

WINTER SPARE THE AIR STUDY  
2014-2015 WINTER WOOD SMOKE SEASON



CONDUCTED FOR THE



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

MARCH 2015





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## INTRODUCTION

The Bay Area Air Quality Management District (BAAQMD) was established in 1955 by the California State Legislature as the first multi-county agency in the State to address the problem of air pollution on a regular basis. The BAAQMD's primary regulatory authority covers stationary sources of air pollution such as factories, industrial facilities, manufacturing operations, gasoline stations and dry cleaners. The BAAQMD is also responsible for transportation control measures to reduce emissions from mobile sources of air pollution in its Clean Air Plan.

Serving the counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and the western half of Solano and southern half of Sonoma, one of the BAAQMD's primary charges is to increase public awareness of positive air quality choices. To facilitate this effort, the Spare the Air Program was established by the BAAQMD in 1991 to educate residents about air pollution and to encourage them to modify their behavior to reduce and prevent it. During the summer ozone season (May to October), the BAAQMD conducts episodic public education campaigns designed to encourage the public to reduce their driving and use of certain household products on days that are expected to violate ozone air quality standards. During the winter season (November to February), the focus of the Program shifts to reducing the impact of wood burning on air quality by encouraging the public to *not* burn wood and to replace their wood-burning fireplaces and stoves with cleaner alternatives, such as natural gas fireplaces.

Although today many air quality management districts throughout the country administer similar programs, the Spare the Air Program in the Bay Area was the first of its kind.

**MOTIVATION FOR STUDY** The primary motivation for this study was to better understand the public's attitudes and behavior with respect to burning wood, their awareness of the Winter Spare the Air Alert Program, as well as the impact it has had on awareness, opinions, and behavior relevant to burning wood and air quality. In this respect, this study is very similar to past surveys conducted for the BAAQMD every year since 2001.

The passage of California Senate Bill 656 to reduce public exposure to particulate matter (PM10 and PM2.5) was another key motivation for the study.<sup>1</sup> SB 656 requires the California Air Resources Board (ARB), in consultation with local air districts, to develop and adopt a list of the most readily available, feasible and cost-effective control measures that could be used to reduce PM10 and PM2.5—with the goal of making progress in the near-term toward attainment of State and Federal PM10 and PM2.5 standards. Although the Bay Area is currently in attainment for the Federal PM10 and PM2.5 standards, like almost every other area in California it does not meet the stricter State standards.

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1. Particulate matter (PM) consists of very small liquid and solid particles suspended in the air, and includes particles smaller than 10 microns (PM10) as well as finer particles smaller than 2.5 microns (PM2.5). Ambient PM is made up of particles that are emitted directly—such as soot and fugitive dust—as well as secondary particles that are formed in the atmosphere from reactions involving precursor pollutants such as oxides of nitrogen, sulfur oxides, volatile organic compounds, and ammonia. Exposure to PM is linked to increased frequency and severity of asthma attacks and even premature death in people with pre-existing cardiac or respiratory disease. Infants and children, the elderly, and persons with heart and lung disease are the most sensitive to PM pollution.

**OVERVIEW OF METHODOLOGY** A full description of the methodology used for this study is included later in this report (see *Methodology* on page 61). A total of 2,100 randomly selected residents within the District’s boundaries participated in the survey between November 17, 2014 and February 8, 2015. Interviews were conducted in English, Spanish and Mandarin Chinese on randomly selected dates throughout the season (subsample = 1,200), as well as 20 targeted for evenings following Winter Spare the Air Alert episodes (subsample = 900). Probability-based sampling techniques and monitoring of the demographics resulted in a sample that is representative of the adult population within the District.

When compared with some of the first surveys conducted for the District on wood burning and the Winter Spare the Air Alert Program, there are several methodological changes worth noting at the outset of this report. In the interest of improving the *validity* and *reliability* of select opinion and behavior measures, the present 2014-2015 study continued several questionnaire changes first implemented in 2004. The most notable of these changes addressed how the questionnaire measured the impacts of the Winter Spare the Air Alert Program. The changes were made so that the impacts of the winter program on wood burning behavior would be measured using the same basic methodology employed by the BAAQMD—and recommended by CARB and EPA<sup>2</sup>—to measure the impacts of the summer Spare the Air Program on driving behavior.<sup>3</sup>

Based on the 2005 results, additional refinements were made to the 2006 questionnaire with respect to measuring ownership of wood-burning heating devices and the practice off-season burning. Because these improvements occasionally involved changing the wording, format and/or response options for a particular question, in some cases it is not possible to statistically compare the results of the post-2006 surveys with previous surveys for select measures. Where such comparisons are possible, however, this report presents the results from past surveys.

**STATISTICAL SIGNIFICANCE** Many of the figures and tables in this report present the results of questions asked in 2014 alongside results found in prior years for identical questions. In such cases, True North conducted the appropriate tests of statistical significance to identify changes that likely reflect actual changes in public opinion or behavior over time—as opposed to being due to chance associated with selecting two cross-sectional samples independently and at random. Differences between studies are identified as *statistically significant* if we can be 95% confident that the differences reflect an actual change in public opinion or behavior between the two studies. Statistically significant differences within response categories over time are denoted by the † symbol which appears in the figure next to the appropriate response value for 2014.

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2. The CARB/EPA Method is summarized in the Transportation Research Board’s (TRB) journal—*Transportation Research Record*—for 2004 in an article entitled *Development of a Quantification Method for Measuring the Travel and Emissions Impacts of Episodic Ozone Alert Programs* (pages 153-159). It is described in detail in the following air resources guidance report: CARB, “Quantification Method Reference Manual: A Method to Measure Travel and Emissions Impacts of Ozone Action Public Education Programs,” April 2003. In addition to Eric Schreffler, Dr. Timothy McLarney and Richard Sarles, the TRB paper and report were co-authored by Joann Lu and Jeff Weir of CARB, as well as Thomas Higgins and Dr. Will Johnson of K.T. Analytics.
  3. For a detailed description of the updated CARB/EPA Method and its application to the BAAQMD’s summer Spare the Air Program, see the *Spare the Air Study: 2011 Summer Ozone Season* report prepared for the BAAQMD by True North.

**ORGANIZATION OF REPORT** This report is designed to meet the needs of readers who prefer a summary of the findings, as well as those who are interested in the details of the results. For those who seek an overview of the findings, the sections titled *Just the Facts* and *Conclusions* are for you. They provide a summary of the most important factual findings of the survey in bullet-point format and a discussion of their implications. For the interested reader, this section is followed by a more detailed question-by-question discussion of the results from the survey by topic area (see *Table of Contents*), as well as a description of the methodology employed for collecting and analyzing the data. And, for the truly ambitious reader, the questionnaire used for the interviews is contained at the back of this report (see *Questionnaire & Toplines* on page 65).

**ACKNOWLEDGEMENTS** True North thanks the BAAQMD and O’Rorke for their valuable input during the design stages of this study. Their expertise and insight improved the overall quality of the research presented here.

**DISCLAIMER** The statements and conclusions in this report are those of the authors, Dr. Timothy McLarney and Richard Sarles at True North Research, Inc. (True North), and not necessarily those of the BAAQMD. Any errors or omissions are the responsibility of the authors.

**ABOUT TRUE NORTH** True North is a full-service survey research firm that is dedicated to providing public agencies with a clear understanding of the values, perceptions, opinions and behaviors of their residents and customers. Through designing and implementing scientific surveys, focus groups and one-on-one interviews, as well as expert interpretation of the findings, True North helps its clients to move with confidence when making strategic decisions in a variety of areas—such as planning, policy evaluation, performance management, and developing effective public information campaigns.

During their careers, Dr. McLarney (President) and Mr. Sarles (Principal Researcher) have designed and conducted over 900 survey research studies for public agencies—including dozens of studies related to air quality and Spare the Air public education programs.



## JUST THE FACTS

The following is an outline of the main factual findings from the 2014-2015 winter season study. For the reader's convenience, we have organized the findings according to the section titles used in the body of this report. Thus, to learn more about a particular finding and how it may compare to findings from prior surveys (where applicable), simply turn to the appropriate report section.

### WINTER WOOD BURNING BEHAVIOR

- Forty-three percent (43%) of respondents reported that their household contained at least one *wood-burning* fireplace, pellet stove, or wood stove.
- Twenty-one percent (21%) of households in the District contain at least one fireplace that burns natural gas or propane.
- Among households with a wood-burning fireplace or wood stove, the most common types of wood primarily burned were natural wood logs (43%) and manufactured logs (14%). Thirty-eight percent (38%) said that they never use their wood-burning fireplace or wood stove.
- When considering primary *and* secondary types of wood burned, the most commonly used wood was natural wood logs (54%), followed by manufactured logs (35%), and scrap wood (18%).
- One fifth (20%) of respondents in households that primarily burn natural wood logs were unable to identify the type of wood that they burn. Among those who knew the type of wood, oak was the most common (62%), followed by pine (14%), and hardwood in general (11%).
- When households that primarily burn natural wood logs were asked how they typically acquire their wood, respondents were split between those who gather their own (42%), those who purchase the wood from a local store (33%), and those who rely on a wood supplier (16%). Nine percent (9%) mentioned an alternative source.
- About two-thirds (68%) of respondents said their wood is already dry and seasoned at the time they acquire it, whereas 17% reported that they typically acquire wood that is fresh-cut, 7% said that it depends or is a mixture, and 8% were unsure.
- Households that burn wood were divided between those who primarily burn for heat (51%) and those who primarily burn for ambiance (49%).
- The majority of households that contain a gas fireplace (62%) and/or a pellet stove (76%) indicated that they would use the device this winter. The rate of use was lower for wood stoves (36%) and wood-burning fireplaces (36%).
- Overall, 16% of District households that own a wood-burning fireplace, wood stove, or pellet stove reported that they would not use their wood-burning heating device *at all* during the winter due to the Winter Spare the Air Alert Program.<sup>4</sup>
- Forty-one percent (41%) of respondents indicated that they expected to burn wood on a weekly basis, although most (26%) said they would burn wood three or fewer days per week. Overall, 18% said they expected to burn wood two to three times per month, 17% once per month, and 20% expected to burn wood less often than once per month.
- Among *all* households with at least one wood-burning device, 17% expect to burn wood at least once per week this winter.

4. That is, they mentioned air quality and/or health-related reasons for not using the wood-burning device this winter *and* they were aware of the Spare the Air Alert Program. Note that this figure does not include households that intend to use their wood-burning device, but did refrain from burning wood on at least one occasion due to the Program (see Figure 37 on page 31 for figure on full program impacts).

- Thirty-five percent (35%) of respondents whose household includes at least one wood-burning device *and* expected to burn wood during the winter months indicated that they had burned wood during the week prior to the interview. Moreover, 13% had burned wood the day prior to the interview.
- On a typical burn day, wood-burning households averaged 4.17 hours of burning time.
- On a typical burn day, wood-burning households consumed an average 5.49 logs.
- More than half (56%) of respondents indicated that they started their most recent fire between 6PM and 8:59PM, and an additional one-fifth (21%) started their fire a bit earlier between 3PM and 5:59PM.

## CHANGES IN WOOD BURNING BEHAVIOR

- Overall, 50% of households that own a wood-burning heating device and expected to burn wood this season reported that they anticipated burning wood at about the same frequency this season as last, 28% expected to burn less often this season, and 12% expected to burn more frequently.
- Fifty-three percent (53%) of respondents who have a wood-burning fireplace, wood stove and/or pellet stove *and* expected to burn wood during the 2014-2015 winter season indicated that, on at least one occasion, they refrained from burning wood.
- When asked *why* they chose not to burn wood on these occasions, 27% specifically mentioned the Winter Spare the Air Alert Program and an additional 5% offered an air quality or health-related reason.
- Among households with a wood-burning fireplace, pellet stove, or wood stove, 16% chose not to burn *at all* during the winter season because of the Winter Spare the Air Alert Program, and 13% refrained from burning on at least one occasion for the same reason.
- Among households that burned during the week prior to a Spare the Air alert (and thus had demonstrated an inclination to burn), 28% chose not to burn on the episode in response to the Program. An additional 42% refrained from burning on the Spare the Air day, but for reasons unrelated to the Program. Approximately 30% of households that had burned in the prior week also burned on the Spare the Air day.

## RECALL AND AWARENESS OF WINTER SPARE THE AIR MESSAGING

- Fifty-eight percent (58%) of adults in the Bay Area recalled being exposed to news stories, advertisements, or public service announcements related to the Winter Spare the Air Alert Program during the winter months.
- Television (36%) and radio (35%) were the most popular sources for encountering Bay Area Air Quality Management District or Winter Spare the Air Alert Program information. Seventeen percent (17%) of respondents encountered information via newspaper, 12% on a website, 8% through social media, 8% on a billboard, and 5% at a community event.
- Seventeen percent (17%) of adults in the Bay Area said they encountered Winter Spare the Air information on television in *an advertisement or public information announcement that talks about fires, wood smoke, air quality and the Winter Spare the Air Program.*
- Thirty percent (30%) of all respondents encountered Winter Spare the Air information on television in a news program, 23% said they encountered the information on a weather report, and 5% saw a televised interview with an air quality expert or representative.
- Of those respondents surveyed on the day after a Winter Spare the Air episode, 45% were aware that a Winter Spare the Air advisory had been issued the day before.

## ATTITUDES ABOUT WOOD SMOKE

- Approximately 70% of adults in the Bay Area perceive that there are negative health effects associated with breathing wood smoke.
- When asked to identify some of the specific negative health effects associated with breathing wood smoke, the most common response was a general reference to lung disease (52%), followed by asthma (37%), allergies (12%), and bronchitis (11%).
- Seventeen percent (17%) of Bay Area adults perceive that their neighborhood periodically experiences air pollution from wood smoke. Ten percent (10%) said the problem was a small one, 4% indicated it was a moderate or medium problem, and 2% felt that air pollution due to wood smoke was a big problem in their neighborhood.

## POLICY ATTITUDES

- Approximately two-thirds (64%) of respondents indicated that they were aware of the BAAQMD's policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels.
- Twenty-eight percent (28%) of respondents felt well-informed about the rules that are part of the policy, 30% felt somewhat informed, 22% slightly informed, and 17% felt not at all informed about the rules that are part of the policy.
- Three-quarters (75%) of Bay Area residents indicated that they support the no-burn policy on nights when air pollution is expected to reach unhealthy levels. Approximately 14% opposed the policy, 5% said it depends, and 6% were unsure or offered no opinion.
- The majority (63%) of respondents felt that households should *not* be allowed to burn on holidays like Christmas and New Year's when pollution levels are high, 29% felt households should be able to burn on holidays regardless of pollution levels, and 8% were unsure.
- Thirty-two percent (32%) of households with a wood-burning device typically burn wood on holidays, and 6% would continue to burn on a holiday, regardless of a Spare the Air episode. The overwhelming majority (92%) do not typically burn on holidays or said they would *not* burn on holidays if a Spare the Air episode were called.
- Half (50%) of respondents indicated that they know how to find out whether today is a 'no burn' day.
- When asked what sources they would turn to for this information, the most commonly mentioned sources were a website in general (59%), radio (24%), newspaper (23%), and the District's website (12%).

## PERCEPTIONS OF ENTITIES

- Prior to taking the survey, 55% of respondents had heard of the Bay Area Air Quality Management District and 56% had heard of the Winter Spare the Air Alert Program.
- Among respondents who had heard of the BAAQMD, most (54%) held a favorable opinion of the District, 35% held a neutral opinion, and just 8% held an unfavorable opinion.
- Among respondents who had heard of the Winter Spare the Air Alert Program, 65% held a favorable opinion of it, 25% held a neutral opinion, and 6% held an unfavorable opinion.
- Twenty-seven percent (27%) of all respondents recalled hearing, reading, or seeing a news story, advertisement, or public service announcement in the six months prior to taking the interview that pertained to the District. The corresponding figure for the Winter Spare the Air Alert Program specifically was 35%.



## CONCLUSIONS

As noted in the *Introduction*, this study was designed to provide a better understanding of the public's attitudes and behavior with respect to burning wood, their awareness of the Winter Spare the Air Alert Program, as well as the impact that the Program has had on awareness, opinions and behavior relevant to wood burning and air quality. Whereas subsequent sections of this report are devoted to conveying the detailed results of the study, in this section we attempt to 'see the forest through the trees' and note how the collective results answer some of the key questions that motivated the research.

*What is the profile of wood burning behavior in the Bay Area?*

Approximately 43% of households in the Bay Area own at least one *wood-burning* fireplace, wood stove, or pellet stove, and 18% burned wood in the 2014-2015 winter months. Among households with a wood-burning device, 17% expected to burn wood on a weekly basis, 24% expected to burn less often than once per week, and 59% did not expect to burn this season. Over the past decade, the propensity to burn wood among households with a wood-burning device has slowly declined.

Natural wood logs continue to be the most commonly-cited type of wood burned by Bay Area households, used by 54% of households as a primary or secondary choice. Manufactured logs, the second most popular option, were used by 35% of Bay Area households this winter. Two-thirds (68%) of households that burn natural wood reported that it is already dry and seasoned at the time it is acquired.

Wood burning behavior varies considerably depending on how frequently a household burns. Wood-burning households can easily be divided between the 41% that burn at least once per week (frequent burners) and the 59% that burn less often (infrequent burners). Not only do frequent burners build fires more often, they tend to burn significantly more hours per burn day (an average of 5.15 hours) and consume more wood per burn day (an average of 7.15 logs) when compared with infrequent burners (averages of 3.35 hours and 4.16 logs). Their reasons for burning wood are also different. Frequent burners primarily build fires for heat (68%), infrequent burners are more likely to do so for ambiance (53%). For more information about wood burning behavior in the Bay Area, see *Winter Wood Burning Behavior* on page 10.

*How effective was the Winter Spare the Air Campaign during the 2014-2015 winter season?*

The Winter Spare the Air campaign seeks to shape public awareness and opinions about the District and air quality issues, as well as change behavior with respect to burning wood. Accordingly, the survey sought to measure the impacts that the campaign had on each of these dimensions.

The BAAQMD followed the most successful campaign season to date (2013-2014) with a solid 2014-2015 Winter Spare the Air campaign effort. Although recalled exposure to specific information about the

BAAQMD and campaign-related messaging dipped somewhat from the highest levels established in 2013, favorable opinions about the District and the Winter Spare the Air campaign exhibited statistically significant increases in the past year, continuing a positive trend that began in 2010. Additionally, the percentage of residents who were aware that a Spare the Air episode had been called on the prior day remained steady, matching an all-time high of 45%, twice the percentage (22%) found in 2010. General awareness of the District's no-burn policy on Spare the Air nights (64%) also remained near an all-time high of 66% found in the prior season.

With respect to the public's attitudes about wood smoke, the Program has succeeded in raising recognition of the negative health impacts of breathing wood smoke by 21 percentage points since 2002. This increased awareness of the health-related problems caused by wood smoke arguably underpins what is broad support for the BAAQMD's adoption of the *Regulation 6, Rule 3: Wood-burning Devices* policy designed to improve air quality in the region. Despite having 53 Spare the Air events over the past two winter seasons, and concerns about the fatigue such a pattern could cause among residents, 75% of Bay Area residents remain supportive of the policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels. Moreover, on popular wood-burning holidays such as Christmas and New Year's, the overwhelming majority (92%) of households with a wood-burning device either do not typically burn or said they *would not* burn on holidays if a Spare the Air Alert episode were called.

Assessing trends in public opinion over time is one way to measure the impacts of the campaign, but one of the primary questions answered in this study is: How did these positive patterns in attitudes and awareness translate to actual changes in wood-burning behavior? Based on the survey data, the Program motivated 16% of households with a wood-burning fireplace, pellet stove, or wood stove not to burn *at all* during the winter season, and another 13% not to burn on at least one occasion. In other words, almost one-third (29.5%) of households with a wood burning device (332,954 District households) reduced their wood burning during the 2014-2015 winter season because of the Winter Spare the Air campaign. This percentage is virtually identical to the 30% found last season, which was the highest recorded to date.



*Were there differences in Program awareness, opinions, or wood burning behaviors between those who took the interview in English, Spanish, and Mandarin Chinese?*

Yes, the findings of the 2014 study identified considerable differences in opinion and wood-burning behavior between residents who took the survey in English, Spanish, and Mandarin Chinese. And although some changes may be communication and outreach related, others are likely the result of socio-demographic and cultural differences between the groups.

Both Spanish and Mandarin Chinese speakers were more likely to reside in an apartment than English speakers, and were thus less likely to report having a wood-burning device in the home (27% of Spanish speaking households and 39% of Mandarin Chinese speaking households, compared with 45% of English speaking households). Use of wood burning devices was also quite different between the groups, with 47% of those who took the survey in English indicating they would burn wood this winter, compared with only 17% of Spanish-speakers and a mere 5% of Mandarin Chinese speakers. Among *all* District households, this works out to 21% of English speaking respondents residing in a household that would burn this year, compared with only 5% of Spanish speaker households and 2% of Mandarin Chinese speaker households.

When asked *why* they did not expect to burn this winter season, Mandarin Chinese speakers cited air quality concerns three times more often than English speakers (75% vs. 25%), and Spanish speakers mentioned health concerns twice as often as English speakers (27% vs 13%). Nevertheless, recalled exposure to campaign and air quality information was lower among non-English speakers. Less than half of Spanish speakers (49%) and Mandarin Chinese speakers (48%) recalled being exposed to Winter Spare the Air information, compared with 60% of English speakers. Further, awareness of specific Winter Spare the Air Advisories among non-English speakers was *less than half* that of English speakers, with just 18% of those who took the survey in Spanish and 25% who took the survey in Mandarin Chinese indicating they were aware of the advisory, compared with 48% of English speakers.

Despite these lower levels of exposure to Program information, campaign and related air quality information appeared to resonate with non-English speakers who *did* encounter it considerably more so than English speakers. Among those in eligible wood-burning households who were exposed to Program information, 58% of Spanish-speakers and 71% of Mandarin-Chinese speakers responded positively with a reduction in wood burning during the winter season, compared with 42% of English speakers. So in total, the Program influenced approximately 36% of all Spanish speaking respondent households and 40% of all Mandarin Chinese speaking households to reduce their burning behavior during the 2014-2015 winter season, compared with 28% of those who took the survey in English.

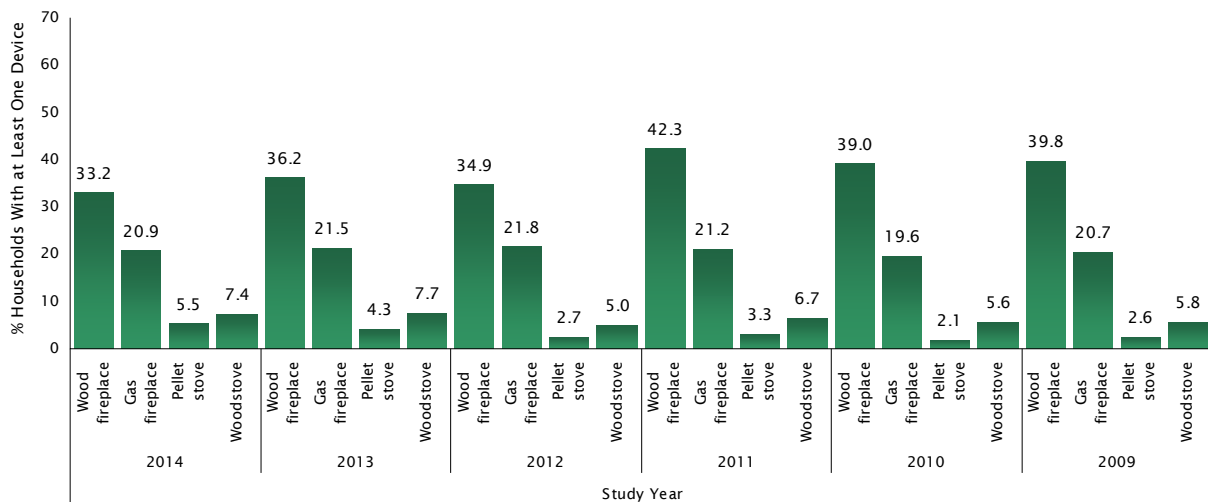
# WINTER WOOD BURNING BEHAVIOR

One of the key objectives of the survey was to profile respondents' use of wood-burning heating devices, including fireplaces, pellet stoves, and wood stoves. Accordingly, the first series of questions in the survey asked respondents about the types of wood-burning heating devices they have in their home, as well as their use of these devices during the 2014-2015 winter months of November through February.

**HEATING DEVICES** The first question in this series asked respondents to identify how many wood-burning fireplaces, natural gas/propane burning fireplaces, wood stoves, and pellet stoves their household contains. As shown in Figure 1 for 2014, 33% of households reported that they contain at least one wood-burning fireplace, 21% contain at least one fireplace that burns natural gas or propane, 6% contain at least one pellet stove, and 7% contain at least one wood stove. Collectively, 43% of respondents reported that their household contained at least one *wood-burning* fireplace, pellet stove, or wood stove, whereas 57% of respondents indicated that their household does not contain a wood-burning heating device (see Figure 2 on page 11).<sup>5</sup>

**Question 1** *Do you have a \_\_\_\_\_ in your home? If yes, ask: How many: \_\_\_\_\_s do you have in your home?*

**FIGURE 1 HEATING DEVICES IN HOME BY STUDY YEAR (N = 2,100)<sup>6</sup>**



† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

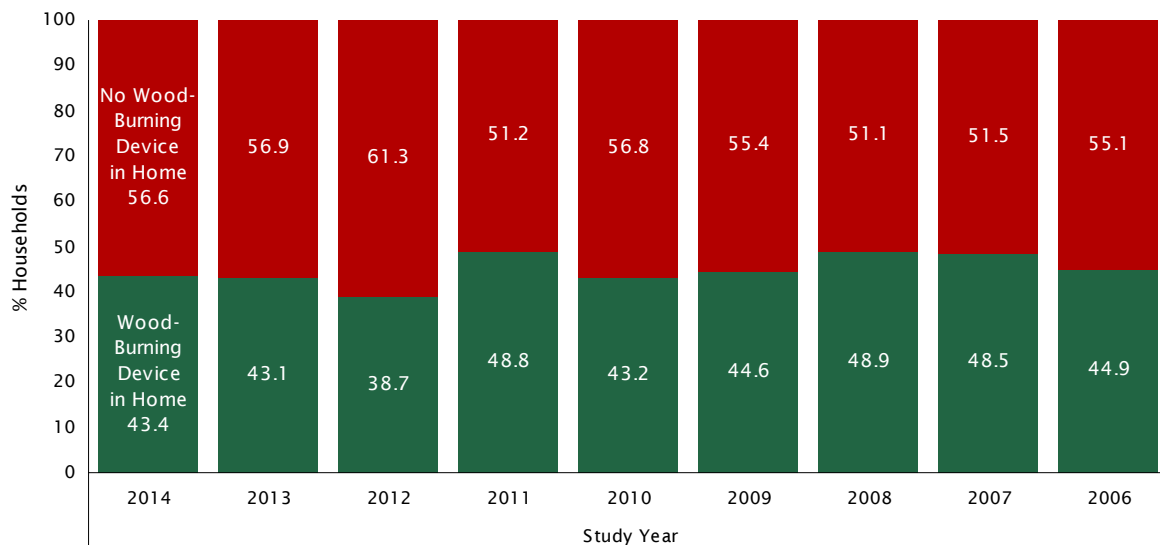
5. Because some households contained more than one type of heating device—e.g., a fireplace *and* a wood stove—one can not simply add the percentages shown in Figure 1 to determine the percentage of households that have at least one type of heating device.

6. The  $n = 2,100$  refers to the weighted number of respondents who received this question. This convention continues throughout the report to allow the reader to identify how many respondents are included in each figure.

