Report on the Feasibility of a Canadian National Fire Information Database

Paul Maxim, Darryl Plecas, & Len Garis

UNIVERSITY OF THE FRASER VALLEY

SCHOOL OF CRIMINOLOGY & CRIMINAL JUSTICE

UNIVERSITY OF THE FRASER VALLEY

CENTRE FOR PUBLIC SAFETY & CRIMINAL JUSTICE RESEARCH

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Executive Summary

This document examines the feasibility of creating a National Fire Information Database for Canada. In pursuing this, we examined what data are currently collected and the structure of organizations responsible for maintaining national databases in other countries. Because of the allocation of jurisdictional responsibilities relating to the services provided by fire departments in Canada, creating, maintaining, and funding a national database poses unique challenges.

Our view is that the creation of such a database is feasible; but, for the venture to be sustainable, a broad base of partner stakeholders needs to be assembled.

In summary, we make five recommendations for moving forward:

1. The implementation of a National Fire Information Database should be done in a staged manner with the initial stage focussing on reintroducing the National Fire Loss reports based on the core items outlined in the Council of Canadian Fire Marshals and Fire Commissioners' *Code Structure* document. Future developments should move toward a more elaborate database that includes the broad range of activities in which Canada's fire services engage. It is also recognized that the implementation of a more inclusive database may require the gradual inclusion of jurisdictions since some have recently renewed their existing infrastructure.

2. We recommend that the project be initiated by the Canadian Association of Fire Chiefs. This type of "bottom-up" approach was used very successfully by the Canadian Association of Chiefs of Police in the development of the national Uniform Crime Reporting (UCR) system. Active involvement by the Fire Chiefs will send a strong signal to all stakeholders that those ultimately responsible for collecting the raw data have a strong commitment to the success of the project.

3. We would recommend that, overall, the agency best suited to construct and maintain the system is Statistics Canada. While not strictly parallel, the system we envision is similar in its demands to the Uniform Crime Reporting system which is managed and maintained by Statistics Canada. Should it not be possible to come to an arrangement with Statistics Canada, we would recommend that a stand-alone, nongovernmental agency be created similar to the Canadian Interagency Forest Fire Centre, Inc (CIFFC).

4. While we recommend that the Canadian Association of Fire Chief take the lead in initiating the system, any governing structure must contain a range of stakeholders. At a minimum, the governing structure would require representatives from the CAFC and the CCFMFC. Ideally, representatives from other government agencies, academia, and the private sector should be represented.

5. Consideration must be given to developing a sustainable funding model. Since most activities engaged in by local fire services are not strictly within the jurisdiction of the federal government, it is unlikely that a single funding source will be found in the short term. Most likely, the primary funding sources will be the provinces and territories, with a possible contribution by the federal government through the Fire Commissioner's office or some other agency.

Purpose of the Study

In December 2010, the Canadian Association of Fire Chiefs (CAFC) presented a proposal to the federal Department of Public Works to examine the feasibility of creating and maintaining a *National Fire Incident Database* (NFID). In its proposal, the CAFC indicated that it was important to identify "the ability to gather and analyze fire incident statistics on a national basis as an important tool for optimizing effective delivery of fire services; particularly, to substantiate improvement in policy, preventative measures and operational response methodologies."[1]

The primary focus of the proposal was on the feasibility of establishing a national online program that would allow for the aggregation of national fire incident reports including the ability to upload fire incident reports over the internet. More specifically, the proposal was oriented toward "seeking funding support to conduct initial concept exploration, e.g., scoping, requirement definition, potential and essential partnerships, partner roles and contributions, feasibility, delivery parameters and identifying alternative funding sources."

Existing Situation

To understand the challenges facing the implementation of an NFID, it is worthwhile to briefly review how fire services are structured in Canada and where responsibilities lie. Unlike with some other important data gathering initiatives, such as gathering police statistics, putting a national fire data gathering mechanism in place poses some jurisdictional challenges.[2] A brief history of some of the issues and motivations surrounding the collection of fire statistics in Canada is provided by Chaput.[3]

With a few exceptions, fire services in Canada are the responsibility of local governments.[4] Most fire departments are funded by and report to local municipalities. This responsibility is generally

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[1]Canadian Association of Fire Chiefs (2010) *Technical Proposal: National Fire Incident Database*. Canadian Police Research Center Program, Project# 91007 Department of Public Works and Government Solicitation No. W7714-115148/A.

[2] Some previous examinations of the state of fire and related statistics in Canada have been conducted. See, for example, the work done by the National Research Council as reported in Bounagui, A., & Benichou, N. (2005). *Review of fire statistics collection in Canada.* [http://www.nrc-cnrc.gc.ca/obj/irc/doc/pubs/rr/rr198/rr198.pdf] and Reid, I., Benichou, N., & Bounagui, A. (2005). *Fire statistics workshop summary: Fire statistics for the protection of Canadians.* [http://www.nrc-cnrc.gc.ca/obj/irc/doc/pubs/rr/rr201/rr201.pdf]. The Master's thesis by Chaput is also quite informative. See Chaput, R.M. (2011) *Can We Develop National Canadian Fire Statistics for Emergency Planning?* Victoria BC: Royal Roads University.

[3] Chaput (2011) ref. above note 2.

[4] While we focus primarily on provincial and territorial jurisdictions in this report, it should be noted that the Department of National Defence and the Fire Protection Services in HRSDC have responsibility for incendiary incidents in the federal domain. The federal government also has some responsibilities with regard to First Nations communities (Indian Reserves).

defined by a provincial municipality act or equivalent. Local governments determine the extent of the services provided, and the type and number of resources to be made available. In larger centres, fire departments are generally staffed by regular, full-time members who make their livelihood as firefighters, or as ancillary staff members. The majority of departments in Canada, however, are staffed by volunteers for whom firefighting is not their primary occupation or professional activity. It should also be noted that while we tend to use the term "fire" departments, responding to incendiary incidents generally constitutes about 10% of all calls for service. Viewed broadly, fire departments are perhaps better thought of as generalized emergency response agencies that address a range of issues from emergency medical calls, to search and rescue, to dealing with hazardous material accidents, and much more in between.

From the perspective of a local department, the collection of information relating to fire and other incidents is usually necessary to provide a measure of accountability to their local municipality. It is because of the role and mandate of provincial Fire Marshals and Fire Commissioners offices that local departments are asked to submit reports of incendiary incidents to a provincial or territorial-level agency. These reports aid the fire marshals'/commissioners' offices in their responsibilities for fire code enforcement and for investigating the origin and cause of fires. Thus, across Canada, each of the fire marshals/commissioners maintains a record of local departments' fire-related activities.

As Chaput[5] points out, from 1922 to 1992, the Fire Commissioner of Canada published the annual report, *Fire Losses in Canada*. Eventually, the task of collecting and publishing a summary of national fire statistics was transferred to Human Resources and Skills Development Canada (HRSDC). The last report from HRSDC, however, was published in 2002 and regional jurisdictions have not been asked to submit reports since 2007.[6] The cessation of national reporting does not seem to be related to one reason alone. Instead, it appears that a combination of general federal funding cut-backs, the lack of a legislated federal mandate to pursue the activity, and a dispersed user group all contributed. Likely, if any one of those three conditions had not existed, the national collation of data and the publication of an annual report would have continued.

Subsequent attempts have been made to revive national level reporting, most notably in 2005 by the federal National Research Council.[7] It should also be noted that HRSDC only requested summary data in spreadsheet format from the provinces and other reporting jurisdictions. The

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[5] See Chaput (2011: 11). See note 2. Several problems appeared to have been associated with HRSDC's decision to suspend data collection. Among these were that the spreadsheet used to collate data was not returned in the proper format, some spreadsheets were not submitted in a timely manner; and, sheets for some jurisdictions were simply not submitted.
[6] Copies of the annual reports from 1986 to 2002 are available on the CCFMFC website at http://www.ccfmfc.ca/stats.html.
[7] See note 2.

submitted data were not in the form of individual incident records, so the amount of analysis that could be conducted with the data was limited.

This split in jurisdiction between the local departments and provincial marshals/commissioners offices creates a set of issues for data collection and maintenance. First, with one exception, the amount and type of data collected by the local departments and the mechanics of how that data are collected is determined by the local department. For example, some departments maintain broad data bases that record all calls for service and include the department's response, and the characteristics and outcomes of those calls. Other departments only record a minimal amount of information required by either their local municipality or the provincial fire marshal/commissioner.

Second, besides variations in the amount and type of data collected, the local departments differ greatly in how they record that information. Some are still at the paper form stage while others have sophisticated enterprise systems that may be linked into that of the host municipality. The form of the existing data collection systems is perhaps best described as a hybrid model where some provinces have a centralized, online system for reporting incendiary incidents while many municipalities maintain a local system. In this latter situation, the information required by the province is usually extracted from the local database and submitted to the provincial database in some form of batch mode, one or more times per year.

