Fire Research Report

Delivery mechanisms for hard to reach groups

McDermott Miller

October 2013

The New Zealand Fire Service (NZFS) surveys households and individuals from time to time as part of its monitoring of their behaviours in response to fire incidents and the Service's fire education and fire safety programmes. Other research has identified "at risk" groups (to fire) within the population as a whole, segments of which have been classed as *hard to reach* by NZFS from its experience to date in surveying them. This research is intended to assess whether the research methods NZFS currently uses to obtain valid responses from *hard to reach* groups are the most effective and to develop soundly based programmes that have the ability to reach and influence these people.

The research results show *hard to reach* groups are accessible in sufficient numbers to generate statistically robust results irrespective of survey delivery mode used, provided a systematic statistically neutral follow up programme is used. Online (web based) surveys are cheaper to deliver than telephone (CATI) or face to face interviews (CAPI) for similar sample sizes, accessibility to the internet through electronic communication services of one kind or another is already high amongst *hard to reach* groups and results can be statistically indistinguishable notwithstanding different survey delivery modes. Accordingly, it is recommended NZFS moves over time to online survey delivery methods for all its surveys seeking to access *hard to reach* groups, except where extensive specialised surveys are required, in which case a face to face interview delivery mechanism may be most effective.

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McDERMOTT MILLER Strategies™

Delivery Mechanisms for Hard to Reach Groups

Final Report by McDermott Miller *Strategies* to New Zealand Fire Service

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ABSTRACT:

The New Zealand Fire Service (NZFS) surveys households and individuals from time to time as part of its monitoring of their behaviours in response to fire incidents and the Service's fire education and fire safety programmes. Other research has identified "at risk" groups (to fire) within the population as a whole, segments of which have been classed as *hard to reach* by NZFS from its experience to date in surveying them. This research is intended to assess whether the research methods NZFS currently uses to obtain valid responses from *hard to reach* groups are the most effective and to develop soundly based programmes that have the ability to reach and influence these people.

The research results show *hard to reach* groups are accessible in sufficient numbers to generate statistically robust results irrespective of survey delivery mode used, provided a systematic statistically neutral follow up programme is used. Online (web-based) surveys are cheaper to deliver than telephone (CATI) or face to face interviews (CAPI) for similar sample sizes, accessibility to the internet through electronic communication services of one kind or another is already high amongst *hard to reach* groups and results can be statistically indistinguishable notwithstanding different survey delivery modes. Accordingly, it is recommended NZFS moves over time to online survey delivery methods for all its surveys seeking to access *hard to reach* groups, except where extensive specialised surveys are required, in which case a face to face interview delivery mechanism may be most effective.

1. SCOPE OF THE RESEARCH

1.1 INTRODUCTION

McDermott Miller was commissioned by the New Zealand Fire Service (NZFS) on 1 June 2012 to assess *Delivery Mechanisms for Hard to Reach Groups* as part of NZFS's 2012 Contestable Research Fund.

The purpose of this research, the methodology used to achieve its purpose, results obtained and implications for improving access to *hard to reach groups* are contained in the following sections of this report.

1.2 DEFINITIONS

The following definition of *hard to reach* groups has been used in this study:

HARD TO REACH GROUPS

Statistically significant populations within NZFS-identified at risk groups, namely:

- *Children*
- *People on low income*
- *People living in rental accommodation*
- *Ethnic groups including Maori and Pacific peoples*
- *Rural communities*
- *Older people*
- *People with special needs*

1.3 RESEARCH AIMS AND OBJECTIVES

The aim of the research is to assess whether the research methods NZFS employs to reach *hard to reach* groups are the most effective, and to develop soundly-based programmes that have the ability to reach and influence these people.

The project objective for the research is to develop an evaluation methodology which:

- is underpinned by analyses of the challenges associated with measuring changes in knowledge and behaviour of *hard to reach* groups;
- has specific measures that can be attached to fire service achievements in influencing *hard to reach* groups;
- gives recommendations about cost-effective survey methodologies for *hard to reach'* groups; and,
- gives recommendations about how to evaluate the effectiveness of any proposed programmes.

1.4 BACKGROUND

NEW ZEALAND FIRE SERVICE RESEARCH:

Since 1998 NZFS has commissioned a range of market research companies to undertake an annual survey to track movements in New Zealanders' knowledge and behaviour in relation to fire safety. The annual 'Fire Knowledge Survey', and the additional quarterly 'Communication Effectiveness Survey', have become the key ways NZFS monitors and evaluates the effectiveness of its social marketing fire safety campaigns.

Over time, the surveys have shown statistically significant improvement in fire knowledge around fire behaviour and fire prevention across New Zealand's general population. However, the current survey does not reach statistically significant proportions of respondents in NZFS's identified *hard to reach* groups. This anomaly makes it difficult to draw statistical inferences for NZFS's identified *hard to reach'* groups in relation to their level of fire knowledge.

NZFS's 2010/2011 Contestable Research Fund looked at the effectiveness of various different communication media for at risk groups (UMR, 2011). The findings revealed that *hard to reach* groups are already current users of the internet, mobile phones and social networking sites. All *hard to reach* groups are receptive (to differing levels) to the idea of receiving fire knowledge messages via social networking sites, accessed either through their home/off-site internet connection or via smart phones. The research report recommends NZFS create *Twitter* and *Facebook* profiles to effectively disseminate fire knowledge messages to *hard to reach* groups.

