

# Fire Research Report

## **A Framework for Social Research funded through the New Zealand Fire Service Research Fund**

**The Centre for Research, Evaluation  
and Social Assessment (CRESA)**

**September 2003**

This report reviewed the research that had previously been conducted through the Contestable Research Fund to determine if there were research areas or questions that may have been overlooked in its first five years of operation.

A social research strategy, covering investigation, monitoring and evaluation, has been outlined. It is suggested that this strategy is needed by the Service to provide the basis for developing a coherent body of social research that is clearly linked to its operational responsibilities. The strategy also provides a basis for possible future setting of research priorities, focusing on both immediate priorities and longer term issues. The strategy is the outcome of a meta-analysis of the research carried out to date in the social field and outlines the most fruitful areas for further research.

The strategy is solely concerned with social phenomena using social research methodologies. Research on the physical or environmental impacts of fire and related human activity is not included.

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**A FRAMEWORK FOR SOCIAL  
RESEARCH FUNDED THROUGH  
THE NEW ZEALAND FIRE SERVICE  
RESEARCH FUND**

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**September 2003**

# **1. BACKGROUND**

## **1.1 Rationale for a Social Research Strategy**

The New Zealand Fire Service (the Service) has reached a new stage in its research planning. The allocation of research funding through the Contestable Research Fund, which has been running for five years, has been guided by some general target areas for research work set out by the Fire Service Commission on an annual basis. The Service has taken this approach to research funding in preference to commissioning of specific projects to take advantage of external research expertise. Currently, the Service is evaluating its research allocation process and research outputs to see whether there are research areas and questions that may have been overlooked.

A social research strategy, covering investigation, monitoring and evaluation, is needed by the Service to provide the basis for developing a coherent body of social research that is clearly linked to its operational responsibilities. The strategy also provides a basis for possible future setting of research priorities, focusing on both immediate priorities and longer term issues. The strategy is the outcome of a meta-analysis of the research carried out to date in the social field and outlines the most fruitful areas for further research. It should be noted that the strategy is solely concerned with investigation, monitoring and evaluation of social phenomena using social research methodologies. Research on the physical or environmental impacts of fire and related human activity is not included.

The breadth of research completed to date through the Contestable Research Fund reflects the diversity of the fire safety field. It relates to the built environment, the social and cultural context (including economic dimensions), the natural environment (including events such as earthquakes) and the physical characteristics of fire and its progress.

This social research strategy:

- defines social research in general and the distinction between investigations, monitoring and evaluation;
- sets out the broad areas of social research direction for the Service for the next 3 – 5 years;
- identifies the key research areas, which are tied to the Statement of Intent;
- sets out some research selection criteria;
- outlines a process for review of the Strategy.

## **1.2 Defining Social Research**

Social research, which incorporates a variety of perspectives, methods of gathering information and ways of analysing data, helps us gain knowledge about the social world. The most useful social research for the Service is applied in nature, providing the evidence base for its management and operational activities. Thus, the overall direction of the strategy and particular research projects need to be oriented to practical problem solving and increasing understanding of the human aspects of the Service's work.

Social research includes investigations, monitoring and evaluation. Although they may involve similar research methods, these three types of research are distinguished for their different purposes and relevance to management and operational needs.

**Investigations** are conducted to improve knowledge through describing a problem or phenomenon and its causes and effects. Investigations assist in developing or refining a policy, programme or management process.

**Monitoring** is used to establish baseline data and track changes over time.

**Evaluation** is undertaken to determine the merit or value of a policy, programme (intervention) or management process. Its operational relevance is to feed into decisions concerning:

- effectiveness of a policy, programme or management process; and
- whether the policy, programme or management process should be continued.

