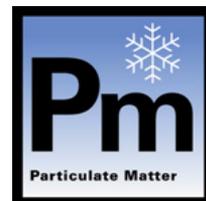


SPARE THE AIR TONIGHT STUDY
2006-2007 WINTER WOOD SMOKE SEASON



CONDUCTED FOR THE



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

MARCH 2007



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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 Spare the Air Tonight Program, as well as the impact that the Program has had on awareness, opinions and behavior relevant to burning wood and air quality. In this respect, this study is quite similar to past surveys conducted for the BAAQMD in 2001, 2002, 2003, 2004 and 2005.

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.¹ 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.

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. For more on particulate matter, SB 656 and the BAAQMD's implementation schedule, see the *Particulate Matter Implementation Schedule* staff report prepared by the Planning and Research Division of the BAAQMD, November 9, 2005.

With a greater emphasis placed on reducing particulate matter in the Bay Area, the 2005 survey was the first step in developing a more detailed, up-to-date profile of wood burning behavior in the Bay Area that would allow for statistically reliable estimates within each of the nine member counties. The 2006 survey continues this effort by collecting an additional 988 interviews that can be pooled with the 2,625 interviews completed in 2005. Prior to 2005, the most recent inventory was conducted in 1988.²

OVERVIEW OF METHODOLOGY A full description of the methodology used for this study is included later in this report (see *Methodology* on page 54). A total of 988 randomly selected residents within the District’s boundaries participated in a telephone survey on one of thirty-seven interviewing dates between December 2, 2006 and February 12, 2007. 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 to the past surveys conducted for the District on wood burning and the Spare the Air Tonight 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 2006 study continued several questionnaire changes that were first implemented in the 2004 season. The most notable of these changes addressed how the questionnaire measured the impacts of the Spare the Air Tonight 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 EPA³—to measure the impacts of the summer Spare the Air Program on driving behavior.⁴

Based on the 2005 results, several 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 2006 survey 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 2006 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 indepen-

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2. *The California Residential Wood Consumption Survey*. Report prepared by Northern California Research Associates for the California Air Resources Board, 1988.
 3. 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, as well as Thomas Higgins and Dr. Will Johnson of K.T. Analytics.
 4. 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: 2005 Summer Ozone Season* report prepared for the BAAQMD by True North & ESTC.

dently 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 2006.

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, and a complete set of crosstabulations for the survey results is contained in Appendix A.

ACKNOWLEDGEMENTS True North would like to thank Ralph Borrmann, Dr. David Fairley and Luna Salaver of the BAAQMD, as well as Eric Schreffler of ESTC, for their valuable input during the design and reporting 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 400 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 2005 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-five percent (45%) of households in the District contain at least one wood-burning fireplace, pellet stove or wood stove.
- Nineteen percent (19%) of households in the District contain at least one fireplace that primarily burns natural gas or propane.
- Among households with a wood-burning fireplace or wood stove, the most commonly used type of wood was natural wood logs (42%), followed by manufactured logs (26%), and scrap wood (1%). Less than 1% of respondents indicated that they use pallets or some 'other' type of wood, 3% were not sure of the type of wood they primarily burn.
- Twenty percent (20%) of respondents who primarily burn natural wood logs were unable to identify the type of wood that they burn. Of the specific woods mentioned, oak was the most common (51%), followed by pine (9%), almond (8%), and fruitwood (4%).
- 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 (44%), those who purchase the wood from a local store (13%), and those who rely on a wood supplier (33%). Five percent (5%) mentioned an alternative source, and 4% were unsure of where their household acquires the wood that they burn.
- Among households that primarily burn natural wood logs, 92% stated that they burn dry, seasoned wood, 4% reported that they typically burn fresh-cut wood, and 5% were not sure.
- Half (50%) of all households that burn wood indicated that they *primarily* do so for ambience rather than heat.
- Eighty-one percent (81%) of households that contain a wood stove indicated that they would use the device this winter. The rate of use was somewhat lower for pellet stoves (68%) and natural gas/propane fireplaces (72%), and markedly lower for wood-burning fireplaces (56%).
- Overall, 9% of households district-wide reported that they would not use their wood-burning heating device *at all* during the winter due to the Spare the Air Tonight campaign.
- Overall, 30% of households with a wood-burning heating device expected to burn wood weekly, 27% expected to burn wood less frequently than once per week, and 43% indicated that they do not expect to burn wood this winter.
- Fifty-one percent (51%) 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. Approximately 22% had burned wood the day prior to the interview.
- On a typical burn day, wood-burning households averaged 3.82 hours of burning time.

- On a typical burn day, wood-burning households consumed an average 5.12 logs.

OUTDOOR & OFF-SEASON BURNING

- Nine percent (9%) of households in the District indicated that they possess an outdoor fireplace, firepit or chiminea *and* they have used the device to burn wood in the past 12 months.
- Eighty-five percent (85%) of households reported that they do not burn wood in non-winter months, whereas 15% indicated that they do burn wood in the off-season.
- Off-season wood burning was most commonly reported for the months of July and August.
- Among households that reported burning wood in non-winter months, 13% indicated that they burn wood on a weekly basis in the off-season.

CHANGES IN WOOD BURNING BEHAVIOR

- Overall, 65% 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.
- Thirty-seven percent (37%) of respondents who have a wood-burning fireplace, wood stove and/or pellet stove *and* expected to burn wood during the 2006-2007 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, 10% specifically mentioned the Spare the Air campaign and an additional 6% offered an air quality or health-related reason.
- Among all households with a wood-burning fireplace, pellet stove or wood stove, nearly 9% chose not to burn *at all* during the winter season because of the Spare the Air Tonight campaign, and an additional 9% refrained from burning on at least one occasion for the same reason.

RECALL AND AWARENESS OF SPARE THE AIR TONIGHT MESSAGING

- Overall, 56% of adults in the Bay Area recalled being exposed to news stories, advertisements or public service announcements related to the Spare the Air Tonight Program during the three months prior to the interview.
- When asked to indicate where they obtained the information about the Spare the Air Tonight Program, the most commonly cited sources were television (57%) and radio (40%).
- Sixteen percent (16%) of respondents interviewed on the day after a Spare the Air Tonight episode were aware of the advisory for the prior day.

ATTITUDES ABOUT WOOD SMOKE

- Approximately three-quarters (74%) of Bay Area adults perceive that there are negative health effects associated with breathing wood smoke.

- When asked in an open-ended manner to identify some of the specific negative health effects associated with breathing wood smoke, most respondents focused on lung disease in general (32%) or made a specific reference to asthma (28%).
- One-quarter (24%) of Bay Area adults perceive that their neighborhood periodically experiences air pollution from wood smoke. Fourteen percent (14%) stated that the problem was a small one, 7% indicated it was a moderate or medium problem, and 3% felt that air pollution due to wood smoke was a big problem in their neighborhood.

CHANGING HEATING DEVICES

- Among individuals who own a wood stove or a pellet stove, 54% indicated that their stove is EPA certified.
- One-third (33%) of respondents who owned a wood-burning fireplace and/or non-EPA certified wood stove or pellet stove were willing to replace their current device -- *without a financial incentive* -- with a gas fireplace.
- Thirty-eight percent (38%) of respondents who owned a wood-burning fireplace and/or non-EPA certified wood stove or pellet stove were willing to replace their current device -- *without a financial incentive* -- with an EPA certified wood stove or pellet stove.
- Seven percent (7%) of those who were initially unwilling to replace their heating device for a cleaner alternative were willing to do so if a \$200 rebate were offered. As the amount of the rebate increased to \$300, \$400 and \$500, the proportion of respondents who indicated that they would participate in the program increased to 11%, 17% and 22%, respectively.
- Sixty-four percent (64%) of Bay Area adults support a policy that would require all new housing construction to use only gas fireplaces or EPA certified fireplace inserts, wood stoves or pellet stoves.
- Seventy-seven percent (77%) of Bay Area adults support a policy that would prohibit wood burning on nights when air pollution is expected to reach unhealthy levels.
- Half (51%) of Bay Area adults support a policy that would require older wood stoves to be removed or replaced with a cleaner burning model when a home is sold to a new owner.

PERCEPTIONS OF ENTITIES

- Prior to taking the survey, 59% of respondents had heard of the Bay Area Air Quality Management District and 52% had heard of the Spare the Air Tonight Program.
- Among respondents who had heard of the BAAQMD, more than half (55%) held a favorable opinion of the agency, whereas 32% held a neutral opinion or weren't sure of their opinion, and just 8% held an unfavorable opinion.
- Among respondents who had heard of the Spare the Air Tonight Program, 72% held a favorable opinion of the Program, whereas 20% held a neutral opinion or weren't sure of their opinion, and 5% held an unfavorable opinion.
- Forty-six percent (46%) of 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 BAAQMD. The corresponding figure for the Spare the Air Tonight campaign was 65%.



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 Spare the Air Tonight 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?

Overall, 45% of households in the Bay Area own at least one *wood-burning* fireplace, wood stove or pellet stove, and (26%) burned wood in the 2006-2007 winter months. Fifteen percent (15%) of households also reported burning wood in non-winter months. Although the type of wood burned varies considerably, as does the source from which the wood is obtained, the vast majority (92%) of households report that they burn dry, seasoned wood.

Wood burning behavior varies considerably depending on how frequently a household burns. Wood-burning households can easily be divided between the 53% that burn at least once per week (frequent burners) and those that burn less often (infrequent burners). Not only do frequent burners build fires more often, then tend to burn significantly more hours per burn day (4.58 hours on average) and consume more wood per burn day (5.78 logs on average) when compared to infrequent burners. Their reasons for burning wood are also different. Whereas frequent burners primarily build fires for heat, infrequent burners primarily build fires for ambiance.

Wood burning behavior also varies considerably across the nine-county District. In the predominately rural counties of Marin, Sonoma, Solano and Napa, the proportion of households with a heating device that burn wood at least once per week was substantially greater in 2005 than in the rest of the District.⁵ For example, whereas 43% of Sonoma County households with a heating device burned wood at least once per week during the winter, the corresponding figure for San Francisco County was just 21%. For more information about wood burning behavior in the Bay Area, see *Winter Wood Burning Behavior* on page 10 and *Outdoor & Off-Season Burning* on page 25.

5. 2005 survey results are used here for conclusions regarding frequency of burning by county because the larger sample size in 2005 provides for more reliable estimates at the county level among households that own a wood-burning heating device.

How effective was the Spare the Air Tonight Campaign during the 2006-2007 winter?

The Spare the Air Tonight 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.

By virtually every measure, the 2006-2007 Spare the Air Tonight campaign was the BAAQMD's most successful to date. From a messaging standpoint, the campaign set new high-water marks in terms of awareness and positive attitudes about the Spare the Air Tonight campaign. Put simply, more residents were aware of the Spare the Air Tonight program, recalled being exposed to Spare the Air Tonight messaging during the winter season, and held positive opinions about the Spare the Air Tonight program than has been recorded since the study began asking these questions in 2002. Moreover, the magnitude of the positive changes between 2005 and 2006 was often substantial. For example, the proportion of residents who recalled hearing, reading or seeing Spare the Air Tonight related stories in the past six months increased by 22% to 65%, and the proportion who held a favorable opinion of the Program increased by 9% to 72%.

With respect to attitudes about wood smoke, the Program has also succeeded in raising public recognition of the negative health impacts of breathing wood smoke by 25% since 2002. Residents were also significantly more likely to perceive wood smoke as being a problem in their neighborhood in 2006 when compared to prior years.

The increased awareness of the health-related problems caused by wood smoke arguably underpins what is broad support for the adoption of new policies designed to improve the air quality in the region. Nearly two-thirds (64%) of adults favor requiring all new housing construction to use only gas fireplaces or EPA certified fireplace inserts, wood stoves or pellet stoves, and more than three-quarters (77%) favor prohibiting wood burning on evenings when air pollution is forecast to reach unhealthy levels.

So how did these positive changes in attitudes and awareness translate to actual changes in wood burning behavior? Based on the survey data, it is estimated that among all households with a wood-burning fireplace, pellet stove or wood stove, nearly 9% chose not to burn *at all* during the winter season because of the Spare the Air Tonight campaign, and an additional 9% refrained from burning on at least one occasion for the same reason. Collectively, the Spare the Air Tonight campaign influenced nearly 18% of households to reduce their wood burning during the 2006-2007 winter season. This represents a dramatic increase of more than 15% when compared to the comparable figure in 2005 (2.4% impacted).

Is the Spare the Air Tonight program shaping behavior throughout the season?

Although the Spare the Air Tonight program focuses on reducing wood burning on specific days that are forecast to have unhealthful concentrations of small particle pollution (PM), one of the clear patterns to emerge from the 2006 survey is that the campaign is shaping wood burning behavior *throughout* the season. Approximately 9% of households reported that they refrained from burning wood the entire season in response to the Spare the Air Tonight campaign.

Are there any opportunities that the Program can take advantage of to be more successful in the future?

The survey results suggest a clear opportunity for the Program to further reduce air pollution due to wood smoke by helping to establish and promote rebate programs for the replacement of traditional fireplaces and non-EPA certified wood stoves and pellet stoves. More than 40% of respondents who owned a wood-burning fireplace and/or a non-EPA certified wood stove or pellet stove indicated that they were willing to replace the device if offered a modest incentive (\$200), yet only two counties (Santa Clara and Marin) have offered such programs in the past, and based on prior surveys public awareness of the programs was poor.

A second opportunity for the program is to increase awareness of specific air quality advisories. Although general awareness of the Spare the Air Tonight Program was high and the program succeeded in reducing wood burning among 18% of households at one or more points throughout the season, awareness of *specific* Spare the Air Tonight advisories was modest at 16%. This is likely to be an ongoing challenge as the number of advisories reached 30 for the 2006-2007 winter season.

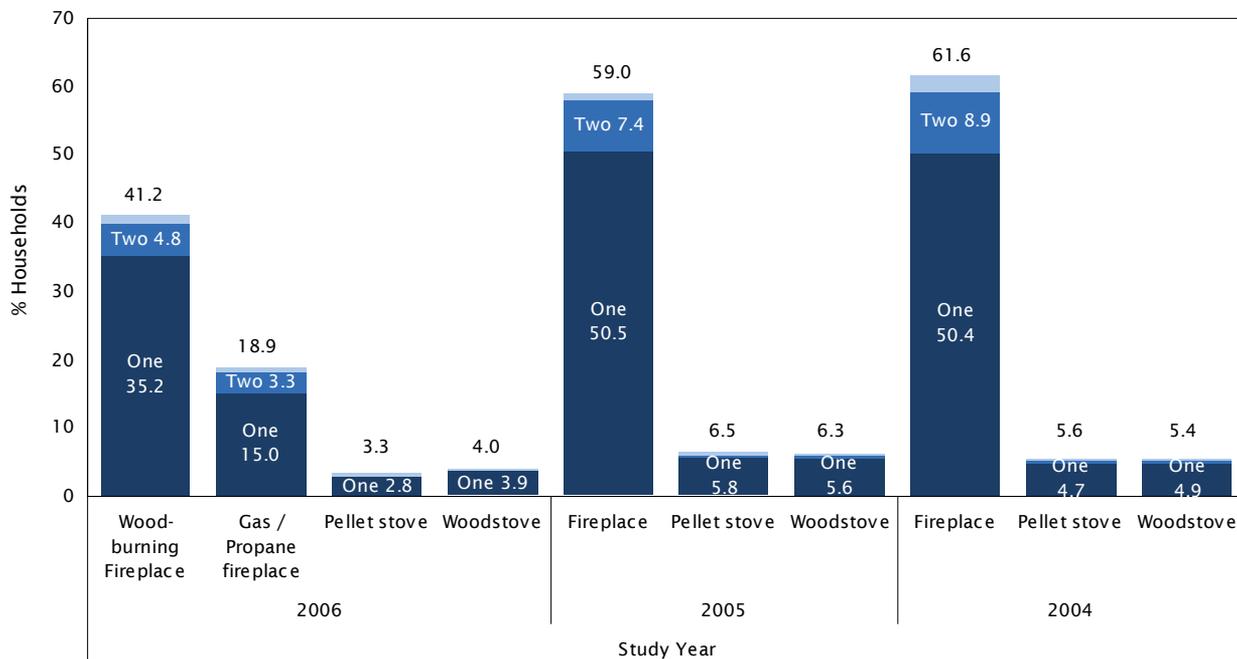
WINTER WOOD BURNING BEHAVIOR

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 2006-2007 winter months of November through February. Whereas in prior years the surveys did not distinguish between wood-burning fireplaces and those that use natural gas or propane at the outset of the interview, as shown in Figure 1 this distinction was added to Question 1 in the 2006 survey.

