2012 Home Heating Survey Results

April 2014 Technical Report 2014/011

Auckland Council
Te Kaunihera o Tāmaki Makaurau

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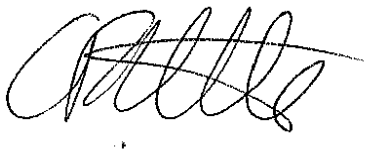

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Executive Summary

This report sets out the methodology and the results of a survey on home heating undertaken by Auckland Council in 2012. The survey contributes to the development of an evidence base to inform a Domestic Fire Emissions Prediction Model (DFEPM), which in turn supports the Auckland Air Emissions Inventory. Previous work on the Air Emissions Inventory identified that further work was required to reduce the uncertainty in the estimates and projections of domestic heating emissions. Therefore, the aim of the survey was to provide the council with information regarding the behaviours and rationales of Aucklanders concerning choice and usage of home heating.

The objectives of the study were to:

- improve certainty in estimates of wood consumption
- determine characteristics and sources of wood being burned
- improve certainty in wood-burner installation and removal rates to improve emissions projections
- determine the incidence of wood-burner usage as a main heating source compared with other methods of home heating
- provide information on rationales for heating-method choice
- provide information required to develop the Domestic Fire Emissions Prediction Model.

This study was based on the findings of a survey of 2800 Auckland households conducted during August 2012. A disproportionate stratified sampling technique rather than pure random sampling was employed to minimise costs. A weighting procedure was used to achieve a balanced sample. To improve estimates of usage levels of the various types of heating, questions were asked about heating usage within an easily remembered time frame.

Wood consumption

Other studies have shown that burner use for domestic home heating, particularly in winter, contributes to significant levels of PM_{10} concentration.[1] Nearly all burners used for domestic home heating in the Auckland area were fuelled by wood. It was estimated that burners are used, on average, for 4.5 hours on a 'typical' winter's day. From this, wood consumption and consequent emissions can be calculated.

Firewood origin and characteristics

Just over half (51%) of the respondents had access to free wood, while a further 16 per cent paid for only some of their wood. In the 2007 survey, 61 per cent of households had said that the wood they used was free.

On average, householders used two different kinds of wood. The most common firewood was natural pine (52%), followed by tea tree or gum (42%) and macrocarpa (38%). However, 17 per cent of respondents used timber that is likely to have been treated (offcuts from building framing, fence posts, etc.), the use of which is prohibited.

The majority of wood users (83%) said that the wood they used in their burner is typically dry.

Methods of home heating

Electricity was the most commonly used method of heating, with 61 per cent of households using electricity for heating their main living areas. Solid-fuel burners (mainly wood) were used by 26 per

[1] PM_{10} are small particles suspended in the air. See the Introduction section for a fuller discussion of the implications of PM_{10} levels.

cent of households, a decline of 3 per cent since 2007. There is also an apparent decline in the use of bottled gas for heating, from 22 per cent in 2007 to 11 per cent in 2012.

Seventy-seven per cent of those who used solid-fuel burners had enclosed wood burners (up from 72 per cent in 2007), while 17 per cent had open fires (down from 23 per cent in 2007) and 6 per cent had multifuel burners and pellet burners.

Around a quarter of the wood burners (24%) used for heating the main living areas were less than seven years old, and so possibly compliant with the National Environmental Standards for Air Quality, which were implemented in 2005. Around half (47%) were between 7 and 20 years old, 17 per cent were more than 20 years old, and the remainder were of unknown age. Open fires tended to be older, with 57 per cent being more than 20 years old. A quarter of open fires (27%) were between 7 and 20 years old and just 5 per cent were less than seven years old.

The main reasons given by respondents for using a solid fuelled burner was that burners are efficient and warm or that they use a wood burner because they can get cheap or free wood. Respondents considering changing to a burner cited similar reasons, although they said they would be dissuaded if other options were cheaper or if there were to be financial help/subsidy into alternative forms of heating. On the other hand, respondents who had switched from a wood burner cited inconvenience, lower efficiency and cost as reasons for their switch away from this type of heating.

Trends in heating methods

The proportion of households using burners (including enclosed wood burners and open fireplaces), has declined from 29 per cent in 2007 to 26 per cent in 2012. This apparent decline is partially offset, though, by the increase in the number of households over those five years. The use of bottled gas has also decreased markedly, from 22 per cent of households in 2007 to 11 per cent in 2012. Although heat pump usage was not measured in 2007, and hence there is no baseline for comparison, it is apparent from replacement patterns that the number of households using heat pumps is rising sharply.

Attitudes to change

Thirteen per cent of all respondents said they had a fireplace that they were not currently using. The main reasons respondents gave for not using their fireplace for heating was that they had “better” heating now, and that alternative methods were more convenient and less messy. Some respondents said they might possibly use their fireplace on a particularly cold night or for ambience on a special occasion, but not on a continuing basis.

Conclusion

The survey has provided valuable information about the number of households that are burning solid fuel (wood in particular), and their reasons for doing so. The usage and attitudinal information will help inform estimation of emissions and future policy direction and initiatives to decrease air pollution associated with domestic heating. Data will also serve as indicators to measure changes in home-heating behaviours over time.

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1.0 Introduction

This report outlines the results of a domestic home heating survey conducted during August 2012 to improve understanding of air emissions arising from domestic heating and the factors that affect those emissions. Previous similar surveys were conducted in 2002 and 2007, allowing trends, if any, to be detected.

Levels of fine particles (PM_{10}) in Auckland's air currently exceed accepted health guidelines, in particular the National Environmental Standards for Air Quality (NES) set by the Ministry for the Environment. PM_{10} are particles smaller than ten micrometres in diameter and are responsible for the majority of adverse health effects and their associated costs to society from air pollution in urban areas. In the Auckland region, home heating is estimated to be responsible for 43 per cent of total annual PM_{10} emissions (Auckland Council, 2011). On a typical winter's day, domestic sources account for 72 per cent of PM_{10} emissions, with wood heating being the principal source, contributing an estimated 91 per cent of those domestic PM_{10} emissions (Auckland Council, 2011; 2012). In other words, PM_{10} emissions from domestic fires are a significant contribution to health risks in Auckland, with significant consequent economic costs (Kuschel et al., 2012).

1.1 Context to the survey

Along with transport (41%), home heating is a major source (43%) of annual PM_{10} emissions, well ahead of industry (15%). Research shows there is considerable variation in emissions, in terms of source and amount, depending on a number of factors including the season, day of the week, and wind; for example, PM_{10} emissions on a typical winter week day were found to be three times those found on a typical summer week day, and on a typical winter week day, 72 per cent of emissions came from domestic sources, whereas in summer it was only 4 per cent (Auckland Council, 2012).

The importance of domestic contributions to emissions suggests the need for accurate assessment of domestic PM_{10} emissions, particularly in the winter months.

Various surveys conducted both in Auckland and nationwide have indicated that the proportion of households using wood and coal burners is declining (Metcalfe, 2010). However, increasing numbers of households due to population growth mean that solid-fuel use remains a significant source of emissions.

This study, based on a survey of 2800 Auckland households, and conducted in August 2012, is required to develop an evidence base to inform the Domestic Fire Emissions Prediction Model (DFEPM). The survey provides measures of average hours of burner use which, in turn, are used to calculate emissions for the Auckland Air Emissions Inventory. The survey also updates data obtained in 2007. The measures included present and past usage of heaters of all kinds, and future usage intention, with particular emphasis on wood burners. From the survey findings, trends in burner use and replacement could be assessed using the model. Respondents' reasons for heater preference were also obtained to provide indications of attitudes to burner use or non-use.

Improvements to the design of the survey method addressed concerns about possible response bias expressed in the estimation of the domestic fire emissions in 2006 (Metcalf, 2010). An improved sampling design also enabled the survey to achieve the 2007 levels of precision (in terms of sampling error) while using a smaller, and hence far less costly, sample than that used in the 2007 survey.[2]

[2] The 2012 survey used using disproportionate stratified sampling then a weighting procedure to achieve a balanced sample. See Appendix C for a full discussion of how the statistical weighting was calculated.

1.2 Objectives

The aim of the research was to build on the findings of the 2007 and 2002 surveys of home heating use. The 2007 survey involved more than 7000 interviews, the cost of which could not be met in 2012 due to budgetary constraints; hence, the 2012 survey had to be designed so that it was as robust as the earlier surveys while costing less.

The main objectives of the study were to:

- estimate levels of wood consumption in terms of hours of burner use
- estimate numbers of solid-fuel burners
- track changes in use of heating methods, particularly solid-fuel burners
- inform estimation of installation and replacement rates for solid-fuel burners based on past usage and future-usage intention
- clarify attitudes to using wood or coal burners, and to changing heating type
- provide inputs for home-heating emissions estimates and modelling.

The survey was conducted through computer-assisted telephone interviews in order to maximise response rates. The sampling precision of the 2007 survey, which used a pure random sample size of more than 7,000, was almost matched using a stratified sample of 2,800 respondents. (See section 2, Survey Method, for a detailed discussion of the rationale behind this approach.)

1.3 Contents of this report

This report outlines the methodology used in conducting the survey including the design of the questionnaire, sampling methodology, and the statistical adjustments made to the raw sample to achieve accurate representation. Information is provided on current home-heating methods, past use and replacement, and future-usage intentions. Detailed topic areas include:

Current use
- The type(s) of heating methods currently used in Auckland households, both in the main living areas and in the rest of the house.
- If a solid-fuel burner is present, its type and the reasons for using it, and also what fuel is used in the burner, including types of wood and how that wood is obtained.

Past use
- The type(s) of heating methods ever used in the current home.
- If a solid-fuel burner had been in use, the age of the burner when it was replaced and the reasons for replacing it.

Future use
- Indications of whether households are considering changing their heating type(s).
- If a household is changing to a solid-fuel burner, the reasons for choosing this type, and factors that might dissuade this change.
- The likelihood of change to another type of heating from the one currently being used.
- If there is a fireplace in the home that is currently not being used, the reasons why it is not being used and factors that might trigger future use.

The results are presented in terms of a number of household descriptors:
- area within the Auckland region
- type of solid-fuel burner in use
- age of burner, by type
- household income
- household tenure, i.e. owner-occupied or rented
- type of home
- age of house.

Technical details are provided in the appendices to this report.

2.0 Survey Method

The survey was conducted under contract to Auckland Council by UMR Research Limited. The survey used telephone interviewing because this method has the best reach for cost given that the incidence of landline telephones in Auckland is high (in 2010, 87% of households had landline access).[3]

The survey was conducted between 7 and 31 August 2012. The response rate was 30 per cent and 2800 telephone interviews were completed.

In designing the survey, consideration was given to the minimisation of biases due to sampling errors (how the sample represents the population being described) and non-sampling errors (including the ways the questionnaire is designed and the interviews conducted).

See Appendix A for a description of the method including full consideration of sources of error.

2.1 Sample selection

Survey respondents were contacted by telephone using a standard computer-aided random-dialling technique. Respondents aged 18 years or over were eligible to be interviewed. If they were not initially available, potential respondents were phoned back up to three times.

While the initial intention was to replicate the sample design used in the 2002 and 2007 surveys, the cost proved prohibitive. Therefore, it was decided to use an unbalanced sample to achieve the required precision.[4] This meant that the sub-samples of burner users were deliberately over-sampled compared with the sub-samples of non-burner users.

Reduction in sample size, and hence cost, was achieved in three stages:

1) The 10 survey areas of the 2007 areas were amalgamated into seven based on similarity, as advised by the client (see Table 1).

2) Precision (in terms of confidence intervals) based on solid-fuel burner use was maintained at the 2007 level (200 in each survey area), but only 200 non-solid-fuel users were included in each area. This is because adding more non-solid-fuel users into the sample would not improve precision of the calculations, which are based on solid-fuel burner usage.

3) The sample was weighted to compensate for the overrepresentation of solid-fuel-burner users.

See Appendix B for full description of the sample and of the dwellings in which they lived.

[3] Statistics New Zealand 2012. http://stats.govt.nz/browse_for_stats/industry_sectors/information_technology_and_communications/HouseholdUseofICT_HOTP2012.aspx

[4] The process is referred to as disproportionate stratified sampling. See Appendix B for a discussion of this sampling method.

2.2 Sample size and weighting

The sample design required at least 200 users of solid-fuel burners to be interviewed in each survey area. Therefore, with the further 200 interviews of users of non-solid-fuel burners, there were 400 interviews for each survey area.

The number of households in each survey area was estimated using the projections from the Auckland Futures Growth Model V3 based on the 2006 Census (Owen, 2012). Table 1 shows how the seven survey areas in the 2012 survey correspond to the 10 survey areas in the 2007 survey.

Table 1 : The seven survey areas

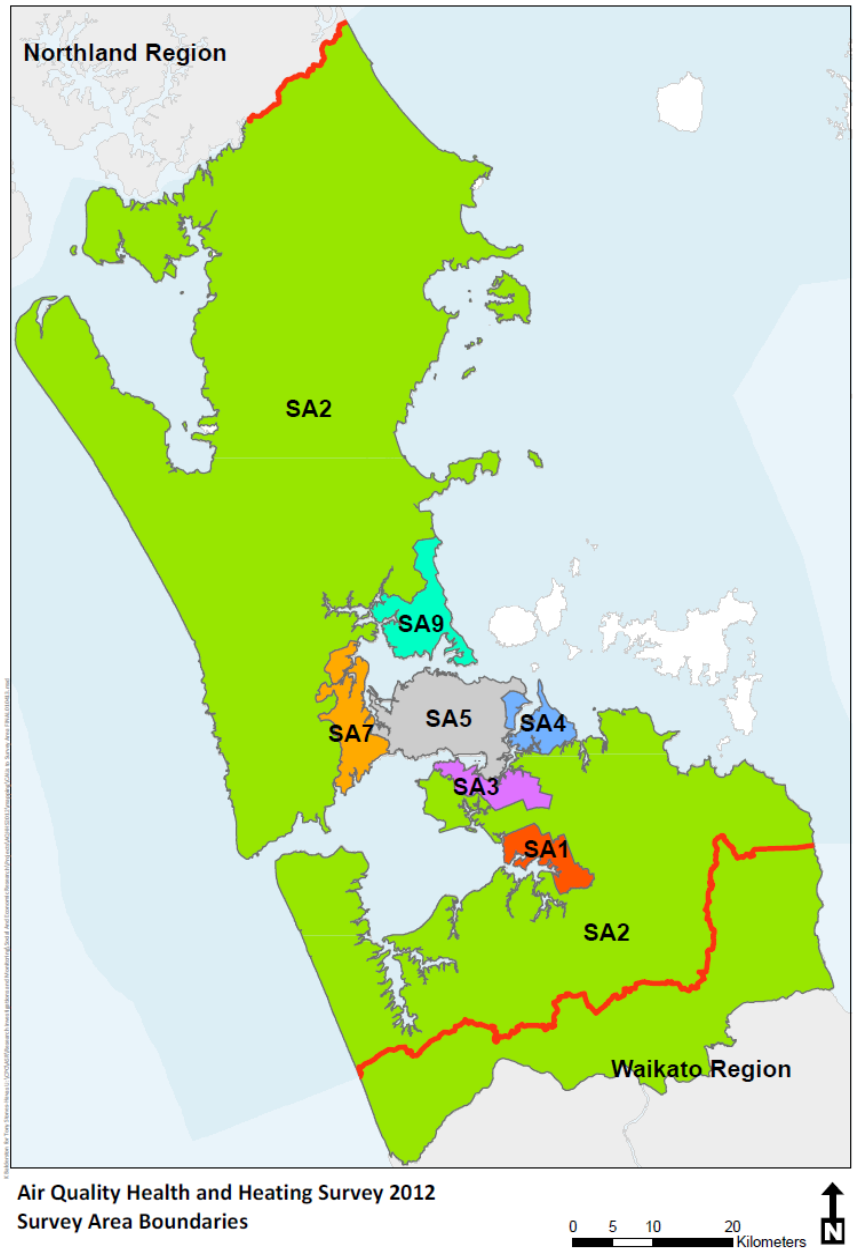
Area No. (2012)	Area No. (2007)	Survey area	Estimated number of households	Number in survey
1	1	Papakura	32,718	400
2	2, 8, 10	Rural Auckland [1]	99,796	400
3	3	South Auckland	34,275	400
4	4	East Auckland	38,347	400
5	5, 6	Central Auckland (Isthmus) [2]	153,970	400
7	7	West Auckland	56,013	400
9	9	North Shore	69,902	400

Notes:

1) The three rural areas from the 2007 survey (Rodney, South Auckland, and West Auckland) were combined into one for the 2012 survey.

2) In the 2007 survey the Auckland isthmus was divided vertically into two equal halves; these two areas were combined into one for the 2012 survey.

Figure 1: The seven 2012 survey area boundaries



The data was weighted by two parameters in combination: the household numbers in each survey area (as estimated) and the incidence of solid-fuel-burner use in each survey area. The latter estimate was derived from two independent surveys: (1) a random sample of approximately 240 households conducted by UMR Research just prior to the main survey, and (2) a survey of 1500 Aucklanders conducted in 2012 for Vector Limited.[5] Both surveys reported 26 per cent of Auckland households using wood burners.[6]

Further adjustment was made to derive estimates of the proportions of burners in each survey area, based on data from the 2007 survey.

[5] The author is grateful to Vector Limited for providing this information.

[6] At the 2013 Census of Population and Dwellings, 23 per cent of households in the Auckland region stated that they used wood to heat their dwelling. This is at the lower level of the 99 per cent confidence interval for the estimate of 26 per cent. More than one heating type could be nominated, and the majority (81.1%) stated that they used electricity.

Finally, the responses from each interview were weighted according to the heating type used by the interviewee and the number of households in their survey area. (See Appendix C for an example of this weighting procedure, full details of the calculations, and a discussion of how the weightings affect the raw data.)

2.3 Potential sources of random sampling error

Even the most representative sample has a margin of error associated with it. The sample in this study was designed to be large enough to yield acceptable margins of error.

The random-dialling technique for the telephone survey was also chosen to maximise the chance that the sample was representative of the population. Even so, a potential bias could arise due to respondents who participate being systematically different on key survey measures (such as types of heating they possess) from those who qualified to participate but did not, due to refusals or not being contactable by landline. It is assumed that given the large sample, those who do not participate would be no different from those who did, although this assumption is difficult to verify.

The extent of bias due to random sampling error is difficult to estimate, but should be kept in mind when interpreting the survey results.

See Appendix A for a more detailed discussion of random sampling error.

2.4 Potential sources of systematic sampling error

2.4.1 Response bias

In designing this questionnaire, consideration was given to potential sources of bias resulting from question wording (such as ambiguous wording, implicit assumptions, leading questions, lack of clarity) and wording susceptible to response bias (such as acquiescence bias, and the related social-desirability bias).

There was the possibility of response bias arising from any risk of detrimental outcomes to the respondent if they were to answer truthfully. This could have arisen if the topic of burner use were sensitive; for example, as it is in Christchurch where there are strong regulatory restraints. However, there are no similar regulatory constraints in Auckland, and there has been no discussion in the political and public arenas over this issue. Therefore, it was concluded that there was insufficient cause for concern about the possibility of deliberately inaccurate responding. Additionally, anonymity of respondents was preserved to encourage candid responding.

Sources of biases due to question wording were minimised by piloting all questions first, paying particular attention to the potential for ambiguity and lack of clarity, as well as appropriateness. Questions relating to usage estimates were made less demanding on the respondent by asking for recall of heater use and broad times of the day used in the recent past (up to a week). A second level of checking was provided by the research company contracted to conduct the interviews – they conducted their own piloting and quality control checks during interviewing.

See Appendix A for a full discussion of potential sources of response biases.

2.4.2 Other sources of error

Other potential sources of error were identified but judged to be sufficiently minor that they could be disregarded. These concerned defining boundaries between survey areas, any supplementary solid-fuel burners in the household in use, and the use of burners using fuels other than wood.

See Appendix A for a more detailed discussion of other sources of error.

2.5 Questionnaire development

Questions were developed in consultation with senior council officers associated with air quality research, monitoring and advice. Questions from the 2007 survey that were relevant to current needs were retained, and other questions added to meet current information requirements. (See section 1.3 for a list of the topic areas).

The questionnaire was designed to enable an efficient, systematic flow of the questions that ensured that answers to earlier questions did not create any tendency to bias responses to subsequent questions.

See Appendix D for a flow chart of the question sequencing and the questionnaire.

2.6 Types and ages of dwellings surveyed

The majority of the respondents to the survey (81%) lived in standalone houses, while 11 per cent lived in townhouses, brick-and-tile flats, or duplexes. Other types of dwellings made up the remaining 8 per cent.

Most dwellings had at least one form of insulation (83%). The most common forms of insulation were above the ceiling (75%), in the walls (50%) and under the floors (37%). Twenty per cent of homes had all three types.

The dwellings were of varying ages. Just over a quarter (26%) were more than 50 years old and 17 per cent were new homes less than a year old (see Table 2).

Table 2: Age of dwellings that were surveyed

	% (n=2800)
0–12 years	17
13–30 years	24
31–50 years	27
More than 50 years	26
Unknown	6
Total	**100**

Around half of the respondents had moved into their current dwelling since 2004, while three-quarters had moved in since 1995.

The largest group (79%) of respondents owned their dwelling, and 21 per cent rented.

See Appendix B for a more detailed breakdown of dwelling characteristics.

3.0 Methods of Home Heating

A key purpose of this survey is to determine the extent to which burners that generate air emissions are used. This chapter reports on the use of burners across the seven survey areas and compares this with other forms of domestic heating.

Note that data about the use of pellet fires and oil burners is excluded from this analysis as their usage was very low.

3.1 Heating methods used

3.1.1 Heating methods used in the main living areas

Respondents were asked which heating methods they use 'these days' for heating the main living areas of their home.

The question allowed respondents to nominate more than one heating method. The majority (88%) used only one form of heating, 11 per cent used two forms, and one per cent used three forms or more.

Most households used electricity – 62 per cent used an electric heater and/or a heat pump, as shown in Table 3. Just over a quarter (26%) burned wood and gas heating was also quite common (21% used bottled or mains gas).

Table 3 also shows which heating methods were the sole forms of heating used. For example, 36 per cent of all households used electric heaters in the main living areas, but 29 per cent used these as their only method of heating.

Table 3: Proportion of respondents using different heating methods in main living areas

	Used at all (%)	Used as sole form of heating (%)
Electric heaters(including bar heaters, oil-filled or fan)	36	29
Heat pump	26	22
Wood burner	26	18
Bottled-gas heater	11	8
Mains-gas heater	10	8
Oil burner	1	1
Coal burner	0.8	<1
Solar heating	<1	0
Some other type of heating	2	1

Notes:
Based on all households in the sample (n=2800).
Respondents could use more than one type of heating; thus totals may exceed 100%.

As Table 3 shows, 26 per cent of households used wood or coal burners for heating their living areas,[7] with 18 per cent using wood burners as their only method of heating. Most users of coal used wood as well, and of the 0.8 per cent of households using coal, very few (0.06 per cent) used it exclusively.

[7] This figure is based on the unweighted sample of around 1700 and has a margin of error of ± 2.5 %.

These results are very similar to those of the 2007 survey. Hence, emissions can be calculated using the proportion of wood burners, without needing to include other types of emission producers (i.e. coal, pellet or oil burners).

3.1.2 Heating methods used in the rest of the home

As well as being asked to nominate which heating methods they use 'these days' for heating the main living areas of their home, respondents were asked to nominate all heating methods used in the home.