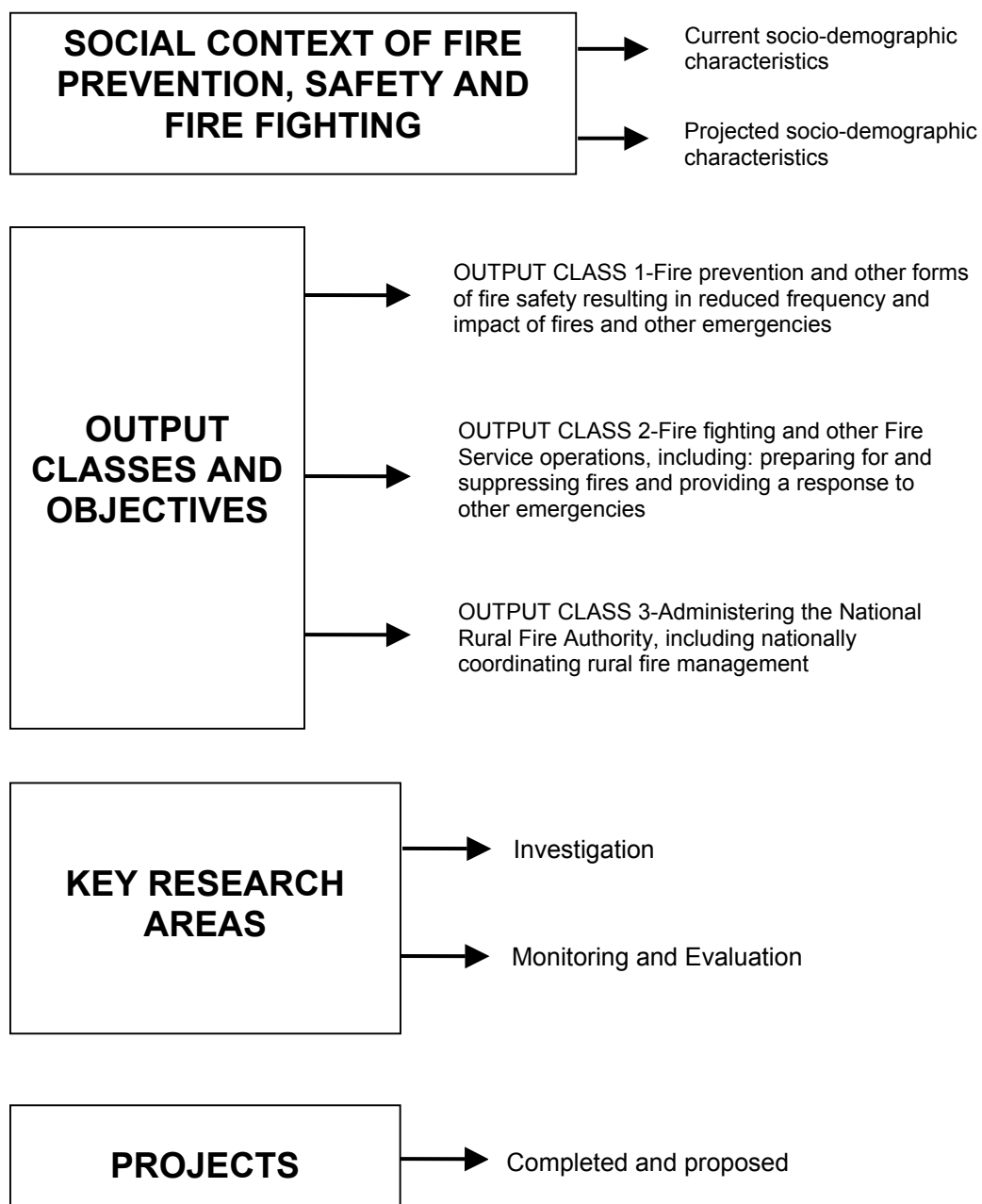
All three types of research are important for the Service to undertake, and are reflected in the strategy.

## 2. THE STRATEGY FRAMEWORK

### 2.1 The Framework

Figure 1, below, provides a framework for considering the research content of the strategy, which is set out in Table 2. The strategy provides an overview of social research within a framework defined by the social context of fire prevention, fire safety and fire fighting and the Output Classes set out in the Service's Statement of Intent. The key research areas, which broadly align with the Output Classes, include investigation, monitoring and evaluation elements. Specific research projects relating to the key research areas need to be further defined as part of the Service's research commissioning and contracting processes.

**Figure 1: The Strategy Framework**



## 2.2 Social Context

The Service's social research effort should include the routine collection and dissemination of relevant socio-demographic data to provide information on population trends at regional and local levels for broader planning and management purposes. This data can be obtained from Statistics New Zealand. A number of regional councils, Territorial Authorities (TAs) and other government agencies (e.g., Work and Income) also develop regional and territorial profiles that could be useful to the Service.

Data collected should include:

- population data nationally, and by TA;
- age, sex and ethnic population profiles nationally, and by TA; and
- population projections.

It may also be useful to include data on incomes, education, household composition and age of children.

## 2.3 Output Classes, Objectives and Key Research Areas

The Key Research Areas, listed under the Output Classes and Objectives, are outlined in more detail in Table 2:

### **i. Output Class 1**

Fire prevention and other forms of fire safety resulting in reduced frequency and impact of fires and other emergencies, including:

- educating the public,
- providing technical advice on building fire safety and undertaking research to improve the knowledge about fire.

**Objective:** reduce the incidence and consequence of fires by educating the public on fire safe behaviour and improving the fire safety characteristics of buildings.

**Key research areas:**

- Public perceptions of and knowledge about fire prevention, fire safety
- Determinants of fire risk
- At-risk or vulnerable groups
- Encouraging safe behaviour
- Encouraging safer built environments
- Community infrastructure

### **ii. Output Class 2**

Fire fighting and other Fire Service operations, including preparing for and suppressing fires and providing a response to other emergencies.

**Objective:** To ensure the consequences from fires for people, property, communities and the environment are minimised (including providing professional response to other emergencies)

**Key research areas:**

- Institutional arrangements and capacity
- Distribution and impacts of fires

### **iii. Output Class 3**

Administering the National Rural Fire Authority, including:  
nationally coordinating rural fire management.

**Objective:** To reduce the number and consequence of wildfires by providing leadership and co-ordination of the rural fire industry.