**TABLE 1 NUMBER OF HEATING DEVICES IN HOME BY STUDY YEAR (N = 2,100)**

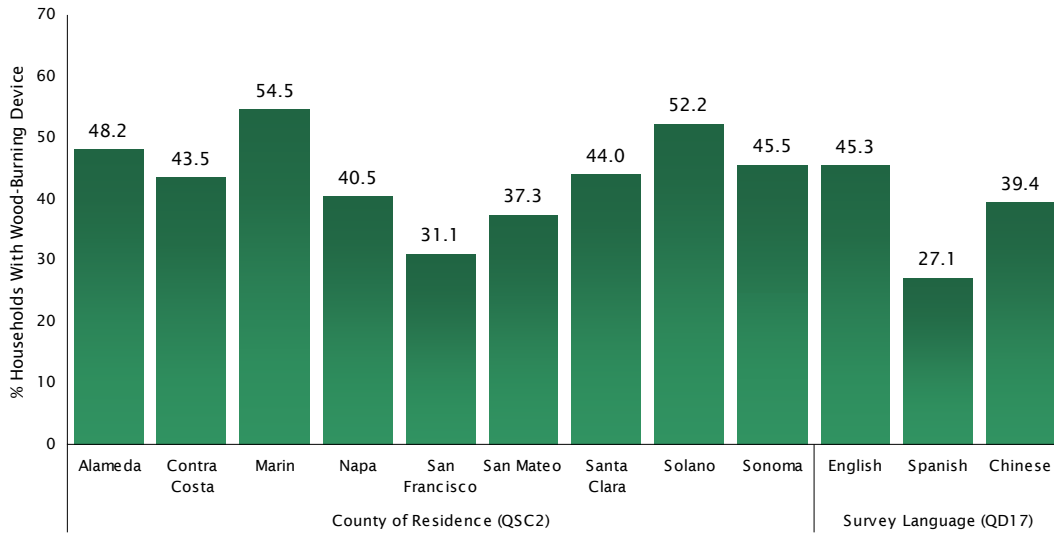
	Number of Devices			
	One	Two	Three or more	
2014	Wood-burning fireplace	29.6	2.8	0.8
	Gas / Propane fireplace	16.7	3.2	0.9
	Pellet stove	4.6	0.2	0.7
	Woods tove	6.3	1.0	0.1
2013	Wood-burning fireplace	32.1	3.0	1.2
	Gas / Propane fireplace	16.0	4.7	0.8
	Pellet stove	3.0	0.5	0.8
	Woods tove	6.3	1.3	0.1
2012	Wood-burning fireplace	31.8	2.8	0.4
	Gas / Propane fireplace	17.6	3.1	1.1
	Pellet stove	2.1	0.0	0.5
	Woods tove	4.7	0.3	0.0
2011	Wood-burning fireplace	37.1	4.7	0.6
	Gas / Propane fireplace	17.8	2.8	0.5
	Pellet stove	2.5	0.1	0.7
	Woods tove	5.0	0.8	0.9
2010	Wood-burning fireplace	33.2	5.7	0.2
	Gas / Propane fireplace	15.8	3.0	0.8
	Pellet stove	1.5	0.6	0.0
	Woods tove	5.2	0.4	0.0
2009	Wood-burning fireplace	35.1	4.0	0.7
	Gas / Propane fireplace	16.1	3.8	0.9
	Pellet stove	2.1	0.3	0.2
	Woods tove	5.2	0.6	0.0
2008	Wood-burning fireplace	39.6	4.0	1.0
	Gas / Propane fireplace	19.7	1.6	1.2
	Pellet stove	1.8	0.3	0.0
	Woods tove	5.2	0.5	0.2
2007	Wood-burning fireplace	38.0	4.7	0.6
	Gas / Propane fireplace	18.6	3.0	0.5
	Pellet stove	3.8	0.1	0.0
	Woods tove	4.0	0.3	0.0
2006	Wood-burning fireplace	35.2	4.8	1.2
	Gas / Propane fireplace	15.0	3.3	0.6
	Pellet stove	2.8	0.0	0.4
	Woods tove	3.9	0.1	0.0
2004/ 2005	Fireplace	50.4	8.1	1.7
	Pellet stove	5.3	0.4	0.4
	Woods tove	5.2	0.4	0.2

**FIGURE 2 WOOD-BURNING DEVICE IN HOME BY STUDY YEAR (N = 2,100)**

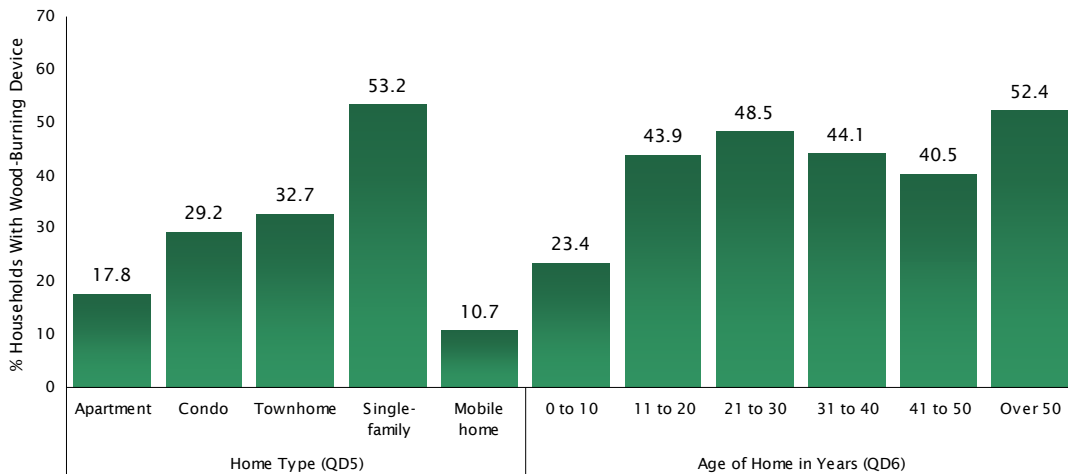


For the interested reader, the next two figures show how the presence of wood-burning fireplaces, wood stoves, and pellet stoves varied by county of residence, survey language (see Figure 3), home type, and age of home (see Figure 4). Those who took the interview in Spanish were considerably less likely to report having a wood-burning device in the home than those who took the survey in English or Chinese.

**FIGURE 3 WOOD-BURNING DEVICE IN HOME BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 2,100)**



**FIGURE 4 WOOD-BURNING DEVICE IN HOME BY HOME TYPE & AGE OF HOME IN YEARS (N = 2,100)**

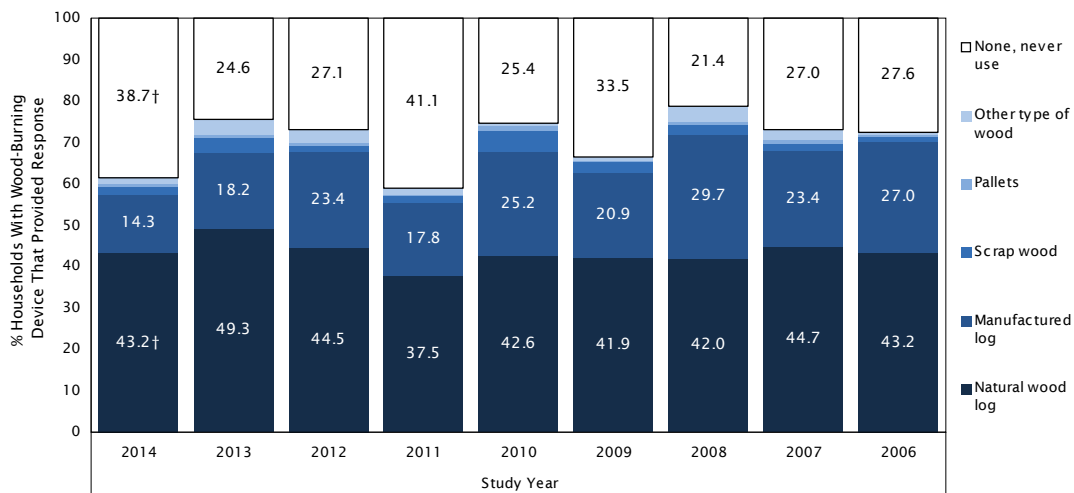


**FUEL TYPE & SOURCE** For the 43% of respondents who reported that their household contains a wood-burning fireplace or wood stove, the survey next inquired about the type of wood they *primarily* use in the fireplace or stove (see Figure 5 on the next page). The most commonly used wood was natural wood logs (43%), followed by manufactured logs (14%). Thirty-nine percent (39%) volunteered that they never use their wood-burning fireplace or wood stove. Compared with 2013, there was a statistically significant increase in the percentage of residents who said they do not burn any type of wood in their fireplace (+14%). Figure 6 displays how the proportional use of natural wood versus manufactured logs as a primary type of wood burned varied

by county and survey language among all households with a wood-burning fireplace or wood stove. Note the considerably small percentage of those who took the survey in Spanish or Mandarin Chinese who reported having a wood burning device in their home and burning a natural wood or manufactured log.

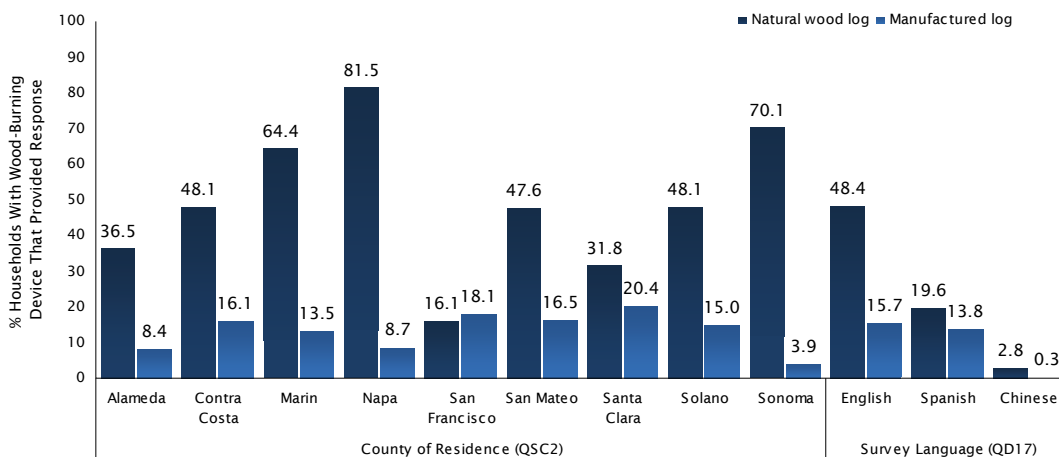
**Question 2** *What type of wood do you primarily use in your wood-burning fireplace or wood stove: natural wood logs, manufactured logs such as Duraflame or Presto, scrap wood, pallets, or some other fuel?*

**FIGURE 5 PRIMARY TYPE OF WOOD BURNED BY STUDY YEAR (N = 801)**



† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

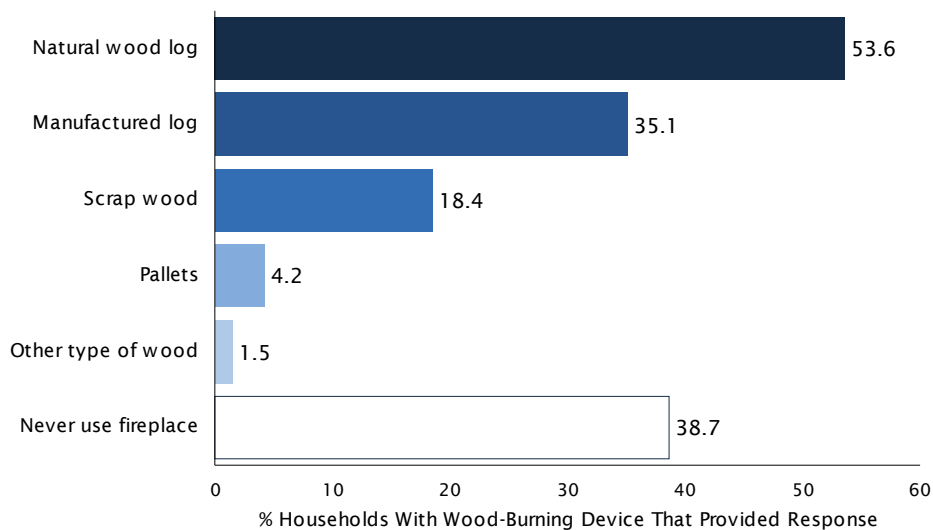
**FIGURE 6 PRIMARY TYPE OF WOOD BURNED BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 801)**



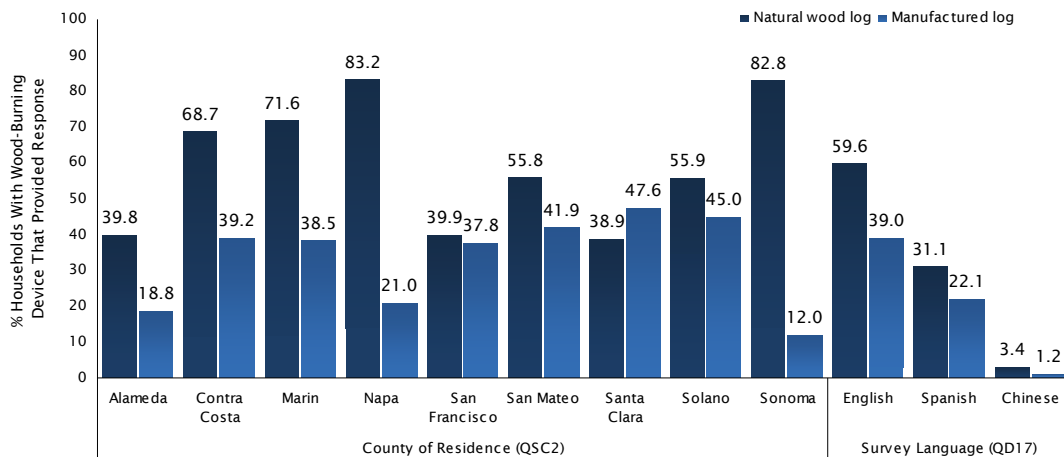
First asked in the 2010-2011 winter season survey, Question 3 asked respondents in households with a wood-burning fireplace or wood stove about any other types of wood burned, listing each of the wood types not mentioned as the *primary* type cited by the respondent in response to the previous question. Figure 7 combines responses to questions 2 and 3 to display the percentage of primary and secondary wood types burned among households with a wood-burning fireplace or wood stove. When considering primary *and* secondary options, the most commonly used wood was natural wood logs (54%), followed by manufactured logs (35%), and scrap wood (18%). Approximately 4% of respondents indicated that they use pallets, and 2% mentioned some other type of wood. Figure 8 displays how the use of natural wood versus manufactured logs as a primary or secondary type of wood burned varied by county and survey language among all households with a wood-burning fireplace or wood stove.

**Question 3** *Do you also ever burn: \_\_\_\_\_?*

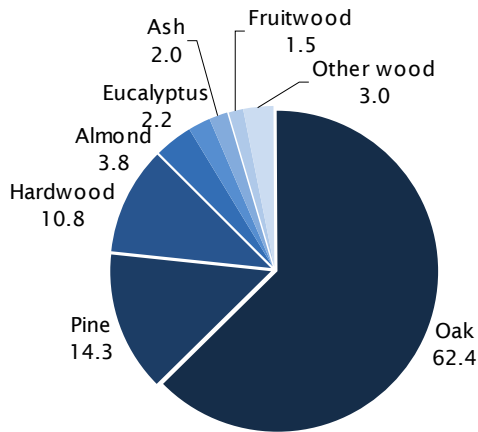
**FIGURE 7 PRIMARY OR SECONDARY TYPE OF WOOD BURNED (N = 801)**



**FIGURE 8 PRIMARY OR SECONDARY TYPE OF WOOD BURNED BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 801)**



**FIGURE 9 TYPE OF NATURAL WOOD BURNED (N = 384)**



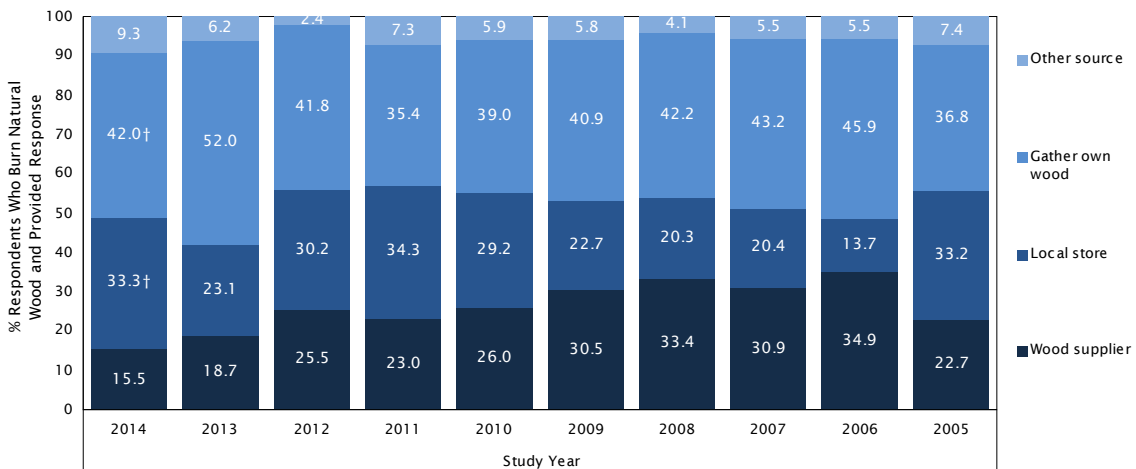
**Question 4** *What type of natural wood do you typically burn?*

Households that reported they *primarily* burn natural wood were next asked a series of questions about the *type* of natural wood they burn (Question 4), from where they purchase their wood (Question 5), and the state of the wood they burn (Question 6). Approximately 20% of respondents in 2014 were unsure of the type of natural wood they burn. Figure 9 shows that among those who knew the type of wood, oak was the most common (62%), followed by pine (14%) and hardwood in general (11%).

When asked how they typically acquire their wood, respondents were split between those who gather their own (42%), those who purchase the wood from a local store (33%), and those who rely on a wood supplier (16%). Nine percent (9%) mentioned an alternative source. As shown in Figure 10, when compared with 2013, there were statistically significant changes in the percentage who indicated that they gather their own wood (-10%) and purchased at a local store (+10%).

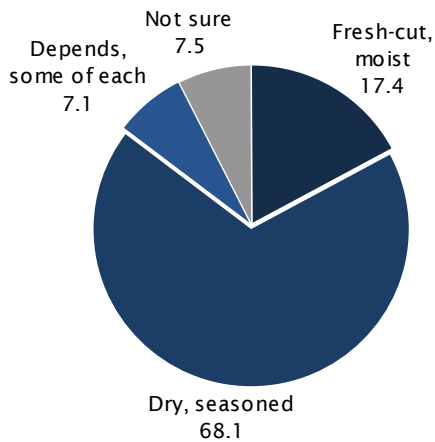
**Question 5** *Do you typically purchase your wood from a wood supplier, the local store, or do you gather your own wood?*

**FIGURE 10 SOURCE FOR NATURAL WOOD BY STUDY YEAR (N = 384)**



† Statistically significant change (p < 0.05) between the 2013 and 2014 studies.

FIGURE 11 CONDITION OF WOOD AT POINT OF ACQUISITION (N = 384)



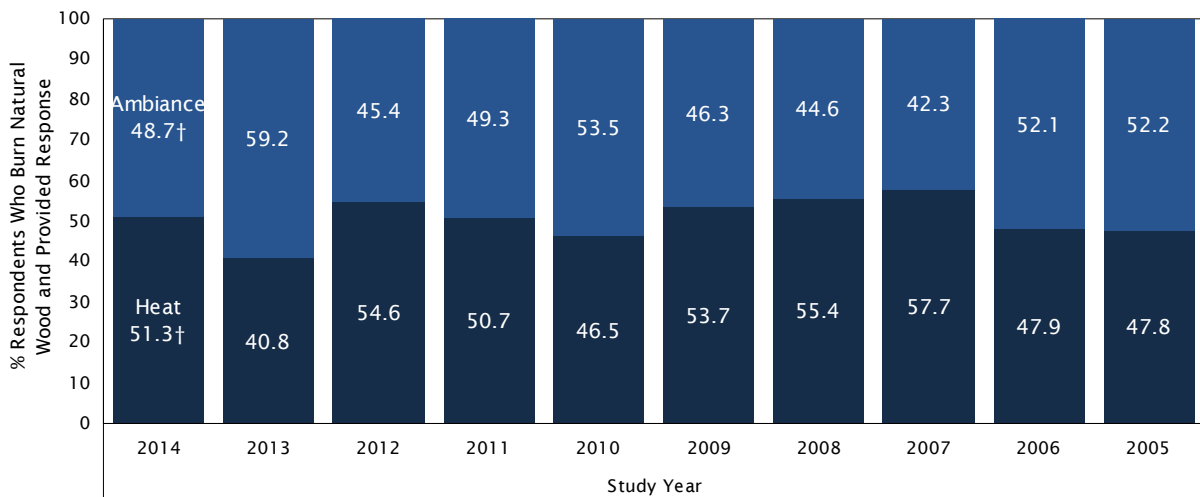
**Question 6** At the point that you acquire your wood, is it fresh-cut and somewhat moist or is it already dry and seasoned?

For those who primarily burn natural wood, the survey next inquired if, at the point the respondent acquires the wood, the wood is fresh-cut and somewhat moist, or if it is already dry and seasoned. About two-thirds (68%) of respondents in 2014 said their wood is already dry and seasoned at the time they acquire it, whereas 17% reported that they typically acquire wood that is fresh-cut, 7% said that it depends or is a mixture, and 8% were unsure.

**PRIMARY REASON FOR BURNING WOOD** Households that have a wood-burning fireplace or wood stove and expected to use it during the winter were next asked to indicate the *primary* reason for why they use the device: to heat their home, or for the ambiance of having a fire? Figure 12 shows that 49% of respondents indicated that they primarily burn wood in their fireplace or wood stove for ambiance, and 51% do so for heat. These findings represent a statistically significant change from the 2013 study, and more closely resemble the findings from 2012.

**Question 7** When you use your fireplace or wood stove, which of the following would you say is the primary reason you do so? For heating your home or for the ambiance of having a fire?

FIGURE 12 PRIMARY PURPOSE OF WOOD BURNING BY STUDY YEAR (N = 384)



† Statistically significant change (p < 0.05) between the 2013 and 2014 studies.



**USE OF FIREPLACE, WOOD STOVE OR PELLET STOVE** Respondents whose household contained at least one wood-burning fireplace, natural gas/propane fireplace, pellet stove, or wood stove were next asked, for each device they own, whether they have used or intend to use the device this winter from November to February. As shown in Figure 13, in 2014 the majority of households that contain a gas fireplace (62%) and/or a pellet stove (76%) indicated that they would use the device this winter. The rate of use was lower for wood stoves (36%) and wood-burning fireplaces (36%). When compared with 2013, there was a significant decrease in the percentage of households that will use their wood fireplace in 2014 (-13%).

**Question 8** Will you use your \_\_\_\_\_ this winter?

**FIGURE 13 HEATING DEVICE USAGE THIS WINTER BY STUDY YEAR (WOOD-BURNING FIREPLACE N = 702; GAS FIREPLACE N = 441; PELLET STOVE N = 117; WOOD STOVE N = 157)**

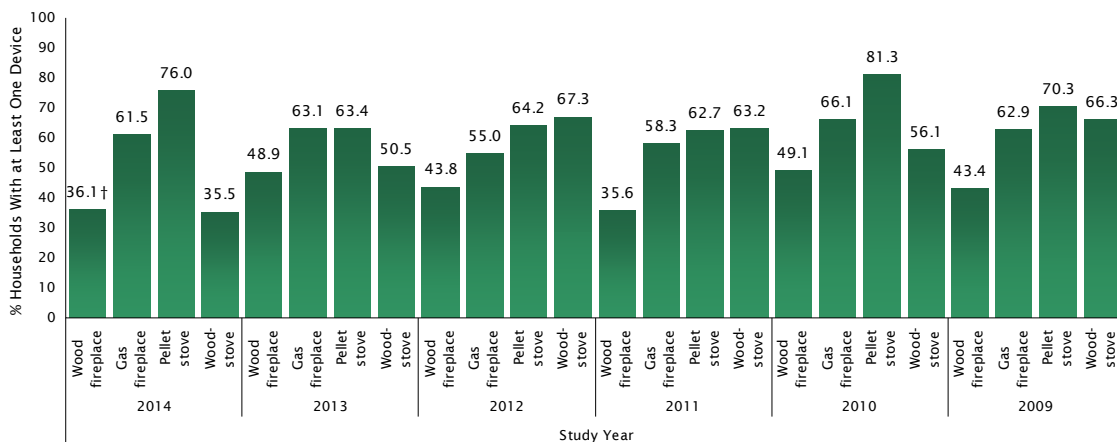
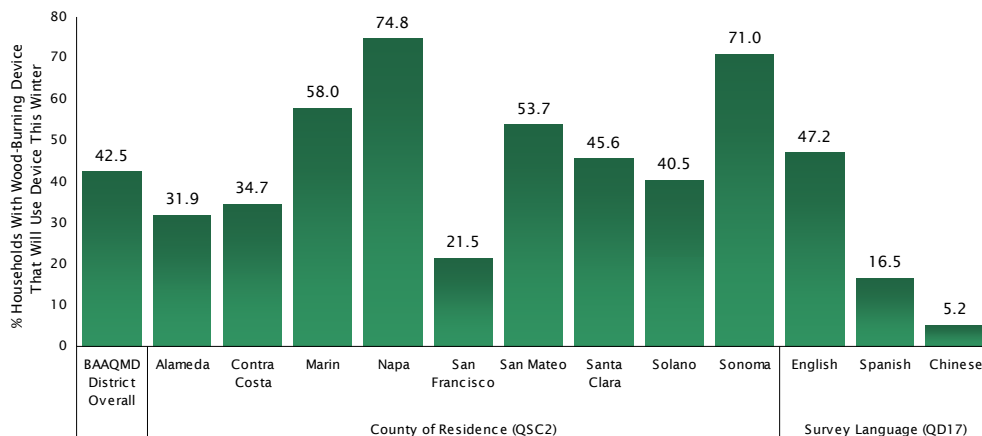


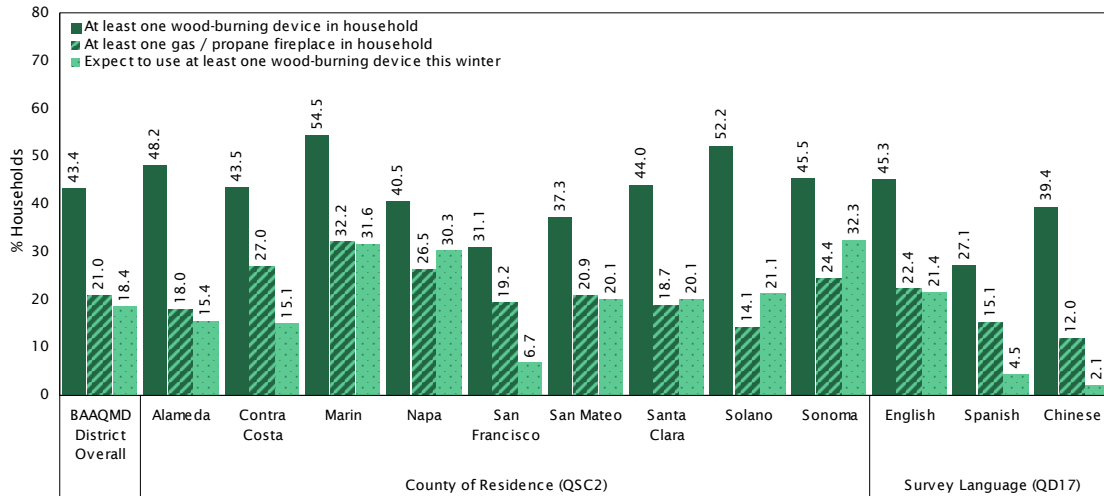
Figure 14 summarizes the information collected in Question 8 among households with a wood-burning device. Overall, 43% of households with at least one wood-burning device indicated that they would use the device this winter. The reported rate of expected use in 2014 among households with a wood-burning device was highest in Napa and Sonoma counties, and lowest in San Francisco County. Only 5% of those who took the survey in Mandarin Chinese and 17% who took the survey in Spanish expected to use their wood-burning device.

**FIGURE 14 OVERALL WOOD-BURNING DEVICE USAGE THIS WINTER BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 869)**



Below, Figure 15 provides a more detailed summary of the presence and expected use of wood-burning heating devices for the District as a whole, as well as by the nine member counties and survey language. Among *all households in the District*, 43% own a wood-burning fireplace, pellet stove, or wood stove, 21% own a natural gas/propane fireplace, and 18% expected to use a wood-burning device this winter. Those who took the survey in Spanish or Mandarin Chinese) were considerably less likely than those who took the survey in English to have and expect to use a wood-burning device this winter (5% and 2% vs. 21%).

**FIGURE 15 WOOD-BURNING DEVICE USAGE THIS WINTER BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 2,100)**



Respondents who indicated that they do not expect to use their fireplace, wood stove, or pellet stove this winter in Question 8 were asked to indicate *why* they do not intend to use the device.

**Question 9** *Why do you not expect to use your \_\_\_\_\_ this winter?*

**FIGURE 16 REASON FOR NOT USING HEATING DEVICE THIS WINTER (WOOD-BURNING FIREPLACE N = 432; GAS FIREPLACE N = 162; PELLET STOVE N = 28; WOOD STOVE N = 98)**

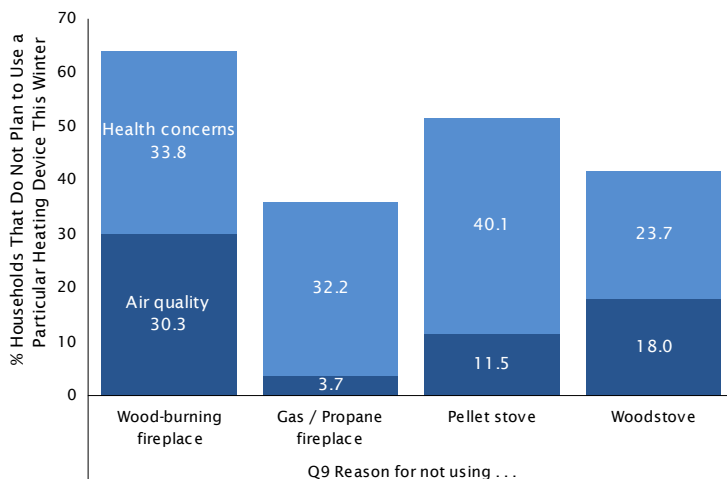
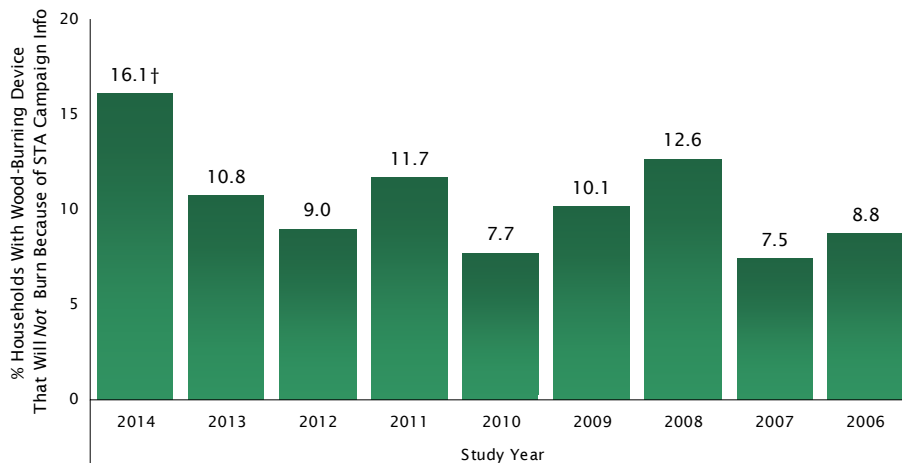


Figure 16 summarizes the results of those who offered program-related reasons. Approximately 30% of wood-burning fireplace owners who did not intend to use the device this winter offered a reason related to air quality and an additional 34% mentioned a specific health-related reason. Approximately 52% of pellet stove owners and 42% of wood stove owners who did not intend to use their device mentioned a reason related to air quality or health concerns. The remaining respondents offered a reason unrelated to air quality or health.

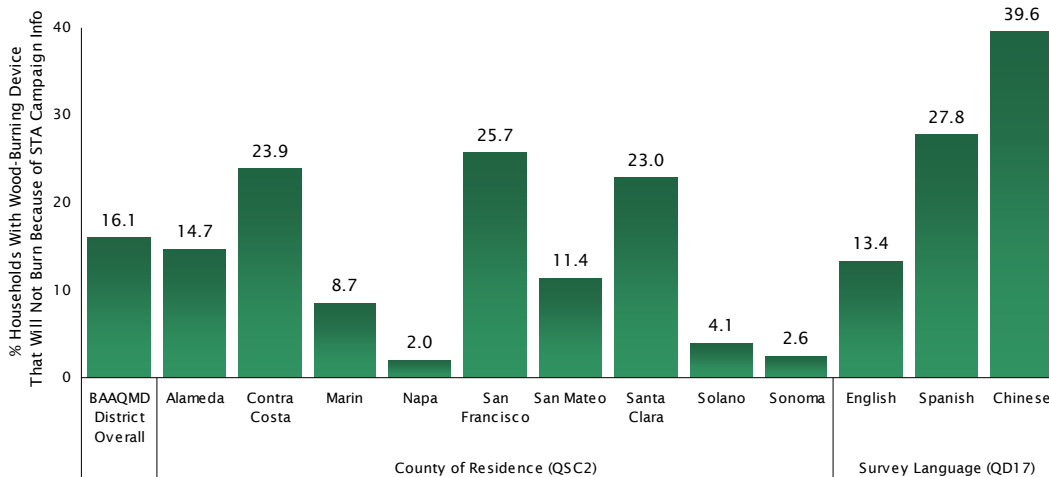
Figure 17 displays the percentage of households that own a wood-burning fireplace, wood stove, or pellet stove and indicated that they will not use the device this winter for reasons that can be attributed to the Winter Spare the Air Alert Program.<sup>7</sup> Overall, 16% of households District-wide reported that they would not use their wood-burning heating device at all during the 2014-2015 winter season due to the Program, a significant increase from the prior season (+5%). Figure 18 shows that among the nine member counties, San Francisco had the highest percentage (26%) of wood-burning device-owning households that fit this description, and approximately 40% of those who took the survey in Mandarin Chinese and 28% who took it in Spanish said they would not burn this season because of program-related information.