Table 4 shows the incidence of types of heating that were used throughout the home. Similar to the results for the main living areas, the largest group (52%) used electric heaters to heat their home.

In order to calculate how areas outside of the main living areas were heated, the percentages of the various heating types used in the main living areas were subtracted from the percentages used overall. As the last column in Table 4 shows, results indicate that other parts of the house were also mainly heated by electric heaters.

Table 4: Proportion of heating methods used in main living areas and the rest of the house

	Used in main living area (%)	Used to heat house (%)	Used to heat outside of main living area (%)
Electric heaters (including bar heaters, oil-filled or fan)	36	52	16
Heat pump	26	28	2
Wood burner	26	28	2
Bottled-gas heater	11	13	2
Mains-gas heater	10	11	1
Oil burner	1	3	2
Coal burner	1	1	0
Solar heating	0	1	0
Some other type of heating	2	2	0

Notes:
Based on all households in the sample (n=2800).
Respondents could use more than one type of heating; thus totals may exceed 100%

3.1.3 Comparison with previous surveys[8]

The survey findings suggest that the use of both wood and coal burners to heat main living areas has declined between 2007 and 2012, as has heating with gas, especially bottled gas (see Table 5). The use of electricity for heating (including heat pumps) has increased between the two surveys however, from 54 per cent to 60 per cent.

[8] 2002 survey data are not used for comparison due to different survey methods.

Table 5: Comparison of heating methods between 2012 and 2007

	2007 (%)	2012 (%)
Electricity (including heat pump)	54	60
Wood	29	26
Bottled gas	22	11
Mains gas	13	10
Coal	2	1
Solar	1	<1

Notes:
Based on all households in the sample (n=7231 for 2007 survey, n=2800 for 2012).

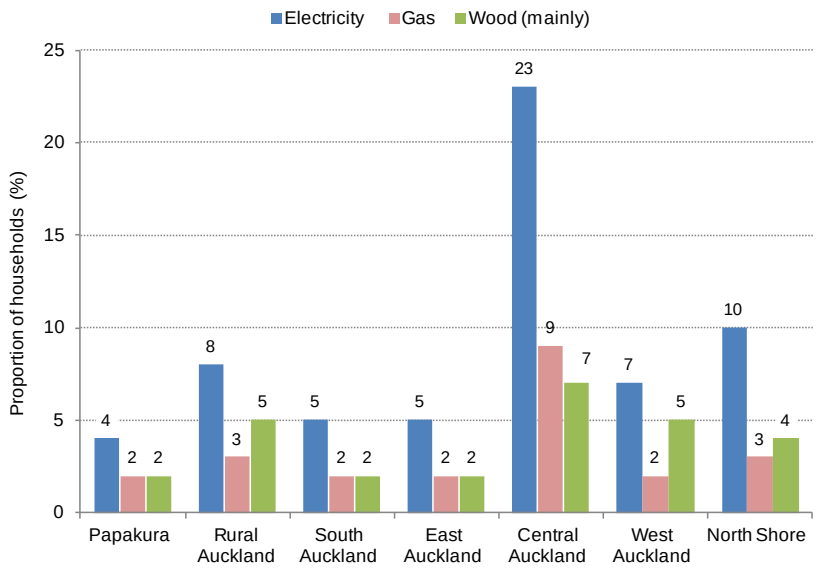
It should be noted that direct comparisons between the 2012 and 2007 survey results are approximate because the two surveys used slightly different categories for recording data. In particular, the incidence of heat pumps was not recorded as a discrete category in the 2007 survey whereas it was an option in the 2012 questionnaire.

3.1.4 Heating methods by survey area

Figure 2 compares the relative frequencies of the three main heating types used in main living areas across the seven survey areas.[9]

Central Auckland had the highest absolute number of wood burners (7% of all wood burners), while South Auckland and East Auckland had the lowest (2% each). However, because Central Auckland had the highest number of households of all seven survey areas, it is perhaps not surprising that it has higher percentages than the other survey areas.

Figure 2: Distribution of main heating types across survey areas



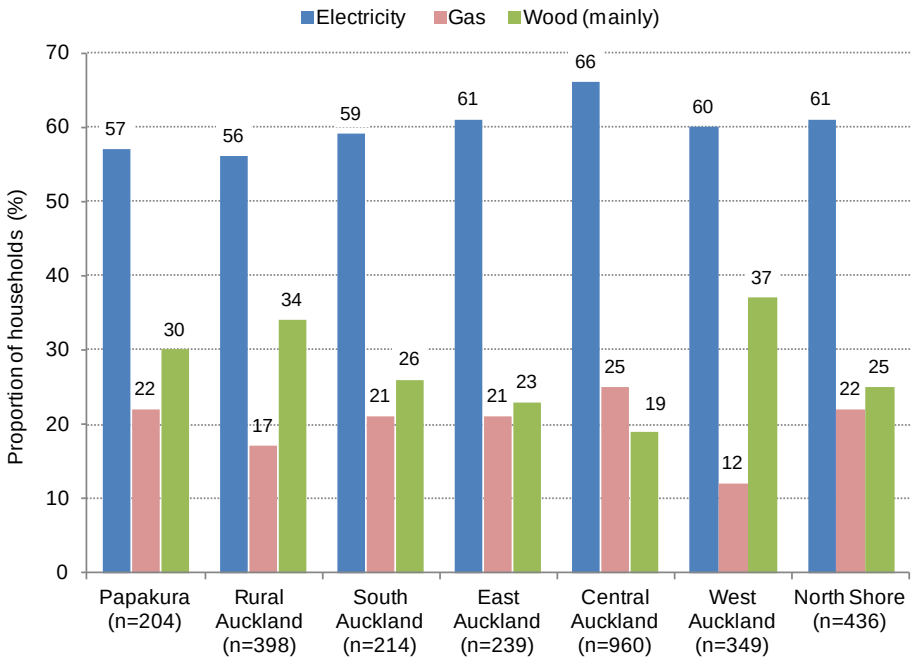
Notes: Proportions are based on all households in the sample (n=2800).
Respondents could use more than one type of heating; thus totals may exceed 100%.

[9] 'Electricity' refers here to those who used electric heaters and or heat pumps, 'Gas' refers to those who used bottled and /or mains gas, and 'wood (mainly)' refers to those who used a solid-fuel burner.

Figure 3 shows the mix of heater types across the seven survey areas.

Electric heaters (including heat pumps) predominate in all areas, but the use of solid-fuel (mainly wood) burners versus gas shows significant differences across the region. For example, higher proportions of households in West Auckland (37%) and Rural Auckland (34%) reported the use of wood burners over gas (bottled and/or mains), whereas use of gas exceeded solid-fuel use in Central Auckland.

Figure 3: Relative proportions of heater types, by survey area

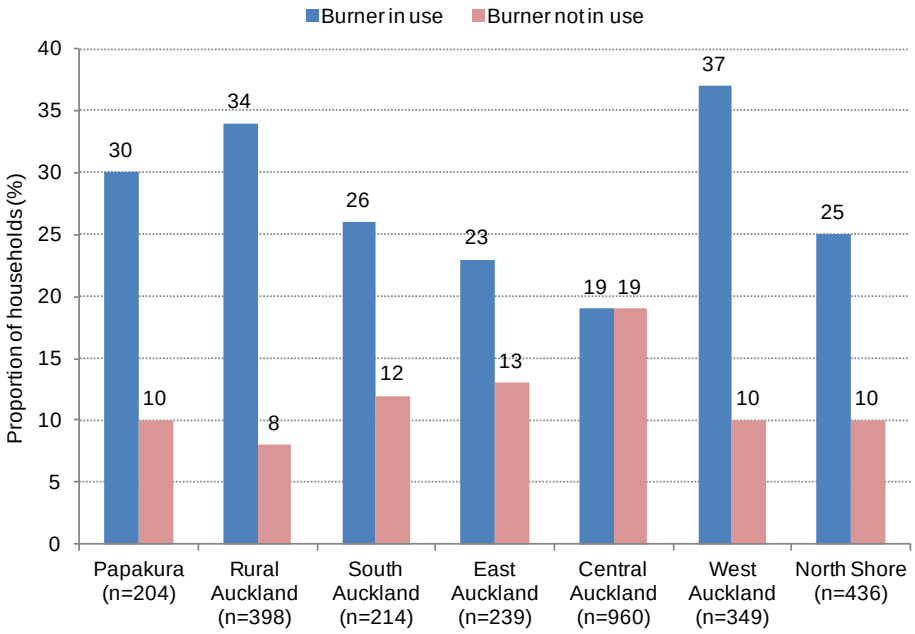


Note: Proportions are based on households within each survey area.

3.2 Unused solid-fuel burners

Thirteen per cent of respondents said they had a fireplace or wood burner that they did not currently use. Around half of these unused solid-fuel burners were in the Central Auckland survey area. This area also had the highest proportion of households who reported that they did not use their solid fuel burner or fireplace, at 19 per cent (refer to Figure 4).

Figure 4: Proportions of used and unused burners, by survey area



Note: Proportions are based on households within each survey area.

When the numbers of used and unused burners were added together, Central Auckland stood out as having the highest number (13% of the region's total) of installed wood burners. West Auckland, North Shore and Rural Auckland had similar numbers (slightly more than 5%), while Papakura, South Auckland, and East Auckland each had less than 5 per cent.

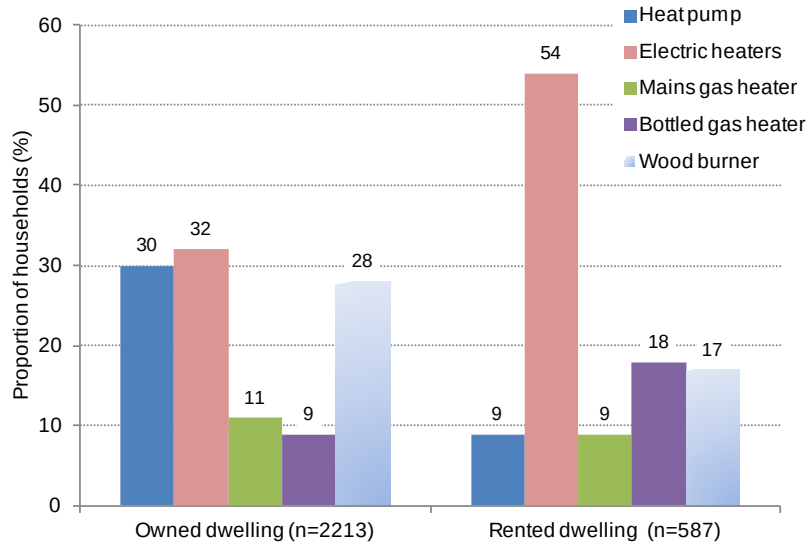
3.3 Heating methods and home ownership

As Figure 5 illustrates, both home owners and renters most commonly used electric heaters (including bar, oil-filled or fan heaters) to heat the main living areas in their households. However, there were several marked differences between the two groups.[10]

In addition to electric heaters, 30 per cent of home owners stated they used a heat pump compared with nine per cent of renters. A higher proportion of renters stated they used bottled gas (18% compared with 9% of homeowners). Thus, renters tend to be more reliant on portable heating sources.

[10] All differences except for mains gas heating are statistically significant at the 0.05 level.

Figure 5: Relative proportions of heating types used in main living areas, by home tenure

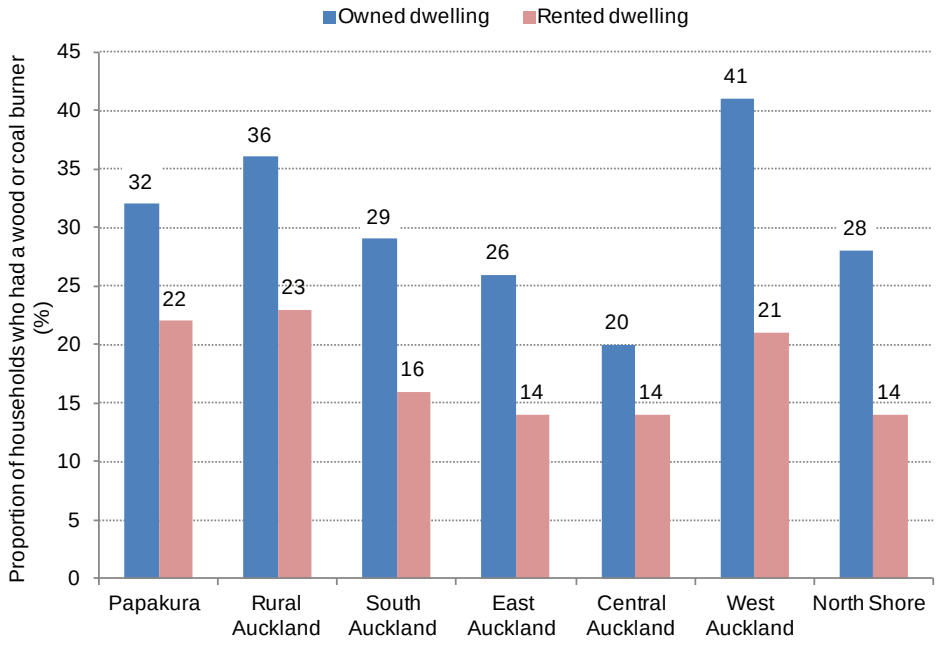


Note: Respondents could have more than one type of heating; thus totals may exceed 100%.

3.3.1 Solid-fuel burners by area and home ownership

As Figure 5 shows, a greater proportion of home owners than renters had a wood or coal burner in their main living area (28% compared with 17%). This finding is consistent across all seven survey areas, as shown in Figure 6. The differences were greatest in West Auckland and lowest in Central Auckland.

Figure 6: Proportions of home owners and renters who had a wood or coal burner, by survey area



Note: Proportions are based on households within each survey area.

3.4 Appliance replacement

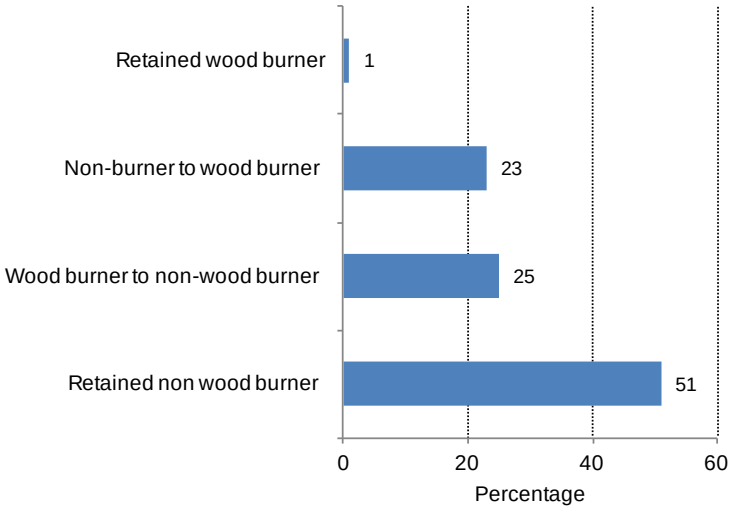
Respondents were also asked what heating methods they had ever used to heat their main living area. Comparison between the responses to this question with the question about current use provides information about levels of switching from burners to non-burners, or vice versa.

Overall, 38 per cent of respondents had used a different form of heating at some time while they were living in their current home. There were differences by the type of dwelling that respondents lived in (for example, 7% of residents in high-rise apartments had switched, compared with 40% in a stand alone house), and whether they owned or rented the dwelling (28% of renters had switched, compared with 41% of those who owned). There were no statistical differences by area.

Of those who had changing their heating method, 51 per cent had changed from one non burner to another, but very few who had used a wood burner previously had changed to another wood burner. The numbers who had switched from a wood burner to a non-wood burner, or vice versa, are almost the same (25 and 23 per cent, respectively).

These findings are summarised in Figure 7.

Figure 7: Patterns of switching and retention between burners and other heating types



Note: Percentages based on those who had 'ever' used a different form of heating than they currently do (n = 1066).

This topic is discussed in more detail later in this report. Section 4.3 provides a full description of appliance switching, including switching from open fires and wood burners, while section 5 provides a full description of past switching patterns and future switching intentions and reasons why.

3.5 Summary of home heating methods

- Wood is by far the most commonly used solid fuel, with 26 per cent of all respondents in the 2012 survey stating they burned wood. Only 1 per cent burned coal, and very few (0.06 per cent) burned coal exclusively.

- The most common heating method for main living areas was by electric heaters (36%), followed by heat pumps (26%), wood burners (26%), bottled-gas heaters (11%), and mains-gas heaters (10%).

- Comparisons with the 2007 survey suggest a rise in the number of households using electricity (including heat pumps) to heat their homes and a similar drop in the use of bottled gas.

- Central Auckland stands out as having the highest numbers of fireplaces or burners, both in use and not in current use, and the proportions of used versus unused burners are almost the same. This is different from the other survey areas; for example, Rural Auckland has between four and five times as ma

- Renters tend more to use portable heating sources, and they use solid-fuel heating much less than home owners do (17 per cent compared with 28 per cent, respectively).

- Thirty-eight per cent of householders had used a different form of heating during the time they had lived in their current dwelling. Half of the switchers (51 per cent) had converted from a non-wood burner to another kind of non-wood burner, while approximately one quarter had switched from a non-wood burner to a burner (23%) or vice versa (25%). Very few had changed from one kind of wood burner to another.

- When householders replace their appliances, the proportion of those moving from a wood burner to a non-wood burner is almost matched by those moving the other way.

4.0 Solid-Fuel Burners

This chapter reports on the use of solid-fuel burners. Data was collected on the types and ages of appliances currently being used, appliance replacement rates, and previous methods of heating used. Different types and ages of appliances yield different emissions, and so the profile of the burners being used is a significant determinant of domestic heating emissions. Knowing the types and ages of burners being used will contribute to developing robust emissions estimates.

4.1 Types of burners

Respondents who had indicated they had a solid-fuel burner heating their main living area were asked what kind of burner it was. Table 6 outlines the choices and definitions that were read out to them.

Table 6: Definitions of types of solid-fuel burners

Wood burner	This is a fully enclosed burner but does not include multi-fuel burner like those that burn coal, or a pellet fire.
Open fire	This is enclosed on three sides but opens on the front; includes a visor fireplace.
Multi-fuel burner	An enclosed burner that burns wood as well as coal; this includes incinerators, pot-belly stoves, McKay space heaters, etc., but does not include open fires.
Pellet fire	A fire that burns processed wood pellets.

Note: The results for responses stating wood burner are referred to as 'enclosed wood burners' in this section of this report.

Figure 8 shows that of those households with a solid-fuel burner, enclosed wood burners were the most common type (77%) used to heat the main living area, followed by open fires (17%). Multi-fuel burners (4%) and other types (2%), including pellet fires, were not common.

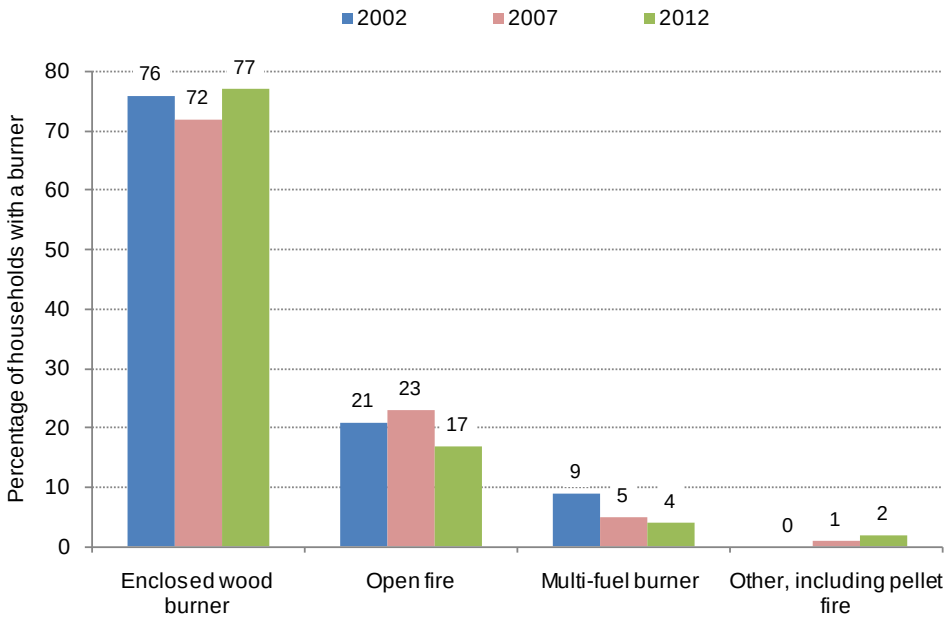
Figure 8: Types of solid-fuel burners used in main living areas

Note: Based on households with a burner (n=733).

Figure 9 (see next page) compares the 2012 findings with those from earlier surveys. The use of open fires has declined since 2007 from 23 per cent to 17 per cent, but this is matched by an increase in the use of wood burners (from 72% to 77%).[11] Enclosed wood burners remain predominant.

[11] *Z*-test for proportions; significant at 0.05 level.

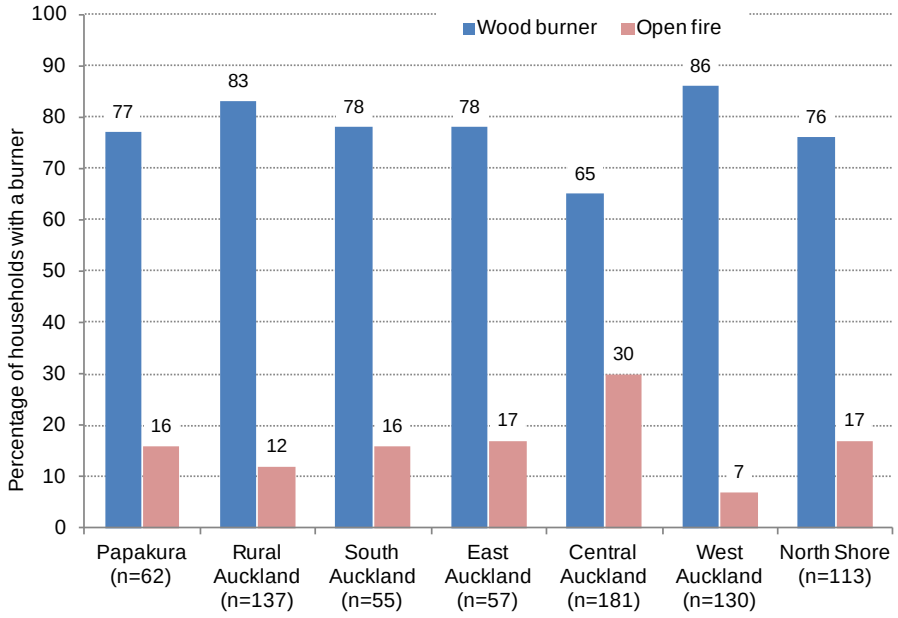
Figure 9: Comparison of solid-fuel burners currently used in main living areas with findings from previous surveys



4.1.1 Types of burners by survey area

The relative use of enclosed wood burners versus open fires varied across the seven survey areas. Central Auckland respondents reported the highest use of open fires (30%) whereas West Auckland had the smallest proportion (7%). The other areas had similar proportions (between 12 and 17%).