**Key research areas:**

- Building capacity in the rural sector

These Key Research Areas are directly linked to the Statement of Intent, as set out in Table 1 below. Each Key Research Area contains a number of issues. Under the issues sit specific investigation, monitoring and evaluation areas.

**Table 1: Key Research Areas**

<b>Key Research Area</b>	<b>Issues</b>
Public perceptions of and knowledge about fire prevention, fire safety	<ul style="list-style-type: none"><li>• How to target public awareness and education programmes to the needs of different groups</li><li>• Trends in the perceptions, knowledge of<ul style="list-style-type: none"><li>○ the general public</li><li>○ households</li><li>○ residents in supported accommodation</li></ul></li><li>• Information transfer between NZFS personnel and the public</li></ul>
Determinants of fire risk	<ul style="list-style-type: none"><li>• Fire risk and socio-economic circumstances</li><li>• Contribution of household energy use and design</li><li>• Effect of current housing programmes on fire safety</li><li>• Risk-behaviour and intentional and unintentional fire incidents</li><li>• Industry specific fire risk</li><li>• School specific fire risk</li><li>• Fire and car accidents</li></ul>
At-risk or vulnerable groups	<ul style="list-style-type: none"><li>• Maori at risk</li><li>• Children at risk</li><li>• Older groups at risk</li><li>• Lower socio-economic groups at risk</li><li>• Rural residents at risk</li></ul>
Encouraging safe behaviour	<ul style="list-style-type: none"><li>• Using best practice to change people's behaviour</li></ul>
Encouraging safer built environments	<ul style="list-style-type: none"><li>• The value of smoke detectors and other fire safety mechanisms</li><li>• Energy use and design</li><li>• Fire-safe house, road and amenities design</li></ul>
Community infrastructure	<ul style="list-style-type: none"><li>• Isolation</li><li>• Rural capacity</li></ul>
Institutional arrangements and capacity	<ul style="list-style-type: none"><li>• Recruitment, retention and training of fire fighters</li><li>• NZFS collaboration with others</li><li>• Call out accuracy and response</li></ul>
Distribution and impacts of fires	<ul style="list-style-type: none"><li>• Matching and comparing NZFS, health and other related data</li><li>• Fire d distribution by deprivation, rurality and other variables</li><li>• Social, cultural, economic and environmental impacts of fires and their management.</li></ul>
Building capacity in the rural sector	<ul style="list-style-type: none"><li>• Recruitment, retention and training of voluntary fire fighters</li></ul>

## **2.4 Criteria for Identifying Research Projects**

The strategy tables include existing and new research projects under each Key Research Area. Specific research projects would be developed by the Service's team year by year, under the Key Research Areas. It is recommended that the set of projects is chosen to provide a well balanced programme of research that reflects the following selection criteria:

- ability to address issues of immediate importance and relevance;
- contribution to identification of emerging problems and future issues;
- clearly targeted to management needs;
- enabling development and analysis of trend data;
- 'adding value' to and building on information already obtained; and
- development of tools and methods to assist staff and others to undertake monitoring and analyse results.

## **3. PROCESS FOR REVIEW OF THE STRATEGY**

The Strategy should be reviewed every three years to align with Output Classes and Objectives in the Statement of Intent. The review should include consideration of:

- successes and shortcomings of the overall research strategy;
- modification of priorities;
- process of project selection; and
- transfer and application of research results.



**Table 2: New Zealand Fire Service – Social Research Programme**

Issues	Completed Research	New Investigations	New Monitoring and Evaluation	Rationale for Research
<b>Primarily relating to Output Class 1: Fire Prevention and Other Forms of Fire Safety Resulting in Reduced Frequency and Impact of Fires and Other Emergencies</b>				
Public perceptions of and knowledge about fire prevention, fire safety	<b>A Strategy for Developing Greater Community Responsibility For Fire Safety and Prevention:</b> Profile of the views of the general public on fire safety, what constitutes safe and unsafe behaviour, and where people think responsibility for fire safety lies. The research also identified key barriers to people acting to reduce risk and recommendations around NZFS communications. Issues covered include: <ul style="list-style-type: none"> <li>▪ smoke alarm usage</li> <li>▪ other fire safety equipment</li> <li>▪ escape plans</li> <li>▪ fire safety behaviour</li> <li>▪ attitudes to fire safety and risk</li> <li>▪ responsibility for fire safety</li> <li>▪ fire safety communication.</li> </ul> (NZFS Report 3).	Identify householders attitudes to fire risk, fire safe and unsafe behaviours, fire safety plans and mechanisms such as smoke alarms, escape plans (usefulness, responsibility, problems, etc) according to household characteristics such as composition, household income, number and age of children, crowding, etc.	Monitor changing perceptions and knowledge by individual and household variables.	<p>Research will inform NZFS public awareness and education strategies, including targeting of programmes.</p> <p>Research will also contribute to NZFS and others' fire interventions and follow up activities (e.g., distribution and maintenance of smoke alarms).</p>
		Research that identifies perceptions of and knowledge about residents in supported accommodation not covered by Rest Homes Act (e.g., mental health and IHC consumers) about fire safety, what constitutes safe and unsafe behaviour, and where responsibility for fire safety lies.	Monitor changing perceptions and knowledge.	<p>Research will contribute to development of targeted public awareness programmes.</p> <p>Research will also inform any review of current fire safety regulations.</p>