HEATING DEVICES The first question in this series simply 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, 41% of households contain at least one wood-burning fireplace, 19% contain at least one fireplace that burns natural gas or propane, 3% contain at least one pellet stove, and 4% contain at least one wood stove. Collectively, 45% of respondents reported that their household contained at least one *wood-burning* fireplace, pellet stove or wood stove, whereas 55% of respondents indicated that their household does not contain a wood-burning heating device (see Figure 2 on page 11).⁶

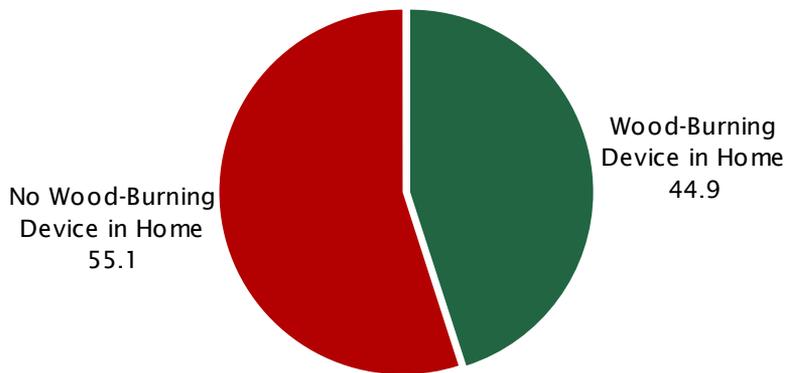
Question 1 *Do you have a _____ in your home? If yes, ask: How many: _____s do you have in your home?*

FIGURE 1 HEATING DEVICES IN HOME: 2004 ~ 2006 (N = 988)⁷



6. 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.
7. The n = 988 refers to the number of respondents who received this question. This convention will be followed throughout the report to allow the reader to identify how many respondents are included in each figure.

FIGURE 2 WOOD-BURNING DEVICE IN HOME (N = 988)



For the interested reader, the following figures show how the presence of wood-burning fireplaces, wood stoves and pellet stoves varied by county (Figure 3), home type, and age of home (see Figure 4).

FIGURE 3 WOOD-BURNING DEVICE IN HOME BY COUNTY (N = 988)

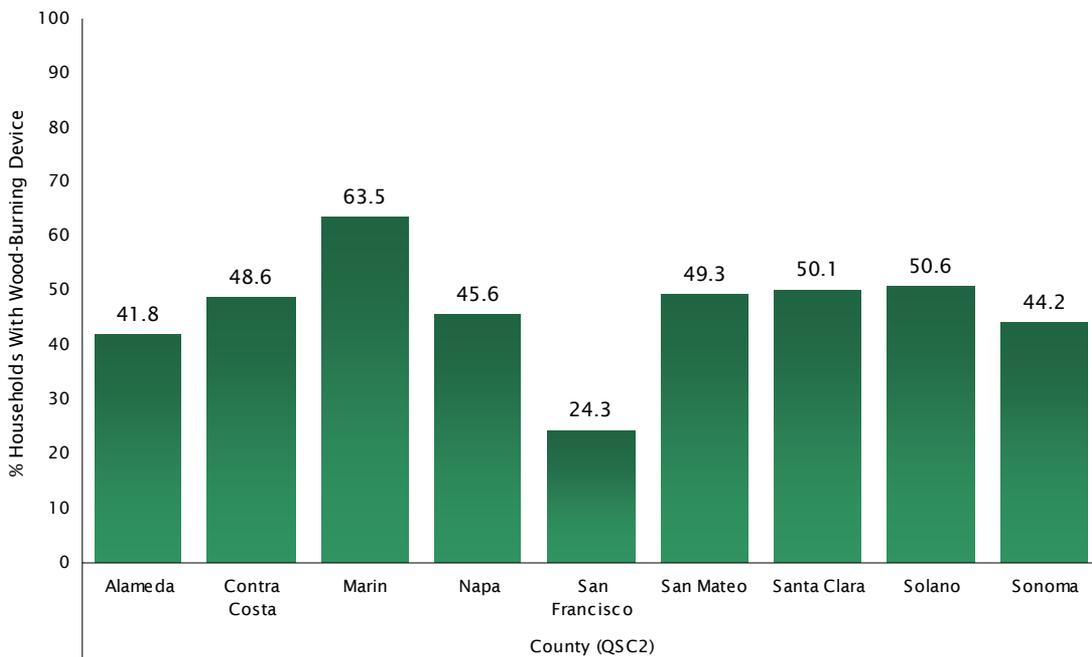
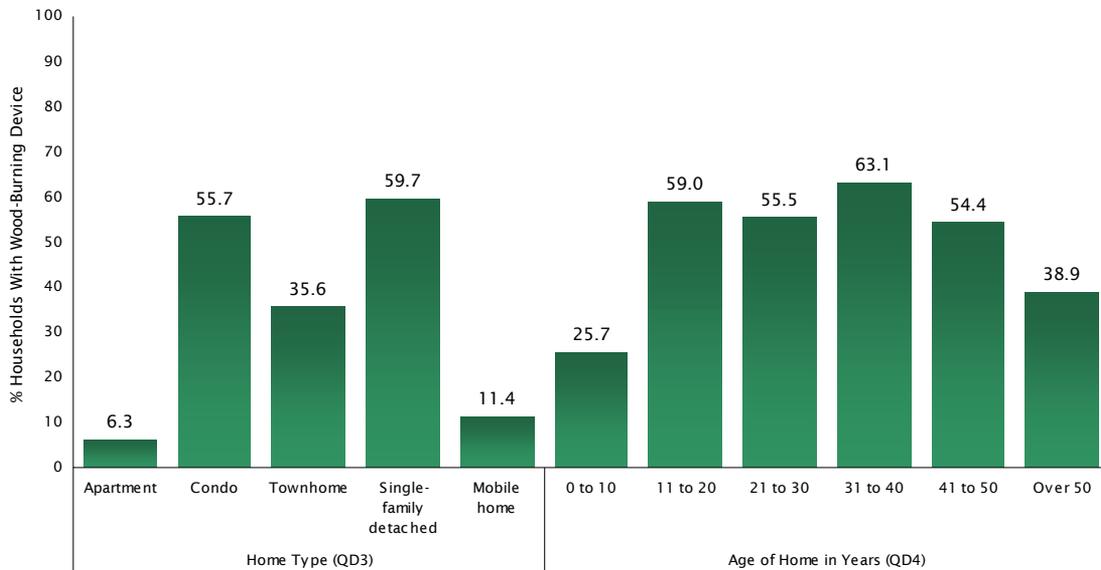


FIGURE 4 WOOD-BURNING DEVICE IN HOME BY COUNTY HOME TYPE & AGE OF HOME IN YEARS (N = 988)



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 as to the type of wood that they *primarily* use in the fireplace or stove (see Figure 5). The most commonly used wood was natural wood logs (42%), followed by manufactured logs (26%), and scrap wood (1%). Less than 1% of respondents indicated that they use pallets or some ‘other’ type of wood, 3% were not sure of the type of wood they primarily burn, and 27% volunteered that they never use their wood-burning fireplace or wood stove. Figure 6 on the next page displays how the proportional use of natural wood versus manufactured logs varied by county.

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 TYPE OF WOOD BURNED (N = 424)

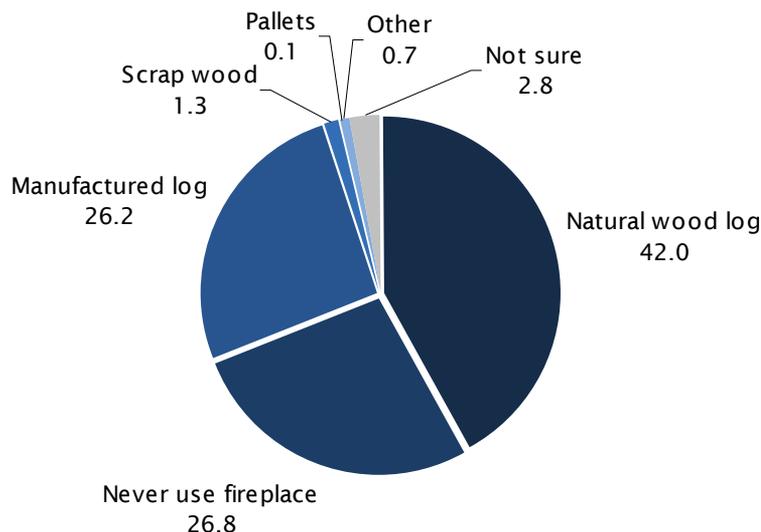
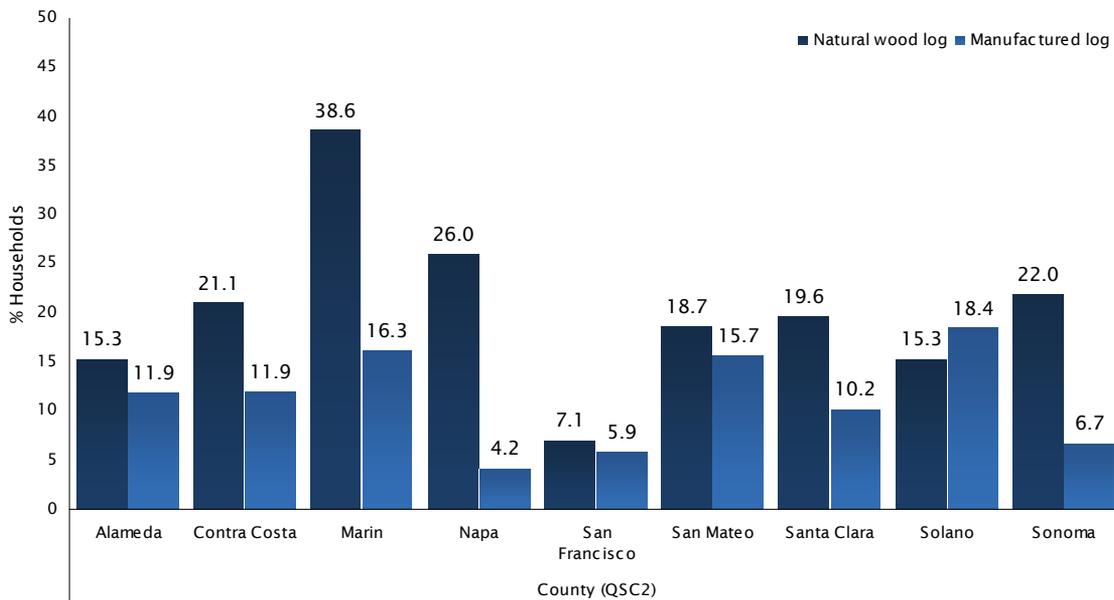


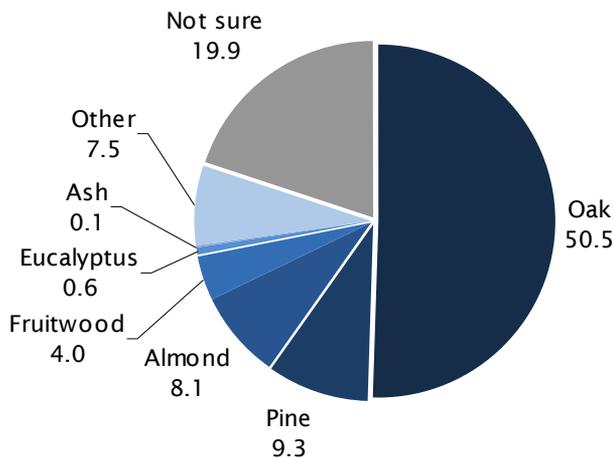
FIGURE 6 TYPE OF WOOD BURNED BY COUNTY (N = 424)



Households that reported that they primarily burn natural wood logs were next asked a series of questions about the *type* of natural wood they burn (Question 3), from where they purchase their wood (Question 4), and the state of the wood they burn (Question 5).

Question 3 *What type of natural wood do you typically burn?*

FIGURE 7 TYPE OF NATURAL WOOD BURNED (N = 178)



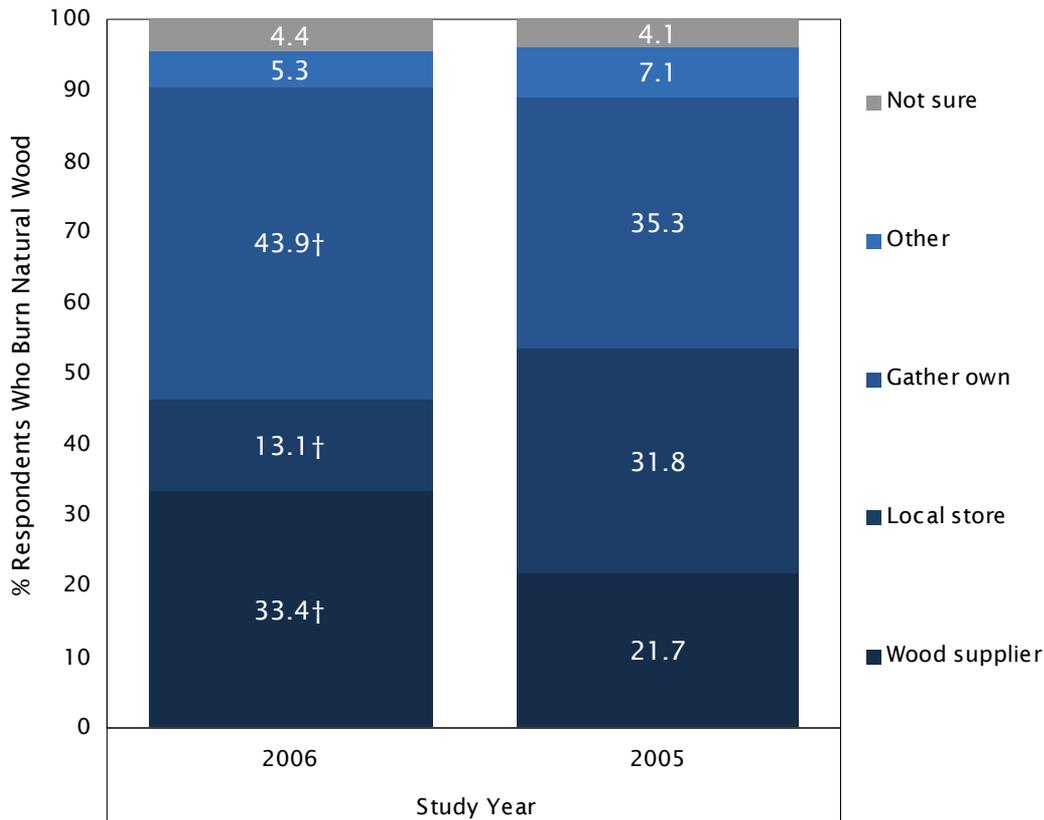
As shown in Figure 7, 20% of respondents were unable to identify the type of wood that they burn. Of the specific woods mentioned, oak was the most common (51%), followed by pine (9%), almond (8%), and fruitwood (4%).

When asked how they typically acquire their wood, respondents were split between those who gather their own (44%), those who purchase the wood from a local store (13%), and those who

rely on a wood supplier (33%). Five percent (5%) mentioned an alternative source, and 4% were unsure of where their household acquires the wood that they burn (Figure 8). When compared to the 2005 results, the percentage of households that reported gathering their own wood or relying on a wood supplier increased significantly, whereas the proportion that purchased their wood from a local store decreased significantly.