Third, because there is no overall national jurisdictional responsibility for fire services, the amount and type of information kept by the provinces also varies widely. That there is some commonality across the provinces is a consequence of the Council of Canadian Fire Marshals and Fire Commissioners (CCFMC) *Canadian Code Structure on Fire Loss Statistics* document. This is the exception we noted in the first point. In fact, the CCFMC comes closest to having a national mandate to support the collection of fire data. As part of their mandate, they note two of their objectives are "arranging for the compilation and dissemination of national fire loss statistics" and "identifying trends relative to the causes and severity of fire."[8]

The CCFMFC has agreed to collect a core of incendiary incident data that does allow for interprovincial comparability.[9] Having noted this, however, it is also the case that particular items or variables may be coded differently across jurisdictions. That is, some provinces report a more refined list of outcomes or responses for a given item that can be re-aggregated to provide for interprovincial comparability. Thus, the ability to compare across jurisdictions exists, but it is often not something that can be done in one step: some pre-processing of the data is required first.[10]

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[8] See http://www.ccfmfc.ca
[9] See http://www.ccfmfc.ca/pdfs/code_structure_2002.pdf
[10] As a background exercise to this report, we wanted to know whether it was still possible to create a common data set across provincial jurisdictions using the CCFCFM standards. Fortunately, Dr. Mahendra Wijayasinghe of the

Why Collect Fire Data?

Fire data are used to monitor the number and characteristics of fires attended by local departments so that action may be taken to reduce the human and financial cost of fire. The effectiveness of such action can also be measured by fire statistics.

Local fire departments use fire statistics in making operational decisions, policy development and in promoting public awareness about the dangers of fire. Used effectively, the collection of fire statistics can contribute to a reduction in the incidence of fire and related death, injury and damage, and ensuring the safety of the public through civil protection. Other agencies and government departments also use fire data to examine such things as the effectiveness of building codes, and to monitor motor vehicle and product safety issues. Incident data in combination with loss information are also necessary for the insurance industry. A small cadre of academics and other researchers also use fire data for other purposes. For example, there are researchers at the National Research Council who focus on the susceptibility of certain kinds of building structures to fires; others examine the effectiveness of fire fighting and fire safety equipment. There are also a small number of questions raised about fire each year in city councils and provincial legislatures.

A comment by the US Fire Administration is probably appropriate for most jurisdictions.[11] "Basic information probably is available already. Typically, the number of fires handled last year, the number of fire-related injuries, and the number of fire deaths are tracked. It is another story, however, if more probing questions are asked:

- How many fires took place on Sundays, Mondays, etc.?
- How many fires took place each hour of the day or month of the year?
- What was the average response time to fires?
- How much did response times vary by fire station areas?
- What was the average time spent at the fire scene?
- How much did the average time vary by type of fire?

To this we can also ask such questions as is there a relationship between health outcomes and participating in firefighting activities? And, are there socioeconomic and sociogeographic factors that correlate highly with the probability of incendiary events?

Alberta Fire Commissioner's office had recently requested copies of the appropriate data for 2007-08 from his provincial counterparts and colleagues. Working with the data and documentation collected by Dr. Wijayasinghe , it was clear that while considerable recoding was necessary in some instances, a core dataset could be created. Wijayasinghe presented some results in a *Preliminary Analysis of Canadian Fire Data* at the CCFMFC meeting in Calgary, September 2011. A summary of the common data items is provided in Appendix B of this report.

[11]U.S. Fire Administration (2004) Fire Data Analysis Handbook, Washington, DC: FEMA. [http://www.usfa.fema.gov/downloads/pdf/publications/fa-266.pdf]

Currently, there is range of data being collected by local department and provincial fire marshals/fire commissioners in Canada. As noted, in some localities, the amount of data collected is extensive while in others, it is very limited. Implementing a new level of data collection or aggregation raises the immediate question as to what would be the net benefit? In other words, what is to be gained by introducing an NFID?

Essentially we suggest that there are two basic outcomes: one operational and the other substantive. We noted that currently, there is a common core of data collected across the country based on the recommendations of the Council of Canadian Fire Marshals and Fire Commissioners. Beyond that, the amount of information collected varies widely. At the operational level, it is likely that the implementation of an NFID would eventually result in a greater consistency of information being generated and recorded. This is not a necessary situation, but it is likely that social and political pressure would result in some form of best practices being identified and a movement to those norms as resources become available. There is no guarantee this would happen, but past experience in other areas such as policing and health care suggests that this often occurs.

It is also possible that some cost savings could be generated, even for larger jurisdictions, through the implementation of a unitary data collection and recording system. For example, scaling a single server installation to handle ten reporting units is much less expensive than having ten separate installations. The same applies to the purchase of software and the hiring of training and support staff. Even in a hybrid model (which we will discuss in detail later) where some jurisdictions use their own installation, it can be beneficial to have one central service for those that do not.

The substantive outcome of an NFID would be that we should be able to address some questions through data aggregation that cannot be addressed now. In other words, what does putting all of the provincial data together buy us?[12] Are there some benefits to aggregation that go beyond keeping information relating to local events only, even if the locality is the province?

Advantages of a National Database

We have attempted to identify a number of significant benefits to be gained from the introduction of a NFIDS system. Needless to say, the scope and depth of those benefits would depend on the type of system implemented.

- Some regions are too small to encompass a comparable jurisdiction for comparison purposes. For example, most regions have a limited number of large cities. First Nations

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[12]In many respects this question can be asked at the provincial level. Except for the fact that the provincial fire marshal or fire commissioner is mandated to track and investigate certain types of incidents, what is the value of a provincial database?

communities are also examples where there are relatively few incidents although the rate per community is quite high. This is due to the fact that the average FN Community has less than 400 residents.

- Some outcomes, for example, certain types of incendiary incidents or fatalities may be rare events in certain jurisdictions. By aggregating to achieve larger numbers for analysis, it may be possible to identify causal and other patterns.

- National data can provide a comparison group for assessing the impact of policies or programs that might be implemented in a particular jurisdiction.

- National data can provide the potential to be able to track emerging patterns that may appear to be random or unique at a local level yet are systematic at a higher level of analysis. For example, individual cases of arson may not arouse inordinate suspicion but a national trend may suggest that a large-scale criminal enterprise is involved.

- There is the potential to reduce costs, particularly in smaller jurisdictions, by reducing the amount of redundant hardware and software that needs to be purchased. There could also be further savings through the provision of common training and support facilities.

- The potential exists to link existing or expanded incident data with other data sets. For example, linking incident data with geo-census data to be able to better track patterns by the social and geographical characteristics of the neighbourhood in which they take place. Obviously, this could be done at the local level but it would be more cost-effective to have it done once, for a national database.

Reasons for not Collecting National Statistics

All actions take resources and the aggregation of fire information at the national level is no exception. The key question is do the benefits outweigh the costs?

Several people we interviewed suggested that the value-added may be minimal. There are two reasons for this. First, fire incidents alone appear to follow fairly stable patterns both across space and time. That is, the numbers do not appear to differ much from year to year, and the overall patterns vary little from place to place. Significant differences it terms of human and resource costs usually appear as outliers and not global trends. An example here is the propane explosion that took place in Toronto in August 2008 at the Sunrise Propane facility. That was a unique event which demands our attention. Looking at aggregate numbers, however, would likely not contribute much to our understanding of the incident.

A second reason is that, given the consistency of many patterns across jurisdictions, it may be sufficient to collect the information from one jurisdiction alone. Particularly if the jurisdiction is large and diverse, such as Québec or Ontario, there may be little to no benefit in obtaining additional data from other jurisdictions.

One suggestion is that the resources could be better spent doing one-time studies focusing on specific topics. The cost per piece of research might be high, but it would likely be far less than the cost of collecting huge amounts of annual data, most of which might be used rarely. For example, it is known in the United States that about 44% of firefighters deaths (440 out of 1,006 from 1995-2004) resulted from sudden cardiac arrest, and in about 35% of those deaths the victim experienced cardiac symptoms during fire operations. We might assume that this pattern holds in Canada but we do not collect these data on a regular basis. Regularly collected national-level data might not provide that indicator but a targeted study would.

While we might be prompted to collect this information, the issue is how far do we go? There are all types of health and safety issues we might wish to explore but the regular collection of those data would be onerous. For example, what impact does the exposure to hazardous materials have on the long-term health of firefighters?

Comparison with Other Jurisdictions

As part of the review for this study, we examined the national models that were put into place in the United Kingdom and the United States. Many Canadians in the field are reasonably familiar with the NFIRS model in the US. The system implemented in the UK is less well known. Both systems faced similar challenges posed by the Canadian model of fire response. In many respects, the system implemented in the UK appears to have been somewhat more successful than its US counterpart. Several things stand out with the UK approach. Among these are that it is a smaller or "tighter" database with fewer data elements, there is a greater level of inclusion of local departments, and the data appear to be more complete.