	<b>Fire Safety as an Interactive Phenomenon:</b> Investigation of similarities and differences in understanding of fire safety, fire risk and response practices between household residents and fire fighters/other NZFS personnel. The research sought to gain more understanding of how lay and expert knowledge intersect and interact within actual practices and social settings. Results have implications for the way fire fighters work with residents to improve fire preparedness (NZFS Report 9).	Further investigate fire safety as an interactive phenomenon between the public and experts (NZFS Report 9).	Monitor and evaluate different approaches taken to education and awareness raising by NZFS personnel (fire fighters and others) in different social settings (households, marae, other social and community locations)	Provides NZFS with some understanding of the dynamics of fire safety knowledge – how it is continually re-created, transformed and adapted in the social contexts where it is used (NZFS Report 9).
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Determinants of fire risk <ul style="list-style-type: none"> <li>• socio-economic determinants</li> <li>• abandoned cooking</li> <li>• heating sources</li> <li>• other behaviours</li> <li>• arson</li> <li>• vehicle fires</li> </ul>	<b>Social &amp; Economic Deprivation and Fatal Unintentional Domestic Fire Incidents in New Zealand 1988 - 1998:</b> Research to explore the relationships between social and economic circumstances of households and risk of death and injury in fire events and strategies to address socio-economic determinants of fire risk. Research was based on an international literature review and comparative analysis of New Zealand fire fatality data (July 1988 - June 1998) and indices of social and economic deprivation. Interventions that may improve fire safety include smoke detectors, housing improvements and changing the burning characteristics of cigarettes. (NZFS Report 5).		Monitoring of relationship between fire and social-economic circumstances of households through monitoring of fire fatality and fire injury data against indicators of social-economic circumstances of households (e.g., with publishing of new indices data from NZDep2001).	
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	<p><b>Cooking, Alcohol and Unintentional Fatal Fires in New Zealand Homes 1991-1997:</b> Analysis of data from fatal fires resulting from abandoned cooking sources from 1991-1997. The research considered contributing factors such as timing of incidents, household composition, sex, age, ethnicity of those who died, cooking utensils and medium, role of alcohol and presence of smoke alarms. The findings have implications for awareness raising strategies, safer cooking practices and smoke alarms (NZFS Report 16).</p>	<p>More qualitative research exploring risk factors contributing to fatal and injury fires for particular groups and household types resulting from:</p> <ul style="list-style-type: none"> <li>abandoned cooking sources (e.g. type of heat source, quality of cooking vessels, cooking medium, location of kitchen, adequacy of insulation around stove, etc.</li> <li>nature of heating</li> <li>lighting (e.g., reliance on candles, kerosene lamps etc)</li> </ul>	<p>Monitoring of fatal and injury fires data by abandoned cooking sources, heating, lighting and related contributing factors (NZFS Report 16).</p>	<p><i>This research can inform NZFS development of public awareness and education programmes.</i></p>
		<p><i>Identify key people's perceptions (agency and community) of the strengths and weaknesses of fire safety awareness, prevention, and response interventions and mechanisms associated with housing and related programmes such as the Rural Housing Programme, NECBOP, the Community Renewal Programme, etc.</i></p>	<p><i>Evaluation of the effectiveness of fire ambassadors and other features (as identified) of programmes like the Rural Housing Programme.</i></p>	

		Research identifying the characteristics of those responsible for fires (including intentional and unintentional) where cause can be attributed: age, sex, risk behaviours, attitudes to fire safety.		<i>Research can contribute to targeted public awareness programmes (e.g., for campers, farmers, hunters, fireworks users, etc.) and to joint police NZFS strategies that address arson.</i>
		Analysis of non-domestic fire incidents by most common determinants (e.g., fireworks, burn-offs, camp fires, use of accelerants, etc) to determine their relative contribution of different determinants.		<i>Research provides the basis for targeted education and public awareness programmes.</i>
	<b>Fire Safety in Small Tourist Accommodation Businesses: Working Towards Developing Best Practice Models:</b> Investigation of issues facing small accommodation businesses to develop ways to reduce their risk of fire. Key factors influencing business owners' fire safety practices were found to include access to resources, level of management skills, influence of industry associations, regulatory environment and relationships with regulatory agencies and small business advisors, and the competitive environment (NZFS Report 37).	Investigation of best practice for developing targeted fire safety awareness and safety strategies for particular industry sectors (including tourism).	Monitoring and evaluation of any applications of targeted awareness programmes.	<i>Research provides the basis for targeted education and public awareness programmes.</i>