A further report ('Project Re-kindled', Research International, 2011), assessed a range of fire safety actions and fire knowledge messages to discover which actions and messages will have the greatest impact on the greatest number of people. The project took a survey-based approach and included a boost sample of *hard to reach* groups. The report made recommendations on the type of emotive and scenario-based content the NZFS should focus on in its social marketing / communications campaigns.

The research, outlined above, recommends various changes to the medium and content of NZFS's fire knowledge messages in relation to *hard to reach* groups, but currently there is no effective way of evaluating if the recommended changes will help increase *hard to reach* groups' level of fire knowledge, due to the sampling deficiencies of the current 'Fire Knowledge' survey. As a result, the purpose of this research is to develop an on-going methodology that can be used to evaluate and monitor the level of fire knowledge for all *hard to reach* groups. This will help NZFS evaluate the effectiveness of its social marketing/communication campaigns in targeting *hard to reach* groups.

CHANGING SURVEY ENVIRONMENT

McDermott Miller has operated its own Market Research Unit since 1987. An example of our time-series CATI-based surveys is the Westpac-McDermott Miller Consumer Confidence Survey which obtains 1550 national responses every quarter. This survey gives us first-hand experience of New Zealand's changing survey environment. Our sample frame for this survey is the New Zealand White Pages. Since 2002, our New Zealand White Pages sample frame has reduced by around 10% each year (although this rate has slowed to around 5% in the last few years), as the New Zealand household population shift from landline telephone numbers to either unlisted telephone numbers or mobile phones only. Prima facie evidence from our surveys suggests that 'renters', low-income households', 'ethnic minorities', and 'flatters' are more likely to shift to alternative forms of communication than the general population. Within our organisation, we have hypothesised that deprived segments of the population are more likely to use 'pre-paid' mobile phones than landlines due to lower running costs. This has implications for survey delivery methods which target *hard to reach* groups.

Additionally, changing communication methods (outlined above) raise the argument that any changes to survey evaluation and monitoring should, to some extent, change in line with new communication methods utilised in campaigns.

It is important to recognise that NZFS's objective for its surveys is not only to access *hard to reach* groups, but to receive sufficient responses from them to its surveys to generate robust results. Hypothetically it is quite possible *hard to reach* groups receive and look at the Fire Service's survey questionnaires no less proportionately than does the general population. However, they may choose not to respond to the same extent as the general population.

If this hypothesis has some validity, then it potentially has greater implications for the design of the surveys themselves than for their delivery mechanisms. The design issue is beyond the scope of the present research which is focused on delivery mechanisms; however a full evaluation of the low (or statistically insignificant) responses from *hard to reach groups* may provide opportunities for improving their level of participation through re-design, rather than varying delivery mechanisms.

1.5 SUMMARY DESCRIPTION OF METHOD

McDermott Miller's research programme was undertaken in five key stages. These stages are designed to achieve the aims and objectives set out above, as follows:

Stage 1. Reconnaissance and Literature Review

We reviewed:

- international and New Zealand literature on survey methodology in general and for at risk/*hard to reach* groups. The review involved consideration of emerging global trends in internet use and mobile technology amongst other things;
- various survey methodologies (face-to-face interviewing – CAPI or PAPI), CATI (mobiles and landlines), internet panels, other web-based methods (through social media) and text surveys; and,
- evaluation methodologies for the general population and *hard to reach* groups accounting for trends in internet use and mobile technology.

Stage 2. Case Study Analysis

The second research stage involved comparative analysis of two case studies, being NZFS's current Fire Knowledge data and survey methodology and an analysis of fire knowledge questions with *hard to reach* groups in the 2011 Fire Efficacy Index. This process included:

- illustrating any significant differences in question response between CATI and internet surveys;
- identifying any significant differences in sample demographics (e.g. age, gender, occupation, etc) between CATI and internet surveys;
- statistical testing of the results of this analysis; and,
- using the results of this analysis to assess the strengths and weaknesses of the two different survey methodologies in the context of NZFS own requirements from its surveys.

Stage 3. Survey Method Assessment

In this stage we consulted Fire Service managers on perceived problems with, and limitations of, existing methodologies for evaluating and targeting *at risk/hard to reach* groups; reviewed previous internal NZFS reports and research on methodologies explored or trialled in the past; compared the results of **Stage 1** (the Literature Review) with NZFS experience to develop a framework for assessing selected current and new survey methodologies. The results of this stage are presented in an evaluation matrix rating the performance of each methodology in terms or quantitative and qualitative criteria and potential cost-effectiveness.

Stage 4. Survey Methodology with Designed On-going Research Programme

Here we made an overall assessment of the findings of **Stages 2** and **3** to develop recommendations for:

- a survey delivery method and evaluation techniques NZFS should, in our view, adopt in order to effectively monitor the level of fire knowledge held by *hard to reach groups*; and,

- the design and estimated cost of an on-going evaluative research programme developed for this purpose.

Stage 5. Interpretation and Reporting

We have analysed the inputs and results obtained at **Stages 1-4** and brought them together in a summary of the research findings and recommendations arising from them.

1.6 OUTLINE OF REPORT

Section 2 of this report discusses the literature review, which underpins and informs the research.

Section 3 summarises the comparative analysis of case studies of the Fire Knowledge Survey and the 2011 Fire Efficacy Survey and discusses the strengths and weaknesses of the two different survey methodologies as applied to NZFS requirements and usage.

Section 4 contains the results of our consultation with NZFS staff which was used, together with the Literature Review of **Stage 1**, to inform the survey method assessment and development of an evaluation matrix to assess the relative merits of different delivery mechanisms for surveying *hard to reach* groups.