**FIGURE 17 NOT BURNING WOOD THIS WINTER BECAUSE OF WINTER SPARE THE AIR ALERT PROGRAM BY STUDY YEAR (N = 869)**



† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

**FIGURE 18 NOT BURNING WOOD THIS WINTER BECAUSE OF WINTER SPARE THE AIR ALERT PROGRAM BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 869)**



7. That is, they mentioned air quality and/or health-related reasons for not using the wood-burning device this winter *and* they were aware of the Winter Spare the Air Alert Program. Note that this figure does not include households that intend to use their wood-burning device, but did refrain from burning wood on at least one occasion due to the Program (see Figure 37 on page 31 for figure on full program impacts).

**SEASONAL WOOD BURNING BEHAVIOR** The next series of questions was asked only of respondents who owned at least one wood-burning fireplace, pellet stove, or wood stove *and* indicated that they would burn wood during the 2014-2015 winter months.

The first question (Question 10) asked each respondent how often they expected that they would burn wood this winter—at least once per week or less often? Respondents who indicated that they expected to burn wood less often than once per week were next asked (Question 11) to be more specific as to how often they expected to burn wood—two to three times per month, once per month, or less often than once per month? For respondents who indicated that they expected to burn wood weekly, Question 12 asked how many days they expected to burn wood in a typical winter week. The results to all three questions are combined in Figure 19.

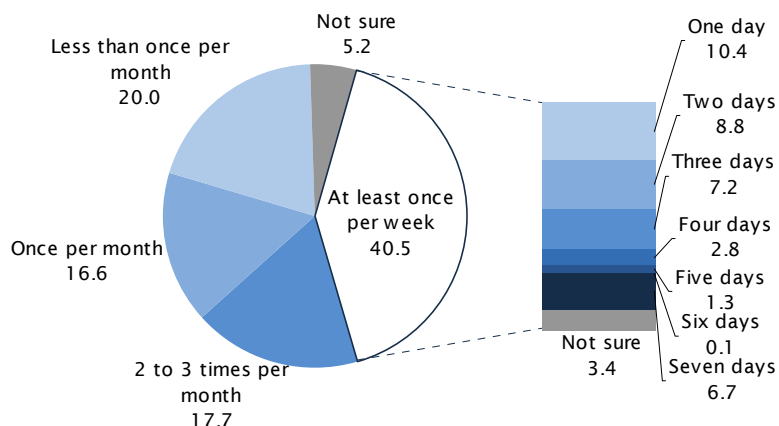
Overall, 41% of respondents indicated that they expected to burn wood on a weekly basis, although most (26%) said they would burn wood three or fewer days per week. Overall, 18% indicated that they expected to burn wood two to three times per month, 17% once per month, and 20% expected to burn wood less often than once per month. When compared with last season, there was a statistically significant decrease in the expected frequency of wood-burning among households that own a wood-burning device and expected to use it this winter (see Table 2 on the next page).

**Question 10** *How often do you expect to burn wood this winter? At least once per week or less often than that?*

**Question 11** *Would you say that you will burn wood about two to three times per month, once per month, or less often than once per month?*

**Question 12** *In a typical winter week, how many days do you expect to burn wood?*

**FIGURE 19 FREQUENCY OF WOOD BURNING THIS WINTER (N = 369)**



**TABLE 2 FREQUENCY OF WOOD BURNING THIS WINTER BY STUDY YEAR (N = 369)**

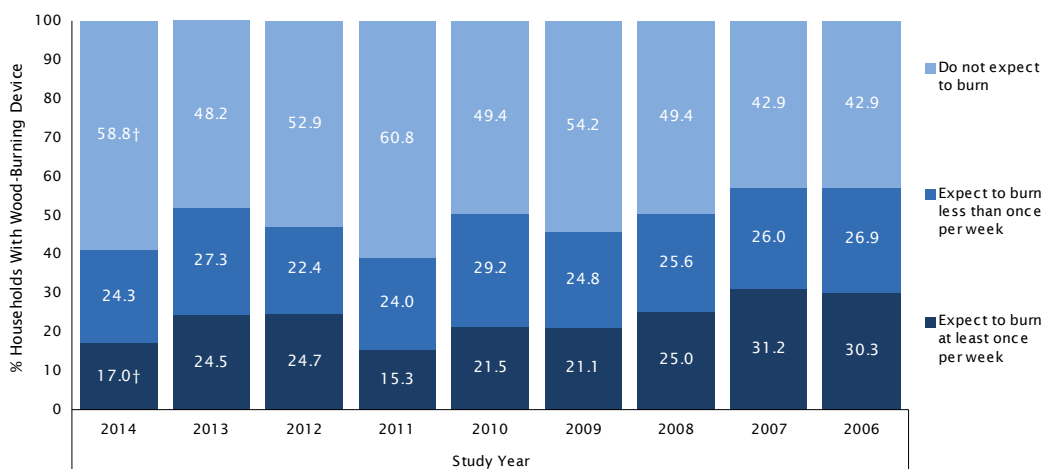
	Study Year								
	2014	2013	2012	2011	2010	2009	2008	2007	2006
At least once per week	40.5%†	48.4%	51.3%	38.2%	40.2%	44.7%	48.7%	54.3%	52.9%
One day	10.4%	10.2%	5.3%	10.1%	9.9%	11.9%	10.3%	10.4%	10.0%
Two days	8.8%	10.5%	11.0%	6.8%	10.2%	8.2%	16.2%	8.6%	17.2%
Three days	7.2%	10.9%	12.0%	4.4%	5.3%	6.9%	6.0%	10.1%	8.0%
Four days	2.8%	1.1%	7.1%	2.4%	4.2%	4.3%	2.2%	6.6%	3.5%
Five days	1.3%	5.7%	4.2%	3.5%	2.3%	2.1%	4.0%	8.3%	3.8%
Six days	0.1%	0.5%	1.5%	0.2%	0.4%	0.6%	0.5%	0.2%	1.9%
Seven days	6.7%	5.8%	5.0%	7.1%	4.5%	6.2%	5.9%	8.9%	7.2%
Not sure # of days	3.4%	3.7%	5.2%	3.7%	3.4%	4.5%	3.6%	1.3%	1.3%
2 to 3 times per month	17.7%	13.3%	15.7%	16.6%	22.4%	16.2%	19.8%	14.9%	15.0%
Once per month	16.6%	20.8%	14.2%	24.8%	19.7%	20.0%	15.2%	18.0%	15.0%
Less than once per month	20.0%	14.4%	15.8%	14.7%	11.4%	14.8%	13.2%	11.4%	16.4%
Not sure of frequency	5.2%	3.1%	3.1%	5.7%	6.2%	4.3%	3.1%	1.4%	0.6%

† Statistically significant change (p < 0.05) between the 2013 and 2014 studies.

Figures 20 and 21 provide useful summaries of wood burning behavior among all households that own a wood-burning heating device in the District, as well as by county and survey language. Overall, 17% of those households in 2014 expected to burn wood weekly, 24% expected to burn wood less frequently than once per week, and 59% indicated that they do not expect to burn wood this winter. When compared with 2013, there was a statistically significant decrease in the expected frequency of burning.

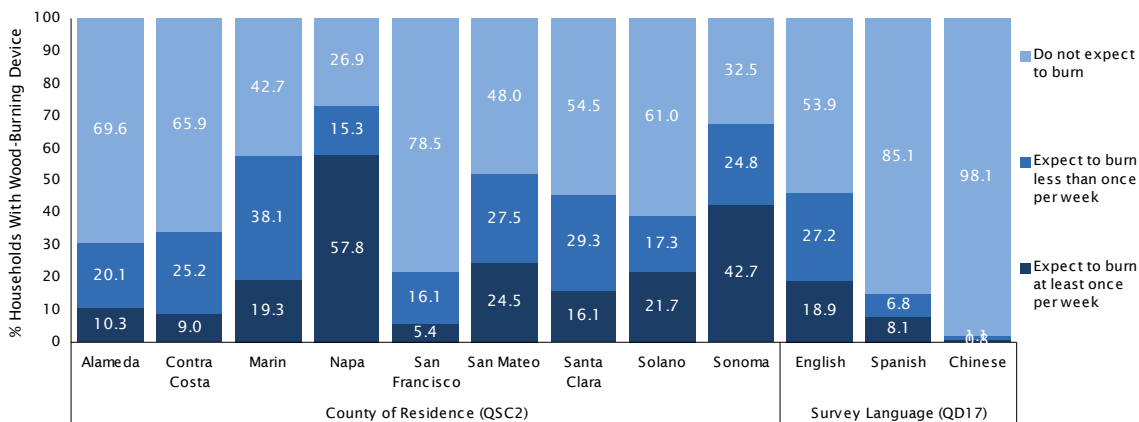
Among the nine member counties, Napa County had the highest percentage of wood-burning device-owning households that expected to burn wood weekly, whereas San Francisco County had the lowest. The vast majority of those who took the survey in Spanish or Mandarin Chinese indicated that they do not expect to burn this season.

**FIGURE 20 FREQUENCY OF WOOD BURNING THIS WINTER AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY STUDY YEAR (N = 869)**



† Statistically significant change (p < 0.05) between the 2013 and 2014 studies.

**FIGURE 21 FREQUENCY OF WOOD BURNING THIS WINTER AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 869)**

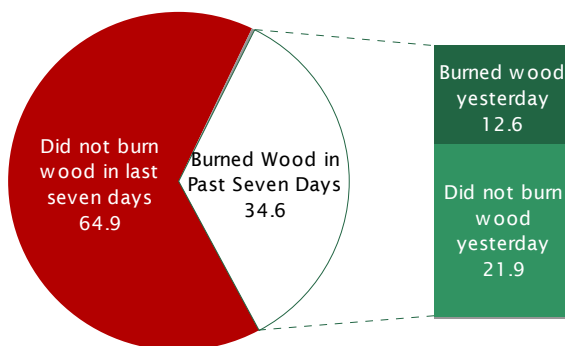


**WOOD BURNING BEHAVIOR IN PAST WEEK** Respondents were also asked whether they burned wood in the past week and, if yes, if they burned wood the day or evening prior to the interview. The results to these two questions are combined in Figure 22. Thirty-five percent (35%) of respondents whose household includes at least one wood-burning fireplace, pellet stove, and/or wood stove *and* expected to burn wood during the winter months indicated that they had burned wood during the week prior to the interview. Moreover, 13% of those households had burned wood the day prior to the interview. When compared with the 2013 season, there no statistically significant changes among this subgroup of respondents (see Table 3 on the next page).

**Question 13** *Did you burn wood in the past seven days?*

**Question 14** *Did you burn wood yesterday or last night?*

**FIGURE 22 BURNED WOOD IN PAST SEVEN DAYS (N = 369)**

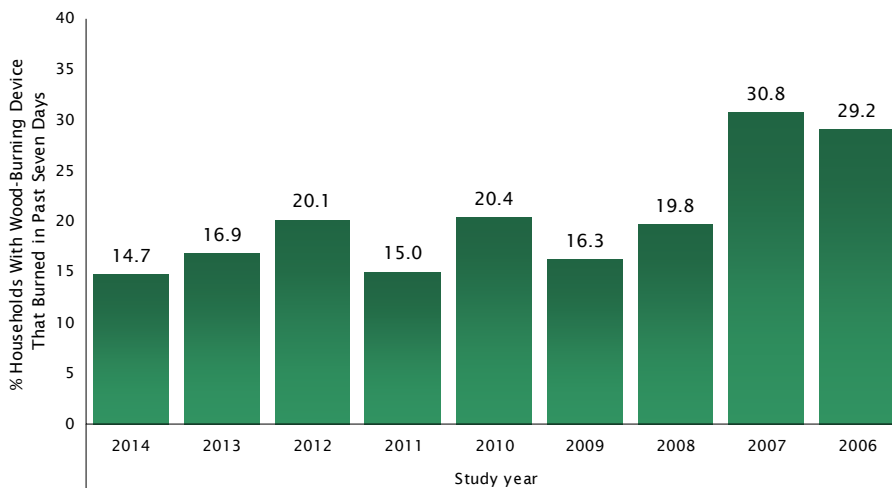


**TABLE 3 BURNED WOOD IN PAST SEVEN DAYS BY STUDY YEAR (N = 369)**

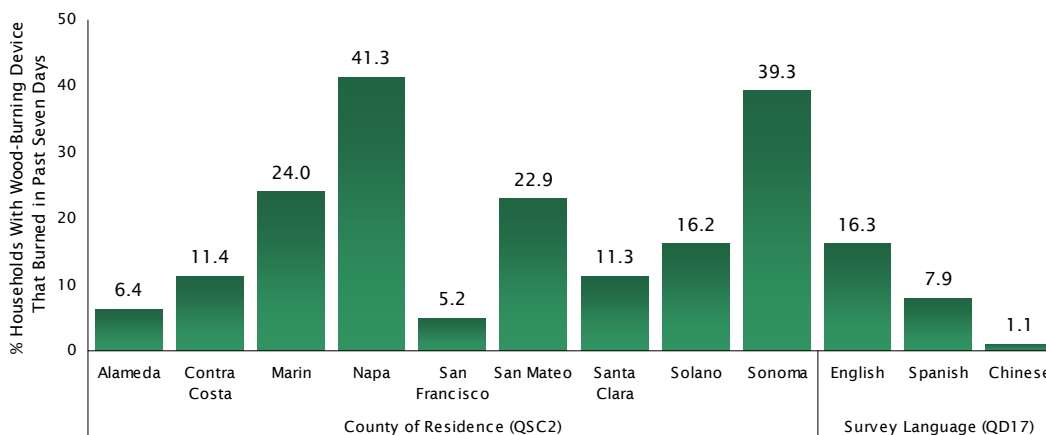
	Study Year									
	2014	2013	2012	2011	2010	2009	2008	2007	2006	
Burned wood in past seven days	34.6%	32.0%	41.9%	37.0%	39.1%	34.7%	38.3%	53.1%	51.0%	
Burned wood yesterday	12.6%	14.2%	16.2%	11.1%	17.0%	13.8%	15.1%	27.2%	22.3%	
Did not burn wood yesterday	21.9%	17.8%	25.7%	25.2%	22.1%	20.9%	23.2%	25.9%	28.7%	
Not sure of burning yesterday	0.1%	0.0%	0.0%	0.7%	0.0%	0.1%	0.1%	0.4%	0.0%	
Did not burn wood in last seven days	64.9%	67.7%	57.9%	63.0%	59.2%	65.0%	61.5%	45.8%	49.0%	
Not sure of burning in past seven days	0.4%	0.3%	0.2%	0.0%	1.7%	0.2%	0.0%	0.7%	0.0%	

The next four figures show the percentage of *all* wood-burning device-owning households that burned wood in the seven days prior to the interview (figures 23 and 24) and on the day prior to the interview (figures 25 and 26) for the District as a whole, as well as by county and interview language. Between 2013 and 2014, there were no significant changes in the percentage of all wood-burning device households that burned in the past week or in the past day.

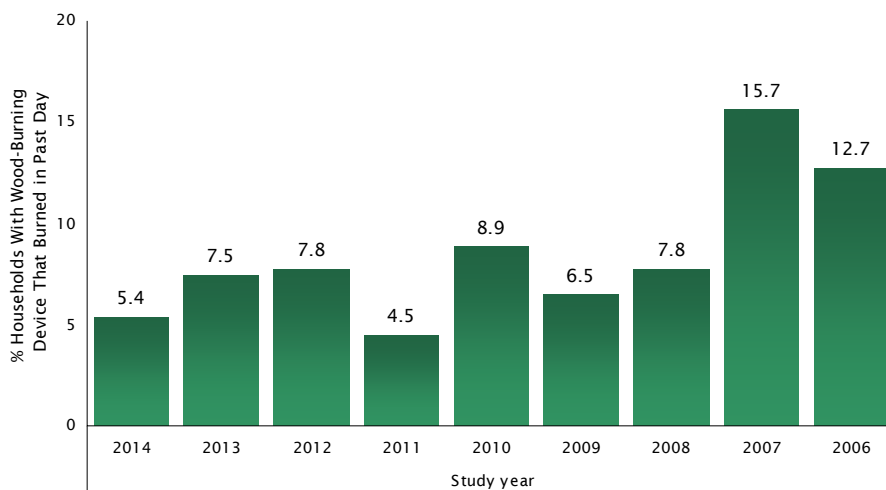
**FIGURE 23 BURNED WOOD IN PAST SEVEN DAYS AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY STUDY YEAR (N = 869)**



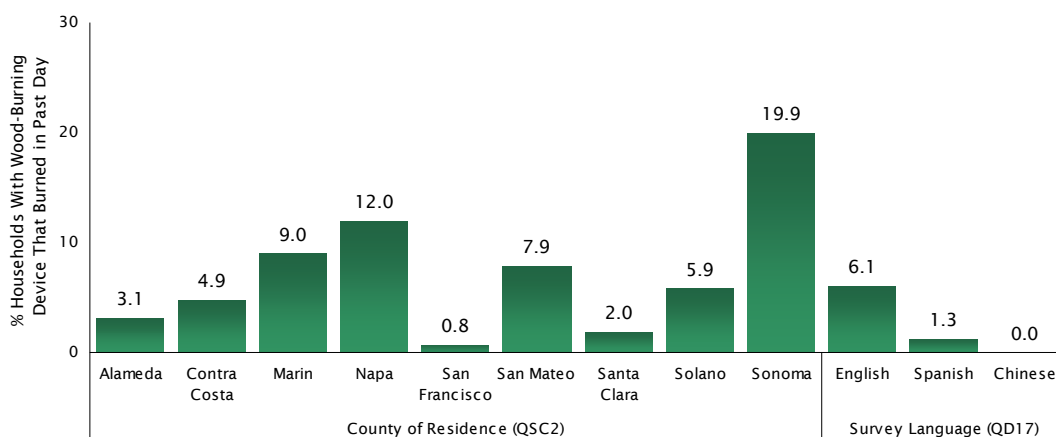
**FIGURE 24 BURNED WOOD IN PAST SEVEN DAYS AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 869)**



**FIGURE 25 BURNED WOOD YESTERDAY AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY STUDY YEAR (N = 869)**



**FIGURE 26 BURNED WOOD YESTERDAY AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 869)**

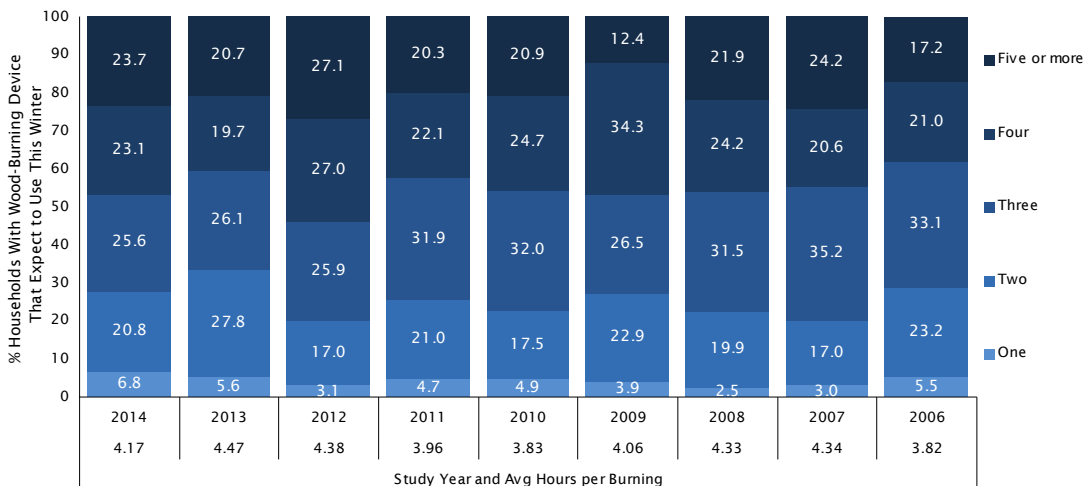


**DURATION & VOLUME OF WOOD BURNING** Questions 15 and 16 asked respondents with wood-burning devices who also expected to use the device this winter to estimate the number of hours they have a fire burning, as well as the number of logs they burn, on a typical day they burn wood. In terms of hours, respondents were split between those who burn at least four hours on a typical day (47%), those who burn approximately three hours per day (26%), and those who burn fewer than three hours (28%). The average duration among all respondents who received this question in 2014 was 4.17 hours, similar to the 4.47 hours reported in 2013. Among the nine member counties, respondents from Sonoma County reported the highest average hours burned per burn day at 5.42 hours (Figure 28). Frequent burners also reported a longer duration (5.15 hours) for a typical burn day when compared with those who burn less than once per week (3.35 hours).

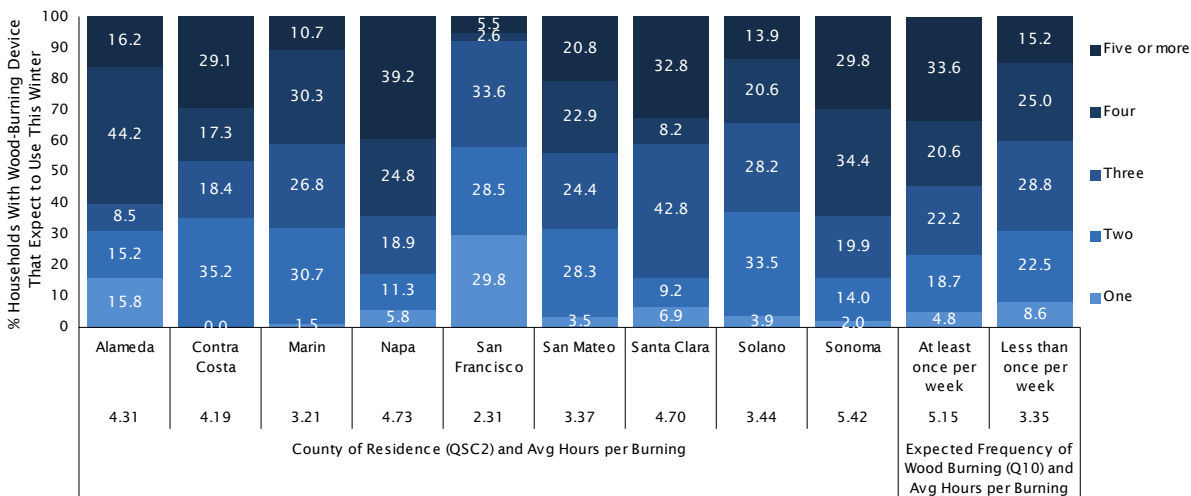


**Question 15** *In a typical day that you burn wood, how many hours of the day do you have a fire burning?*

**FIGURE 27 DISTRIBUTION AND AVERAGE HOURS OF BURNING IN TYPICAL DAY OF WOOD-BURNING BY STUDY YEAR (N = 369)**



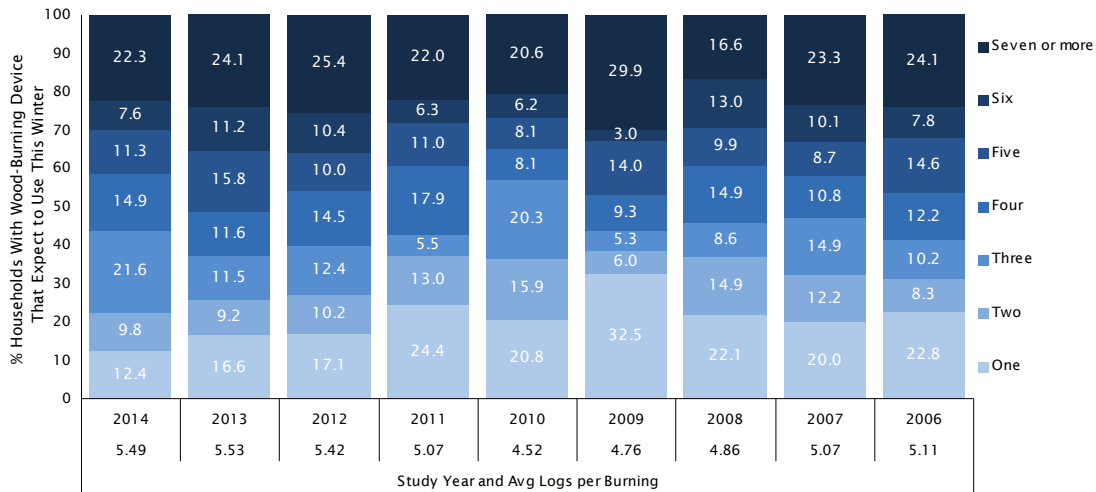
**FIGURE 28 DISTRIBUTION AND AVERAGE HOURS OF BURNING IN TYPICAL DAY OF WOOD-BURNING BY COUNTY OF RESIDENCE & EXPECTED FREQUENCY OF WOOD BURNING (N = 369)**



In terms of volume, respondents with a wood-burning fireplace or woodstove were split in 2014 between those who burn one or two logs per typical burn day (22%), those who estimated that they burn three to five logs (48%), and those who reported burning more than five logs per day (30%). The average number of logs reported per burn day in 2014 was 5.49, similar to the 5.53 recorded in the prior study (see Figure 29 on the next page).

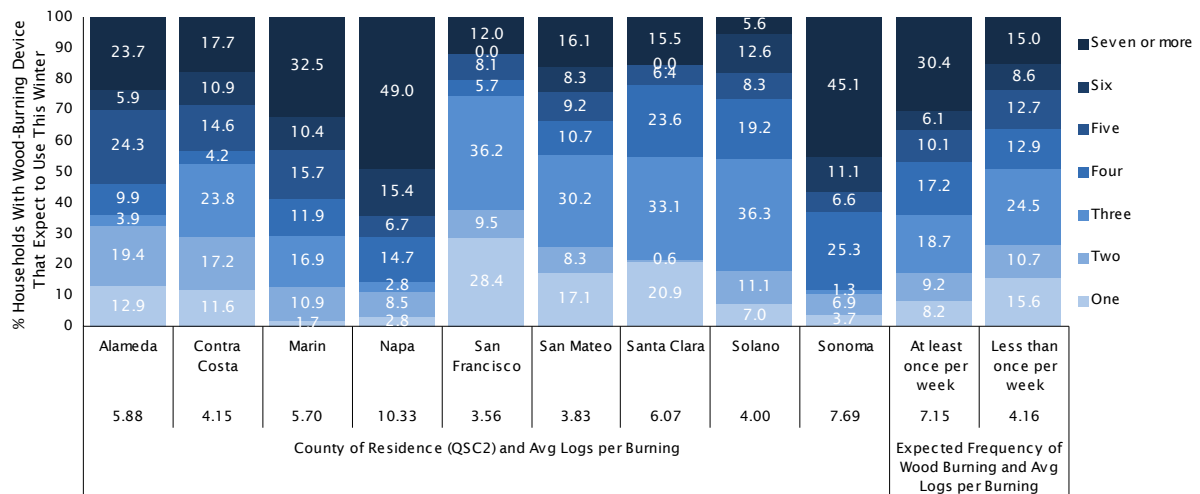
**Question 16** *In a typical day that you burn wood, how many logs do you burn throughout the entire day?*

**FIGURE 29 DISTRIBUTION AND AVERAGE NUMBER OF LOGS BURNED IN TYPICAL DAY OF WOOD-BURNING BY STUDY YEAR (N = 296)**



Shown in Figure 30, counties that reported longer than average burn durations on a typical burn day (e.g., Napa and Sonoma) also tended to report higher than average volumes of logs burned per burn day. Frequent burners also reported a higher number of logs burned (7.15) per burn day when compared with their counterparts (4.16) who burn less frequently than once per week.

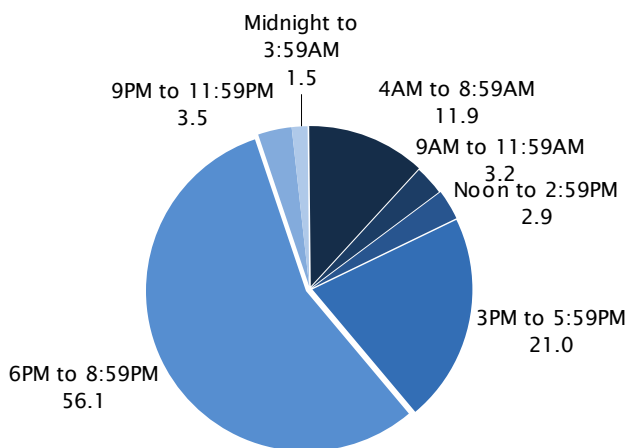
**FIGURE 30 DISTRIBUTION AND AVERAGE NUMBER OF LOGS BURNED IN TYPICAL DAY OF WOOD-BURNING BY COUNTY OF RESIDENCE & EXPECTED FREQUENCY OF WOOD BURNING (N = 296)**



The final question in this series asked respondents to identify the time of day that they first lit their most recent fire. More than half (56%) of respondents indicated that they started their most recent fire between 6PM and 8:59PM, and an additional one-fifth (21%) started their fire a bit earlier between 3PM and 5:59PM (see Figure 31 on the next page).