United Kingdom Model

The reporting structure in the UK is simpler than it is in the US or might be in Canada. Local brigades collect incident data and it is then aggregated at the national level. There is no provincial or state intermediary. In creating the Fire Incident Recording System, the Department of Communities and Local Government negotiated definitions and other aspects of the system directly with the local brigades.[13] Rather than purchasing an existing software solution, the UK decided to create a custom online data entry and recording system. A private contractor was brought in to work with the government to facilitate the process. Overall, it took about three

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[13] For a broad description of the Fire Incident Recording System, see the agency website at http://www.communities.gov.uk/fire/researchandstatistics/firestatistics/newincidentrecording/

years to get the initial version up and running. They are currently in the process of creating an updated version of the system.

Although we could not obtain exact costs, it was estimated that the capital cost for the UK system was approximately £1.5 million and annual operating costs run at approximately £300,000 per year. Currently, there are about 6 FTEs associated with the centralized collection and maintenance of the data in Hemel Hampstead, and another 4 FTEs responsible for policy and other analyses in London.

In the UK many departments maintain both a local data base and submit information to the national system (a rough estimate was about half). In these instances, the typical situation is that a "macro" or conversion program has been written to provide an interface between the local and national systems. Generally, this involves running a batch routine to upload the data. The details of how to link local systems to the national database was left to the local entities to figure out based on published specifications. Other brigades, however, enter data directly into the national system. Where brigades keep local systems, it is generally to maintain detailed information of local interest. It appears that there is currently a 50:50 split between those departments that maintain local systems and those that use the national system only.

Some local systems have up to 200 fields but typically, only about 20 to 30 fields are loaded into the national system. Overall, the national system processes about 1.4 million records annually. This includes not just fire and rescue calls, but also responses to such emergencies as floods, traffic accidents and medical calls.

Some departments have also tied their "command and control" (dispatch) software into the system so that some fields are pre populated. Thus, information such as the time of the call, location of the incident, and the amount and type of equipment and personnel dispatched do not require re-entry. At the back end, the data are linked to risk assessment software that can be used for tactical and policy analysis.

Local units have the capacity to download all of the information they have entered into the system in one of several formats to conduct their own secondary analysis. Currently, local brigades and units can only download data for their own jurisdiction. Consideration is being given to allowing broader access for comparative purposes. There is also a fire statistics user group (mostly academics) who access the data for research purposes.

United States Model

The United States has three levels of governance similar to that in Canada. As in Canada, local municipalities are responsible for creating and maintaining local fire departments or brigades.

As with the provinces, state governments have some legislative authority relating to fire and EMS services but the federal government does not. The federal government, however, has established a National Fire Incident Reporting System (NFIRS).

NFIRS origins reside in the late 1970s and early 1980s as a result of a joint push from both the federal government and some states. The system is voluntary and not all states participate. Since NFIRS' inception, the federal government has provided about $400 million in grants, largely to encourage state agencies and local departments to become part of NFIRS. As with the model in the UK, NFIRS is a hybrid model where some local departments maintain their own information systems while others use the national, online system supported by the US Fire Administration.

The mechanics of the US system are also far more complex than that in the UK. For example, as many departments moved from paper to electronic reporting, the National Fire Data Centre provided space on their servers for states to use either their own software or the NFIRS software. Essentially, however, the participating local departments send their data to the states which then transfer it to the National Fire Data Center. The states also provide the first line of support and technical assistance to the local departments.

The NFIRS system is also a complex entity in that it consists of a core with various modules attached to it. For example, one module relates to arson. As a consequence, the system can be unwieldy, although entering basic information can be done quickly and efficiently. Because participation both in the reporting system and in what modules are used is voluntary, there are considerable issues relating to coverage. This is above and beyond the "normal" issues of data validity and reliability that all data collection operations face. The system has also come under recent challenges as some states such as Nevada and Arizona have had to withdraw because of the recent budgetary crisis.

The NFIRS software is custom built based on the Oracle data base management system. The latest incarnation took about three years to develop at a cost of about $4-5 million. Support costs for the Data Center are about $700,000 per year and the total costs, including the Data Center, contracts and grants run about $3 million per year. The number of core staff members at the Data Center supporting the system is about the same as in the UK with two part-time people maintaining the data base, two part-time developers and 2.5 full-time NFIRS positions who provide some support and analysis. There are several others who are involved in research and analysis. This system handles about 20 million records of which about 1 million are the result of incendiary calls. Currently, the US is looking to upgrade the system to version 6.

Going Forward: What to Include?

As indicated, the provinces collect a core set of data agreed to by the Canadian Association of Fire Marshals and Fire Commissioners in 2001. This is an update of the *Canadian Code Structure on Fire Loss Statistics (CCS)* which goes back to the early 1960s with a revision in 1971. Broadly, this is a common set of information collected by all provinces on fire incidents within their jurisdictions.

We also noted that a second set of data might be considered as augmenting that outlined in the CCS document. That is, several provinces and many local jurisdictions collect information that goes beyond the strict recording of fire incidents and their characteristics as outlined in the CCS. Generally, this involves the collection of variables or factors beyond those described in the CCS or a more refined listing of categories for variables listed in the CCS.

Briefly, it appears that any attempt to formulate a national repository would require a fundamental decision as to whether only the core/common data currently outlined in the CCS would be aggregated, or whether ancillary data should also be recorded. The collection of ancillary data would require those jurisdictions/departments that do not currently collect this information to expand their collection procedures. Among the categories of data that are collected in other jurisdictions (e.g., the UK and the US) are the following:

- Dispatch and Management Information System Data (identifying the type and amount of equipment dispatched to an incident; the number and possible names of individual fire fighters).

- Non fire incident data. The CCS does not require the recording of emergency medical calls, non incendiary motor vehicle incidents, emergency rescue calls, false alarms and other responses that make up the preponderance of calls in most departments.

- External data. This generally takes the form of other databases that can be linked to the fire database that are usually not recorded or generated by the fire service. Examples here are GIS data bases that maintain terrain information or small area information regarding the socioeconomic characteristics of the location where the incident took place.

A schematic of what could possibly be included in a national database is outlined in Figure 1. At level (1) we identify four general sources of information. These are: dispatch and MIS data; core incendiary data; enhanced incendiary data; and, other calls for service. The box identified as core incendiary data consists of the material identified in the Council of Canadian Fire Marshals and Fire Commissioners' Code Structure document. This is what is currently being collected and could remain as the minimal core data within an initial NFID structure.

The box identified as enhanced incendiary data represents an expansion of information beyond the core material currently identified in the Code Structure document. As noted, most provinces and territories collect more information than is represented in the common core. These data are inconsistent from jurisdiction to jurisdiction both in the identifying variables recorded and the manner in which they are represented. That is to say, there are differences in definition and in the way those definitions are represented. The identification of what items should be included within the enhanced database would involve a series of negotiations as took place in both the UK and the US. Possible items for inclusion could be drawn from the items currently identified by the various provinces and territories or from the national UK and US databases. One could start from "scratch" but it is often easier to use an existing list as a starting point. Furthermore, using examples from an existing system might give some insight into which items are easier to collect, are more useful and are more reliable.
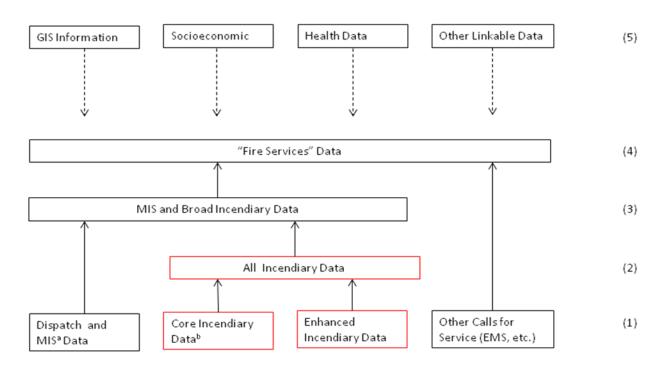

Figure 1: Scope of Data Options for an NFID

a. Management Information Systems
b. Data identified in CCFMFC document

Including dispatch and MIS information is a way of identifying what resources are sent on a call and the efficiency (and occasionally, the effectiveness) of those personnel and materiel. Many larger departments already collect this information as part of their enterprise system. Smaller departments and volunteer departments might have reservations about having to collect

additional data. One of the things the UK model shows, however, is that much of that information can be "pre populated" based on the known inventory of the department and what is recorded by dispatch from the call for service. This is not to say that there is no additional work involved; it is the case, however, that the additional amount of recording work can be minimal.