Section 5 draws together the findings of **Stages 2, 3** and **4** in an overall set of findings and recommendations of a survey delivery methodology most suited to the Fire Service's need to monitor the level of fire knowledge held by *hard to reach* groups and presents design and indicative costs for an ongoing evaluative research programme for this purpose.

2. RESEARCH UNDERPINNING THE STUDY

2.1 LITERATURE REVIEW OF RELEVANT TEXTS

McDermott Miller undertook a selective literature review of NZFS reports and other relevant New Zealand and overseas literature, including both theory and case-studies. The review helped identify and clarify:

- difficulties and opportunities for obtaining responses from *hard to reach* groups to survey questionnaires;
- issues around response rates and response bias for the whole population as well as for *hard to reach* groups as between survey modes (telephone interview, email, web and post);
- non-survey mode issues influencing reaching these groups; and,
- impact of cost differences as between survey modes.

Annex I: Selective Bibliography to this report records the works from which this literature review was developed.

2.2 SELECTIVE LITERATURE SEARCH GUIDELINES

Our systematic literature search consisted of identifying relevant search terms, and relevant bibliographic sources to search.

IDENTIFYING SEARCH TERMS

Relevant Search Terms were identified from:

- the overall research objectives and aims;
- terms used by NZFS staff in previous interviews with them;
- review of key previous Contestable Research Fund reports; and,
- McDermott Miller's own knowledge and use of a wide range of survey methodologies

RELEVANT LITERATURE SOURCES

We accessed NZFS's library catalogue system using knowledge gained from previous research undertaken for NZFS to obtain useful references for the Literature Review. They also provided us with links to key web sites for relevant fire research literature.

Sources included:

- NZFS Information Centre catalogue: as well as providing references to published and unpublished literature (both scholarly and non-academic).
- Academic journal publishers' websites.
- Bibliographic sites accessed through Victoria University of Wellington (VUW).
- McDermott Miller's previous reports to New Zealand Fire Service.

CRITERIA FOR SELECTING REPORTS AND ARTICLES FOR REVIEW

The selection criteria were:

- **Type of Publication:** The searches were not limited by publication type and a wide range has been considered including peer-reviewed scholarly journals, independent reports commissioned by fire services, internal fire service reports, Government reports, and web sites aimed at fire-fighters.

  However, not all material has been given equal weight. In reviewing the documents and considering the significance of their findings for the current study, we put most weight on articles in peer-reviewed journals, followed by reports and conference papers by professionally qualified authors that appear to have been prepared with scholarly/scientific approach. Other material was used for "colour", or to glean search terms and (subject headings) for further searching.

- **Language:** we have only considered documents published in English.

2.3 REVIEW CONCLUSIONS

This review revealed two opposing views about the effect of online and offline delivery mechanisms in general which are summarised below as:

- That *data obtained by online modes may be somewhat inferior to data collected by offline survey mode* [Roster, Catherine A, Rogers, Robert D, *et al*) ; and,
- *although there are important differences in the response characteristics of these three groups* (post, email and website), these survey modes do not appear to significantly influence the results obtained. Indeed *the differences detected in the response groups indicate that using multi-mode survey techniques improved the representativeness of the sample without biasing other results* [Yun, Gi Woong, Trumbo, Craig W.]

It is interesting to note that the view coming through this selected literature review does not support earlier views that poor quality data is obtained from surveys delivered through online means. The debate is now about the closeness in quality of data derived using online and telephone interview survey methods. This change reflects much greater internet access by households and individuals internationally occurring over time.

Moreover, some researchers firmly believe *hard to reach* groups can successfully be reached through internet surveys [Andrews, Dorinne, Nonnecke, Blair, Preece Jennifer] by applying specific quality criteria to the design of the survey, emphasising privacy and confidentiality to participants and following a "multistep survey and presentation process" to achieve high response rates. As with all soundly delivered survey modes, they also emphasise the importance of piloting surveys to test both the survey instrument and its distribution process.

Some researchers reinforce these views with the belief respondents to internet surveys prefer the relative anonymity of web-based surveys to giving answers to questions from a real person over the telephone [Kuran, Timur. McCaffery, Edward J.]

Whatever the delivery mechanism, a key influence is the application of the mechanism. For example, it may be that response rates can be improved for web-based mechanisms by a consistent follow up to initial email invitations to potential respondents to participate in a survey [Andrews,

Dorine, et al]. Other issues, such as language, can also be managed to improve responses. Of course cost is a key determinant, not only of the design of the survey and the delivery mechanism used, but also of their application.

Importantly almost all researchers reminded us that survey design can be as much an influence on reaching *hard to reach* groups as the delivery mechanism itself.

3. CASE STUDY EVALUATION

3.1 SCOPE

In order to test the effectiveness of delivery mechanisms for *at risk/hard to reach* groups in a practical way between two delivery mechanisms – telephone interviews and web-based surveys, we undertook case studies of:

- NZFS's annual Fire Knowledge Survey of households; and,
- The 2011 Fire Efficacy Survey of households which was undertaken by McDermott Miller for the New Zealand Fire Service and reported to it in *Changes in community self-reliance and implications for fire safety messages and emergency response* by McDermott Miller on 30 November 2011.

