Sustainability of the National Fire Information Database
Next Steps

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for
the Canadian Association of Fire Chiefs

September 2017

Statistics Canada Statistique Canada

Canada

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1. Introduction

1.1 Background
Overview of the National Fire Information Database project

The objectives of the National Fire Information Database (NFID) pilot project were to gather 10 years of microdata information on fire incidents and fire losses from provincial/territorial Fire Marshals and Fire Commissioners Offices across Canada, and to create a standardized national system for the collection of fire statistics that could be accessed by academics for the purpose of new and innovative research. Another equally important objective was to link the database with other relevant socio-economic data to assist in the development of new, relevant, evidence-based research related to fire incidents, public safety and security.

Support for the NFID project has been provided by the Canadian Safety and Security Program (CSSP), a federal program led by Defence Research and Development Canada's (DRDC) Centre for Security Science in partnership with Public Safety Canada (PSC) and in collaboration with the Canadian Association of Fire Chiefs (CAFC) and the Council of Canadian Fire Marshals and Fire Commissioners (CCFMFC).

Guidance and direction in regards to the data content for the NFID have been provided by the National Fire Incident Statistics Committee (NFISC), a subcommittee of the CCFMFC and the CAFC. The mandate of the NFISC is to provide immediate direction and oversight for the collection, analysis, and dissemination of information relating to fire incidents in Canada, primarily through its oversight of the NFID.

The collection and standardization of data, along with the development of the central database was the responsibility of the Canadian Centre for Justice Statistics (CCJS), a division of Statistics Canada. The CCJS has significant experience in the collection and dissemination of policing, courts, and correctional services data at the national level, in addition to other justice and public safety-related data. The CCJS worked in collaboration with the CAFC and the CCFMFC to develop the capacity to collect, compile and analyze fire incident information on a national basis. These activities represent requisite first steps towards addressing an important gap in existing knowledge and gaining a greater understanding of the nature and extent of fire incidents across the country.

2. Objectives of this report

The objectives of this report are to: (i) briefly describe the tasks and deliverables of the project as they relate to the objectives; (ii) identify the challenges that were encountered; and (iii) discuss the key considerations in regards to sustainability of the project should there be support to continue beyond the pilot stage. Recommendations have been made, where relevant, in regards to such areas as:

- improving participation/coverage rates;
- increasing the frequency of data collection;
- ensuring the highest-level of data quality;
- data collection methodology;
- improving the capacity for possible future record linkage activities; and
- communications and networking.

3. Where we started: The first National Fire Information Database

3.1 Project deliverables and accomplishments

In April 2017, the CCJS delivered the NFID database to the CAFC. The final database was composed of two files—an incident file and a victim file—which included information from seven participating jurisdictions: New Brunswick, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and the Canadian Armed Forces. While each jurisdiction provided data for the project to varying degrees of detail and annual coverage, in total, they represented 72% of the Canadian population in 2014. Other social domain data from the 2006 Census/2011 National Household Survey (NHS) and the Uniform Crime Reporting (UCR) Survey were also added, where possible, to the incident file. A data dictionary and user guide were produced to accompany the database.

In addition to the database, an analytical report presenting a high level analysis of fire incident and casualty data was produced for the CAFC. Both trend analysis and jurisdictional analysis were provided, along with a series of tables, focusing primarily on the characteristics of residential fires at the incident level, and fire-related deaths at the victim level.

3.2 Development of the NFID

The CCJS worked with the CAFC and the CCFMFC to develop the capacity to collect, compile and analyze fire incident information on a national basis. These activities were a requisite first step towards addressing an important gap in existing knowledge and gaining a greater understanding the nature and extent of fire incidents across the country.

The development of the NFID involved the following key steps:

- the development of content ("taxonomy");
- data collection;
- standardization of data;
- geo-coding activities and the addition of other social domain data;
- aggregation of jurisdictional files; and
- providing CAFC and researchers access to the data.

An overview of the developmental process is provided below.