**Question 17** Thinking back to your most recent fire, approximately what time of the day did you first light the fire?

**FIGURE 31 TIME OF LIGHTING MOST RECENT FIRE (N = 369)**



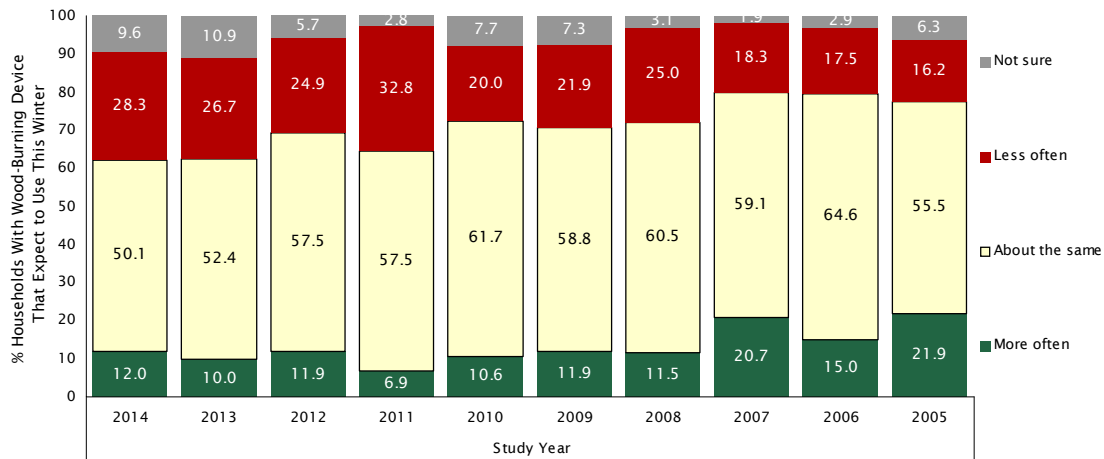
# CHANGES IN WOOD BURNING BEHAVIOR

Having measured respondents' basic wood burning behavior, the survey next focused on whether respondents had made changes in their wood burning behavior during the 2014-2015 winter season in response to the Winter Spare the Air Alert Program or other factors.

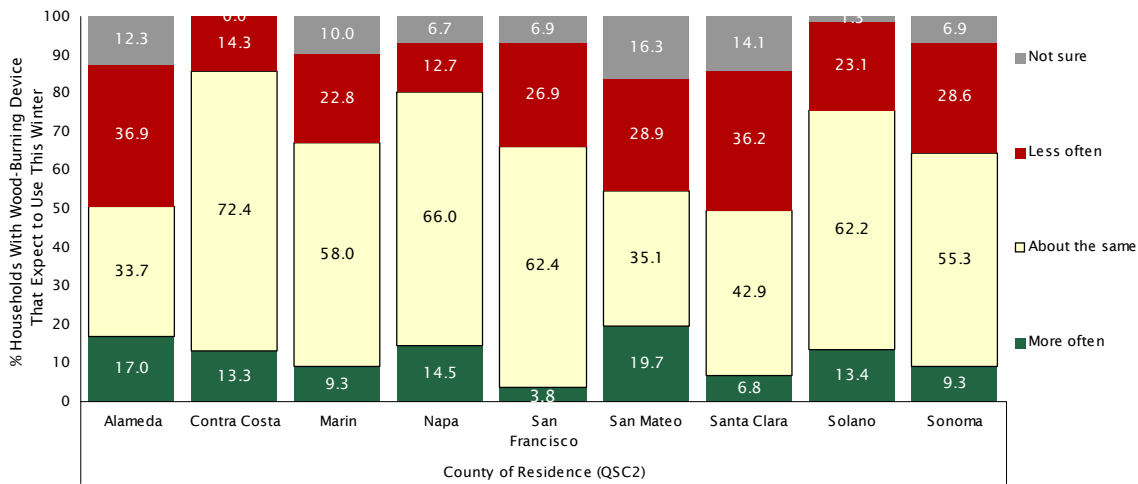
**GENERAL CHANGES IN WOOD BURNING BEHAVIOR** The first question in this series asked respondents if they expected to burn wood more frequently, less frequently, or at about the same frequency as the prior winter season. Overall, 50% of households that own a wood-burning heating device and expected to burn wood this season anticipated burning wood at about the same frequency this season as last (Figure 32). More than one-quarter (28%) expected to burn less often this season, and 12% expected to burn more frequently. There were no statistically significant differences between the current study and prior. For the interested reader, Figure 33 on the next page provides the responses to this question by the nine member counties.

**Question 18** *This winter, do you expect that you will burn wood more often, less often, or about the same frequency as you did last winter?*

**FIGURE 32 EXPECTED FREQUENCY OF WOOD BURNING THIS WINTER COMPARED WITH LAST WINTER BY STUDY YEAR (N = 369)**



**FIGURE 33 EXPECTED FREQUENCY OF WOOD BURNING THIS WINTER COMPARED WITH LAST WINTER BY COUNTY OF RESIDENCE (N = 369)**



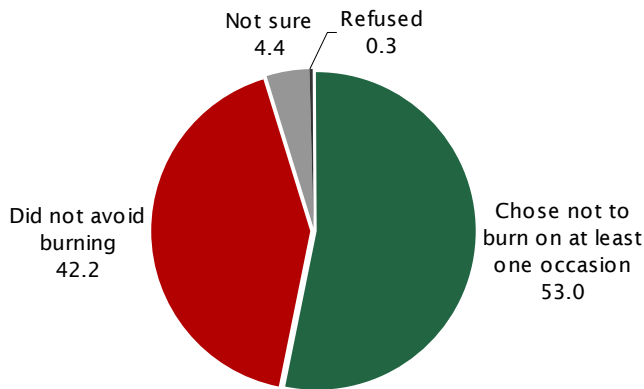
**SEASONAL CHANGES IN WOOD BURNING BEHAVIOR** Those in households that burned wood this winter (or anticipated doing so) were next asked whether there were occasions when they normally would have burned wood but refrained from doing so. For those who answered in the affirmative, the survey asked in an open-ended manner *why* they decided not to burn wood on these occasions.

The manner in which these questions were asked, as well as their placement in the survey relative to specific questions about the Winter Spare the Air Alert Program, was changed in 2004 from prior surveys. Previous surveys first introduced the Winter Spare the Air Alert Program and then asked if individuals responded to the Program by reducing the amount of wood they burned. Asking the question in this manner is likely to prompt a *socially desirable* response from some respondents that they had reduced their wood burning even if they had not—which leads to artificially high estimates of the Program’s impact. To more accurately measure reductions in wood burning that can be attributed to the Program, the 2004 to 2014 surveys employed an indirect approach similar to that used in the CARB/EPA Method for estimating reductions in driving due to the summer Spare the Air Program.

As shown in Figure 34 on the next page, 53% of respondents who have a wood-burning fireplace, wood stove, and/or pellet stove *and* expected to burn wood during the 2014-2015 winter season indicated that, on at least one occasion this season, they refrained from burning wood. When asked *why* they chose not to burn wood on these occasions, 27% specifically mentioned the Winter Spare the Air Alert Program and an additional 5% offered an air quality or health-related reason (see Figure 35).<sup>8</sup> When compared with 2013, there were no statistically significant changes for the 2014 season. For the interested reader, the percentage of respondents who mentioned the Program or air quality and/or health reasons as a reason for not burning wood at least once this winter is shown by county in Figure 36.

8. Among those who refrained from burning wood due to Winter Spare the Air, air quality and/or health-related reasons, the average number of occasions they refrained from burning wood during the season prior to taking the interview was 3.99.

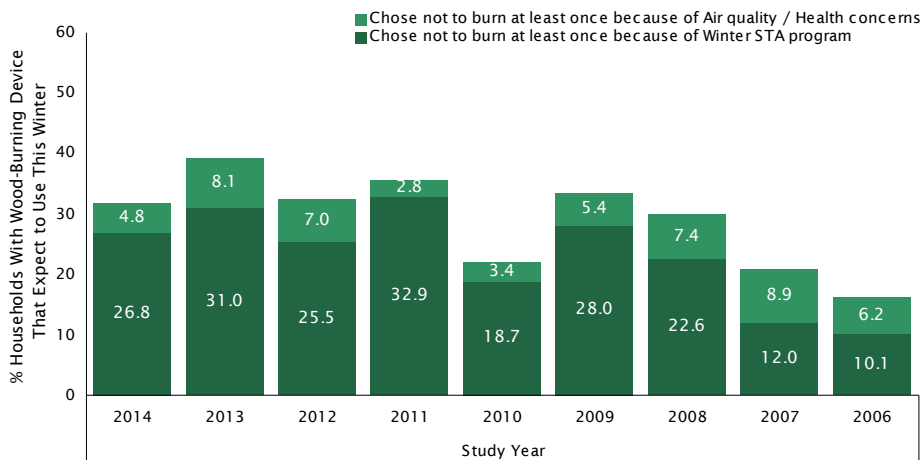
**FIGURE 34 CHOSE NOT TO BURN THIS WINTER (N = 369)**



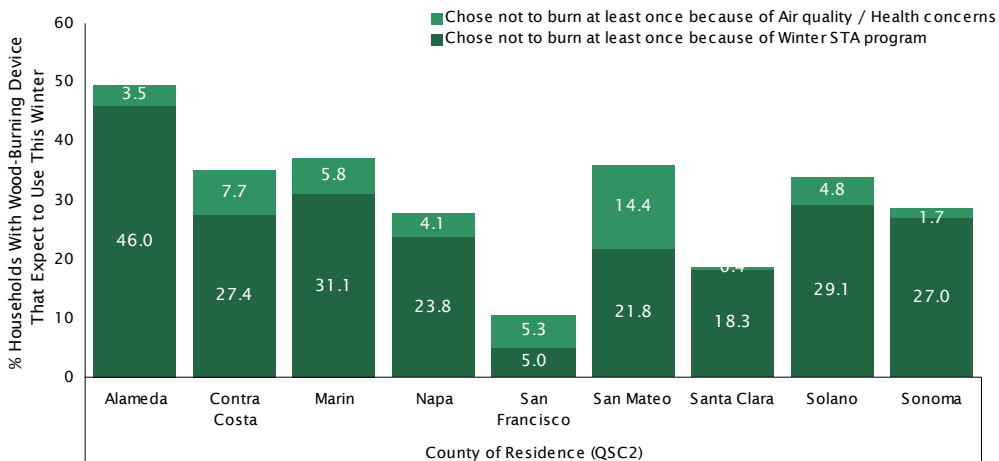
**Question 19** *Were there occasions this winter when you normally would have burned wood, but decided not to?*

**Question 20** *Why did you decide not to burn wood on these occasions?*

**FIGURE 35 CHOSE NOT TO BURN THIS WINTER BECAUSE OF WINTER SPARE THE AIR ALERT PROGRAM INFO OR AIR QUALITY / HEALTH CONCERNS BY STUDY YEAR (N = 369)**

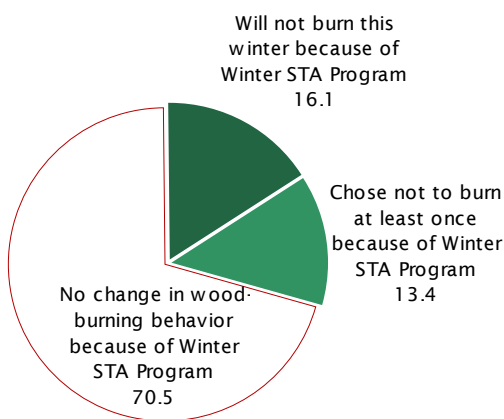


**FIGURE 36 CHOSE NOT TO BURN THIS WINTER BECAUSE OF WINTER SPARE THE AIR ALERT PROGRAM INFO OR AIR QUALITY / HEALTH CONCERNS BY COUNTY OF RESIDENCE (N = 369)**



**SEASONAL PROGRAM IMPACTS ON WOOD BURNING** To estimate the percentage of adults in the District who reduced the amount of wood that they burned during the winter season in response to the Program, one must combine the responses from several questions in the survey. Naturally, respondents who do not live in a household that contains a wood-burning fireplace, wood stove, or pellet stove (Question 1) should not be included in the analysis because they could not respond to the Program by reducing their wood burning behavior. Respondents who chose not to burn wood *at all* during the winter (Question 8), did so because of air quality or health related reasons (Question 9), *and* were aware of the Winter Spare the Air Alert Program (Question 23) can be considered a Spare the Air (STA) reducer. So too can respondents who indicated that although they did burn wood, they refrained from doing so on occasion (Question 19), did so because of the Program and/or for air quality/health reasons (Question 20), *and* were aware of the Winter Spare the Air Alert Program (Question 23).

**FIGURE 37 SPARE THE AIR REDUCERS (N = 869)**



Among all households with a wood-burning fireplace, pellet stove or wood stove, 16% chose not to burn *at all* during the winter season because of the Winter Spare the Air Alert Program, and an additional 13% refrained from burning on at least one occasion for the same reason. Collectively, the Winter Spare the Air Alert Program influenced approximately 30% of households with a wood-burning fireplace, pellet stove or wood stove to reduce their wood burning during the 2014-2015 winter season (Figure 37).

Table 4 shows that of the 869 respondents in the survey eligible to respond to the Program, 256 (30%) reduced their wood burning behavior on at least one occasion during the 2014-2015 winter in response to the Winter Spare the Air Alert Program.<sup>9</sup> This represents 332,954 households out of the estimated 1,130,223 households with a wood-burning heating device. In terms of the reliability of the estimate, we can be 95% confident that the actual proportion of Winter Spare the Air reducer households this season was between 26.4% and 32.5%.

**TABLE 4 SPARE THE AIR REDUCERS: CONFIDENCE INTERVAL**

Winter Spare the Air Alert Reducers		
Universe Estimate (households with heating device)		1,130,223
Sample Size (surveyed households with heating device)		869
STA Reducers		256
Non-STA Reducers		613
Proportion of STA Reducers		29.5%
Proportion of Non-STA Reducers		70.5%
Maximum Margin of Error (95% confidence)		3.0%
Confidence Interval for Proportion of Winter STA Reducers	Lower Bound	26.4%
	Upper Bound	32.5%

9. Question 21 asked respondents who refrained from burning wood for program-related reasons how many times they did so for air quality or health-related reasons during the winter season. The average response was 3.99 times, although the small sample size for this question means that the margins of error around the estimate are large. Moreover, those who did not burn wood at all during the winter were not asked this question, so the figure represents the average reduction among individuals who normally burn wood.

Figure 38 displays the estimated percentage of wood-burning fireplace, wood stove, and pellet stove owning households that reduced their wood burning on at least one occasion due to the Winter Spare the Air Alert Program by study year. For reference, the confidence intervals are also shown to provide a sense for the reliability of the estimates.<sup>10</sup> The percentage of spare the air reducer households identified in 2014 was nearly identical to that found in 2013. Historically, the percentages found in this and the prior winter season are the highest seen to date. Just 4% of eligible households in 2004 and 2% of eligible households in 2005 responded to the Program.

**FIGURE 38 SPARE THE AIR REDUCERS BY STUDY YEAR SHOWING CONFIDENCE INTERVALS (N = 869)**

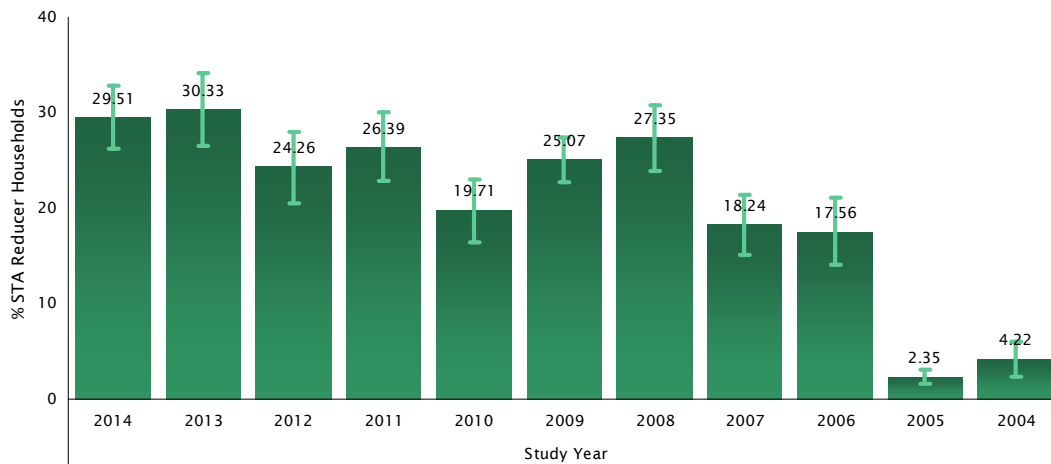


Figure 39 on the next page displays the number of Spare the Air Alert episodes called per winter season, as they correspond to Study Year. Comparing figures 38 and 39, we see a relationship between the number of episodes and response to the Program. That is, response to the Program during winter seasons in which no Spare the Air Alert episodes were called (2004 and 2005) was low, as one would expect given fewer opportunities to encounter program and air quality information, and fewer opportunities to respond to the Program by not burning on specific episode evenings. With the substantial increase in episodes during the 2006 and 2007 seasons came a substantial increase in awareness of and response to the Program.<sup>11</sup> Since that time, response to the Program has remained high and somewhat proportional to the number of Spare the Air Alert episodes, and thus opportunities for exposure to air quality information, called each winter season.

10. The confidence intervals indicate the range within which one can be 95% confident that the true value exists.

11. Between 1995 and 2005, only one Spare the Air Alert episode was called. In 2006, research on the impacts of fine particles on public health prompted federal government to strengthen particulate matter air quality standards, resulting in a dramatic increase in the number of episodes called during the 2006 winter season.



**FIGURE 39 NUMBER OF SPARE THE AIR ALERT EPISODES PER SEASON**

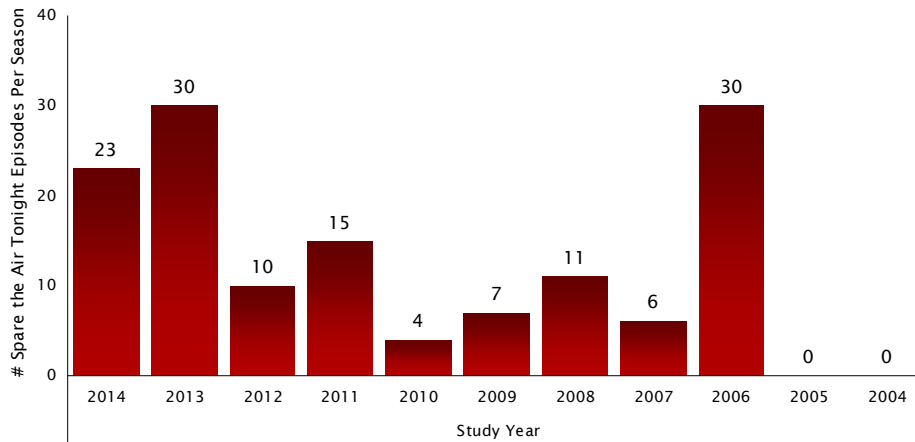
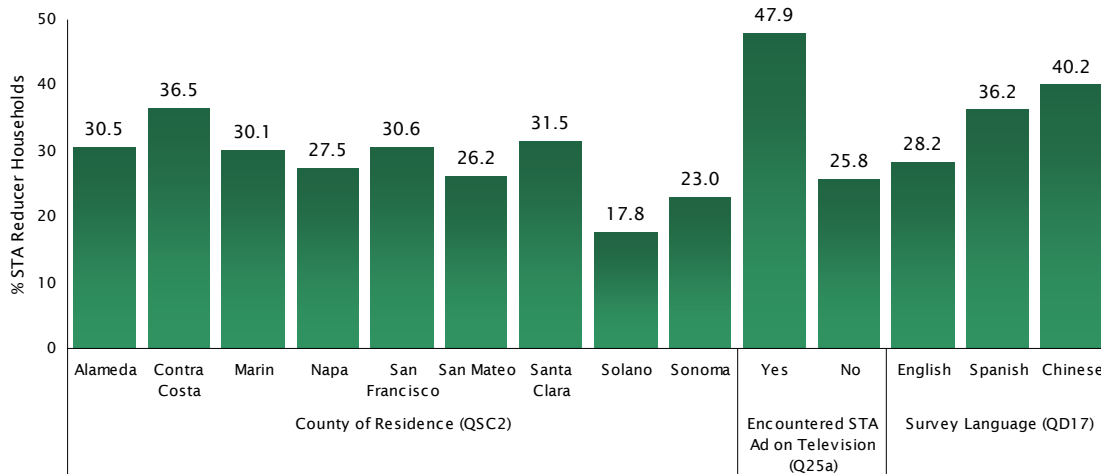


Figure 40 provides the percentage of wood-burning households that reduced their burning on at least one occasion due to the Winter Spare the Air Alert Program by county of residence, whether or not the respondent had encountered a Spare the Air ad on television, and survey language. Households in Contra Costa County, those in which the survey respondent had seen a Spare the Air advertisement or announcement on television, and those who took the survey in Spanish or Mandarin Chinese were the most likely to have reduced burning because of the Program.

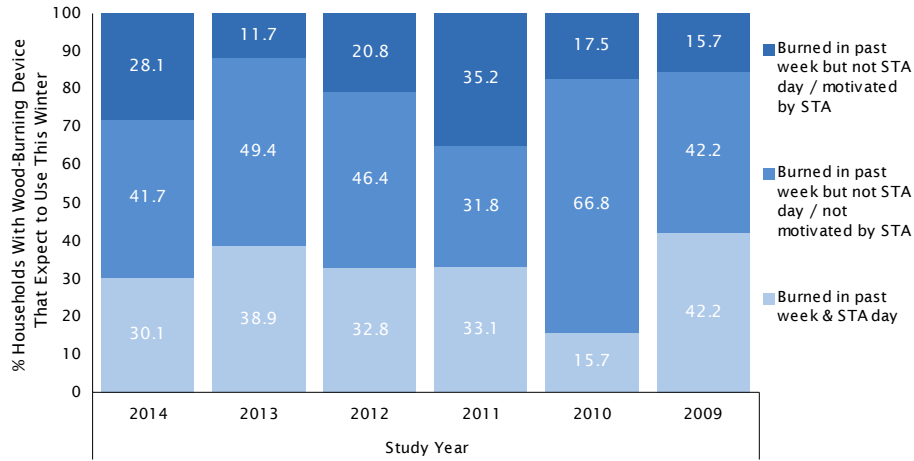
**FIGURE 40 SPARE THE AIR REDUCERS BY COUNTY OF RESIDENCE, ENCOUNTERED STA AD ON TELEVISION & SURVEY LANGUAGE (N = 869)**



**EPISODIC IMPACTS OF PROGRAM ON WOOD BURNING** Whereas the prior section discussed changes to wood-burning on a *seasonal* basis, the study also sought to identify the impact that occurs when specific Spare the Air alerts are issued. To characterize the impacts, it is important to isolate the target market for the alert: households that are inclined to burn on the Spare the Air episode. Figure 41 on the next page shows that among households that burned during the week prior to a Spare the Air alert (and thus demonstrated an inclination to burn), 28% chose not to burn on the episode in response to the Program. An additional 42% refrained from burning on the Spare the Air day, but for reasons unrelated to the Program. Approximately 30% of households that had burned in the prior week also burned on the Spare the Air day.

**Question 22** You previously indicated that you chose not to burn wood yesterday or last night. Why did you decide not to burn wood yesterday or last night?

**FIGURE 41 ANALYSIS OF WOOD BURNING ON STA EVENINGS: BURNED THIS SEASON AND IN PAST WEEK BY STUDY YEAR (N = 56)**



## RECALL AND AWARENESS OF WINTER SPARE THE AIR ALERT MESSAGING

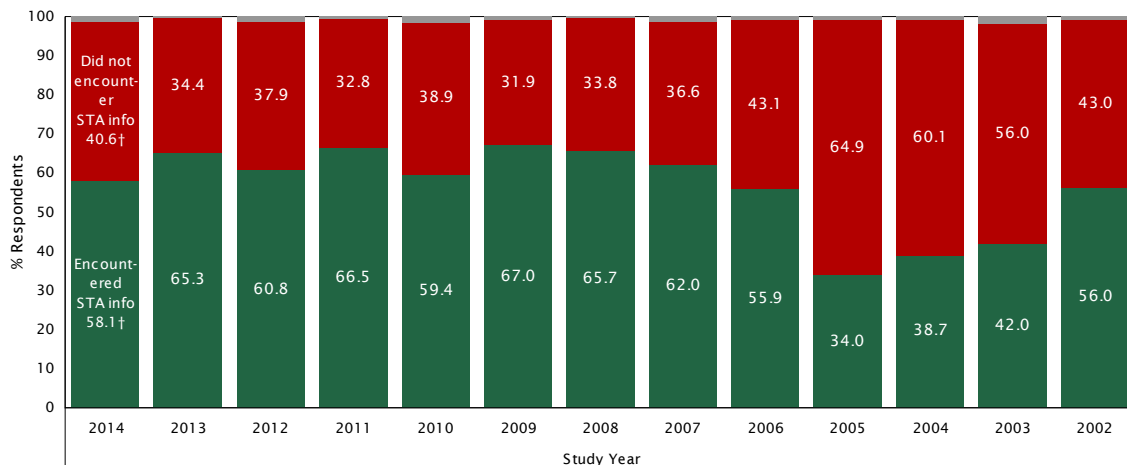
Although the ultimate goal of the Winter Spare the Air Alert Program is to persuade individuals to reduce the amount of wood they burn and to replace wood-burning devices with cleaner alternatives, there are a series of related objectives which must be met for this to occur. For example, regardless of how compelling the message may be, if the message does not reach the target audience then the Program cannot succeed in its primary goal. Thus, an objective of the Program is simply to increase awareness of the Winter Spare the Air Alert Program and related events.

**RECALL EXPOSURE TO SPARE THE AIR MESSAGING** Accordingly, a series of questions was asked of respondents about their recall of Winter Spare the Air messaging. The first of these questions asked: *During this winter, have you heard, read, or seen any new stories, advertisements or public service announcements about the Winter Spare the Air Alert Program, poor air quality, or requests not to use your fireplace, pellet stove, or wood stove?*

Figure 42 presents the results to this question for the study years 2002 through 2014. In the current study, 58% of respondents recalled being exposed to news stories, advertisements, or public service announcements related to the Winter Spare the Air Alert Program during the winter months, which represents statistically significant decrease from the 65% recorded in 2013.

**Question 23** *During this winter, have you heard, read, or seen any news stories, advertisements, or public service announcements about the Winter Spare the Air Alert Program, poor air quality, or requests not to use your fireplace, pellet stove, or wood stove?*

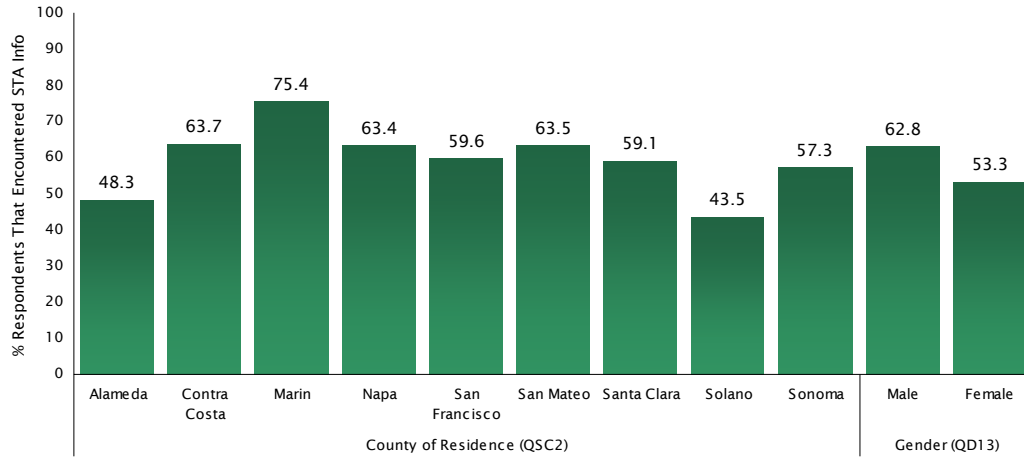
**FIGURE 42 ENCOUNTED WINTER SPARE THE AIR INFORMATION BY STUDY YEAR (N = 2,100)**



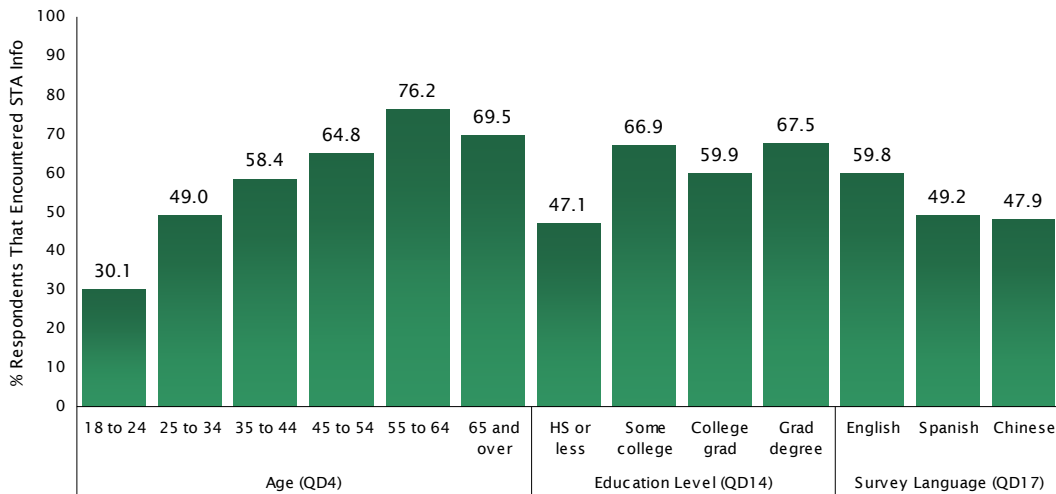
† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

For the interested reader, figures 43 and 44 display the percentage of respondents who recalled being exposed to news stories, advertisements, or public service announcements related to the Winter Spare the Air Alert Program during the 2014 winter months by county, gender, age, education level, and survey language. When compared with their respective counterparts, those in Marin County, men, those 55 years of age and older, those with at least some college education, and those who took the survey in English were the most likely subgroups to recall being exposed to the Winter Spare the Air Alert Program.

