fires, and associated casualties.

TABLE 7: OUTDOOR FIRES AND CASUALTIES CAUSED BY CIGARETTES IN BC AND ALBERTA: 2012-2015

Province	Year	Outdoor Fires Caused by Cigarettes	% of all Outdoor Smoking Fires	Injuries	Injury Rate*	Deaths	Death Rate*	Fire Loss** (\$ CAD)	% Loss**
British Columbia	2012	276	73%	2	0.7	0	0	29,530	3%
	2013	279	67%	0	0	0	0	34,210	62%
	2014	298	76%	0	0	0	0	35,993	85%
	2015	586	80%	0	0	0	0	159,721	84%
Alberta	2012	21	62%	0	0	0	0	15,630	68%
	2013	16	67%	2	12.5	0	0	40,550	29%
	2014	17	71%	0	0	0	0	28,180	69%
	2015	10	50%	0	0	0	0	3,857	73%

* Injury and death rates have been calculated to reflect the rate of casualties per 100 incidents.

** All outdoor fires.

Key findings:

- Cigarettes are the primary cause of outdoor smoking material fires, although this trend is increasing in BC and decreasing in Alberta. In 2015, 80% of outdoor smoking material fires in BC were caused by cigarettes, up from 73% in 2012. However, in Alberta, 50% of outdoor smoking fires were caused by cigarettes in 2015, down from 62% in 2012.
- Cigarette-caused outdoor fires result in significant economic losses in both provinces. In BC, they caused more than \$259,400 in losses from 2012-2015 and increased in proportion from 3% to 84% of all outdoor fire losses. Over the same timeframe, Alberta experienced more than \$88,200 in losses but had a more modest increase in percentage of total losses (from 68% to 73%).
- Injury rates related to cigarette-caused outdoor fires are low for both provinces, with the exception of Alberta's 2013 injury rate of 12.5.

Projections Based on Data from the National Fire Information Database

PROJECTED RESIDENTIAL SMOKING FIRES ACROSS CANADA

Ontario, BC, Alberta, Saskatchewan and Manitoba represent around 70% of Canada's population. An assumption has been made that the fire rates for those five jurisdictions represents the rates for Canada overall and for the remaining provinces and territories. Based on that perspective, structure fire and residential fire rates from the five jurisdictions have been aggregated and applied to the remaining eight jurisdictions. See **Appendix I** for the aggregation of residential smoking fire rates per 1 million population from the five jurisdictions.

The following methodology was used to fill additional data gaps:

- Missing 2015 and 2016 smoking fires in Ontario – applying the previous year-to-year growth rate for smoking material fires in Ontario.
- Missing 2016 residential smoking material fires in Ontario – using the new figure above and applying the average proportion of residential smoking material fires to all smoking material fires in Ontario from 2012-2014 (35%).
- Missing 2016 residential smoking material fires in Ontario, BC, Alberta and Saskatchewan – using the same methods as above. (For Saskatchewan, no smoking material residential fires were assumed based on its reporting from previous years.)
- Missing 2016 residential smoking fires in Manitoba – because it did not include smoking material fires in its annual reports, the number of structure fires was adjusted.

Using this data, the table below extrapolates national residential smoking material fires from 2012-2016 after calculating the projected fire rate per 1 million population. The limitations of the projection methodology should be noted: because the fire rate is mostly based on those of the western provinces and Ontario and did not include any territories, projected data for territories may be overestimated.

TABLE 8: PROJECTED RESIDENTIAL SMOKING FIRES IN CANADA: 2012-2016

Jurisdiction	Year	Population	Fire Rate per 1M population	Residential Smoking Fires
Canada*	2012	34,750,545	28.4	987
	2013	35,152,370	29.7	1,044
	2014	35,535,348	28.3	1,006
	2015	35,832,513	31.1**	1,114
	2016	36,264,604	28.9**	1,004

* Based on data from Ontario, BC, Alberta, Saskatchewan and Manitoba representing 70% of Canada's population

** Projected

See **Appendix J** for a breakdown for the jurisdictions that did not provide that information to the NFID.

Key findings from the data:

- Overall, there are no consistent trends for residential smoking material fires from 2012 to 2016. The lowest rate occurred in 2014 and the highest rate in 2015.
- Among the five jurisdictions that provided data, BC and Ontario had declining trends for residential smoking material fires until 2014, after which the rates increased.
- Among the five jurisdictions that provided data, Alberta consistently had the highest rates for residential smoking material fires from 2013 and onwards. Ontario consistently had the lowest rates throughout the five-year period.

No comparisons can be performed between the projected numbers and the provincial annual reports because they are not identical; the provincial reports show fires caused by both smoking materials and open flames.

PROJECTED CASUALTIES AND LOSS FROM RESIDENTIAL SMOKING FIRES ACROSS CANADA

Projected fire casualties were generated from rates of casualties per 1,000 projected residential smoking material fires, whereas projected economic loss was derived from the rates of loss per fire incident. For years with no fire casualties, an average rate of casualties was extrapolated from the available annual rates, using similar methods to how the missing rates for smoking fires and residential smoking material fires were calculated. Also – similar to the above projections – the projected casualty and economic loss rates from the five jurisdictions making up 70% of Canada’s population were assumed to be the nationwide rates and were applied to jurisdictions that did not provide the data to the NFID.

See **Appendix K** for the aggregate rates for casualties and economic loss from residential smoking fires in the five jurisdictions, **Appendix L** for the projected number of casualties and economic loss from residential smoking material fires in the five jurisdictions, and **Appendix M** for the projected number of casualties and economic loss from residential smoking fires in the remaining jurisdictions with missing data.

Based on this data, the table below extrapolates Canada-wide casualties and economic loss from residential smoking fires over the five years.