3.2.1 Content development

Unlike other administrative surveys conducted by the CCJS, where the development of content (i.e., concepts, definitions, data elements, code sets, etc.) must be newly designed in collaboration with the various stakeholders, the NFID had a well-established starting point in a document titled, "Canadian Code Structure on Fire Loss Statistics (CCS)." The CCS contains the data reporting requirements determined and accepted by the CCFMFC in 2002.

The CCS was transformed from a data reporting guide to a data dictionary, which was required to supplement the final database. New data elements and response categories for existing data elements were added to the data dictionary (where the analytical utility was identified) as jurisdictional data were submitted to the CCJS.

In addition to data collected by Fire Commissioners and Fire Marshals Offices, other social domain data produced by Statistics Canada were added to the file, where possible, to provide additional contextual information to assist new relevant, evidence-based research related to fire, public safety, and security. Refer to "Geo-coding and addition of other social domain data" below for further details.

3.2.2 Data collection

The initial call for data was sent out to the members of the CCFMFC in mid-April 2016. As the database was to be shared with the CAFC and researchers, the CCJS was required to obtain agreement from the jurisdictions in order to share their data with the CAFC. This was done by entering into what is referred to as "Data Sharing Agreements" or "Section 13 Agreements", referring to the section of the Statistics Act that gives Statistics Canada permission to disclose the data to specified parties for the purpose of statistical and research activities. These agreements were sent out along with the request for data.

The data providers were asked to submit 2 microdata files – an incident file and a victim file with the relevant information that is contained in their databases, including the geographical location of the fire incident. Additional support files and documentation were provided on an as-required basis (e.g., reporting manuals/data dictionaries, code set descriptions, location codes, etc.) which assisted in the data standardization processes.

3.2.3 Standardization of data

There were variations in the file content from jurisdiction to jurisdiction in regards to the specific variables provided, variable names, code values, descriptions and levels of detail — all of which required standardization to the NFID specifications.

All files were converted to SAS[1] files for further processing. All data elements were analysed to determine if they corresponded to the NFID data elements. If so, the data element names were renamed and code values mapped and converted to the NFID names and code values. Although the taxonomy of the NFID was primarily based on the CCS, additional variables and response categories for existing variables that were identified as having potential analytical utility were also included in the database.

3.2.4 Geo-coding and addition of other social domain data

The process of adding other social domain data[2] to the NFID file required that the address information provided in the jurisdictional incident data files be coded according to Statistics Canada's Standard Geographical Classification (SGC) system.

Other social domain data were provided on the final NFID incident records where (i) the geographical information for the incident was of sufficient quality to map to an SGC; and (ii)

[1] SAS, the Statistical Analysis System, is a software suite developed by the SAS Institute for undertaking various levels of statistical analysis

[2] Examples of other social domain data added to the file are as follows: median (after-tax) family income; percentage of population aged 65 years and older; percentage of population aged 5 years and younger; employment and unemployment rates; and crime (total, property, and violent) rates.

data were available for the data element at the particular SGC level (i.e., data may be suppressed for certain geographies due to data quality issues or for reasons of possible disclosure of an individual).

Based on the two criteria above, where available, other social domain data elements in the NFID have been provided at the census subdivision (CSD) and census metropolitan (CMA)/census agglomeration (CA) levels.

In an attempt to account for any possible gaps, data (where available) have been provided from both the 2006 Census and the 2011 National Household Survey (NHS).

3.2.5 Aggregation of jurisdictional files/creation of finalized database

Once jurisdictional files were standardized, geo-coded and the other social domain data were appended, each of the incident files were appended to create a single "national" incident file. The same process was repeated for the victim files.

The final incident file contains 138 data elements, while the victim file has 30. Both files contain a derived unique key which is used to link between the two files. The following table summarizes data availability by jurisdiction, years reported, and file type.