**FIGURE 43 ENCOUNTERED WINTER SPARE THE AIR INFORMATION BY COUNTY OF RESIDENCE & GENDER (N = 2,100)**



**FIGURE 44 ENCOUNTERED WINTER SPARE THE AIR INFORMATION BY AGE, EDUCATION LEVEL & SURVEY LANGUAGE (N = 2,100)**

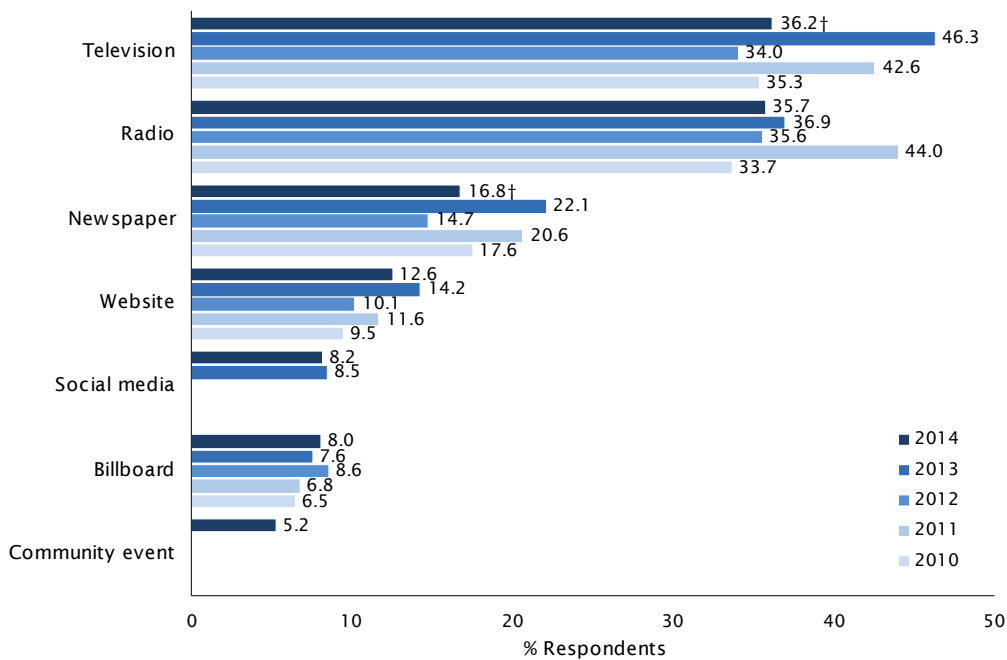


**INFORMATION SOURCES** Those who indicated that they recalled hearing, reading, or seeing Winter Spare the Air related information during the winter were asked where they obtained the information. In this study’s early years, this question was asked in an open-ended manner, allowing respondents to mention particular sources without being prompted. To more accurately gauge exposure to various media types, in 2010 the question was modified to ask respondents if they had or had not encountered Bay Area Air Quality Management District or Winter Spare the Air Alert Program information via *each* of the media types presented below in Figure 45. Percentages in the figure were calculated to represent the portion of *all* survey respondents who encountered information, not just those who received the question. Five study years are represented in the figure, with 2014 results shown in the darkest blue bars.

Television (36%) and radio (35%) were the most popular sources for encountering Bay Area Air Quality Management District or Winter Spare the Air Alert Program information, with each cited by just over one third of all respondents. Seventeen percent (17%) of respondents encountered information via newspaper, 12% on a website, 8% through social media, 8% on a billboard, and 5% at a community event. Compared with 2013, there were statistically significant decreases in exposure to Bay Area Air Quality Management District or Winter Spare the Air Alert Program information via television and newspaper, with both returning to the levels recorded in 2012. For the interested reader, figures 46 and 47 on the next page displays exposure to media types by age of the respondent and survey language.

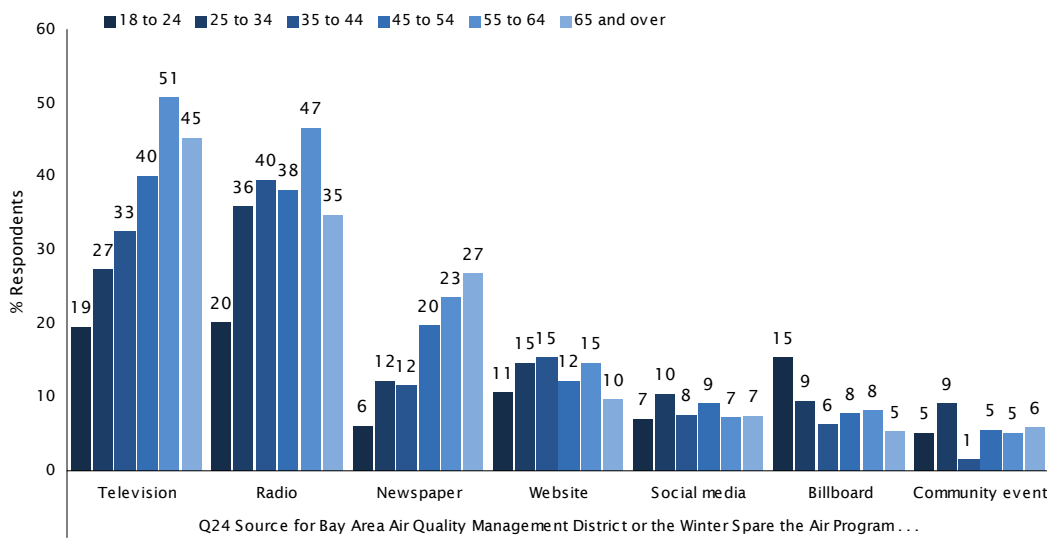
**Question 24** *During this winter, do you recall encountering information about the Bay Area Air Quality Management District or the Winter Spare the Air Program: \_\_\_\_\_?*

**FIGURE 45 SOURCE FOR WINTER SPARE THE AIR INFORMATION BY STUDY YEAR (N = 2,100)**

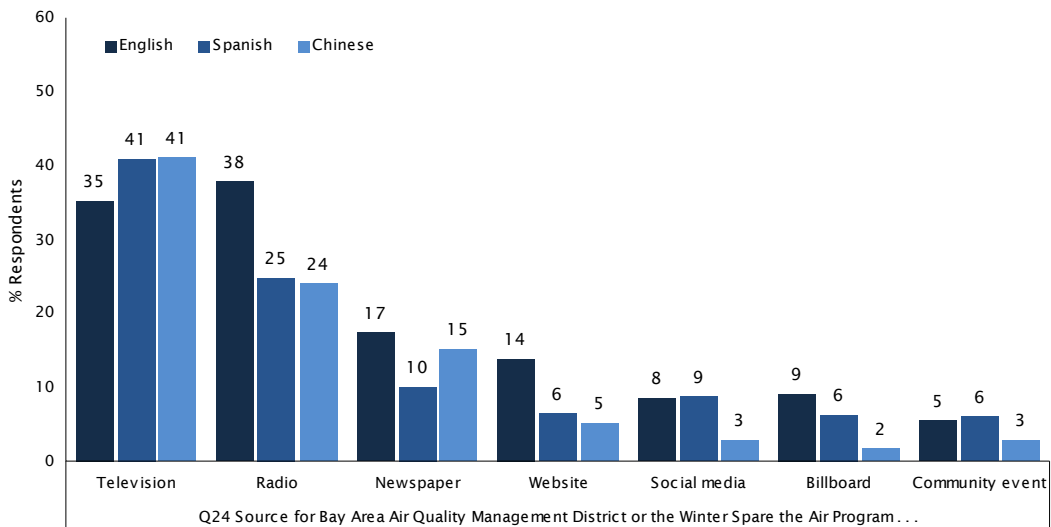


† Statistically significant change (p < 0.05) between the 2013 and 2014 studies.

**FIGURE 46 SOURCE FOR WINTER SPARE THE AIR INFORMATION BY AGE (N = 2,100)**



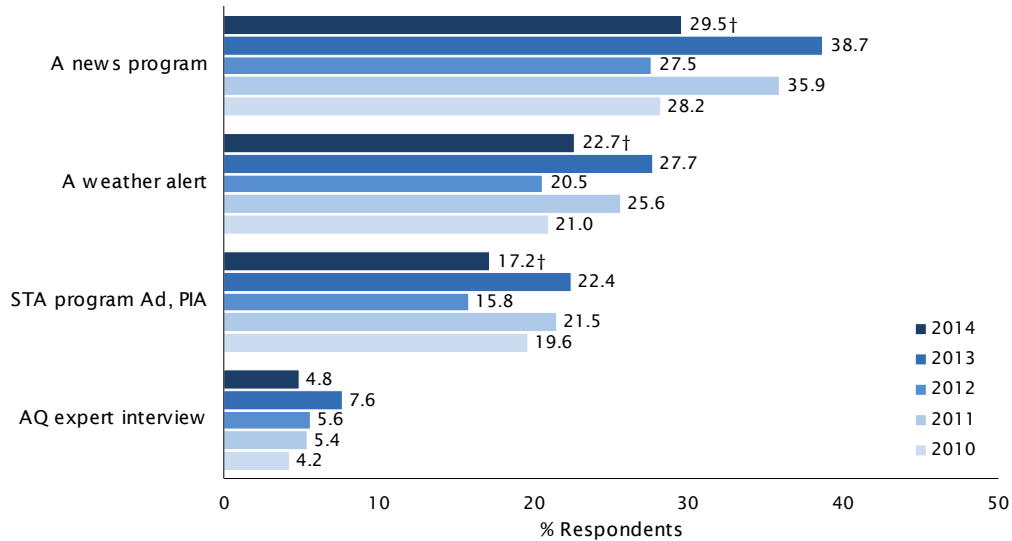
**FIGURE 47 SOURCE FOR WINTER SPARE THE AIR INFORMATION BY SURVEY LANGUAGE (N = 2,100)**



**TELEVISION PROGRAMMING** Air quality information on television originates from a variety of sources, directly and indirectly related to the District’s outreach efforts. To look more closely at penetration rates of four different television sources, Question 25 was asked of those who had encountered Spare the Air information on television in the prior question. The results of this question are presented on the next page in Figure 48, with percentages representing the portion of *all* survey respondents who encountered information from each television source. Thirty percent (30%) of all respondents encountered Winter Spare the Air information on television in a news program, 23% said they encountered the information on a weather report, and just under one-fifth (17%) of all respondents encountered Winter Spare the Air information on television in *an advertisement or public information announcement that talks about fires, wood smoke, air quality and the Winter Spare the Air Program*. All three findings represent statistically significant decreases from the 2013 study and are similar to the findings of the 2012 study.

**Question 25** Information about the Winter Spare the Air Program is carried on television in a number of ways. Do you recall encountering information about Winter Spare the Air on television in: \_\_\_\_\_?

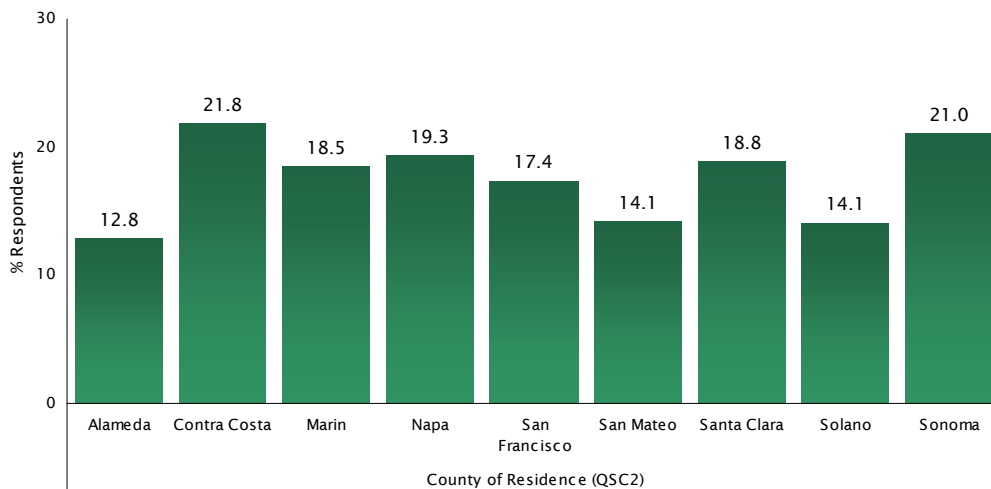
**FIGURE 48 SOURCE OF SPARE THE AIR INFORMATION ON TELEVISION BY STUDY YEAR (N = 2,100)**



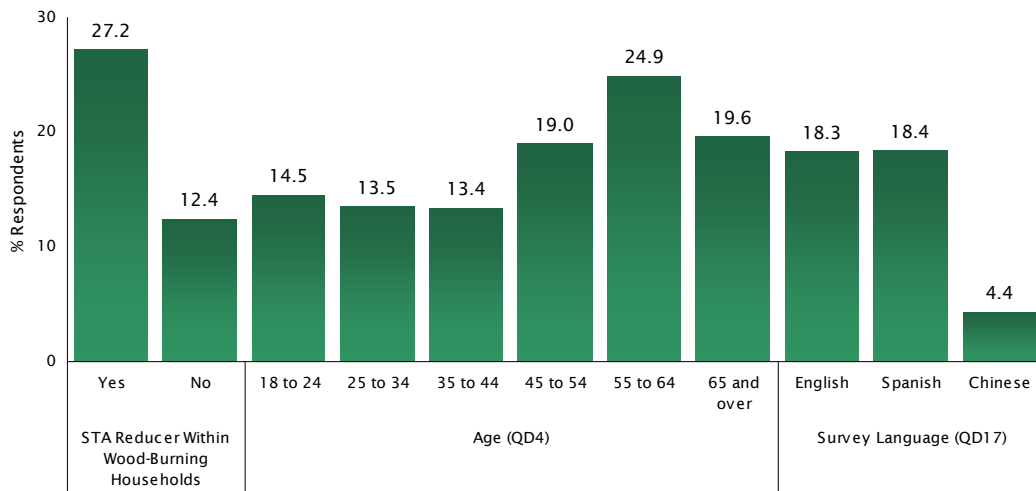
† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

For the interested reader, figures 49 and 50 present the percentage of all respondents who encountered Winter Spare the Air information on television in *an advertisement or public information announcement that talks about fires, wood smoke, air quality and the Winter Spare the Air Program* by county of residence, whether or not the household has responded to the Program by reducing wood-burning behavior, age of the respondent, and survey language.

**FIGURE 49 ENCOUNTERED AD, PIA ABOUT FIRES, WOOD SMOKE, AIR QUALITY ON TELEVISION BY COUNTY OF RESIDENCE (N = 2,100)**



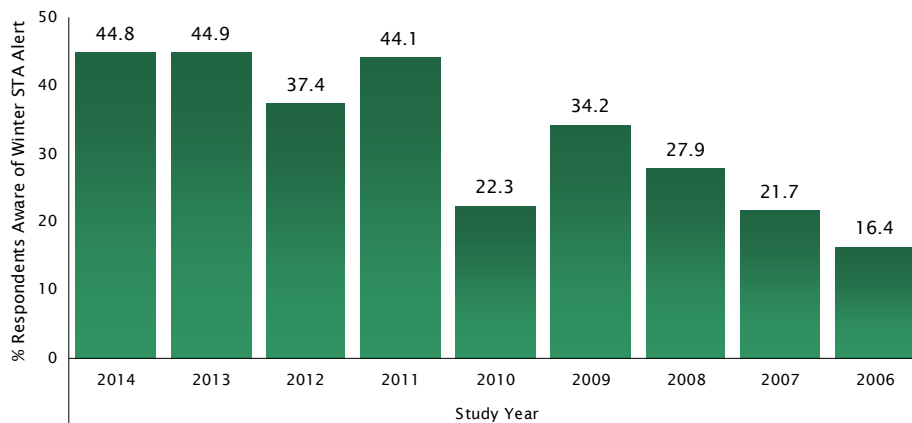
**FIGURE 50 ENCOUNTERED AD, PIA ABOUT FIRES, WOOD SMOKE, AIR QUALITY BY STA REDUCER WITHIN WOOD-BURNING HOUSEHOLDS, AGE & SURVEY LANGUAGE (N = 2,100)**



**AWARE OF SPARE THE AIR DAY** The final question in this series asked all respondents who received the interview on the day after a Winter Spare the Air episode if, prior to taking the survey, they were aware that a Winter Spare the Air advisory had been issued the day before. As shown in Figure 51, 45% of respondents in 2014 answered this question in the affirmative, which is virtually identical to the percentage found in 2013, and higher than the percentages found in any other year dating back to 2006. When compared with their respective counterparts, awareness was highest among Marin County residents, those who had encountered a Spare the Air ad on television, those 55 years and older, individuals with at least some college education, and those who took the survey in English (see figures 52 and 53).

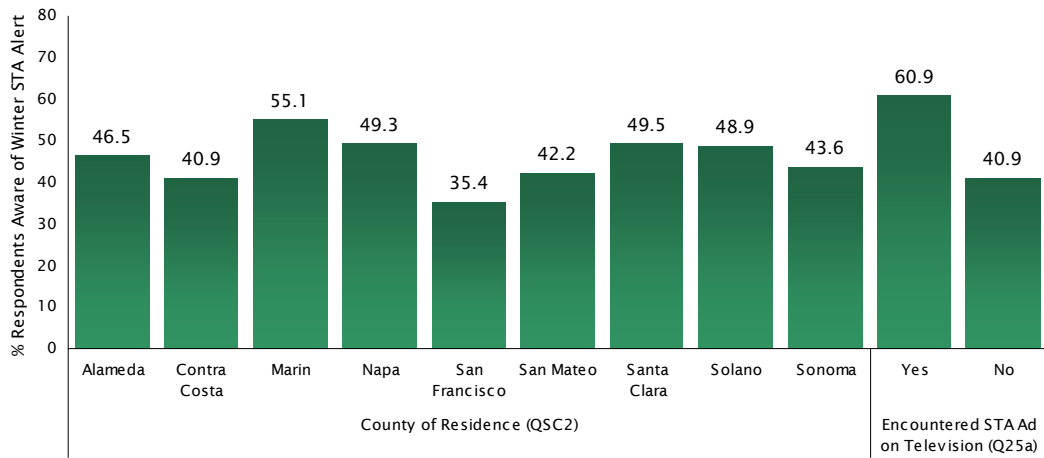
**Question 26** *Prior to taking this survey, were you aware that there was a “Winter Spare the Air Alert” yesterday?*

**FIGURE 51 AWARE OF WINTER SPARE THE AIR ALERT BY STUDY YEAR (N = 931)**

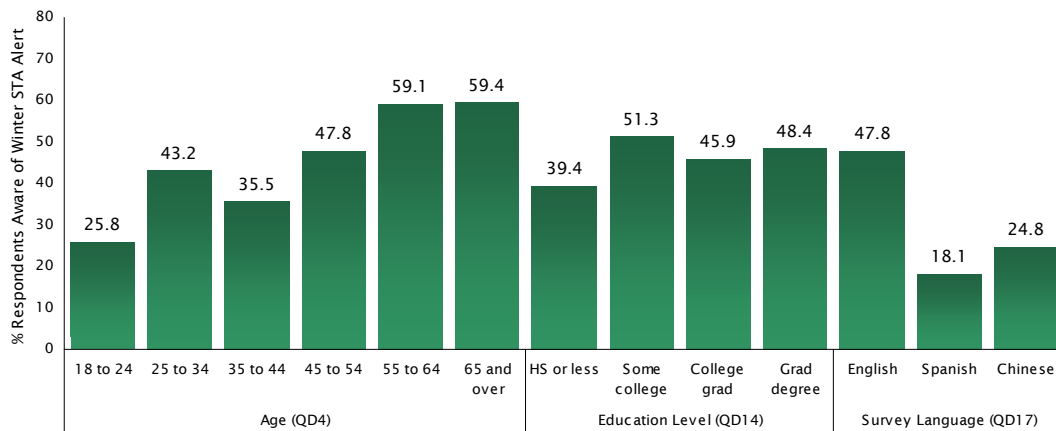




**FIGURE 52 AWARE OF WINTER SPARE THE AIR ALERT BY COUNTY OF RESIDENCE & ENCOUNTERED STA AD ON TELEVISION (N = 931)**



**FIGURE 53 AWARE OF WINTER SPARE THE AIR ALERT BY AGE, EDUCATION LEVEL & SURVEY LANGUAGE (N = 931)**



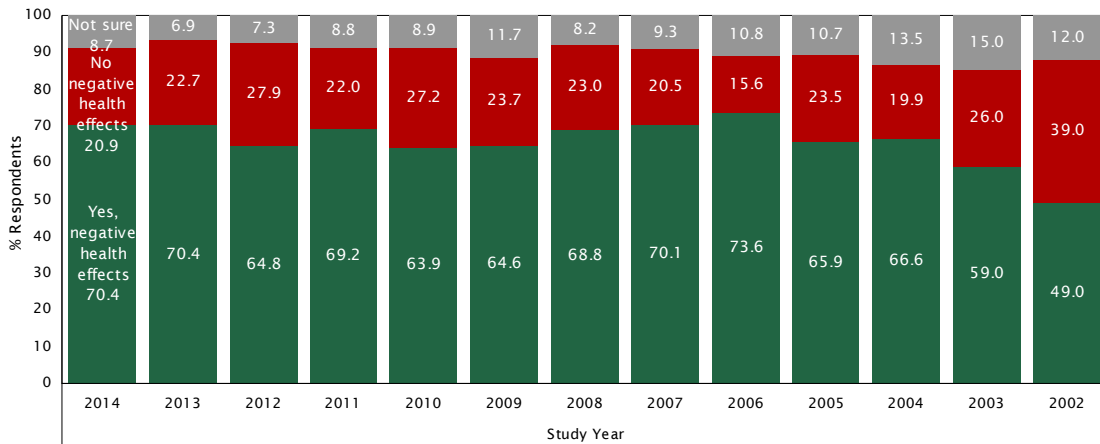
## ATTITUDES ABOUT WOOD SMOKE

In addition to changing wood burning behavior, one of the goals of the Winter Spare the Air Alert Program is to change how residents think about wood smoke and its impact on public health. To track how effective the Program has been in achieving this goal, the survey included several measures of residents' opinions and perceptions about wood smoke.

The first of these questions asked the respondent whether they think there are any negative health effects associated with breathing wood smoke. As shown in Figure 54, approximately 70% of adults in the Bay Area perceive wood smoke to have negative health impacts, which is identical to the findings of the 2013 survey. It is worth noting that public opinion on this matter has changed substantially since 2002—in part likely due to the Winter Spare the Air Alert Program. The proportion of adults that perceive wood smoke to have negative health impacts has increased by 21% since 2002.

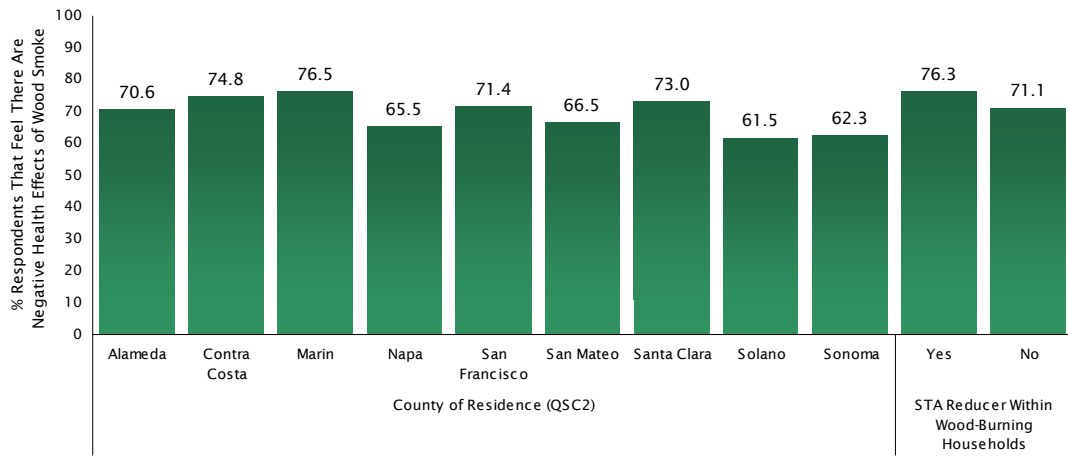
**Question 27** *Do you think there are any negative health effects associated with breathing wood smoke?*

**FIGURE 54 PERCEIVE NEGATIVE HEALTH EFFECTS ASSOCIATED WITH WOOD SMOKE BY STUDY YEAR (N = 2,100)**

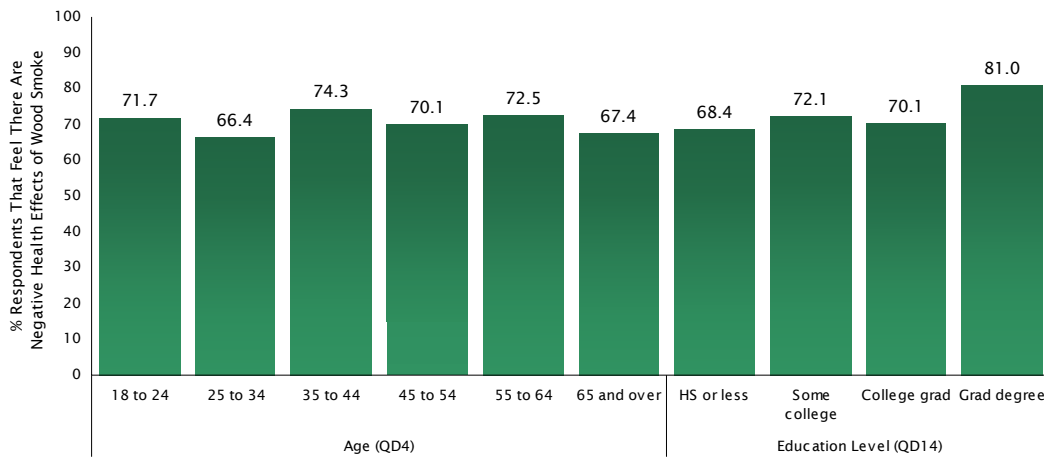


For the interested reader, figures 55 through 57 on the next page display the percentage of respondents that perceive wood smoke to have negative health impacts by a variety of demographics.

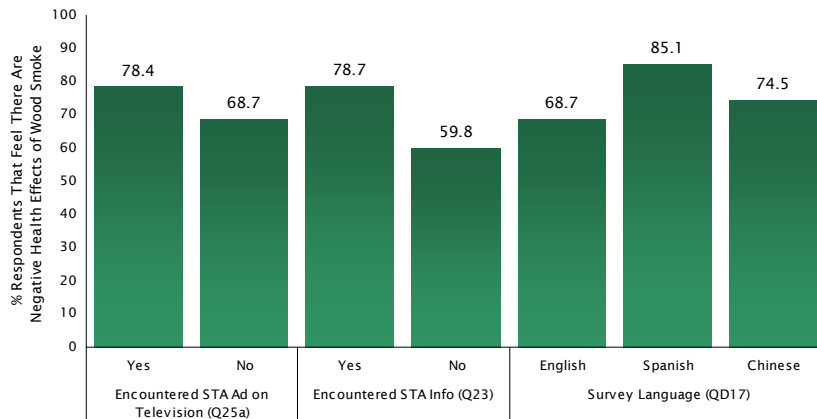
**FIGURE 55 PERCEIVE NEGATIVE HEALTH EFFECTS ASSOCIATED WITH WOOD SMOKE BY COUNTY OF RESIDENCE & STA REDUCER WITHIN WOOD-BURNING HOUSEHOLDS (N = 2,100)**



**FIGURE 56 PERCEIVE NEGATIVE HEALTH EFFECTS ASSOCIATED WITH WOOD SMOKE BY AGE & EDUCATION LEVEL (N = 2,100)**



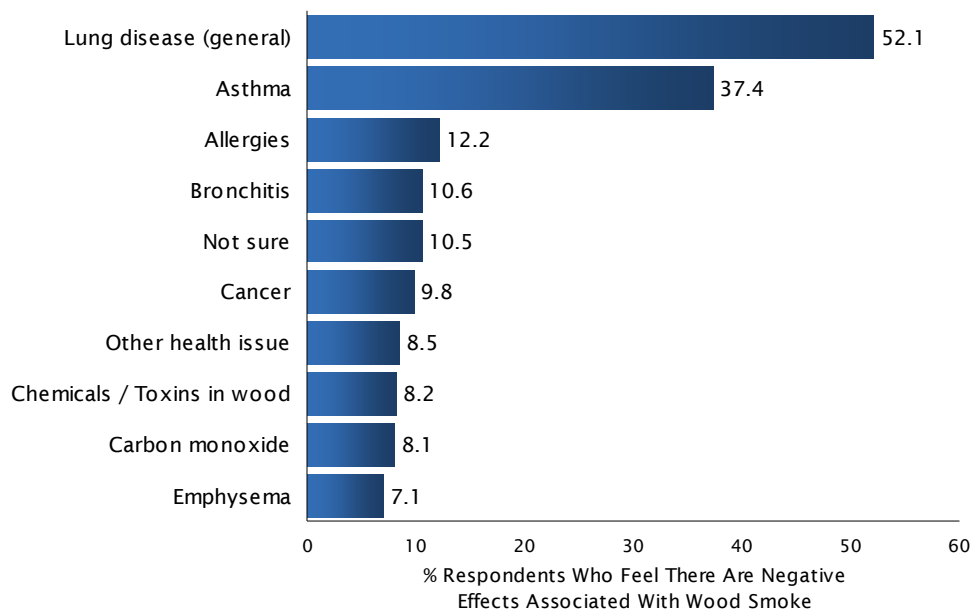
**FIGURE 57 PERCEIVE NEGATIVE HEALTH EFFECTS ASSOCIATED WITH WOOD SMOKE BY ENCOUNTERED STA AD ON TELEVISION, ENCOUNTERED STA INFO & SURVEY LANGUAGE (N = 2,100)**



Respondents who perceived wood smoke to have negative health impacts (Question 27) were asked to identify what the specific health effects are of breathing wood smoke. This question was asked in an open-ended manner, allowing respondents to mention any health impact that came to mind without being prompted by or restricted to a list of options. Multiple responses were allowed for this question, so the percentages shown in Figure 58 represent the percentage of respondents who mentioned a particular health effect. The most common response was a general reference to lung disease (52%), followed by asthma (37%), allergies (12%), and bronchitis (11%).

**Question 28** *What are the negative health effects associated with breathing wood smoke?*

**FIGURE 58 PERCEIVED NEGATIVE HEALTH EFFECTS ASSOCIATED WITH WOOD SMOKE (N = 916)**



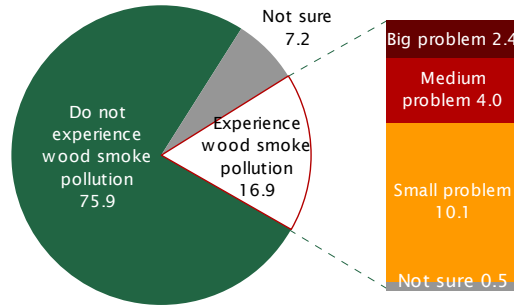
**WOOD SMOKE A NEIGHBORHOOD PROBLEM?** Most adults recognize that there are negative health impacts due to wood smoke, but do they think that *their* neighborhood has a wood smoke problem? To answer this question, the survey first informed respondents that neighborhoods in the Bay Area experience different levels of air pollution from wood smoke. Respondents were then asked to indicate if, in their opinion, their neighborhood periodically experiences air pollution from wood smoke. Those who perceived their neighborhood to have a wood smoke problem were asked in a follow-up question to identify the magnitude of the problem. The answers to both of these questions are combined in Figure 59 on the next page.

Overall, 17% of adults surveyed indicated that their neighborhood periodically experiences air pollution from wood smoke. Eleven percent (10%) said the problem was a small one, 4% indicated it was a moderate or medium problem, and 2% felt that air pollution due to wood smoke was a big problem in their neighborhood. When compared with 2013, there were no statistically significant changes in the perceived magnitude of their neighborhoods' wood smoke problem among those who held an opinion (see Figure 60). Figure 61 presents the results of these questions by county of residence.