TABLE 9: PROJECTED CASUALTIES AND ECONOMIC LOSS FROM RESIDENTIAL SMOKING FIRES IN CANADA: 2012-2016

Jurisdiction	Year	Residential Smoking Fires*	Injuries	Deaths	Economic Loss (\$ CAD)
Canada*	2012	987	126	25	72M
	2013	1,044	129	24	56.5M
	2014	1,006	111	21	34.5M
	2015	1,114	120	20	111.6M
	2016	1,004	114	22	66M**

* Based on data from Ontario, BC, Alberta, Saskatchewan and Manitoba representing 70% of Canada’s population

** Projected

Key findings from the data:

- Based on the aggregate data for the five provinces, Manitoba and Ontario dominate the injury and death rates respectively, while British Columbia had the highest economic loss per fire.
- The projection for the five jurisdictions shows an upward trend of the number of injuries since 2014, after declining numbers in 2012 and 2013. The year 2014 also marks the lowest economic loss in the five-year period.
- The Canada-wide projection marks 2015 as the year with the lowest injury and death rates but the highest economic losses.

Projections for outdoor smoking material fires using population rates were not conducted because BC's exceptional high fire rates in 2015 would likely lead to an overestimation for jurisdictions with missing information.

IMPACT OF E-CIGARETTES ON FIRES

STATISTICAL INFERENCE TESTING

In the absence of widespread data related to cigarettes or e-cigarettes, the researchers conducted statistical inference tests to attempt to extrapolate findings from the provincial fire reports and NFID data. In particular, the testing studied differences in data between the years before and after the 2014 spike in e-cigarette use noted in the US Fire Administration advisory.

No conclusions were drawn because none of the tests showed any significant differences in the pre- and post-2014 data.

See **Appendix N** for the results from the various inference tests:

- Presence of cigarettes and/or e-cigarettes in the number of structure fires and casualties.
- Differences in residential smoking fires, both with extrapolated 2016 data and excluding the year 2016.
- Differences in cigarette-related fires and casualties.
- Differences in outdoor smoking fires.
- Differences in outdoor fires caused by cigarettes.

E-CIGARETTE SURVEY

A survey inquiring about the effect of e-cigarettes on structural fires was disseminated to Canadian Fire Marshals/Commissioners and selected Fire Chiefs from 15 major Canadian fire departments (based on size of population served). These are listed below:

- Toronto
- Calgary
- Ottawa
- Edmonton
- Mississauga
- Vancouver
- Brampton
- Hamilton
- London
- Markham
- Vaughan
- Winnipeg
- Oshawa
- Burnaby
- Windsor

The survey asked the following question: “Has your fire investigation branch determined E-Cigarettes a contributing factor in any structure fires?” Respondents were asked to answer Yes or No and were given the opportunity to add comments. See **Appendix O** for the sample survey letter.

Eleven respondents returned the survey. The results, shown in the table below, appear to indicate that few incidents resulted from e-cigarettes. However, this may be related to the small sample size and lack of consistent tracking or awareness of e-cigarettes as an ignition source.

TABLE 10: E-CIGARETTE SURVEY RESULTS

Response	Number of Responses	Number of Known E-cigarette Fires	Number of Casualties	Economic Loss (CAD)
Yes	4	8	2 injuries	\$57,300
No	7	n/a	n/a	n/a
Comments	<ul style="list-style-type: none"> • No codes to track the incidents caused by e-cigarettes. • The information are embedded in the narratives within the fire investigation sections using the following search terms: e-cigarettes, electronic cigarettes, electronic smoke, E-Cig, Vape, Vaporizer. • The information can also be withdrawn from the notes under misuse of ignition category under response type 01 fires for property fires. • One jurisdiction is currently adjusting its database and reporting system to allow specific reports for e-cigarettes. 			

Discussion

Both the provincial annual reports and NFID data reveal declining numbers of structure fires related to smoking materials and/or open flames, although they remained a generally consistent proportion of overall structure fires. (The NFID data showed a decline in proportion but only 4.7% – from 6.8% to 6.3%.)

Further, the NFID data shows that when smoking is the cause of a structure fire, it is most often in a residential building – 70 to 90% in most jurisdictions, with the exception of Ontario, with only 30%. As well, like the decline in the number of smoking material -related structure fires as a whole, there

is also a declining trend in the number of residential smoking material fires, which make up on average 9% of all residential fires.

Overall, numbers of outdoor fires and those caused by smoking materials are also declining, according to the NFID data – with BC being the notable exception. In 2015, BC experienced a significant increase in both outdoor fires and the proportion caused by smoker’s materials (of BC’s 2,835 outdoor fires in 2015, almost 26% were caused by smoking materials). When that outlier year is removed from the calculation, the proportion of outdoor smoking fires to all outdoor fires averaged about 9%. With 2015 included, the proportion averaged 11%.

It should be of no surprise that cigarettes were the primary cause of smoking material fires in BC and Alberta, the only two provinces that reported on cigarettes as a cause of smoking fires. BC alone provided data on cigarette-caused structure fires in general, and reported that from 2012 to 2016, cigarettes were responsible for 66% of smoking material structure fires and 55% of all related injuries and deaths. The year 2015 was notable in BC, with cigarettes causing 76% of fires, 73% of injuries and 91% of the economic loss related to smoking structure fires.

In terms of residential smoking material fires, both BC and Alberta showed cigarettes to be the primary cause, with increasing trends in BC starting in 2014 and in Alberta starting in 2012. Cigarettes were also the main cause of outdoor smoking material fires in both provinces, but it should be noted that this trend is increasing in BC and decreasing in Alberta. In 2015, 80% of outdoor smoking fires in BC were caused by cigarettes, up from 73% in 2012. However, in Alberta, 50% of outdoor smoking fires were caused by cigarettes in 2015, down from 62% in 2012.