Figure 10: Proportion of enclosed wood burners and open fires, by survey area

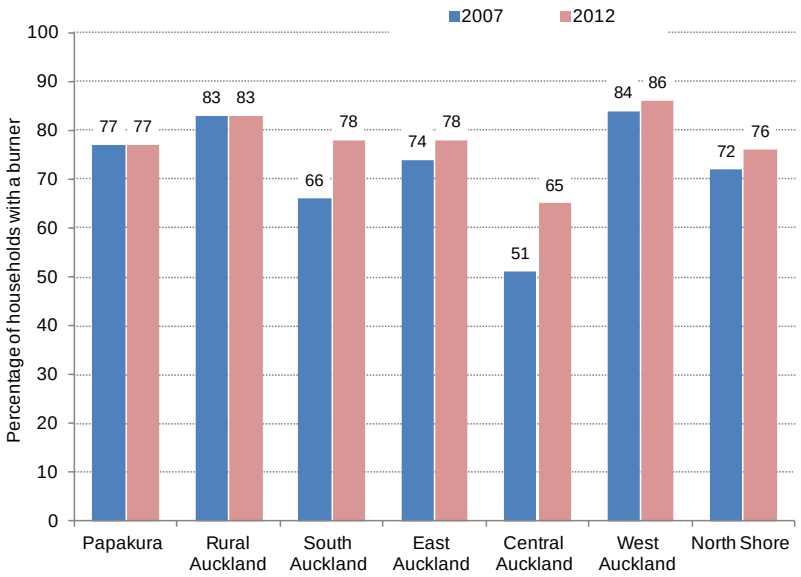


Notes: Based on households with a burner (weighted n=733, unweighted n=1405).
Unweighted bases are approximately n=200 in each of the survey areas.

Wood burners

As mentioned previously, the proportion of households with solid-fuel burners who reported they had enclosed wood burners increased slightly from 72 per cent in 2007 to 77 per cent in 2012.[12] However, this increase was not consistent across the region - increases were evident in South Auckland and Central Auckland, but the other areas showed little or no change in the use of wood burners. See Figure 11.

Figure 11: Comparison of enclosed wood burners currently used in main living areas with findings from previous survey, by survey area



Note: Based on households with any burner (2007: n=2070; 2012: weighted n=733, unweighted n=1045).

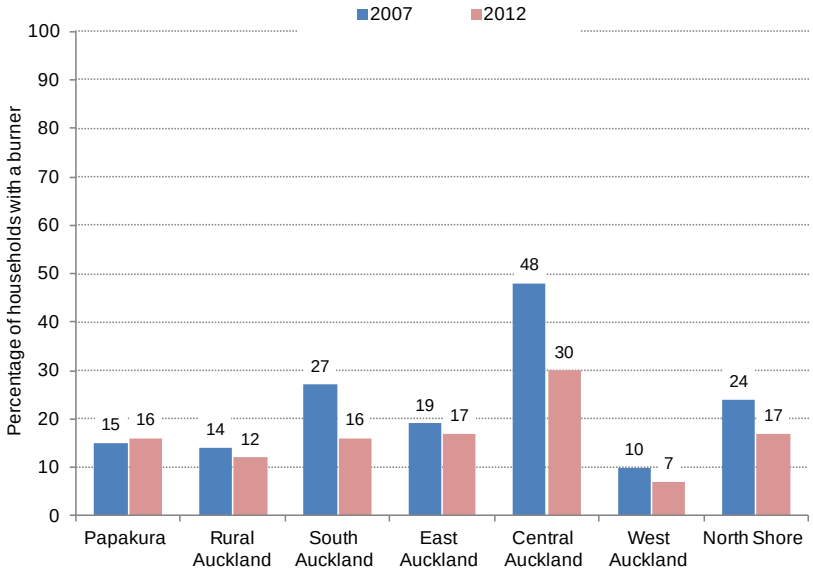
Open Fires

In contrast to wood burners, the use of open fires has declined across Auckland since the 2007 survey, from 23 per cent of households with solid-fuel burners in 2007 to 17 per cent in 2012.

Once again, though, the declines are not uniform across the region: households in Central Auckland, South Auckland and North Shore reported they used open fires less, but the proportions of use remained at similar levels (within 3%) in the other four survey areas. Refer to Figure 12 over page.

[12] *Z*-test for proportions; significant at 0.05 level.

Figure 12: Comparison of open fires currently used in main living areas with findings from previous survey, by survey area

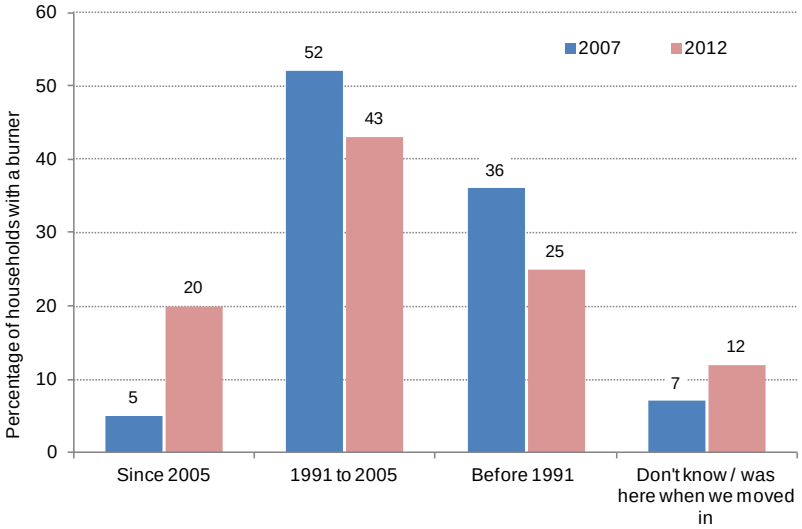


Note: Based on households with any burner (weighted n=733, unweighted n=1405).

4.2 Age of burners

Respondents were asked how old their solid-fuel burner was. Figure 13 shows the results compared to results from the 2007 survey. It shows that incidence of burners that comply with the National Environmental Standards for Air Quality (NES) have increased from 5 per cent to 20 per cent.

Figure 13: Distribution of ages of solid-fuel burners, 2007 and 2012 surveys



Note: Percentages based on households using a solid-fuel burners (2007 survey n=1924, 2012 survey n=1383)

Table 7 below shows how the age-distribution of burners has changed between the 2007 and 2012 surveys, but it relates this as a percentage of all the households in the surveys, not just those households with a burner. These percentages are used to provide estimates of the total number of households using burners of different ages within the Auckland region.

Table 7: Comparison of age of burners, 2007 and 2012

	Percentage of all households		Estimated number of households	
	2007 (n=7231)	2012 (n=2800)	2007 (1)	2012 (2)
Less than 7 years (i.e. since 2005)	2	5	6804	25,300
Between 7 and 21 years (i.e. from 1991)	15	11	67,585	53,800
More than 21 years (before 1991)	10	6	46,266	31,000
Unknown age	2	3	9072	14,700

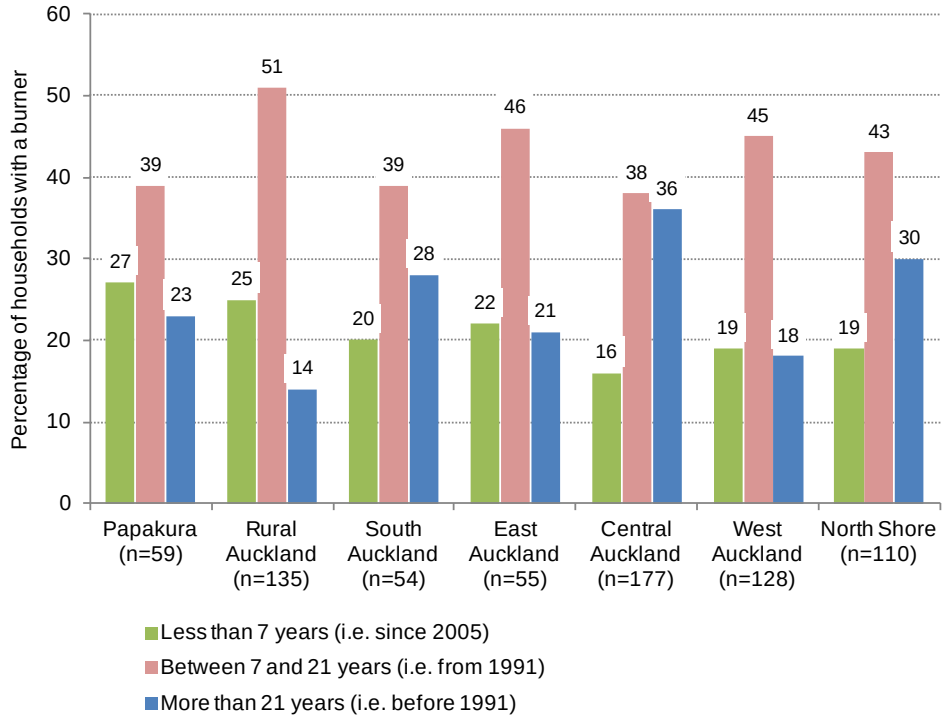
Notes:
1. Based on 2006 New Zealand Census counts
2. Based on Auckland Futures Growth Model

4.2.1 Age of burners by survey area

Central Auckland, at 36 per cent of households, stands out as having highest proportion of solid-fuel burners that are more than 21 years old (i.e. in place before 1991), and Rural Auckland had the lowest proportion (14 per cent). The proportions of burners older than 21 years old in other areas were quite similar.

The proportions of solid-fuel burners less than seven years old ranged from 16 to 27 per cent across the survey areas, however, these differences are not statistically significant.

Figure 14: Ages of solid-fuel burners, by survey area



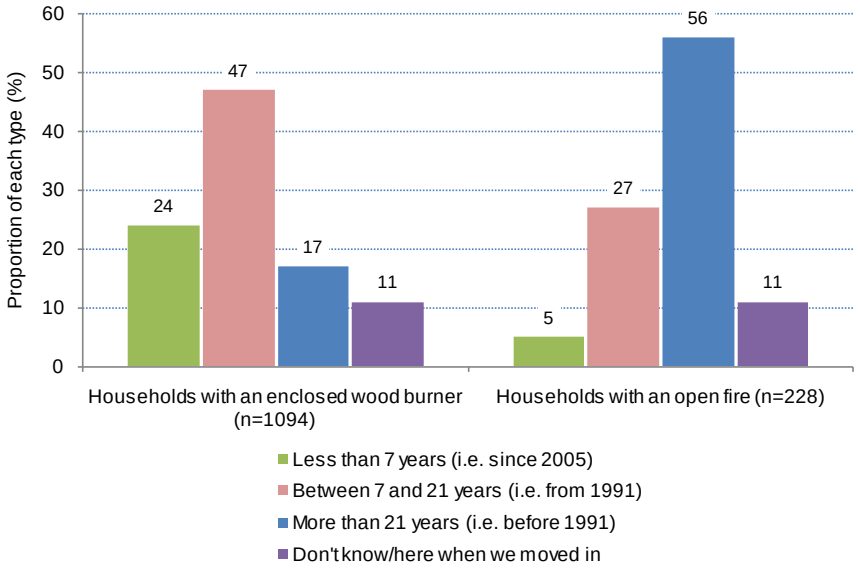
Notes: 1. Based on all households in each survey area with a solid-fuel burner.
2. Weighted bases are shown in the graph; unweighted bases are approximately n=200 in each of the survey areas.
3. "Don't know" responses are not shown, so totals do not add to 100%.

4.2.2 The relationship between types and age of burners

Open fires have a much older age profile than enclosed wood burners. Figure 15 shows that only five per cent of open fires were less than seven years old while more than half were 21 years or older.

In contrast, 24 per cent of enclosed wood burners were less than seven years old, while fewer than one in five were in the oldest category.

Figure 15: Ages of enclosed wood burners and open fires



Notes: Based on all households with one of the three main types of solid-fuel burner (weighted n=719, unweighted n=1383).

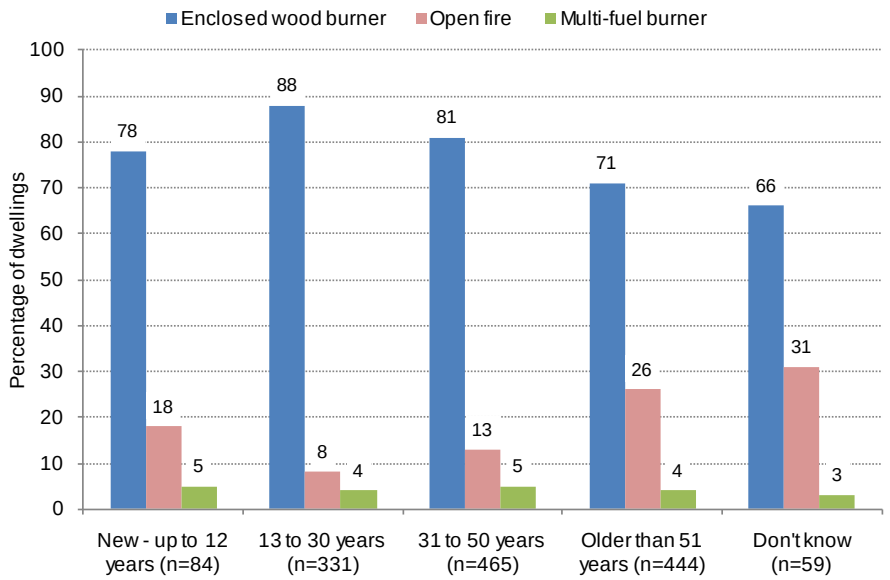
4.3 Appliance and dwelling age

Enclosed wood burners were the most common type of solid-fuel burners, regardless of the age of the dwelling.

There was, however, a correlation between the use of open fires and dwelling age. That is, the proportion of open fires was highest in the older dwellings, i.e. dwellings more than 50 years old, while their use was much lower in the newer dwellings. The exception to this was in the dwellings built within the last 12 years, where 18 per cent of all fires were recorded. See Figure 16.

It should be noted however, that the base number of these new dwellings is relatively small (n=84), and that the difference compared with the percentages in the other age categories is not statistically significant.

Figure 16: Distribution of the main types of burner, by dwelling age groups



Note: Based on all households with burner of any of the three main types (weighted n=719, unweighted n=1383).

4.4 Appliance switching and replacement rates

As discussed in section 3.4, respondents were asked if they had ever used a different method of heating in their main living area, and if so, what method they had used previously. Thirty-eight per cent of respondents said they had used a different heating method before their current one. As outlined earlier, the proportion who switched from a wood burner to a non-wood burner (25%) was almost matched by the proportion who switched the other way (23%). This section discusses in more detail those who switched from open fires and enclosed solid-fuel burners.

4.4.1 Open-fire replacement

Of those who had changed their heating method, 14 per cent had previously used an open fire. This equates to five per cent of all respondents.

Just over a third (38%) of those who had changed from an open fire were currently using a heat pump in their main living area. A further 36 per cent were using electric heating, 16 per cent a mains-gas heater, and 14 per cent a bottled-gas heater.[13]

Nearly half (43%) said that their open fire had been more than 30 years old when they replaced it. In reality, this figure could be even higher because nearly a quarter (24%) did not know how old their open fire was when it was replaced.

Table 8: Age of open fire when it was replaced

	Among households who previously had an open fire (%) (n=145)	As percentage of all households surveyed (n=2800)
Less than 15 years old	15	<1
Between 15 and 30 years old	18	1
More than 30 years old	43	2
Don't know/here when we moved in	24	1
Total	**100**	**5**

4.4.2 Enclosed solid-fuel burner replacement

Of those who had changed their heating method, 13 per cent had previously used an enclosed solid-fuel burner.

Over half (58%) of those who had changed from an enclosed solid-fuel burner were now using a heat pump in their main living area. A further 32 per cent were using electric heating, 8 per cent a bottled-gas heater, and 4 per cent a mains-gas heater.

Twenty-six per cent said their enclosed solid-fuel burner had been less than 15 years old when they replaced it, 24 per cent said it had been between 15 and 30 years old, and 20 per cent said it had been more than 30 years old. As with the open fire data, these numbers should be treated with caution because nearly a third of respondents (30%) did not know the age of their solid-fuel heater when they replaced it.

Table 9: Age of enclosed solid-fuel burner when it was replaced

	Among households who previously had an enclosed solid-fuel burner (%) (n=140)	Percentage of all households surveyed (n=2800)
Less than 15 years old	26	1
Between 15 and 30 years old	24	1
More than 30 years old	20	1
Don’t know/here when we moved in	30	2
Total	**100**	**5**

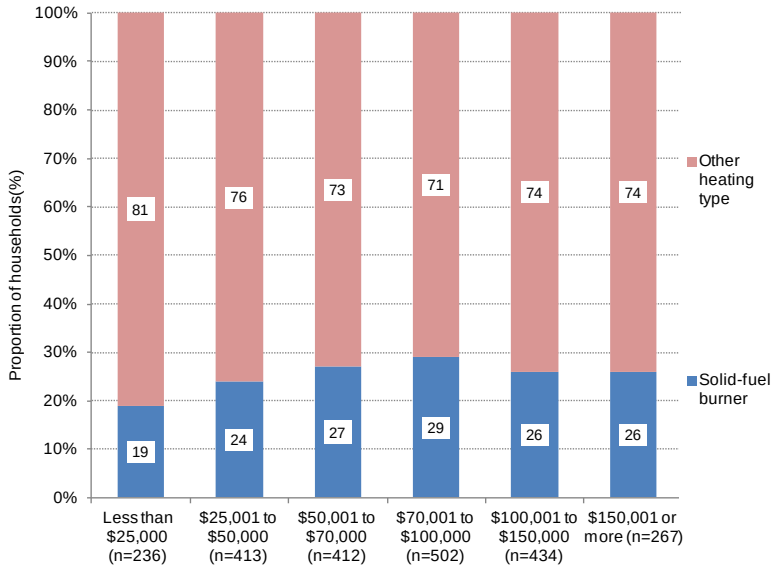
[13] Respondents could mention more than one type.

4.5 Burner type and household income

Households earning less than $25,000 a year appear to be less likely than households with a higher annual income to use solid-fuel burners for heating (see Figure 17).

The pattern shown in Figure 17 is similar to that found in the 2007 survey, except that the incidence of burners in households with an annual income exceeding $100,000 appears to be slightly lower than that in 2007.

Figure 17: Use of solid-fuel burners, by household income



Note: Based on all households in the sample (*n* = 2800).

There were no statistically significant differences in the use of wood burners or open fires by household income.

The incidence of open fires appears to vary with household income, but the differences from one income category to another are too small to be statistically significant. The same applies for enclosed wood burners.

4.6 Summary of solid-fuel burners

- Seventy-seven per cent of households with a solid-fuel burner had an enclosed wood burner, a slight increase from 72 per cent in 2007. This rise is almost matched by the decline in open fires (fireplaces), down from 23 per cent in 2007 to 17 per cent in 2012. The remaining 6 per cent of households with a solid-fuel burner had a multi-fuel or some other kind of burner, a similar level to that found in the 2007 survey.

- One-fifth of solid-fuel burners (20%) were less than seven years old, and so were likely to comply with National Environmental Standards.

- The incidence of solid-fuel burners that comply with the National Environmental Standards for Air Quality (i.e. solid-fuel burners installed since 2005) has increased from 5 per cent to 20 per cent of households. Most of this change seems to come from the replacement of older burners.

- Forty-three per cent of solid-fuel burners were between 7 and 21 years old, and a quarter (25%) was more than 21 years old. These numbers could be even higher, as nearly one in eight

householders (12%) did not know the age of their burner. These older burners may not comply with the 2005 National Environmental Standards for Air Quality.

- Central Auckland had proportionately more open fires in use (30% of solid-fuel burners) than the other survey areas, and West Auckland had the least (7%).

- Central Auckland had a higher proportion of older solid-fuel burners (36%) than other areas. However, there had been change in this area since 2007, with enclosed wood burners showing a proportionately greater increase, matched by a corresponding decrease in open fires, compared with the other survey areas.

- Open fires tended to be older, with 56 per cent more than 21 years old. By comparison, only 17 per cent of enclosed wood burners were in the oldest category.

- Open fires were most commonly found in older dwellings. In houses more than 50 years old, 26 per cent of all solid-fuel burners are open fires, but for houses built in the last 12 years, the incidence of open fires dropped to 18 per cent.

- Householders who had switched from an open fire tended to replace it with a heat pump (38 per cent) or other method of electric heating (36%). Mains gas (16%) and bottled gas (14%) appear to be less preferred as the replacement heating method. Usually it was the older fireplaces that were being replaced.

- When householders switched from an enclosed solid-fuel burner, they tended to replace it with a heat pump (58 per cent). Heat pumps were preferred over other methods of electric heating (32%), bottled gas (8%), and mains gas (4%). Unlike fireplaces, solid-fuel burners of all ages are being replaced.

5.0 Factors Affecting Choice and Use of Solid Fuel

The questionnaire asked people why they used a solid-fuel burner, or why they had switched from, or were not currently using, their solid-fuel burner. The questionnaire also asked whether they were considering switching their method of home heating and their future intentions about using solid-fuel heating. This information is useful to inform policy development.

5.1 Reasons for burning solid fuel

The main reasons why respondents used a wood burner, open fire or multi-fuel burner in their main living area were:

- more efficient/warmer than other methods (28%)
- wood supply is cheap (26%)
- enjoyment/ambience (23%)
- wood supply is free (20%)
- there is no other heating in the house/living area (20%)
- it heats the whole house (17%)
- the burner was already here when we moved in (5%).[14]

The reasons varied according to the type of burner in use. For example, efficiency and being warmer than other methods was mentioned more by respondents with fully enclosed wood burners (30%) than those with open fires (19%), whereas enjoyment and ambience were mentioned more by those with open fires (32%) than those with enclosed wood burners (20%).

Home-owners (24%) were more likely to mention enjoyment and ambience than renters (15%).

No statistically significant differences were apparent by survey area.

5.2 Reasons for switching from a burner to another heating method

The main reasons why respondents had switched from a wood or coal burner to a different heating method were:

- convenience/work involved (38%)
- wood/coal less efficient (25%)
- cost (18%)
- renovating/burner didn't work properly/worn out (11%).[15]

[14] Percentages are based on the weighted sample size of 719 households currently using a solid-fuel burner.
[15] Percentages are based on a sub-sample of those who had previously used a wood or coal burner but had switched to a different heating method (weighted n=271).

5.3 Considering change

Eighteen per cent of respondents were considering changing to another method of home heating in the next few years. Respondents living in older dwellings were more likely to be considering change, with 17 per cent of those living in dwellings between 13 and 30 years old considering it, compared with 22 per cent of those living in houses between 31 and 50 years old. A slightly higher proportion of those currently using a non-wood burner (19%) were considering change, compared with those who are using a wood burner (15%).

Nearly two-thirds (65%) of those considering change were looking to switch to a heat pump. Nine per cent were considering switching to a wood burner, while other heating methods had much lower preference levels.

Forty-eight households were considering changing to a wood or coal burner, for the following main reasons:

- more efficient/warmer than other methods (37%)
- wood supply is free (26%)
- enjoyment/ambience (21%).

When those who indicated a preference for a wood burner were asked what might make them consider some form of heating other than wood or coal, their responses were varied. However, two main circumstances stood out:

- if alternative types of heating were cheaper (30%)
- with financial help or subsidy (24%).

Those who were considering change were then asked when they would most likely make the change.[16] As Table 10 shows, 13 per cent said they would do so within the next six months. This equates to around two per cent of all households in the survey, or 11,000 households in the Auckland region.