	<p><b>School Fires in New Zealand:</b> Research using school-based case studies and regional analysis to identify risk factors contributing to school fires and their implications for individual schools, communities and NZ - based on analysis of trends in school fires from NZFS Emergency Incidents Statistics and Ministry of Education: Property Management Information System. Recommendations related to risk management with respect to readiness and reduction issues; and response and recovery (NZFS Report 26).</p>	<p>Research to identify children's, teachers', caretakers' and Trustees' perceptions of and knowledge about fire safety, what constitutes safe and unsafe behaviour, and where people think responsibility for fire safety lies. What are the key barriers to people acting to reduce risk, for instance with respect to smoke detectors and other fire safety equipment, escape plans, fire safety behaviour, etc?</p>	<p>Monitoring of changes in fire-risk related perceptions, knowledge and behaviours.</p> <p>Evaluation of the effectiveness of school fire awareness programmes for the prevention of fires in schools.</p>	<p><i>The research provides the basis for further development of school-focused awareness programmes that address particular school characteristics (e.g., decile rating, urban/rural location, size, etc).</i></p>
	<p><b>Analysis of Vehicle Fires using the In-Depth Fatal Accident Database:</b> Research into the characteristics of fatal road accidents involving fires identified risk factors including: being a passenger, high speed roads, head-on collisions, trucks, old vehicles, excessive speed and drink driving. Responses include targeted education and awareness, lowering the speed limit, improved road construction, reduced number of trucks and older cars, fire safety mechanisms such as fire extinguishers (NZFS Report 15).</p>			

<p>At-risk or vulnerable groups:</p> <ul style="list-style-type: none"> <li>• life cycle stage</li> <li>• level of disability</li> <li>• physical and mental illness</li> </ul>	<p><b>Interventions in Māori House Fire Mortality Rates Through Innovations in Healthy Māori Housing Solutions:</b> Research to better understand issues associated with Māori house fire fatalities, including:</p> <ul style="list-style-type: none"> <li>• Treaty policy</li> <li>• interagency taskforce and intervention programmes</li> <li>• appointment and roles of Māori fire safety educators</li> <li>• Fire Service Whanau liaison and media policy</li> <li>• understanding Māori/cultural awareness</li> <li>• availability of appropriate grief counselling services</li> <li>• delivery of fire safety information</li> <li>• advertising and awareness campaigns</li> <li>• behavioural and environmental factors</li> <li>• smoke detectors (NZFS Report 14).</li> </ul>	<p>Research and/or consultation with other agencies in order to adequately design and implement specific strategies to address Māori issues (NZFS Report 14 and 33).</p> <p>Targeted research and/or consultation with other agencies as a basis for developing joint venture intervention programmes focused on improving fire safety in Māori households.</p> <p>Investigate the best ways to develop appropriate programmes to address ethnic disparities in fire-related injury rates (NZFS Report 33)</p>	<p>Monitoring and evaluation of any joint venture interventions taking account of the type of collaboration, the agency/organisation involved and the type of programme or intervention.</p>	<p>Research provides a basis for NZFS developing public awareness and education programmes and interventions to reduce numbers of Māori affected (death, injury, property damage) by domestic fires.</p>
	<p><b>Determining Effective Fire Safety Strategies for Māori:</b> Case study investigation into why death by fire is more common place for Māori than for others (Bay-Waikato Fire Region) to:</p> <ul style="list-style-type: none"> <li>• assess the level of awareness of fire safety behaviour</li> <li>• examine how Māori would respond in an emergency</li> <li>• understand lifestyle factors possibly contributing to the higher incidence of fire death among Māori, and</li> <li>• assess communication options and determine how best to reach at-risk Māori (NZFS Report 2).</li> </ul>	<p>Research through NZFS partnerships with Māori communities to understand cultural values and practices in order to make sense of why particular attitudes, behaviours and practices occur (NZFS Report 2).</p> <p>Qualitative research on lifestyle, and unsafe practices such as alcohol and drug use amongst Māori (NZFS Report 2).</p>	<p>Monitoring of changes in fire-risk related perceptions, knowledge and behaviours amongst identified at-risk Māori groups.</p>	

	<p><b>Unintentional Fire-Related Childhood Injuries in Auckland Resulting in Hospitalisation or Death 1989-1998:</b> Research on unintentional fire injury among children in developed countries, based on an international literature review and analysis of data on unintentional fire-related injury resulting in death or hospitalisation among Auckland children (0-14 years) from 1989-1998. Recommendations relate to NZFS partnerships with Maori and Pacific Island groups, education, targeted prevention, strategies, incentives and requirements around fire prevention mechanisms and improved data collection and analysis (NZFS Report 13).</p>	<p>Case-control study to identify potentially modifiable risk factors for fire-related childhood injury (NZFS Report 13).</p> <p>Assessment of the short and long term effects of non-fatal fire-related childhood injury (NZFS Report 13).</p> <p>Market research among current smokers to identify realistic options to reduce access of children to lighters and matches (NZFS Report 30).</p>	<p>Monitor and report on the proportion of domestic structural fire incidents, injuries and fatalities resulting from children playing with cigarette lighters (NZFS Report 30).</p> <p>Evaluation of interventions designed to reduce the impact of non-fatal fire-related childhood injuries (NZFS Report 13).</p>	<p>Provides basis for developing education and public awareness programmes as well as fire prevention and safety mechanisms that target parents and children, including those implemented through schools.</p>
	<p><b>Improving the Fire Safety Knowledge &amp; Practices of Vulnerable Groups:</b> Research on the fire safety needs of vulnerable groups. Identified vulnerable groups include children under 5 years old, older people, lower socio-economic groups, rural populations, ethnic groups and alcohol and drug use. The research focused on the understandings vulnerable groups had of the fire risk, fire prevention and responses to fires. It also identified the dangerous behaviours that play a key role in fire fatalities. A literature review also focused on successful education programmes targeted at particular groups (NZFS Report 8).</p>			<p>This research contributes to the identification of best practice regarding public fire safety education programmes and resources (NZFS Report 8).</p>