The picture of injuries and deaths related to smoking fires is less clear. There are no consistent trends about casualties in either the provincial annual reports or NFID data, except for in Manitoba, which showed a steady decline in the number of injuries. Across the five jurisdictions making up 70% of Canada’s population, outdoor smoking material fires led to 14 injuries but no fatalities from 2012-2014 (this range does not include 2015 because Ontario did not report that year, but it should be noted that BC reported one injury and no deaths in 2015, when it experienced its spike of wildfires). Residential smoking material fires were deadlier, causing approximately 85 injuries and 16 deaths each year from 2012-2014 in the five jurisdictions.

The overall decrease in actual numbers of structure and outdoor fires, and related smoking fires, is good news and reflects a National Fire Protection Association study indicated a consistent decreasing trend in smoker’s materials fires [31]. The NFPA study also shows a decrease in related casualties.

The decrease in fires could, in part, be the result of the declining trend in smoking in Canada, as shown in the study from the Propel Centre for Population Health Impact at the University of Waterloo and other studies from Statistics Canada [28] [29] [30].

That being said, the economic losses related to smoking material fires are significant. More than \$1.5 million estimated in economic losses from outdoor smoking material fires were reported to the NFID from 2012-2015, with BC reporting the highest loss (more than \$1 million in 2012).

When it comes to cigarette-caused fires only, in BC, they caused more than \$259,400 in losses caused by outdoor fires from 2012-2015, and increased in proportion from 3% to 84% of all outdoor fire losses. Over the same timeframe, Alberta experienced more than \$88,200 in cigarette-caused outdoor fire losses but had a more modest increase in proportion of total losses (from 68% to 73%).

How do e-cigarettes fit in the picture? No conclusions could be drawn from the statistical inference tests to attempt to extrapolate findings from the provincial fire reports and NFID data, based on differences in data from the years before and after the 2014 spike in e-cigarette use noted in the US Fire Administration advisory. None of the tests showed any significant differences in the pre- and post-2014 data.

Similarly, no conclusions can be made following the survey of Canadian Fire Marshals/Commissioners and Fire Chiefs. Although few respondents reported e-cigarettes had been a factor in structure fires, the results are not reliable due to the sample size (eleven) and lack of consistent tracking.

As well, the data integrity constrains the researchers from deriving any conclusions based on the projections made from the data for other jurisdictions in Canada. In particular, several jurisdictions showed underestimated and overestimated projections of incidents and casualties after cross-validations with the published reports took place.

Conclusion

Although smoking and the number of fires it causes is generally declining in Canada, it is still a significant cause of residential, structure and outdoor fires, along with related casualties and economic loss. Cigarettes, in particular, appear largely to blame for causing these fires. There is still work to be done to reduce smoking as a cause of fires across the country.

The data analysis for this paper points to the following:

- The need for the Canadian fire service – from individual fire departments to provincial Fire Marshals/Commissioners – to make an effort to provide timely and complete data to the NFID through their annual reports. This includes collecting detail about specific ignition sources.
- The need for fire services and data-collectors to be mindful of emerging trends – e.g. e-cigarettes – in order to provide appropriate data-reporting options.

As the Canadian fire service strives to provide a strategic, evidence-based response to this and other public safety threats, access to up-to-date and complete national fire data is critical. Without it, the fire service will struggle to monitor its progress and identify problems and emerging trends; it will continually be a reactive service rather than a proactive one.

References

1. <https://www.nfpa.org/Public-Education/By-topic/Top-causes-of-fire/Smoking/Coalition-for-Fire-Safe-Cigarettes/States-that-have-passed-fire-safe-cigarette-laws/Canada-the-first-nation-to-enact-a-fire-safe-cigarette-law>
2. Statistics Canada. Fire Statistics in Canada, Selected Observations from the National Fire Information Database 2005 to 2014. 2017.
3. Council of Canadian Fire Marshals and Fire Commissioners. 2002 Annual Report. http://www.ccfmfc.ca/pdfs/report_e_02.pdf
4. McKenna Jr. L.A. Electronic Cigarette Fires and Explosions in the United States 2009-2016. July 2017. US Fire Administration.
5. <https://www.canada.ca/en/health-canada/services/science-research/activity-highlights/health-protection-promotion/program-estimates-damage-cigarette-fires-science-research-health-canada.html>.
6. https://www.mcscs.jus.gov.on.ca/english/FireMarshal/MediaRelationsandResources/FireStatistics/OntarioFires/FireLossesCausesTrendsIssues/stats_causes.html
7. <https://www.ofc.gov.bc.ca/OFC/fireLossStatisticsSearchResults.jsp>
8. <http://www.ofc.alberta.ca/interactive-fire-data-analysis>
9. [http://www.ofc.alberta.ca/documents/Web_Ready_ofc-2011-12-stat-report_\(final\).pdf](http://www.ofc.alberta.ca/documents/Web_Ready_ofc-2011-12-stat-report_(final).pdf)
10. [http://www.ofc.alberta.ca/documents/2013-2014_Annual_Report_Data_Amended_\(2\).pdf](http://www.ofc.alberta.ca/documents/2013-2014_Annual_Report_Data_Amended_(2).pdf)
11. https://www.faa.gov.nl.ca/forestry/forest_fires/pdf/fire_stats_2012.pdf
12. https://www.faa.gov.nl.ca/forestry/forest_fires/pdf/fire_stats_2013.pdf
13. https://www.faa.gov.nl.ca/forestry/forest_fires/pdf/fire_stats_2014.pdf
14. https://www.faa.gov.nl.ca/forestry/forest_fires/pdf/fire_stats_2015.pdf
15. https://www.faa.gov.nl.ca/forestry/forest_fires/pdf/fire_stats_2016.pdf
16. <https://www.securitepublique.gouv.qc.ca/securite-incendie/publications-et-statistiques/incendies-declares/2012/en-ligne.html>
17. <https://www.securitepublique.gouv.qc.ca/securite-incendie/publications-et-statistiques/incendies-declares/2013/en-ligne.html>
18. <https://www.securitepublique.gouv.qc.ca/securite-incendie/publications-et-statistiques/incendies-declares/2014.html>