Question 4 *Do you typically purchase your wood from a wood supplier, the local store, or do you gather your own wood?*

FIGURE 8 SOURCE FOR NATURAL WOOD: 2005 ~ 2006 (N = 178)

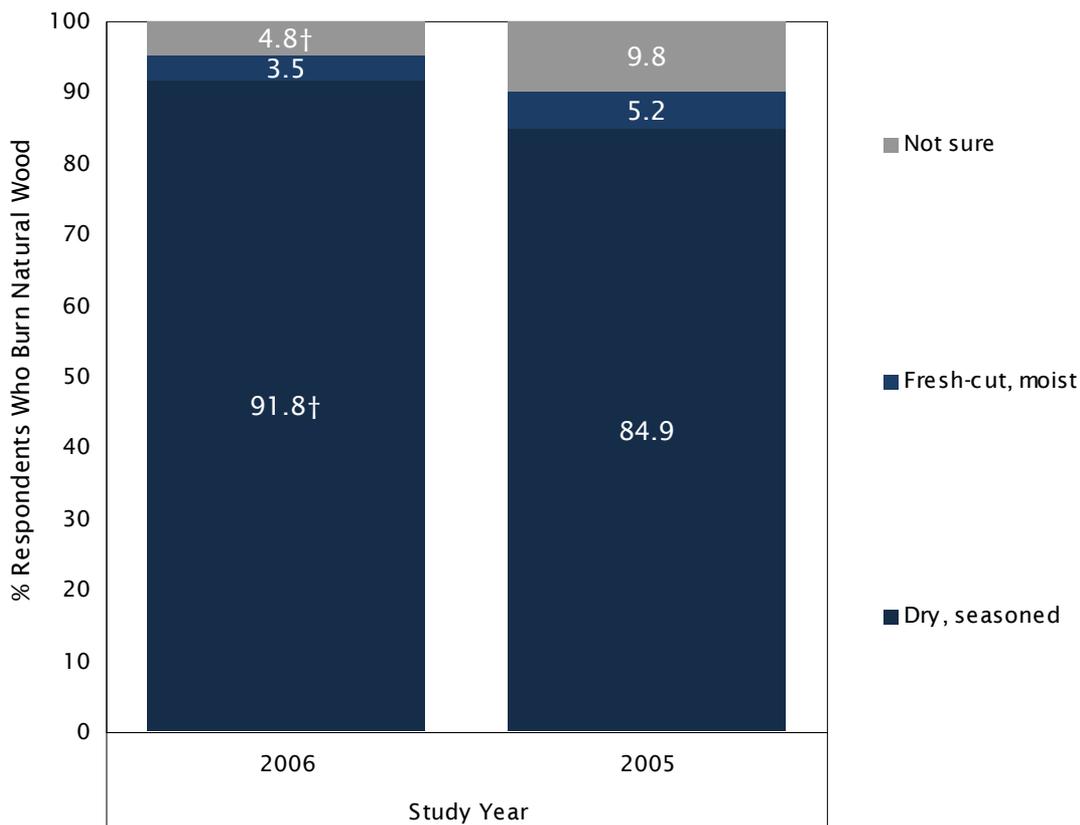


† Statistically significant change (p < 0.05) between the 2005 and 2006 studies

The survey next inquired as to whether the respondent typically burns dry, seasoned wood or wood that is fresh-cut and somewhat moist. As shown in Figure 9 on page 15, 92% of respondents stated that they burn dry, seasoned wood, 4% reported that they typically burn fresh-cut wood, and 5% were not sure. When compared to 2005, the proportion of respondents who indicated that they burn dry, seasoned wood increased significantly, whereas the proportion who were unsure decreased significantly.

Question 5 Do you tend to burn dry, seasoned wood or wood that is fresh-cut and somewhat moist?

FIGURE 9 CONDITION OF WOOD TYPICALLY BURNED: 2005 ~ 2006 (N = 178)

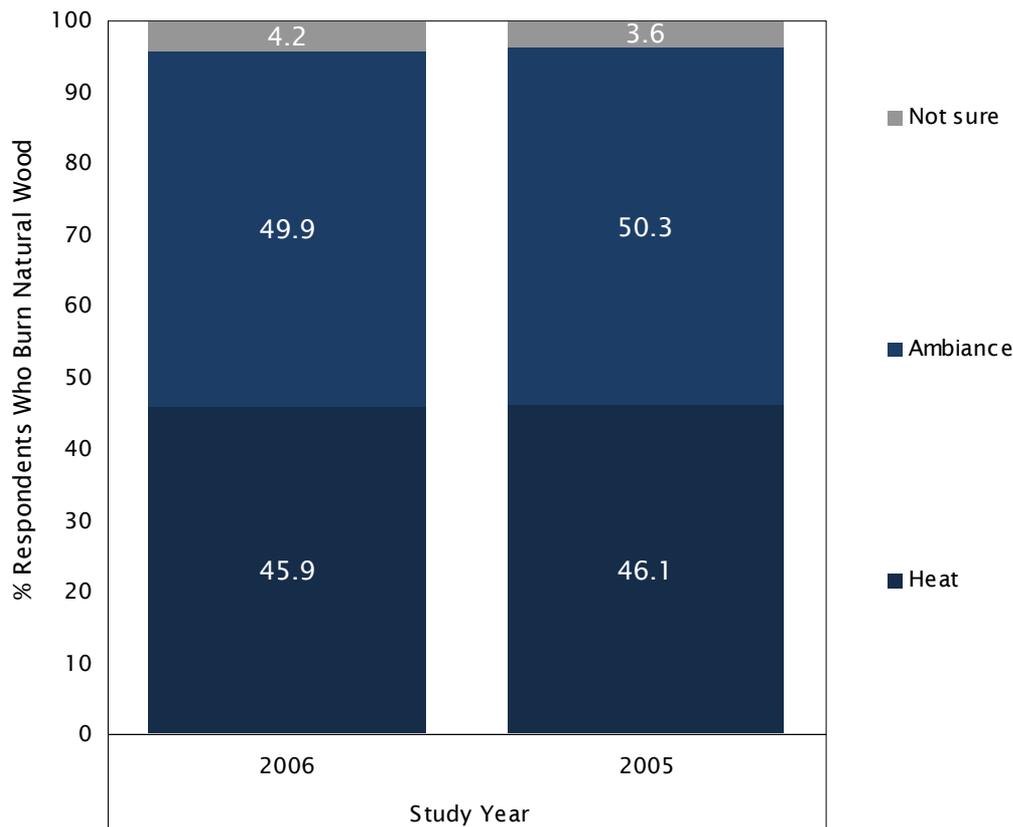


† Statistically significant change ($p < 0.05$) between the 2005 and 2006 studies

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 10 on page 16 shows that residents, as a whole, were rather evenly divided between those who primarily burn for heat (46%) and those who primarily burn for ambiance (50%). The results for 2006 on this question are nearly identical to those found in 2005.

Question 6 *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 10 PRIMARY PURPOSE OF WOOD BURNING: 2005 ~ 2006 (N = 178)



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 or intend to use the device this winter between the months of November through February. As shown in Figure 11 on page 17, 81% of households that contain a wood stove indicated that they would use the device this winter. The rate of use was somewhat lower for pellet stoves (68%) and natural gas/propane fireplaces (72%), and markedly lower for wood-burning fireplaces (56%). The results for the 2005 and 2004 surveys are presented for comparison, but note that wood-burning fireplaces are combined with natural gas/propane devices in the figure for prior years.

Figure 12 on page 17 provides a useful 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. Among all households in the District, 45% own a wood-burning fireplace, pellet stove or wood stove, 19% own a natural gas/propane fireplace, and 26% expected to use their wood-burning device this winter. Ownership (64%) and use (52%) of a wood-burning device was highest in Marin County.

Question 7 Will you use your _____ this winter?

FIGURE 11 HEATING DEVICE USAGE THIS WINTER: 2004 ~ 2006 (WOOD-BURNING FIREPLACE N = 407; GAS FIREPLACE N = 187; PELLET STOVE N = 32; WOOD STOVE N = 39)

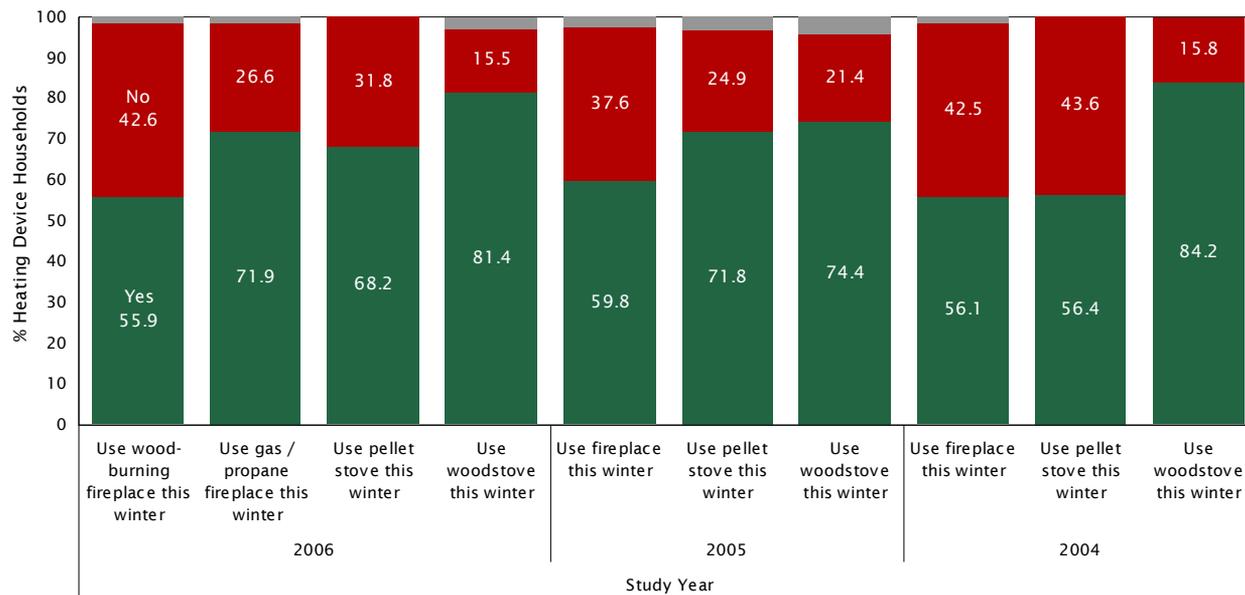
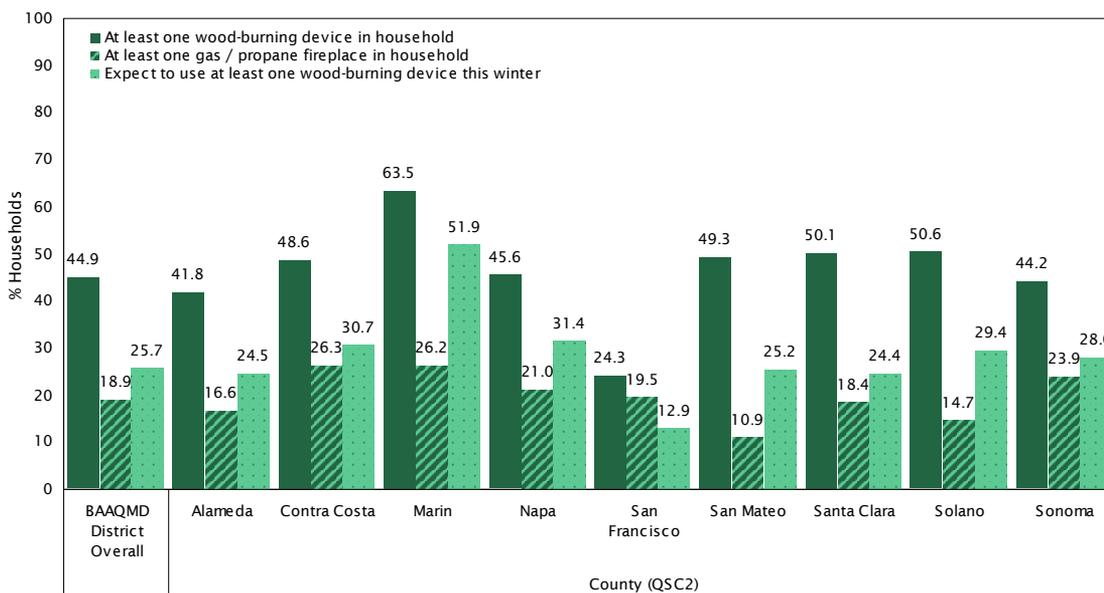


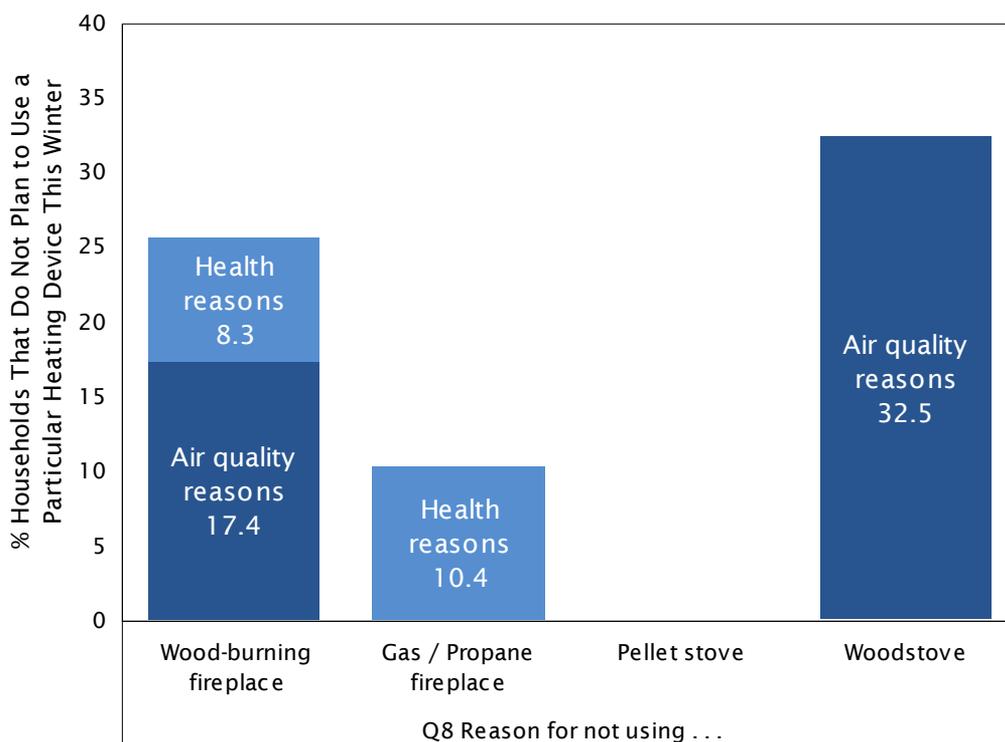
FIGURE 12 WOOD-BURNING DEVICE USAGE THIS WINTER BY COUNTY (N = 988)



Respondents who indicated that they do not expect to use their fireplace, wood stove or pellet stove this winter in Question 7 were next asked to indicate *why* they do not intend to use the device. As shown in Figure 13, approximately 17% 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 8% mentioned a specific health-related reason. Approximately 10% of natural gas/propane fireplace owners mentioned health-related reasons, and one-third (33%) of wood stove owners who did not intend to use their stoves also mentioned air quality as a reason for not using the device this winter. The remaining respondents offered a reason unrelated to air quality or health.

Question 8 *Why do you not expect to use your _____ this winter?*

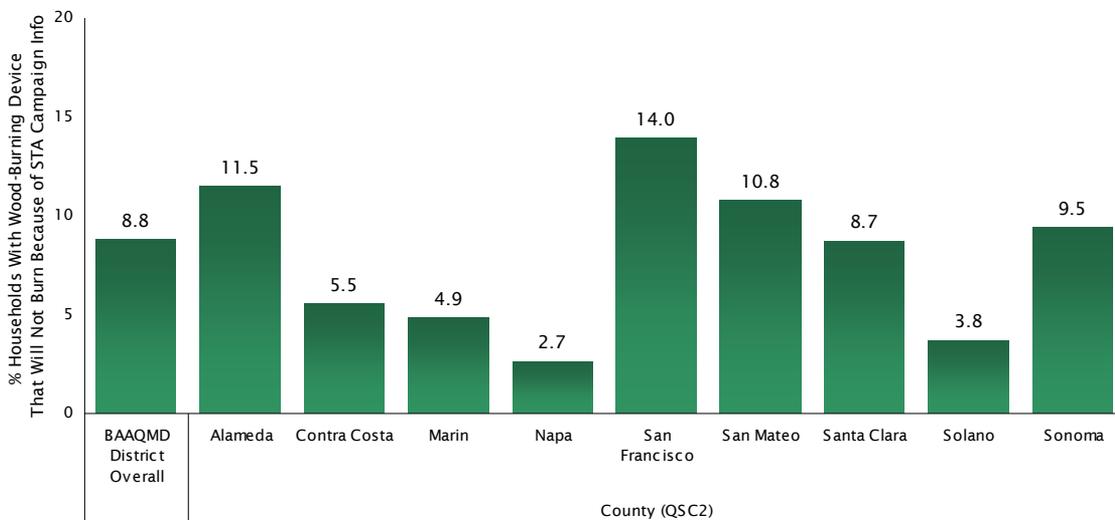
FIGURE 13 REASON FOR NOT USING HEATING DEVICE THIS WINTER (WOOD-BURNING FIREPLACE N = 173; GAS FIREPLACE N = 50; PELLET STOVE N = 10; WOOD STOVE N = 6)



For the interested reader, Figure 14 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 Spare the Air Tonight campaign.⁸ Overall, 9% of households District-wide reported that they would not use their wood-burning heating device at all during the winter due to the campaign. Among the nine member counties, San Francisco had the highest percentage of wood-burning device-owning households that fit this description, whereas Napa had the lowest (3%).

8. 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 Tonight campaign. 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 campaign (see Figure 32 on page 32 for figure on full campaign impacts).