Ideally responses to most NZFS surveys from the key *at risk/hard to reach* groups should be as robust as possible irrespective of the survey delivery mechanism used given the same sample frame and questionnaire. While the questionnaires used in these two surveys did differ, they were similar in many respects and the New Zealand household sample frame was used for both. They are therefore considered to be directly relevant case studies, illustrating the effectiveness (or not) of different delivery mechanisms reaching sufficient of the *hard to reach* groups to generate robust results from them that can reliably be used by the Fire Service.

This section contains a background to the selected case studies, and outlines the issues and methodology employed to assess the relative effectiveness of their respective delivery mechanisms.

3.2 BACKGROUND

The Fire Knowledge Survey is delivered annually to households by means of a Computer Aided Interview (CATI). Over each of the last five years around 1,000 valid responses have been received on average. All *hard to reach* groups are included as part of the sample drawn from the general population, other than children under the age of 15 who were excluded from this survey. The survey response rate is around 25%-35% and the margin of error 2.5% at the 95% confidence level.

The Fire Efficacy Survey is a once-off (to date) web-based survey delivered in 2011 through an introductory email on a quota basis to which 1,989 valid responses were received in total. The survey of the general population resulted in 1,007 valid responses. A "boost sample" of *at risk/hard to reach* groups resulted in a further 983 valid responses. Children under the age of 18 were excluded from this survey. The survey response rate was 15% and the margin of error for the survey as a whole was 2.2% at the 95% confidence level.

While the Fire Efficacy web-based survey specifically targeted *at risk/hard to reach* groups, the sample frame of the Fire Knowledge survey responses also included a sample of these groups.

3.3 EVALUATION METHODOLOGY

As noted in **Section 3.1** above, these two surveys were used as case studies to demonstrate, if possible, effectiveness of their respective delivery mechanisms as measured by the robustness of their results in an environment of changes in knowledge and behaviour of *hard to reach* groups.

This was done by undertaking a comparative analysis of their results for at *risk/hard to* reach groups in the light of the following criteria:

- representativeness and sampling;
- response rates;
- non-response bias;

- response differences (if any), that is whether and to what extent survey results for the same or similar question was different as between CATI and email surveys; and,

- differences (if any) in sample demographics.

Differences were tested for statistical significance against the null hypothesis that there is no difference in results arising from the different delivery mechanisms used by the surveys.

3.4 RESULTS OF COMPARING THE SURVEYS

In the following sub-sections we review the results of our analysis of the two case study surveys.

REPRESENTATIVENESS AND SAMPLING.

The New Zealand household population is the sample from which respondents were drawn for both surveys. Sample sizes, sampling methodology and the boost sample collected for *hard to reach* groups in the web-based Fire Efficacy survey are summarised in **Section 3.2** above.

The New Zealand population has access to landlines and the internet at similar levels. In 2012, around 80% of all New Zealand households had access to the internet and 87% had a landline according to Statistics New Zealand reports.

New Zealanders' access to other people and data and information has also increased through use of cell phones. In 2011, New Zealand had 4.82 million cell phones connected to networks, more than one per capita.

Internet access for households with above average annual income ($70,000 pa) was 94%, whereas slightly fewer (92%) had landlines. On the other hand only 72% of households with below average income had internet access, whereas 84% had landlines. In 2012, New Zealand had 3.026 million "internet hosts" (PCs, tablets and other devices connected to the internet).

Some 78% of households in rural communities, (81% in all urban areas), had access to the internet, and 89% of them had a landline.

Individuals' access to the internet is even higher when access though devices outside households is taken into account. The following table illustrates individuals' access in 2012.

Table 3.1: Access to the Internet in 2012: At risk/hard to reach groups

Individual Characteristic At risk/hard to reach groups	Individuals who have had recent internet access 2012 Year %
Young people aged 15-24	82
People aged 65-74	76
People aged 75+	52
Maori	77
Pacific peoples	62
Other ethnicity	84
Income <$30,000pa	77

Source: Statistics New Zealand, April 2013
Compiled by: McDermott Miller, August 2013

Other than people aged over 75 and Pacific peoples, more than 75% of individuals in *hard to reach* groups have access to the internet.

The proportion of households with internet access has been catching up to the proportion of households with landlines for some time, although the rate of convergence is slowing.

Use of social media sites is also expanding rapidly. Around 2.8 million New Zealanders (aged 2+) visited social media sites in the month of October 2012 (according to Nielsen Online Ratings for the month of October 2012). This is up from 1.8 million visiting social media sites at the same time in 2010.

In effect, the population sampled, irrespective of either survey mode, is almost the same and in the future differences are unlikely to be material and can be allowed for in any event.

Therefore a web-based survey can be representative of the general population and segments within it, such as *hard to reach* groups just as much as a CATI survey. The web-based Fire Efficacy survey is statistically more robust in respect of *hard to reach* groups (other than children) because of larger samples obtained and consequently lower margins of error (4%-6% at the 95% confidence level for the segments of low income, renters, ethnicity, rural communities and older people).

RESPONSE RATES

However, the two surveys do have different overall response rates – 25%-35% claimed for the CATI delivered Fire Knowledge Survey and 15% for the web-based Fire Efficacy survey.

Given the potential accessibility of *hard to reach* groups to both the internet and telephones, it is unlikely these differences in response rates alone would materially impact the statistical reliability of the result in a material way.

NON-RESPONSE BIAS

The general issue here is whether web-based surveys have a higher and significant non-response bias than do surveys using CATI delivery mechanisms. Non-response bias has been an increasing concern for many researchers using CATI methods for some time as response rates have fallen.