	File Type	
Jurisdiction	Incident	Victim
British Columbia	2005 to 2015	2005 to 2015
Alberta	2005 to 2015	2005 to 2015
Saskatchewan	2012 to 2015	2012 to 2015
Manitoba	2005 to 2015	2005 to 2015
Ontario	2005 to 2014	2005 to 2014
New Brunswick	2005 to 2015	2010 to 2015
Canadian Armed Forces	2005 to 2015	n/a

3.2.6 Providing access to the data

In initial discussions around data accessibility, the Statistics Canada's Research Data Centres (RDCs) were identified as one potential option for allowing access to the final or research database. Currently there is an RDC or a branch on campus at twenty six universities which are run and serviced by Statistics Canada analysts. Given the limited number of RDCs in Canada, not all researchers would have access. As a result of this potential limitation, alternative methods of data accessibility were explored.

Several other options were considered, including the creation of a Public Use Microdata File (PUMF) and the Real Time Remote Access (RTRA) Program. However, it was decided that the preferred method by which access to the data would be granted to the CAFC would be by directly sharing the database with them through a "Data Disclosure Agreement" (also referred to as a "Section 17 Agreement", referring to the section of the Statistics Act which grants such disclosure). This agreement allowed for the CAFC to be the custodian of the database, subject to the same secrecy and custodial requirements under which the data were initially collected by Statistics Canada. The agreement also gave the CAFC the

flexibility of providing access to the data to researchers across Canada who were awarded grant funding.

4. What we experienced: Project challenges

This section describes some of the challenges that were encountered in the various activities associated with the development of the NFID. Some recommendations which may assist in overcoming these challenges in future iterations and/or ongoing collection of NFID data are presented in the section entitled "Other considerations and/or recommendations".

The following section outlines a few of the key challenges.

4.1 Signed agreements and submission of data files

Section 13 of the Statistics Act permits Statistics Canada, where information is sought, to obtain any documents or records of relevance that are maintained in any department or in any municipal office, corporation, business or organization. A decision was taken to enter into section 13 agreements with the Fire Marshals and Fire Commissioners Offices whereby they would agree to the disclosure of their data with the CAFC, pursuant to paragraph 17(2) under the Statistics Act.

Several jurisdictions required a legal review of the agreement before signing and submitting the data files. In a few instances, amendments were requested which required review by Statistics Canada legal analysts. Amendments were accommodated where possible. The delays encountered in the signing of agreements in turn led to delays in the submission of data in these jurisdictions.

Other delays in submitting data were due to challenges in extracting data from somewhat antiquated and/or complex systems.

Although a cut-off date of mid-December 2016 had been established, late submissions were accepted, with the final set of jurisdictional files being received in mid-January 2017.

4.2 Participation

In the early discussions and planning for the NFID project, it was anticipated that all jurisdictions (including the Canadian Armed Forces) would participate in the NFID project. As mentioned, seven jurisdictions were able to provide data within the timeframe allocated for data collection. The remaining jurisdictions were unable to participate due to:

- the lack of a jurisdictional database or alternate means of collection of fire data; or
- operational and administrative constraints (e.g., competing priorities, shortage of IT staff, extensive approval processes) which made it impossible to meet the deadline.

4.3 Standardization of jurisdictional data

In the early stages of the project, a working assumption was that most, if not all, jurisdictions had adopted the reporting standards set out in the Canadian Code Structure (CCS)—with the acknowledgement that not all data elements may be collected.

Although there were notable similarities in the types of data collected by the various jurisdictions, as noted by Wijayasinghe (2012) and Maxim et. al. (2013), upon examination of the data files provided to the CCJS, no jurisdiction adopted the complete CCS standards. Some code sets showed some alignment with the coding structure of the CCS, while others had no resemblance to the nationally accepted data standards.

In order to facilitate the analysis of fire data across the country, it was necessary to apply a standardized and uniform coding structure to all files and "transform" each of the jurisdictional files to the standard. The CCS served as the basis for the NFID standard in terms of data element names, definitions, code sets and descriptions. Standard formats and lengths were defined for each of the data elements by the CCJS.

The process by which CCJS standardizes data from its providers is commonly referred to as data mapping. This involved mapping each jurisdiction's data independently to the NFID standard, re-naming variables, applying defined formats and lengths, and mapping code values for each data element. This exercise required system documentation from the jurisdictions that provided definitions and descriptions of variables and response code values (e.g., data dictionaries, code set documents, etc.).