FIGURE 14 NOT BURNING WOOD THIS WINTER BECAUSE OF SPARE THE AIR TONIGHT CAMPAIGN BY COUNTY (N = 441)



SEASONAL WOOD BURNING BEHAVIOR The next series of questions were only asked of respondents who owned at least one wood-burning fireplace, pellet stove or wood stove *and* indicated that they will burn wood during the 2006-2007 winter months.

The first question (Question 9) 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 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 11 asked how many days they expected to burn wood in a typical winter week. The results to all three questions are combined in Figure 15 on page 20.

Overall, just over half (53%) of respondents indicated that they expected to burn wood on a weekly basis, although most (35%) stated that they would burn wood three days or less per week. Overall, 15% indicated that they expected to burn wood two to three times per month, 15% once per month, and 16% expected to burn wood less often than once per month.

When compared to 2005, there was a statistically significant increase in the percentage of households that indicated they expect to burn an average two days per week, as well as a significant increase in the percentage who expect to burn less than once per month (see Table 1 on page 20).

Question 9 How often do you expect to burn wood this winter? At least once per week or less often than that?

Question 10 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 11 In a typical winter week, how many days do you expect to burn wood?

FIGURE 15 FREQUENCY OF WOOD BURNING THIS WINTER (N = 252)

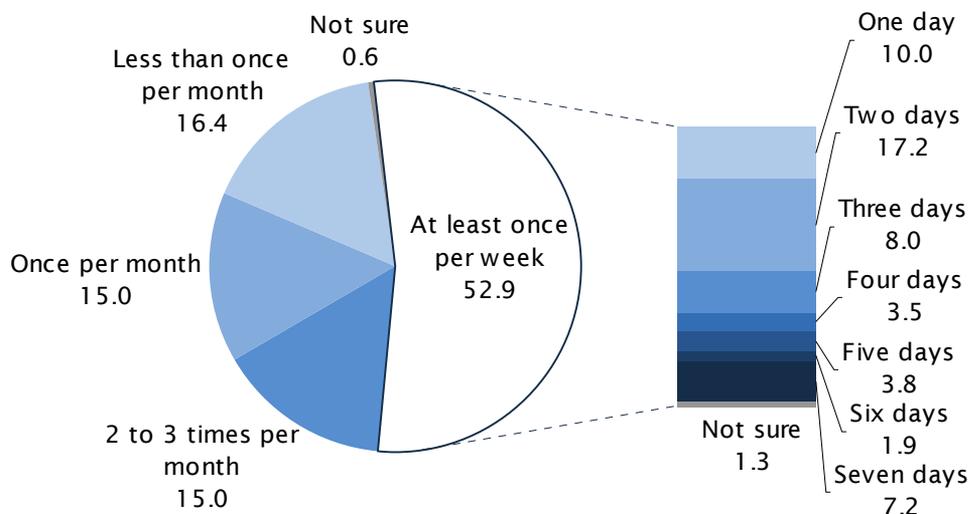


TABLE 1 FREQUENCY OF WOOD BURNING THIS WINTER: 2004 ~ 2006

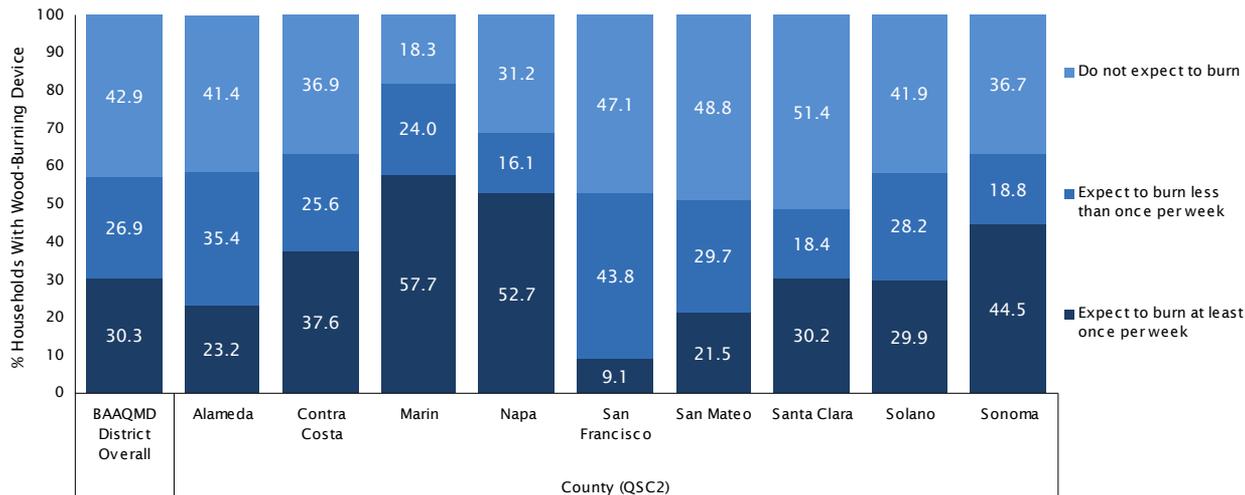
	Study Year		
	2006	2005	2004
At least once per week	52.9%	48.9%	34.2%
One day	10.0%	9.3%	11.2%
Two days	17.2%†	11.5%	5.6%
Three days	8.0%	10.4%	6.1%
Four days	3.5%	4.3%	1.0%
Five days	3.8%	3.2%	2.6%
Six days	1.9%	0.8%	1.5%
Seven days	7.2%	7.2%	6.1%
Not sure # of days	1.3%	2.2%	0.0%
2 to 3 times per month	15.0%	18.5%	28.1%
Once per month	15.0%	17.0%	15.8%
Less than once per month	16.4%†	11.7%	18.4%
Not sure of frequency	0.6%	4.0%	3.6%

† Statistically significant change (p < 0.05) between the 2005 and 2006 studies

Figure 16 provides a useful summary of wood burning behavior among households that own a wood-burning heating device in the District overall, as well as by county. Overall, 30% of households expected to burn wood weekly, 27% expected to burn wood less frequently than once per week, and 43% own a wood-burning heating device but indicated that they do not expect to burn wood this winter. Among the nine member counties, Marin County had the highest percentage of

wood-burning device-owning households that expected to burn wood weekly (58%), whereas San Francisco had the lowest (9%).

FIGURE 16 FREQUENCY OF WOOD BURNING THIS WINTER AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY COUNTY (N = 441)

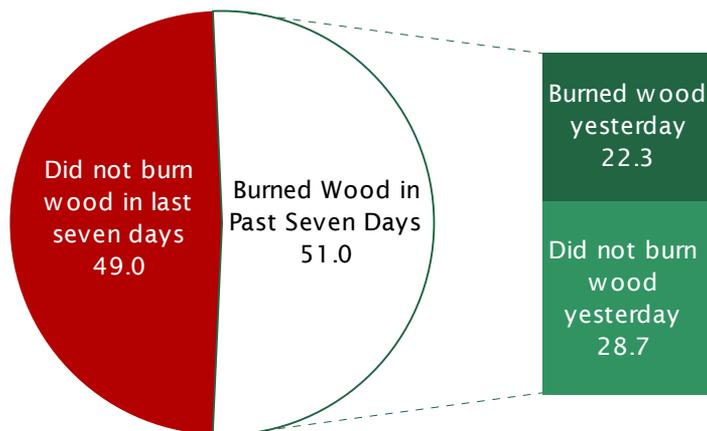


WOOD BURNING BEHAVIOR IN PAST WEEK Respondents were also asked whether they burned wood in the past week and—if yes—if they burned wood the day or evening prior to the interview. The results to these two questions are combined in Figure 17. Fifty-one percent (51%) of respondents whose household includes 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, approximately 22% had burned wood the day prior to the interview.

Question 12 *Did you burn wood in the past seven days?*

Question 13 *Did you burn wood yesterday or last night?*

FIGURE 17 BURNED WOOD IN PAST SEVEN DAYS (N = 252)



When compared to the 2005 season, a significantly higher percentage of households reported that they had burned wood in the week prior to the interview, but the percentage who did not burn the day prior also increased significantly and represents a substantially larger proportion of those who burned in the past week. This is likely an indication of the impact of the 2006 Spare the Air Tonight campaign, as the vast majority of the 2006 interviews were conducted the day after a Spare the Air Tonight episode. In 2005, there were no Spare the Air Tonight episodes, whereas there were 30 episodes in 2006.

TABLE 2 BURNED WOOD IN PAST SEVEN DAYS 2004 ~ 2006

	Study Year		
	2006	2005	2004
Burned wood in past seven days	51.0%†	43.0%	32.1%
Burned wood yesterday	22.3%	21.7%	12.8%
Did not burn wood yesterday	28.7%†	21.1%	19.4%
Not sure of burning yesterday	0.0%	0.2%	0.0%
Did not burn wood in last seven days	49.0%†	56.6%	67.3%
Not sure of burning in past seven days	0.0%	0.4%	0.5%

† Statistically significant change (p < 0.05) between the 2005 and 2006 studies

The following two figures show the percentage of wood-burning device-owning households that burned wood in the seven days prior to the interview (Figure 18) and on the day prior to the interview (Figure 19) for the District as a whole, as well as by the nine member counties. Consistent with prior measures of wood burning frequency, Marin and Napa County residents reported the highest rates of wood burning behavior.

FIGURE 18 BURNED WOOD IN PAST SEVEN DAYS AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY COUNTY (N = 441)

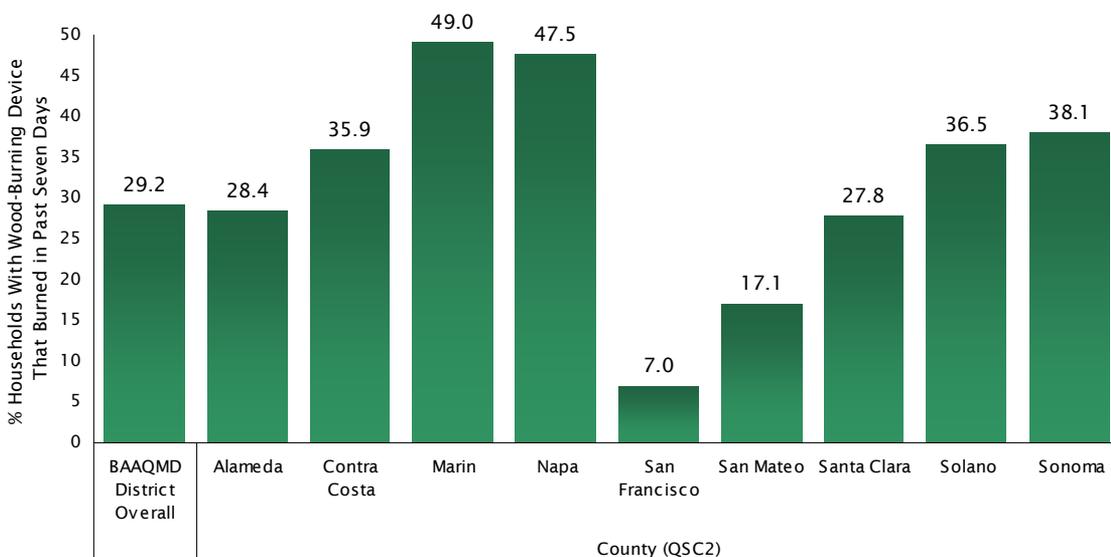
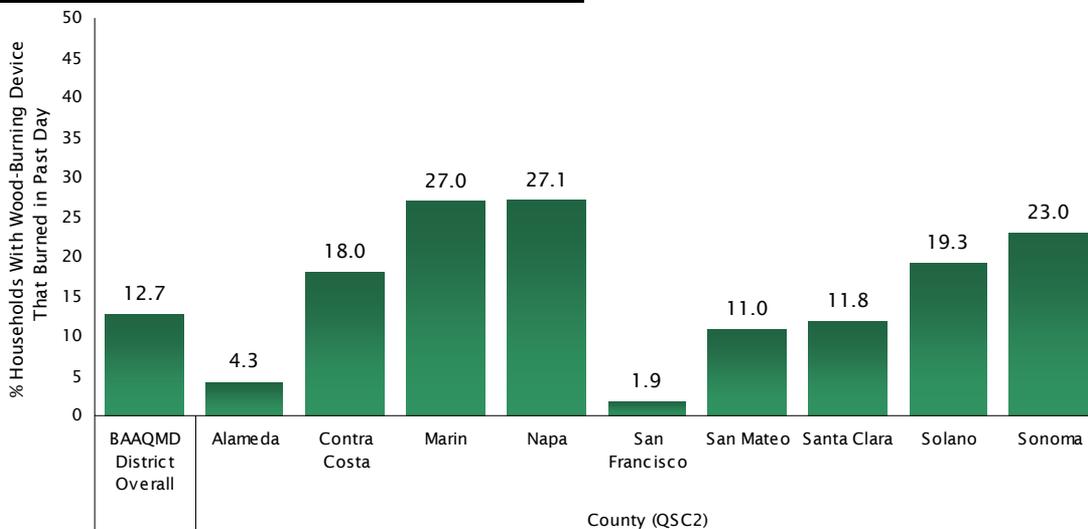


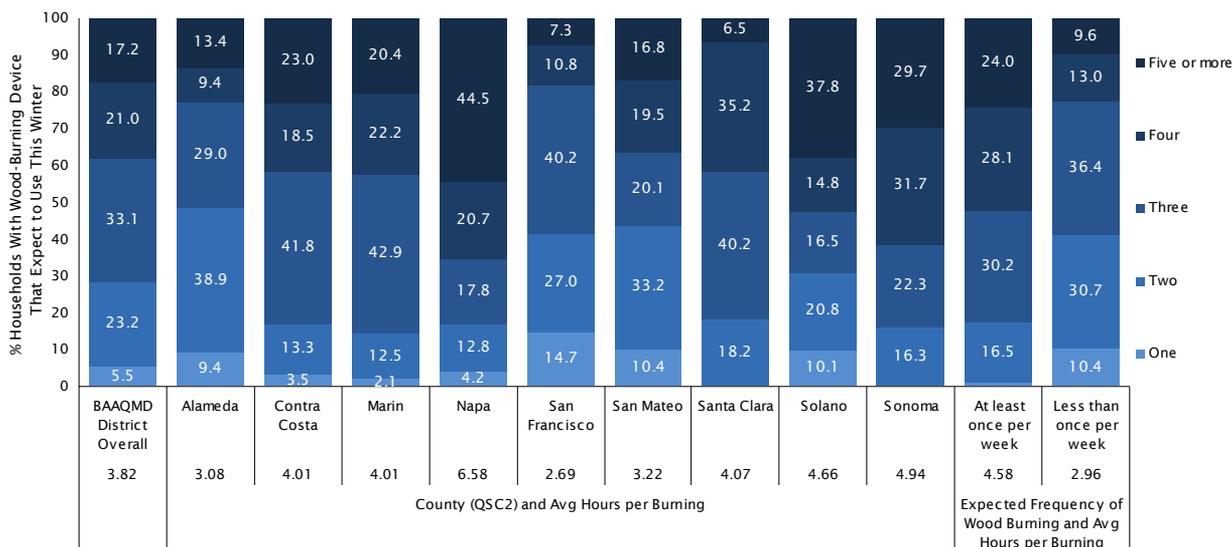
FIGURE 19 BURNED WOOD YESTERDAY AMONG ALL WOOD-BURNING DEVICE HOUSEHOLDS BY COUNTY (N = 441)



DURATION & VOLUME OF WOOD BURNING Questions 14 and 15 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 that they burn wood. In terms of hours, respondents were rather evenly split between those who burn at least four hours on a typical day (38%), those who burn approximately three hours per day (33%), and those who burn less than three hours (29%). The average duration among all respondents who received this question was 3.82 hours. Among the nine member counties, respondents from Napa County reported the highest average hours burned per burn day at 6.58 hours (Figure 20). Frequent burners also reported a longer duration (4.58 hours) for a typical burn day when compared to those who burn less than once per week (2.96 hours).