Statistical testing of responses from *hard to reach* groups in these two case studies shows the results were statistically indistinguishable in all cases other than for minority ethnic groups (i.e. other than Maori, Pacific Island and Asian) where sample sizes were too small to produce reliable results.

These results suggest a web-based survey could have no greater non-response bias than a corresponding CATI survey.

RESPONSE DIFFERENCES

The analysis revealed very little difference in survey results between the *hard to reach* groups and the general population, irrespective of survey delivery mode, except for fire preparedness, which is assessed as to equipment, (such as fire extinguishers, first aid kit, garden hose, fire blanket, home sprinklers and access to water sources), available to householders and existence and knowledge within the household of household escape plans.

McDermott Millers Fire Efficacy Survey in 2011 defined Fire Efficacy as the combination of *Individual knowledge about and experience in dealing with fire incidents coupled with a person's fire fighting equipment available in the home* (fire preparedness) and *the belief in one's capability to organise and execute the courses of action required to manage prospective [fire] situations* (fire self-efficacy).

McDermott Miller's 2011 Fire Efficacy Survey also showed, *at risk/hard to reach* groups, with the exception of low income households and renters, are more prepared for fire incidents

than is the general population. Renters and low income households are less likely to own fire safety equipment than the general population and other *hard to reach* groups and are therefore not as well prepared for fire incidents.

Table 3.2 below shows the Fire Preparedness Index values for *at risk*/*hard to reach* groups compared with the general population derived from the survey. The values for all groups other than low income and renters exceed the value for the general population.

Table 3.2: Indice Values for Fire Preparedness: At Risk/Hard to Reach Group Segments compared to General Population

	Low income	Maori & PI	Renter	70 yrs+	Disability	Gen pop
Indice value	5.40	6.00	4.9	6.10	6.3	5.70
N=	493	272	689	211	464	1007

Source: McDermott Miller Fire Efficacy Survey, 2011

With the exception of aged households, all other 'at risk' groups have had greater fire experience than the general population, which increases their overall fire preparedness. Although the aged and the disabled may have had less actual fire experience, they appear to have invested in being better equipped to deal with fires than are the other 'at risk' segments and the general population.

This pattern is repeated in the survey results for overall fire efficacy as shown in the following **Table 3.3**.

Table 3.3: Indice Values for Fire Efficacy: At Risk Group Segments compared to General Population

Segment	Low income	Maori & PI	Renter	70 yrs+	Disability	Gen pop
Index value	8.60	9.30	8.1	9.30	9.6	8.80
N=	493	272	689	211	464	1007

Source: McDermott Miller Fire Efficacy Survey, 2011

Again, the values for all groups shown in **Table 3.3**, other than for low income and renter groups, exceed the value for the general population. These results principally reflect better fire preparedness in all *hard to reach* groups other than low income and renters.

This survey had a margin of error of +/-2.2% at the 95% confidence level as a whole, and results reported for each of the *hard to reach* segments were statistically robust with margins of error of around 4-6% at the 95% confidence level.

The reliability of responses from the web-based survey was greater for *hard to reach* groups than reliability of responses from the CATI survey. This means survey mode is not necessarily a critical factor in determining reliability.

DEMOGRAPHICS

A comparison of the demographics of respondents to the two surveys is shown in the following **Table 3.4.**

Table 3.4: Comparison of Demographic Characteristics in CATI and Web Survey Modes for Hard to Reach Groups

DEMOGRAPHIC CHARACTERISTIC		SURVEY MODE	
HARD TO REACH GROUP	Subset	Fire Knowledge CATI %	Self Efficacy WEB %
ETHNIC GROUPS	NZ European	76.5%	83.0%
	Maori	9.8%	10.3%
	Pacific Island	6.0%	3.4%
	Asian	2.5%	3.0%
	Other	5.2%	0.3%
	Total	**100.0%**	**100.0%**
RURAL COMMUNITIES	Town	35.7%	42.2%
	City	45.9%	31.0%
	Rural	18.3%	26.8%
	Total	**99.9%**	**100.0%**
RENTERS	Own	70.8%	64.6%
	Rent	26.9%	34.6%
	Other	2.3%	0.8%
	Total	**100.0%**	**100.0%**
CHILDREN <18		3.6%	0.4%
LOW INCOME	<$10,000	1.8%	1.7%
	$10,000-$19,999	6.3%	6.7%
	$20,000-$29,999	8.8%	13.0%
	Total	**16.9%**	**21.4%**
OLDER PEOPLE	65+	19.5%	22.1%

Source: McDermott Miller Limited, August 2013

Table 3.4 shows the surveys are similar in accessing *hard to reach* groups although:

- There are some differences in the demographic samples of minority ethnic, renters and low income groups, as well as rural communities, which were more highly represented in the web-based survey reflecting its boost sampling.

- Neither survey reached children in any significant sense. This is not surprising as children under age 18, and under age 15, were excluded from the sample frames of the web-based and CATI surveys respectively as noted in **Section 3.2** above.

3.5 CONCLUSIONS

This case study comparison of the two surveys shows:

- Most individuals in *hard to reach* groups have ready access to telephones and the internet. Even for the group with the lowest level of access (people aged 75+), more than half of them have access to the internet. In other words they can be accessed as well as the general population in most cases.

- Both survey delivery modes can produce representative samples of target populations.

- Response rates do not necessarily mean lower reliability of results or greater non-response bias from either delivery mode.

- Indeed, at the general population level results of the two surveys are statistically indistinguishable, with the exception of minority ethnic groups and children, (which was due to small sample sizes).