The data mapping exercise proved to be a more onerous task than anticipated for the following reasons:

- all jurisdictional data, including those which somewhat followed the CCS, required cleaning as they had lengthy descriptors following the code values;
- it was necessary to validate every jurisdictional code value for all reported data elements against the standards because even where the codes seemingly conformed to the CCS, there were variations from the standard found in each jurisdiction;
- several jurisdictions provided more than the expected 2 files[3]—incident and victim—due to system changes or enhancements during the ten-year reporting period.

For these reasons, more standardization of the data was required than anticipated.

4.4 Data quality issues and limitations

A number of data quality issues and limitations were encountered during the development of the NFID and related products, however, not all posed a challenge. Those that did are briefly described below, while those that did not are discussed under "Data quality/audit/evaluation" in the Moving Forward section.

[3] One jurisdiction provided 8 data files, none of which conformed to the CCS.

4.4.1 Absence of a unique key

There were two jurisdictions that did not provide a unique key in their data files. A unique key is required for the NFID in order to link between the victim file and the incident file. The lack of key required that the CCJS assign one. This was achieved by creating a new linking variable on the incident files, and generating unique and standardized values for each incident record. To generate the same variable on the victim file, common variables on both the victim and incident files were used to find the matching incident record, and assign the same value on the victim record. For the most part, this was a straight-forward and successful process. However, in some instances there was insufficient information and/or lack of common variables on the two files to successfully create the link.

4.4.2 Duplicate "keys"

Related to the issue above, two jurisdictions appeared to have a variable that was intended to be the unique key, however when attempting to link between the two files, many duplicate keys were found in the incident file. In effect, this created a one-to-many relationship between the files and it was not possible to determine which incident record to link to without using additional information and different approach.

A decision was made to create a new standardized linking variable [as in (i) above] for all jurisdictions that would facilitate the linkage process in the future, should it be required (e.g., for custom data requests).

4.4.3 Large proportion of unknown values

A number of the variables in the NFID contain a relatively high proportion of "unknown" values. This posed a challenge in the analysis and interpretation of the data in the preparation of the analytical report in that "unknown" values create an underestimate in the "known" values.

4.4.4 Geo-coding/addition of other social domain data

As described earlier, where possible, other social domain data were appended to incident records. The first step in this process involved using the incident location information on the jurisdictional files to add the appropriate Standard Geographical Classification code to the records. Postal codes, which are an integral piece of information in the geo-coding process, were not always available. In these instances, the location information was run through postal conversion software to assign postal codes where possible and add them to the file.

The geo-coding process posed some challenges for the following reasons:

- the address information was completely missing;
- the address information was incomplete (e.g., the street address was missing);
- rural address information was provided as opposed to civic addresses;
- information other than the civic address was provided such as street intersections or directional information, e.g., "one km from County Rd #5";
- the address information was not parsed, i.e., street number, street name, street type, etc. were all entered in one field.

5. Where we need to be: Moving forward and future opportunities

The creation of the NFID has addressed an important data gap in providing ten years of fire-related incident and victim data in Canada. However, the relevance of data diminishes over time, therefore they must remain current. Moving forward, discussions between the various stakeholders will take place with respect to the sustainability of the NFID project, to identify if there is interest, willingness and resources to move forward and continue ongoing data collection.

This section identifies a number of key requirements that would have to be set in place should the project continue beyond the pilot stage. Other considerations are also presented and recommendations have been made, where possible.

5.1 Project sustainability – key requirements and considerations

If the NFID project were to move forward, the following items are key requirements and considerations to be taken into account.

5.1.1 Interest and support

The viability of any project, short-, mid- or long-term, requires strong support and engagement from stakeholders. The NFID pilot project demonstrated the capacity to develop a national database of standardized fire and loss data. However, the two key questions moving forward are:

- "Is there sufficient interest in continuing data collection and other activities to keep the database current?", and
- "Is there adequate support to endorse and promote the importance of the need for these data to provide the fire service community with informed policy and operational guidance, and to help promote public awareness about the dangers of fire?"