19. http://www.community.gov.yk.ca/pdf/2012_annualreport.pdf
20. http://www.community.gov.yk.ca/pdf/2013_FMO_Annual_Report.pdf
21. http://www.community.gov.yk.ca/pdf/2014_FMO_Annual_Report.pdf
22. http://www.community.gov.yk.ca/pdf/2015_FMO_Annual_Report.pdf
23. http://www.community.gov.yk.ca/protectiveservices/pdf/2016_Yukon_FMO_Annual_Report.pdf
24. [http://www.assembly.nu.ca/sites/default/files/TD%2041-4\(2\)%20Fire%20Marshall%202013%20Annual%20Report%20-%20English.pdf](http://www.assembly.nu.ca/sites/default/files/TD%2041-4(2)%20Fire%20Marshall%202013%20Annual%20Report%20-%20English.pdf)
25. [http://www.assembly.nu.ca/sites/default/files/TD%2030-4\(3\)%20ENG%20Office%20of%20the%20Fire%20Marshal%202014%20Annual%20Report.pdf](http://www.assembly.nu.ca/sites/default/files/TD%2030-4(3)%20ENG%20Office%20of%20the%20Fire%20Marshal%202014%20Annual%20Report.pdf)
26. [http://www.assembly.nu.ca/sites/default/files/TD%20143-4\(3\)%20EN%20Office%20of%20the%20Fire%20Marshall%202015%20Annual%20Report.pdf](http://www.assembly.nu.ca/sites/default/files/TD%20143-4(3)%20EN%20Office%20of%20the%20Fire%20Marshall%202015%20Annual%20Report.pdf)
27. [http://www.assembly.nu.ca/sites/default/files/TD-370-4\(3\)-EN-Office-of-the-Fire-Marshall's-2016-Annual-Report.pdf](http://www.assembly.nu.ca/sites/default/files/TD-370-4(3)-EN-Office-of-the-Fire-Marshall's-2016-Annual-Report.pdf)
28. <https://uwaterloo.ca/tobacco-use-canada/adult-tobacco-use/smoking-canada/historical-trends-smoking-prevalence>
29. <https://www150.statcan.gc.ca/n1/pub/82-625-x/2015001/article/14190-eng.htm>
30. <https://www150.statcan.gc.ca/n1/pub/82-625-x/2017001/article/54864-eng.htm>
31. [Ahrens. M. Home Structure Fires. September 2017. National Fire Protection Association.](#)

Author Biographical Information

Len Garis is the Fire Chief for the City of Surrey, British Columbia, an Adjunct Professor in the School of Criminology and Criminal Justice & Associate to the Centre for Social Research at the University of the Fraser Valley (UFV), a member of the Affiliated Research Faculty at John Jay College of Criminal Justice in New York, and a faculty member of the Institute of Canadian Urban Research Studies at Simon Fraser University. Contact him at lwgaris@surrey.ca

Chris Biantoro, Ph.D, is the strategic planning analyst for the City of Surrey Fire Service, BC. He has a background of operations research with 10 years of working experience in advanced analytics, data science, and statistical modeling. He possesses a Doctorate degree in Operations Engineering from the Technical University of Berlin, Germany. Contact him at chris.biantoro@surrey.ca

Acknowledgements

Thank you to the Canadian Association of Fire Chiefs, Council of Canadian Fire Marshals and Fire Commissioners, Defense Research and Development Canada and Public Safety Canada. Without their contributions, this work would not have been possible. The authors also wish to thank Statistics Canada, Canadian Centre for Justice Statistics for their invaluable efforts in developing the National Fire Information Database. This research made extensive use of NFID holdings. This research was supported by JUUL Labs Inc.

Appendix A

PROPORTION OF FIRES FROM SMOKING MATERIALS/OPEN FLAMES TO STRUCTURE FIRES, AND DATA SOURCE

Province/Territory	Year	Smoking /Open Flames Fires	% of Structure Fires	Source
1. Ontario	2012	612	6.9%	[6]
	2013	470	5.6%	
	2014	461	5.5%	
	2015	587	6.9%	
	2016	532	6.3%	
2. British Columbia	2012	221	7.3%	[7]
	2013	214	6.9%	
	2014	196	6.5%	
	2015	222	7.3%	
	2016	227	7.7%	
3. Alberta	2012	213	3.9%	[8], [9], [10]
	2013	310	5.9%	
	2014	263	5.1%	
	2015	215*	3.9%	
	2016	215*	1.3%	
4. Quebec	2012	937	13.0%	[16], [17], [18]
	2013	840	11.7%	
	2014	750	10.3%	
	2015	865	11.7%	
	2016	Not available	Not available	
5. Newfoundland and Labrador	2012	18	9.4%	[11], [12], [13], [14], [15]
	2013	5	5.0%	
	2014	4	3.2%	
	2015	14	10.9%	
	2016	7	7.7%	
6. Yukon	2012	Not available	Not available	[19], [20], [21], [22], [23]
	2013	19	8.4%	
	2014	14	8.4%	
	2015	12	6.1%	
	2016	20	13.6%	
7. Nunavut	2012	Not available	Not available	[24], [25], [26], [27]
	2013	92	58.5 %	
	2014	78	48.4%	
	2015	71	53%	
	2016	65	56.5%	
Total	2012	2001**	8.1%**	
	2013	1950	8.0%	
	2014	1766	7.2%	
	2015	2014	8.1%	
	2016	1066***	3.8%***	