The fourth box identifies all other (non incendiary) calls for service to which fire departments respond. While the proportions vary somewhat across jurisdictions, it appears that incendiary incidents only account for about 10% of calls for service in most areas. Other services typically offered by fire departments include search and rescue operations, emergency medical services, hazmat responses and the proverbial "cat up the tree" situation. In most communities, fire departments are a key element in the community's overall emergency response service. Thus, while the original raison d'être for fire departments or brigades was fighting fires, much of the practical value local communities gain from their departments results from their emergency response capabilities.

This latter component is not included in the CCFMFC Canadian Code Structure since it is not a direct component of the role of the Office of the Fire Marshal or Fire Commissioner. This information is vital to assessing the functioning of local departments and for making the case for public support for the enterprise. In the Canadian context, it would appear that for these data to be incorporated into an NFID, an agency outside the fire marshals'/fire commissioners' offices would likely be needed to provide funding and support. This support might come from a federal agency with a mandate for emergency response issues, or from a similar budget line within the provinces and territories.

Beyond the items specified at level (1) in the diagram, we have indicated how they might be aggregated to form different capacities within the NFIC system. While an initial implementation of a full model such as the NFRS program in the US or the IRS in the UK may be feasible, it is more likely that an incremental approach would be more realistic. Hence, the notion that at stage (2) the core data might be expanded to include other elements of incendiary events; the inclusion of dispatch and MIS information at stage (3); and, the inclusion information of all other calls for service at stage (4).

While it is possible to link many of the existing provincial and territorial data to other databases, linking those to a national database would be far more cost-efficient. It is also though this data linkage process that the exercise would be a substantial value-added proposition. Enhanced GIS information, block-level socioeconomic information from the census and other existing data sets could be very useful for policy and planning purposes. Perhaps the best examples here are the various police services that use such data to identify crime patterns and predict demand for service.

Possible Database Relationships across Jurisdictional Levels

Figure 2 provides a general idea of what currently exists and what might possibly exist in terms of the database relationship across levels of jurisdiction. The first column outlines the system as it currently exists. Typically, an incendiary incident is observed and is reported in a local system, which is indicated by flow (1). At one or more points in time, that local data will be transferred to a provincial/territorial system maintained by the Office of the Fire Marshal/Fire Commissioner, as indicated by flow (2). In some jurisdictions, some or all data entry is input directly into the provincial/territorial system as indicated by flow (3). We should also note that for data input into local systems, not all will be transferred to the provincial or territorial level.

The other point to note in the current system is that just as the flow patterns differ across provincial and territorial jurisdictions, so to the recorded content differs. In the current system, the only commonality of content is that identified in the CCFMFC Code Structure document.

By adding a pan Canadian or national element, an additional layer is added to the system. Possible models are outlined in the next two columns. The middle column, labeled "Future Model A," is what we found with the national reports that were generated up to 2002. Essentially, each province's data was submitted for national aggregation as indicated by the addition of flow pattern (4). Previously, only the *Code Structure* data were aggregated but it is conceivable that this model could be retained even if some of the additional material outlined in the discussion of Figure 1 were included. The obvious advantage of this structure is that, ultimately, it is the provincial/territorial fire marshal/fire commissioner's office that is responsible for ensuring the validity of the data.
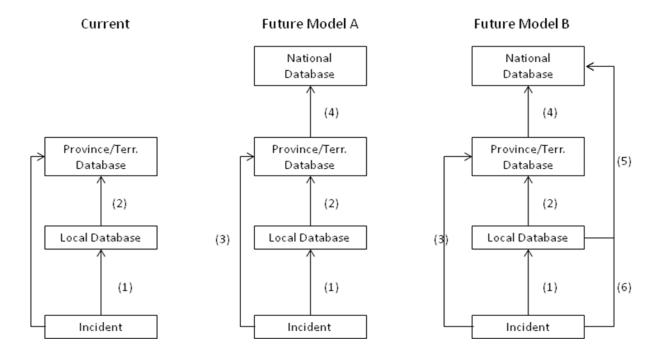
Figure 2: Possible Data Flow Models

Model A, however, is not the only possible future flow alternative. As in the US with the NFIRS data, there are alternate models. Just as some provinces have a direct entry mechanism for recording incidents without having to "batch up" from local systems, so it is possible to have a national direct entry system. In this instance, the national system can play the role of some provincial database systems. In the column labeled "Future Model B" in Figure 2, we indicate the option of a direct entry into a common national data base. This could either be done directly by a firefighter or staff person, as indicated in flow (6) or through the local system as indicated in flow (7).

The advantage of Model B is that one could do away with some of the duplication of data management at the provincial level. This could save on both hardware and software maintenance and development costs. Presumably, training for data entry and support would be centralized as it is in both the US and the UK. Direct entry into a national system, however, would not cut the provincial and territorial fire marshals/commissioners out of the process. The provincial and territorial offices would have access to the data. Within reason, the national system could even be structured to allow for different indicators to be collected in different provincial and territorial jurisdictions. The greatest gains, though, would be made by having as much common data as possible being recorded in each jurisdiction.

We would also point out that the Model B scenario does not have to be implemented in its entirety from the beginning. A multiyear transition phase could be agreed to where the migration process takes effect with time. Such a phasing in would have several benefits. Two of the prime ones would be that it would address the concerns of jurisdictions which have recently invested in their own system. In those cases, the transition could be made at the next point of system refresh. The other advantage of a phased-in approach is that time would be available to work out the inevitable wrinkles in the system. As everyone knows who has worked with a new database system, even the best implementations have some issues that need to be corrected. A phase-in would give concerned provinces and territorial officials a chance to gain confidence in the system before making the transition.

Software Requirements

At present, there is no single or standard software package for recording incidents used across Canada. Instead, what we have identified is a range of Database Management System (DBMS) packages that have been customized for local purposes. Some of these appear relatively sophisticated (as, for e.g., in the case of New Brunswick) while others are quite rudimentary. It is also the case that data are recorded through a combination of on-line entry and hand-filled forms that are centrally transcribed.

Going forward, there appear to be a series of options.

- The current status quo could be maintained with the agency supporting the national database simply extracting and collating information from the various provincial repositories. This would be the simplest and least costly approach to the creation of an NFID.

- A system that is currently used by one jurisdiction could be adopted as the national standard. This would require agreement on the part of all jurisdictions that one system is acceptable by all. This might mean that some jurisdictions would not see all of their information being stored and used nationally while others would have to put procedures in place to collect information not currently recorded. This would not be an expensive proposition from the perspective of acquiring software, but would involve substantial costs associated with implementing new data collection procedure in some jurisdictions.

- A new, system could be created (as in the cases of the US, UK and New Zealand) that would be used by all jurisdictions. This would likely be the most costly approach, although most of the expense would be embedded in the "one-time" cost associated with setting up such a system. Annual maintenance fees could be relatively small.

Under the latter two alternatives, it would also be possible for hybrid systems to still exist as is the situation in the UK. The UK system is an extensive one, recording information on all calls for service and the ensuing outcomes. However, some larger jurisdictions still collect ancillary information that they use for local purposes or for sale to outside clients such as the insurance companies.

Issues for a Common Recording System

When the CAFC initially proposed this project, part of the vision was to consider a single national data recording system. This would parallel that used in the UK and the US. Technically, constructing such a system would not be overly challenging. The UK chose to implement a system "from scratch." On the other hand, there are several competent vendors who can provide the necessary software and hardware. Some of these vendors provide generic systems while others have solutions specifically designed to fit within the milieu of a fire department. While not completely trivial, finding a technical solution is not the biggest problem.

Issues around implementation are usually the largest challenge when any new system is proposed. On the managerial side, for example, there is the consideration that many provinces have invested substantial resources in their own systems. Most of those are viewed as addressing the current needs of the province. Switching to a national system would raise the question of whether to retain the existing infrastructure or to "write down" the investment and make the transition to the national platform. For provinces that have recently implemented new systems, this might not be politically palatable or feasible. Some years down the road when the system needs a refresh, however, that transition might be more acceptable. The problem, of course, is that not all provinces are on the same refresh cycle.

Similarly, some municipalities have extensive investments in infrastructure. For these organizations, the questions are similar to those faced by the provinces. Do they keep their existing structure or make the transition to the national platform? Some departments do not have local systems but use provincial, online systems for their fire services.

Ultimately, it *may* prove to be more cost effective to have either one national platform or a hybrid model where local departments keep their own systems and interface with the national one. An argument could be made that by offloading many local and the provincial systems onto a single platform would save resources in the long term. The ultimate question is whether there is the will to go in this direction.

Implementing a national system in the UK can be seen as paralleling the implementation of a provincial platform where there are essentially only two levels of governance. In Canada, the situation is more similar to that existing in the US where there are three levels of responsibility: the local municipality, the state and the federal system. Currently, about half of the states in the

US participate in the NFRS system. The US Fire Service also has implemented a grant program that is to support states and municipalities in making the transition. To date, that program has consisted of a large part of the operational budget. Some people we spoke with also suggested that without the grant program, many fewer jurisdictions would participate in the current system.