Question 14 *In a typical day that you burn wood, how many hours of the day do you have a fire burning?*

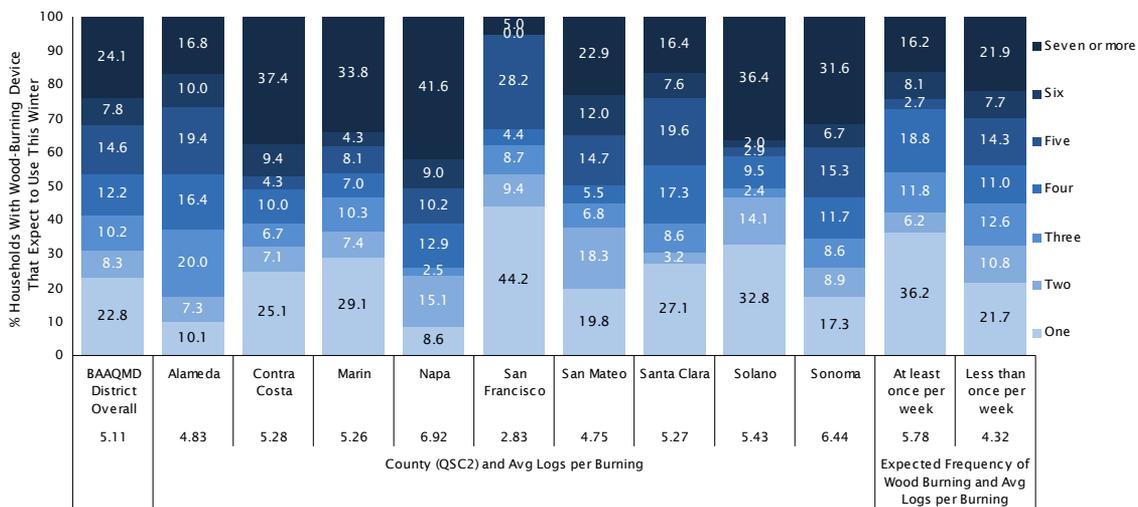
FIGURE 20 DISTRIBUTION AND AVERAGE HOURS OF BURNING IN TYPICAL DAY OF WOOD-BURNING BY COUNTY & EXPECTED FREQUENCY OF WOOD BURNING (N = 252)



In terms of volume, respondents were rather evenly split between those who burn one or two logs per typical burn day (31%), those who estimated that they burn three to five logs (37%), and those who reported burning more than five logs per day (32%). The average number of logs reported per burn day was 5.11 (Figure 21). As shown in Figure 21, counties that reported longer than average burn durations on a typical burn day also tended to report higher than average volumes of logs burned per burn day. Frequent burners also reported a higher number of logs burned (5.78) per burn day when compared to their counterparts (4.32) who burn less frequently than once per week.

Question 15 *In a typical day that you burn wood, how many logs do you burn throughout the entire day?*

FIGURE 21 DISTRIBUTION AND AVERAGE NUMBER OF LOGS BURNED IN TYPICAL DAY OF WOOD-BURNING BY COUNTY & EXPECTED FREQUENCY OF WOOD BURNING (N = 244)



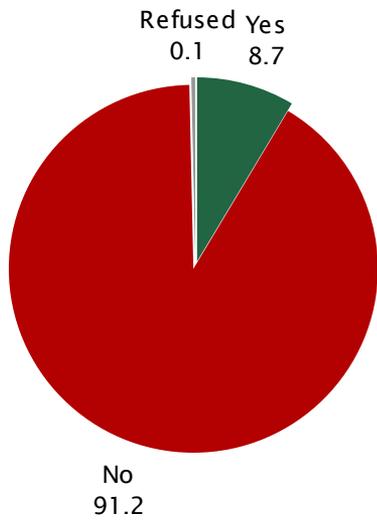
OUTDOOR & OFF-SEASON BURNING

Whereas the bulk of the questions on wood burning focused on indoor wood burning during the winter season, respondents were also asked about their wood burning behavior during non-winter months and in outdoor settings. This line of inquiry was administered to *all* respondents—not just those with a heating device in the home—in order to capture wood burning that occurs at campfires and beaches, in chimineas and at other locations in addition to their home.

OUTDOOR FIREPLACE, FIREPIT OR CHIMINEA The first question in this series simply asked respondents if they possess an outdoor fireplace, firepit or chiminea that they have used to burn wood in the past 12 months. Overall, 9% of respondents answered Question 37 in the affirmative (Figure 22).

Question 37 *Do you have an outdoor fireplace, firepit or chiminea that you've used to burn wood in the past 12 months?*

FIGURE 22 OUTDOOR WOOD-BURNING DEVICE USED IN PAST 12 MONTHS (N = 988)



When compared to their respective counterparts, ownership and use of an outdoor fireplace, firepit or chiminea was most commonly reported by residents in Marin County (Figure 23), those who reside in homes that were built between 11 and 20 years ago, and households that earn between \$75,000 and \$99,999, or more than \$200,000 per year (see Figure 24 on page 26).

FIGURE 23 OUTDOOR WOOD-BURNING DEVICE USED IN PAST 12 MONTHS BY COUNTY (N = 988)

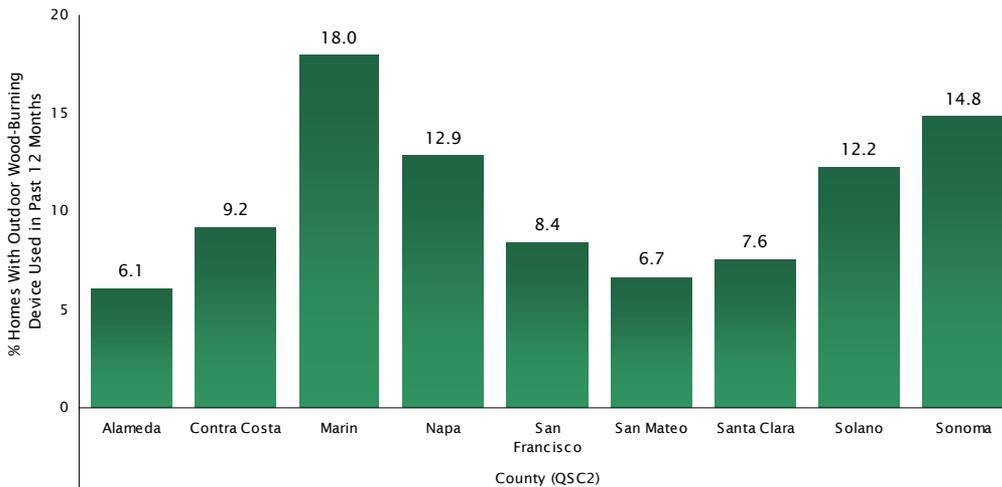
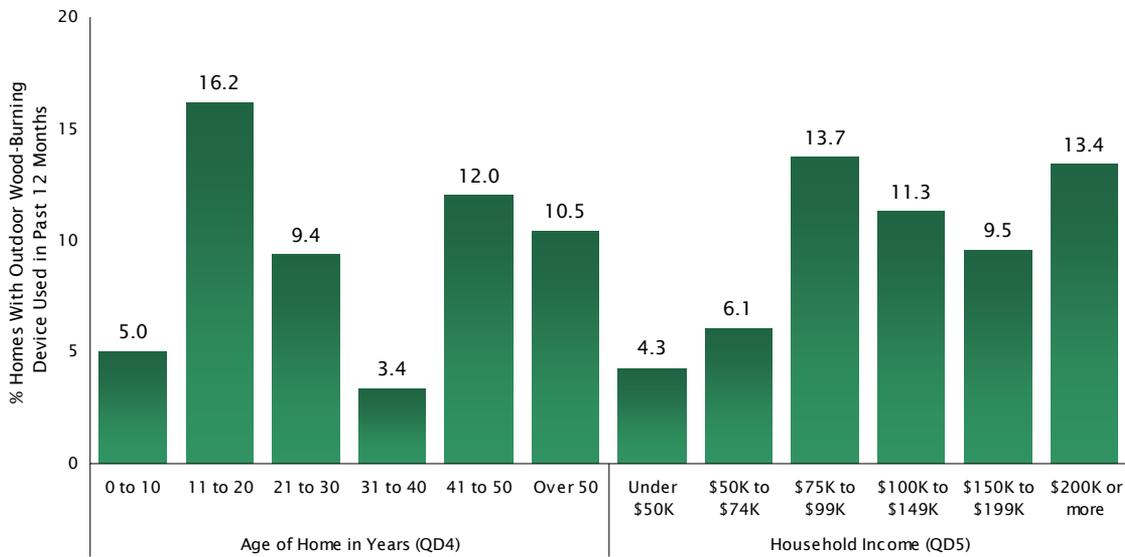


FIGURE 24 OUTDOOR WOOD-BURNING DEVICE USED IN PAST 12 MONTHS BY AGE OF HOME IN YEARS & HOUSEHOLD INCOME (N = 988)



OFF-SEASON BURNING The vast majority of households (85%) reported that they do *not* burn wood in non-winter months. Figure 25 also displays the percentage of respondents that indicated they do burn wood in each non-winter month overall. The percentage of households that burn wood in non-winter months was highest in Sonoma County (22%), and lowest in San Mateo County (7%), as shown in Figure 26 on page 27.

Question 38 *Do you ever burn wood indoors or outdoors in non-winter months, between March and October?*

FIGURE 25 NON-WINTER WOOD BURNING (N = 988)

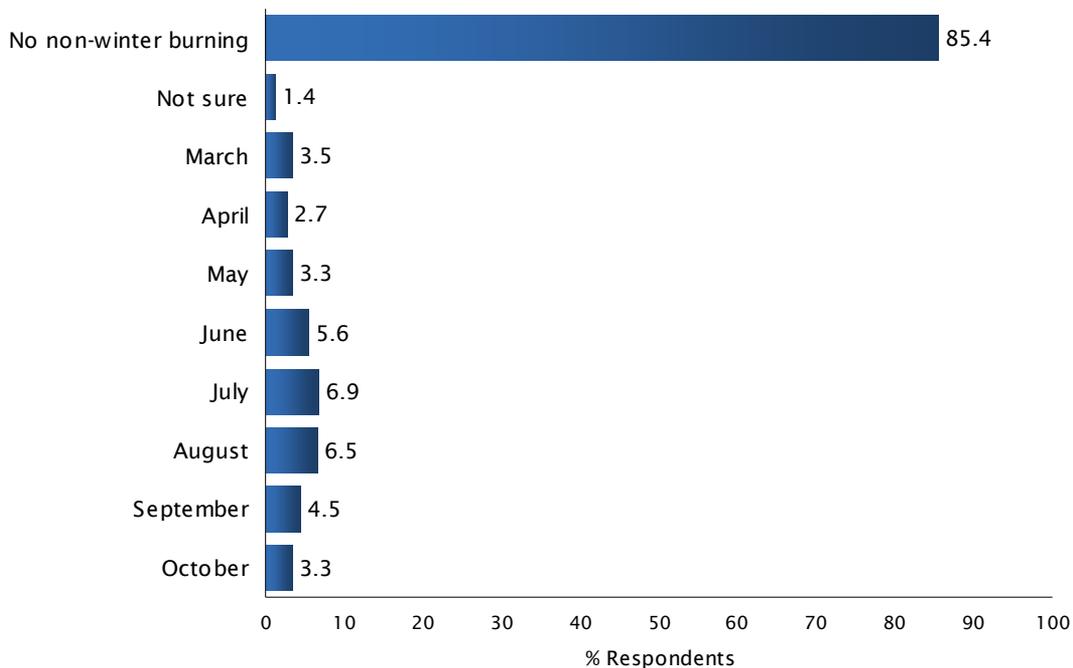
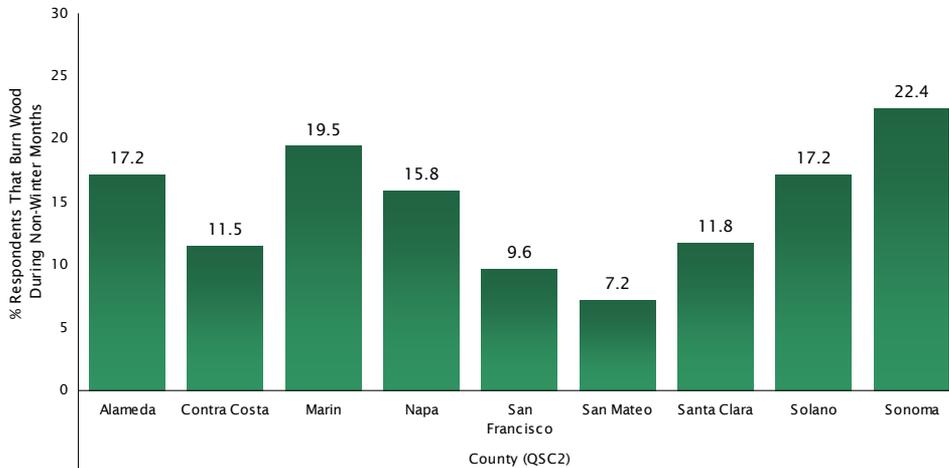


FIGURE 26 NON-WINTER WOOD BURNING BY COUNTY (N = 988)



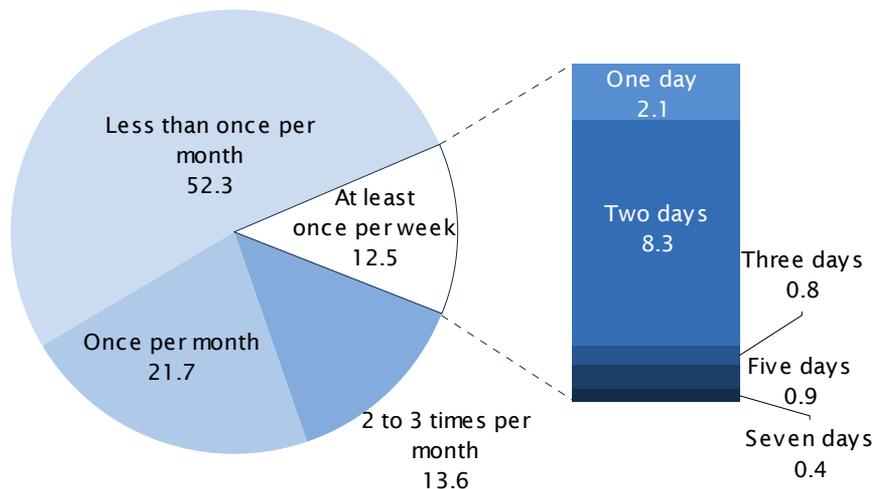
The next series of questions were only asked of respondents who indicated that they burn wood during non-winter months. The first question (Question 39) asked each respondent how often they burn wood in non-winter months—at least once per week or less often? Respondents who indicated that they burn wood less often than once per week were next asked to be more specific as to how often they burn wood in non-winter months—two to three times per month, once per month, or less often than once per month? For respondents who indicated that they burn wood weekly during non-winter months, Question 41 asked how many days they burn wood in a typical non-winter week. The results to all three questions are combined in Figure 27.

Question 39 *How often do you burn wood in non-winter months? At least once per week or less often than that?*

Question 40 *In non-winter months, would you say that you burn wood about two to three times per month, once per month, or less often than once per month?*

Question 41 *In a typical week during non-winter months, how many days do you expect to burn wood?*

FIGURE 27 FREQUENCY OF WOOD BURNING DURING NON-WINTER MONTHS (N = 130)



Among households that reported burning wood in non-winter months, 13% indicated that they burn wood on a weekly basis, although most (10%) of these respondents stated that they would burn wood two days or less per week in non-winter months. Overall, 14% indicated that they burn wood two to three times per month, 22% once per month, and 52% burn wood less often than once per month in the off-season.

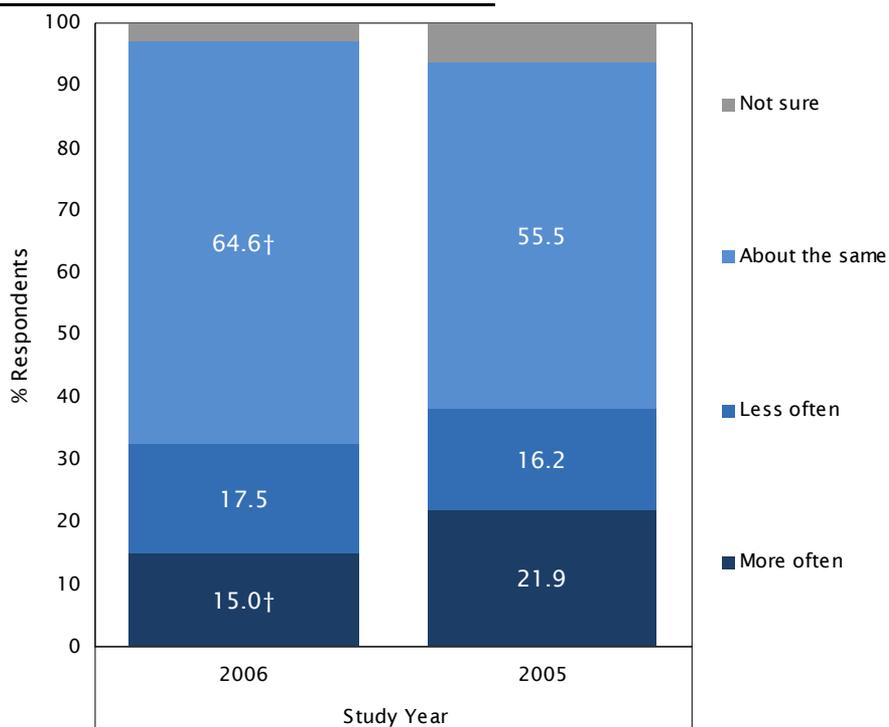
CHANGES IN WOOD BURNING BEHAVIOR

Having measured respondents' basic wood burning behavior, the survey next focused on whether respondents had made changes in their wood burning behavior during the 2006-2007 winter season in response to the Spare the Air Tonight campaign or other factors such as the higher cost of natural gas and propane this season.