* The number of fires is adjusted to reflect the 10-year average number of fires

** Excludes Yukon and Nunavut

***Excludes Quebec

Appendix B

CASUALTIES AND ECONOMIC LOSS FROM FIRES CAUSED BY SMOKING MATERIALS/OPEN FLAMES

Province/Territory	Year	Number of Injuries	Number of Deaths	Economic Loss (\$ CAD)
1. Ontario	2012	63	20	Not Available
	2013	59	14	Not Available
	2014	64	16	Not Available
	2015	85	25	Not Available
	2016	59	23	Not Available
	2. British Columbia	2012	17	0
2013		32	4	\$12,277,748
2014		24	6	\$13,570,104
2015		22	3	\$29,774,334
2016		17	3	\$16,248,652
3. Alberta		2012	12	6
	2013	15	4	\$30,072,237
	2014	10	7	\$21,386,639
	2015	24*	2*	\$45,184,321 *
	2016	24*	2*	\$45,184,321 *
	4. Yukon	2012		
2013				0
2014				\$165,354
2015				\$31,315
2016				\$107,620
5. Nunavut		2012	Not Available	Not Available
	2013	5 (1 FF)**		\$1,670,275
	2014	6 (0 FF)**		\$2,011,645
	2015	6 (4 FF)**		\$39,717,597
	2016	11 (1 FF)**		\$2,538,670

* The number of casualties is adjusted to reflect the 10-year average number of casualties

** The number of injuries included firefighter (FF) injuries

Appendix C

STRUCTURE FIRES AND SMOKING MATERIALS STRUCTURE FIRES REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Structure Fires	Total Smoking Structure Fires	% Smoking Structure Fires
1. Ontario	2012	9539	753	7.9%
	2013	8990	578	6.4%
	2014	8911	584	6.6%
	2015	Not Available	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
2. British Columbia	2012	3131	231	7.4%
	2013	3154	236	7.5%
	2014	3075	216	7.0%
	2015	3038	233	7.7%
	2016	Not Available	Not Available	Not Available
3. Alberta	2012	3192	232	7.3%
	2013	3014	296	9.8%
	2014	3056	300	9.8%
	2015	3248	298	9.2%
	2016	Not Available	Not Available	Not Available
4. Saskatchewan	2012	1551	1	0.1%
	2013	1496	1	0.1%
	2014	1579	1	0.1%
	2015	1855	0	0.0%
	2016	Not available	Not Available	Not Available
5. Manitoba	2012	1843	84	4.6%
	2013	1517	77	5.1%
	2014	1628	58	3.6%
	2015	1373	69	5.0%
	2016	Not available	Not Available	Not Available
Totals	2012	19,256	1,301	6.8%
	2013	18,171	1,188	6.5%
	2014	18,249	1,159	6.4%
	2015	9,514*	600*	6.3%*
	2016	Not Available	Not Available	Not Available

* Excluding Ontario

Appendix D

TOTAL SMOKING FIRES AND SMOKING MATERIAL-RELATED RESIDENTIAL FIRES REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Smoking Fires	Total Residential Smoking Fires	% Residential Smoking Fires of Total Smoking Fires
1. Ontario	2012	753	233	30.9%
	2013	578	222	38.4%
	2014	584	216	36.9%
	2015	Not Available	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
2. British Columbia	2012	231	174	75.3%
	2013	236	172	72.9%
	2014	216	157	72.7%
	2015	233	176	75.5%
	2016	Not Available	Not Available	Not Available
3. Alberta	2012	232	198	85.3%
	2013	296	264	89.2%
	2014	300	274	91.3%
	2015	298	273	91.6%
	2016	Not Available	Not Available	Not Available
4. Saskatchewan	2012	1	0	0.0%
	2013	1	0	0.0%
	2014	1	0	0.0%
	2015	0	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
5. Manitoba	2012	84	82	97.6%
	2013	77	69	89.6%
	2014	58	55	94.8%
	2015	69	68	98.5%
	2016	Not Available	Not Available	Not Available
Total	2012	1301	687	52.8%
	2013	1188	727	61.2%
	2014	1159	702	60.6%
	2015	600*	517*	86.2%*
	2016	Not Available	Not Available	Not Available

* Excluding Ontario

Appendix E

RESIDENTIAL FIRES INVOLVING SMOKING MATERIAL REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Residential Fires	Total Residential Smoking Fires	% Residential Smoking Fires of Total Residential Fires
1. Ontario	2012	1534	233	15.2%
	2013	1575	222	14.1%
	2014	1541	216	14.0%
	2015	Not Available	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
2. British Columbia	2012	2134	174	8.2%
	2013	2177	172	7.9%
	2014	2098	157	7.5%
	2015	2112	176	8.3%
	2016	Not Available	Not Available	Not Available
3. Alberta	2012	2175	198	9.1%
	2013	2122	264	12.4%
	2014	2130	274	12.9%
	2015	2313	273	11.8%
	2016	Not Available	Not Available	Not Available
4. Saskatchewan	2012	17	0	0.0%
	2013	8	0	0.0%
	2014	26	0	0.0%
	2015	22	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
5. Manitoba	2012	1750	82	4.7%
	2013	1571	69	4.4%
	2014	1552	55	3.5%
	2015	1398	68	4.9%
	2016	Not Available	Not Available	Not Available
Total	2012	7610	687	9.0%
	2013	7453	727	9.8%
	2014	7437	702	9.6%
	2015	5845*	517*	8.8%*
	2016	Not Available	Not Available	Not Available

* Excluding Ontario

Appendix F

CASUALTIES AND ECONOMIC LOSS CAUSED BY RESIDENTIAL SMOKING MATERIAL FIRES REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Injuries in Residential Smoking Fires	Total Deaths in Residential Smoking Fires	Economic Loss (\$ CAD)
1. Ontario	2012	25	8	\$ 695,000
	2013	31	9	\$498,540
	2014	35	4	\$142,000
	2015	Not Available	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
2. British Columbia	2012	14	0	\$26,168,728
	2013	29	4	\$10,263,215
	2014	22	5	\$ 6,316,198
	2015	19	3	\$27,373,548
	2016	Not Available	Not Available	Not Available
3. Alberta	2012	17	5	\$17,516,032
	2013	14	3	\$24,847,576
	2014	10	4	\$12,958,660
	2015	21	2	\$42,170,020
	2016	Not Available	Not Available	Not Available
4. Saskatchewan	2012	0	0	0
	2013	0	0	0
	2014	0	0	0
	2015	Not Available	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
5. Manitoba	2012	32	4	\$5,749,537
	2013	16	1	\$3,732,332
	2014	11	2	\$4,704,802
	2015	8	1	\$8,170,564
	2016	Not Available	Not Available	Not Available
Total	2012	88	17	\$50,129,297
	2013	90	17	\$39,341,663
	2014	78	15	\$24,121,660
	2015	48*	6*	\$77,714,132
	2016	Not Available	Not Available	Not Available