- However, the web-based survey is statistically more robust for the *hard to reach* groups due to its larger sample sizes and consequent lower margins of error.

- Given the current level of access to the internet, survey delivery mode (as represented by CATI and Web-based surveys of New Zealand households) makes very little difference to the ability to achieve statistically robust survey results for large sample *hard to reach* groups.

- Moreover, most differences could be controlled by design of surveys and systematic statistically neutral application programmes to obtain required response rates which set the number of follow ups and other assistance to complete surveys.

4. SURVEY METHOD ASSESSMENT

4.1 OUTLINE

The research shows achieving satisfactory results from surveying the *hard to reach* groups is a function of:

- the survey purpose;
- survey design and sample frame;
- the delivery mechanism, together with:
    - scope of the sample frame;
    - accessibility of members of the sample frame;
    - its systematic statistically neutral presentation and follow up; and,
    - community environment in which the survey is delivered;
- survey cost.

This study focuses on delivery mechanisms and their **delivery** cost, but it is important to note the purpose of the survey and design of its questionnaire can have as much if not more impact on obtaining statistically robust responses from *hard to reach* groups than can the delivery mechanism itself.

Assessing which delivery mechanism is most appropriate for delivering each individual survey can be done by considering a range of criteria, including:

- Survey purpose and design (e.g. large sample survey of populations with a target respondent participation time of, say 15 minutes which could best be delivered as CATI or web-based, or small sample survey of a special group, e.g. persons aged over 75 in Counties-Manakau with a target participant time of say 45 minutes, which could best be delivered by face to face interviews).

- Sample frame and availability of contact information from sample frame (e.g., telephone numbers or email addresses).
- Ease of connecting with respondents (source of email addresses or telephone numbers).
- Scope and delivery of programmes to follow up unresponsive or unavailable respondents (e.g. how many repeat telephone calls or repeat emails).
- Presentation requirements to aid respondent engagement and understanding of questions (e.g. text only (for CATI) or visual prompts (web-based or face to face surveys only).
- Required accuracy and likely response rates.
- Delivery cost per valid response.

These criteria are presented in the form of an evaluation matrix in **Section 4.3** below.

4.2 DELIVERY COST

Recent experience shows that, on average, delivery of web-based surveys will cost around one-third to one half the cost of a CATI survey for the same number of valid responses, assuming the same sample and questionnaire design.

- Currently the most expensive part of delivering web-based surveys is obtaining a sample of email addresses. To date there is no public directory of email addresses distributed on a similar basis as telephone directories have been and still are. This means surveyors either develop their own ad hoc address lists with attendant skews and potentially questionable representativeness, or they purchase specified samples from professional sample providers.
- On the other hand, given the continuing availability of telephone directories, the most expensive part of delivering a CATI survey is paying for the interview team.
- These costs are likely to diverge over time – costs of interviewing personnel will continue to rise whereas the

cost of email addresses will fall (as was the case for specific quota telephone numbers in the past).

- Already costs of delivering email/web surveys are around one third to one half the cost of delivering CATI surveys, as a general guideline.

This means delivery cost per valid response could be around half to two thirds the cost of delivering a CATI survey.

Note that these estimates are not derived from a benefit-cost analysis, but are simply a comparison of expenditure on survey delivery assuming similar sample sizes and survey design.

While the ongoing cost of delivery per valid response through web-based mechanisms is lower than through CATI (or face to face interviews), the once-off transition cost from, say, CATI to web-based surveys can be high, particularly if both CATI and web-based surveys are run in parallel for a period to ensure workability and reliability of the new delivery mechanism.

4.3 CONSULTATION WITH NZFS

Consultation with NZFS Managers and Executive Officers was undertaken with the following officers nominated by NZFS.

Piki Thomas	National Maori Advisor
Megan Dromgool	Principal Advisor Fire Risk Management
Keith McIntosh	Area Manager
Mark Thomas	Senior Fire Risk Management Officer
Caroline Rosanowski	Senior Advisor, Communications

Their views are summarised below:

- the key issue in surveying is engaging respondents, not necessarily the delivery mechanism;

- if the subject or purpose of the survey is relevant and/or interesting, then people will respond irrespective of how the survey is delivered;

- engagement is best achieved in face to face interviews, but this a very expensive way of surveying per respondent;

- NZFS may actually generate a better response rate than surveys by other organisations do because of its nature and standing in the community;
- social media is the way of the future and surveying therefore needs to use social media;
- different *hard to reach* groups are more significant in different parts of the country (e.g. ethnic minorities are larger in the North Island than in the South Island), and therefore responses will vary as each group is targeted; and,
- it is important to retain specialised survey methods for small groups (e.g. focus groups of elderly people).

4.4 EVALUATION MATRIX

The following **Figure 4.1** shows an Evaluation Matrix template McDermott Miller has designed to assist evaluation of different survey delivery mechanisms for their effectiveness in reaching *hard to reach* groups. It contains a set of quantitative, qualitative and cost effectiveness criteria for this purpose.

Figure 4.1: Proposed Evaluation Matrix for Evaluating Survey Delivery Mechanisms –Template

SURVEY DELIVERY MECHANISM	EVALUATION CRITERIA											
	QUANTITATIVE					QUALITATIVE					COST EFFECTIVENESS	
	Representativeness	Required Accuracy (margin of error)	Likely Response Rates	Resulting Sample Size	Expected Delivery Time	Ease of connecting with respondent	Sample availability from sample frame	Presentation (Use of visual prompts)	Follow up requirements and programme	Future Research Potential	Delivery Cost per Valid Response	Total Delivery Budget
POST (electoral roll)												
CATI (telephone directory)												
WEB (web panels)												
FACE-TO-FACE (electoral roll)												

Source: McDermott Miller, September 2013.