SEASONAL CHANGES IN WOOD BURNING BEHAVIOR The first question in this series simply asked the respondent if they expected that they would burn wood more frequently, less frequently, or at about the same frequency as the prior winter season. Overall, 65% 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 (Figure 28), which is a significant increase when compared to the 2005 results. Approximately 18% expected to burn less often this season, whereas 15% expected to burn more frequently. The percentage that expected to burn more frequently also decreased significantly when compared to 2005. Among the nine member counties, Contra Costa contained the highest proportion of households that expected to burn more frequently this season, whereas San Francisco contained the largest percentage who expected to burn less frequently (see Figure 29 on page 30).

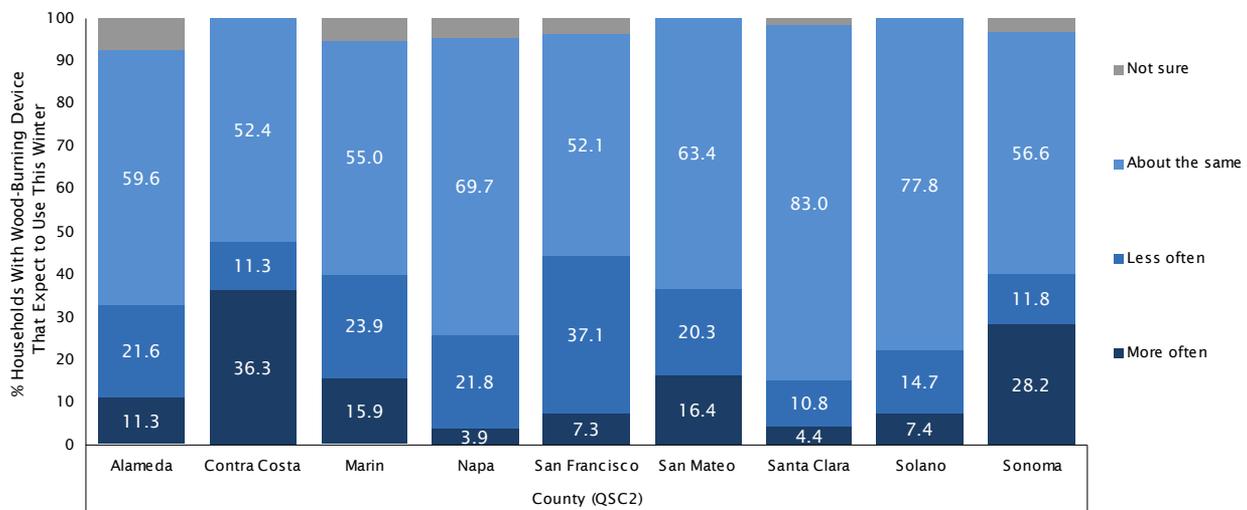
Question 16 *This winter, do you expect that you will burn wood more often, less often, or about the same frequency as you did last winter?*

FIGURE 28 EXPECTED FREQUENCY OF WOOD BURNING THIS WINTER COMPARED TO LAST WINTER: 2005 ~ 2006 (N = 252)



† Statistically significant change ($p < 0.05$) between the 2005 and 2006 studies

FIGURE 29 EXPECTED FREQUENCY OF WOOD BURNING THIS WINTER COMPARED TO LAST WINTER BY COUNTY (N = 252)



EPISODIC CHANGES IN WOOD BURNING BEHAVIOR 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 next 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 Spare the Air Tonight Campaign, was changed in 2004 from prior surveys. Previous surveys first introduced the Spare the Air Tonight 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 campaign’s impact. To more accurately measure reductions in wood burning that can be attributed to the campaign, the 2004, 2005 and 2006 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 Campaign.

As shown in Figure 30, 37% of respondents who have a wood-burning fireplace, wood stove and/or pellet stove *and* expected to burn wood during the 2006-2007 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, 10% specifically mentioned the Spare the Air campaign and an additional 6% offered an air quality or health-related reason.⁹ For the interested reader, the proportion of respondents who mentioned the campaign 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 31 on page 31.

9. Among those who refrained from burning wood due to Spare the Air Tonight, 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 3.92.

Question 17 *Were there occasions this winter when you normally would have burned wood, but decided not to?*

Question 18 *Why did you decide not to burn wood on these occasions?*

FIGURE 30 CHOSE NOT TO BURN THIS WINTER (N = 252)

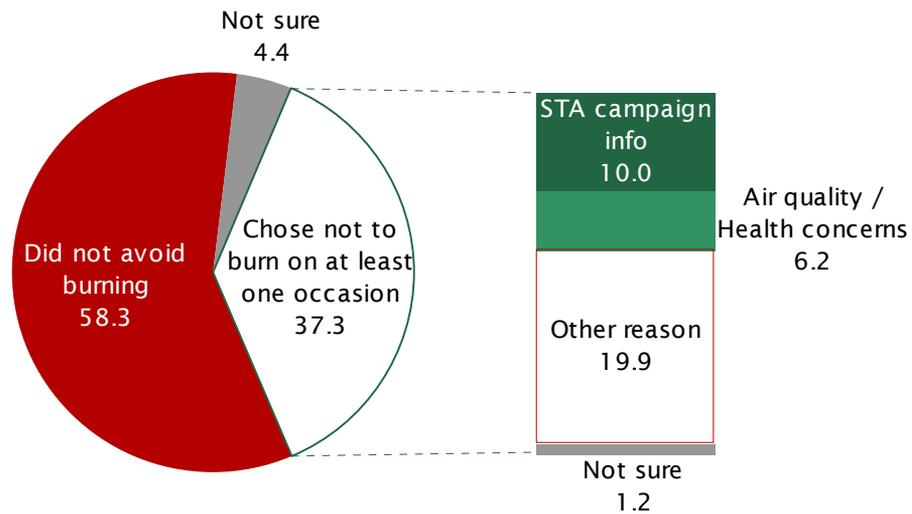
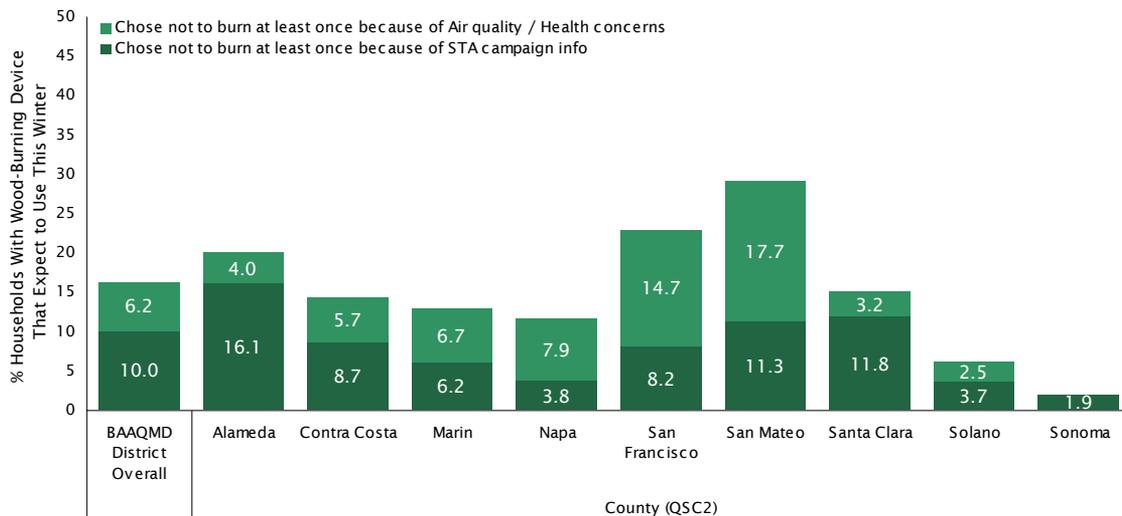


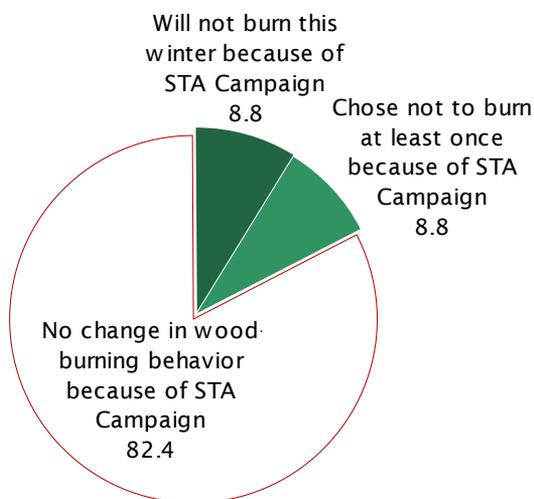
FIGURE 31 CHOSE NOT TO BURN THIS WINTER BECAUSE OF SPARE THE AIR TONIGHT CAMPAIGN INFO OR AIR QUALITY / HEALTH CONCERNS BY COUNTY (N = 252)



CAMPAIGN IMPACTS ON WOOD BURNING To estimate the proportion of adults in the District who reduced the amount of wood that they burned during the winter season in response to the campaign, 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 since they could not respond to the campaign by reducing their wood burning behavior. Respondents who

chose not to burn wood *at all* during the winter (Question 7), did so because of air quality or health related reasons (Question 8), *and* were aware of the Spare the Air Tonight Program (Question 34) 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 17), did so because of the campaign and/or for air quality/health reasons (Question 18), *and* were aware of the Spare the Air Tonight Program (Question 34).

FIGURE 32 SPARE THE AIR REDUCERS (N = 441)



Among all households with a wood-burning fireplace, pellet stove or wood stove, nearly 9% chose not to burn *at all* during the winter season because of the Spare the Air Tonight campaign, and an additional 9% refrained from burning on at least one occasion for the same reason. Collectively, the Spare the Air Tonight campaign influenced nearly 18% of households to reduce their wood burning during the 2006-2007 winter season (Figure 32).

Table 3 shows that of the 441 respondents in the survey who were eligible to respond to the campaign, 78 (17.6%)

reduced their wood burning behavior on at least one occasion during the 2006-2007 winter in response to the Spare the Air Tonight Program.¹⁰ This represents 273,090 households out of the estimated 1,094,466 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 Spare the Air Tonight reducer households this season was between 14.01% and 21.11%.

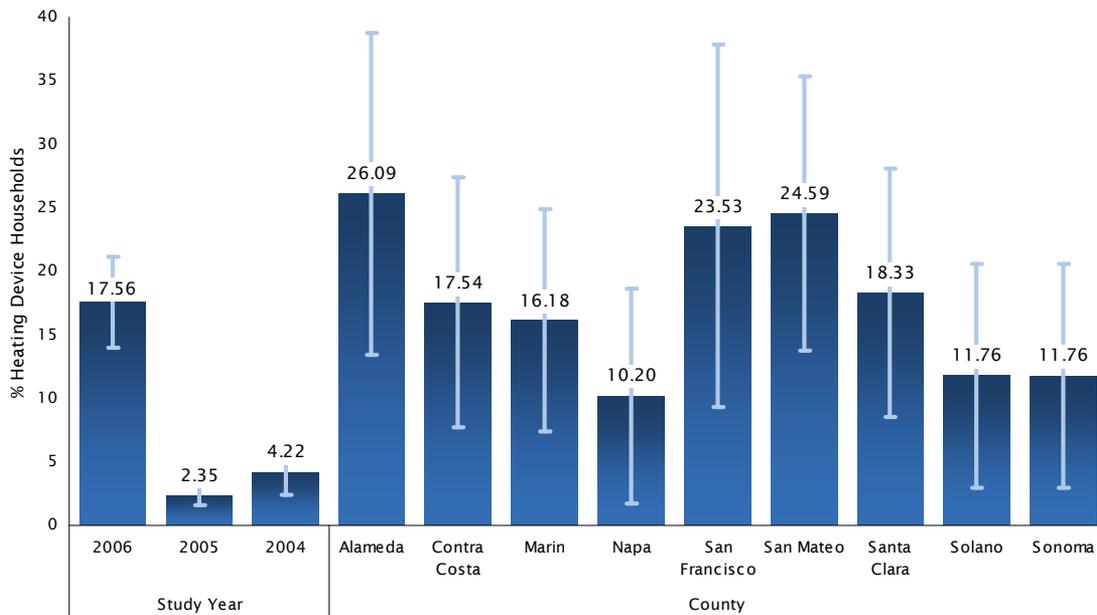
TABLE 3 SPARE THE AIR REDUCERS: CONFIDENCE INTERVAL

Winter Spare the Air Tonight Reducers	
Universe Estimate (households with heating device)	1,094,466
Sample Size (surveyed households with heating device)	441
STA Reducers	78
Non-STA Reducers	364
Proportion of STA Reducers	17.56%
Proportion of Non-STA Reducers	82.44%
Maximum Margin of Error (95% confidence)	3.55%
Confidence Interval for Proportion of Winter STA Reducers	Lower Bound 14.01%
	Upper Bound 21.11%

10. The survey included a follow-up question (Question 19) which asked respondents who refrained from burning wood for campaign-related reasons (Question 18) how many times they refrained from burning wood for air quality or health-related reasons during the winter season. The average response was 3.92 times, although the small sample size for this question means that the statistical margins of error around the estimate are large. Moreover, respondents 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 33 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 Spare the Air Tonight Program by study year (2006, 2005 and 2004), as well as by county for 2006. For reference, the confidence intervals are also shown to provide a sense for the reliability of the estimates.¹¹ The most striking result in the figure is the dramatically larger impact that the Spare the Air Tonight campaign had in 2006 when compared to the prior two years. Whereas 2.35% and 4.22% of eligible households reduced their wood burning in response to the campaign in 2005 and 2004, respectively, the corresponding value in 2006 was 17.6%—an increase of over 15% in the past year.

FIGURE 33 SPARE THE AIR REDUCERS BY STUDY YEAR & COUNTY SHOWING CONFIDENCE INTERVALS (N = 441)



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

RECALL AND AWARENESS OF SPARE THE AIR TONIGHT MESSAGING

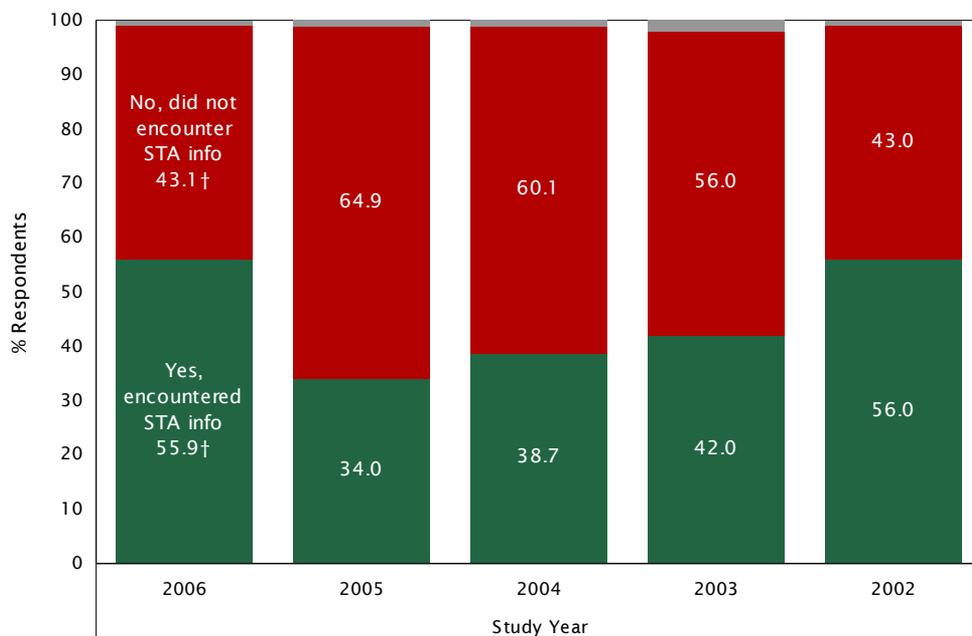
Although the ultimate goal of the Spare the Air Tonight Campaign is to persuade individuals to reduce the amount of wood that they burn and to replace wood-burning devices with cleaner alternatives, there are a series of related objectives which must be met in order for this to occur. For example, regardless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

RECALL EXPOSURE TO SPARE THE AIR MESSAGING Accordingly, a series of questions was asked of respondents about their recall of Spare the Air Tonight 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 Spare the Air Tonight, poor air quality, or requests not to use your fireplace, pellet stove or wood stove?*

Figure 34 presents the results to this question for the study years 2002 through 2006. In 2006, 56% of respondents recalled being exposed to news stories, advertisements or public service announcements related to the Spare the Air Tonight Program during the winter months. Recalled exposure was significantly higher in 2006 when compared to recent prior winters, which is likely a reflection of the greater number of Spare the Air Tonight episodes this season.