Should the decision be made to accept a national platform, there are several technical items to address. Some of these have been touched on previously. In summary, however, the following issues need to be considered.

- *Content*. What information should the new system collect? Should it be limited to the core elements such as suggested by the CCFMFC Canadian *Code Structure* document or should it be a broader system? One of the biggest challenges in the construction of any data collection system is where to draw the line. Not collecting enough information results in trivial data and makes the exercise more expensive than it is worth. Similarly, there is occasionally a pressure to collect "everything under the sun." This again is an expensive exercise that often results in the collection of little used information or information of little to no inherent value. Other questions about content include: are jurisdictions willing to come to agreement over differences in definition? Should non incendiary data be included? Should the system be modularized such as that used by NFRS?

- *Architecture*. How should the system be structured? Should the system be totally interactive, online (a "cloud" system or "software as a service") or should there be the capability for offline or local implementation? Should the system have the capacity to pre populate fields with such things as dispatch information? Should all of the entries be "point and click" or should there be an allowance for free field or textual entry?

- *Efficiency*. While there is debate over the matter, one reservation some stakeholders had with the NFRS system was that its modular system could be seen as overly complex. Others saw this as a strength of the system. Both in Canada and elsewhere, a common complaint we heard was that, often, small volunteer departments found even the bare minimum of data collection and entry challenging. Many volunteers see themselves as there to "fight fires and respond to emergencies" not to be "data collectors." Any system needs to be efficient and, while obviously meeting the needs of stakeholders, not overly complex in implementation.

- *Timeliness*. Currently, the Fire Marshals'/Fire Commissioners' offices follow up with departments to ensure that data are reported and in a reasonably timely manner. Some we spoke with indicated that this could be a challenge at times despite the fact that the

provinces had the legislated authority to request the information. A national, arms-length body might have even greater difficulties ensuring compliance.

- *Quality*. Data quality is always an issue. Perfect data are an elusive dream; the most we can hope for are data that are good enough to provide statistically reliable estimates. Indeed, this is what the science of statistics is about. Decisions need to be made within a context of error and uncertainty. Statistical analyses allow us to estimate how much quantitative uncertainty surrounds our estimates. Still, some data are so selective and error prone as to be of limited value. In the US, the International Association of Fire Fighters voices considerable concern over the value of the NFRS data arguing that much of it is of little value.

- *Accessibility*. Entering data is one issue. Using it is another. Stakeholders who go to considerable time and expense to collect and input information typically expect reciprocity. Are the data available to them quickly and in the necessary format when the need it to answer questions? Local fire chiefs, for example, are often grilled at council budget meetings over the cost of operation. Evidence-based responses using hard data are typically the best ways to address the concerns of local politicians and the public at large.

Ongoing Issues

In both the UK and the US, certain ongoing issues were identified that challenge the maintenance of the system. These same issues will undoubtedly challenge a Canadian NFID should it come into existence.

The first and most obvious concern is obtaining stable funding. In all of the jurisdictions we have examined, the responsibility for fire services is vested in local government, consequently, the maintenance of a national database can be considered a non essential item. This is less of an issue in the UK, more of an issue in the US where FEMA sees itself as having a broad mandate in the area, but likely a major issue in Canada where there is currently no obvious federal mandate.

A second concern is the need to conduct regular upgrades or refreshes to the system. This need comes from two sources. One is the obvious need to replace equipment and software that age and reaches its natural life expectancy. Another need is generated by the ongoing evolution to collect more data in some areas, less in others, and different types of information for those items that remain of interest. This is particularly challenging for systems that collect "peripheral" information on incidents and resources since practices and standards evolve with time. In all jurisdictions, there is the constant tension between those interests that perceive the need to collect more information and those for whom any data collection process is an onerous activity.

A third concern is the constant and evolving need to provide training and support. Beyond the initial and significant investment in training, there is an ongoing demand as new people come on board and systems evolve. Training and support is not a one-time cost, but is an ongoing expense that peaks when changes are made to the system.

A fourth concern is that of security. As we have come to realize, no online system appears perfectly secure and keeping up with evolving security challenges is not trivial. While it might be argued that there is little harm to be done with the public exposure of some data elements, the legal and social consequences become more serious as more data are collected and core data are linked to other databases.

A fifth concern is best described as an amalgamation of residual concerns. Among these are economic shocks and changing political and social view of the value of collecting information. In the Canadian context, we only have to look at the fate of the long gun registry and revisions to the 2011 Census for examples.

Funding

Since there is no legislated mandate at the national level in Canada, it is questionable as to whether funding would be provided by a single, national level agency. Parallel models do exist, however, in other jurisdictions. For example, in both the US and the UK, the legislated responsibility and funding for fire and related services rest with either state or local governments. In the United States, the Department of Homeland Security provides support for the NFIRS data system through FEMA, the Federal Emergency Management Agency. FEMA does this since fire and related services are considered part of the agency's broader emergency management mandate. In the UK, the Fire Information Record System is maintained by the national Department for Communities and Local Government.

There are components of the federal government that are responsible for fire services. For example, the Ministry of National Defence maintains fire services. In the past, Human Resources and Skills Development Canada (HRSDC) has collected data from the provinces. HRSDC has a "fire" mandate through its Fire Protection Services to oversee technical standards and guidelines relating to the *National Building Code of Canada*, the *National Fire Code of Canada*, and *Treasury Board Fire Protection Standards*. HRSDC also provides some selected fire protection services for First Nations communities. It is also possible that Public Safety Canada or another federal agency might also consider part of its mandate to overlap with fire, rescue and EMS issues.

Most likely, however, any central agency taking responsibility for a national database would need to be funded through a broad cost-sharing agreement among the appropriate provincial

agencies. Depending upon the scope of the data collected and other factors, the cost could be fairly modest or it could run into several millions. For example, Statistics Canada has proposed that it could collect, collate and manage the existing core data for about $216,000. Split across provincial and territorial jurisdictions, this would be approximately $20,000 each.

This amount can be put into a broader perspective. Both the UK and the US allocate about six to seven person years to maintaining their national data collection systems. In the UK, this amounts to about £300,000 ($478,000 at current exchange rates). In the US, equivalent cost is about $700,000 per year. A significant amount of that PY allocation is for the maintenance of the national online data entry system. In both instances, most data analysis is conducted in other units with the exception of a few "canned" reports that are generated annually.

Putting a national online data collection system in place would involve a substantial one-time start-up cost in addition to annual maintenance fees. The most expensive approach would be to develop a new system "from scratch." In the UK, it took slightly more than three years and about £1.5 million (approx. $2.4 million at current exchange rates) to implement their system. The US Fire Service took also about three years to fully implement their system and the capital cost was in the range of $4-5 million.

Needless to say, substantial cost savings could be obtained if an existing provincial system were used as the template. However, it should be noted that the hardware and software costs for the system are a relatively small proportion of the overall cost of implementation. Most of the cost is on the "human" side and this involves coming to agreements on what should and should not be included in the system along with agreements on definitions. It appears to be the case that in multi jurisdictional models, it is coming to agreements on content that take up the most time and, consequently, the largest part of the cost of implementation. After that, there are initial costs relating to training and ongoing costs of maintaining some form of supporting help line. While a relatively small proportion of the calls for service are generated by remote and volunteer departments, they are the units that generally have the greatest need for support. Larger departments tend to have one or more individuals who take the responsibility for data entry and acquire a reasonable facility with whatever system is in place.

Another start-up cost component results from the fact that multi jurisdictional models invariably include hybrid data collection systems. None that we could identify used a single collection vehicle. Rather, a national system was implemented that some departments chose to use. Many other departments had systems from different vendors or home-grown systems that had to be patched into the national database. As might be expected, the US was the extreme case where patches or interfaces had to be provided for about 100 different vendor systems. In most cases, individual vendors provided that capability.

Governance

Essentially, there are two key questions relating to the governance or management of a national system. The first question is who or what entity will be responsible for doing the work. The second question is to whom will that entity be responsible? It is worthwhile examining each of these issues separately.

Responsible Agency

As with the overall governance question, there are probably two basic options here. The first option is for an existing entity to take on the responsibility of maintaining the system. In both the US and the UK, an existing national agency assumed this responsibility. In the US, it was the US Fire Administration which is an arm of FEMA. In the UK, the task fell to a unit within the Department for Communities and Local Government.