Table 10: Intended time frame for change

	Percentage of households intending to change (n=503)	Percentage of all households surveyed (n=2800)
Within the next month	7	1
Within the next 6 months	6	1
Within the next 12 months	28	5
Within the next 2 years	27	5
Sometime after 2 years	21	4
Don't know/not sure	11	2
Total	**100**	**18**

[16] It should be noted that when interpreting these findings, an expressed intention to purchase is only reliable within short time frames. Experience suggests that an expressed *intention* to purchase is generally not a reliable indicator of a *commitment* to purchase unless time frames are short, i.e. the commitment to purchase becomes more probable in a shorter time frame. This finding is based on forecasting demand from surveys about intention to purchase over a variety of products and services in a commercial marketing research setting.

5.4 Reasons for not using an existing fireplace or wood burner

As reported in section 3.2, respondents were asked whether they had a fireplace or wood burner in their home that is not used. Just over one in ten (13%) said that this was the case.

There was a sharp distinction in responses between those living in dwellings less than 30 years old (e.g., 6% of those living in dwellings aged 13 to 30 years had an unused fireplace or wood burner) and those living in older dwellings (e.g., 24% in dwellings aged 50 years or older). There was a higher concentration of unused burners in Central Auckland (20%) than in the other survey areas.

The main reasons that households did not use their fireplaces or wood burners centred on the presence of alternatives that were better and more convenient to use:

- have better heating now (32% of those with an unused fireplace)
- convenience (28%)
- it is not in working order (12%)
- cost (11%)
- too messy (11%)
- environmental reason (6%)
- health reasons (6%)
- renovating (5%)

Just over a third (37%) of those with unused fireplaces (equating to 5% of all households) said they would want to use it again sometime. When asked on what sort of occasion that would be, responses were:

- on a particularly cold day or night (39% of those with unused fireplaces)
- when there are visitors or a special occasion (18%)
- if there is a power cut (6%)
- if they get free firewood (5%).

5.5 Summary of factors affecting choice and use of solid fuel

- Those using a solid-fuel burner did so because they considered that it was more efficient and warmer than other methods, wood supply was cheap or free, and it provided a good ambience.

- Those who had used a wood or coal burner in the past but changed to non-burner did so because of the burner's inconvenience, its lack of efficiency, cost, or its state of disrepair.

- Twelve per cent of respondents stated they were considering changing their heating method in the next six months. The majority (65%) of these people said they would prefer to be using a heat pump. Wood burners ranked as the next preferred method, although these were well behind, at only 9 per cent.

- Those considering changing to wood burners gave reasons including efficiency, heat output, free wood supply and their liking of wood burners' ambience. These householders said they could be dissuaded from switching to wood burners if alternative methods of heating were cheaper, or if there were a financial subsidy for alternatives.

- Thirteen per cent of respondents said that their dwelling had a fireplace or wood burner that they did not currently use. They said this was because they have better heating now (i.e. a method that was more efficient or convenient), or because the fireplace was not in working order, or was costly or messy. These householders might consider using their fireplace on a particularly cold night, or for special occasions.

6.0 Fuel Consumption in Solid-Fuel Burners

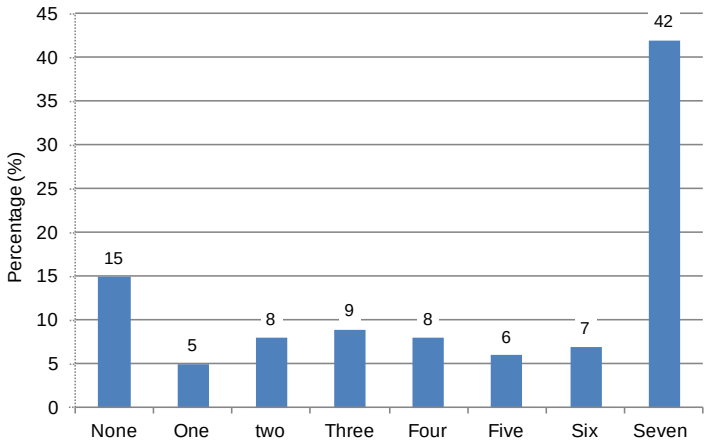
This section outlines respondents' estimations of fuel use in the week prior to the survey, what types of fuel they used, and where they got it from. Respondents using wood were asked about the types of wood they use and how it was acquired, whether free or commercially.

Respondents were asked how often they had used their enclosed wood burners or open fires in the week preceding the interview, and on which days. They were also asked to estimate the typical number of hours it was in use during a weekday and over the weekend. Their answers provide an indicative snapshot of typical winter usage, assuming that week was typical for the winter period.

6.1 Use of burner in previous week

As Figure 18 shows, 15 per cent of those with an enclosed wood burner or an open fire had not used it in the week prior to the survey, while 42 per cent had used it every day.

Figure 18: Number of days solid-fuel burner was used in the previous week



Note: Percentages based on the 719 households in the survey that had a solid-fuel burner.

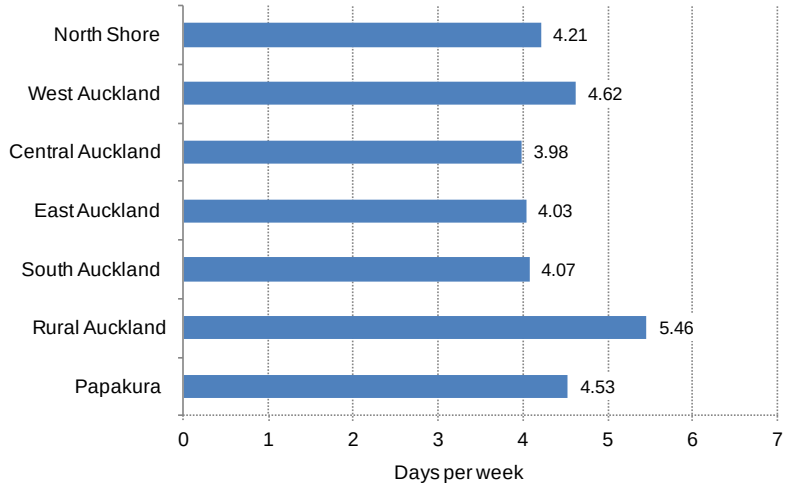
6.1.1 Average number of days burner was used

On average, respondents used their burners 4.47 days over the previous week.[17]

Use ranged across the seven survey areas, and was highest in Rural Auckland (5.46 days on average over the week preceding the interview). Burners were used at similar levels across the other areas in the survey (averaging from 3.98 to 4.62 days over the preceding week). See Figure 19.

[17] 95% confidence interval is (4.27, 4.66).

Figure 19: Average number of days the solid-fuel burner was used in the previous week, by survey area



6.1.2 Average days per week by type of burner

Enclosed wood burners were used more often than open fires, averaging 4.77 days in the week compared with 3.20 days for open fires.

6.2 Weekday and weekend burner use

Nearly five out of six households with a burner (85%) had used their burner in the week preceding the interview, and most (71%) had used their burners both on weekdays and at the weekend.

Table 11: Proportion who used burner on weekdays and weekends

	%
Used weekdays only	8
Used weekend only	6
Used both weekdays and weekend	71
Don't know/Did not use it in the last week	15
Total – used at some time over the preceding week	**85**

Note: Based on the 719 households in the survey that had a solid-fuel burner.

6.2.1 'Typical' hours of burner use on weekdays and on weekends

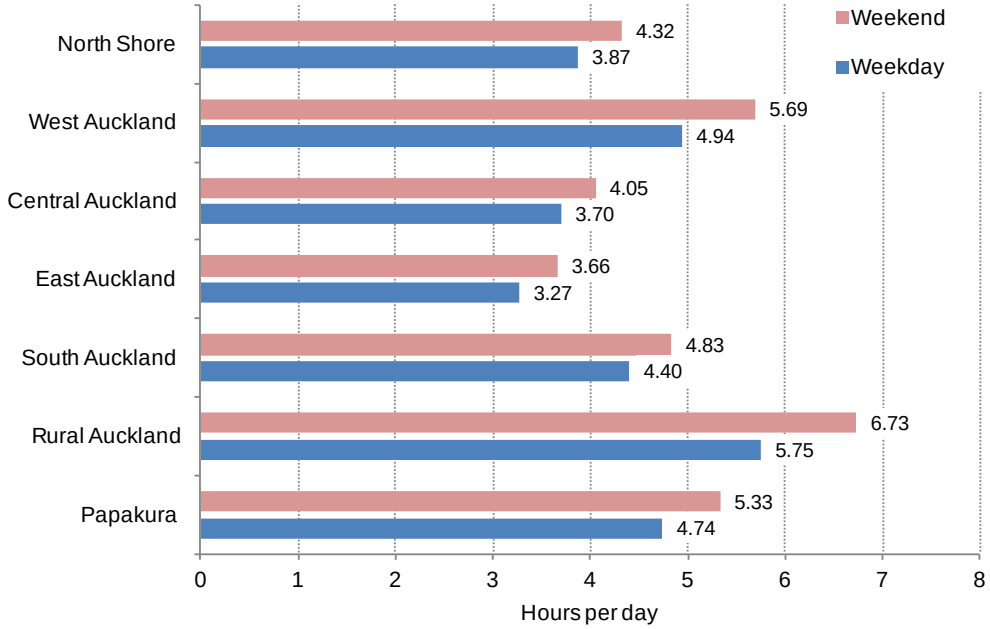
Respondents were asked how many hours their burner was typically in use on weekdays and on weekends.

Including those who did not use their burner that week, the average number of hours a burner was in use on weekdays was 4.44 hours,[18] and 5.02 hours per day in the weekend.[19]

[18] 95% confidence interval is (4.12, 4.75); includes households who had not used their burner that week.
[19] 95% confidence interval is (4.66, 5.38); includes households who had not used their burner that week.

Households in Rural Auckland had the highest average usage for both week and weekend days. They also showed the largest difference between weekday and weekend levels of use (around one hour difference).

Figure 20: Averages of typical hours per day during the week and at the weekend



6.2.2 Weekday versus weekend use by type of burner

There was little difference between wood burners and open fires in terms of the average number of hours they were typically used in either the weekdays or weekend.

Enclosed wood burners were used for slightly longer than open fires, averaging 4.77 hours a day in the week and 5.34 hours in the weekend, compared with 3.13 hours and 3.30 hours respectively for open fires.

6.4 Estimate of hours of use on a 'typical' winter's day

A key objective of the survey was to improve estimates of wood consumption, since wood consumption is directly related to emissions. Wood consumption can be estimated from the extent of time that burners are in use.

Time usage on a 'typical' winter's day was estimated from a combination of two measures: 1) reported actual use over the previous seven days, and 2) in cases where there was no burner use that week, the respondents' recall of 'typical' weekday and weekend winter use. This included the use of data from the following six questions:

Those who had used their burner in the week preceding the interview were asked:

1. how many weekdays they had used their burner. This was used to calculate the average number of weekdays of burner use.
2. what was the 'typical' number of hours they had used their burner each weekday. This was used to calculate the average 'typical' hours of burner use per weekday.[20]

[20] These calculations are based on the sample of all households with either an enclosed wood burner, open fire or multifuel burner; it excludes households with a pellet fire, oil burner and "other", which all occur at low frequencies. The total weighted burner sample is 719 households and the unweighted is1383.

3. on which weekend days they had used their burner. This was used to calculate the average number of weekend days of burner use.
4. what was the 'typical' number of hours they had used their burner each weekend day. This was used to calculate the average 'typical' hours of burner use per weekend day.

Those who had not used their burner in the week preceding the interview were asked to estimate:

5. the number of hours they used their burner on a 'typical' winter's weekday
6. the number of hours they used their burner on a 'typical' winter's weekend day.

It was assumed that the week preceding the survey interview was typical for the winter period. Usage over that week was used to derive usage values for a 'typical' winter's day.

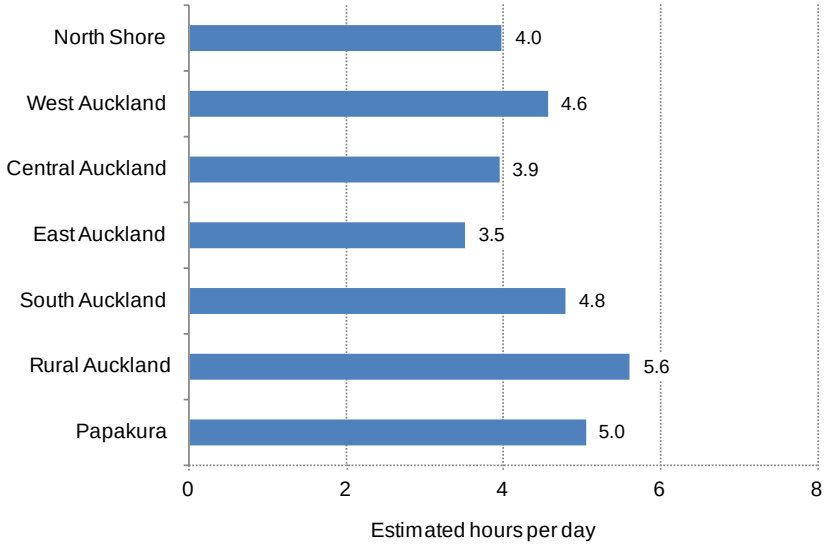
See Appendix G for the usage values derived for each case of a 'typical' winter's day.

6.4.1 Average of 'typical' hours of burner use

On average, each household used its burner for 4.49 hours on a 'typical' winter's day.[21] This equates to 566,200 burner hours per typical winter's day for the 126,000 households across Auckland that have a solid-fuel burner.

The average hours of burner use is relatively higher for Rural Auckland, and lower for East Auckland.

Figure 21: Estimated average number of hours per 'typical' winter's day that households used their solid-fuel burner, by survey area



[21] 95% confidence interval is (4.21, 4.78).

6.5 Comparison with 2007 survey

This survey gives lower estimates of burner use in terms of days in use and typical hours of days in use than that reported in 2007, where the mean reported average number of days in a week of burner use was 4.75. In the 2012 survey it was 4.47 days.

A more marked difference is evident in comparing the reported average hours of use per day

Table 12: Comparison of estimated weekday and weekend hours of solid-fuel burner use for 2007 and 2012

	2007	2012
– weekday	5.5	4.4
– weekend	7.5	5.0

Table 13: Distribution of typical hours of burner use for 2007 and 2012

Hours used on "typical" weekday	2007	2012
	n=2055	n=1383
	%	%
0	7	23
1	1	0
2	3	3
3	13	12
4	26	21
5	22	19
6	12	9
7	3	2
8	3	3
9	0	0
10	1	1
>10	8	6
	100	100

Hours used on "typical" weekend day	2007	2012
	n=2055	n=1383
	%	%
0	2	26
1	1	0
2	2	1
3	8	8
4	16	16
5	17	16
6	15	13
7	6	3
8	10	5
9	2	1
10	5	3
>10	17	9
	100	100

It can be seen that the largest difference are in the lower tails of the distributions. This has marked effects on derivation of the means.

The differences may be due to one or a combination of three factors:

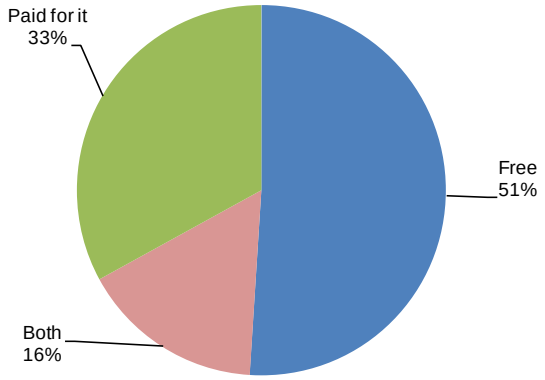
1) the period of the 2012 survey was not typical of the winter period (i.e. markedly warmer)
2) changes in the question wording significantly altered the meaning, or
3) the differences are real, and show actual change in burner use.

Refer to Appendix H for further details on (1) and (2).

6.5 Sources and types of wood burned

Just over half (51%) of households in the survey with wood burners can obtain free wood, and a further 16 per cent can obtain nearly half of their wood for free. Only one in three users of wood burners pay for all of their wood. Highest usage of free wood was in the rural areas (61%), and amongst those using open fires (63%).

Figure 22: Source of firewood



Respondents typically use two different kinds of wood in their burners, with the most common being cut natural pine (52%), tea tree or gum (42%), and cut macrocarpa (38%). One in six (17%) households use treated timber off-cuts.

Table 14: Type of wood used for burning

Type of wood	%
Cut natural pine	52
Tea tree or gum	42
Cut macrocarpa	38
Another kind of natural cut wood	26
Timber offcuts from building framing, fence posts, etc.	17
Processed logs from the supermarket	7
Other	7
Don't know	6

Note: Based on a weighted sample of 714 households, giving an unweighted sample of 1376.

Those with open fireplaces tend to use fewer different kinds of wood (1.6 on average) than those with wood burners (1.9). Users of open fireplace were also more likely to use treated timbers (24%, compared with 15% for users of wood burners).

The majority of wood users (83%) said they typically used dry wood. This did not vary across survey area or by type of burner.

6.6 Summary of burner-use behaviour

- Householders used their burner for an average 4.47 days in the week preceding the survey interview. Usage was higher for wood burners (4.8 days on average) than open fires (3.2).

- Householders who had used their burner in the week preceding the survey interview used it for an average 4.4 hours per day during the week and 5 hours per day in the weekend.

- The majority of respondents (71%) used their burner both on weekdays and on weekends. Fifteen per cent had not used their burner in the week prior to interview.

- Using estimates based on hours per weekday used, hours per weekend used, and estimated typical winter use for those not using their burner in the past week, the overall average burner use on a typical winter's day in 2012 was 4.49 hours. This is less than the 2007 estimate but may be accounted for by differences in survey design. Some uncertainty also remains because the average ambient evening temperature during the survey period was almost 1^0C warmer than that during the 2007 survey.

- Just over half of respondents with wood burners were able to obtain free wood. Highest usage of free wood was in the rural areas (61%), and amongst those using open fires (63%).

- On average, respondents obtained around two different kinds of wood. The most common kinds were cut natural pine, tea tree or gum, and cut macrocarpa. One in six households used treated timber offcuts.

- The majority of wood users said they typically used dry wood.

7.0 Summary and Conclusions

7.1 Summary of results

Section 3: Methods of home heating

- The main means of heating used 'these days' to heat the main living area of people's homes were electric heaters (36% of households), heat pumps (26%), wood fires (enclosed or open; 26%), and gas (mains and/or bottled; 21%).

- Comparisons with the 2007 survey results suggest an increase in the use of electricity (including heat pumps) in main living areas.

- Wood is by far the most commonly used solid fuel. Twenty-six per cent of all respondents used a wood burner (18% said they used it as the sole form of heating), while less than 1 per cent used a cola burner.

- Central Auckland stands out for having both the highest numbers of fireplaces and burners in the region, and also the highest proportion of unused burners, with an almost equal proportion of used and unused burners. Households in the other six survey areas were more likely to be using their burners, particularly Rural Auckland which had between four and five times as many burners in use than unused burners.

- Higher proportions of renters than home owners use portable heating sources. Just over half (54%) of renters in the survey used electric heaters, compared with 32 per cent of home owners, and 18 per cent of renters used bottled-gas heaters, compared with 9 per cent of home owners. Lower proportions of renters used solid-fuel heating– 17 per cent of renters used enclosed wood-burners in main living areas, compared with 28 per cent of home owners.

- It is quite common for householders to switch their heating method over time. Thirty-eight per cent of respondents had used a different form of heating during the time they had been living in their current dwelling. Half (51%) of the switchers had converted from one kind of non-wood burner to another, but only 1 per cent had changed from one kind of wood burner to another. For the remainder, similar proportions had switched from a non-wood burner to a burner (23%) or vice versa (25%).

- A sizeable minority (38%) had changed their means of heating in their main living area during the time they had been living in their dwelling.

Section 4: Solid-fuel burners

- Seventy-seven per cent of households with a solid-fuel burner had an enclosed wood burner, a slight increase from 72 per cent in 2007. This rise was almost matched by the decline in open fires (fireplaces), down from 23 per cent in 2007 to 17 per cent in 2012. The remaining 6 per cent of households with a solid-fuel burner had a multi-fuel or some other kind of burner, a similar level to that found in the 2007 survey.

- There is still a significant spread in the ages of solid-fuel burners. Around one-fifth of solid-fuel burners were reported to be less than seven years old, and so it can be assumed that they are compliant with National Environmental Standards. One-quarter of solid-fuelled burners were more than 21 years old, and 43 per cent were between 7 and 21 years old.

- Households in Central Auckland had proportionately more open fires (30% of households with a burner), whereas West Auckland had the least (7%).

- Central Auckland also had the highest proportion of solid-fuel burners that were more than 21 years old (36%), compared with the other survey areas. However, there had been more change in this area since 2007. Enclosed wood burners showed a proportionately greater increase since

2007, matched by a corresponding decrease in open fires, in Central Auckland compared with other areas in the region.

- Open fires are relatively more common among the older burners, making up 40 per cent of all burners more than 21 years old but just 4 per cent of burners less than seven years old. Correspondingly, enclosed wood burners make up a larger proportion of the newer burners, representing 94 per cent of all burners less than seven years old.

- Open fires are also relatively more common in older dwellings, with open fires making up 26 per cent of all burners in dwellings more than 50 years old. Their presence steadily declines as the dwellings get younger (down to 8 per cent for dwellings between 13 and 30 years old), but rises again (to 18%) in dwellings less than twelve years old. This unexpected change to the trend could be due to the relatively small number of young dwellings in the survey sample.

- Open fires tend to be replaced by electricity as the preferred means of heating. Thirty-eight per cent of those who had switched from an open fire chose a heat pump and 36 per cent another form of electric heating. Fewer than one in three switchers went to gas (16 per cent to mains gas, and 14 per cent to bottled gas).

- Enclosed burners also tend to be replaced by a heat pump or other form of electric heating. Fifty-eight per cent of those who had switched from a solid-fuel burner chose a heat pump and 32 per cent another form of electric heating. Only 8 per cent chose bottled-gas heating and 4 per cent mains-gas heating.

- Fireplaces that are being replaced tend to be older. Nearly half (43 per cent) of the fireplaces that respondents had replaced were more 30 years old. In contrast, householders are replacing solid-fuel burners of all ages, with only 20 per cent of those replaced being more than 30 years old and more than a quarter (26 per cent) being less than 15 years old.

Section 5: Factors affecting choice and use of solid fuel

- Those using a solid-fuel burner did so because it was more efficient and warmer than other methods, wood supply was cheap or free, and it provided a good ambience.

- Householders who had used a wood or coal burner in the past and who had changed to non-burner had made the change to a different form of heating because of the solid-fuel burner's inconvenience, lack of efficiency, cost or state of disrepair.

- Twelve per cent of respondents stated they were considering changing their heating in the next six months. Heat pumps were preferred by the majority of those people (65%). Wood burners ranked next but were well behind, at 9 per cent.

- Those considering wood burners were attracted by their efficiency and heat, the opportunity of a free wood supply, or because they liked the ambience of a wood burner. Respondents said they could be dissuaded from choosing a wood burner if alternative methods of heating were cheaper, or if there were a financial subsidy for an alternative.

- Thirteen per cent of all households had a fireplace not in current use. Reasons for non-use include having better heating now, convenience, the fireplace not being in working order, cost, and mess. These householders might consider putting it into use on a particularly cold night, or for special occasions.