* Excluding Ontario

Appendix G

NUMBER OF OUTDOOR FIRES CAUSED BY SMOKING MATERIALS REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Outdoor Fires	Total Outdoor Smoking Fires	% Outdoor Smoking Fires
1. Ontario	2012	1378	88	6.4%
	2013	766	42	5.5%
	2014	749	38	5.1%
	2015	Not Available	Not Available	Not Available
	2016	Not available	Not available	Not available
2. British Columbia	2012	2361	379	16.1%
	2013	2187	417	19.1%
	2014	2292	390	17.0%
	2015	2835	729	25.7%
	2016	Not Available	Not Available	Not Available
3. Alberta	2012	361	34	9.4%
	2013	315	24	7.6%
	2014	315	24	7.6%
	2015	365	20	5.5%
	2016	Not Available	Not Available	Not Available
4. Saskatchewan	2012	202	0	0.0%
	2013	206	0	0.0%
	2014	246	0	0.0%
	2015	329	0	0.0%
	2016	Not Available	Not Available	Not Available
5. Manitoba	2012	2637	37	1.4%
	2013	1447	25	1.7%
	2014	1214	8	0.7%
	2015	1342	25	1.9%
	2016	Not Available	Not Available	Not Available
Totals	2012	6,737	538	8.0%
	2013	4,715	508	10.8%
	2014	4,570	460	10.1%
	2015	4,542*	774*	17%*
	2016	Not Available	Not Available	Not Available

* Excluding Ontario

Appendix H

CASUALTIES AND ECONOMIC LOSS FROM OUTDOOR FIRES CAUSED BY SMOKING MATERIALS REPORTED TO NFID: 2012-2015

Province/Territory	Year	Total Injuries from Outdoor Smoking Fires	Total Deaths from Outdoor Smoking Fires	Economic Loss (\$ CAD)
1. Ontario	2012	8	0	\$0
	2013	0	0	\$0
	2014	0	0	\$0
	2015	Not Available	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
2. British Columbia	2012	2	0	\$1,049,432
	2013	0	0	\$55,549
	2014	0	0	\$42,569
	2015	1	0	\$189,092
	2016	Not Available	Not Available	Not Available
3. Alberta	2012	0	0	\$22,960
	2013	3	0	\$139,500
	2014	0	0	\$40,580
	2015	0	0	\$5,262
	2016	Not Available	Not Available	Not Available
4. Saskatchewan	2012	0	0	0
	2013	0	0	0
	2014	0	0	0
	2015	Not Available	Not Available	Not Available
	2016	Not Available	Not Available	Not Available
5. Manitoba	2012	0	0	\$26,400
	2013	0	0	\$4,000
	2014	0	0	\$0
	2015	0	0	\$7,683
	2016	Not Available	Not Available	Not Available
Totals	2012	10	0	\$1,098,792
	2013	3	0	\$199,049
	2014	0	0	\$83,149
	2015	1*	0*	\$202,037
	2016	Not Available	Not Available	Not Available

* Excluding Ontario

Appendix I

AGGREGATE RESIDENTIAL SMOKING MATERIAL FIRES: 2012-2016

Province/Territory	Year	Population	Fire Rate per 1M population	Smoking Residential Fires
1. Ontario	2012	13,413,702	1.7	233
	2013	13,555,754	1.6	222
	2014	13,680,425	1.6	216
	2015	13,789,597	1.9*	264*
	2016	13,976,320	1.7*	239*
2. British Columbia	2012	4,546,290	38.3	174
	2013	4,590,081	37.4	172
	2014	4,646,462	33.8	157
	2015	4,694,699	37.5	176
	2016	4,757,658	37.2*	177*
3. Alberta	2012	3,880,755	51.0	198
	2013	3,997,950	66.0	264
	2014	4,108,416	66.7	274
	2015	4,177,527	65.3	273
	2016	4,236,376	62.8*	266*
4. Saskatchewan	2012	1,086,018	0.00	0
	2013	1,104,825	0.00	0
	2014	1,120,639	0.00	0
	2015	1,131,150	0**	0**
	2016	1,148,588	0**	0**
5. Manitoba	2012	1,250,265	65.6	82
	2013	1,265,588	54.5	69
	2014	1,280,912	42.9	55
	2015	1,295,422	52.5	68
	2016	1,318,115	40.2*	53*
Totals	2012	24,177,030	28.4	687
	2013	24,514,198	29.7	727
	2014	24,836,854	28.3	702
	2015	25,088,395	31.1*	781*
	2016	25,437,057	28.9*	735*