We have had extensive discussions with Statistics Canada about the possibility of housing and maintaining a national database. Given their experience with collecting national police, court and other criminal justice data, it is most likely that the Canadian Centre for Criminal Justice Statistics could manage this project. These discussions involved outlining the form and content of data currently collected at the provincial level, and what would be required to aggregate such data into a single unit. This has required our estimating the amount of data currently collected (both in terms of numbers of cases and variables identified); the potential complexities involved in merging the data; and, estimates of how the database might be expanded in the future. Statistics Canada has indicated that it would be interested in maintaining the database in principle. They have done a costing analysis based on the expected resource needs we have suggested that it would be possible to generate a coherent data set based on the CCFMC Code Structure for about $217,000. A note from Statistics Canada is attached as Appendix A.

Our discussions with Statistics Canada have also identified some ancillary issues that would need to be addressed. For example, all data collected by Statistics Canada would be subject to the rules imposed on Statistics Canada by the *Statistics Act*. The *Statistics Act* indicates how data privacy is to be maintained and under what conditions Statistics Canada can publically release data entrusted to it. The issues do not pose insurmountable challenges but they will need to be considered and addressed. It is also evident that Statistics Canada would be the source of ancillary data that could be linked to the NFID. Some of this, such as much GIS and some local census data are available publically (or easily accessible through the Data Liberation Initiative) and would pose no acquisition challenges. Other linkages, such as with Health Canada=s cancer and other health data bases would prove to be exceedingly challenging due to privacy issues.

Other options include another federal department such as HRSDC or the National Research Council (both of which collected some data in the recent past) or an existing unit within one of the provinces. Obviously, both data management and substantive expertise exists within the units

associated with the provincial fire marshals'/commissioners' offices. Similar expertise exists within some federal units.

Another option would be to create a new agency specifically for the task. An example of this approach is the Canadian Interagency Forest Fire Centre Inc. (CIFFC). The CIFFC was established in 1982 to provide operational forest fire management services across the country. The agency's mandate is to gather, analyse and disseminate fire management information to improve forest fire management in Canada. CIFFC is structured as a private, nonprofit corporation with two levels of management.

Responsibility

Regardless of whichever agency is selected to do the actual data collection and management, a management or governance structure will be required to ensure the agency does what it is expected to do. The members of that structure will be responsible for representing those who support the project, and ensure that the appropriate strategic and operational goals are developed and maintained.

There are several models that could be implemented but it is probably worthwhile to consider how the Canadian Interagency Forest Fire Centre is governed. Undoubtedly, some element of this model could be employed regardless of who is actually responsible for day-to-day operations.

The first level of management is a board of trustees consisting of Assistant Deputy-Ministers responsible for forestry matters within the provinces, territories and federal government. The Board of Trustees sets policy and approves the annual budget for the Fire Centre

The second level of management is a council of directors comprising the individuals responsible for forest fire management within the provinces and territories along with a representative from the federal government. This group provides operational control, prepares the budget and suggests policies relating to the Fire Centre.

The CIFFC staff operate and implement programs approved by the Council of Directors and the Board of Trustees. In addition, they oversee working groups to address specific issues or tasks.

Modifications to this basic model could be made to include other stakeholders. For example, in the UK there is a "user's group" which is consulted on a regular basis. This group consists of academics, agency representatives and other researchers who use the data. The US Fire Administration also consults outsiders on a regular basis.

In all of the situations we examined, it was clear that there were essentially two functional components relating to fire data systems. The first component consists of the unit responsible for collecting, aggregating and maintaining the data. Occasionally, this unit generated a series of stock reports, usually annually, and an occasional one-off or special request for analysis. The second component generally consists of a group or groups who are users of the data. These range from academics interested in pure and applied research to policy analysts in government agencies who need to generate program and policy suggestions or evaluate existing practices.

There are already numerous individuals and groups who use the existing fire data. These range from individual academics to such groups as the National Research Council. If a national database system were to be implemented, it might be worthwhile considering the establishment of a separate analytical unit. This could be located within something like a university structure, where it could establish and provide a consistent level of expertise in the use of the data, provide responses to both academic and applied issues, and would be relatively cost-effective. Such a unit would presumably become efficient in linking and leveraging other data sets to provide for a greater return on investment. This capacity would most likely complement the existing individuals responsible for analysis among the existing stakeholder community such as the provincial fire marshals'/commissioners' offices.

Summary

Most people we spoke with for this report suggested that the establishment of a national fire information database seemed like "a good thing to do," and then proceeded with a significant *but* or *however*. The reservations express by those buts and howevers appeared to be grounded in a firm knowledge of the wide variations that exist across the existing provincial systems, and the challenges that would face the establishment of a worthwhile and functional national database. There was also an understanding of the fact that while the creation of an NFID system might be interesting, it can only be justified if the system provided a positive and worthwhile return on investment. While not universally held, there is a belief in some area that the systems currently in place satisfy core needs and that a national system would not provide much value-added.

Regardless, a national system is feasible if certain issues are addressed. The key driver is obviously a willingness on the part of industry stakeholders to pursue such a project. We have seen the introduction of national systems in both the United Kingdom and the United States. Both countries face similar and, in some areas, greater challenges to those that we would need to deal with in Canada.

All record keeping systems have certain common challenges associated with them. Those common challenges, such as broad coverage and the collection of reliable and timely data, would

exist with an NFID. However, there are certain issues that are unique to this enterprise. Among the key issues are:

- The current lack of a central or national agency with the legislated or delegated authority to manage a national system.

- The lack of an obvious funding mechanism.

- Substantial variations in the information and data collection mechanisms currently in place across the country.

Lack of Central Agency

As we have noted, there is no legislated agency in Canada responsible for responding to and collecting information on incendiary incidents or the other activities in which fire departments engage. Consequently, any central mechanism for collecting and maintaining an NFID would require "delegated authority" either from the provincial and territorial jurisdictions, or from local departments and their host municipalities. In other words, participation in such a system would be voluntary. This is certainly not a unique model – the NFIRS system in the US works on this basis.

Once the principle of a national agency is accepted, the next issue is who or what should be that agency? Essentially, we see three possible options here. First, one province or jurisdiction (such as a larger municipality) could serve this role. In many ways, this would be the least expensive option in that the physical and human infrastructure to do this is more or less already in place. Expanding the system would only require marginal as opposed to fixed or sunk costs.

Second, an existing external agency could serve the role. We have approached Statistics Canada about this possibility and they have been receptive given the right funding arrangement. Undoubtedly, there are other agencies that have Statistics Canada's expertise in data collection and management that would be willing to serve in this capacity. An advantage to this approach is that the agency would not be directly associated with one of the jurisdictions responsible for dealing with fire issues, and might be perceived as a more politically acceptable choice than using an existing provincial or local facility.

A third option would be to create a new agency specifically for this purpose. We already identified the Canadian Interagency Forest Fire Centre Inc. which serves this purpose in the realm of forest fires as an example. Options here include the creation of an incorporated non profit entity such as the CIFFC or the establishment of a dedicated research centre within a post secondary institution.

Regardless of the choice of model, a governance structure would have to be set up to define the mandate and operational responsibilities of the agency's role regarding the NFID. Since participation within a national collection agency would be voluntary, stakeholder participation in the entity's governance would be important in maintaining high levels of support.

Funding Mechanism

The issue of funding has been discussed previously. At this point, it is unclear if any significant federal support might be forthcoming, although there are existing federal agencies that would benefit from the creation of an NFID. If the decision is made to go forward in principal, several federal agencies could be approached with a business case.

Initial support for the system would most likely come from either provincial and territorial agencies or local departments. As with the Canadian Interagency Forest Fire Centre, the participants would impose a "tax" on themselves to support the activity. Given the number of jurisdictions involved, this tax or membership fee would likely not be onerous. Once the system is in place, it might also be possible to obtain support from entities that would benefit from access to the data. Here, the insurance and building industries come readily to mind, but there are undoubtedly other sectors that might participate.

Agreement on Content

Most of this report has focussed on the variability and amount of information collected across the country. If the decision to move forward is accepted, a process would be needed to generate a consensus over the data to be collected. We have noted that the information outlined in the CCFMFC *Code Structure* document seems to provide a minimum commitment at this point. As is, it is likely those data could be linked with other datasets to form the start of a national system.

In discussions with our colleagues in the UK and the US, coming to an agreement over definitions and content was perhaps the greatest challenge they faced. Both indicated that this process took 2-3 years of discussion to work out and that it remains an ongoing issue.

Recommendations

Based on the research behind this report, stakeholder reviews on earlier drafts, and commentaries from two focus groups held in May, 2012, we propose a series of recommendations.

First, we would recommend that while the ultimate goal of a National Fire Information Database would be to include the broad range of activities to which fire services respond, the initial project should be more limited. That is, we recommend that an initial database be constructed that

contains the core elements outlined by the CCFMFC *Code Structure* document. The reconstruction of this material could provide a relatively immediate deliverable that would be consistent with what the CCFMFC and HRDSC supported until recently. At the same time, efforts could be made to negotiate a framework for a more inclusive database.