Such a matrix would be completed in respect of each *hard to reach* group to be surveyed, and all resulting matrices could be consolidated into a single "master matrix" where more than one *hard to reach* group is to be surveyed.

EVALUATION CRITERIA AND THEIR VALUES

Values of the evaluation criteria contained in **Figure 4.1** are expected to be a mix of numeric and non-numeric indicators, some of which will be subjective. Explanations of the criteria and the assignment of values to them are contained in **Figure 4.2** below.

Figure 4.2: Evaluation Criteria and Estimating their Values

CRITERIA	VALUE MEASURE	EXPLANATION
QUANTITATIVE		
Representativeness	%	% of the targeted population able to be sampled. If this value is less than 100% then biases may arise in the survey sample and the survey become less than representative as a result. An example is sampling children for a survey.
Required accuracy	%	Required margin of error at 95% confidence level. This requirement sets number of valid responses needed to achieve the survey's reliability target.
Likely response rates	%	Proportion of valid responses/total sample. This value sets the sample size required to provide the number of valid responses needed to minimise any biases in the survey.
Number of contacts required	number	Number contacts within the population required to attain a given margin of error at a confidence level at likely response rate.
Expected delivery time	days	Period over which delivery should be made an target valid responses received.
QUALITATIVE		
Sample Availability	yes/no source	Availability of email addresses/telephone numbers/addresses. This enables assessment of whether and to what extent telephone numbers or email addresses or other means of sampling are available (e.g. from telephone directories or commercial providers of email addresses).
Ease of connecting with respondents	good/poor	This measure enables assessment of the extent to which the sample population has access to telephones/internet or must be contacted using other methods (e.g. through membership of a community association).
Presentation (use of visual prompts)	Usable/not usuable	If the survey design requires visual prompts then the delivery mechanisms must provide them which effectively reduces the choice of mechanism by eliminating CATI only surveying.
Follow up requirements & programme	number	Number of follow ups of non-respondents to each survey. This measure is intended to indicate the work required to achieve target response rates. The delivery programme should be designed to minimise biasing slow/non-responses.
Future research resource	high/low	Ability to retain and use names and addresses in panels for future research.
COST EFFECTIVENESS		
Delivery cost per valid response	$	Total delivery cost/number of valid responses. Total Delivery cost includes direct costs (if any) of the sample, interviewing, communications, quality assurance and management and excludes survey design, analysis and interpretation.
Total Delivery Budget	$	Total delivery budget (excludes costs of survey design, collation of respondents data, its analysis and reporting).

Source: McDermott Miller, September 2013.

An example of the application of the evaluation criteria of **Figure 4.2** above to the matrix, based on McDermott Miller's own experience of different delivery mechanisms is shown in the following **Figure 4.3**.

This example compares the use of all four mechanisms delivering the equivalent of a 10 minute CATI survey questionnaire to secure 1500 valid responses achieving a margin of error of 2.5% at the 95% confidence level. The results of this example evaluation are illustrative only and may not apply to any other survey or survey delivery in any other situation or circumstance.

Figure 4.3: Example of the Application of the Evaluation Criteria – Illustrative Results

SURVEY DELIVERY MECHANISM	EVALUATION CRITERIA											
	QUANTITATIVE					QUALITATIVE					COST EFFECTIVENESS	
	Representativeness	Required Accuracy (margin of error)	Likely Response Rates	Number of Contacts Required	Expected Delivery Time	Ease of connecting with respondent	Sample availability from sample frame	Presentation (Use of visual prompts)	Follow up requirements and programme	Future Research Potential	Delivery Cost per Valid Response	Total Delivery Budget
POST (electoral roll)	95%	2.5%	5%	30,000	30 days	+	+++	++		+	$30-$33	$45,000-$50,000
CATI (telephone directory)	87%	2.5%	30%	5,000	10 days	++	+++	-	2	+	$12-$17	$20,000-$25,000
WEB (web panels)	80%	2.5%	15%	10,000	5 days	+++	+++	+++	1 to 2	+++	$6-$10	$10,000-$15,000
FACE-TO-FACE (electoral roll)	95%	2.5%	50%	3,000	14-30 days	+	+++	+++	1	+++	$80-$90	$130,000-$140,000

Notes:
1. Basis is a survey questionnaire which would take 10 minutes if delivered by CATI for which 1500 valid responses are required to achieve a 2.5% margin of error at the 95% level of confidence.
2. Results shown in this figure are for illustrative purposes only and may not be representative of any evaluation of delivery mechanisms in any other situation.

Source: McDermott Miller, September 2013.

This example illustrates the advantages of web-based delivery mechanisms as compared with CATI, Post and face-to-face interviewing as:

- a more efficient from of delivery mechanism;
- having greater ability to use visual prompts to present the survey issues;
- a tool for expanding NZFS' future research potential by developing research resources (contact data) as surveys are carried out; and,
- lower cost for the same given levels of reliability and statistical robustness.

5. FINDINGS AND RECOMMENDATIONS

5.1 RESEARCH AIMS AND OBJECTIVES

The objective of this project was to research and develop a methodology for evaluating survey delivery mechanisms for different survey purposes which can guide NZFS in obtaining statistically robust responses from *hard to reach* groups.