* Projected

** Assumed the same as previous years

Appendix J

PROJECTED RESIDENTIAL SMOKING MATERIAL FIRES IN JURISDICTIONS WITH MISSING DATA: 2012-2016

Province/Territory	Year	Population	Fire Rate per 1M population	Residential Smoking Fires
1. New Brunswick	2012	756,777	28.4	22
	2013	755,710	29.7	22
	2014	754,700	28.3	21
	2015	753,944	31.1*	23
	2016	757,384	28.9*	22
2. Nova Scotia	2012	944,943	28.4	27
	2013	943,049	29.7	28
	2014	942,209	28.3	27
	2015	941,545	31.1*	29
	2016	948,618	28.9*	27
3. Prince Edward Island	2012	145,080	28.4	4
	2013	145,198	29.7	4
	2014	145,915	28.3	4
	2015	146,791	31.1*	5
	2016	145,080	28.9*	4
4. Quebec	2012	8,085,906	28.4	230
	2013	8,151,331	29.7	242
	2014	8,210,533	28.3	232
	2015	8,254,912	31.1*	257
	2016	8,321,888	28.9*	241
5. Newfoundland and Labrador	2012	526,450	28.4	15
	2013	527,399	29.7	16
	2014	528,386	28.3	15
	2015	528,815	31.1*	16
	2016	530,305	28.9*	15
6. Yukon	2012	36,058	28.4	1
	2013	36,298	29.7	1
	2014	36,817	28.3	1
	2015	37,289	31.1*	1
	2016	38,086	28.9*	1
7. Northwest Territories	2012	43,594	28.9*	1
	2013	43,773	28.4	1
	2014	43,867	29.7	1
	2015	44,214	28.3	1
	2016	44,617	31.1*	1
8. Nunavut	2012	34,707	28.9*	1
	2013	35,414	28.4	1
	2014	36,067	29.7	1
	2015	36,608	28.3	1
	2016	37,177	31.1*	1

Appendix K

AGGREGATE CASUALTY AND ECONOMIC LOSS RATES FROM RESIDENTIAL SMOKING MATERIAL FIRES: 2012-2016

Province/Territory	Year	Residential Smoking Fires	Injury Rate per 1M population	Death Rate per 1M population	Economic Loss per Fire (CAD)
1. Ontario	2012	233	107	34	\$2,983
	2013	222	140	41	\$2,246
	2014	216	162	19	\$657
	2015	264*	136*	31*	\$1,962*
	2016	239*	136*	31*	\$1,962*
2. British Columbia	2012	174	80	0	\$150,395
	2013	172	169	23	\$59,670
	2014	157	140	32	\$40,231
	2015	176	108	17	\$155,532
	2016	177*	124*	18*	\$101,457*
3. Alberta	2012	198	86	25	\$88,465
	2013	264	53	11	\$94,120
	2014	274	36	15	\$47,294
	2015	273	77	7	\$154,469
	2016	266*	63*	15*	\$96,087*
4. Saskatchewan	2012	0	0	0	0
	2013	0	0	0	0
	2014	0	0	0	0
	2015	0**	0**	0**	0**
	2016	0**	0**	0**	0**
5. Manitoba	2012	82	390	49	\$70,116
	2013	69	232	14	\$54,092
	2014	55	200	36	\$85,542
	2015	68	118	15	\$120,155
	2016	53*	235*	29*	\$82,476*

* Extrapolated

** Assumed the same as previous years

Appendix L

PROJECTED NUMBER OF CASUALTIES AND ECONOMIC LOSS FROM RESIDENTIAL SMOKING MATERIAL FIRES: 2012-2016

Province/Territory	Year	Residential Smoking Fires	Injuries	Deaths	Economic Loss (\$ CAD)
1. Ontario	2012	233	25	8	\$695,000
	2013	222	31	9	\$498,540
	2014	216	35	4	\$142,000
	2015	264*	36*	8*	\$517,140*
	2016	239*	33*	7*	\$68,686*
2. British Columbia	2012	174	14	0	\$26,168,728
	2013	172	29	4	\$10,263,215
	2014	157	22	5	\$6,316,198
	2015	176	19	3	\$27,373,548
	2016	177*	22*	3*	\$17,913,006*
3. Alberta	2012	198	17	5	\$17,516,032
	2013	264	14	3	\$24,847,576
	2014	274	10	4	\$12,958,660
	2015	273	21	2	\$42,170,020
	2016	266*	17*	4*	\$25,589,985*
4. Saskatchewan	2012	0	0	0	\$0
	2013	0	0	0	\$0
	2014	0	0	0	\$0
	2015	0**	0**	0**	\$0**
	2016	0**	0**	0**	\$0**
5. Manitoba	2012	82	32	4	\$5,749,537
	2013	69	16	1	\$3,732,332
	2014	55	11	2	\$4,704,802
	2015	68	8	1	\$8,170,564
	2016	53*	12*	2*	\$4,332,907*
Total	2012	687	88	17	\$50,129,297
	2013	727	90	17	\$39,341,663
	2014	702	78	15	\$24,121,660
	2015	781*	84*	14*	\$78,231,272*
	2016	735*	84*	16*	\$48,304,583*

* Extrapolated

** Assumed the same as previous years

Appendix M

PROJECTED NUMBER OF CASUALTIES AND ECONOMIC LOSS FROM RESIDENTIAL SMOKING MATERIAL FIRES IN JURISDICTIONS WITH MISSING DATA: 2012-2016

Province/Territory	Year	Residential Smoking Fires	Injuries	Deaths	Economic Loss (\$ CAD)
1. New Brunswick	2012	22	3	1	\$1,605
	2013	22	3	1	\$1,191
	2014	21	2	0	\$722
	2015	23	2	0	\$2,304
	2016	22	3	0	\$1,446
2. Nova Scotia	2012	27	3	1	\$1,970
	2013	28	3	1	\$1,515
	2014	27	3	1	\$928
	2015	29	3	1	\$2,905
	2016	27	3	1	\$1,774
3. Prince Edward Island	2012	4	1	0	\$292
	2013	4	0	0	\$216
	2014	4	0	0	\$137
	2015	5	1	0	\$501
	2016	4	0	0	\$263
4. Quebec	2012	230	29	6	\$16,783
	2013	242	30	6	\$13,096
	2014	232	26	5	\$7,972
	2015	257	28	5	\$25,743
	2016	241	27	5	\$15,839
5. Newfoundland and Labrador	2012	15	2	0	\$1,095
	2013	16	2	0	\$866
	2014	15	2	0	\$515
	2015	16	2	0	\$1,603
	2016	15	2	0	\$986
6. Yukon	2012	1	0	0	\$73
	2013	1	0	0	\$54
	2014	1	0	0	\$34
	2015	1	0	0	\$100
	2016	1	0	0	\$66
7. Northwest Territories	2012	1	0	0	\$73
	2013	1	0	0	\$54
	2014	1	0	0	\$34
	2015	1	0	0	\$100
	2016	1	0	0	\$66
8. Nunavut	2012	1	0	0	\$73
	2013	1	0	0	\$54
	2014	1	0	0	\$34
	2015	1	0	0	\$100
	2016	1	0	0	\$66