The experience of other jurisdictions suggests that it takes about three years for agreements to be reached on issues of ultimate content and definition. It is also the case in Canada that some jurisdictions have recently invested substantially in new infrastructure. Asking those jurisdictions to abandon those implementations is simply not reasonable. However, those systems will require a refresh in the future. Consequently, it would not be unreasonable to create a national system toward which all jurisdictions could migrate. It may be that the initial implementation would encompass only a few provinces and territories. With time, however, other jurisdictions could migrate as their infrastructure needs replacing.

The disadvantages of this approach are fairly evident: it would take a few years before a coherent national system would be implemented. On the other hand, a gradual migration would allow for the system to start small and mature with time. This would also provide time to work out the "bugs" which inevitably arise in such systems. Furthermore, a gradual evolution would provide time to implement an effective management structure and to establish a long-term funding model.

Second, we recommend that the initiative for the project be led by the Canadian Association of Fire Chiefs. This type of "bottom-up" approach was used very successfully by the Canadian Association of Chiefs of Police in the lead up to the Uniform Crime Reporting (UCR) system. Active involvement by the Fire Chiefs will send a strong signal to all stakeholders that those ultimately responsible for collecting the raw data have a strong commitment to the success of the project. A coherent and concerted effort by the CAFC will also signal the merits of national collaboration to other jurisdictional stakeholders.

Third, we would recommend that, all else being equal, the agency best suited to construct and maintain the system is Statistics Canada. While not strictly parallel, the system we envision is very similar in its demands of the Uniform Crime Reporting system which is managed and maintained by Statistics Canada. Because of its experience with the UCR, Statistics Canada has the information technology and systems structures necessary to both collate and process these kinds of data. They work closely with multiple stakeholders and multiple jurisdictions to ensure that the data are reliable and reported in a timely fashion. They also have a broad range of existing skilled and experienced personnel on whom they can draw. Finally, the organization has the capacity to function in a bilingual environment.

Should it not be possible to come to an arrangement with Statistics Canada, we would recommend that a stand-alone nongovernmental agency be created similar to the Canadian Interagency Forest Fire Centre, Inc (CIFFC). This would be a more complex undertaking but the success of the CIFFC speaks to the feasibility of this approach.

Fourth, while we recommend that the CAFC take the lead in initiating the system, any governance structure must contain a range of stakeholders. At a minimum, the governance structure would require representatives from the CAFC and the CCFMFC. Ideally, representatives from other government agencies (such as the National Research Council), academia, and the private sector (possibly the insurance and building/construction industries) should be represented. Not only would this solidify a broad base of support for the project, it would also help to ensure that the database is structured to benefit best those most likely to use and benefit from the data. The lack of a coordinated response among user groups was probably one of the major contributing factors as to why the annual reports stopped being produced. By having the major users more directly involved in the oversight of the process, it is likely that arguments for the value of the activity will be more concerted.

Fifth, we recommend that consideration be given to an appropriate funding model. Since fire incidents and other the other issues to which fire services respond are not strictly within the jurisdiction of the federal government, it is unlikely that a single funding source will be found in the short term. Most likely, the primary funding sources will be the provinces and territories, with a possible contribution by the federal government through the Fire Commissioner's office or some other agency. Whether assessments should be based on a flat or a proportionate fee (as is the case with the CIFFC), is open to negotiation. Regardless, an average commitment of about $20,000-$25,000 across a dozen jurisdictions would be sufficient to create a basic national database similar to the one supported by the CCFMFC in the past. It is likely that a "full blown" database encompassing the range of calls for service to which fire departments currently respond, plus the capability to link with complementary socio-economic, health and other relevant databases, would require a commitment of about $100,000 per year, per jurisdiction. Put in perspective, this is less than the cost of a single, well-equipped fire truck per year, per jurisdiction.

Should Statistics Canada be ultimately be the agency responsible for maintaining the database, it might ultimately be possible to change their mandate through an amendment to the *Statistics Act*. At best, however, this change would likely be several years in the future.

It would also be reasonable to approach the private sector for support. While various industry stakeholders might not be willing or able to commit to long-term, base funding, their support could be used to generate a range of scientific studies and one-time reports. Similarly, it would be worthwhile to investigate the possibility of one or more national fire research centres being

created in affiliation with the university and college sector. Support for this might be drawn from existing funding agencies such as the Canada Research Chair program, the Tri-Councils (SSHRC, NSERC and CIHR), and other granting councils.

It may be difficult to argue for the value of creating and maintaining a national fire database based on the needs of a single constituency. However, the value of a national database becomes more apparent when the range of actual and potential users is identified. By bringing together the broader base of users, it will be less likely that support for the activity will fade.

Appendix A – Briefing Notes

Preliminary cost estimate for the recoding and analysis of a National Fire incident data base

1.   What is the Canadian situation on the topic?

Currently, there is no comprehensive or reliable data on fire incidences in Canada.   Available data on fire incidents are incomplete, inconsistent and or lack comparability between jurisdictions.   The Canadian Centre for Justice Statistics (*CCJS*) was asked to prepare a preliminary estimate to develop and maintain a national Incidence Fire Database that would involve the re-coding of an existing data file, the release of a descriptive report, and a 5 year plan for moving forward which would outline the necessary annual resources to maintain a national fire database.

2.   Governance Structure – partner roles and responsibilities

In order for the development and maintenance of a National Incidence Fire data base the project would be jointly managed by CCJS and a *National Fire Marshals Steering Committee* with provincial, federal, & territorial representatives from the Canadian Fire Marshals and Fire Commissioner's Office.   The role of the steering committee will be to provide an agreed upon common set of definitions and terminology which will guide the processing of the data file and the subsequent analytical report (determine which variables are most important and what level of detail is required).

In addition through this pilot project a preliminary reporting manual will be created that would amalgamate common definitions, coding options and scoring procedures which could be distributed and   adapted by fire stations across the country once approved by the Steering Committee.   Once again the Steering Committee would be instrumental in ensuring that these terms are adapted and implemented within their jurisdictions.

The steering committee will also be responsible for compiling and electronically transmitting their jurisdictional data to CCJS by a prescribed date (or have assigned a representative from their jurisdiction to complete this task).   They will also be responsible for signing off on their respective data sets.   Due to the fact that each jurisdiction has adapted their reporting systems to meet local needs, it is understood that there will be differences between the data sets.   However, each jurisdiction should have sufficient documentation to allow the analysis of their data files. Data files should also be housed in systems that can be converted into a single format to permit national aggregation of data.   The jurisdictional representative of the steering committee will ensure that these criteria are met.

Moving forward, the CCJS and the Steering Committee will jointly co-ordinate data quality workshops to ensure the development and on-going maintenance of the database (Beyond the pilot stage).

3.   File Structure and recoding of date file

While there are some core variables that most jurisdictions capture (i.e. property details, fire protection features, cause of the fire, fire loss and casualties) how they are captured and the granularity of the variables is varied among the jurisdictions. Estimates of the number of variables contained on data files range from 60- 80 variables with 3 to 5 levels of granularity. Due to the size of the data file and lack of standardization (across jurisdictions) the time allotted to re-code and clean the aggregated data file has been estimated at 6 month. This recoding process will include developing decisions rules, cleaning the file and recoding. Determining which variables are recoded will be based on a list of agreed upon core variables (and their respective levels of granularity) from the Steering Committee. User documentation will be developed as a result of this exercise as well as best practices. Without having seen the data file it is impossible to predict the number of variables that would be releasable.

4.   Statistical Profile of fire incidents – National level analysis

CCJS will disseminate an analytical report released under a bulletin like "Juristat" which will provide a descriptive analysis of those agreed upon core variables which are of a high quality and have been verified through the jurisdictional representatives and re-coded in the allotted 6 month time frame. This product will be a pilot analysis only (At this point in time without seeing the data file we cannot commit to any trend analysis, nor can we commit to provincial analysis).
The report will provide a profile of the overall national fire problem. Detailed analyses of the residential and non-residential fire problem, firefighter casualties, civilian casualties, causes of the fire will also be included.

Additional topic-specific analyses could be addressed as separate, stand-alone publications if data were of good quality and additional financial resources were supplied to fund this work.