Section 6: Fuel consumption in solid-fuel burners

- The week preceding the survey interview was used as a proxy for typical winter usage of solid-fuel burners.
- Households used their solid-fuel burners an average 4.47 days in the week prior to the survey interview. Usage was higher for wood burners (4.8 days on average) than open fires (3.2).
- The majority of respondents used their burner both on weekdays and at the weekend (71%). Fifteen per cent had not used their burner in the previous week.
- Rural Auckland households had used their wood burners for an average 5.46 days in the week preceding the survey interview. Their usage of wood burners was higher than that in any of the other six survey areas.
- Households used their burners for an average 4.4 hours on a weekday and 5.0 hours per day at the weekend. However, enclosed wood burners were used for an average 4.8 hours on weekdays and 5.3 hours in the weekends, while the average usage for open fires was just 3.1 and 3.6 hours, respectively.
- Using estimates based on hours per weekday used, hours per weekend used, and estimated typical winter use for those not using their burner in the past week, it was calculated that on a typical winter's day solid-fuel burners are used, on average, for 4.49 hours. This figure is less than the 2007 estimate, but the difference may be accounted for by survey design factors related to usage recall. Some uncertainty also remains because the average ambient evening temperature during the 2012 survey period was almost 1^{o} warmer than that during the 2007 survey.
- Respondents with a wood burner were asked if they paid for their wood. Just over half obtained all of it free, and a further 8 per cent got about half of their wood for free. A third of respondents paid for all their wood.
- On average, respondents obtained around two different kinds of wood. The most common kinds were cut natural pine, tea tree or gum, and cut macrocarpa. One in six obtained treated timber offcuts.
- The majority of wood users said they typically used dry wood.

7.2 Discussion

Estimation of solid-fuel-burner usage levels

- Households in the 2012 survey used their solid-fuel burners for an average 4.47 hours on a typical winter's day. This equates to 566,200 burner hours per typical winter's day for the 126,000 households across Auckland that have a solid-fuel burner.
- Although there has been an estimated 7 per cent increase in the number of households in the Auckland region, the decrease in the proportion of households using solid-fuel burners since 2007 (from 29 per cent to 26 per cent) suggests there might be a small net decrease in the number of households contributing to emissions (from around 132,000 to 126,000). Additionally, any increase in the numbers of wood burner would mostly comprise wood burners that are NES compliant. This suggests a modest but lower overall drop in emissions.

Burner replacement

- Many households in the survey (38%) had used a different form of heating prior to the one they were currently using in their main living area. There appears to be no net move away from burners. Overall replacement of a burner by a non-burner heating method is almost equally matched by replacement the other way.

- There appears to be a clear move away from open fires, particularly those that are older. Householders tend to replace their fireplace and enclosed wood burners with a heat pump or other electric heating. If a household stays with a burner, the tendency is to switch from an open fireplace to an enclosed burner. The younger the appliance, the more likely it is to be an enclosed wood burner. Open fires are still more prevalent in older houses.

Attitudes to wood burners

- Those using solid-fuel heating (wood burners and open fireplaces mainly) like them for the warmth they generate, their ambience, and because the householder has access to cheap or free wood. People considering changing to a wood burner cite the same reasons for their attraction to this method of heating. However, there are detractions. Respondents who had previously had solid-fuel heaters but had switched to a non-burner form of heating said they had switched because burners are inefficient, costly and require work.

- People who have an unused fireplace (13 per cent of all households) leave it unused because of the inconvenience (in line with the reasons given in the above bullet point for former users), and because they prefer their current form of heating.

Appendix A:
Methodology and Potential Sources of Error

Method

The survey was conducted under contract to Auckland Council by UMR Research Limited, using computer aided telephone interviewing. Other methods were considered, but rejected:

- Face-to-face methods which generate highest response rates are very expensive to conduct in large numbers.
- Self-completion methods typically generate low to very low response rates, even with incentives.
- On-line surveys generate higher response rates but result in biased samples because they only apply to those with home computers and the willingness to use them for on-line work.

Computer-aided telephone interviewing has excellent reach, since the incidence of land-line telephones is high (given that until very recently, people wanting internet access required a land-line). Response rates also tend to be relatively higher, and far less costly than face-to-face interviewing, particularly if large samples are required for interviews of between 10 and 15 minutes' duration, as in this survey.

The survey was conducted by telephone between 7th and 31st August 2012. It achieved 2,800 completed interviews at a response rate of 30 per cent.

Potential sources of random sampling error

All measures derived from survey results are subject to a "margin of error" (expressed by the 95 per cent confidence interval), since they are based on a sample of qualifying respondents. In this case, calculation of confidence intervals of each weighted measure is a complex process. Specifically, the margin of error for incidence of solid fuel heaters in main living areas at 26 per cent is not based on the sample size of 2,800 as if it were a pure random sample (which would yield a margin of error of ± 1.6 per cent). An approximation for this measure is provided by the size of the independent research used to derive this figure, being a total of 1,740 respondents. This yields a margin of error of ± 2 per cent.

Confidence intervals are only meaningful if the sample is unbiased, i.e. representative of the population. This was achieved in this telephone survey by using random dialling techniques.

Sampling errors could arise where those refusing to participate were systematically different from those who participated. The likelihood of this occurring tends to be higher with lower response rates. In this study, there is the potential risk to validity that those refusing are more likely to be wood burner users. This could arise if they suspect that the Council is about to develop a policy to restrict the use of wood fires. This would leave wood burner users under-represented in the sample. It is assumed that the proportion of wood burner users amongst those who responded and those who did not is the same.

A related, but more likely, risk concerns those who were unable to participate because they had no land-line telephone. They may come from lower socio-economic levels, where they might opt for cheaper forms of heating, including wood fires (particularly if the wood they get is free). This again could result in lower representation of wood burner users.

The survey sample was based on a sample frame of people having access to a land-line telephone. It was assumed that those households with cell phones only are not likely to be different from those with land-lines in their use of home heating method. Until recently, landline penetration was high overall (exceeding 97 per cent) (Gray and Sunteralingham, 2007), indicating that those with cell phones only make little difference to overall heating use. However, the study also shows that land-line penetration falls to around 80 per cent for

Maori and 87 per cent for Pacific ethnic groups. The assumption that the heating methods used by these groups are no different from the general population may represent a potential for underestimating total wood burner incidence. The extent of bias due to these factors is difficult to estimate, but should be kept in mind when interpreting the survey results.

Potential sources of systematic error

Non-sampling errors, due to sources other than sampling (systematic error), may also contribute. These need to be controlled in survey design.

Response bias

In designing this questionnaire, consideration was given to potential sources of bias resulting from question wording (such as ambiguous wording, implicit assumptions, leading questions, lack of clarity) and wording susceptible to response bias (such as acquiescence bias, and the related social desirability bias). (See for example Malhotra, et al. 1996 and Zikmund 1994).

Sources of biases due to question wording were minimised by piloting all questions first, paying particular attention to the potential for ambiguity and lack of clarity, as well as appropriateness. Questions relating to usage estimates were made less demanding on the respondent by asking for recall of the recent past (up to a week) of heater use and broad times of the day used. Indeed, most of the questions asked for behaviour around heating, with no complex attitudinal measures. A second level of checking was provided by the research company contracted to conduct the interviews. They conducted their own piloting.

Errors due to response bias were minimised at the level of interviewing by quality control checks used by the research company (supervisors listening in on the interviews). Although respondents knew that the survey was being conducted on behalf of Auckland Council, they were promised anonymity to encourage candid responding. No contact data apart from overall aggregates was passed on to council.

Estimates based on recall over a prolonged period may be unreliable (see for example, the discussions on problems in recall in Malhotra, et al. 1996 and in Zikmund 1994). In the 2007 survey, respondents were asked to recall typical burner use over the winter period. In this survey, recall error was minimised by confining recall to the seven days prior to interview. Although reliability of recall was improved, some potential for inaccuracy still remained because respondents were asked for their “typical” hours of use on those days their burner was in use. This still relied on respondent guesswork. Where usage was constant from one day to the next, this task is relatively easy, but it could be difficult and more subject to error where usage varied from one day to the next. The extent of this kind of error cannot be estimated.

Biases due to inaccurate recall could not be eliminated entirely. Other questions were demanding on respondent knowledge. It could be particularly challenging to estimate the age of a burner which had been replaced, especially one which was already there when the respondent took up residence.

Other sources of error

The study areas were derived from aggregating Census Area Units. However, suburbs were recorded in terms of what each respondent called their location. Inaccuracies of location, particularly with households near area boundaries, may have arisen.

Focusing on heating in the main living area ignores any supplementary use of wood burners elsewhere in the house. This is assumed to be small enough to ignore.

Most of the findings on burner use excluded other potential PM_{10} sources such as pellet burners and oil-fired burners. However the incidence of these types is so low that they can be ignored. Indeed, by far most of the burners were wood fired. The incidence of coal use, although included, is very low.

Recommendations for future research

A survey of this type using disproportionate stratified sampling requires an independently derived figure for the incidence of burners in the home, since this is a key weighting variable. If such a figure is not available, it is recommended that the survey be conducted in two consecutive phases. In the first phase, interviewing is conducted until areas quotas for non-wood burners are met (in the present survey, this would be 200 interviews in each area). Analysis of data weighted by area would yield the correct household incidence of burners. The second phase would achieve quotas for wood-burner users. The two databases may then be merged to permit full analysis to proceed.

The survey should be timed for June or July, because these are typically the coldest months of the year.

Question content needs to be reviewed in the light of any changes in information requirements.

In the present survey, those refusing to participate may have included people not using any home heating. The introduction to the survey should be modified to capture them.

Appendix B: Sample Description

The sample is described in terms of the following household characteristics.

	Raw Numbers	Unweighted	Weighted number	Weighted
STUDY AREA				
Papakura	400	14.3	204	7.3
Rural Auckland	400	14.3	398	14.2
South Auckland	400	14.3	214	7.6
East Auckland	400	14.3	239	8.5
Central Auckland	400	14.3	960	34.3
West Auckland	400	14.3	349	12.5
North Shore	400	14.3	436	15.6
Total	2800	100.0	2800	100.0
HOUSEHOLD INCOME BEFORE TAX				
$25,000 or less	236	8.4	240	8.6
$25,001 - $50,000	413	14.8	401	14.3
$50,001 - $70,000	412	14.7	386	13.8
$70,001 - $100,000	502	17.9	471	16.8
$100,001 - $150,000	434	15.5	462	16.5
Over $150,000	267	9.5	319	11.4
Refused/ other/ none	536	19.1	520	18.6
Total	2800	100.0	2800	100.0
HOUSEHOLD SIZE				
Single	335	12.0	387	13.8
2	868	31.0	857	30.6
3	482	17.2	479	17.1
4	625	22.3	624	22.3
5 or more	475	17.0	438	15.6
Refused	15	0.5	15	0.5
Total	2800	100.0	2800	100.0
TENURE				
Own	2270	81.1	2213	79.0
Rent	530	18.9	587	21.0
Total	2800	100.0	2800	100.0

The following records a respondent rather than a household characteristic. If a respondent claimed more than one ethnicity, they were asked to give their main ethnicity. This is recorded below.

ETHNICITY (of respondent)	Raw Numbers	Unweighted	Weighted number	Weighted
European/ New Zealander	2088	74.6	2047	73.1
Maori	155	5.5	131	4.7
Pacific Peoples	100	3.6	74	2.6
Chinese	63	2.2	104	3.7
Indian	100	3.6	122	4.4
Other	18	0.6	14	0.5
Not stated	276	9.9	308	11.0
Total	2800	100.0	2800	100.0

DWELLING CHARACTERISTICS

Q2. And, can you tell me, what type of home do you live in? (%)

	Papakura	Rural Auckland	South Auckland	East Auckland	Central Auckland	West Auckland	North Shore	Total
A stand alone house	85.8	82.4	82.1	83.4	77.1	88.8	80.0	81.3
Townhouse, brick and tile flat or duplex	8.4	8.3	12.6	13.0	12.6	6.5	13.1	11.0
Terraced house or semi-detached	3.8	2.0	2.4	2.1	4.2	1.9	4.2	3.3
High rise apartment block	0.0	1.0	0.9	0.0	3.2	0.3	1.5	1.6
Farm or lifestyle block	1.6	4.9	0.5	0.0	0.0	0.5	0.1	0.9
Don't know	0.0	0.0	0.6	0.1	0.4	0.3	0.4	0.3
Other (specify)	0.4	1.5	1.0	1.3	2.4	1.8	0.7	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
n= (weighted)	204	398	214	239	960	349	436	2800
n= (unweighted)	400	400	400	400	400	400	400	2800

Note: percentages are column based.

Q3. And does your house have …(%)

	Papakura	Rural Auckland	South Auckland	East Auckland	Central Auckland	West Auckland	North Shore	Total
Insulation in the walls	50.2	67.6	42.1	51.3	42.5	59.7	50.9	50.8
Insulation above the ceilings	79.1	82.1	70.5	75.2	72.3	74.8	75.0	75.0
HRV or DVS	25.1	19.0	21.0	23.4	18.1	20.4	17.0	19.5
Double glazing in main living or bedroom areas	8.4	11.5	7.7	9.9	8.5	8.5	6.7	8.7
Under floor insulation	29.4	37.2	30.9	30.3	39.9	38.6	38.0	36.8
None	9.6	7.2	16.2	8.7	12.0	9.5	10.7	10.7
Don't know	3.9	3.5	6.2	5.9	6.1	3.8	2.7	4.7
n= (weighted)	204	398	214	239	960	349	436	2800
n= (unweighted)	400	400	400	400	400	400	400	2800

Note: Households could nominate more than one type of insulation so percentages do not add to 100.

Q3. How old is your home?

	Papakura	Rural Auckland	South Auckland	East Auckland	Central Auckland	West Auckland	North Shore	Total
Less than 5 years old (built in 2008 or later)	4.9	13.6	3.6	3.4	7.1	3.8	1.6	6.0
Between 6 and 12 years old (built between 2000 and 2007)	14.5	21.6	15.0	7.5	5.7	14.4	10.2	11.3
Between 13 and 20 years old (built between 1992 and 1999)	14.4	13.8	10.6	11.5	7.3	12.9	12.6	10.9
Between 21 and 30 years old (built between 1982 and 1991)	18.6	13.2	16.0	17.9	6.7	16.7	16.4	12.9
Between 31 and 40 years old (built between 1972 and 1981)	16.3	9.7	13.9	20.8	10.9	14.6	17.7	13.7
Between 41 and 50 years old (built between 1962 and 1971)	10.5	9.3	10.8	18.2	14.8	12.2	16.6	13.7
Older than 50 years (built in or before 1962)	14.1	15.8	20.5	16.1	41.0	18.2	21.9	26.0
Don't know	6.7	3.0	9.6	4.6	6.4	7.2	3.0	5.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
n= (weighted)	204	398	214	239	960	349	436	2800
n= (unweighted)	400	400	400	400	400	400	400	2800

Note: percentages are column based.

Q6. Do you own your home or do you rent it? (%)

	Papakura	Rural Auckland	South Auckland	East Auckland	Central Auckland	West Auckland	North Shore	Total
Own	74.8	83.4	74.8	78.6	77.2	81.3	81.4	79.0
Rent	25.2	16.6	25.2	21.4	22.8	18.7	18.6	21.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
n= (weighted)	204	398	214	239	960	349	436	2800
n= (unweighted)	400	400	400	400	400	400	400	2800

Appendix C: Calculation of Statistical Weights

Data were weighted by two parameters in combination, Study Area household numbers (as estimated) and incidence of solid fuel burner use (as derived by independent surveys). The latter estimate was provided by two surveys, (1) a random sample of around 240 households conducted by UMR Research just prior to the main survey, and (2) a survey of 1500 Aucklanders conducted in 2012 for Vector Limited. Both surveys were in agreement that the incidence of wood burners in Auckland is 26%.

Further adjustments were made because the incidence of solid fuel burner is not the same (i.e. 26%) in each area. The 2007 survey estimated overall incidence at 28.6%, but with area variations ranging from 20.3 per cent to 39.9 per cent across the survey areas. An estimate of the proportion of solid fuel burners for each area in the present survey were based on these figures, deflated to reflect the lower overall incidence of 26 per cent for 28.6 per cent.

Calculation of weights using Growth Model data and with estimated burner incidence set at 26%

	Papakura	Rural Auckland	South Auckland	East Auckland	Central Auckland	West Auckland	North Shore	Total
Burner [2007 survey sample]	200	602	236	201	405	223	203	2070
Totals [2007 survey sample]	630	1642	860	799	2000	559	741	7231
Proportion of burners [2007 survey sample]	31.7	36.7	27.4	25.2	20.3	39.9	27.4	28.6
Burner estimate based on 26 overall *	28. 9	33.4	25.0	22.9	18.4	36.3	24.9	91
Total households [2012 estimates]	32,718	99,796	34,275	38,347	153,970	56,013	69,902	485,021
Proportion of households in area (2012) (%)	6.7	20.6	7.1	7.9	31.7	11.5	14.4	100.0
Estimated number of burners [2012]	9452	33,295	8559	8779	28,373	20,334	17,426	126,218

Note: * A multiplier of 0,.91 (=26÷28.6) is applied to the 2007 estimates of proportions of burners in each of the survey areas to provide 2012 estimates consistent with an overall incidence of 26 per cent.

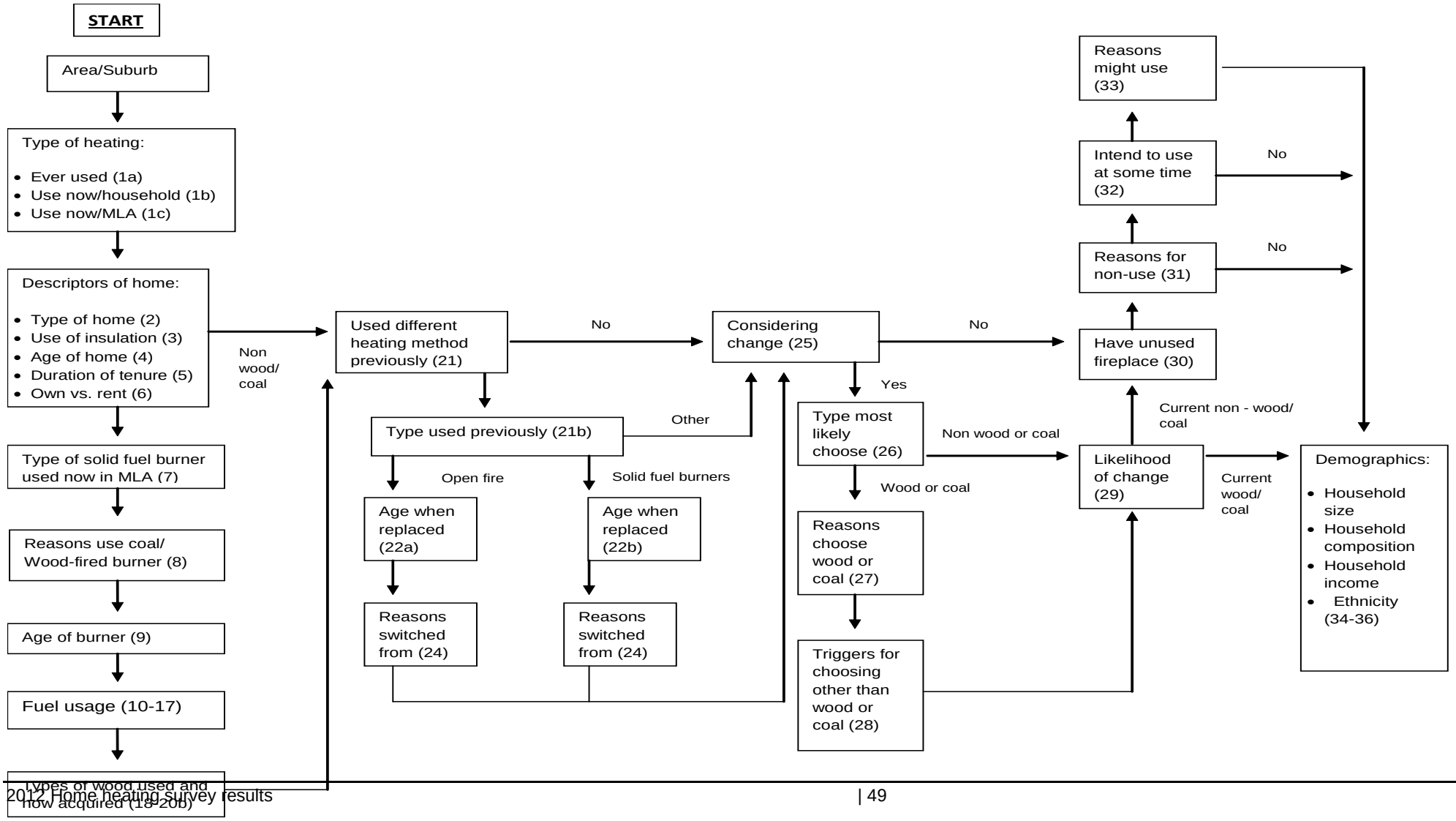
Frequency weighting works by adjusting each case by a factor reflecting their degree of under- or over-representation and then summing each case. For example, consider a hypothetical case where a survey yields a sample composition of 40 per cent males and 60 per cent females. A pure sample should have around 50 per cent of each. Each case of a male's response is adjusted by a factor (known population proportion ÷ obtained sample proportion), i.e. 50/40 =1.25. Instead of counting each response value each time we count the adjusted value (e.g. if the response value is 1, we count 1.25). Similarly, females receive the weight of 50/60 = 0.83, and if the response value is 1, we count 0.83. In this analysis, counts are performed on each combination of Study Area and Major heating type, shown in the column headed "Weight factor" below. In other words, each respondent with a particular combination of Study Area and heating type received the count shown.

Calculation of weights

Survey Area		Number of households	Proportion of population	Sample size	Proportion of sample	Weight factor	SPSS value
Papakura	non wood burner	23,266	0.05	200	0.0714	0.672	1
	wood burner	9452	0.02	200	0.0714	0.273	2
	total	32,718					
Rural Auckland	non wood burner	66,501	0.14	200	0.0714	1.920	3
	wood burner	33,295	0.07	200	0.0714	0.961	4
	total	99,796					
South Auckland	non wood burner	25,716	0.05	200	0.0714	0.742	5
	wood burner	8559	0.02	200	0.0714	0.247	6
	total	34,275					
East Auckland	non wood burner	29,568	0.06	200	0.0714	0.853	7
	wood burner	8779	0.02	200	0.0714	0.253	8
	total	38,347					
Central Auckland	non wood burner	125,597	0.26	200	0.0714	3.625	9
	wood burner	28,373	0.06	200	0.0714	0.819	10
	total	153,970					
West Auckland	non wood burner	35,679	0.07	200	0.0714	1.030	11
	wood burner	20,334	0.04	200	0.0714	0.587	12
	total	56,013					
North Shore	non wood burner	52,476	0.11	200	0.0714	1.515	13
	wood burner	17,426	0.04	200	0.0714	0.503	14
	total	69,902					
Total of all households		485,021		2800		14.000	

Appendix D: Question Flow Chart and Questionnaire

Home Heating Survey 2012: Questionnaire Flow Chart



Home Heating Survey 2012: Questionnaire

Good [morning / afternoon / evening]. My name is [ ] and I am calling from UMR research on behalf of Auckland Council. We are doing research on what forms of home heating people are using.

Can I speak to someone aged 18 and over, living in this household, who is most responsible for deciding what sorts of home heating is used or knows about the home heating in use in this household??

CHECK AREA QUOTAS.
Suburb – will 'slot' into Survey areas:

SA1: Papakura
SA2: Rural Auckland
SA3: South Auckland
SA4: East Auckland
SA5: Central Auckland
SA7: West Auckland
SA9: North Shore

This survey should take about 10 - 15 minutes depending on your answers. The results will be used to help households with their home heating choices in the future. The results from this survey will remain anonymous. We will not ask for your full name or address, and no personal information will be used outside of this research. There will be no sales calls as a result of this conversation.