5.1.2 Ongoing funding

Funding support for the pilot project was provided by the Canadian Safety and Security Program (CSSP), a federal program delivered by Defence Research and Development Canada's (DRDC) Centre for Security Science in partnership with Public Safety Canada (PSC).

The CCJS received funding for its role in the project from the CAFC. There are currently no funding sources for data collection, standardization and other activities beyond the pilot project. An ongoing funding source would be required if the NFID project were to continue in the future. The amount of funding would be dependent on the scope of the project moving forward, as well as the method and periodicity of data collection.

5.1.3 Re-assess the scope of project

The current NFID contains a wealth of information on the characteristics of fire incidents and casualties. The scope of the project should be re-examined to determine whether these

data meet stakeholders' and other users' needs, or if there are needs and interests in pursuing other types of data related to fire services such as:

- baseline (aggregate) information on fire service personnel and expenditures;
- micro-data on types/reasons of calls for service and the service provided;
- insurance information (e.g., the amount of a claim, items claimed, the value of items, the amount paid out by insurance, etc.);
- micro-data from fire investigators' offices, e.g., reason for investigation (fatal fires, serious injury fires, explosions, fires in vulnerable occupancies such as retirement homes and care and treatment occupancies), the origin and cause of fire, other investigating bodies such as the police, insurance claims adjusters and forensic science technicians, court appearances, etc.

5.1.4 The National Fire Incident Statistics Committee (NFISC)

It is recommended that the CAFC, through its membership on the NFISC, ensure that the sustainability of the NFID project and its on-going data collection (beyond the pilot phase) are identified as one of the key strategic priorities for the Committee.

In order to ensure the future sustainability of the NFID, it is further recommended that the NFISC consider the following data and system-related objectives:

- address data quality and comparability issues within the existing NFID
- in collaboration with Statistics Canada and firefighting agencies, structure fire data so that it can be linked to other social domain data (e.g. tax, health, education and justice data) allowing for greater analytical capacity
- facilitate the development of partnerships among governments and firefighting agencies to further the integration of fire information systems
- collaborate with Statistics Canada and firefighting agencies in the development of standard fire service performance indicators
- promote improved fire management and decision making by identifying, developing and communicating best practices in the collection, analysis and application of statistical information; and
- promote innovation in information systems, collection techniques and other matters that improve the production and utility of fire incident information

5.2 Data-related considerations and recommendations

5.2.1 Improve the coverage of reporting jurisdictions

From the onset, it was assumed that all thirteen provinces and territories, as well as the Canadian Armed Forces (CAF) would participate in the pilot project. As mentioned previously, seven jurisdictions (including 6 provinces and the CAF) were able to provide data within the timeframes. These jurisdictions represented 72% of the Canadian population (on June 1, 2014). Ideally, the database would represent full coverage in Canada. However, as previously discussed there were challenges in obtaining data from every jurisdiction. Moving forward, every effort should be made to increase the coverage of NFID. This could be achieved through a number of potential mechanisms, as outlined below.

Recommendations:

(i) Raise the profile of the project so that non-reporting jurisdictions are able to report in the future

(ii) Build reporting capacity where it doesn't exist

For those jurisdictions that currently do not have an information management system, alternate methods of data reporting could be considered such as submitting paper forms directly for in-house data capture.

There may be instances where the Fire Marshal's or Fire Commissioner's Office is unable to report to the NFID, however there may be municipal fire services within their jurisdictions that could. In these instances, data submissions from individual fire services should be considered. See 2.1 below for further discussion in regards to alternate reporting methods.

(iii) Longer, more flexible data collection period

Typical data collection periods span the course of a full year, regardless of the frequency of data submissions (i.e., monthly, quarterly, or annual reporting). Submissions are due one month after the end of the reporting period.

Allowing for longer data collection periods may assist in factoring in possible delays where legal reviews (such as Statistics Canada's Section 13 agreements) are required.

5.2.2 Frequency of reporting/data collection

The key to sustainability is to ensure that the frequency of future reporting is properly evaluated. Two options could be considered:

(i) ongoing annual data collection and release of data (although jurisdictional data could be submitted more frequently, i.e., monthly or quarterly); or
(ii) data collection every two or five years.