Appendix N

INFERENCE TEST * OF NUMBER OF FIRES AND CASUALTIES – PRE VS. POST 2014

Significance Level: 0.05 – two-tailed hypothesis

Metrics	Test Result
1. Number of Fires	U=111.5; p-value= 0.659; Null hypothesis accepted
2. Percentage of Fires to Structure Fires	U= 107.5; p-value= 0.555; Null hypothesis accepted
3. Number of Injuries	U=39.5; p-value= 0.741; Null hypothesis accepted
4. Number of Deaths	U=22; p-value= 0.596; Null hypothesis accepted

* Most of the data in the table shows no normality in their distributions. For consistency, non-parametric tests of U-Mann Whitney were performed with the null hypothesis of no differences between the two groups.

INFERENCE TEST* ON NUMBER OF RESIDENTIAL SMOKING MATERIAL FIRES AND CASUALTIES – 2012-2014 VS 2015-2016

Significance Level: 0.05 – two-tailed hypothesis

Metrics	Test Result
1. Number of Fires	t=0.249 ; p-value= 0.805 ; Null hypothesis accepted
2. Percentage to Residential Fires	T=-0.21 ;p-value= 0.831 ; Null hypothesis accepted
3. Number of Injuries	t=0.054; p-value= 0.957 ; Null hypothesis accepted
4. Number of Deaths	t=-0.23; p-value= 0.817 ; Null hypothesis accepted

* T-test-parametric tests were performed since the data shows normality in their distributions.

INFERENCE TESTS OF NUMBER OF RESIDENTIAL SMOKING MATERIAL FIRES AND CASUALTIES – 2012-2013 VS 2014-2015 (2016 EXCLUDED)

Significance Level: 0.05 – two-tailed hypothesis

Metrics	Test Result
1. Number of Fires	t=-0.15; p-value= 0.883 ; Null hypothesis accepted
2. Percentage to Residential Fires	t=0.107; p-value= 0.916 ' Null hypothesis accepted
3. Number of Injuries	t= -0.29; p-value= 0.773. ; Null hypothesis accepted
4. Number of Deaths	t=-0.38; p-value= 0.704 ; Null hypothesis accepted

* T-test-parametric tests were performed since the data show normality in their distributions.

INFERENCE TEST ON NUMBER OF CIGARETTE-RELATED FIRES AND CASUALTIES – 2012-2013 VS 2014-2015

Significance Level: 0.05 – two-tailed hypothesis

Metrics	Test Result
1. Number of Fires	t=-0.54; p-value= 0.303 ; Null hypothesis accepted
2. Percentage to Residential Fires	t=-0.34; p-value= 0.741 ; Null hypothesis accepted
3. Injury rate per 1,000 fires	t= -0.63; p-value= 0.55. ; Null hypothesis accepted
4. Death rate per 1,000 fires	t=-1.29; p-value= 0.242 ; Null hypothesis accepted

INFERENCE TEST ON NUMBER OF OUTDOOR SMOKING MATERIAL FIRES- 2012-2013 VS 2014-2015

Significance Level: 0.05 – two-tailed hypothesis

Metrics	Test Result
1. Number of Fires	U=-31; p-value= 0.66 ; Null hypothesis accepted
2. Percentage to Outdoor Fires	t=-0.386; p-value= 0.705 ; Null hypothesis accepted

Appendix O

SAMPLE OF SURVEY LETTER FOR FIRE MARSHALS/COMMISSIONERS AND FIRE CHIEFS



the future lives here.

December 2018

XXXX
XXXX
XXXX

Re: Surrey Fire Service Survey on Electronic Cigarettes

Dear xxxx:

In its 2017 analysis on the National Fire Information Database (NFID), Statistics Canada determined that smoker's material/open flame became one of the leading sources of ignition in residential fires. The category contributed to approximately 27% of the total residential fires over the 10 year period¹. Although the study only included five jurisdictions in Canada, it still shows the magnitude of smoker's material/open flame as a cause of fire incidents taking place in residential structures. The NFID captures cigarettes, but does not take electronic cigarette (e-cigarette) as an igniting object within the smoker's material definition. This would limit our understanding of the effect of e-cigarettes in any structure fires, particularly in residential fires.

In a different study conducted by the US Fire Administration, it concluded that the number of fire incidents caused by e-cigarettes increased by more than 6 times over the last 2 years (from 2014 to 2016)². This shows the significance of e-cigarettes as a contributing factor in fire incidents. However, the same analysis cannot be conducted in Canada yet due to the data limitation. Therefore, I consider the following survey would be necessary to understand the needs in data collection related to e-cigarettes:

Has your fire investigation branch determined E-Cigarettes a contributing factor in any structure fires?	
YES	NO
Comments:	

It would be very much appreciated if you could please provide us with your respond by January 11, 2019 via email or fax.

Thank you in advance for your participation in the survey, and I would happily be available for discussion, should you have any questions.

Sincerely,

Len Garis
Fire Chief
Surrey Fire Services
LWGaris@surrey.ca

¹Statistics Canada. Fire Statistics in Canada, Selected Observations from the National Information Database 2005 to 2014. September 2017.p.11

²McKenna Jr., L.A., Electronic Cigarette Fires and Explosions in the United States 2009-2016. July 2017. US Fire Administration.