Which suburb do you live in? _____

QUESTIONNAIRE

1a) The first few questions are about heating used in your current home. Which of the following have you ever used to heat this home?

INTERVIEWER: Read out

1. Heat pump
2. Solar heating
3. Electric heaters (including bar heaters, oil filled or fan)
4. Bottled gas heater
5. Mains gas heater
6. Wood burner
7. Coal burner
8. Other solid fuel burner e.g. pellets
9. Oil burner
10. Some other type of heating
11. No form of heating ever used (GO TO TERMINATE 1)

1b) And which of these do you use, these days, for heating your home?

INTERVIEWER: Read out

1. Heat pump
2. Solar heating
3. Electric heaters (including bar heaters, oil filled or fan)
4. Bottled gas heater
5. Mains gas heater
6. Wood burner
7. Coal burner
8. Other solid fuel burner e.g. pellets
9. Oil burner
10. Some other type of heating
11. No form of heating ever used (GO TO TERMINATE 1)

1c) And what are you using, these days, for heating the main living areas of your home?

INTERVIEWER: Read out

1. Heat pump
2. Solar heating
3. Electric heaters (including bar heaters, oil filled or fan)
4. Bottled gas heater
5. Mains gas heater
6. Wood burner
7. Coal burner
8. Other solid fuel burner e.g. pellets
9. Oil burner
10. Some other type of heating
11. No form of heating ever used (GO TO TERMINATE 1)

PROGRAMMER – RECORD NUMBER OF TERMINATIONS
Terminate1 – Thanks for your time, unfortunately you do not qualify for this survey

2) And, can you tell me, what type of home do you live in? Is it.. ..

1. a standalone house
2. townhouse, brick and tile flat, or duplex
3. terraced house or semi-detached
4. high rise apartment block
5. farm or lifestyle block
6. (DO NOT READ) don't know
7. other

3) Does your house have…

(MULTICODE)

1. insulation in the walls
2. insulation above the ceilings
3. HRV or DVS (*if necessary:* air made to circulate through roof space)
4. double glazing in main living or bedroom areas
5. Under Floor Insulation
6. None of these
7. (DO NOT READ) don't know

4) How old is your home? (IF NECERSARY: When was it built?) is it…

1. New - that is less than 5 years old (built in 2008 or later)

2. Between 6 years and 12 years old (built between 2000 and 2007)
3. Between 13 and 20 years old (built between 1992 and 1999)
4. Between 21 and 30 years old (built between 1982 and 1991)
5. Between 31 and 40 years old (built between 1972 and 1981)
6. Between 41 and 50 years old (built between 1962 and 1971)
7. Older than 51 years (built in or before 1970)
8. Don't know

5) What year did you move in to your current home?

1. (Specify year)
99. Don't know

6) Do you own your home or do you rent it?
1. Own
2. Rent

*IF Q1c = 6-8 ASK Q7. OTHERS GO TO Q21
7) What type of solid fuel burning appliance do you use in your main living area? Is it one of these…

INTERVIEWER: if more than one, ask for the one most frequently used.

1. Wood burner (This is a fully enclosed burner but does not include multi fuel burner like those that burn coal, or a pellet fire)
2. Open fire (this is enclosed on three sides but open on the front. Includes a visor fireplace)
3. Multifuel burner (an enclosed burner which burns wood as well as coal, this includes incinerators, pot belly stoves, McKay space heaters etc, but does not include open fires)
4. Pellet fire (using processed wood pellets) (GO TO Q21)
5. None of these (GO TO Q21)
6. Don't know (GO TO Q21)

*IF Q7 = 1 -3 ASK Q8. OTHERS GO TO Q21
8) For what reasons are you using wood or coal fired heating?

(MULTICODE) (DO NOT READ OUT – PROBE FULLY)

1. There is no other heating in the house / living area
2. Wood supply is cheap
3. Wood supply free
4. Coal supply is cheap
5. More efficient / warmer than other methods
6. Heats the whole house
7. Enjoyment / ambience
8. When visitors come over
9. Don't know
10. Other (Specify)

9) How old is your solid fuel burner? Is it..

1. Less than 7 years (that is, since 2005)
2. Between 7 and 21 years (that is, from 1991)
3. More than 21 years (before 1991)
4. [DO NOT READ] Don't know/ here when we moved in

10) Thinking back over the last week, did you use your burner during the weekdays, on the weekend or both?

1. Weekdays only
2. Weekends only
3. Both weekdays and weekends
4. Don't know / Did not use it in the last week (GO TO Q15)

*IF Q10=1 OR 3 ASK Q10a
10a) For each week day please tell me if your burner was in use or not:
[READ LIST]
Monday
Tuesday
Wednesday
Thursday
Friday

*IF Q10=2 OR 3 ASK Q10b
10b) For each day of the weekend please tell me if your burner was in use or not:
[READ LIST]
Saturday
Sunday

*IF Q10 = 1 OR 3 ASK Q11. OTHERS GO TO Q13
11) How many hours a day did you typically use your burner on weekdays?

1. Record hours (RANGE 1 - 24)
25. Don't know

12) And for those weekdays, did you typically use it …

1. all day
2. both morning and evening
3. only in the morning
4. only in the evening
5. DO NOT READ: don't know

*IF Q10 = 2 OR 3 ASK Q13 OTHERS GO TO Q15
13) How many hours a day did you typically use your burner at the weekend?

INTERVIEWER: IF USED BOTH DAYS, SELECT DAY IT WAS USED MOST

1. Record hours (RANGE 1 - 24)
25. Don't know

14) And for the weekend day it was (used / used most) did you use it…

1. all day
2. both morning and evening
3. only in the morning
4. only in the evening
5. *Don't read:* don't know

*IF Q10 = 4 ASK Q15, Q16 OTHERS GO TO Q17

15) Over the winter months, on average, how many hours a day would you use your burner on a week day?

1. Record hours (RANGE 1 - 24)
25. Don't know

16) Over the winter months, how many hours a day would you typically use your burner on a weekend day?

1. Record hours (RANGE 1 - 24)
25. Don't know

*IF Q10 = 1 -4 ASK Q17.

17) Was the last week...

1. Typical for winter usage
2. A bit less usage than typical
3. A lot less usage than typical
4. A bit more usage than typical
5. Or a lot more usage than typical

*IF Q1c = 6 ASK Q18. OTHERS GO TO Q21

18) This year, did you pay for your wood, get it free, or both?

1. Paid for it (GO TO Q20)
2. Free (GO TO Q20)
3. Both
4. (DO NOT READ) don't know

*IF Q18 = 3 ASK Q19.

19) How much of your wood was bought? A rough percentage will do.

INTERVIEWER: MUST ADD TO 100%

1. % Paid for (specify)
2. % Free (specify)
99. Don't know

*IF Q18 = 1-4 ASK Q20. OTHERS GO TO Q21

20) What kinds of wood do you typically use? Would it include…

(MULTICODE)

1. Cut natural pine
2. Cut macrocarpa
3. Tea tree or gum
4. Another kind of natural cut wood
5. Processed logs from Supermarket
6. Timber offcuts from building framing, fence posts, etc.
7. (DO NOT READ) don't know
8. Other (SPECIFY)

20b) Thinking of the wood you use regularly, would you say it is typically moist or typically dry?

1. Moist.
2. Dry
3. Varies
4. DO NOT READ] Don't know

Section 3: Types of heating used previously

*ALL

21) You told me earlier that you use [Response from Q1c] for heating the main living area in your home, have you ever used a different method of heating in this area before this?

1. Yes
2. No (GO TO Q25)
3. Don't know (GO TO Q25)

*IF Q21 = 1 ASK Q21b. OTHERS GO TO Q22

Q21b) What heating method did you use previously, in your main living area?

DO NOT READ. (MULTICODE)

1. Open fire
2. Solid fuel burner (coal, wood or pellet)
3. Oil burner
4. Electrical heating
5. Mains gas heater
6. Bottled gas heater
7. Heat pump
8. Don't know

PROGRAMMER: INSERT TEXT 'OPEN FIRE' IF Q21b = 1 OR 'SOLID FUEL BURNER' IF Q21b = 2.

*IF Q21b = 1 ASK Q22a. OTHERS GO TO Q25

22a) Thinking about the open fire. How old was this when it was replaced (as far as you know)? READ OUT

1. Less than 15 years old
2. Between 15 and 30 years old
3. More than 30 years old
4. DO NOT READ: Don't know/ here when we moved in

*IF Q21b = 1 OR 2 ASK Q22. OTHERS GO TO Q25

22b) Thinking about the Solid fuel burner. How old was this Solid fuel burner when it was replaced (as far as you know)? READ OUT

1. Less than 15 years old
2. Between 15 and 30 years old
3. More than 30 years old
4. DO NOT READ: Don't know/ here when we moved in

23) (deleted)

*IF Q21b = 1 or 2 AND Q1c ≠ 6 or 7 ASK Q24. OTHERS GO TO Q25
24) For what reasons did you switch from wood/coal burner?

(MULTICODE) (DO NOT READ - PROBE FULLY)

1. Environmental reason
2. Cost
3. Convenience
4. Current heating too messy
5. Health reasons
6. Renovating
7. Saving space
8. Qualify for subsidy/ financial assistance
9. Safety
10. Wood/ coal less efficient
11. Don't know
12. Other (specify)

*ASK ALL
25) Still thinking about your main living area, are you considering changing to another type of home heating in the next few years or so? [DO NOT READ]

1. Yes
2. No (GO TO Q30)
3. Unsure (GO TO Q30)

*IF Q25 =1 CONTINUE. OTHERS GO TO Q30
26) What type of heating are you most likely to choose?

INTERVIEIWER: DO NOT READ – PROBE FOR MOST LIKELY CHOICE.

1. Heat pump
2. Solar heating
3. Electric heater (including bar heaters, oil filled or fan)
4. Bottled gas heater
5. Mains gas heater
6. Wood burner
7. Coal burner
8. Other solid fuel burner e.g. pellets
9. Oil burner
10. Some other type of heating
11. Not decided yet

PROGRAMMER: INSERT TEXT 'A WOOD BURNER' IF Q26 = 6 OR 'A COAL BURNER' IF Q26 = 7.

*IF Q26 = 6 or 7 ASK Q27. OTHERS GO TO Q29
27) For what reasons would you choose a [INSERT RESPONSE FROM Q26]?

(MULTICODE) (DO NOT READ OUT - PROBE FULLY)

1. Wood supply is cheap
2. Wood supply free
3. Coal supply is cheap
4. More efficient / warmer than other methods
5. Heats the whole house
6. Enjoyment / ambience
7. When visitors come over
8. Other (specify)

28) Under what circumstances would you consider changing to another type of home heating, not wood or coal?

(MULTICODE) (DO NOT READ - PROBE FULLY)

1. With financial help / subsidy
2. If alternative types of heating were cheaper
3. If alternative types of heating were more environmentally friendly
4. Thinking about changing anyway
5. Landlord/ other person's responsibility
6. Only if I have to (because of rules/regulations etc)
7. Would not consider changing
8. Don't know/ no answer
9. Other (specify)

*IF Q25 = 1. OTHERS GO TO Q30

29) And how soon are you likely to change? Would this be…

1. Within the next month
2. Within the next 6 months
3. Within the next 12 months
4. Within the next 2 years
5. Sometime after 2 years
6. DO NOT READ: Don't know/ not sure

*IF Q1c = 6 OR 7 GO TO Q34. OTHERS ASK Q30

30) Do you have a fireplace or woodburner in your home that is not used?

1. Yes
2. No (GO TO Q34)
3. Unsure (GO TO Q34)

31) For what reasons is it not in use?

(MULTICODE) (PROBE FULLY)

1. Environmental reason
2. Cost
3. Convenience
4. Too messy
5. Health reasons
6. Renovating
7. Saving space
8. Qualify for subsidy/ financial assistance for other kind of heating
9. Have better heating now
10. [DO NOT READ]Don't Know
11. Other (Specify)

32) Do you think you will want to use it again sometime?

1. Yes
2. No (GO TO Q34)
3. Unsure (GO TO Q34)

*IF Q32 = 1 ASK Q33. OTHERS GO TO Q34

33) On what sorts of occasions?

(MULITCODE) (DO NOT READ - PROBE FULLY)

1. Particularly cold day or night
2. Power cut
3. Visitors/ special occasion
4. Free firewood
5. Don't Know/Unsure
6. Other (Specify)

Appendix E: Tables

Most tables are based on the numbers in each group, such as Survey Area. That is, the percentages in each column add to 100%. This allows for comparison of groups (columns) to check how the incidence or prevalence of a particular item or category compares from one group to another. Other cross-tabulations as used in the commentary are also shown.

The tables show both weighted and unweighted raw number bases, with weighted bases above. Use unweighted bases for Confidence Interval calculations, as described in Appendix B.

Interpret tables with unweighted base numbers of less than 50 with caution. They provide indications only.

Interpretation guide: Example using the first table

- Of households in Papakura, 27.3 per cent use a heat pump for heating their main living area now, 29.5 per cent use a woodburner of any kind, etc.
- Of households in Central Auckland, 24.2 per cent use a heat pump for heating their main living area now, 18.4 per cent use a woodburner of any kind, etc.
- Of all households in the region, 25.8 per cent use a woodburner of any kind now.

Using these tables

The purpose of tables in this format is to compare areas (or some other descriptor, such as home ownership).

The 'Total' value in this case represents an average or reference which can be used to compare a value for any given area with the overall value for the region and with the other areas. For example, 27.3 per cent of households in Papakura used a heat pump for heating their main living area now, as have 28.8 per cent in Rural Auckland, 21.4 per cent in South Auckland, and so on. When compared with the overall value of 26.0 per cent of households in the region it can be seen that use of a heat pump use is highest for North Shore (29.8%), and lowest for South Auckland (21.4%).

If we want to know how, say heat pumps usage, is distributed across Auckland by area then we refer to the tables as formatted in Appendix F.

Accuracy of data values

Note that percentages are shown to one decimal place, but this does not indicate the accuracy of the data. The percentages shown should be regarded as estimates of the true value. This true value is unknown but it can be stated that with 95 per cent certainty it lies within the 95 per cent confidence interval. An approximation of the 95 per cent confidence interval is given by:

$$P_w \pm 1.96 \sqrt{\frac{(P_w)(100 - P_w)}{N_u}}$$

P_w: weighted percentage value

N_u: base number for the percentage value (unweighted)

In the report, percentages are reported to rounded whole numbers.

Section 3: Methods of home heating

Tables for Section 3.1: Heating methods used

Q. And what are you using, these days, for heating the main living areas of your home?

		%
Type of heater in main living area	Electricity	61.3
	Gas	21.1
	Wood (mainly)	26.0
	Total (n=) weighted	2800
	unweighted	2800

Base: Column percentages based on weighted numbers in each column.
Note that respondents could use more than one type of heating. Hence totals exceed 100%

Q. Which of the following have you ever used to heat this home?

		Area							
		Papakura	Rural Auckland	South Auckland	East Auckland	Central Auckland	West Auckland	North Shore	Auckland Total
		%	%	%	%	%	%	%	%
Heating ever used in current home	Heat pump	31.8	30.5	24.0	29.1	28.3	27.9	32.4	29.2
	Solar heating	1.0	3.2	1.7	2.3	0.3	0.9	2.1	1.4
	Electric heaters(including bar heaters, oil filled or fan)	69.4	66.2	69.6	81.3	81.1	74.4	74.5	75.4
	Bottled gas heater	39.1	29.2	34.1	27.7	20.2	25.6	25.0	26.0
	Mains gas heater	7.3	7.3	9.8	12.9	25.4	5.6	14.3	15.1
	Wood burner	36.5	41.6	33.8	32.1	32.9	47.9	36.1	36.8
	Coal burner	2.3	1.7	1.8	2.4	3.1	2.7	3.0	2.6
	Other solid fuel burner e.g. pellets	1.1	0.8	0.5	0.4	0.1	1.3	2.3	0.8
	Oil burner	5.1	3.3	5.6	5.8	6.9	5.3	7.0	5.9
	Some other type of heating	3.1	2.5	1.2	3.9	3.2	3.1	2.7	2.9
	No form of heating ever used	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

3.1.1 Heating methods used in the main living areas/ 3.1.4 Heating methods by survey area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Heating used now for main living areas	Heat pump	27.3	28.8	21.4	26.9	24.2	24.6	29.8	26.0
	Solar heating	0.0	0.0	0.4	0.0	0.0	0.2	0.5	0.1
	Electric heaters(including bar heaters, oil filled or fan)	30.6	27.8	38.5	34.9	43.1	35.3	32.4	36.3
	Bottled gas heater	19.1	12.7	15.5	11.7	6.6	9.5	12.3	10.7
	Mains gas heater	3.5	4.6	6.0	9.7	18.4	2.8	9.8	10.4
	Wood burner	29.5	34.1	25.4	23.3	18.4	37.1	25.5	25.8
	Coal burner	1.2	0.9	0.8	0.5	0.9	0.4	0.9	0.8
	Other solid fuel burner e.g. pellets	0.7	0.3	0.0	0.4	0.0	0.0	0.4	0.2
	Oil burner	0.9	1.3	0.7	1.0	0.6	1.6	2.6	1.2
	Some other type of heating	1.4	1.3	1.5	2.3	2.0	2.1	0.0	1.6
	No form of heating ever used	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Heating used now in main living area	Any burner	29.5	34.1	25.5	23.4	18.8	37.1	25.5	26.0
	Non wood / coal heating	70.5	65.9	74.5	76.6	81.2	62.9	74.5	74.0

3.1.2 Heating methods used in the rest of the home

Q. And which of these do you use, these days, for heating your home?

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Use these days for heating home	Heat pump	27.7	30.4	22.1	27.9	27.3	26.4	32.5	28.1
	Solar heating	0.4	1.5	0.4	0.0	0.1	0.8	0.9	0.5
	Electric heaters(including bar heaters, oil filled or fan)	47.4	40.8	49.0	53.8	61.0	51.5	48.2	52.4
	Bottled gas heater	21.3	14.1	18.7	13.0	8.9	11.1	12.8	12.5
	Mains gas heater	3.9	4.8	7.8	9.8	19.1	4.3	11.0	11.2
	Wood burner	30.4	34.7	26.5	24.7	22.7	39.1	27.7	28.2
	Coal burner	1.3	1.0	0.8	0.5	1.4	0.4	1.6	1.1
	Other solid fuel burner e.g. pellets	0.9	0.3	0.1	0.4	0.0	0.2	1.2	0.4
	Oil burner	2.4	1.8	2.9	2.2	2.9	2.6	4.0	2.8
	Some other type of heating	2.4	1.7	1.5	3.4	2.0	2.7	1.0	2.0
	No form of heating ever used	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total								
		204	398	214	239	960	349	436	2800
		400	400	400	400	400	400	400	2800

Summary table: Heating methods by area

		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Type of heater in main living area	Electricity	56.6	55.8	59.5	61.0	66.0	59.7	60.8	61.3
	Gas	22.3	17.3	21.5	21.4	25.0	12.3	22.1	21.1
	Wood (mainly)	29.5	34.1	25.5	23.4	18.8	37.1	25.5	26.0
	Total weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: Column percentages based on weighted numbers in each column.
Note that respondents could use more than one type of heating. Hence totals exceed 100%

Table for Section 3.2: Unused solid fuel burners

	Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Wood or coal burner in use	29.5	34.1	25.5	23.4	18.8	37.1	25.5	26.0%
Unused burner or fireplace	10.2	7.6	11.5	12.6	19.5	10.1	9.7	13.2%
Total weighted	204	398	214	239	960	349	436	2800
unweighted	400	400	400	400	400	400	400	2800

Base: All households (n=2800).

Tables for Section 3.3 Heating methods and home ownership

		Do you own your home or do you rent it?		
		Own %	Rent %	Auckland Total %
Heating used now for main living areas	Heat pump	30.4	9.4	26.0
	Solar heating	0.2	0.0	0.1
	Electric heaters(including bar heaters, oil filled or fan)	31.6	54.1	36.3
	Bottled gas heater	8.9	17.7	10.7
	Mains gas heater	10.9	8.6	10.4
	Wood burner	28.3	16.5	25.8
	Coal burner	0.9	0.7	0.8
	Other solid fuel burner e.g. pellets	0.2	0.0	0.2
	Oil burner	1.4	0.5	1.2
	Some other type of heating	1.5	1.6	1.6
	No form of heating ever used	0.0	0.0	0.0
	Total weighted	2213	587	2800
	Total unweighted	2270	530	2800

Base: Percentages based on home owners and renters respectively.

Distribution of heater types by type of home tenure

		Do you own your home or do you rent it?		
		Own %	Rent %	Auckland Total %
Heating used now for main living areas	Heat pump	24.0	2.0	26.0
	Solar heating	0.1	0.0	0.1
	Electric heaters(including bar heaters, oil filled or fan)	25.0	11.4	36.3
	Bottled gas heater	7.0	3.7	10.7
	Mains gas heater	8.6	1.8	10.4
	Wood burner	22.3	3.5	25.8
	Coal burner	0.7	0.1	0.8
	Other solid fuel burner e.g. pellets	0.2	0.0	0.2
	Oil burner	1.1	0.1	1.2
	Some other type of heating	1.2	0.3	1.6
	No form of heating ever used	0.0	0.0	0.0
	Total weighted	2213	587	2800
	unweighted	2270	530	2800

Base: Percentages based on total sample (n=2800). Cells sum to 100%

3.3.1 Solid-fuel burners by area and home ownership

		Area															
		Papakura		Rural Auckland		South Auckland		East Auckland		Central Auckland		West Auckland		North Shore		Auckland Total	
		Own %	Rent %	Own %	Rent %	Own %	Rent %	Own %	Rent %	Own %	Rent %	Own %	Rent %	Own %	Rent %	Own %	Rent %
Heating used now in main living area	Any burner	32.2	21.7	36.4	22.6	28.8	15.7	25.9	14.2	20.1	14.5	40.8	20.9	28.2	13.7	28.5	16.7
	Non wood/ coal heating	67.8	78.3	63.6	77.4	71.2	84.3	74.1	85.8	79.9	85.5	59.2	79.1	71.8	86.3	71.5	83.3
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	153	51	332	66	160	54	188	51	742	219	284	65	355	81	2213	587
	unweighted	307	93	339	61	312	88	326	74	317	83	332	68	337	63	2270	530

Base: Percentages based on home owners and renters respectively.

Tables for Section 3.4: Appliance replacement

Q. You told me earlier that you use [Response from Q1c] for heating the main living area in your home, have you ever used a different method of heating in this area before this?

		Total sample (%)	Weighted count	Unweighted count
Have you ever used a different method of heating the main living area before this?	Yes	38.1	1066	1048
	No	61.9	1733	1749
	Don't know	0.0	1	3
	Total	100.0	2800	2800

What heating method did you use previously, in your main living area?

		Open fire (%)	Proportion of all households in Auckland region (%)
Types of heating method used previously in main living area	Solid fuel burner (coal, wood or pellet)	13.6	5.2
	Oil burner	13.2	5.0
	Electrical heating	7.0	2.7
	Mains gas heater	41.6	15.8
	Bottled gas heater	6.8	2.6
	Heat pump	26.4	10.0
	Don't know	2.0	0.8
	Total	0.7	0.3
	Total		

Base: Ever used a different heating method in main living area.