Recommendation:

In order to maintain the relevance of the data, it is recommended that data be collected, processed and disseminated on an annual basis as opposed to on a less frequent basis.

5.2.3 Improve national uniformity of the data elements collected and reported

Each of the Fire Commissioner's and Fire Marshal's Offices across the country determines the type of data to be collected from the fire services in their jurisdiction. These data are identified on various fire reports and submitted by the fire services either electronically or via paper forms. Although there are some common elements amongst jurisdictions, the content of these reports does vary. Ideally, the content of these forms would follow that of the NFID taxonomy, but would also allow for the capacity to include additional jurisdictional-specific data requirements.

Recommendation:

It is recommended that an effort is made to nationally standardize the content of the jurisdictional fire reports that are completed by individual fire services and submitted to their respective Fire Commissioner's/Fire Marshal's Office, where possible.

5.2.4 Review and update current NFID data elements

The Canadian Code Structure (CCS) was last updated in 2002. Since then there have been advancements in different facets which relate to several data elements, especially those that have technology-related response categories. For example, the Igniting Object data element has a response category of "Radio, stereo, phonograph, tape recorder, video cassette recorder", which requires updating to today's standards. This category should either be updated to include such things as cell phones, laptops, tablets, e-readers, etc., or create new response categories to account for these advancements in technology.

Other response categories may also benefit from a review and revision. For instance, the Condition of Casualty data element has a response category described as "Mental handicap – includes senility" which may be better described as "Mental disorder, intellectual disability, learning disability, etc.".

Additionally, there are a number of data elements where multiple response categories may be applicable (e.g. Cause of Failure to Escape) and only one response is able to be reported. Key details may be lost in limited the number of responses.

Recommendations:

(i) It is recommended that a comprehensive review of NFID taxonomy (i.e., data dictionary) be conducted. This would involve reviewing the content, concepts, definitions, response categories, and use of reserve codes (e.g., "Not available", "Not applicable", "Not classified", etc.) for relevance, accuracy and completeness. It is recommended that this review is a joint effort between the CAFC, the CCFMFC and future data collection partner(s).

(ii) It is also recommended that the content of international surveys/databases be reviewed and evaluated, and additional content is added to the NFID taxonomy, where relevant and where the analytical utility has been identified.

(iii) The existing NFID taxonomy is currently documented as a data dictionary which is geared towards end-users of the database. However, once the above content reviews are complete, it is recommended that the revised taxonomy be compiled as a separate document and referred to as NFID National Data Requirements (NDR), where the target audience is the data provider. The main difference between these two documents is that the NDR provides the instructions to the data provider on the coding of values/responses, while the data dictionary provides guidance and instructions to the end-user on how to use the analytical database.

5.2.5 Conduct data quality audit/evaluation

In the development of the NFID, a number of data quality issues and limitations have been identified. A few examples of the known issues include:

(a) Data quality issues

- inability to differentiate between true zeros versus "unknowns" in numeric fields;
- use of reserve codes (e.g., '99', '999', '97', '997', etc.) to represent unknown values, which makes it impossible to identify whether these are true values or the reserve codes;
- some numeric fields contain extreme values (outliers) which may or may not be valid;
  the absence of a unique key, in some jurisdictions, which facilitates the linkage between the incident and victim files.

(b) Data limitations

- there is an unknown amount of underreporting of fire incidents across the country for the following reasons:
  - not all fire services report their fire incident information to their respective Fire Commissioner's or Fire Marshal's Office;
  - others may report, but not on a consistent basis (this may be true of firefighting agencies providing services primarily/solely through volunteer firefighters or smaller municipalities with small scale operations); and
  - First Nations fire services may/may not be included, and their reporting may not be mandatory in some jurisdictions.

Recommendations:

(i) Undertake a detailed data quality analyses for each jurisdiction that reported to the NFID, and provide them with a report[4] identifying possible areas of improvement;
(ii) Moving forward, annual jurisdictional files would be subject to edit and imputation (E&I) processes, which would include outlier detection for extreme values (see "2.2 Processing system" for further details);
(iii) Jurisdictions should be provided with annual data quality reports based on the E&I reports, and work closely with the data collectors to correct any anomalies.