	<p><b>Vulnerability and the Translation of Safety Knowledge:</b> Research based on interviews with NZFS staff to identify ways in which NZFS could optimally reach out to at-risk or vulnerable groups with fire safety promotions to reduce domestic fires. It assumes that fire fighters are the principal interface between NZFS and the public concerning the promotion of domestic fire safety. Research based on a translation model of fire safety, that is, fire safety knowledge is created through human knowledge. The research shows the need for NZFS employees to be more involved in community activities and have the resources to better promote fire safety (NZFS Report 25).</p>	<p>Research to further understand the different ways that different at-risk groups gain knowledge and respond to new understandings of fire risk.</p>	<p>Monitoring and evaluation of any application of new fire safety awareness programmes.</p>	<p>The research informs the development of targeted education and awareness programmes.</p> <p>The research can also inform training for NZFS personnel engaged in public awareness and education programmes.</p>
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Encouraging safe behaviour	<b>Scoping a Social Marketing Programme for Fire safety Research in the Community:</b> Analysis of promotional activities of the NZFS using a social marketing model (to understand people's perceptions of gains from 'negative' behaviour as opposed to costs of 'positive' behaviour). Development of a plan for NZFS to make a transition to a social marketing promotion plan that recognises audience segmentation (NZFS Report 12).		Evaluate the effectiveness of any application of social marketing techniques to different segments of the population.	<i>To market socially beneficial behaviour, with the marketing of ideas to achieve attitude changes leading to behaviour changes (NZFS Report 12).</i>
Encouraging safe built environments <ul style="list-style-type: none"> <li>• housing</li> <li>• roads</li> <li>• water supply</li> </ul>	<b>Follow-up Survey of Auahi Whatatūpato Smoke Alarm Installation Project in the Eastern Bay of Plenty:</b> Research examining the effectiveness of a smoke alarm distribution programme in 8 Eastern Bay of Plenty communities. The research showed that, over time, alarms were less likely to still be functioning, usually because of battery problems. Options to improve smoke detector effectiveness could include longer-life batteries and/or hardwiring of detectors (NZFS Report 7).	Research to identify key people's perceptions (agency and community) of the strengths and weaknesses of fire safety awareness, prevention, and response interventions and mechanisms associated with housing and related programmes such as the Rural Housing Programme, NECBOP, the Community Renewal Programme, etc.	Evaluation of the effectiveness of fire ambassadors and other features (as identified) of programmes like the Rural Housing Programme.	
		Research into the infrastructural factors that hinder and/or assist NZFS ability to respond to fire incidents, using fire incident case studies, including housing density, quality and design; road design and quality; source and adequacy of water supply; etc.  Identification of ways to mitigate identified infrastructural problems and optimise infrastructural benefits.	Monitoring and evaluation of any actions to mitigate identified hindrances to fire response	

				<i>Provides basis for NZFS to determine the characteristics of safe home heating, cooking and lighting systems and develop fire safety promotion programme to promote home safely.</i>
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Community infrastructure <ul style="list-style-type: none"> <li>• isolation</li> <li>• rurality</li> </ul>	An investigation of the issues associated with increasing geographical distance from Fire Stations (NZFS Report 30).	Research that identifies rural residents' perceptions of and knowledge about their particular fire risk and their consequent precautions, fire safety behaviour.		<i>Research to inform public awareness, education and other intervention approaches to improving fire safety in geographically isolated areas</i>
		Research into community understanding of, and preparedness for, fire after earthquake, with a focus on key central and local government agencies, key community groups, schools, hospitals, workplaces and households.		
	<b>Prediction of Rural Fire Risk for the Wellington Region:</b> Prediction of rural fire risk for the Wellington region using national scale climatic information to make spatially explicit predictions through generalised regression analysis and spatial prediction (GRASP). Variations included in the model were related to climate, land form, culture (distance to road and human density) and land cover. The resulting predictions generally accorded with actual fire incidents (NZFS Report 24).			<i>Research provides a basis for NZFS to target high risk areas for fire safety awareness, education and interventions.</i>