Question 20 *During this winter, have you heard, read, or seen any news stories, advertisements, or public service announcements about Spare the Air Tonight, poor air quality, or requests not to use your fireplace, pellet stove, or wood stove?*

FIGURE 34 ENCOUNTERED SPARE THE AIR TONIGHT INFORMATION: 2002 ~ 2006 (N = 988)



† Statistically significant change ($p < 0.05$) between the 2005 and 2006 studies

For the interested reader, Figures 35 and 36 display the percentage of respondents who recalled being exposed to news stories, advertisements or public service announcements related to the Spare the Air Tonight Program during the winter months by county, gender, age and household income. When compared to their respective counterparts, those who reside in Marin County, females, those 55 years of age or older, and those who enjoy annual family incomes of \$100,000 to \$149,999 were the most likely to recall being exposed to the Spare the Air Tonight Program.

FIGURE 35 ENCOUNTERED SPARE THE AIR TONIGHT INFORMATION BY COUNTY (N = 988)

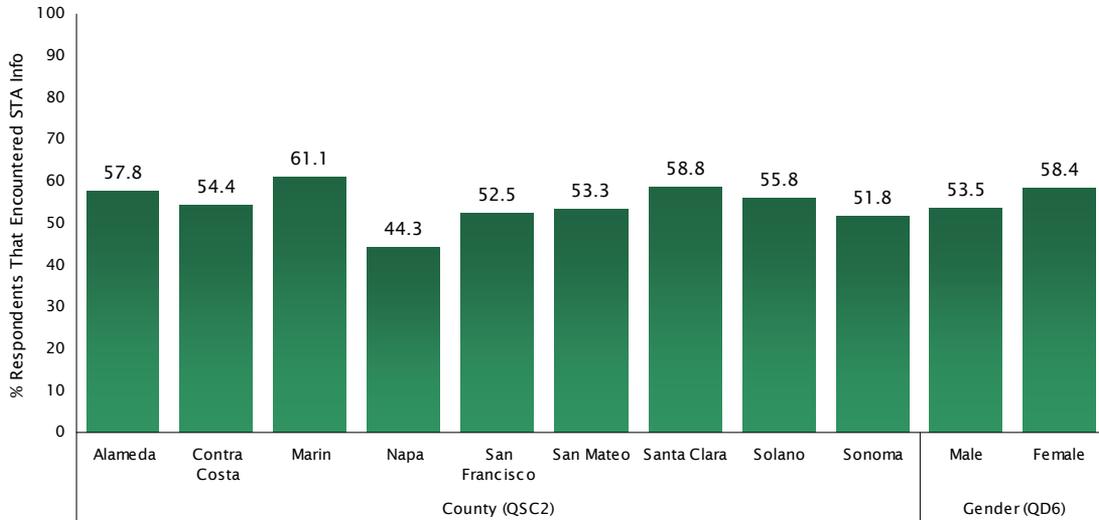
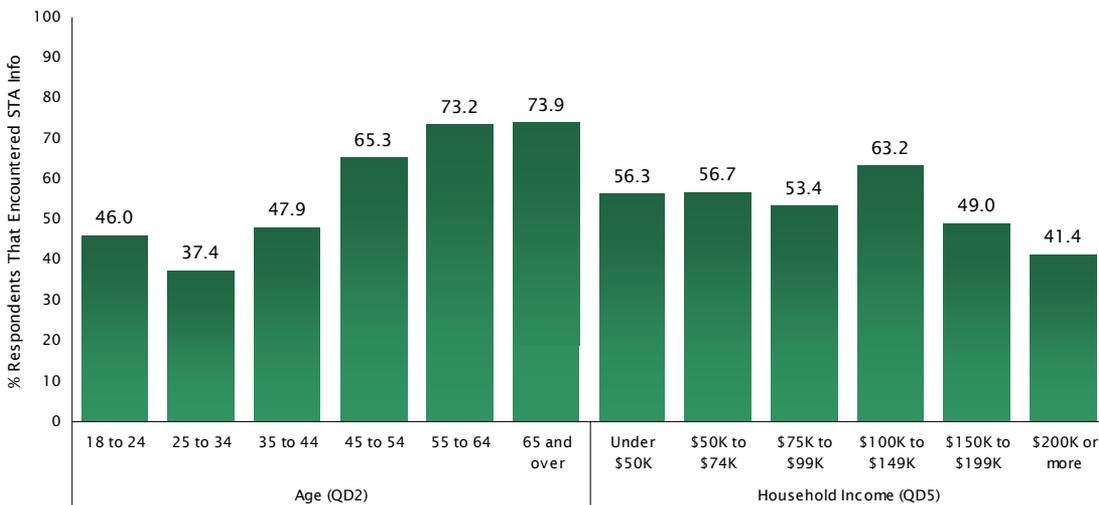


FIGURE 36 ENCOUNTERED SPARE THE AIR TONIGHT INFORMATION BY AGE & HOUSEHOLD INCOME (N = 988)

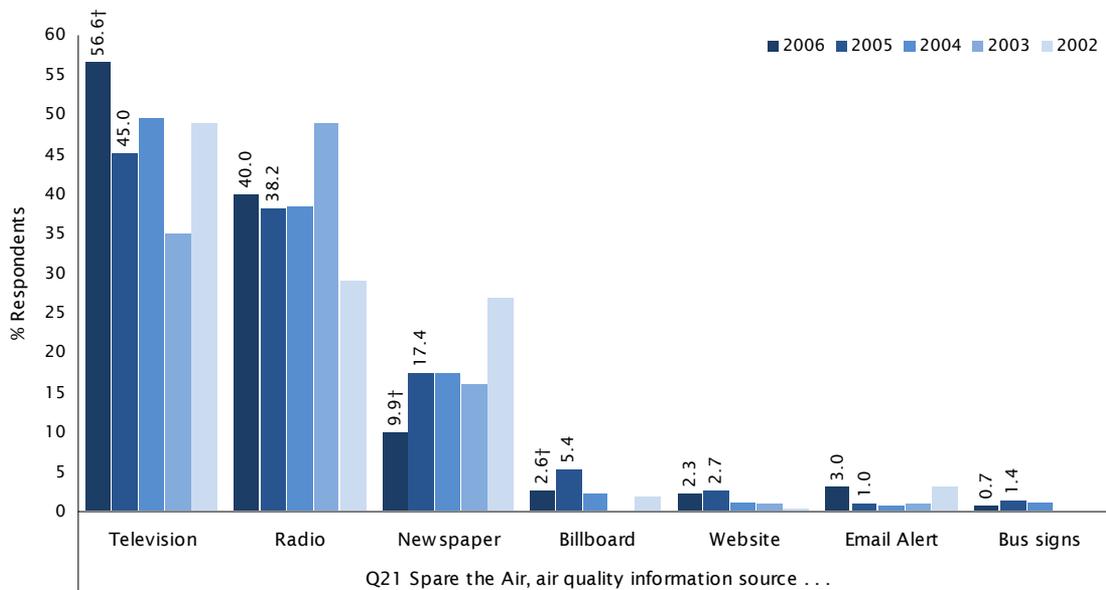


INFORMATION SOURCE Those who indicated that they recalled hearing, reading, or seeing Spare the Air Tonight related information during the winter were next asked where they obtained the information. Multiple responses to the question were allowed, so the percentages shown in Figure 37 represent the percentage of respondents who mentioned a particular source and thus add to more than 100%. Because this question was asked in an identical manner in past surveys dating back to 2002, the results from these surveys are also included in Figure 37 for comparison.

As in the previous surveys, the most popular methods of obtaining information related to Spare the Air Tonight and air quality during the winter of 2006-2007 were television (57%) and radio (40%). Within these two sources, however, the trend toward a greater reliance on television continued as there was a statistically significant increase in the proportion of respondents who cited television as their source for Spare the Air Tonight related messages. Newspapers, meanwhile, declined significantly as a source for air quality messages, from 17% in 2005 to 10% in 2006. No other single sources were mentioned by at least 10% of respondents, respectively.

Question 21 *Where did you see or hear the news story, advertisement or public service announcement?*

FIGURE 37 SOURCE FOR SPARE THE AIR TONIGHT INFORMATION: 2002 ~ 2006 (N = 552)



AWARE OF SPARE THE AIR DAY The final question in this series asked all respondents who received the interview on the day after a Spare the Air Tonight episode if, prior to taking the survey, they were aware that a Spare the Air Tonight advisory had been issued the day before. As shown below in Figure 38 on page 37, 16% of respondents answered this question in the affirmative. When compared to their respective counterparts, awareness was highest among Marin County residents, females, seniors, and individuals whose households earn between \$75,000 and \$99,999 annually (see Figures 39 and 40).

Question 22 Prior to taking this survey, were you aware that there was a “Spare the Air Tonight” advisory yesterday?

FIGURE 38 AWARE OF SPARE THE AIR TONIGHT ADVISORY (N = 762)

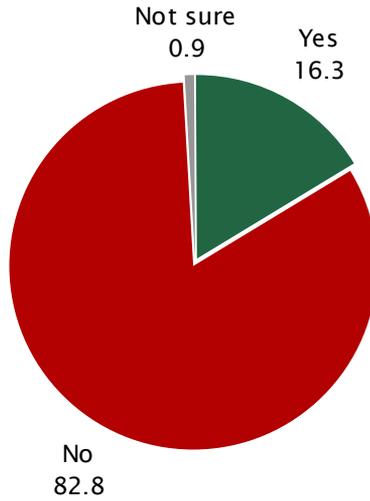


FIGURE 39 AWARE OF SPARE THE AIR TONIGHT ADVISORY BY COUNTY & GENDER (N = 762)

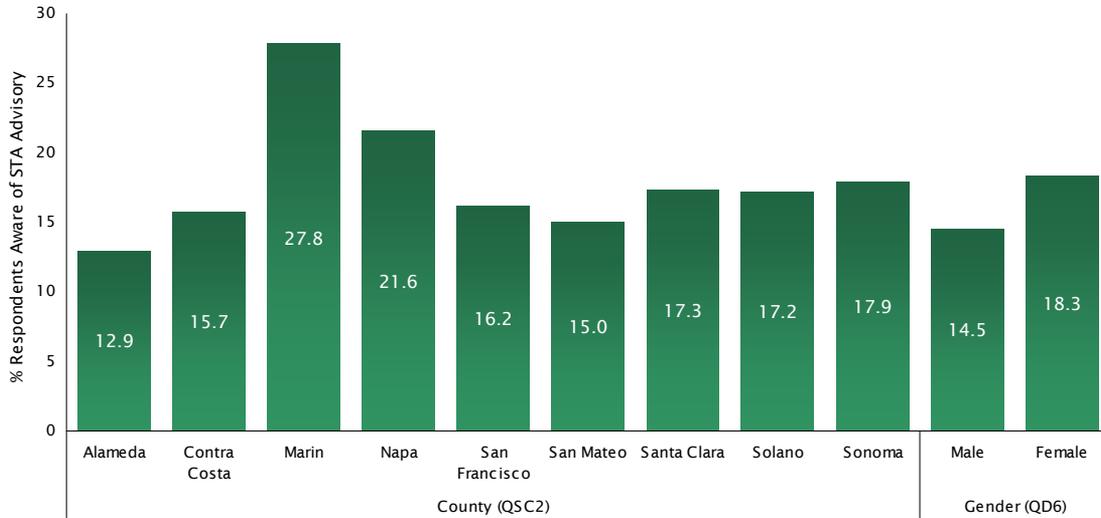
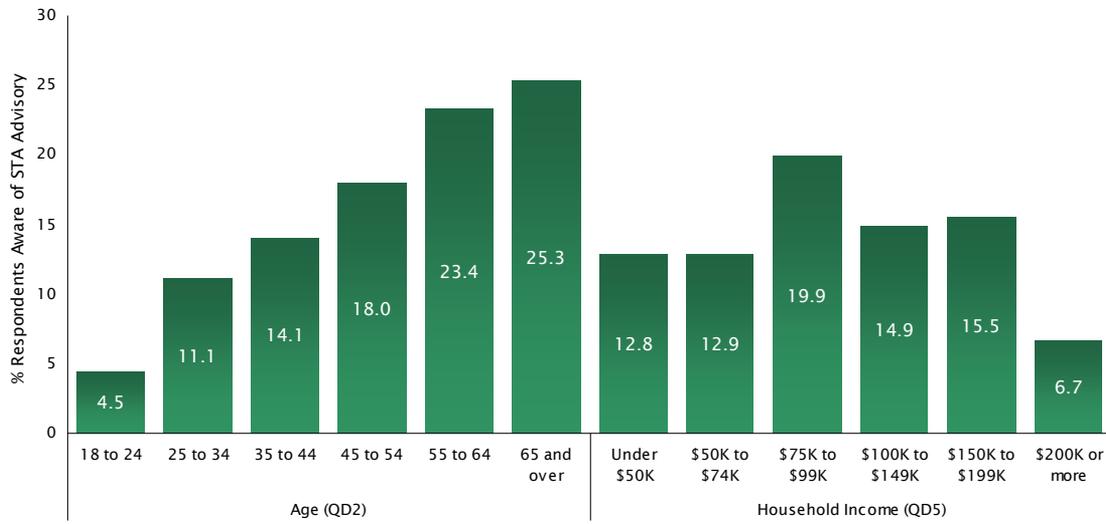


FIGURE 40 AWARE OF SPARE THE AIR TONIGHT ADVISORY BY AGE & HOUSEHOLD INCOME (N = 762)



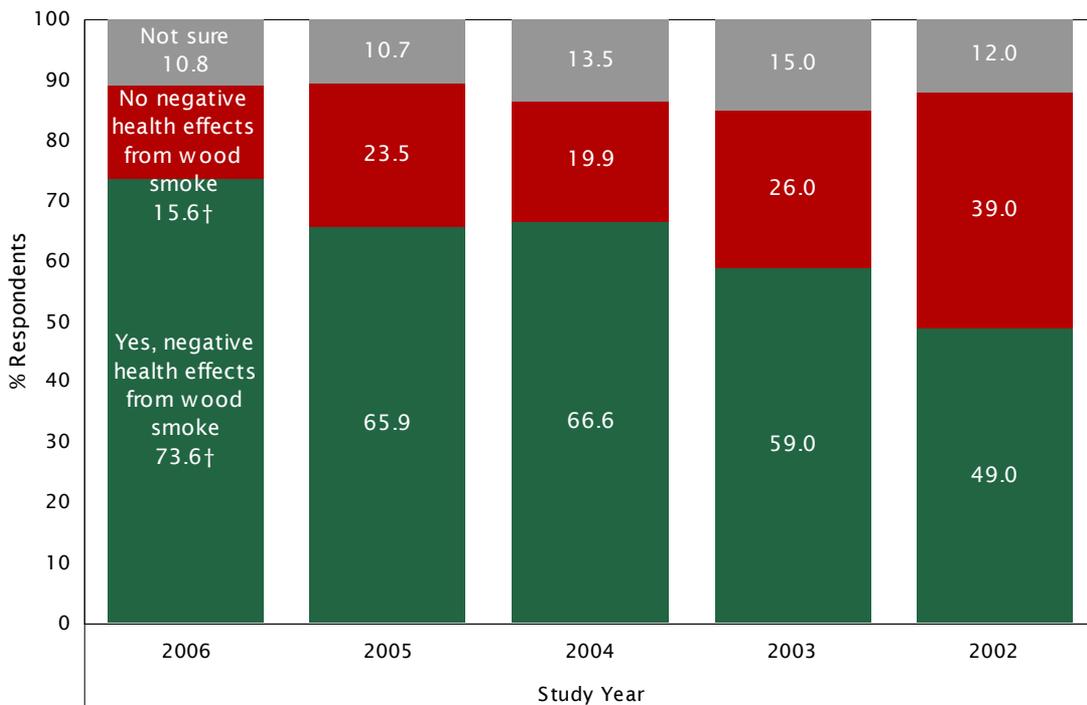
ATTITUDES ABOUT WOOD SMOKE

In addition to changing wood burning behavior, one of the goals of the Spare the Air Tonight 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 simply asked the respondent whether they think there are any negative health effects associated with breathing wood smoke. As shown in Figure 41, approximately three-quarters (74%) of adults in the Bay Area do perceive wood smoke to have negative health impacts. Moreover, public opinion on this matter has changed substantially in the past five years—in part due to the Spare the Air Tonight Program. The proportion of adults that perceive wood smoke to have negative health impacts has increased by nearly 25% since 2002.