5.   Next Steps Report
This report will outline the necessary processes to be in place to support annual/biannual collection. In this report associated costs and working groups will be detailed that will be required to support data collection over the next 5 years:

   A. Costs for on-going maintenance of the data base, and plan of how much work can be done on the database moving forward
   B. Creation of data quality working group to help with standardization of reporting practices and ensure consistency in definitions across jurisdictions

C. Additional documentation – for coding purposes, training and best practices
D. Reporting processes, verification from the regions, timelines for sending files and for verification
E. Exploration of data sharing agreements
F. Cost estimates to move forward (two cost estimates, annual collection and annual release, annual collection bi-annual release)

Potential Time Line

Month 1	Data file sent to CCJS, with required documentation, contact from jurisdiction
Month 1-6	Cleaning of data file
Month 2-6	Steering Committee meets to review and approve common definitions, and scoring options. Steering Committee must approve core definitions
Month 6- 10	Preliminary Analysis of the data file
Month 11	review of Draft reports
Month 12	Costing and planning document for moving forward
Month 14	Release of Analytical report through Statistics Canada and distribution of the "Next Steps" (4-5 year plan) report to Steering Committee

Please note that these are baseline estimates and may need to be adjusted, accordingly, upon initial receipt and review of the initial database.

Total Cost: **$216,700.00**

Incident Variable	Details	CCS	B.C.	ALB	Sask	Man	Ont	QB	N.S.	N.B.	PEI	NFLD	NWT	Yukon	Nunavut
1A. Incident Information															
Year	Year (XXXX)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Month	Month (1-12)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Date	Date of Month (1-31)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Day of Week	Day (1-7)	Yes		Yes		Yes							Yes	Yes	
Time	Time of 24 hour Clock	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes			Yes	Yes	
Incident Situation	etc.	Yes	Yes	Yes		Yes		Yes		Yes			Yes	Yes	
Incident Location	Province, County, City, Street	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Response Time	In Minutes	Yes		Yes	Yes	Yes	Yes	Yes	Yes				Yes	Yes	
Mutual Aid	Departments	Yes		Yes	Yes	Yes							Yes	Yes	
Crew Size (Initial)	Initial Crew Size	Yes			Yes		Yes	Yes					Yes	Yes	
Response Time of Subsequent Vehicles	In Minutes	Yes			Yes			Yes					Yes	Yes	
Subsequent Crew Size	Total Number of all Attending	Yes			Yes			Yes					Yes	Yes	
# of Engines		Yes			Yes								Yes	Yes	
# of Aerials		Yes			Yes								Yes	Yes	
# of Tankers		Yes			Yes								Yes	Yes	
# of CFR Vehicles		Yes			Yes								Yes	Yes	
# of Other Vehicles		Yes			Yes								Yes	Yes	
Distance from Dept. To Emergency	In Kms.	Yes		Yes	Yes								Yes	Yes	
Status on Arrival	etc.	Yes			Yes			Yes					Yes	Yes	
# of Persons Rescued		Yes			Yes		Yes	Yes					Yes	Yes	
# of Casualties		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes			Yes	Yes	
Type of Weather	Clear, Rain, Snow, etc	Yes			Yes								Yes	Yes	
Temperature in Celsius		Yes		Yes	Yes								Yes	Yes	
Wind Direction		Yes			Yes								Yes	Yes	
Wind Speed	In Kms.	Yes			Yes								Yes	Yes	

Incident Variable	Details	CCS	B.C.	ALB	Sask	Man	Ont	QB	N.S.	N.B.	PEI	NFLD	NWT	Yukon	Nunavut
2. Property Description															
Major Occupancy	Assembly, etc.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Property Classification	Specific Property Classification - Single Family Dwelling, Bowling	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Property Ownership	Owned, etc.	Yes		Yes	Yes		Yes			Yes			Yes	Yes	
3. Property Details															
General Construction	Wood Frame, Concrete, Steel, etc.	Yes	Yes	Yes	Yes	Yes							Yes	Yes	
Method of Construction	etc	Yes		Yes	Yes			Yes					Yes	Yes	
Year of Construction		Yes	Yes	Yes	Yes	Yes		Yes					Yes	Yes	
Building Height	Storeys	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Ground Floor Area	In Meters Squared	Yes	Yes	Yes	Yes	Yes		Yes					Yes	Yes	
Number of Occupants		Yes		Yes	Yes	Yes							Yes	Yes	
Value at Risk	Building Value, Content Value	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes			Yes	Yes	
4. Fire Protection Features															
Manual Fire Protection Facilities	Extinguishers, Standpipe, etc.	Yes	Yes	Yes	Yes	Yes							Yes	Yes	
Sprinkler Protection		Yes	Yes	Yes	Yes	Yes		Yes		Yes			Yes	Yes	
Fixed System Other Than Sprinklers		Yes		Yes	Yes			Yes					Yes	Yes	
Automatic Fire Detection System	(Central Alarm, etc)	Yes	Yes	Yes		Yes	Yes	Yes					Yes	Yes	
Fire Detection Devices	Smoke Detector, Heat Detector, etc	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Outside Fire Protection	Water Mains, Hydrants, etc.	Yes	Yes	Yes	Yes	Yes	Yes						Yes	Yes	
Fire Service in Area	Industrial Fire, Etc.	Yes	Yes	Yes		Yes							Yes	Yes	

Incident Variable	Details	CCS	B.C.	ALB	Sask	Man	Ont	QB	N.S.	N.B.	PEI	NFLD	NWT	Yukon	Nunavut
5. Circumstances of Fire Outbreak															
Igniting Object	equipment, etc	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Fuel or Energy Associated with Igniting Object	Wood, Oil, Electricty, etc	Yes	Yes	Yes	Yes	Yes		Yes	Yes				Yes	Yes	
Energy Causing Ignition (Form of Heat)	Spark, Direct Flame, Friction, etc	Yes	Yes	Yes	Yes	Yes	Yes	Yes					Yes	Yes	
Material First Ignited	Wall, Furniture, Clothing, etc	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Act or Omission	Malfunction, Deficiency, etc.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
6. Factors Relating to Origin and Spread of Fire															
Area of Origin	Bedroom, Cooking Area, etc	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Level of Origin	Storeys)	Yes	Yes	Yes	Yes	Yes	Yes						Yes	Yes	
Flame Spread - Interior Finish	On Ceiling, On Walls, On Floor, etc.	Yes		Yes		Yes							Yes	Yes	
Flame Spread - Vertical Openings	Shaft, etc	Yes		Yes		Yes							Yes	Yes	
Flame Spread - Horizontal Openings	Through Windows, etc.	Yes		Yes		Yes							Yes	Yes	
Smoke Spread Avenues	etc.	Yes		Yes		Yes							Yes	Yes	
7. Fire Loss Details															
Extent of Fire		Yes	Yes	Yes		Yes		Yes	Yes				Yes	Yes	
Extent of Damage		Yes	Yes	Yes		Yes		Yes	Yes				Yes	Yes	
Dollar Loss	Building Value, Content Value	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	

Incident Variable	Details	CCS	B.C.	ALB	Sask	Man	Ont	QB	N.S.	N.B.	PEI	NFLD	NWT	Yukon	Nunavut
8. Discovery of Fire and Action Taken															
Initial Detection	etc.	Yes	Yes	Yes	Yes	Yes							Yes	Yes	
Transmission of Alarm to Fire Department	Private Alarm System, 911, etc.	Yes	Yes	Yes		Yes	Yes						Yes	Yes	
Action Taken	Extinguished by Occupant, Burned Out, Extinguished by F.D., etc.	Yes		Yes		Yes							Yes	Yes	
Performance of Automatic Extinguishing Equip	Operate, etc.	Yes		Yes		Yes		Yes					Yes	Yes	
Method of Fire Control and Extinguishment	Garden Hose, etc	Yes	Yes	Yes		Yes							Yes	Yes	
Performance of Smoke Alarm Device	Worked, Battery Dead, etc.	Yes		Yes	Yes		Yes	Yes	Yes				Yes	Yes	
Impact of Smoke Alarm Activation on Occupan	Occupants Evacuated, Did Not Evacuate (Alarm Inaudible, Age	Yes		Yes									Yes	Yes	
Occupants in Dwelling Unit at Time of Fire		Yes	Yes	Yes	Yes	Yes							Yes	Yes	
9. Fire Casualties															
Age of Victim		Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Sex of Victim		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Status of Victim	Firefighter, Civilian	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Nature of Casualty	Death, Injury	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	
Probably/Possible Cause	Smoke Inhalation, Burns, etc.	Yes	Yes	Yes	Yes		Yes			Yes			Yes	Yes	
Class of Victim	Adult, Senior)	Yes		Yes									Yes	Yes	
Condition of Casualty	Asleep at Time, Too Young to React, Physically Disabled, etc.	Yes	Yes	Yes	Yes	Yes	Yes			Yes			Yes	Yes	
Action of Casualty		Yes	Yes	Yes	Yes	Yes	Yes			Yes			Yes	Yes	
Cause of Failure to Escape	Explosion, etc.	Yes	Yes	Yes	Yes	Yes							Yes	Yes	
Ignition of Clothing or Other Fabrics		Yes	Yes	Yes	Yes	Yes	Yes			Yes			Yes	Yes	
Type of Fabric or Material Ignited		Yes	Yes	Yes	Yes	Yes	Yes						Yes	Yes	