In **Sections 2** to **4** above we have discussed and answered the research aims and objectives for this project.

The following sub-sections summarise the research findings, address some implications for NZFS arising from the findings, and make recommendations about appropriate survey delivery mechanisms for the future.

5.2 FINDINGS

The research revealed:

- *Hard to reach* groups are accessible, and are accessible in sufficient numbers to generate statistically robust results. This was shown in McDermott Miller's Fire Efficacy Survey (2011). Achieving this result required persistence in pursuing responses using a systematically neutral statistically reliable method to avoid or minimise response bias.

- Survey delivery mode does not necessarily make accessing *hard to reach* groups more or less difficult (as between CATI and web-based delivery mechanisms).

- Results of individual fire knowledge questions from *hard to reach* groups need not be significantly different between survey delivery modes.

- More than 75% of individuals in *hard to reach* groups have ready access to telephones (landline and/or mobiles) and the internet. Even for the group which has

the lowest level of access (the 75+ age group), more than 50% have access to the internet and 80% have access to a landline.

- Given the prevalence of telephone and internet access amongst *hard to reach* groups (excluding children), survey results by delivery mode can be statistically indistinguishable from one another in terms of robustness.

- In New Zealand access to households via landlines and "snail mail" (post) is decreasing and the unit cost of face to face interviews is increasing. This means post and face to face interview delivery modes are likely to be phased out for all but specialised surveys.

- At the same time, internet access across the whole population including *hard to reach* groups is increasing and visits to social media sites, (particularly "Facebook"), grew very rapidly over the last two years.

- Respondent's engagement with a survey may be assisted by combining a short CATI sampling process of telephoning them to introduce the subject of the survey, check their eligibility to participate, and secure their active participation in the subsequent web-based survey.

- Web-based surveys are cheaper to deliver than CATI or face to face interviews – by about half to two thirds lower cost.

- However, achievement of cost savings over NZFS's long term survey programme will require up front investment in transition from the current survey delivery mode, especially where both web-based and CATI survey delivery modes are initially run in parallel to ensure continuity and integrity and of past existing survey results and workability of the new delivery mode.

- Accessing *hard to reach* groups is more a function of:

    - survey purpose (does it catch the attention of potential respondents?),
    - survey design (are the questions relevant for their particular circumstances?), and
    - application (follow up to potential respondents) to obtaining response rates.

5.3 EVALUATION METHODOLOGY

The following evaluation matrix has been designed to guide NZFS in selecting appropriate delivery mechanisms for *hard to reach* groups (and is applicable to the general population), depending upon the purpose and scope of each survey and the population to be sampled.

Figure 5.1: Proposed Evaluation Matrix Template for Evaluating Survey Delivery Mechanisms.

SURVEY DELIVERY MECHANISM	EVALUATION CRITERIA											
	QUANTITATIVE					QUALITATIVE					COST EFFECTIVENESS	
	Representativeness	Required Accuracy (margin of error)	Likely Response Rates	Resulting Sample Size	Expected Delivery Time	Ease of connecting with respondent	Sample availability from sample frame	Presentation (Use of visual prompts)	Follow up requirements and programme	Future Research Potential	Delivery Cost per Valid Response	Total Delivery Budget
POST (electoral roll)												
CATI (telephone directory)												
WEB (web panels)												
FACE-TO-FACE (electoral roll)												

Source: McDermott Miller, September 2013

Explanations of the criteria contained in **Figure 5.1** are given in **Figure 4.2** and an illustration of their application is shown in **Figure 4.3** in **Section 4.4** above.

5.4 IMPLICATIONS FOR NZFS SURVEYS

These results mean:

On balance there need be little difference in the results achieved from different survey delivery modes, given the widespread access to the internet now available to New Zealand households for *hard to reach* groups as well as the general population. Indeed, over time, as New Zealand Post reduces its "snail mail" service, and the increasing growth of mobile phones and smartphone technology, it is more likely that web-based surveys will become the dominant form of survey as well as the most reliable one.

Choice of survey delivery mode is therefore a function of:

- Subject and purpose of the survey and its need/intent to engage respondents to obtain valid responses from *hard to reach groups*;
- Survey Design;

- Ability and resource available for securing statistically robust sample responses through a well designed statistically neutral follow up programme;
- Delivery cost.

The research showed web-based surveys to be reliable and able to reach *hard to reach* groups, and can be significantly more cost effective than CATI or face to face surveys (for similar sample sizes) once transition costs have been met. These differences are likely to become even greater as access to electronic communication services in all forms (PC, laptops, tablets, smartphones, etc) reaches all parts of the population and segments such as *hard to reach* groups within it.

This highlights a need to change the delivery mechanism for the annual Fire Knowledge Surveys to web-based in the medium to long term.

5.5 RECOMMENDATIONS

In the light of the research results, McDermott Miller recommends that NZFS:

1. Plans to switch its survey delivery mechanisms for *hard to reach* groups to web-based formats, (except where limited special purpose surveys are required for which face to face interviewing may be the most useful delivery mechanism).

2. Effects the change in survey delivery mechanisms over the next 2-5 years to enable web-based and CATI versions to be run in parallel as a test for workability and reliability of the web-based system and to establish a benchmark method for other future surveys that NZFS may wish to undertake.

3. Makes this change in the Fire Knowledge Survey in the first instance

[END]

McDermott Miller Limited
11 October 2013

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ANNEX I
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