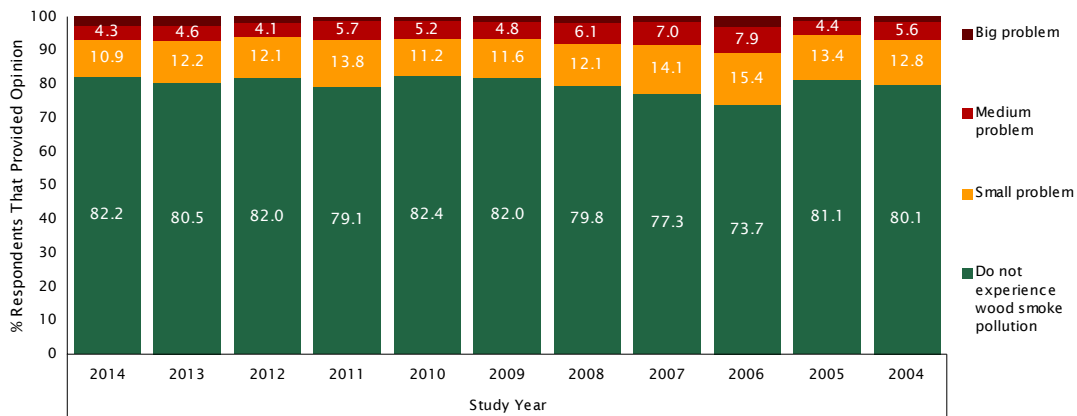
**Question 29** Different neighborhoods in the Bay Area experience different levels of air pollution from wood smoke. In your opinion, does your neighborhood periodically experience air pollution from wood smoke?

**Question 30** Would you say that periodic air pollution from wood smoke in your neighborhood is a big problem, medium problem, or a small problem?

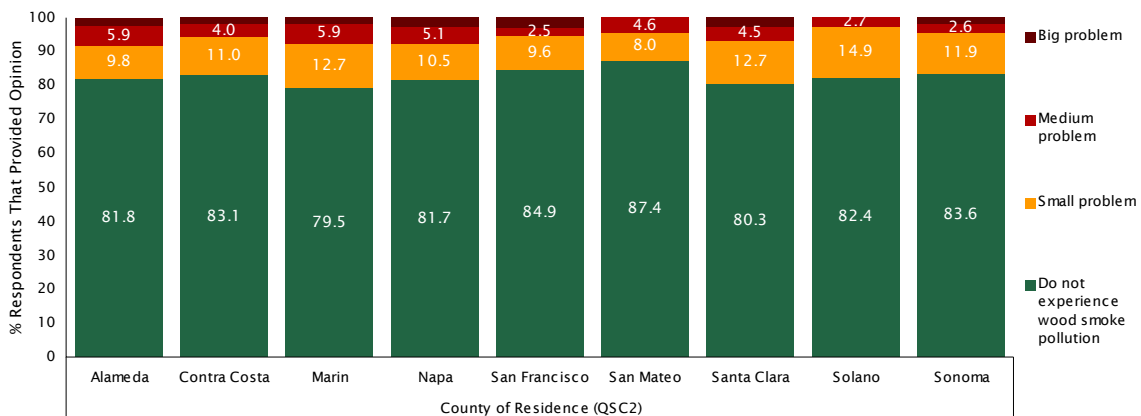
**FIGURE 59 PERCEPTION OF PERIODIC WOOD SMOKE PROBLEM IN NEIGHBORHOOD (N = 2,100)**



**FIGURE 60 PERCEPTION OF PERIODIC WOOD SMOKE PROBLEM IN NEIGHBORHOOD BY STUDY YEAR (N = 2,100)**



**FIGURE 61 PERCEPTION OF PERIODIC WOOD SMOKE PROBLEM IN NEIGHBORHOOD BY COUNTY OF RESIDENCE (N = 2,100)**



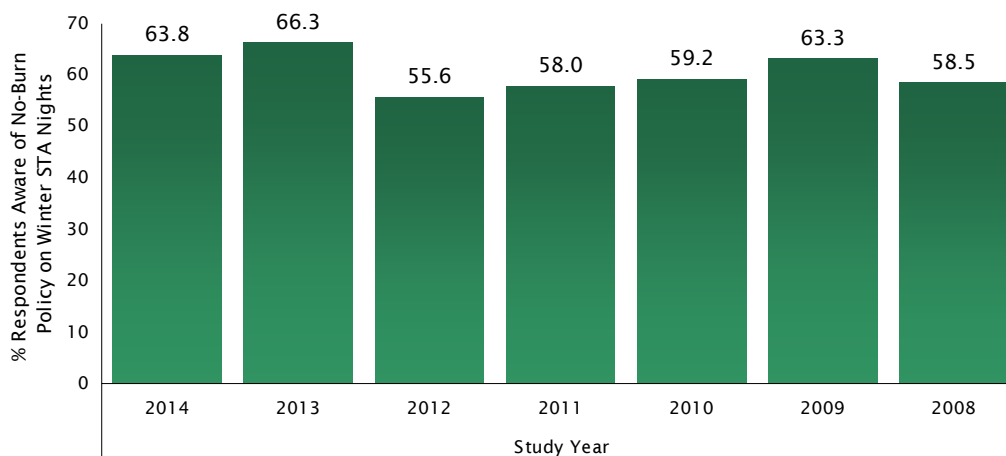
## POLICY ATTITUDES

In 2008, the BAAQMD adopted *Regulation 6, Rule 3: Wood-burning Devices* to reduce the harmful emissions that come from wood smoke. The rule restricts wood burning when air quality reaches unhealthy levels and a Spare the Air advisory is issued, places limits on excessive smoke, requires that only cleaner burning EPA certified stoves and inserts be sold or installed in new construction/remodels, and prohibits the burning of garbage and other harmful materials. This section of the report presents the results of a series of questions designed to measure public awareness, knowledge, and attitudes as they relate to the rule and related policies.

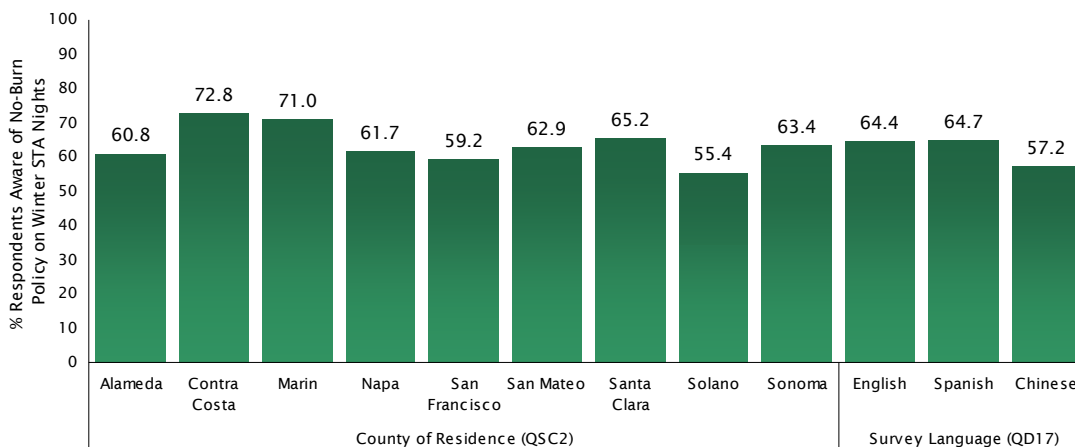
**AWARENESS** The first question in this series asked respondents if they were aware that the BAAQMD had passed a policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels. As shown in Figure 62, approximately two-thirds (64%) of respondents indicated that they were aware of the policy in 2014, statistically similar to the 66% recorded in 2013. Awareness of the rule was highest in Contra Costa and Marin counties. Awareness was also strongly and positively related to respondent age, and 81% of respondents who encountered a Spare the Air advertisement on television were aware of the rule (see figures 63 and 64 on the next page).

**Question 31** *Prior to taking this survey, were you aware that several years ago the Bay Area Air Quality Management District passed a rule that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels?*

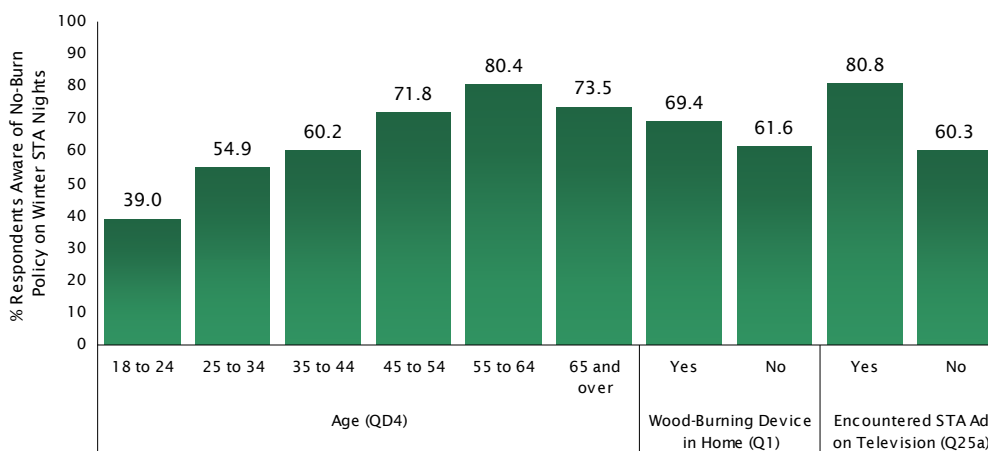
**FIGURE 62 AWARENESS OF NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY STUDY YEAR (N = 2,100)**



**FIGURE 63 AWARENESS OF NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 2,100)**



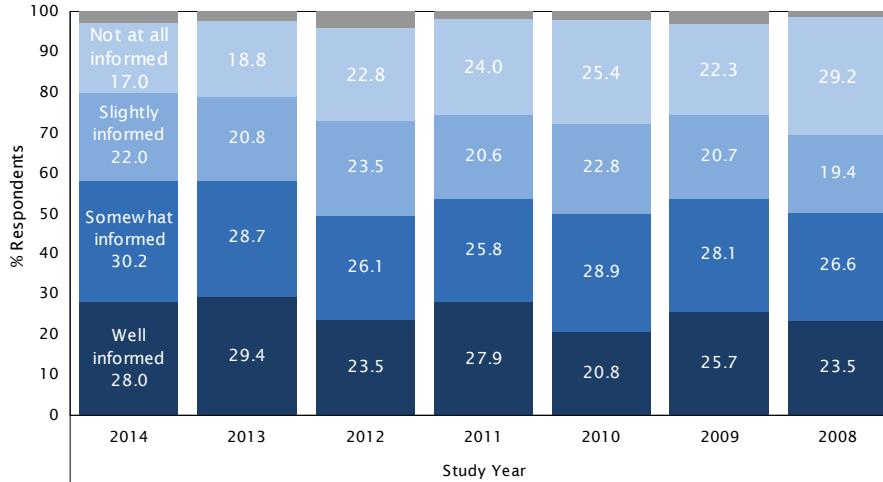
**FIGURE 64 AWARENESS OF NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY AGE, WOOD-BURNING DEVICE IN HOME & ENCOUNTERED STA AD ON TELEVISION (N = 2,100)**



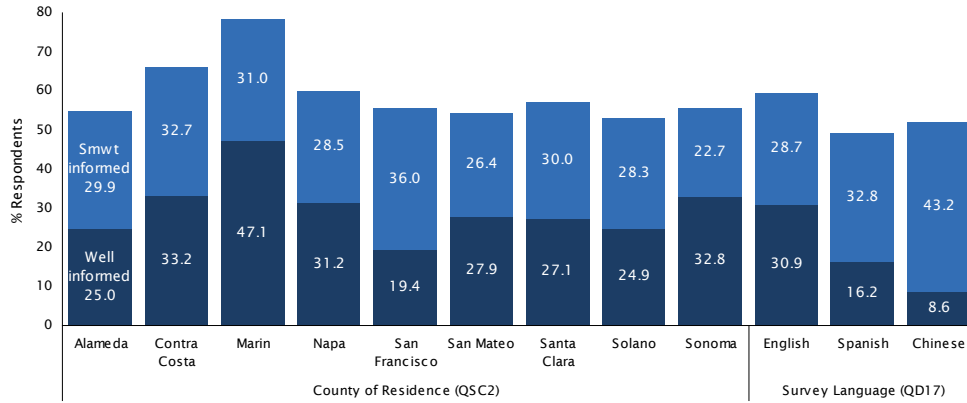
Respondents were next asked how informed they felt about the rules that are part of the wood-burning policy. Residents were mixed in how informed they felt, with 28% feeling well-informed, 30% somewhat informed, 22% slightly informed, and 17% feeling not at all informed about the rules that are part of the policy. These findings are nearly identical to those recorded in 2013. Marin County residents, those who took the survey in English, residents 55 years and older, and respondents who encountered a Spare the Air advertisement on television were the most likely to report feeling at least somewhat informed about the rules that are part of the new policy (see figures 66 and 67 on the next page).

**Question 32** Overall, how informed do you feel about the rules that are part of this new wood-burning policy? Would you say you feel well informed, somewhat informed, slightly informed, or not at all informed?

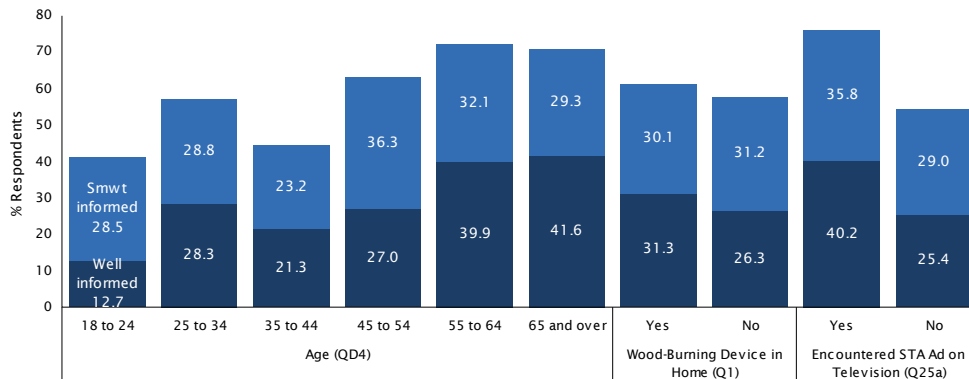
**FIGURE 65 HOW INFORMED ABOUT NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY STUDY YEAR (N = 2,100)**



**FIGURE 66 HOW INFORMED ABOUT NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 2,100)**



**FIGURE 67 HOW INFORMED ABOUT NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY AGE, WOOD-BURNING DEVICE IN HOUSEHOLD & ENCOUNTERED STA AD ON TELEVISION (N = 2,100)**

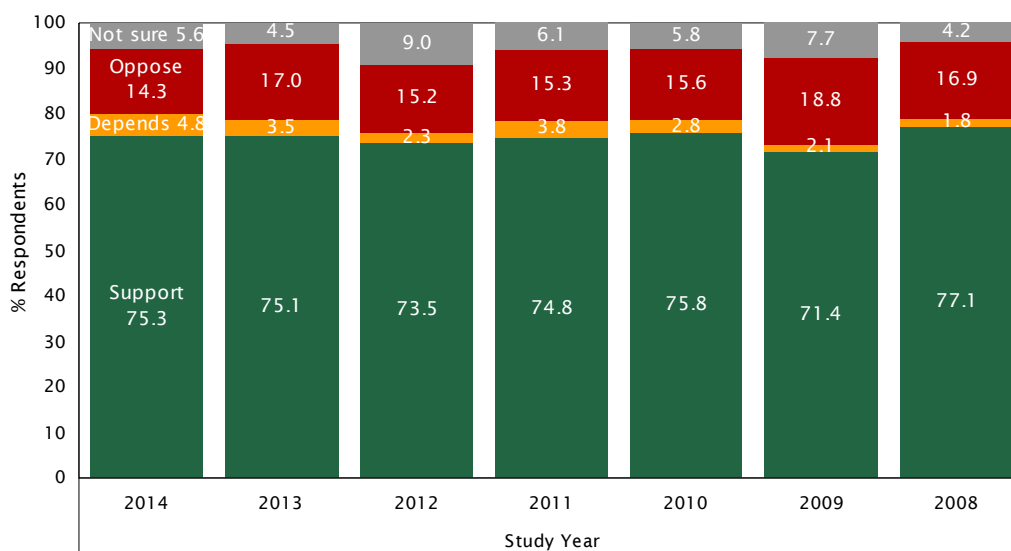




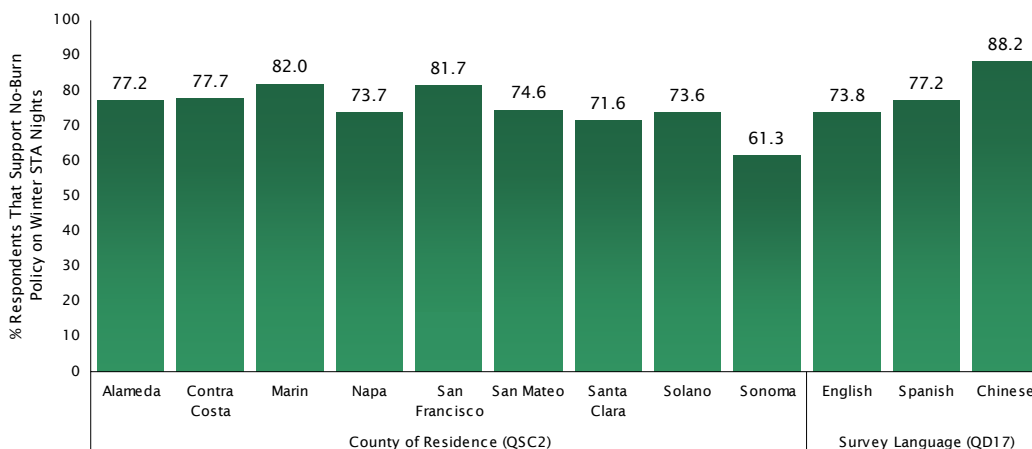
**DO YOU SUPPORT THE POLICY?** Regardless of how informed they felt about the policy, all respondents were asked whether they generally support or oppose a policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels. As shown in Figure 68, three-quarters (75%) of Bay Area residents indicated that they support the no-burn policy on nights when air pollution is expected to reach unhealthy levels. Approximately 14% opposed the policy, 5% said it depends, and 6% were unsure or offered no opinion. These results were nearly identical to those found in 2013. For the interested reader, figures 69 and 70 display how support for the no-burn policy varied across a variety of demographic subgroups.

**Question 33** *In general, do you support or oppose a policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels?*

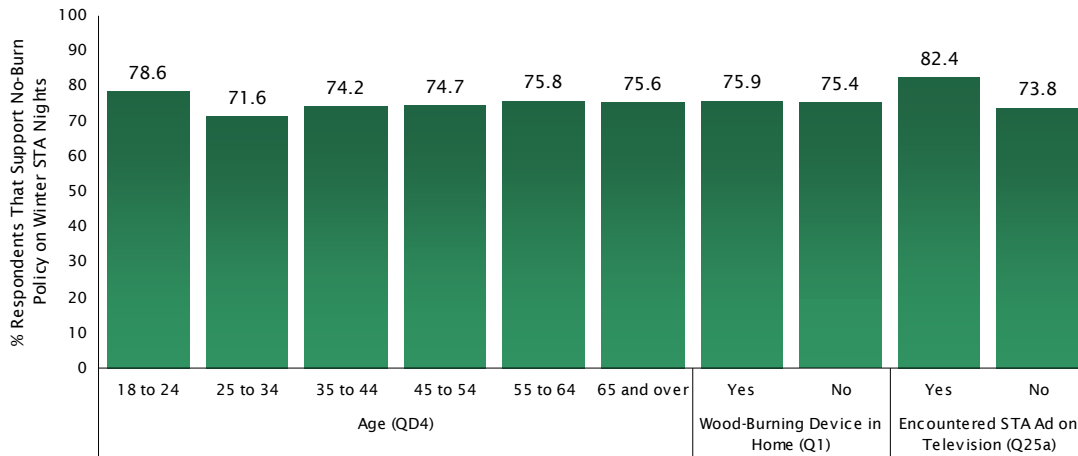
**FIGURE 68 SUPPORT FOR NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY STUDY YEAR (N = 2,100)**



**FIGURE 69 SUPPORT FOR NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 2,100)**

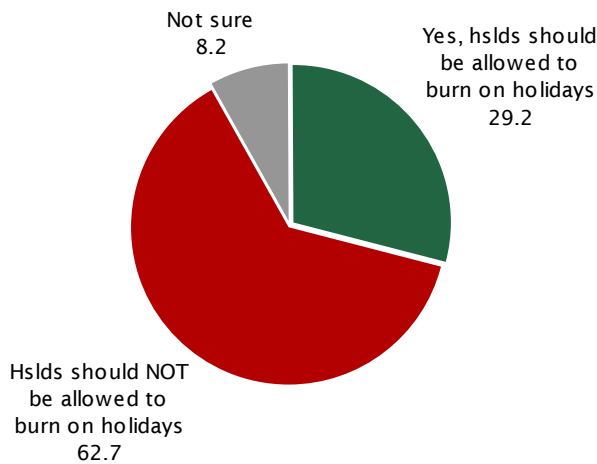


**FIGURE 70 SUPPORT FOR NO-BURN POLICY ON WINTER SPARE THE AIR ALERT NIGHTS BY AGE, WOOD BURNING DEVICE IN HOME & ENCOUNTERED STA AD ON TELEVISION (N = 2,100)**



**WOOD BURNING ON HOLIDAYS** To gather a statistically reliable assessment of District residents’ opinions and behaviors regarding holiday wood burning, the survey included three questions. The first asked all respondents if they felt residents should be allowed to burn wood on holidays like Christmas and New Year’s even if air pollution was expected to reach unhealthy levels.

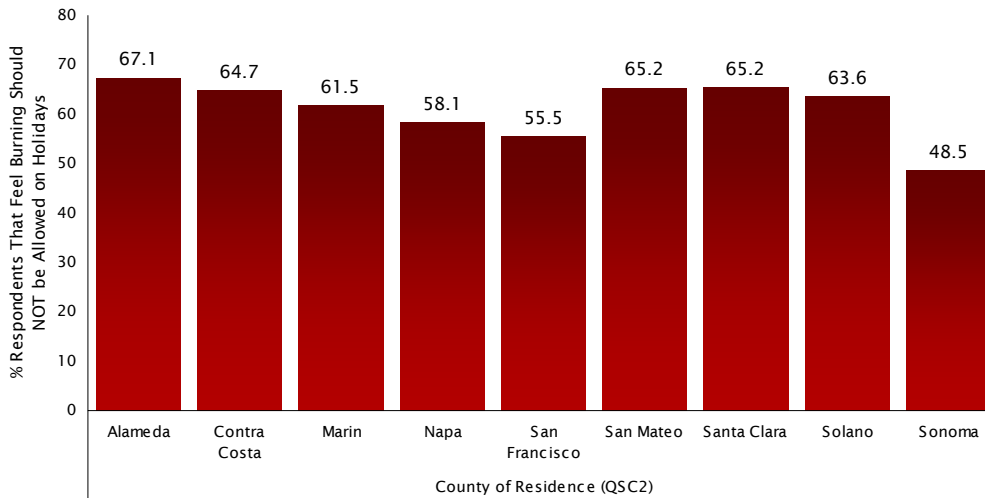
**FIGURE 71 OPINION OF BURNING ON HOLIDAYS (N = 2,100)**



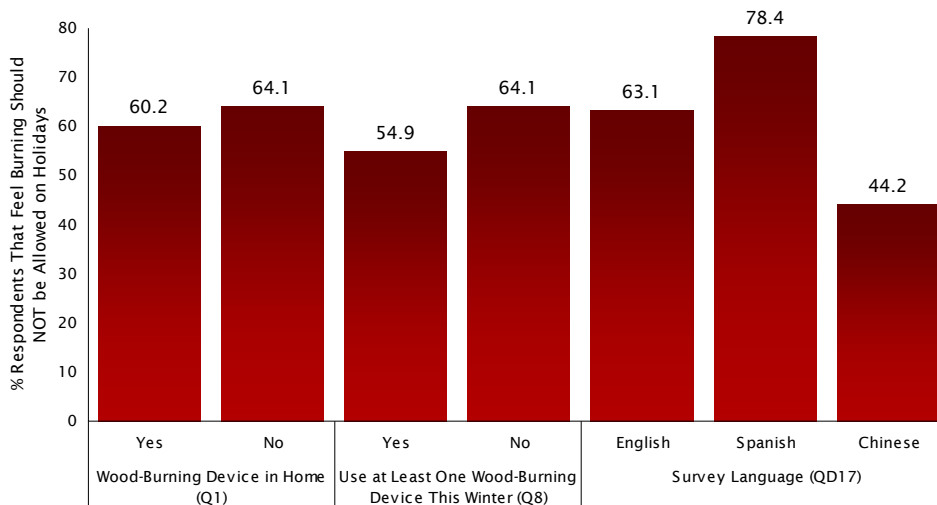
**Question 34** *Should people be allowed to burn wood on holidays like Christmas and New Year’s even if air pollution is expected to reach unhealthy levels that day?*

The majority (63%) of respondents felt that households should *not* be allowed to burn on holidays when pollution levels are high, 29% felt households should be able to burn on holidays regardless of pollution levels, and 8% were unsure. Figures 72 and 73 on the next page display the percentage of respondents who feel burning should *not* be allowed on holidays by a variety of demographics.

**FIGURE 72 OPINION OF BURNING ON HOLIDAYS BY COUNTY OF RESIDENCE (N = 2,100)**



**FIGURE 73 OPINION OF BURNING HOLIDAYS BY WOOD-BURNING DEVICE IN HOME, USE AT LEAST ONE WOOD-BURNING DEVICE THIS WINTER & SURVEY LANGUAGE (N = 2,100)**

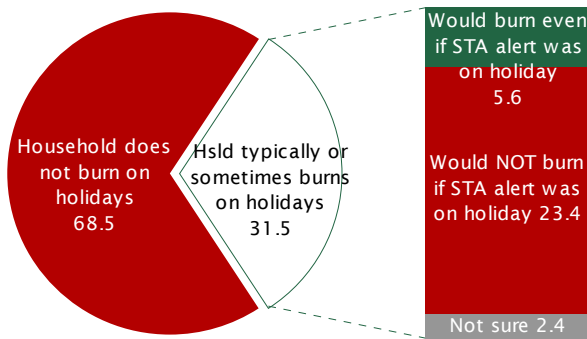


The next two questions addressed holiday wood-burning behavior. The first of these asked respondents if their household normally burns on holidays like Christmas and New Year’s, and those who said *yes* or *depends* were then asked if they would continue to do so if pollution levels were high and a ‘no burn’ day was set. Figure 74 on the next page combines the responses to these questions and presents the results among those in households with a wood-burning device. As shown in the figure, 32% of households with a wood-burning device typically burn wood on holidays, and 6% would continue to burn on a holiday, regardless of a Spare the Air episode. The overwhelming majority (92%) of households with a wood-burning device do not typically burn on holidays or would *not* burn on holidays if a Spare the Air episode were called.

**Question 35** Does your household normally burn wood on holidays like Christmas and New Year's day?

**Question 36** If air pollution levels were high and a 'no burn' day was set on Christmas or New Year's day, would you still burn wood?

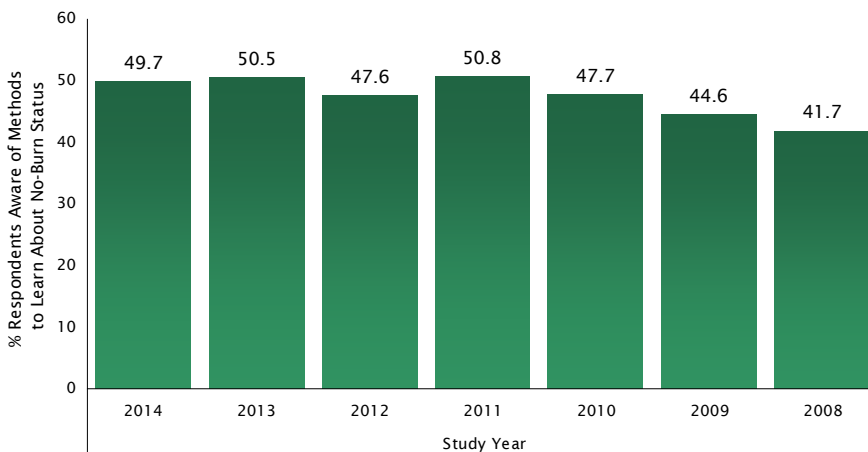
**FIGURE 74 HOUSEHOLD WOOD BURNING ON HOLIDAYS (N = 869)**



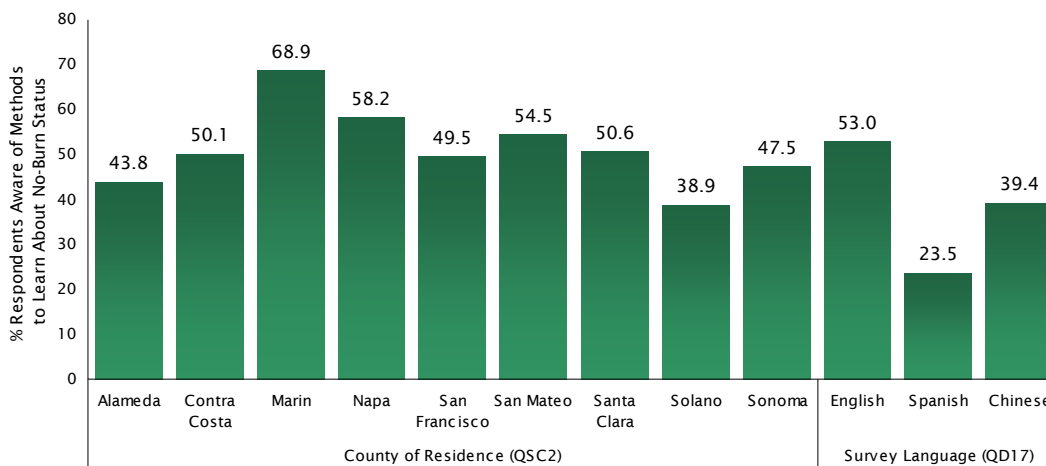
**HOW TO FIND OUT ABOUT 'NO BURN' STATUS** The final questions in this series were designed to measure how informed the public is about how they can find out the day's 'no burn' status. Half (50%) of all respondents indicated that they do know how to find out whether today is a 'no burn' day, which is unchanged from the prior study (Figure 75). Residents in Contra Costa, Marin, Napa, and Sonoma counties, those between the ages of 45 and 54, those with a wood-burning device in the home, and those who encountered a Spare the Air advertisement on television were the most likely subgroups to report awareness (see figures 76 and 77 on the next page).