5.2.6 Improve/develop capacity for record linkage activities to other social domain data

Record linkage between data sets requires robust common identifiers. For the purpose of the NFID pilot project, record linkage (at the person level) with other social domain data holdings at Statistics Canada was not possible due to the lack of personal identifiers, particularly names and dates of birth.

Interest has been expressed in linking casualty information for firefighters to other databases such as the Death and Cancer Registries to analyse the effects of exposure to smoke, fire and other noxious substances over time. In order to conduct these linkages, names, dates of births and postal codes of persons would be required, at a minimum.

[4] CCJS has provided British Columbia with such a report in support of identifying business requirements in the development of a new system for the Office of the Fire Commissioner.

Health insurance numbers would provide additional assurance in making successful linkages.

Recommendations:

(i) Names of victims (both deaths and those injured) should be collected and captured in a standardized manner;
(ii) Separate fields for first, middle and last names are best practice and yield the best linkage results;
(iii) Dates of birth of victims should be captured in any standard system date format;
(iv) Postal codes should be captured in any standard system format;
(v) Collection of other personal identifiers, such as Social Insurance Numbers, driver's license numbers, etc., acknowledging that these may not be feasible within the context of providing fire services.

Although direct record linkage was not possible for the pilot project, geographical linkages were possible where sufficient incident location information was provided in the jurisdictional files. As described earlier, there were challenges in making these linkages. There are changes that could be made to local jurisdictional systems in order to facilitate and improve the success of future linkages.

Recommendations:

(i) Incident location information should be a mandatory collection field;
(ii) Standardize how fire incident location are recorded and reported;
(iii) Separate fields for each component of civic addresses is the ideal method of reporting, i.e., street number, street name, direction (if applicable), city/town/municipality, province, postal code;
(iv) If complete address information is unknown, the postal code, if available, is very useful in coding Statistics Canada's Standard Geographical Classifications (SGCs).

5.2.7 Training

In an effort to produce nationally comparable crime data, Statistics Canada's Uniform Crime Reporting (UCR) Survey provides training to police officers across the country in regards to survey reporting requirements. The training, which may be conducted in person by the CCJS Police Training Officer, or as on-line courses, covers a broad series of survey components such as concepts, definitions, and scoring rules.

A similar approach to the UCR Survey's training could be adopted by the NFID project.

Recommendations:

(i) Raise the profile of NFID data at the local fire service level to promote detailed, consistent and standardized reporting across the country; and
(ii) Prepare training packages for fire officers, covering high priority NFID topics;

5.3 IT-related considerations and recommendations

5.3.1 Method(s) of reporting

The CCJS has significant experience and a long history in the collection, processing and dissemination of policing, courts, correctional services and other justice and public safety-related data at the national level.

For the purpose of the NFID pilot (and due to time constraints), jurisdictions were asked to send their fire incident and victim data as they are stored in their databases (i.e., with the variables names, formats and code set that they use). As previously described, all jurisdictional data were transformed by the CCJS to the NFID standard.

Ideally the data would be standardized at source (i.e., fire service level). However, it is recognized that this may be considered cost-prohibitive for some fire services and, therefore, should be considered as a long-term objective.

However, fire incident, loss and casualty data are standardized at the provincial level, where systems exist. Since most Fire Marshal's and Fire Commissioner's Offices collect and standardize the data within their respective jurisdictions, it would be possible to develop extraction interfaces to their information management systems—essentially data extraction programs that transform the survey-relevant jurisdictional data into the NFID National Data Requirements.

The options for future data reporting are as follows:

(i) develop interfaces for collection from provincial/territorial Fire Marshals/Fire Commissioners Offices;
(ii) collection directly from fire services, working with vendors or independent systems, especially where a municipal fire service has the capacity to report, but the Fire Marshal or Fire Commissioner's Office does not; or
(iii) a temporary hybrid of (i) and (ii) until the capacity for a full type (ii) approach can be developed; and
(iv) providing the capacity for jurisdictions that currently do not have a database, by allowing for submission of data by paper forms to be captured

Recommendations:

It is recommended that jurisdictional interfaces be developed for future data collection, given these data are standardized at the jurisdictional level.