Primarily relating to Output Classes 2 and 3: Fire fighting and other Fire Service Operations and Administering the National Rural Fire Authority, including: Nationally Coordinating Rural Fire Management				
Institutional arrangements and capacity <ul style="list-style-type: none"> <li>NZFS</li> <li>inter-agency collaboration and co-ordination</li> <li>emergency response</li> <li>other capacity building</li> </ul>		Meta-analysis of completed research to: <ul style="list-style-type: none"> <li>identify recommendations for addressing issues identified in the research findings</li> <li>identity the extent to which these recommendations have been taken account of in NZFS and other related agencies work programmes</li> <li>monitor gaps in knowledge and further research requirements.</li> </ul>		This meta-analysis can inform on-going planning for fire safety awareness and education programmes and other interventions.
		Research into the impacts of intentional fire incidents (arson) on the capacity of NZFS to respond to unintentional fire incidents.	Auditing of existing and potential communications mechanisms to ensure that the right information is getting to the right people in the right manner (NZFS Report 36).	
		Research to identify the factors that enhance or limit NZFS working relationships and/or collaboration with other agencies, organisations and professional groups (i.e. architects, engineers, manufacturers, etc) that lead to fire-safe design, joint fire safety strategies, etc.	Monitor collaborations by agency/organisation and type of strategy, programme, intervention, etc.	

<p>Distribution and impacts of fires</p>	<p><b>Overview of Fire-related Mortality Data for New Zealand 1991-1997; Fire Incidents Resulting in Deaths of New Zealand Children Aged Under 15 Years 1991-1997; Fire Incidents Resulting in Deaths of New Zealanders Aged 15-64 Years 1991-1997; Fire Incidents Resulting in Deaths of New Zealanders Aged 65 and Older 1991-1997; Hospitalisation for Non-fatal Injury as a Result of Unintentional Domestic Fire Incidents: New Zealand 1996-2000:</b></p> <p>Development of a methodology for developing a comprehensive account of fire-related deaths and injury in New Zealand domestic fire incidents by collating and analysing 1991-1997 fire fatality data (by age cohort) from the Fire Incident Recording System and linking it with:</p> <ul style="list-style-type: none"> <li>▪ coroners' files (NZFS Reports 30, 31, 32, 33), and</li> <li>▪ New Zealand Health Information Service and coroners' files (NZFS Report 29).</li> </ul> <p>Recommendations relate to improved internal and external data collection, the development of culturally appropriate services, improvements in the safety of consumer selected products, safe construction of housing, NZFS involvement in well-being strategies, reduction of risk around isolation.</p>		<p>Evaluation of the effectiveness of any application of a methodology to link fire fatality data from the Fire Incident Recording System, the New Zealand Health Information Service and coroners' files.</p>	<p>Provides the basis for establishing robust monitoring systems.</p>
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	<p><b>Where in New Zealand Have Fatal Domestic Fires Occurred? Descriptive Analysis of Data 1986-1998:</b> Identification of the distribution of fatal structural fire incidents in NZ (July 1996-June 1998). Results show link between high fatal fire incidents and high rates of poverty, poor housing, undereducated populations and sole parenting (NZFS 6).</p>	<p>Further analysis of geographical data to identify factors associated with fatal fire incidents including vulnerable communities (NZFS Report 6).</p> <p>Identification of the psychological, social and economic impacts of intentional and unintentional fire incidents involving property damage, injury and/or death.</p>	<p>Monitoring of the impacts of intentional and unintentional incidents involving property damage, injury and/or death.</p>	<p>This research could inform NZFS public awareness strategies and priority setting.</p>
	<p><b>An Economical Assessment of Industrial Fires in New Zealand:</b> Research on the economic impacts of industrial fire incidents, with reference to industry incidence rate and regional prevalence. Costs included industry cost, cost of emergency response and social costs of fire injury. Although industrial fires account for only a small proportion of all fire incidents they account for a large proportion of total resource. In addition, NZFS have to maintain the capacity to respond to large industrial fire incidents (NZFS Report 28).</p>	<p>Research into factors that mitigate or exacerbate the psychological, social and economic impacts of domestic and commercial fire incidents (including those involving death, injury and/or property damage)</p>		
	<p><b>Costs and Benefits of Regulating Fire Safety Performance of Upholstered Furniture in NZ:</b> Assessment of the likely costs and benefits (expected cost per life saved) of regulating fire safety performance of upholstered furniture in NZ. The research concluded that, given the current value of a statistical life, the introduction of new standards are unlikely to be cost effective (NZFS Report 35).</p>			