**Question 37** Do you know how you could find out whether today is a 'no burn' day?

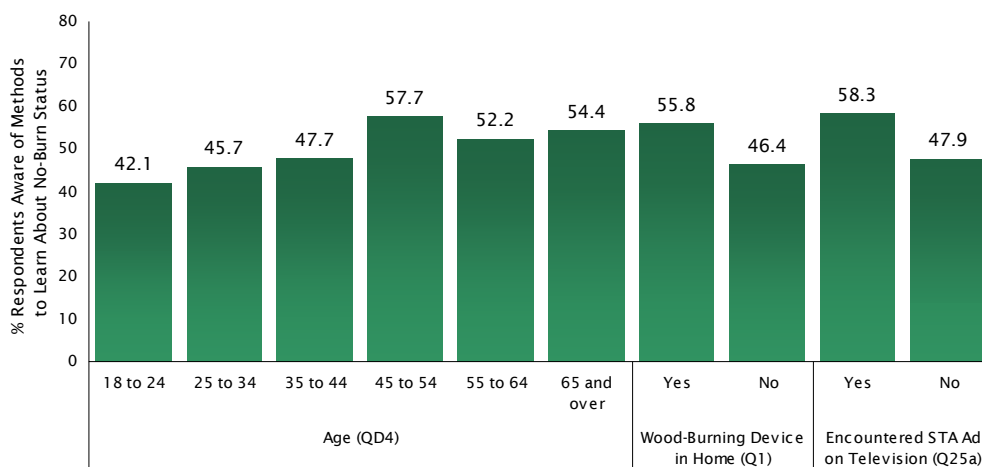
**FIGURE 75 AWARE OF METHODS TO LEARN ABOUT NO-BURN STATUS BY STUDY YEAR (N = 2,100)**



**FIGURE 76 AWARE OF METHODS TO LEARN ABOUT NO-BURN STATUS BY COUNTY OF RESIDENCE & SURVEY LANGUAGE (N = 2,100)**



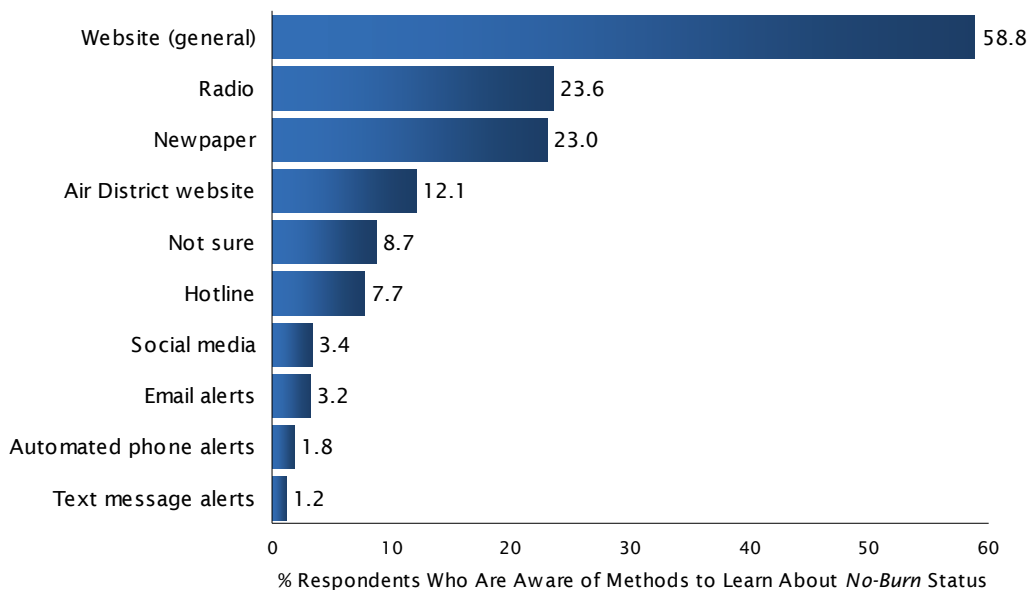
**FIGURE 77 AWARE OF METHODS TO LEARN ABOUT NO-BURN STATUS BY AGE, WOOD-BURNING DEVICE IN HOME & ENCOUNTERED STA AD ON TELEVISION (N = 2,100)**



When asked what sources they would turn to for this information (see Figure 78 on the next page), the most commonly mentioned sources were a website in general (59%), radio (24%), newspaper (23%), and the District’s website (12%). As shown in Table 5, there were no statistically significant changes in sources cited in 2014. For the interested reader, Table 6 provides the responses to this question by interview language.

**Question 38** How can you find out [whether today is a 'no burn' day]?

**FIGURE 78 SOURCES FOR LEARNING ABOUT NO-BURN STATUS (N = 1,043)**



**TABLE 5 SOURCES FOR LEARNING ABOUT NO-BURN STATUS BY STUDY YEAR (N = 1,043)**

	Study Year						
	2014	2013	2012	2011	2010	2009	2008
Website (general)	58.8	61.9	63.2	59.5	62.9	61.8	59.2
Radio	23.6	20.7	17.0	20.3	17.3	16.5	16.2
Newspaper	23.0	22.0	16.5	19.8	24.5	22.6	24.2
Air District website	12.1	11.7	11.8	15.6	16.4	13.6	17.5
Not sure	8.7	6.4	4.5	8.4	5.5	5.7	5.6
Hotline	7.7	12.4	11.7	12.7	14.2	18.2	16.4
Social Media	3.4	0.0	0.0	0.0	0.0	0.0	0.0
Email alerts	3.2	3.7	3.6	2.3	2.6	2.2	4.9
Automated phone alerts	1.8	0.6	2.8	1.6	1.9	1.2	2.1
Text message alerts	1.2	0.9	0.2	0.2	0.9	0.2	0.2

**TABLE 6 SOURCES FOR LEARNING ABOUT NO-BURN STATUS BY SURVEY LANGUAGE (N = 1,043)**

	Survey Language (QD17)		
	English	Spanish	Chinese
Website (general)	62.1	31.1	27.3
Radio	19.7	23.1	78.8
Newspaper	20.4	13.7	65.0
Air District website	8.6	23.0	55.4
Not sure	9.2	9.3	1.3
Hotline	4.5	12.0	50.8
Social Media	3.3	4.3	5.0
Email alerts	2.8	6.1	7.6
Automated phone alerts	1.7	1.4	4.8
Text message alerts	0.9	3.9	4.3

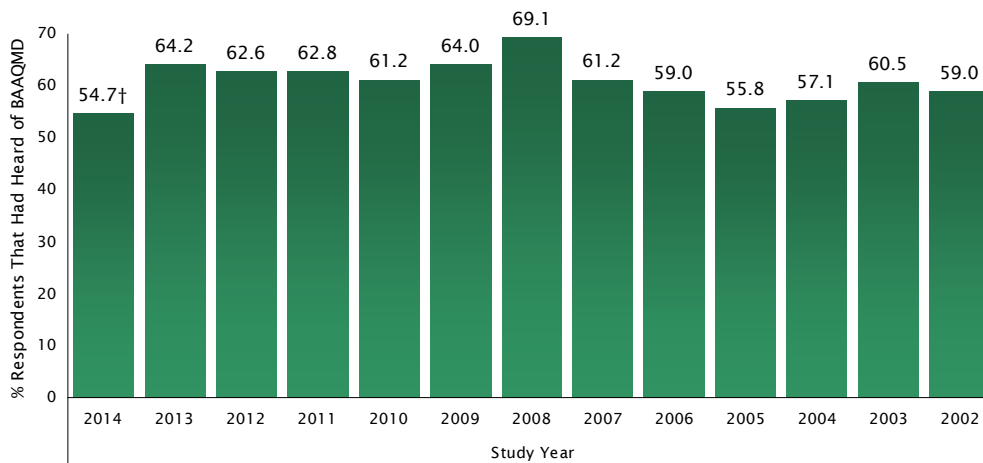
## PERCEPTIONS OF ENTITIES

To identify and track perceptions of the District and the Winter Spare the Air Alert Program, a series of three questions was presented to respondents to measure their awareness and opinions of the agency and the Program, as well their recent exposure to information about each. Because these questions were asked in an identical manner in past winter surveys dating back to 2002, the results from these studies are also shown for comparison.

**AWARENESS** Figure 79 shows that 55% of all respondents surveyed in the 2014 study had heard of the BAAQMD, which is significantly lower than the figure found in the 2013 study (-10%). Overall awareness of the Winter Spare the Air Alert Program (56%) was also significantly lower in the present study than in 2013 (-6%).

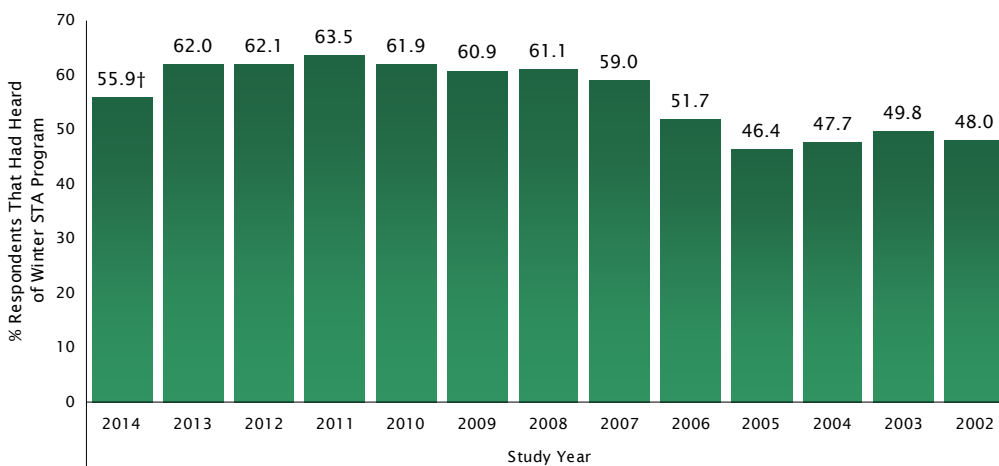
**Question 39** *Let's change gears a bit. Have you ever heard of the \_\_\_\_\_?*

**FIGURE 79 AWARENESS OF BAAQMD BY STUDY YEAR (N = 2,100)**



† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

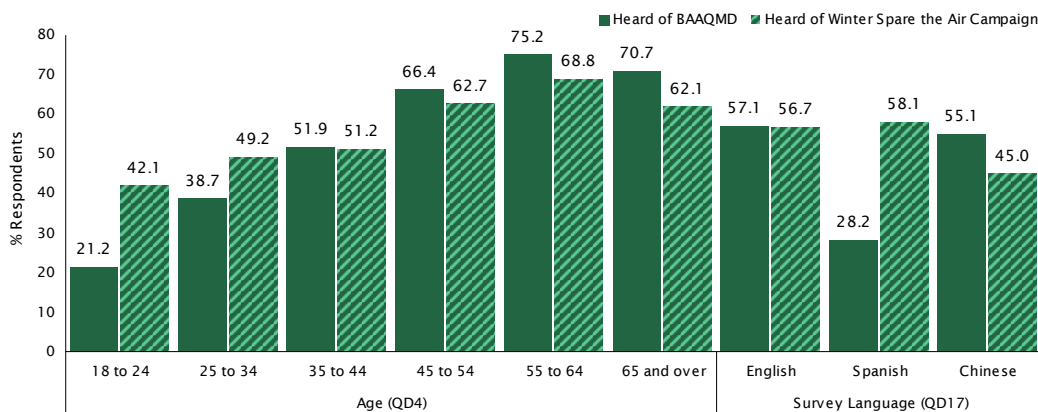
**FIGURE 80 AWARENESS OF WINTER SPARE THE AIR ALERT PROGRAM BY STUDY YEAR (N = 2,100)**



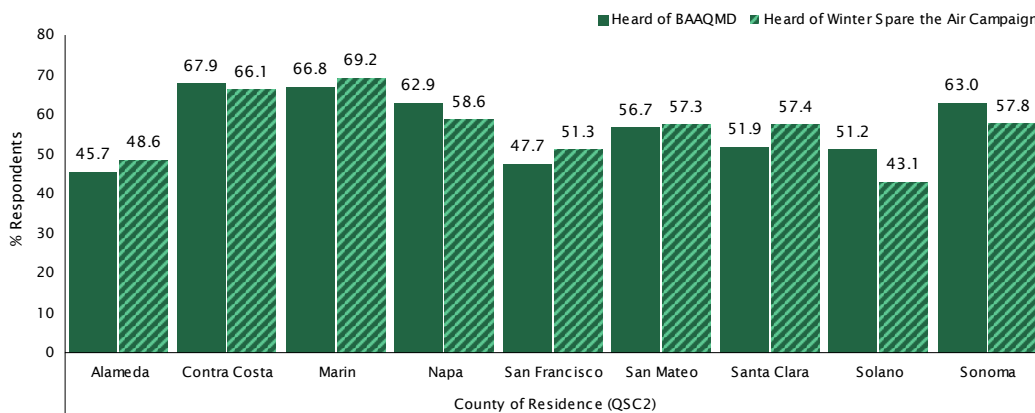
† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

Figures 81 and 82 present awareness levels by age, survey language, and county of residence. As in prior studies, awareness of the District and Program were generally lowest among younger residents. With regards to survey language, Spanish speakers were the least likely to have heard of the BAAQMD, and Mandarin Chinese speakers were the least likely to have heard of the Program. Turning to county of residence, as one might expect, counties with higher concentrations of younger individuals and/or Spanish- and Mandarin-Chinese speakers (e.g., Alameda and San Francisco) generally reported lower levels of awareness of the District and Program.

**FIGURE 81 AWARENESS OF BAAQMD & WINTER SPARE THE AIR ALERT PROGRAM BY COUNTY OF RESIDENCE (N = 2,100)**



**FIGURE 82 AWARENESS OF BAAQMD & WINTER SPARE THE AIR ALERT PROGRAM BY COUNTY OF RESIDENCE (N = 2,100)**

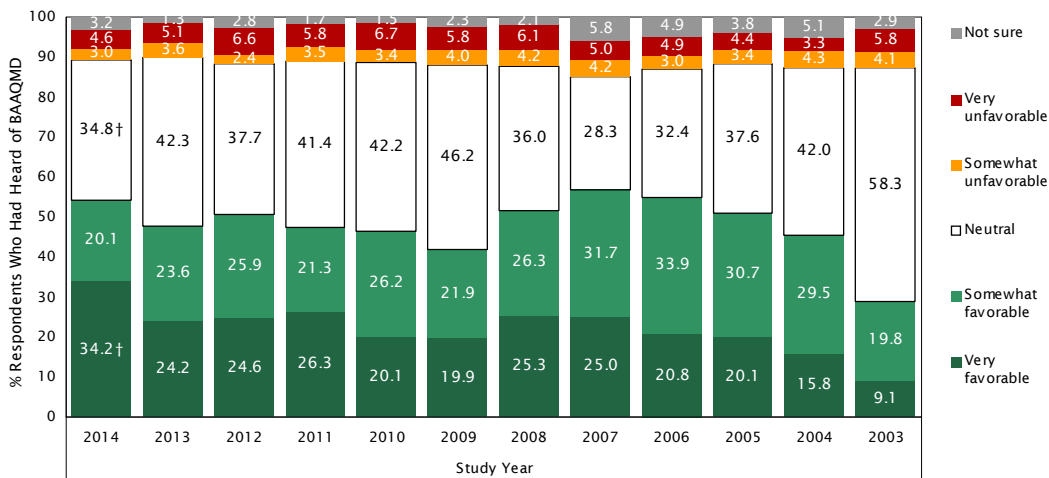




**OPINIONS** Respondents who had heard of an entity were next asked whether their opinion of the entity was favorable, unfavorable, or neutral. Figures 83 and 84 display the findings of these questions in 2014, as well as the findings from the prior studies. Of those who received the question, 54% held a favorable opinion of the District, whereas 35% held a neutral opinion and just 8% held an unfavorable opinion. Perceptions of the Program were more positive, with 65% holding a favorable opinion. Compared with 2013, there were statistically significant *increases* in the percentage who held a *very favorable* opinion of the District and the Program.

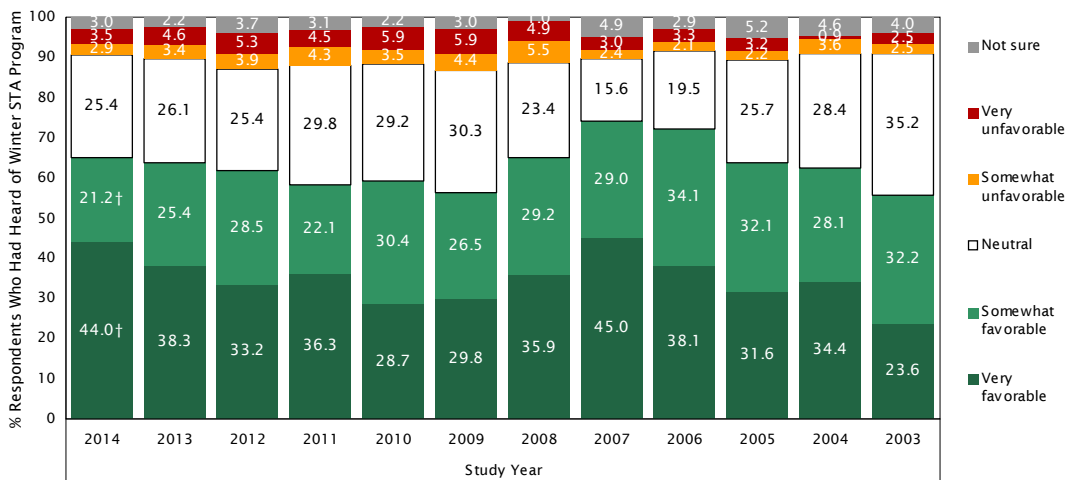
**Question 40** *Generally speaking, would you say you have a favorable or unfavorable opinion of the \_\_\_\_\_, or do you have no opinion either way?*

**FIGURE 83 OPINIONS OF BAAQMD BY STUDY YEAR (N = 1,150)**



† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

**FIGURE 84 OPINIONS OF WINTER SPARE THE AIR ALERT PROGRAM BY STUDY YEAR (N = 1,173)**

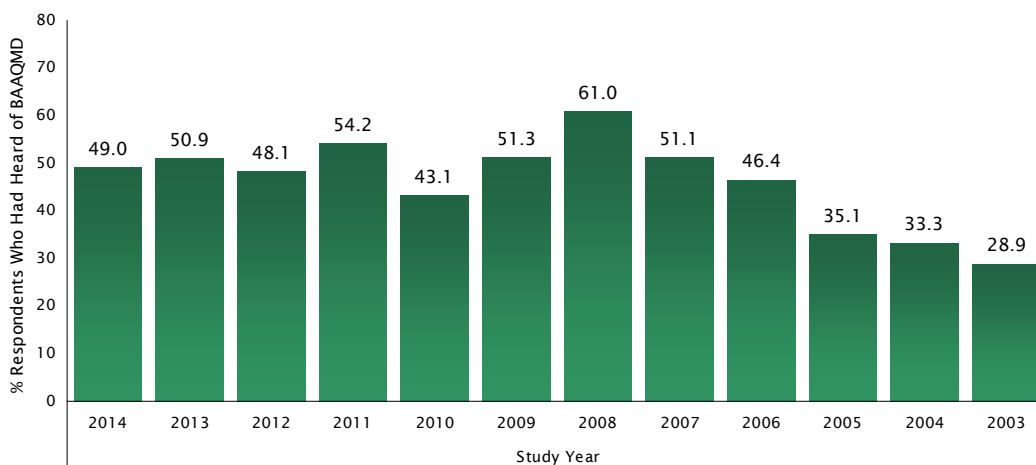


† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

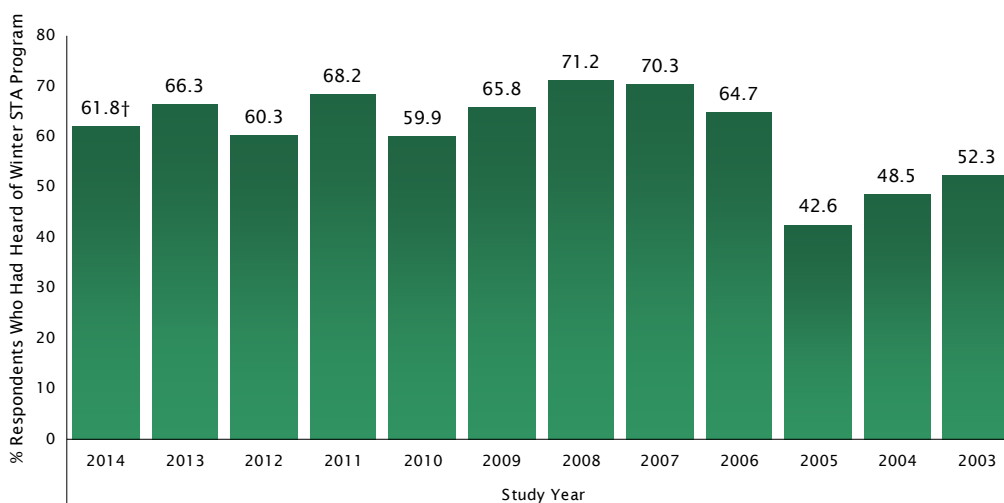
**EXPOSURE TO INFORMATION** The last question in this series asked respondents whether they recalled hearing, reading, or seeing any news stories, advertisements or public service announcements about the BAAQMD and/or the Winter Spare the Air Alert Program in the six months prior to the interview. As shown in Figure 85, the proportion of respondents who recalled being exposed to information about the BAAQMD during this period was 49%, statistically similar to the 51% found in the prior study. Just under two-thirds (62%) of respondents recalled exposure to the Winter Spare the Air Alert Program in 2014, which represents a small but statistically significant drop from the 66% reported in 2013.

**Question 41** *In the past six months, have you heard, read, or seen any news stories, advertisements, or public service announcements about the \_\_\_\_\_?*

**FIGURE 85 ENCOUNTERED INFORMATION ABOUT BAAQMD IN PAST SIX MONTHS BY STUDY YEAR (N = 1,150)**



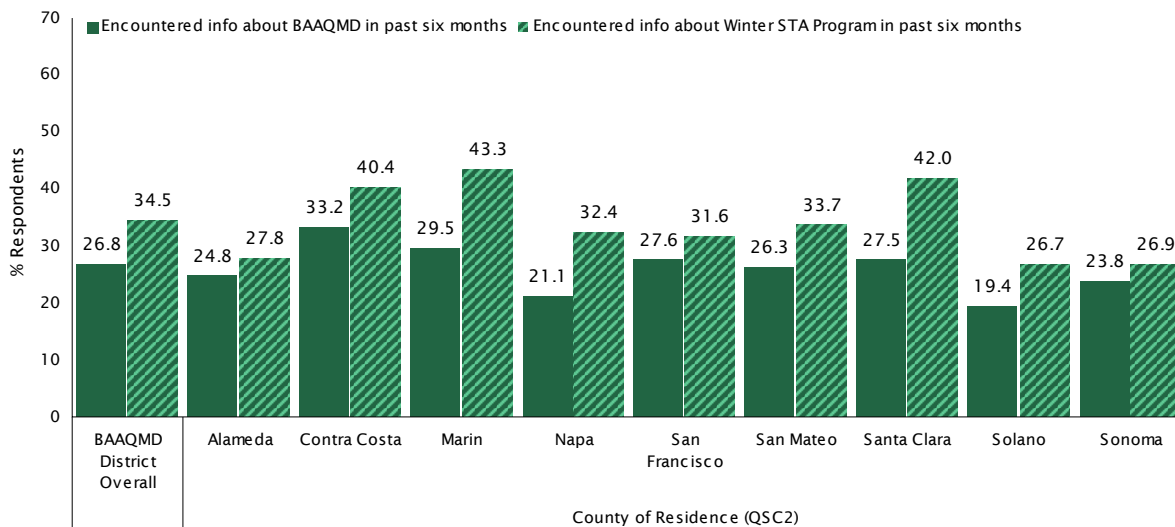
**FIGURE 86 ENCOUNTERED INFORMATION ABOUT WINTER SPARE THE AIR ALERT PROGRAM IN PAST SIX MONTHS BY STUDY YEAR (N = 1,173)**



† Statistically significant change ( $p < 0.05$ ) between the 2013 and 2014 studies.

For the interested reader, Figure 87 displays the percentage of all respondents who recalled hearing, reading, or seeing information about the BAAQMD and the Winter Spare the Air Alert Program—not just among those who had heard of the agency or program as shown in figures 85 and 86. Among all respondents, recalled exposure was greatest for the District among Contra Costa County residents. Exposure to the Program was greatest among Marin and Santa Clara County residents.

**FIGURE 87 ENCOUNTERED INFORMATION ABOUT BAAQMD & WINTER SPARE THE AIR ALERT PROGRAM IN PAST SIX MONTHS BY COUNTY OF RESIDENCE (N = 2,100)**



## BACKGROUND & DEMOGRAPHICS

Table 7 displays the primary demographic and background information collected during the survey. The demographic and background information was used to monitor the sample during data collection, as well as provide insight into how the results of the substantive questions of the survey vary across important subgroups of adults. For the interested reader, additional background and household level information is available for 2014 at the back of the topline provided in *Questionnaire & Toplines* on page 65.

**TABLE 7 DEMOGRAPHICS OF SAMPLE BY STUDY YEAR**

	Study Year												
	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
<b>Total Respondents</b>	<b>2,100</b>	<b>1,300</b>	<b>1,300</b>	<b>1,305</b>	<b>1,300</b>	<b>3,000</b>	<b>1,200</b>	<b>1,200</b>	<b>988</b>	<b>2,625</b>	<b>700</b>	<b>400</b>	<b>400</b>
<b>Age</b>													
18 to 29	20	19	18	18	19	18	15	19	19	20	11	16	15
30 to 39	17	20	20	19	21	21	23	21	25	22	19	19	18
40 to 49	18	20	18	17	21	18	19	20	18	20	23	21	18
50 to 64	26	25	27	26	23	19	22	19	21	19	18	25	27
65 and over	16	16	16	15	15	13	14	15	14	14	21	13	18
Refused	3	0	0	6	0	10	7	6	3	5	8	7	5
<b>Home Type</b>													
Apartment	16	18	17	16	19	19	16	20	20	21	20	21	16
Condo	6	5	7	5	7	7	4	6	5	6	4	5	2
Town home	5	7	5	8	6	6	4	6	7	8	8	5	4
Single-family detached	63	63	61	62	60	61	68	63	63	60	63	66	73
Mobile home	3	2	2	3	2	2	3	2	3	2	2	2	4
Refused	7	5	8	6	6	5	4	3	2	4	3	3	1
<b>Age of Home</b>													
0 to 10 years	9	10	9	8	13	12	15	13	12	11	10	14	20
11 to 20 years	10	12	12	13	11	12	12	12	10	14	10	9	18
21 to 30 years	12	12	13	12	13	13	16	14	12	13	12	14	20
31 to 40 years	11	14	14	15	14	14	12	16	15	13	13	15	10
41 to 50 years	9	10	12	9	10	11	13	10	13	10	11	14	8
Over 50 years	28	30	27	27	24	23	23	26	28	27	30	18	10
Not sure / Refused	20	12	14	17	15	16	9	11	11	13	14	16	15
<b>Gender</b>													
Male	50	52	52	50	51	50	44	50	52	48	43	45	44
Female	50	48	48	50	49	50	56	50	48	52	57	55	56
<b>County</b>													
Alameda	19	21	21	20	21	20	21	21	21	21	23	22	-
Contra Costa	15	14	14	14	14	14	14	14	13	14	15	14	-
Marin	5	4	4	4	4	5	4	4	4	4	4	4	-
Napa	3	2	2	2	2	3	2	3	2	2	2	2	-
San Francisco	13	13	12	12	13	13	12	12	13	13	14	14	-
San Mateo	12	10	10	10	10	11	10	10	11	11	10	11	-
Santa Clara	21	25	24	24	25	24	25	24	24	24	23	23	-
Solano	6	5	5	6	5	6	6	5	6	6	3	5	-
Sonoma	6	5	7	7	5	5	5	5	6	5	5	6	-



## M E T H O D O L O G Y

This section of the report outlines the methodology and protocols used when conducting this study, as well as the motivation for employing certain techniques.

**QUESTIONNAIRE** Dr. McLarney of True North Research worked with the BAAQMD and O’Rorke to develop and refine the survey instrument for the 2014 study. In the interest of improving the *validity* and *reliability* of select opinion and behavior measures, the 2014 study continued several questionnaire changes that were first implemented in the 2004 season. The most notable of these early changes addressed how the questionnaire measured the impacts of the Winter Spare the Air Alert Program. The changes were made so that impacts of the winter program on wood burning behavior would be measured using the same methodology employed by the BAAQMD—and recommended by CARB and EPA<sup>12</sup>—to measure the impacts of the summer Spare the Air Program on driving behavior. The final questionnaire used in this study can be found at the back of this report (see *Questionnaire & Toplines* on page 65).

**PROGRAMMING, PRE-TEST & TRANSLATION** Before fielding the survey, the questionnaire was CATI (Computer Assisted Telephone Interviewing) programmed to assist interviewers when conducting the interviews. The CATI program automatically navigates the skip patterns, randomizes the appropriate question items, and alerts the interviewer to certain types of keypunching mistakes should they occur during the interview. The integrity of the questionnaire was pre-tested internally by True North and by dialing into random homes within the District prior to formally beginning the survey. Once finalized, the survey was professionally translated into Spanish and Mandarin Chinese. Training sessions were conducted to familiarize the interviewing teams with the study and to answer questions and clarify details of the study.

**SAMPLE & WEIGHTING** Because the focus of the study was to gather information from adults who reside within the District, households were primarily chosen for this study using a random digit dial (RDD) sampling method. An RDD sample is drawn by first selecting all of the active phone exchanges (first three digits in a seven-digit phone number) and working blocks that service the area. After estimating the number of listed households within each phone exchange that are located within the area, a sample of randomly selected phone numbers is generated with the number of phone numbers per exchange being proportional to the estimated number of households within each exchange in the area. This method ensures that both listed and unlisted households are included in the sample. It also ensures that new residents and new developments have an opportunity to participate in the study, which is not true if the sample were based on a telephone directory. In addition, 15% of the sample was dedicated to cell phone numbers so that those who rely on cell phones were represented in the study.