It is acknowledged however, that the CAFC may prefer another approach, so these discussions would have to be had well in advance of any operational planning and considered in the funding for the project.

5.3.2 Develop an NFID processing system

All ongoing surveys at Statistics Canada are subject to a series of data cleaning processes including standard classification of data, editing for data validity and consistency, outlier detection, etc. These processes are typically conducted by running data files through a series of modules developed for a survey-specific processing system.

Recommendations:

(i) Develop validity and consistency edits to ensure data conform to the standards and to ensure correctness, consistency, accuracy, and completeness;
(ii) Build a formal processing system for the NFID project, including edit and imputation modules;
(iii) Develop jurisdictional data quality reports;
(iv) Partner with methodology resources to develop formal outlier detection rules and standards.

5.3.3 Conduct an environmental scan

Not unlike other provincial/territorial administrative databases, there are no shared or common jurisdictional fire incident and loss databases across Canada, hence the lack of uniformity and standardization. Moving forward, it would be considered best practice to conduct an environmental scan of existing systems and the status of any possible development or re-development activities.

Recommendation:

It is recommended that the CAFC and CCFMFC undertake an environmental scan of jurisdictional IT systems currently in existence. The scan would include, but not be limited to, the gathering of the following information:

- name of the system;
- identify the system developers and those responsible for its maintenance;
- database model diagrams;
- entity relationship diagrams;
- data dictionaries, code set tables;
- current or future development plans and activities.

5.4 Communications and networking-related recommendations

5.4.1 IT sub-committee (CAFC/CCFMFC)

The environmental scan described above would be a fundamental first step in addressing the status of jurisdictional databases across the country. Not directly related to the NFID project, but in support of continuing such communications and knowledge-sharing, the CAFC and CCFMFC could benefit from creating an IT sub-committee, comprised of IT staff from provincial/territorial Fire Marshals' and Fire Commissioners' across the country, as well as CAFC and CCJS representatives.

Broadly-speaking, the purpose of the IT sub-committee would be to facilitate inter-jurisdictional communication of knowledge, experience and information and a range of fire-technology related issues. More specifically, the committee would:

- raise awareness of technological developments;
- keep informed of jurisdictional IT requirements with respect to system re-design, development or new acquisitions;
- share information in regards to IT development or acquisition options.

5.4.2 Build/foster partnerships (CCJS with CAFC/CCFMFC)

Fire safety and the provision of fire services is an evolving enterprise. In support of keeping the NFID project relevant, it is important for the CAFC and the CCFMFC to not only maintain current partnerships and relationships, but also to foster new strategic partnerships to further its knowledge in the area of fire-related issues.

Statistics Canada, for example, often forms special working groups with its partners, such as subject matter or data quality working groups to identify and discuss emerging issues, special topics, and new areas of data development. Moving forward, it would be beneficial for an NFID project team to work closely with the CAFC and CCFMFC in the same manner, particularly to take advantage of the project's infancy and the potential to expand beyond its current scope.

6. Summary

The NFID pilot project fulfilled its objectives of: (i) collecting ten years of microdata information on fire incidents and fire losses from Fire Marshals and Fire Commissioners Offices across Canada; (ii) creating a standardized national system for the collection of fire statistics; and (iii) linking the database with other relevant socio-economic data to assist in the development of new, relevant, evidence-based research related to fire incidents, public safety and security.

Moving forward, the sustainability of the NFID project will be discussed between the various stakeholders and sponsors. The viability of the project is highly dependent on interest and support as well as ongoing funding. A governance structure which would provide ongoing guidance and project oversight is essential to the NFID's future success.

If these key requirements are met, then the scope of the project should be re-examined to identify if there are further data needs to support the ongoing activities in regards to the delivery of fire services across Canada, as well as evidence-based policy development.

7. References

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