	<p><b>Cost Effective Domestic Fire Sprinkler Systems:</b> Economic assessment of the cost effectiveness (cost per life saved) of a proposed domestic fire sprinkle system in reducing loss of life, injury and property damage. The research shows the greater cost-effectiveness of the proposed low-cost multi-purpose sprinkler compared with sprinklers installed to the New Zealand standard (NZFS Report 1).</p>			
Building capacity in the rural sector	<p><b>The New Zealand Volunteer Fire Service in 3 Rural Communities in Northland:</b> Examination of the social and administrative structures of rural volunteer fire services (based on 3 Northland community case studies), issues affecting rural fire services generally and ways to strengthen them. Research shows need to support rural fire fighters, recruit younger volunteers, and provide regular training and insurance cover (NZFS Report 34).</p>	Further research into how better to ensure call out accuracy and response times for emergency calls for rural and volunteer fire units (NZFS Report 34).	Monitoring of call out accuracy and response times for emergency calls for rural and volunteer fire units.	
	<p><b>Developing a Strategy to Nurture, Enhance, and Expand the Volunteer Fire Brigade; Recruitment and Retention of Women Volunteers Within the Fire Service:</b> Research to develop profiles of NZFS volunteers in general including their motivation to join; expectations of the job and quality of relationship with paid fire fighters (NZFS Report 23) and female NZFS volunteers in particular focusing on volunteer behaviour, experiences, recruitment, challenges for women, turnover and retention, training issues and volunteer fire organisations (NZFS Report 36).</p>		Monitoring of volunteer numbers and characteristics (age, sex, etc.). Monitoring of motivations and expectations of those joining the fire service.	This research informs the development of strategies to enhance and expand the volunteer fire brigade movement, including increasing the number of Māori and female volunteers.

## 4. SUMMARY

A meta-analysis of research to date shows a broad coverage of the social aspects of fire safety, fire risk factors and fire prevention strategies. It also highlights some fruitful research areas for future attention. These include:

- A focus on household composition and community dynamics, given recent social trends in New Zealand;
- A focus on different industry sectors, given the economic costs of industrial fire incidents and the potentially different ways that particular industries respond to fire risk;
- Fire service capacity, given problems around recruitment and retention issues and residential trends;
- Meta-analysis of current research recommendations; and
- On-going monitoring and evaluation.

**Households and communities:** Recent social trends in New Zealand may have implications for fire risk and fire safety behaviours at household and community. These trends include:

- The ageing population;
- Increasing divorce and relationship breakdown;
- Increasing numbers of reconstituted families;
- Increasing central city living (including young people living alone);
- Young people staying at home for longer;
- Inner city living and rural depopulation/repopulation.

Changes in household composition and community dynamics as a consequence of these social trends may have implications for Fire Service strategies given their impact on household and community fire risk, fire awareness, fire safety behaviours, etc. Key changes include:

- An increase in the number of households, for instance as split families require two households;
- An increase in the number of single parent households (usually led by women), given divorce and relationship breakdown. In many cases, both parents set up households, with children moving between them on a regular basis;
- An increase in the number of households with parents and children of previous families combined into new family formations;
- An increase in the number of older people (usually women) living alone, given that people are living longer and in better health (and therefore able to live independently);
- An increase in the number of family households without children (including couples without children and ‘empty nesters’).
- An increase in multi-generational households (including parents with adult children) and families with parents (especially amongst new immigrants, Pacific families);
- Higher density inner city living, through apartment development;
- Changing rural populations given young people seeking work in the cities, farmers seeking off-farm work, city people moving into life style blocks, changing land use (e.g. dairying), people (especially Maori) returning the rural areas, people



(especially single parent families) attracted to rural areas for lower housing costs), etc.

Research is needed to understand the implications of these changes for household and community fire risk, fire awareness, fire safety behaviours, etc. For instance:

- Does changing household composition increase fire risk, have an impact on fire safety awareness, fire preparedness, etc.?
- Are there differences in fire risk, fire safety, fire preparedness, across different household types?
- Do fire safety strategies, public awareness strategies and interventions need to be tailored to different household types (including life style stage);
- Do community dynamics (e.g. high density living in cities, changing rural populations) have implications for targeting awareness strategies, etc.

**Industry and fire:** Very little of the research has focused on industry, although the economic impacts of industrial fires have been shown to be considerable. Further research may be required that provides the Fire Service with more specific information about different industry sectors as a basis for more targeted fire awareness strategies. Possible research projects could focus on:

- Industry specific fire risks
- Industry specific economic impacts
- Industry specific preparedness
- The need for any industry specific fire safety education, awareness strategies.

**Fire Service capacity:** A number of research projects have focused on Fire Service capacity issues, particularly around recruitment and retention of voluntary fire fighters in rural areas and of women amongst fire fighters in general. This research highlights on-going problems, including problems relating to the relationships between male and female fire fighters and between voluntary and full-time staff. The Fire Service may need to do follow-up research to identify any changes in the recruitment/retention of voluntary and female fire fighters and key staff relationships and the reasons for them, given strategies to address identified problems.

Community dynamics, as discussed above, may have an impact on the capacity of the Fire Service to respond to fire incidents. While there has been some research focusing on the physical properties of fire and issues to do with the isolation of rural communities, there has been less attention given to the implications of increasing population and traffic density in cities on the Fire Service's capacity to respond to fire incidents.

**Meta-analysis of research recommendations:** The completed research reports include a multitude of recommendations. A meta-analysis of these would be useful to both identify and categorise the wide range of recommendations and, in consultation with researchers and Fire Service personnel, identify key recommendations.

**On-going monitoring and evaluation:** Finally, research is needed to establish monitoring systems as a basis for ongoing monitoring and evaluation of current Fire Service practices and interventions.

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