Patterns of switching and retention between burners and other heating types

		Ever used different method of heating main living area (%)
history	Wood burner to wood burner	0.9
	Non-burner to wood burner	23.1
	Wood burner to non-woodburner	25.4
	Non-wood burner to non-wood burner	50.6
	Total	100.0
	weighted	1066
	unweighted	1048

Section 4: Solid Fuel Burning Appliances

Tables for Section 4.1 Types and ages of appliances

Q. What type of solid fuel burning appliance do you use in your main living area? Is it one of these

		Those with any kind of burner %	Proportion of all households in Auckland region %	Count	Unweighted Count
What type of solid fuel burning appliance do you use in your main living area?	Wood burner(This is a fully enclosed burner but does not include multi fuel burner like those that burn coal, or a pellet	76.6	20.1		
	Open fire (this is enclosed on three sides but open on the front. Includes a visor fireplace)	17.2	4.5		
	Multifuel burner (an enclosed burner which burns wood as well as coal, this includes incinerators, pot belly stoves, McK	4.3	1.1		
	Pellet fire (using processed wood pellets)	1.0	0.3		
	None of these	0.7	0.2		
	Don't know	0.2	0.1		
	Total	100.0		733	1405

Base: Those with any kind of burner.

Comparison of ages of burners by survey year

	2007 %	2012 %
Since 2005	1.5	5.2
1991 to 2005	14.9	11.1
Before 1991	10.2	6.4
Don't know	2.0	3.0
	100	100
	7231	2800

Based on all households.

	2007 %	2012 %
Since 2005	5.1	20.3
1991 to 2005	52.0	43.2
Before 1991	35.8	24.8
Don't know	7.1	11.8
	100	100
weighted	n/a	719
unweighted	2070	1383

Based on households using solid fuel.

4.1.1 Types of burners by survey area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
What type of solid fuel burning appliance do you use in your main living area?	Wood burner(This is a fully enclosed burner but does not include multi fuel burner like those that burn coal, or a pellet	76.7	83.2	77.5	78.2	64.5	86.0	75.9	76.6
	Open fire (this is enclosed on three sides but open on the front. Includes a visor fireplace)	15.8	12.4	15.5	16.7	29.5	7.0	16.8	17.2
	Multifuel burner (an enclosed burner which burns wood as well as coal, this includes incinerators, pot belly stoves, etc.	3.9	3.0	6.0	2.5	4.0	5.5	5.4	4.3
	Pellet fire (using processed wood pellets)	1.0	1.0	0.5	1.6	1.0	0.5	1.4	1.0
	None of these	2.1	0.5	0.0	0.5	1.0	0.5	0.5	0.7
	Don't know	0.5	0.0	0.5	0.5	0.0	0.5	0.0	0.2
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	62	137	55	57	181	130	113	733
	unweighted	202	201	200	201	200	200	201	1405

Percentage of wood burners within survey areas

	2007 %	2012 %
Papakura	76.5	76.7
Rural Auckland	82.9	83.2
South Auckland	66.1	77.5
East Auckland	73.6	78.2
Central Auckland	51.4	64.5
West Auckland	84.3	86.0
North Shore	71.9	75.9
Weighted base	n/a	733
Unweighted base	2070	1405

Percentage of open fires within survey areas

	2007 %	2012 %
Papakura	15.0	15.8
Rural Auckland	14.0	12.4
South Auckland	26.7	15.5
East Auckland	19.4	16.7
Central Auckland	47.7	29.5
West Auckland	10.3	7.0
North Shore	24.1	16.8
Weighted base	n/a	733
Unweighted base	2070	1405

Table for section 4.2: Appliance and dwelling age

Q9. How old is your solid fuel burner?

		Weighted count of all households with burners in main living area	Unweighted count	Those with a solid fuel burner %	Proportion of all households in Auckland region %	Estimated number of households in Auckland region
How old is your solid fuel burner?	Less than 7 years (that is, since 2005)	146	292	20.3	5.2	25,278
	Between 7 and 21 years (that is, from 1991)	311	594	43.2	11.1	53,794
	More than 21 years (before 1991)	178	334	24.8	6.4	30,834
	Don't know/ here when we moved in	85	163	11.8	3.0	14,660
	Total	719	1383	100.0	25.7	485,021

Base: Those with main burner type – wood burner, open fire, or multifuel burner.

4.2.1 Age of burners by survey area

		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
How old is your solid fuel burner?	Less than 7 years (that is, since 2005)	27.4	25.1	19.7	21.7	15.8	18.8	19.1	20.3
	Between 7 and 21 years (that is, from 1991)	38.7	50.8	38.9	46.5	37.8	45.2	43.2	43.2
	More than 21 years (before 1991)	22.8	14.1	28.3	20.7	35.7	17.8	29.6	24.8
	Don't know/ here when we moved in	11.1	10.1	13.1	11.1	10.7	18.3	8.0	11.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	59	135	54	55	177	128	110	719
	unweighted	196	199	198	198	196	197	199	1383

Base: those aware of burner age.

4.2.2 The relationship between types and age of burners

		Type of solid fuel appliance in main living area			
		Wood burner %	Open fire %	Multifuel burner %	Auckland Total %
How old is your solid fuel burner?	Less than 7 years (that is, since 2005)	24.3	4.8	10.4	20.3
	Between 7 and 21 years (that is, from 1991)	47.3	27.2	33.7	43.2
	More than 21 years (before 1991)	17.1	56.5	33.4	24.8
	Don't know/ here when we moved in	11.2	11.4	22.5	11.8
	Total	100.0	100.0	100.0	100.0
	weighted	562	126	32	719
	unweighted	1094	228	61	1383

Base: Those who have woodburner/ open fire/ multifuel burner in main living area.

Appliance age and type

		How old is your solid fuel burner?				
		Less than 7 years (that is, since 2005) %	Between 7 and 21 years (that is, from 1991) %	More than 21 years (before 1991) %	Don't know/ here when we moved in %	Auckland Total %
What type of solid fuel burning appliance do you use in your main living area?	Wood burner(This is a fully enclosed burner but does not include multi fuel burner like those that burn coal, or a pellet	93.6	85.5	54.1	74.6	78.1
	Open fire (this is enclosed on three sides but open on the front. Includes a visor fireplace)	4.2	11.0	40.0	17.0	17.5
	Multifuel burner (an enclosed burner which burns wood as well as coal, this includes incinerators, pot belly stoves,	2.3	3.4	5.9	8.4	4.4
	Total	100.0	100.0	100.0	100.0	100.0
	weighted	146	311	178	85	719
	unweighted	292	594	334	163	1383

Main appliance types by age of dwelling

		Age of house)					
		0-12 years %	13-30 years %	31-50 years %	Over 50 years %	Don't know %	Auckland Total %
What type of solid fuel burning appliance do you use in your main living area?	Wood burner	77.6	88.0	81.4	70.6	66.3	78.1
	Open fire	17.8	7.6	13.2	25.7	30.8	17.5
	Multifuel burner	4.6	4.3	5.4	3.7	2.9	4.4
	Total	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	50	160	220	258	31	719
	unweighted	84	331	465	444	59	1383

Base: Have woodburner/ open fire/ multifuel burner in main living area.

Tables for section 4.3: Appliance switching and replacement rates

Q. You told me earlier that you use [TYPE OF HEATING] for heating the main living area in your home, have you ever used a different method of heating in this area before this?

		Total sample %	Count	Unweighted Count
Have you ever used a different method of heating the main living area before this?	Yes	38.1	1066	1048
	No	61.9	1733	1749
	Don't know	0.0	1	3
	Total	100.0	2800	2800

Base: total sample.

Ever used different method, by survey area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Have you ever used a different method of heating the main living area before this?	Yes	41.2	35.3	36.7	40.7	38.2	38.5	37.7	38.1
	No	58.8	64.7	62.8	59.2	61.8	61.5	62.3	61.9
	Don't know	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: total sample.

Ever used different method, by type of dwelling

		And what type of home do you live in?							
		A standalone house %	Townhouse, brick and tile flat, or duplex %	Terraced house or semi-detached %	High rise apartment block %	Farm or lifestyle block %	Don't know %	Other (specify) %	Auckland Total %
Have you ever used a different method of heating the main living area before this?	Yes	40.2	26.9	36.1	7.2	34.1	63.9	37.1	38.1
	No	59.7	73.1	63.9	92.8	65.9	36.1	62.9	61.9
	Don't know	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	2277	308	92	45	26	8	45	2800
	unweighted	2402	242	65	19	37	7	28	2800

Base: total sample

Ever used different method, by tenure

		Do you own your home or do you rent it?		
		Own %	Rent %	Total %
Have you ever used a different method of heating the main living area before this?	Yes	40.7	28.1	38.1
	No	59.2	71.8	61.9
	Don't know	0.0	0.0	0.0
	Total	100.0	100.0	100.0
	weighted	2213	587	2800
	unweighted	2270	530	2800

Base: total sample

Ever used different method, by type of heating

		Heating used now in main living area		
		Any burner %	Non wood/ coal heating %	Total %
Have you ever used a different method of heating the main living area before this?	Yes	35.2	39.1	38.1
	No	64.8	60.9	61.9
	Don't know	0.1	0.0	0.0
	Total	100.0	100.0	100.0
		728	2072	2800
		1400	1400	2800

Base: total sample

Q. What heating method did you use previously, in your main living area?

		Used different heating source previously %	Total sample %
Types of heating method used previously in main living area	Open fire	13.6	5.2
	Solid fuel burner (coal, wood or pellet)	13.2	5.0
	Oil burner	7.0	2.7
	Electrical heating	41.6	15.8
	Mains gas heater	6.8	2.6
	Bottled gas heater	26.4	10.1
	Heat pump	2.0	0.8
	Don't know	0.7	0.3
	Total		
		1066	2800
		1048	2800

Base: total sample

4.3.1 Open-fire replacement

Type of heating used now, by those who previously had an open fire

		Previously had open fire %	Per cent of all households %	Count	Unweighted Count
Heating used now for main living areas	Heat pump	38.3	2.0		
	Solar heating	0.0	0.0		
	Electric heaters(including bar heaters, oil filled or fan)	36.1	1.9		
	Bottled gas heater	13.7	0.7		
	Mains gas heater	16.3	0.8		
	Wood burner	5.7	0.3		
	Coal burner	0.2	0.0		
	Other solid fuel burner e.g. pellets	0.0	0.0		
	Oil burner	1.9	0.1		
	Some other type of heating	0.8	0.0		
	No form of heating ever used	0.0	0.0		
	Total	100.0	5.2	145	103

Age of open fire when it was replaced

		Previously had open fire %	Per cent of all households %	Count	Unweighted Count
Age of open fire when it was replaced	Less than 15 years old	0.8	14.7		
	Between 15 and 30 years old	1.0	18.4		
	More than 30 years old	2.2	43.0		
	Don't know/here when we moved in	1.2	23.9		
	Total	5.2	100.0	145	103

4.3.2 Enclosed solid-fuel burner replacement

Type of heating used now, by those who previously had a solid fuel burner

		Previously had solid fuel burner %	Per cent of all households %	Count	Unweighted Count
Heating used now for main living areas	Heat pump	57.6	2.9	81	55
	Solar heating	0.0	0.0	0	0
	Electric heaters(including bar heaters, oil filled or fan)	32.4	1.6	45	30
	Bottled gas heater	8.2	0.4	12	11
	Mains gas heater	4.2	0.2	6	6
	Wood burner	1.1	0.1	2	3
	Coal burner	0.0	0.0	0	0
	Other solid fuel burner e.g. pellets	0.9	0.0	1	1
	Oil burner	0.0	0.0	0	0
	Some other type of heating	2.8	0.1	4	1
	No form of heating ever used	0.0	0.0	0	0
	Total	100.0	5.0	140	97

Age of solid fuel burner when it was replaced

		Previously had solid fuel burner %	Per cent of all households %	Count	Unweighted Count
Age of solid fuel burner when it was replaced	Less than 15 years old	1.3	25.7		
	Between 15 and 30 years old	1.2	24.5		
	More than 30 years old	1.0	19.6		
	Don't know/here when we moved in	1.5	30.2		
	Total	5.0	100.0	140	97

Tables for section 4.4: Appliance type and household income

Appliance type and household income

		Household income before tax							
		$25,000 or less %	$25,001 - $50,000 %	$50,001 - $70,000 %	$70,001 - $100,000 %	$100,001 - $150,000 %	Over $150,000 %	Refused/ other/ none %	Auckland Total %
Heating used now in main living area	Any burner	19.3	24.3	27.2	28.8	25.7	25.7	27.3	26.0
	Non wood/coal heating	80.7	75.7	72.8	71.2	74.3	74.3	72.7	74.0
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	240	401	386	471	462	319	520	2800
	unweighted	236	413	412	502	434	267	536	2800

Base: Total sample (n=2800)

		Household income before tax							
		$25,000 or less %	$25,001 - $50,000 %	$50,001 - $70,000 %	$70,001 - $100,000 %	$100,001 - $150,000 %	Over $150,000 %	Refused/ other/ none %	$25,000 or less %
Type of burner	Wood burner	75.2	71.3	79.8	78.8	77.7	76.4	75.5	76.6
	Open fire	21.9	21.5	14.7	14.2	16.6	19.3	16.6	17.2
	Other	2.9	7.2	5.6	7.0	5.7	4.2	7.9	6.2
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	47	99	105	136	120	83	144	733
	unweighted	90	192	215	271	222	143	272	1405

Base: Those with any type of burner.

Section 5: Factors Affecting Choice and Use of Solid Fuel

Section 5.1: Burner users: Reasons for burning solid fuel

Q. For what reasons are you using wood or coal fired heating? (Asked of current wood or coal burner users)

		Sample: Have woodburner/ open fire/ multifuel burner in main living area %
Reasons using wood or coal-fired burner	More efficient / warmer than other methods	27.9
	Wood supply is cheap	25.7
	Enjoyment / ambience	22.5
	Wood supply free	20.3
	There is no other heating in the house / living area	20.3
	Heats the whole house	16.5
	Already here when we moved in	5.0
	Other (specify)	3.5
	Use also for water heating	1.4
	Environmentally friendly	0.9
	Saves on electricity	0.6
	Don't know	0.6
	Dry heat/ less condensation	0.5
	When visitors come over	0.4
	Coal supply is cheap	0.3
	Total weighted	719
	unweighted	1383

Base: Have any type of burner in main living area

Section 5.2: Non-burner users: Reasons for switching from a wood or coal burner to another heating type

Q. For what reasons did you switch from wood/coal burner?

		Sample: Switched from wood/coal %
Reasons switched from wood/ coal	Convenience/ work involved	38.0
	Wood / Coal less efficient	25.4
	Cost	17.6
	Renovating/ didn't work properly/ worn out	11.5
	Other (specify)	9.2
	Environmental reason	6.4
	Safety	5.8
	Saving space	5.6
	Too messy	5.2
	Don't Know	3.1
	Health reasons	2.6
	Qualify for subsidy/ financial assistance	0.0
	Total	
	weighted	271
	unweighted	176

Base: Switchers for wood or coal burner

Tables for Section 5.3: Considering change to another type of home heating

Q. Still thinking about your main living area, are you considering changing to another type of home heating in the next few years or so?

By survey area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Considering change	Yes	18.4	13.0	17.0	17.9	20.3	20.2	15.8	18.0
	No	79.5	85.3	72.2	78.6	74.8	74.6	80.9	77.7
	Unsure	2.1	1.7	10.9	3.5	4.9	5.2	3.4	4.4
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: Total sample

Considering change, by type of dwelling

		And what type of home do you live in?							
		A standalone house %	Townhouse, brick and tile flat, or duplex %	Terraced house or semi-detached %	High rise apartment block %	Farm or lifestyle block %	Don't know %	Other (specify) %	Auckland Total %
Considering change	Yes	18.5	17.8	10.6	9.4	5.4	0.0	23.4	18.0
	No	78.0	72.1	77.8	88.9	94.6	100.0	74.2	77.7
	Unsure	3.5	10.1	11.6	1.8	0.0	0.0	2.4	4.4
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	2277	308	92	45	26	8	45	2800
	unweighted	2402	242	65	19	37	7	28	2800

Base: Total sample

Considering change, by age of dwelling

		Age of house (years)						
		5 or under %	6-12 %	13-30 %	31-50 %	Over 50 %	Don't know %	Total %
Considering change	Yes	7.1	13.9	16.8	22.3	19.5	14.3	18.0
	No	90.6	82.3	79.6	72.8	76.3	76.1	77.7
	Unsure	2.3	3.8	3.5	4.9	4.2	9.6	4.4
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	168	316	666	767	727	157	2800
	unweighted	122	286	725	831	686	150	2800

Base: Total sample

Considering change, by tenure

		Do you own your home or do you rent it?		
		Own %	Rent %	Total %
Considering change	Yes	18.1	17.2	18.0
	No	78.4	75.0	77.7
	Unsure	3.5	7.8	4.4
	Total	100.0	100.0	100.0
	weighted	2213	587	2800
	unweighted	2270	530	2800

Base: Total sample

Considering change, by heating used now in main living area

		Heating used now in main living area		
		Any burner %	Non wood/ coal heating %	Total %
Considering change	Yes	15.0	19.0	18.0
	No	81.5	76.3	77.7
	Unsure	3.5	4.7	4.4
	Total	100.0	100.0	100.0
	weighted	728	2072	2800
	unweighted	1400	1400	2800

Base: Total sample

Q. What type of heating are you most likely to choose?

Type of heating likely to choose, by survey area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
What type of heating are you most likely to choose?	Heat pump	66.5	56.4	62.5	71.4	67.8	57.6	63.5	64.5
	Solar heating	3.8	1.3	4.4	2.1	0.5	4.6	8.7	2.9
	Electric heater (including bar heaters, oil filled or fan)	0.0	3.8	2.9	4.1	2.0	3.4	3.2	2.6
	Bottled gas heater	2.7	0.0	1.5	2.8	0.0	4.0	0.0	1.1
	Mains gas heater	0.0	3.8	3.7	0.7	5.9	1.6	6.3	4.1
	Wood burner	11.2	21.7	13.2	4.9	6.0	14.3	4.8	9.4
	Coal burner	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.1
	Other solid fuel burner e.g. pellets	1.9	0.0	0.0	0.7	0.0	1.6	3.2	0.9
	Oil burner	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Some other type of heating	9.3	6.5	4.4	4.9	8.9	5.9	4.8	7.0
	Not decided yet	4.6	6.4	7.3	7.7	8.9	7.1	5.5	7.4
	Total								
	weighted	38	52	36	43	195	71	69	503
	unweighted	65	51	64	69	70	82	64	465
	Wood or coal burner	11.2	21.7	13.2	5.6	6.0	14.3	4.8	9.5

Caution: Treat any results based on subsamples of less than 50 with caution. They provide indications only.

Type of heating likely to choose, by dwelling age

		Age of house (years)						
		5 or under %	6-12 %	13-30 %	31-50 %	Over 50 %	Don't know %	Total %
What type of heating are you most likely to choose?	Heat pump	54.8	67.1	58.5	72.0	60.5	62.2	64.5
	Solar heating	7.6	0.0	5.1	2.6	2.6	0.0	2.9
	Electric heater (including bar heaters, oil filled or fan)	14.9	0.0	2.7	1.7	1.1	17.4	2.6
	Bottled gas heater	0.0	0.0	0.8	0.7	1.0	9.4	1.1
	Mains gas heater	0.0	4.3	2.3	3.2	7.4	0.0	4.1
	Wood burner	17.0	6.2	14.1	6.5	11.1	0.0	9.4
	Coal burner	0.0	0.0	0.0	0.0	0.0	1.2	0.1
	Other solid fuel burner e.g. pellets	0.0	0.6	0.5	0.6	1.7	0.0	0.9
	Oil burner	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Some other type of heating	5.7	7.7	3.9	5.9	11.9	0.0	7.0
	Not decided yet	0.0	14.1	12.1	6.7	2.8	9.8	7.4
	Total							
	weighted	12	44	112	171	142	22	503
	unweighted	14	42	107	165	117	20	465

Type of heating likely to choose, by tenure

		Do you own your home or do you rent it?		
		Own %	Rent %	Total %
What type of heating are you most likely to choose?	Heat pump	67.4	52.8	64.5
	Solar heating	2.5	4.8	2.9
	Electric heater (including bar heaters, oil filled or fan)	0.9	9.4	2.6
	Bottled gas heater	0.6	3.0	1.1
	Mains gas heater	5.1	0.0	4.1
	Wood burner	9.7	8.2	9.4
	Coal burner	0.0	0.3	0.1
	Other solid fuel burner e.g. pellets	1.1	0.0	0.9
	Oil burner	0.0	0.0	0.0
	Some other type of heating	6.3	10.1	7.0
	Not decided yet	6.4	11.5	7.4
	Total			
	weighted	402	101	503
	unweighted	387	78	465

Type of heating likely to choose, by type of heating method currently used

		Heating used now in main living area		
		Any burner	Non wood/coal heating	Total
		%	%	%
What type of heating are you most likely to choose?	Heat pump	63.9	64.6	64.5
	Solar heating	5.4	2.2	2.9
	Electric heater (including bar heaters, oil filled or fan)	3.3	2.5	2.6
	Bottled gas heater	1.6	1.0	1.1
	Mains gas heater	5.7	3.6	4.1
	Wood burner	6.1	10.3	9.4
	Coal burner	0.3	0.0	0.1
	Other solid fuel burner e.g. pellets	0.8	0.9	0.9
	Oil burner	0.0	0.0	0.0
	Some other type of heating	8.4	6.7	7.0
	Not decided yet	4.4	8.2	7.4
	Total			
	weighted	109	394	503
	unweighted	208	257	465

Preferences of those considering changing to a burner

Q. For what reasons would you choose a [BURNER TYPE SPECIFIED]?

		Sample: Would replace with a burner %
	More efficient / warmer than other methods	37.0
	Wood supply free	25.6
	Other (specify)	24.1
	Enjoyment / ambience	21.0
	Wood supply is cheap	15.4
	Heats the whole house	12.1
	When visitors come over	2.3
	Coal supply is cheap	0.0
	Total weighted	48
	unweighted	46

Base: Those considering change to a burner

Q. Under what circumstances would you consider changing to another type of home heating, not wood or coal?

		Sample:
		Choose wood or coal burner
		%
	If alternative types of heating were cheaper	29.5
	With financial help / subsidy	24.3
	Don't know/ no answer	22.8
	Would not consider changing	13.0
	Other (specify)	11.4
	If alternative types of heating were more environmentally friendly	4.0
	Landlord/ other person's responsibility	2.7
	Only if I have to (because of rules/regulations etc)	1.4
	Thinking about changing anyway	0.0
	Total	
	weighted	48
	unweighted	46

Base: Those considering change to a burner

Q. And how soon are you likely to change? Would this be…

		Sample: Considering change %
	Within the next month	6.5
	Within the next 6 months	6.0
	Within the next 12 months	28.3
	Within the next 2 years	27.0
	Sometime after 2 years	21.3
	Don't know/ not sure	10.9
	Total	100.0
	weighted	503
	unweighted	465
Likely to change	Within next 6 months	12.5
	After 6 months/ not sure	87.5

Base: those who said they were considering changing the type of heating in their main living area (18% of total)

Intention to change, by survey area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Likely to change	Within next 6 months	10.1	9.0	14.0	8.2	14.9	6.8	17.4	12.5
	After 6 months/ not sure	89.9	91.0	86.0	91.8	85.1	93.2	82.6	87.5
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	38	52	36	43	195	71	69	503
	unweighted	65	51	64	69	70	82	64	465

Base: those who said they were considering changing the type of heating in their main living area (18% of total)

Intention to change, by type of dwelling

		And what type of home do you live in?							
		A standalone house %	Townhouse, brick and tile flat, or duplex %	Terraced house or semi-detached %	High rise apartment block %	Farm or lifestyle block %	Don't know %	Other (specify) %	Auckland Total %
Likely to change	Within next 6 months	11.5	24.1	9.4	6.5	0.0	0.0	0.0	12.5
	After 6 months/ not sure	88.5	75.9	90.6	93.5	100.0	0.0	100.0	87.5
	Total	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0
	weighted	422	55	10	4	1	0	10	503
	unweighted	401	45	9	2	2	0	6	465

Base: those who said they were considering changing the type of heating in their main living area (18% of total)

Intention to change, by age of dwelling

		Age of house (years)						
		5 or under %	6-12 %	13-30 %	31-50 %	Over 50 %	Don't know %	Total %
Likely to change	Within next 6 months	9.2	6.6	15.1	12.4	11.4	20.9	12.5
	After 6 months/ not sure	90.8	93.4	84.9	87.6	88.6	79.1	87.5
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	12	44	112	171	142	22	503
	unweighted	14	42	107	165	117	20	465

Intention to change, by tenure

		Do you own your home or do you rent it?		
		Own %	Rent %	Total %
Likely to change	Within next 6 months	9.0	26.6	12.5
	After 6 months/ not sure	91.0	73.4	87.5
	Total	100.0	100.0	100.0
	weighted	402	101	503
	unweighted	387	78	465

Intention to change, by main heating method

		Heating used now in main living area		
		Any burner %	Non wood/ coal heating %	Total %
Likely to change	Within next 6 months	11.3	12.8	12.5
	After 6 months/ not sure	88.7	87.2	87.5
	Total	100.0	100.0	100.0
	weighted	109	394	503
	unweighted	208	257	465

Tables for Section 5.4: Reasons not using an existing fireplace or wood burner

Incidence of unused fireplace.