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12. The CARB/EPA Method is summarized in the Transportation Research Board’s (TRB) journal—*Transportation Research Record*—for 2004 in an article entitled *Development of a Quantification Method for Measuring the Travel and Emissions Impacts of Episodic Ozone Alert Programs* (pages 153-159). It is described in detail in the following air resources guidance report: CARB, “Quantification Method Reference Manual: A Method to Measure Travel and Emissions Impacts of Ozone Action Public Education Programs,” April 2003. In addition to Eric Schreffler, Dr. Timothy McLarney and Richard Sarles, the TRB paper and guidance report were co-authored by Joann Lu and Jeff Weir of CARB, and Thomas Higgins and Dr. Will Johnson of K.T. Analytics.

Although the RDD method is widely used for local and regional surveys, the method also has several known limitations that must be adjusted for to ensure representative data. Research has shown, for example, that individuals with certain demographic profiles (e.g., older women) are more likely to be at home and are more likely to answer the phone even when other members of the household are available. If this tendency is not adjusted for, the RDD sampling method will produce a survey that is biased in favor of women—particularly older women. To adjust for this behavioral tendency, the survey included a screening question which initially asked to speak to the youngest male adult available in the home. If a male adult was not available, then the interviewer was instructed to speak to the youngest female adult currently available. This protocol was followed to the extent needed to ensure a representative sample of adults. In addition to following this protocol, the sample demographics were monitored as the interviewing proceeded to make sure they were within certain tolerances. Because the District is composed of seven complete counties and two partial counties, respondents were initially asked the ZIP code of their residence so that only those within the District’s boundaries were included in the study.

To accommodate the District’s interest in evaluating the opinions and wood-burning behaviors of non-English speaking residents, the 2014 study included a strategic oversample of Spanish- and Mandarin-Chinese-speaking adults. In addition to 1,300 English language interviews, 400 interviews were completed in Spanish and 400 in Mandarin Chinese. The Spanish and Mandarin interviews were gathered on the natural through the RDD method described above, and also using targeted phone databases. The final raw data were weighted by age groups within each county, and balanced to adjust for the strategic oversample of Spanish- and Mandarin-speakers to match Census 2010 and 2013 American Community Survey estimates. The results presented in this report are the weighted results, which are representative at the District-wide level, as well as within the nine member counties.

**MARGIN OF ERROR** By using a probability-based sample and monitoring the sample characteristics as data collection proceeded, True North ensured that the final sample was representative of adults and households in the District. The results of the sample can thus be used to estimate the opinions of *all* adults—and characteristics of *all* households—in the District. But because not every adult or household in the District participated, the results have what is known as a statistical margin of error due to sampling. For household characteristics, the margin of error refers to the difference between what was found in the survey of 2,100 households for a particular question and what would have been found if all of the estimated 2,608,023 households in the District had been interviewed.

For example, in estimating the percentage of District households that have a wood stove (Question 1), the margin of error can be calculated if one knows the number of households, the size of the sample, a chosen confidence level, and the distribution of responses to the question. The appropriate equation for estimating the margin of error, in this case, is shown below.

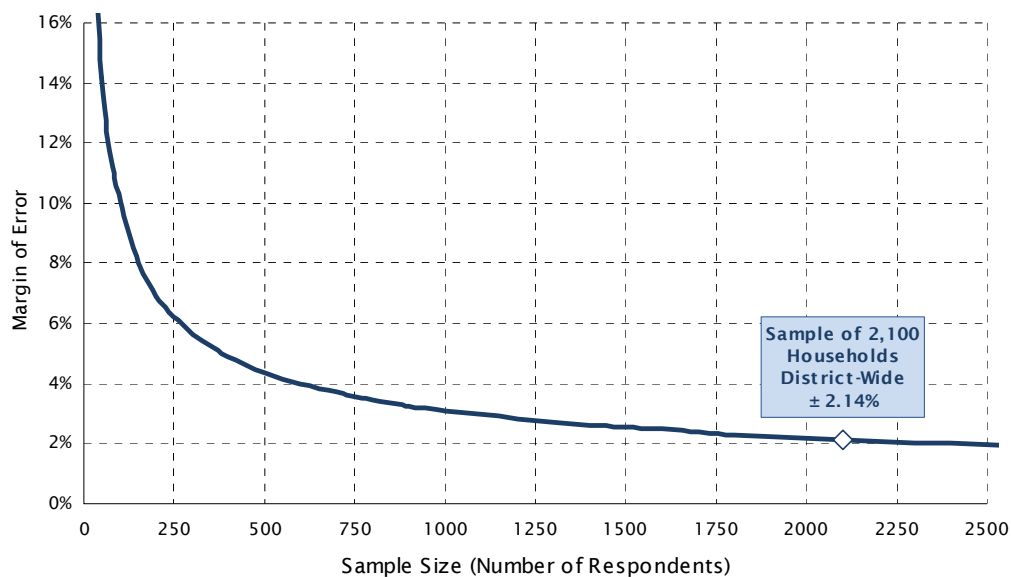
$$\hat{p} \pm t \sqrt{\left(\frac{N-n}{N}\right) \frac{\hat{p}(1-\hat{p})}{n-1}}$$

where  $\hat{p}$  is the proportion of households that indicated they possess a wood stove (0.074 for 7.4% in this example),  $N$  is the total number of households in the District (2,608,023),  $n$  is the sample size that received the question (2,100), and  $t$  is the upper  $\alpha/2$  point for the t-distribu-

tion with  $n - 1$  degrees of freedom (1.96 for a 95% confidence interval). Solving the equation using these values reveals a margin of error of  $\pm 1.1\%$ . This means that with 7.4% of sampled households surveyed indicating they own a wood stove, one can be 95 percent confident that the actual percentage of all households in the District with a wood stove is between 6.3% and 8.5%.

Figure 88 provides a graphic plot of the *maximum* margin of error in this study. The maximum margin of error for a dichotomous percentage result occurs when the answers are evenly split such that 50% provide one response and 50% provide the alternative response (i.e.,  $\hat{p} = 0.5$ ). For this survey, the maximum margin of error is 2.14% for District-wide estimates. Although not shown in the figure, the maximum margin of error within the Spanish and Mandarin Chinese versions of the survey is approximately 4.90%.

**FIGURE 88 MAXIMUM MARGIN OF ERROR**



Within this report, figures and tables show how responses to certain questions varied by interview language, county, and other demographic characteristics such as presence of a heating device in the home, respondent age, and education level. Because the margin of error grows exponentially as the sample size decreases (see the left side of Figure 88), the reader should use caution when generalizing and interpreting the results of questions received by only a small percentage of the sample or when comparing results within subgroups of respondents.

**DATA COLLECTION** A total of 2,100 randomly selected residents within the District’s boundaries participated in the survey on weekday evenings (5:30PM to 9PM) and on weekends (10AM to 5PM) between November 17, 2014 and February 8, 2015. It is standard practice not to call during the day on weekdays because most working adults are unavailable and thus calling during those hours would bias the sample. Interviewing was also suspended for the Thanksgiving, Christmas, and New Year’s holidays.

Interviews were conducted in English, Spanish, and Mandarin Chinese on randomly selected dates throughout the season (subsample = 1,200), as well as 20 targeted for evenings following Winter Spare the Air Alert episodes (subsample = 900). The average interview was 14 minutes.

**DATA PROCESSING** Data processing consisted of checking the data for errors or inconsistencies, coding and recoding responses, categorizing open-end responses, and preparing frequency analyses and crosstabulations. Because the research objectives involved comparing the 2014 results with those of prior studies, where appropriate, True North also accessed and processed data from the 2013 through 2002 winter seasons surveys to allow for comparisons.

**STATISTICAL SIGNIFICANCE** Many of the figures and tables in this report present the results of questions asked in 2013 alongside the results found in prior years for identical questions. In such cases, True North conducted the appropriate tests of statistical significance to identify changes that likely reflect actual changes in public opinion or behavior over time—as opposed to being due to chance associated with selecting two cross-sectional samples independently and at random. Differences between studies are identified as *statistically significant* if we can be 95% confident that the differences reflect an actual change in public opinion or behavior between the two studies. Statistically significant differences within response categories over time are denoted by the † symbol which appears in the figure next to the appropriate response value for 2014.

**ROUNDING** Numbers that end in 0.5 or higher are rounded up to the nearest whole number, whereas numbers that end in 0.4 or lower are rounded down to the nearest whole number. These same rounding rules are also applied, when needed, to arrive at numbers that include a decimal place in constructing figures and charts. Occasionally, these rounding rules lead to small discrepancies in the first decimal place when comparing tables and pie charts for a given question.



## QUESTIONNAIRE &amp; TOPLINES



Winter 14-15 Spare the Air Survey  
Designed by True North Research  
Final Toplines  
2,100 Respondents

#### Section 1: Introduction to Study

Hi, my name is \_\_\_\_\_ and I'm calling on behalf of TNR, a public opinion research firm. We're conducting a survey concerning issues of importance to residents in the Bay Area region and we'd like to get your opinions.

*If needed:* This is only a survey about important issues in the Bay Area. I'm NOT trying to sell anything.

*If needed:* The survey should take about 12 minutes to complete.

*If needed:* If now is not a convenient time, can you let me know a better time so I can call back?

*If the person says they are an elected official or is somehow associated with the survey, politely explain that this survey is designed to measure the opinions of those not closely associated with the study, thank them for their time, and terminate the interview.*

#### Section 2: Screener for Inclusion in the Study

For statistical reasons, I would like to speak to the youngest adult male currently at home that is at least 18 years of age. *If there is no male currently at home that is at least 18 years of age, then ask:* Ok, then I'd like to speak to the youngest female currently at home that is at least 18 years of age.

*If there is no adult currently available, then ask for a callback time.*

**NOTE:** Adjust this screener as needed to match sample quotas on gender & age

The number of respondents that received each question is shown in brackets following the question wording.

SC1 To begin, what is the ZIP code of your residence? *Read zip code back to respondent to confirm before submitting. Terminate those that fall outside District.* [2,100]

Record 5-digit ZIP code

Data on file

SC2 What county do you live in? [2,100]

1	Alameda	19%
2	Contra Costa	15%
3	Marin	5%
4	Napa	3%
5	San Francisco	13%
6	San Mateo	12%
7	Santa Clara	21%
8	Solano	6%
9	Sonoma	6%

**Section 3: Heating Device Use**

I'd like to begin by asking you a few questions about heating devices that you may have in your home.

Q1 Do you have a: \_\_\_\_\_ in your home? *If yes, ask: How many: \_\_\_\_\_s do you have in your home?*

A	Wood-burning fireplace* [2,100]	
	None	66%
	One	30%
	Two	3%
	Three or more	1%
	Not sure / Refused	1%
B	Natural gas or propane fireplace [2,100]	
	None	77%
	One	17%
	Two	3%
	Three or more	1%
	Not sure / Refused	3%
C	Pellet stove* [2,100]	
	None	89%
	One	5%
	Two	0%
	Three or more	1%
	Not sure / Refused	5%
D	Woodstove or woodstove insert* [2,100]	
	None	90%
	One	6%
	Two	1%
	Three or more	0%
	Not sure / Refused	2%

*If Q1.1a, Q1.1b, Q1.1c AND Q1.1d = (2, 98), skip to Q23.*

*Only ask Q2 if Q1.1a = 1 OR Q1.1d = 1, otherwise skip to instructions preceding Q4.*

\*41% of households reported at least one wood-burning device.

Q2 What type of wood do you primarily use in your wood burning fireplace or woodstove: Natural wood logs, manufactured logs such as Duraflame or Presto, scrap wood, pallets, or some other fuel? If 'other', ask: what type? [801]					
	1	Natural wood log		39%	
	2	Manufactured log/Duraflame/Presto		13%	
	3	Scrap wood		2%	
	4	Pallets (not pellets)		0%	
	5	Never use fireplace		35%	
	6	Other		1%	
	98	Not sure		8%	
	99	Refused		2%	
Q3 Do you also ever burn: _____?					
<i>Do not read option below that was chosen in Q2.</i>					
	<i>Randomize</i>		Yes	No	Not Sure/ Doesn't Apply
A	Natural wood logs [411]		18%	75%	6%
B	Manufactured logs such as Duraflame or Presto [618]		24%	70%	6%
C	Scrap wood [708]		17%	79%	4%
D	Pallets (not pellets) [718]		4%	90%	6%
<i>Only ask Q4 if Q2 = 1 OR Q3a = 1, otherwise skip to introduction preceding Q8.</i>					
Q4 What type of natural wood do you typically burn? [384]					
	1	Ash		2%	
	2	Eucalyptus		2%	
	3	Oak		50%	
	4	Pine (Cedar)		11%	
	5	Almond		3%	
	6	Fruitwood		1%	
	7	Hardwood (general)		9%	
	8	Other wood		2%	
	98	Not sure		20%	
	99	Refused		1%	

Q5	Do you typically purchase your wood from a wood supplier, the local store, or do you gather your own wood? [384]				
	1	Wood supplier	15%		
	2	Local store	32%		
	3	Gather own wood	40%		
	4	Other source	9%		
	98	Not sure	3%		
	99	Refused	1%		
Q6	At the point that you acquire your wood, is it fresh-cut and somewhat moist or is it already dry and seasoned? [384]				
	1	Fresh-cut & moist	17%		
	2	Dry & seasoned	66%		
	3	Depends/mixed	7%		
	98	Not sure	7%		
	99	Refused	3%		
Q7	When you use your fireplace or woodstove, which of the following would you say is the primary reason you do so? For heating your home, or for the ambiance of having a fire? [384]				
	1	Heat	49%		
	2	Ambiance	46%		
	98	Not sure	4%		
	99	Refused	0%		
For the next series of questions, when I refer to "winter" I mean the months of November through February.					
<i>Only ask Q8 for each appliance where Q1.1 = 1.</i>					
Q8	Will you use your: _____ this winter?				
<i>Do Not Randomize</i>		Yes	No	Not Sure	Refused
A	Wood-burning fireplace [702]	36%	61%	2%	0%
B	Natural gas or propane fireplace [441]	61%	37%	2%	0%
C	Pellet stove [117]	76%	24%	0%	0%
D	Woodstove [157]	36%	63%	2%	0%

<i>Only ask Q9 for each appliance where Q8 = 2.</i>					
Q9 Why do you not expect to use your _____ this winter? <i>Do Not Read Responses. Multiple Responses OK.</i>					
<i>Do Not Randomize</i>		Air Quality Reasons	Too Much Hassle	Health Reasons	Other
A	Wood-burning fireplace [432]	30%	34%	20%	35%
B	Natural gas or propane fireplace [162]	4%	32%	14%	54%
C	Pellet stove [28]	11%	40%	27%	38%
D	Woodstove [98]	18%	24%	23%	49%
<i>Read the following instruction if Q1.1c = 1.</i>					
For the remainder of this interview, when I refer to 'burning wood' I mean burning any type of wood product, including wood pellets for a pellet stove.					
<i>Only ask Q10 if Q8a = 1, Q8c = 1 or Q8d = 1. Otherwise, skip to Q23.</i>					
Q10 How often do you expect to burn wood this winter? At least once per week or less often than that? <i>If unsure, ask them to estimate.</i> [369]					
	1	At least once per week	39%	<i>Skip to Q12</i>	
	2	Less often than once per week	56%	<i>Ask Q11</i>	
	98	Not sure	4%	<i>Skip to Q13</i>	
	99	Refused	1%	<i>Skip to Q13</i>	
Q11 Would you say that you will burn wood about two to three times per month, once per month, or less often than once per month? <i>If unsure, ask them to estimate.</i> [206]					
	1	Two to three times per month	32%	<i>Skip to Q13</i>	
	2	Once per month	30%	<i>Skip to Q13</i>	
	3	Less often than once per month	36%	<i>Skip to Q13</i>	
	98	Not sure	2%	<i>Skip to Q13</i>	
	99	Refused	0%	<i>Skip to Q13</i>	

Q12	In a typical winter week, how many days do you expect to burn wood? <i>If unsure, ask them to estimate.</i> [144]		
	1	One day	27%
	2	Two days	22%
	3	Three days	18%
	4	Four days	7%
	5	Five days	3%
	6	Six days	0%
	7	Seven days	17%
	98	Not sure	5%
	99	Refused	0%
Q13	Did you burn wood in the past seven days? [369]		
	1	Yes	35%
	2	No	65%
	98	Not sure	0%
	99	Refused	0%
Q14	Did you burn wood yesterday or last night? [128]		
	1	Yes	36%
	2	No	63%
	98	Not sure	0%
	99	Refused	0%
Q15	In a typical day that you burn wood, how many hours of the day do you have a fire burning? <i>If unsure, ask them to estimate.</i> [369]		
		One	7%
		Two	20%
		Three	25%
		Four	22%
		Five or more	23%
		Not sure	4%

*Only ask Q16 if Q8a = 1 or Q8d = 1.*

Q16		
In a typical day that you burn wood, how many logs do you burn throughout the entire day? <i>If unsure, ask them to estimate.</i> [296]		
	One	11%
	Two	9%
	Three	19%
	Four	13%
	Five	10%
	Six	7%
	Seven or more	20%
	Not sure	12%
Q17		
Thinking back to your most recent fire, approximately what time of the day did you first light the fire? <i>If unsure, ask to estimate.</i> [369]		
1	4AM to 8:59AM	11%
2	9AM to 11:59AM	3%
3	Noon to 2:59PM	3%
4	3PM to 5:59PM	20%
5	6PM to 8:59PM	53%
6	9PM to 11:59PM	3%
7	Midnight to 3:59AM	1%
99	Not sure / Refused	5%

#### Section 4: Changes in Wood Burning Behavior

*Only ask Q18 if Q8a = 1, Q8c = 1 or Q8d = 1. Otherwise, skip to Q23.*

Q18		
This winter, do you expect that you will burn wood more often, less often, or about the same frequency as you did last winter? [369]		
1	More often	12%
2	Less often	28%
3	About the same	50%
98	Not sure	10%
99	Refused	0%

Q19	Were there occasions this winter when you normally would have burned wood, but decided not to? [369]			
	1	Yes	53%	Ask Q20
	2	No	42%	Skip to Q22
	98	Not sure	4%	Skip to Q22
	99	Refused	0%	Skip to Q22
Q20	Why did you decide not to burn wood on these occasions? <i>Do NOT Read Response Options. Multiple Responses OK.</i> [196]			
	1	Winter Spare the Air Alert Program/ Advertisements and notices asking people not to burn wood/Laws against burning wood	51%	Ask Q21
	2	Air quality reason/health reason	9%	Ask Q21
	3	Other reason	37%	Skip to Q22
	98	Not sure	5%	Skip to Q22
	99	Refused	0%	Skip to Q22
Q21	So far this winter, how many times did you choose not to burn wood because of air quality alerts or health-related reasons? <i>If unsure, ask respondent to estimate.</i> [112]			
	One		10%	
	Two		25%	
	Three		14%	
	Four		6%	
	Five or more		18%	
	Not sure		27%	
<i>Only ask Q22 if Q14 = 2.</i>				
Q22	You previously indicated that you chose not to burn wood yesterday or last night. Why did you decide not to burn wood yesterday or last night? <i>Do NOT Read Response Options. Multiple Responses OK.</i> [81]			
	1	Winter Spare the Air Alert Program/ Advertisements and notices asking people not to burn wood/Laws against burning wood	26%	
	2	Air quality reason/health reason	3%	
	3	No need/not cold	28%	
	4	Other reason	37%	
	98	Not sure	7%	
	99	Refused	0%	
29.5% of households with at least one wood-burning device reported not burning wood this winter (Q9) or a reduction in burning wood this winter (Q20,Q22) because of Winter STA Program / Air quality info, or because of health concerns paired with encountering Winter STA Program / Air quality info (Q23).				



<i>Section 5: Awareness of Campaign</i>					
Q23	During this winter, have you heard, read, or seen any news stories, advertisements, or public service announcements about the Winter Spare the Air Alert Program, poor air quality, or requests not to use your fireplace, pellet stove, or woodstove? [2,100]				
	1	Yes	58%	Ask Q24	
	2	No	41%	Skip to Q26	
	98	Not sure	1%	Skip to Q26	
	99	Refused	0%	Skip to Q26	
Q24	During this winter, do you recall encountering information about the Bay Area Air Quality Management District or the Winter Spare the Air Program: _____? [1,220]				
	<i>Randomize</i>		Yes	No	Not Sure/ Doesn't Apply
A	On television		62%	36%	2%
B	On the radio or Internet radio		62%	37%	2%
C	In a newspaper		29%	68%	3%
D	On a website		22%	76%	2%
E	On a billboard		14%	81%	5%
F	On social media like Facebook or Twitter		14%	83%	2%
G	At a community event		9%	89%	2%
<i>Ask Q25 if Q24a = 1.</i>					
Q25	Information about the Winter Spare the Air program is carried on television in a number of ways. Do you recall encountering information about Winter Spare the Air on television in: _____? [760]				
	<i>Randomize</i>		Yes	No	Not Sure/ Doesn't Apply
A	An advertisement or public information announcement that talks about fires, woodsmoke, air quality and the Winter Spare the Air program		48%	48%	4%
B	A news program		82%	15%	3%
C	A weather alert		63%	34%	4%
D	An interview with an air quality expert or representative		13%	83%	4%

*Only ask Q26 if interviewing the day after a Winter STA Alert. Otherwise, skip to Q27.*

Q26	Prior to taking this survey, were you aware that there was a "Winter Spare the Air Alert" yesterday? [931]		
1	Yes		44%
2	No		55%
98	Not sure		1%
99	Refused		0%

#### Section 6: Attitudes about Wood Smoke

Q27	Do you think there are any negative health effects associated with breathing wood smoke? [2,100]		
1	Yes	70%	Ask Q28
2	No	21%	Skip to Q29
98	Not sure	9%	Skip to Q29
99	Refused	0%	Skip to Q29
Q28	What are the negative health effects associated with breathing wood smoke? <i>Don't read options. Multiple response OK.</i> [1,478]		
1	Lung Disease (general reference)	52%	
2	Asthma	37%	
3	Allergies	12%	
4	Bronchitis	11%	
5	Cancer	10%	
6	Emphysema	7%	
7	Chemicals/Carcinogens/Toxins in wood	8%	
8	Carbon monoxide	8%	
9	Other health issue	9%	
98	Not sure	11%	
99	Refused	0%	
Q29	Different neighborhoods in the Bay Area experience different levels of air pollution from wood smoke. In your opinion, does your neighborhood periodically experience air pollution from wood smoke? [2,100]		
1	Yes	17%	Ask Q30
2	No	76%	Skip to Q31
98	Not sure	7%	Skip to Q31
99	Refused	0%	Skip to Q31

Q30	Would you say that periodic air pollution from wood smoke in your neighborhood is a big problem, medium problem or a small problem? [355]		
	1	Big problem	14%
	2	Medium problem	24%
	3	Small problem	60%
	98	Not sure	3%
	99	Refused	0%

#### Section 8: Policy Attitude

Q31	Prior to taking this survey, were you aware that several years ago the Bay Area Air Quality Management District passed a rule that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels? [2,100]		
	1	Yes, was aware	64%
	2	No, was not aware	34%
	98	Not sure	2%
	99	Refused	0%
Q32	Overall, how informed do you feel about the rules that are part of this wood-burning policy? Would you say you feel well informed, somewhat informed, slightly informed, or not at all informed? [2,100]		
	1	Well informed	28%
	2	Somewhat informed	30%
	3	Slightly informed	22%
	4	Not at all informed	17%
	98	Not sure	3%
	99	Refused	0%
Q33	In general, do you support or oppose a policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels? [2,100]		
	1	Support	75%
	2	Oppose	14%
	3	Depends	5%
	98	Not sure	5%
	99	Refused	0%

Q34	Should people be allowed to burn wood on holidays like Christmas and New Years even if air pollution is expected to reach unhealthy levels that day? [2,100]			
	1	Yes	29%	
	2	No	63%	
	98	Not sure	8%	
	99	Refused	0%	
Q35	Does your household normally burn wood on holidays like Christmas and New Year's day? [2,100]			
	1	Yes	15%	Ask Q36
	2	No	82%	Ask Q37
	3	Depends	2%	Ask Q36
	98	Not sure	1%	Ask Q37
	99	Refused	0%	Ask Q37
Q36	If air pollution levels were high and a 'no burn' day was set on Christmas or New Year's day, would you still burn wood? [364]			
	1	Yes	22%	
	2	No	69%	
	98	Not sure	9%	
	99	Refused	0%	
Q37	Do you know how you could find out whether today is a 'no burn' day? [2,100]			
	1	Yes	50%	Ask Q38
	2	No	46%	Skip to Q39
	98	Not sure	4%	Skip to Q39
	99	Refused	0%	Skip to Q39

Q38	How can you find out? <i>Probe: Are there any other ways to find out? Do NOT read options. Check all mentions.</i> [1,043]	
1	Check the newspaper	23%
2	Listen to radio	24%
3	Call a hotline	8%
4	Check the Air District's website	12%
5	Check a website (general reference)	59%
6	Social Media / Facebook / Twitter	3%
7	Sign-up for email alerts	3%
8	Sign-up for text message alerts	1%
9	Sign-up for automated telephone calls/robo-call notification	2%
98	Not sure	9%
99	Refused	1%

#### Section 10: BAAQMD and Winter Spare the Air Alert Program Recognition

Q39	Let's change gears a bit. Have you ever heard of the _____? Code 'Not sure' as 'No'.						
	<i>Randomize</i>	Yes No					
A	Bay Area Air Quality Management District [2,100]	55% 45%					
B	Winter Spare the Air Alert Program [2,100]	56% 44%					
<i>Only ask Q40 and Q41 for each item in Q39 that respondent had heard of (i.e., ask if Q39 = 1).</i>							
Q40	Generally speaking, would you say you have a favorable or unfavorable opinion of the _____, or do you have no opinion either way? <i>Get answer and ask: Would that be very or somewhat favorable / unfavorable?</i>						
		Very Favorable	Somewhat Favorable	Neutral/ No Opinion Either Way	Somewhat Unfavorable	Very Unfavorable	Not sure
A	Bay Area Air Quality Management District [1,150]	26%	22%	39%	4%	6%	3%
B	Winter Spare the Air Alert Program [1,173]	36%	23%	30%	4%	5%	3%

Q41	In the past six months, have you heard, read, or seen any news stories, advertisements, or public service announcements about the _____?	Yes	No	Not sure
A	Bay Area Air Quality Management District [1,150]	49%	46%	5%
B	Winter Spare the Air Alert Program [1,173]	62%	33%	5%

### Section 12: Background & Demographics

Thank you so much for your participation. I have just a few background questions for statistical purposes.

D1	Including yourself, how many adults live in your household? [2,100]		
	One		14%
	Two		43%
	Three or more		38%
	Refused		4%
D2	Do you have children in your home that are in elementary or middle school? [2,100]		
	1	Yes	30% Ask D3
	2	No	66% Skip to D4
	99	Refused	4% Skip to D4
D3	Have your children ever raised the topic or brought home information about air pollution or the Spare the Air program? [632]		
	1	Yes	20%
	2	No	80%
	99	Refused	1%
D4	In what year were you born? Year recoded into age categories shown below. [2,100]		
	18 to 24		13%
	25 to 34		16%
	35 to 44		17%
	45 to 54		19%
	55 to 64		15%
	65 and over		16%
	Refused		3%

D5	Do you live in an apartment, condo, townhome, single-family detached home, or mobile home? [2,100]			
	1	Apartment	16%	
	2	Condo	6%	
	3	Townhome	5%	
	4	Single-family detached home	63%	
	5	Mobile home	3%	
	99	Refused	7%	
D6	Approximately how many years ago was your home built? [2,100]			
	1	0 to 10 years	9%	
	2	11 to 20 years	10%	
	3	21 to 30 years	12%	
	4	31 to 40 years	11%	
	5	41 to 50 years	9%	
	6	Over 50 years	28%	
	98	Not sure	16%	
	99	Refused	4%	
<i>Only ask D7 if Q1d = 1. Otherwise skip to instructions preceding D10.</i>				
D7	Is your woodstove or woodstove insert EPA certified? <i>If not sure, clarify: Most woodstoves manufactured after 1992 are EPA certified, while older ones are not.</i> [157]			
	1	Yes, EPA certified	42%	Ask D8
	2	No, not EPA certified	11%	Skip to D9
	98	Not sure	36%	Ask D8
	99	Refused	12%	Skip to D9
D8	Approximately what year was the woodstove installed? <i>If unsure, ask to estimate. Year recoded into age categories shown below.</i> [122]			
	1992 or before		18%	
	1993 to 2004		20%	
	2005 to 2015		17%	
	Not sure / Refused		44%	

Only ask D9-D11 if [(Q1a = 1, Q1c = 1, or Q1d = 1) and (Q1b = (2,98))]. Otherwise skip to D12.				
D9	Do you have natural gas service at your home? [712]			
	1	Yes	70%	Skip to D11
	2	No	20%	Ask D10
	98	Not sure	5%	Ask D10
	99	Refused	5%	Ask D10
D10	Do you pay for propane delivery at your home? [214]			
	1	Yes	9%	
	2	No	73%	
	98	Not sure	3%	
	99	Refused	14%	
D11	Besides your fireplace, do you have any other form of permanently installed devices to heat your home, such as a gas furnace, radiator, propane heater, or electric heaters? [712]			
	1	Yes	70%	
	2	No	23%	
	98	Not sure	1%	
	99	Refused	5%	
D12	Do you have an <u>outdoor</u> firepit, chiminea (chim-uh-nay-uh), or pizza stove? [2,100]			
	1	Yes	16%	Ask D14
	2	No	79%	Skip to D15
	98	Not sure	1%	Skip to D15
	99	Refused	3%	Skip to D15
D13	How often do you burn wood using your outdoor firepit, chiminea (chim-uh-nay-uh), or pizza stove? At least once per week, two to three times per month, once per month, 5 to 11 times per year, 1 to 4 times per year, or never? [340]			
	1	At least once per week	4%	
	2	Two to three times per month	4%	
	3	Once per month	7%	
	4	5 to 11 times per year	8%	
	5	1 to 4 times per year	39%	
	6	Never	36%	
	98	Not sure	2%	
	99	Refused	1%	



D14 What is the last grade or level you completed in school? [2,100]			
1	Elementary (8 or fewer years)		2%
2	Some high school (9 to 11 years)		4%
3	High school graduate (12 years)		19%
4	Technical / Vocational school		1%
5	Some college		15%
6	College graduate		31%
7	Some graduate school		2%
8	Graduate, professional, doctorate degree (DDS, DVM, JD, LLM, MA, MS, MBA, MD, PhD)		18%
99	Refused		7%

Those are all of the questions that I have for you. Thanks very much for participating. This survey is sponsored by the Bay Area Air Quality Management District.

Post-Interview Items			
D15 Gender [2,100]			
1	Male		50%
2	Female		50%
D16 Interview month [2,100]			
11	November		11%
12	December		42%
01	January		39%
02	February		8%
D17 Interview language [2,100]			
1	English		84%
2	Spanish		8%
3	Chinese		8%