Q. Do you have a fireplace or wood burner in your home that is not used?

Fireplace or wood burner not in use, by survey area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Unused fireplace in home	Yes	10.2	7.6	11.5	12.6	19.5	10.1	9.7	13.2
	No/ don't know	89.8	92.4	88.5	87.4	80.5	89.9	90.3	86.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: Total sample

Fireplace or wood burner not in use, by type of dwelling

		And what type of home do you live in?							
		A standalone house %	Townhouse, brick and tile flat, or duplex %	Terraced house or semi-detached %	High rise apartment block %	Farm or lifestyle block %	Don't know %	Other (specify) %	Auckland Total %
Unused fireplace in home	Yes	14.5	5.3	14.4	1.8	5.0	47.3	12.4	13.2
	No/ don't know	85.5	94.7	85.6	98.2	95.0	52.7	87.6	86.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	2277	308	92	45	26	8	45	2800
	unweighted	2402	242	65	19	37	7	28	2800

Base: Total sample

Fireplace or wood burner not in use, by age of dwelling

		Age of house (years)						
		5 or under %	6-12 %	13-30 %	31-50 %	Over 50 %	Don't know %	Total %
Unused fireplace in home	Yes	1.3	5.1	5.5	14.7	24.2	17.1	13.2
	No/ don't know	98.7	94.9	94.5	85.3	75.8	82.9	86.8
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	168	316	666	767	727	157	2800
	unweighted	122	286	725	831	686	150	2800

Base: Total sample

Fireplace or wood burner not in use, by tenure

		Do you own your home or do you rent it?		
		Own %	Rent %	Total %
Unused fireplace in home	Yes	12.7	15.2	13.2
	No/ don't know	87.3	84.8	86.8
	Total	100.0	100.0	100.0
	weighted	2213	587	2800
	unweighted	2270	530	2800

Base: Total sample

Fireplace or wood burner not in use, by main heating method

		Heating used now in main living area		
		Any burner %	Non wood/ coal heating %	Total %
Unused fireplace in home	Yes	0.0	17.9	13.2
	No/ don't know	100.0	82.1	86.8
	Total	100.0	100.0	100.0
	weighted	728	2072	2800
	unweighted	1400	1400	2800

Base: Total sample

Q. For what reasons is it not in use?

		Sample: Have unused fireplace %
Main reasons fireplace not in use	Have better heating now/ heat was just going up the chimney/ not efficient	31.9
	Convenience	28.0
	Not in working order	12.1
	Cost	11.0
	Too messy	10.6
	Other (specify)	6.6
	Environmental reason	6.3
	Health reasons/ safety	6.0
	Renovating	5.4
	Saving space	3.9
	Don't need it	3.6
	Don’t know	2.2
	Qualified for subsidy/ financial assistance for other kind of heating	0.0
	Total	100.0
	weighted	370
	unweighted	222

Base: Those with unused fireplace (13% of total)

Reasons not in use, by survey area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Main reasons fireplace not in use	Have better heating now/ heat was just going up the chimney/ not efficient	27.6	39.1	29.0	15.2	39.6	9.4	26.9	31.9
	Convenience	17.2	21.7	16.1	36.4	29.2	31.3	30.8	28.0
	Not in working order	13.8	13.0	22.6	12.1	10.4	21.9	3.8	12.1
	Cost	20.7	13.0	9.7	12.1	10.4	6.3	11.5	11.0
	Too messy	10.3	13.0	3.2	15.2	12.5	12.5	0.0	10.6
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	weighted	21	30	25	30	187	35	42	370
	unweighted	29	23	31	33	48	32	26	222

Base: Those with unused fireplace (13% of total)

Note: Mentions below 10% excluded

Future usage intention for currently unused fireplace

Q. Do you think you will want to use it again sometime?

		Sample: Have unused fireplace %
Do you think you will want to use it again sometime?	Yes	36.9
	No	57.1
	Unsure	6.0
	Total	100.0
	weighted	370
	unweighted	222

Base: Those with unused fireplace (13% of total)

Q) On what sorts of occasions?

		Sample: Use it again sometime %
Occasions might re-use	Particularly cold day or night	39.2
	Other (specify)	21.4
	Visitors/ special occasion	18.3
	Don't Know	17.6
	Power cut	5.8
	Free firewood	4.6
	Total	
	weighted	136
	unweighted	93

Base: Those with unused fireplace who might want to use it

Appendix F: Special Additional Tables

This appendix presents a series of tabulations of overall findings, based on all households in the region.

Instructions on how to read these tables

The cells in each table show an estimate of the percentage of all households in each of the survey areas in the region with a particular characteristic. These may be used to estimate the percentage of households in the region that possess that characteristic. All percentages in the body of the table (i.e. all cells excluding columns and rows labelled 'Total') sum to 100%.

Unlike the tables shown in Appendix E, these tables are not suitable for comparing similarities and differences between survey areas.

All percentages reported are based on the total sample of 2,800.

Interpretation guide: Example, using the first table:

- Of all households in the region, 36.8 per cent have ever used a wood burner
- Of all households in the Auckland region, 2.3 per cent are in Papakura and have ever used a heat pump
- Of all households in the Auckland region, 11.3 per cent are in Central Auckland and have ever used a wood burner.

Note that all row percentages total to give the overall percentage in the Auckland region for that form of heating, e.g. for heat pumps this is 29.2 per cent.

Aggregating household responses

Percentages in cells may be aggregated. For example, the percentage of wood burners in "southern" Auckland is the sum of the percentages for Papakura (2.7%) and South Auckland (2.6%), i.e. 5.3%.

Accuracy of data values

As also applies in Appendix E, percentages shown to one decimal place do not indicate the accuracy of the data.

Percentage values are reported to whole numbers. Unweighted bases may be used to calculate confidence intervals.

Section 1: Heating used in-home

Q. And which of these do you use, these days, for heating your home?

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Use these days for heating home	Heat pump	2.0	4.3	1.7	2.4	9.4	3.3	5.1	28.1
	Solar heating	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.5
	Electric heaters(including bar heaters, oil filled or fan)	3.5	5.8	3.7	4.6	20.9	6.4	7.5	52.4
	Bottled gas heater	1.6	2.0	1.4	1.1	3.1	1.4	2.0	12.5
	Mains gas heater	0.3	0.7	0.6	0.8	6.5	0.5	1.7	11.2
	Wood burner	2.2	4.9	2.0	2.1	7.8	4.9	4.3	28.2
	Coal burner	0.1	0.1	0.1	0.0	0.5	0.0	0.3	1.1
	Other solid fuel burner e.g. pellets	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.4
	Oil burner	0.2	0.3	0.2	0.2	1.0	0.3	0.6	2.8
	Some other type of heating	0.2	0.2	0.1	0.3	0.7	0.3	0.2	2.0
	No form of heating ever used	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	7.3	14.2	7.6	8.5	34.3	12.5	15.6	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: Total sample

Q. And what are you using, these days, for heating the main living areas of your home?

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
	Heat pump	2.0	4.1	1.6	2.3	8.3	3.1	4.6	26.0
	Solar heating	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	Electric heaters(including bar heaters, oil filled or fan)	2.2	3.9	2.9	3.0	14.8	4.4	5.0	36.3
	Bottled gas heater	1.4	1.8	1.2	1.0	2.2	1.2	1.9	10.7
	Mains gas heater	0.3	0.7	0.5	0.8	6.3	0.4	1.5	10.4
	Wood burner	2.2	4.8	1.9	2.0	6.3	4.6	4.0	25.8
	Coal burner	0.1	0.1	0.1	0.0	0.3	0.0	0.1	0.8
	Other solid fuel burner e.g. pellets	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2
	Oil burner	0.1	0.2	0.1	0.1	0.2	0.2	0.4	1.2
	Some other type of heating	0.1	0.2	0.1	0.2	0.7	0.3	0.0	1.6
	No form of heating ever used	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	7.3	14.2	7.6	8.5	34.3	12.5	15.6	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: Total sample

Summary tables: main living area

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Heating used now in main living area	Any burner	2.2	4.8	2.0	2.0	6.5	4.6	4.0	26.0
	Non-wood or coal heating	5.1	9.4	5.7	6.5	27.8	7.9	11.6	74.0
	Total	7.3	14.2	7.6	8.5	34.3	12.5	15.6	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Type of heater in main living area	Electric heater or heat pump	4.1	7.9	4.5	5.2	22.6	7.4	9.5	61.3
	Gas (mains or bottled)	1.6	2.5	1.6	1.8	8.6	1.5	3.4	21.1
	Wood or coal or both	2.2	4.8	2.0	2.0	6.5	4.6	4.0	26.0
	Any other	0.2	0.4	0.2	0.3	0.9	0.5	0.5	3.1
	Total	7.3	14.2	7.6	8.5	34.3	12.5	15.6	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: Total sample

Section 2: Solid fuel burners

Q. What type of solid fuel burning appliance do you use in your main living area? Is it one of these [if multiple responses only most frequently used recorded]

		Sample							
		Have solid fuel heater in main living area							
		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
What type of solid fuel burning appliance do you use in your main living area?	Wood burner(This is a fully enclosed burner but does not include multi fuel burner like those that burn coal, or a pellet	1.7	4.1	1.5	1.6	4.2	4.0	3.1	20.1
	Open fire (this is enclosed on three sides but open on the front. Includes a visor fireplace)	0.3	0.6	0.3	0.3	1.9	0.3	0.7	4.5
	Multifuel burner (an enclosed burner which burns wood as well as coal, this includes incinerators, pot belly stoves	0.1	0.1	0.1	0.1	0.3	0.3	0.2	1.1
	Pellet fire (using processed wood pellets)	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3
	None of these	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Total	2.2	4.9	2.0	2.0	6.5	4.6	4.0	26.2
	weighted	62	137	55	57	181	130	113	733
	unweighted	202	201	200	201	200	200	201	1405

Base: Households having a solid fuel heater in their main living area.

Q. How old is your solid fuel burner?

		Sample:							
		Have woodburner/ open fire/ multifuel burner in main living area							
		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
How old is your solid fuel burner?	Less than 7 years (that is, since 2005)	0.6	1.2	0.4	0.4	1.0	0.9	0.8	5.2
	Between 7 and 21 years (that is, from 1991)	0.8	2.4	0.8	0.9	2.4	2.1	1.7	11.1
	More than 21 years (before 1991)	0.5	0.7	0.5	0.4	2.3	0.8	1.2	6.4
	Don't know/ here when we moved in	0.2	0.5	0.3	0.2	0.7	0.8	0.3	3.0
	Total	2.1	4.8	1.9	2.0	6.3	4.6	3.9	25.7
	weighted	59	135	54	55	177	128	110	719
	unweighted	196	199	198	198	196	197	199	1383

Base: Those with a solid fuel burner in the main living area

Section 3: Types of heating used previously

Q. You told me earlier that you use [Response from Q1c] for heating the main living area in your home, have you ever used a different method of heating in this area before this?

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Have you ever used a different method of heating the main living area before this?	Yes	3.0	5.0	2.8	3.5	13.1	4.8	5.9	38.1
	No	4.3	9.2	4.8	5.1	21.2	7.7	9.7	61.9
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	7.3	14.2	7.6	8.5	34.3	12.5	15.6	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: Total sample

Q. What heating method did you use previously, in your main living area?

		Sample:							
		Ever used different method of heating main living area							
		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Types of heating method used previously in main living area	Open fire	0.3	0.4	0.3	0.4	2.0	0.7	1.1	5.2
	Solid fuel burner (coal, wood or pellet)	0.4	0.9	0.3	0.4	1.9	0.7	0.4	5.0
	Oil burner	0.2	0.3	0.1	0.2	0.7	0.5	0.6	2.7
	Electrical heating	1.2	1.8	1.1	1.6	5.2	1.9	2.9	15.8
	Mains gas heater	0.1	0.3	0.2	0.1	1.2	0.1	0.4	2.6
	Bottled gas heater	0.8	1.7	1.0	0.9	3.2	1.1	1.3	10.0
	Heat pump	0.1	0.1	0.0	0.1	0.2	0.2	0.1	0.8
	Don't know	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3
	Total	3.0	5.0	2.8	3.5	13.1	4.8	5.9	38.1
	weighted	84	140	79	97	367	135	164	1066
	unweighted	157	138	144	159	154	150	146	1048
summary table	Open fire or solid fuel burner	0.6	1.1	0.5	0.8	4.0	1.2	1.5	9.8
	Not open fire or solid fuel burner	2.4	3.9	2.3	2.7	9.1	3.6	4.3	28.2

Base: ever used different heating method in main living area (38.1% of 2800)

Q. Thinking about the open fire. How old was this when it was replaced (as far as you know)?

		Count of number of households replacing an open fire	Unweighted count	Percentage of all households in Auckland %
Age of open fire when it was replaced	Less than 15 years old	21	16	0.8
	Between 15 and 30 years old	27	24	1.0
	More than 30 years old	63	34	2.2
	Don't know/here when we moved in	35	29	1.2
	Total	145	103	2800

Base: Those who replaced an open fire

Q. Thinking about the solid fuel burner. How old was this when it was replaced (as far as you know)?

		Count of number of households replacing a solid fuel burner	Unweighted count	Percentage of all households in Auckland %
Age of solid fuel burner when it was replaced	Less than 15 years old	36	29	1.3
	Between 15 and 30 years old	34	27	1.2
	More than 30 years old	27	16	1.0
	Don't know/here when we moved in	42	25	1.5
	Total	140	97	2800

Base: Those who replaced a solid fuel burner

Section 4: Considering change

Q. Still thinking about your main living area, are you considering changing to another type of home heating in the next few years or so?

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Still thinking about your main living area, are you considering changing to another type of home heating in the next few years or so?	Yes	1.3	1.8	1.3	1.5	7.0	2.5	2.5	18.0
	No	5.8	12.1	5.5	6.7	25.6	9.3	12.6	77.7
	Unsure	0.2	0.2	0.8	0.3	1.7	0.6	0.5	4.4
	Total	7.3	14.2	7.6	8.5	34.3	12.5	15.6	100.0
	weighted	204	398	214	239	960	349	436	2800
	unweighted	400	400	400	400	400	400	400	2800

Base: Total sample

Q. What type of heating are you most likely to choose?

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
What type of heating are you most likely to choose?	Heat pump	0.9	1.0	0.8	1.1	4.7	1.5	1.6	11.6
	Solar heating	0.1	0.0	0.1	0.0	0.0	0.1	0.2	0.5
	Electric heater (including bar heaters, oil filled or fan)	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.5
	Bottled gas heater	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2
	Mains gas heater	0.0	0.1	0.0	0.0	0.4	0.0	0.2	0.7
	Wood burner	0.1	0.4	0.2	0.1	0.4	0.4	0.1	1.7
	Coal burner	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other solid fuel burner e.g. pellets	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
	Oil burner	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Some other type of heating	0.1	0.1	0.1	0.1	0.6	0.1	0.1	1.3
	Not decided yet	0.1	0.1	0.1	0.1	0.6	0.2	0.1	1.3
	Total	7.3	14.2	7.6	8.5	34.3	12.5	15.6	100.0
		38	52	36	43	195	71	69	503
		65	51	64	69	70	82	64	465

Base: Those are considering changing to another type of home heating

Q. And how soon are you likely to change?

		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
And how soon are you likely to change? Would this be..	Within the next month	0.0	0.1	0.1	0.1	0.9	0.0	0.0	1.2
	Within the next 6 months	0.1	0.1	0.1	0.0	0.2	0.1	0.4	1.1
	Within the next 12 months	0.4	0.6	0.3	0.6	1.7	0.9	0.7	5.1
	Within the next 2 years	0.4	0.5	0.3	0.2	2.1	0.7	0.7	4.8
	Sometime after 2 years	0.3	0.4	0.4	0.4	1.5	0.5	0.4	3.8
	Don't know/ not sure	0.1	0.2	0.2	0.2	0.7	0.3	0.3	2.0
	Total	7.3	14.2	7.6	8.5	34.3	12.5	15.6	100.0
		38	52	36	43	195	71	69	503
		65	51	64	69	70	82	64	465

Base: Those considering change to another kind of heating (=18% of 2800)

Q. Do you have a fireplace or woodburner in your home that is not used?

		Sample:							
		No solid fuel burner in main living area							
		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Do you have a fireplace or woodburner in your home that is not used?	Yes	0.7	1.1	0.9	1.1	6.7	1.3	1.5	13.2
	No	4.4	8.3	4.8	5.5	21.2	6.6	10.0	60.7
	Unsure	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	Total	5.1	9.4	5.7	6.5	27.8	7.9	11.6	74.0
		144	262	159	183	779	220	325	2072
		200	200	200	200	200	200	200	1400

Base: All households excluding those currently using a burner or fireplace in their main living areas

Q. Do you think you will want to use it again sometime?

		Sample:							
		Have unused fireplace							
		Area							
		Papakura %	Rural Auckland %	South Auckland %	East Auckland %	Central Auckland %	West Auckland %	North Shore %	Auckland Total %
Do you think you will want to use it again sometime?	Yes	0.4	0.5	0.5	0.5	1.9	0.4	0.7	4.9
	No	0.3	0.6	0.4	0.5	4.3	0.7	0.8	7.6
	Unsure	0.1	0.0	0.1	0.1	0.4	0.1	0.1	0.8
	Total	0.7	1.1	0.9	1.1	6.7	1.3	1.5	13.2
		21	30	25	30	187	35	42	370
		29	23	31	33	48	32	26	222

Base: Have unused fireplace.

Appendix G:
Derivation of Hours Burner was used on a 'Typical' Winter's Day

A 'typical' winter's day

A 'typical' winter's day is defined as one-seventh of the use of a burner over a winter week. It takes into account the varying usage over the week, including heavier usage over the weekend, as well as days when the burner is not used. The 'typical week' is based on survey data about the seven days immediately preceding the survey interviews.

From the survey, total wood consumption in terms of hours of burner use can be calculated from the formula:[22]

Total wood consumption = hours burn rate x day rate (days in week used) ÷ 7

The survey data is then extrapolated to give typical winter daily usage:

Typical winter daily use = 'typical' number of hours per day burner was in use (as reported)

x number of days burner was in use per week (as reported) ÷ 7

There are four components to this calculation, based on the estimates provided by survey respondents:

1. weekday users reporting the number of weekdays and the 'typical' number of hours their burner was in use
2. weekend users reporting the number of weekend days and the 'typical' number of hours their burner was in use
3. those who had not used their burner in the preceding week reporting the 'typical' number of hours their burner is used on a weekday in the winter
4. those who had not used their burner in the preceding week reporting the 'typical' number of hours their burner is used on a weekend day in the winter.

The four components were calculated using the following formula and assumptions:

1. Typical winter weekday use in hours as an average of the week (known)

   = 'typical' number of hours per weekday burner was in use[23]

   x 'typical' hours of week day burner use ÷ 7

[22] Incidence of coal consumption was negligible.
[23] Survey question 11.

2. Typical winter weekend use in hours as an average of the week (known)

= 'typical' number of hours per weekend day burner was in use[24]

x Average number of weekend days of burner use ÷ 7

3. Imputed typical winter weekday use in hours as an average of the week

= Typical estimated number of hours of weekday burner use per day[25]

x Imputed average number of weekdays of burner use[26] ÷ 7

4. Imputed typical winter weekend use in hours as an average of the week

= Typical estimated number of hours of weekend burner use per day[27]

x Imputed average number of weekend days of burner use[28] ÷ 7

The sum of these four components gives the total hours of burner use in the week. This sum is then divided by seven to give the hours that burners are used in a typical winter's day.

[24] Survey question 13.
[25] Survey question 15.
[26] This is assumed to be the same as for those knowing the typical hours of weekday use.
[27] Survey question 16.
[28] Calculated from known weekend days and hours.

Appendix H:
Differences between 2007 and 2012 Fuel Consumption Results

Analysis of temperature patterns

Differences in burner usage between the two survey periods may be due to differences in average ambient temperatures. This was examined using temperature records for high use times of day, taken to be 5pm to 11pm for weekdays (based on the finding that 87% reported their weekday usage to be mainly in the evening) and 8am to 11pm for weekends, for the two survey periods.

The 2007 survey was conducted between 13th June and 31st July, and the 2012 survey between 7th and 30th August. The calculated average temperature for the 2007 survey was 11.8°C, and for 2012 it was 12.7°C, a difference of about 1°C. Whether this is sufficient to account for the higher frequencies of burner non-use in 2012 is open to question.

Respondents were also asked if their actual usage in the past week was typical for winter usage. Thirty four per cent said they had used their burner less, and eight per cent said they had used it more. This leaves a net difference of 26 per cent saying their actual usage was less than was typical for winter. This indicates that lower usage in 2012 compared to 2007 could be possible. In 2012 the average temperatures for the high use periods in June and July were 12.2°C and 11.9°C respectively, compared with the 12.7°C for the survey period. This difference is slightly less than that of the 2007 and 2012 survey periods.

However, since there could have been problems with accurate recall this seems insufficient on its own to account for the different levels of usage reported.

Table 15: Claimed comparison of actual use with what was regarded as typical

	Have burner %	
Typical for winter usage	55	
A bit less usage than typical	23	} 34%
A lot less usage than typical	11	
A bit more usage than typical	6	} 8%
Or a lot more usage than typical	2	
Don't Know/Unsure	3	
	100	

Question wording

The question asked in 2007 was: “On a typical winter weekday how many hours per day would you use your burner?” Respondents in the 2012 survey were asked on which days their burner was in use over the last week, and then: “How many hours per day did you typically use your burner on weekdays?”

The 2012 questions were devised to obtain estimates based on a recent period in which use could be more accurately recalled rather than a simple impression of usage over the winter period. The work “typical winter weekday” may be more likely to have connotations of “cold winter’s day” rather than a “typical day in the winter period”. This suggests that question wording may be responsible for the relatively higher estimates of 2007.

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