Question 23 *Do you think there are any negative health effects associated with breathing wood smoke?*

FIGURE 41 PERCEIVE NEGATIVE HEALTH EFFECTS ASSOCIATED WITH WOOD SMOKE BY STUDY YEAR (N = 988)



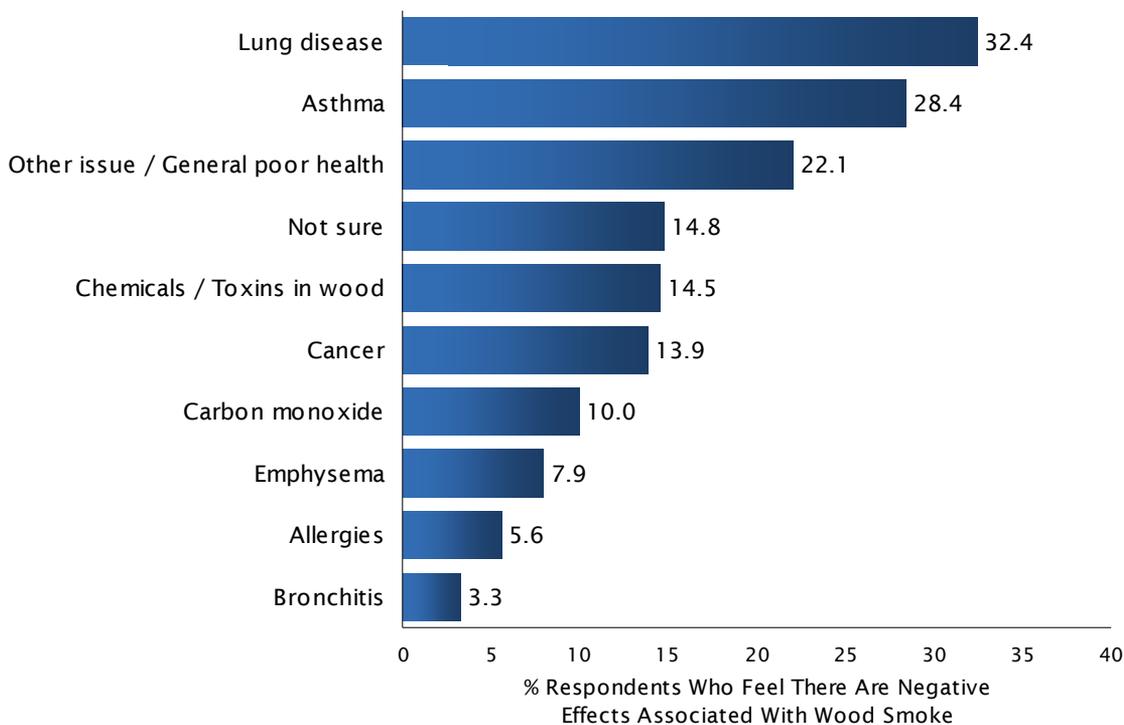
† Statistically significant change ($p < 0.05$) between the 2005 and 2006 studies

Respondents who perceived wood smoke to have negative health impacts (Question 23) were next asked to identify what the specific health effects are of breathing wood smoke. This question was asked in an open-ended manner which allowed respondents to mention any health impact that came to mind without being prompted by—or restricted to—a particular list of options. Multiple responses were also allowed for this question, so the percentages shown in Figure 42 represent the percentage of respondents who mentioned a particular health effect. The most common response (32%) was a general reference to lung disease, followed by a spe-

cific reference to asthma (28%). Approximately 22% of respondents mentioned some other general health impact, and 15% mentioned properties of wood—chemicals, carcinogens and toxins—that are released when burned. Overall, 15% of those who perceived that wood smoke had negative health impacts could not name a specific impact.

Question 24 *What are the negative health effects associated with breathing wood smoke?*

FIGURE 42 PERCEIVED NEGATIVE HEALTH EFFECTS ASSOCIATED WITH WOOD SMOKE (N = 728)



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 different neighborhoods in the Bay Area experience different levels of air pollution from wood smoke. Respondents were then asked to indicate whether, in their opinion, their neighborhood periodically experiences air pollution from wood smoke. Those who perceived their neighborhood to have an occasional 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 43 on page 41.

Overall, nearly one-quarter (24%) of adults surveyed indicated that their neighborhood periodically experiences air pollution from wood smoke. Fourteen percent (14%) stated that the problem was a small one, 7% indicated it was a moderate or medium problem, and 3% felt that air pollution due to wood smoke was a big problem in their neighborhood. When compared to 2005, the proportion of respondents who perceived that their neighborhood has a big or moderate wood smoke problem increased significantly, whereas the proportion who perceived that their neigh-

neighborhood does not have a wood smoke problem diminished significantly (see Figure 44). Residents in Contra Costa County and San Mateo County were the most likely to perceive that their neighborhood has a wood smoke problem in 2006-2007.

Question 25 *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 26 *Would you say that periodic air pollution from wood smoke in your neighborhood is a big problem, medium problem, or a small problem?*

FIGURE 43 PERCEPTION OF PERIODIC WOOD SMOKE PROBLEM IN NEIGHBORHOOD (N = 988)

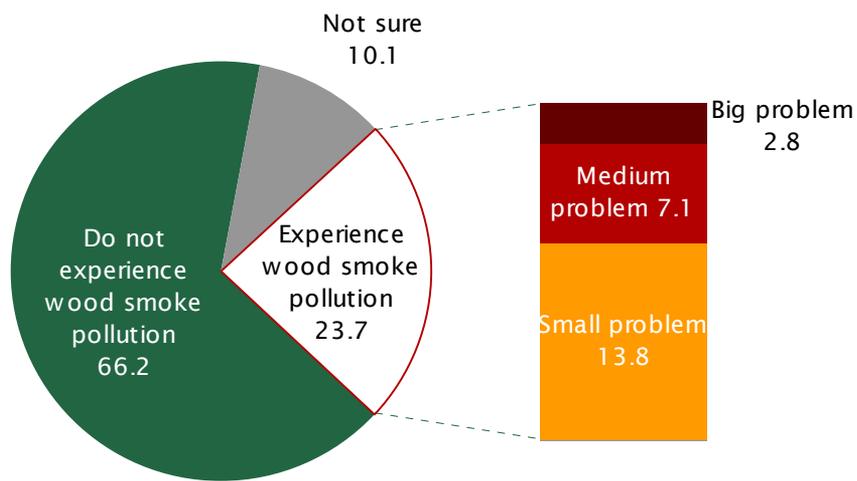
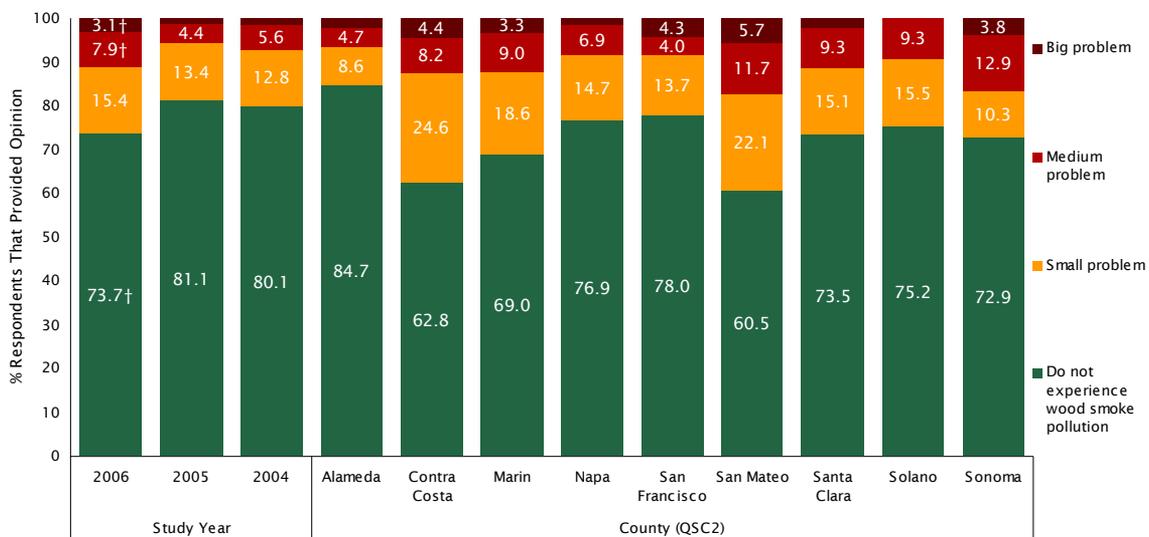


FIGURE 44 PERCEPTION OF PERIODIC WOOD SMOKE PROBLEM IN NEIGHBORHOOD BY STUDY YEAR & COUNTY (N = 988)



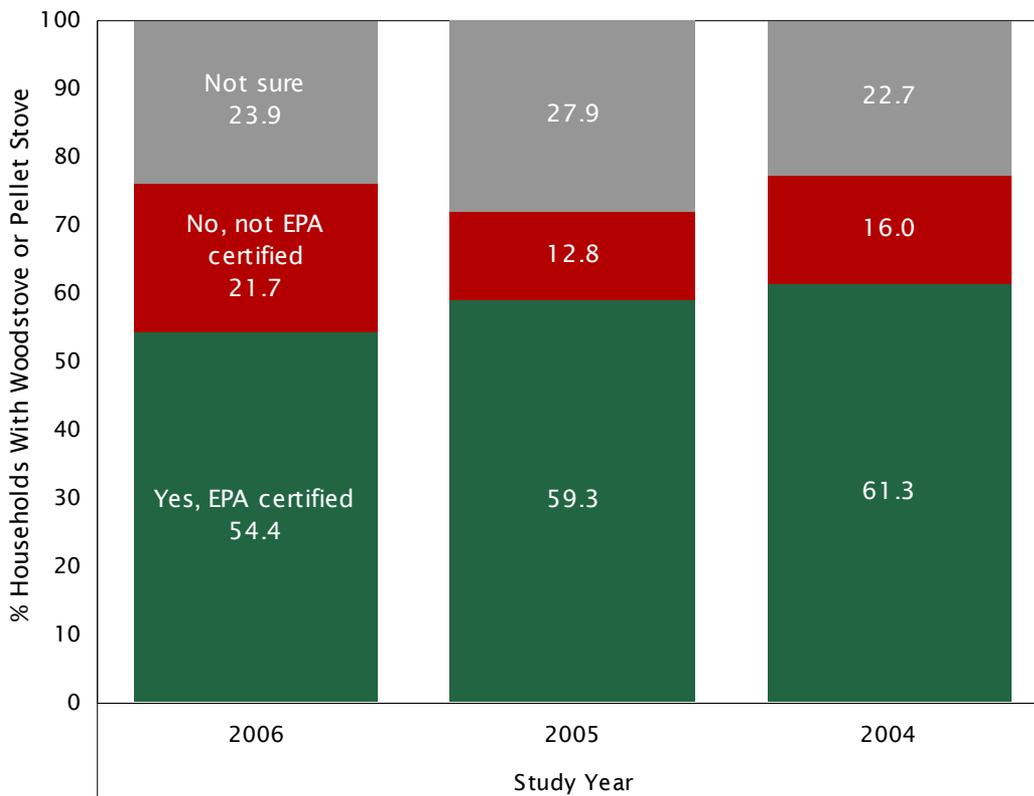
CHANGING HEATING DEVICES

Reducing the amount of air pollution caused by wood burning is the ultimate goal of the Spare the Air Tonight Program. Toward this end, the Program adopts both direct and indirect strategies. Direct strategies encourage individuals to simply not use their fireplace, wood stove or pellet stove—or to use it less frequently. For respondents who depend on their fireplace or stove for heat, however, this strategy may not be practical or effective. For these and other individuals, the Program also employs strategies to reduce wood smoke pollutants indirectly—that is, by changing the type of fuel burned and/or the efficiency of the heating device, rather than the frequency of burning.

To understand the potential impact that these indirect strategies may have on air pollution from wood smoke, the first task is to develop a profile of the specific type of heating devices that are owned by Bay Area residents. In addition to understanding the *number* of fireplaces, wood stoves and pellet stoves that are owned by respondents (see *Heating Devices* on page 10) and the type of fuel that they burn (see *Fuel Type & Source* on page 12), respondents with wood stoves or pellet stoves were also asked to identify whether their stove is EPA certified. Figure 45 shows that in 2006 most respondents (54%) thought that their stove was EPA certified, whereas 22% indicated that it was not and 24% were unsure. The 2004 and 2005 results are also shown in Figure 45 for comparison.

Question 27 *Is your wood stove or pellet stove EPA certified?*

FIGURE 45 WOOD STOVE OR PELLET STOVE EPA CERTIFIED: 2004 ~ 2006 (N = 68)

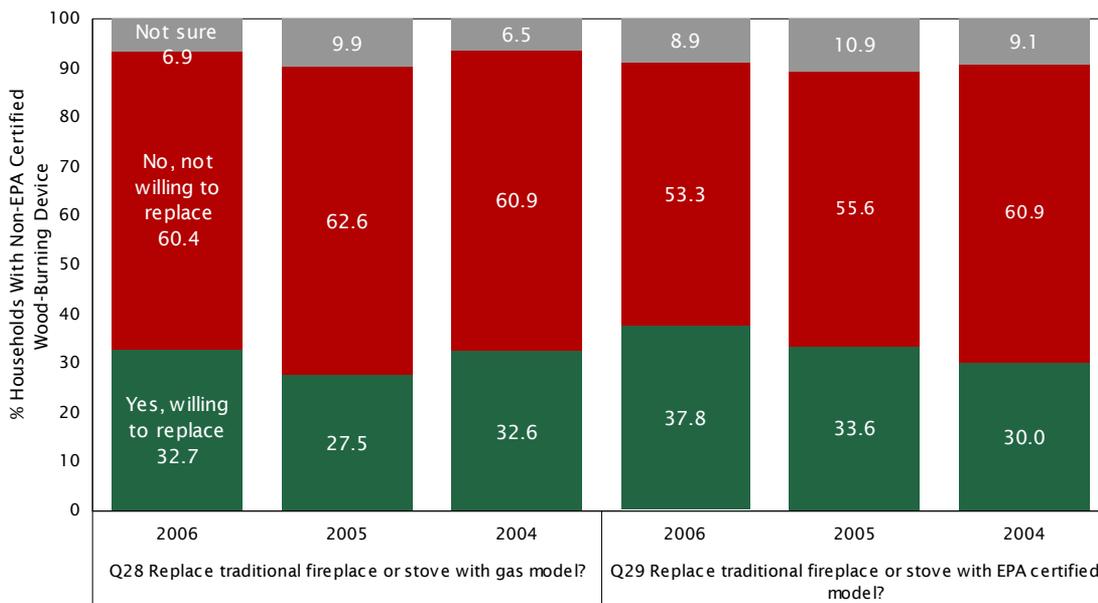


WILLINGNESS TO CHANGE HEATING DEVICE For respondents who owned a wood-burning fireplace and/or a non-EPA certified wood stove or pellet stove, the survey next inquired as to whether the respondent would be willing to replace their current device with a gas fireplace (Question 28) or EPA certified wood stove or pellet stove (Question 29) that would burn much cleaner and be less polluting. The responses to both of these questions are presented in Figure 46. Overall, 33% of respondents in 2006 were willing to replace their current device with a gas fireplace, whereas a slightly higher percentage (38%) were willing to replace their device with an EPA certified wood stove or pellet stove. The results are statistically similar to those found in 2005.

Question 28 *Gas fireplaces and EPA certified wood stoves, inserts or pellet stoves burn much cleaner and are less polluting than traditional fireplaces or old wood stoves. Would you be willing to replace your traditional fireplace, non-EPA certified wood stove or pellet stove with a gas fireplace?*

Question 29 *Would you be willing to replace your traditional fireplace, non-EPA certified wood stove or pellet stove with an EPA certified wood stove or pellet stove?*

FIGURE 46 WILLINGNESS TO REPLACE FIREPLACE OR STOVE WITH EPA CERTIFIED MODEL: 2004 ~ 2006 (N = 405)



Figures 47 and 48 show the proportion of respondents who were administered these questions that were willing to replace their fireplace or non-EPA certified stove, respectively, with a cleaner burning model by county and age.

FIGURE 47 WILLINGNESS TO REPLACE FIREPLACE OR STOVE WITH EPA CERTIFIED MODEL BY COUNTY (N = 405)

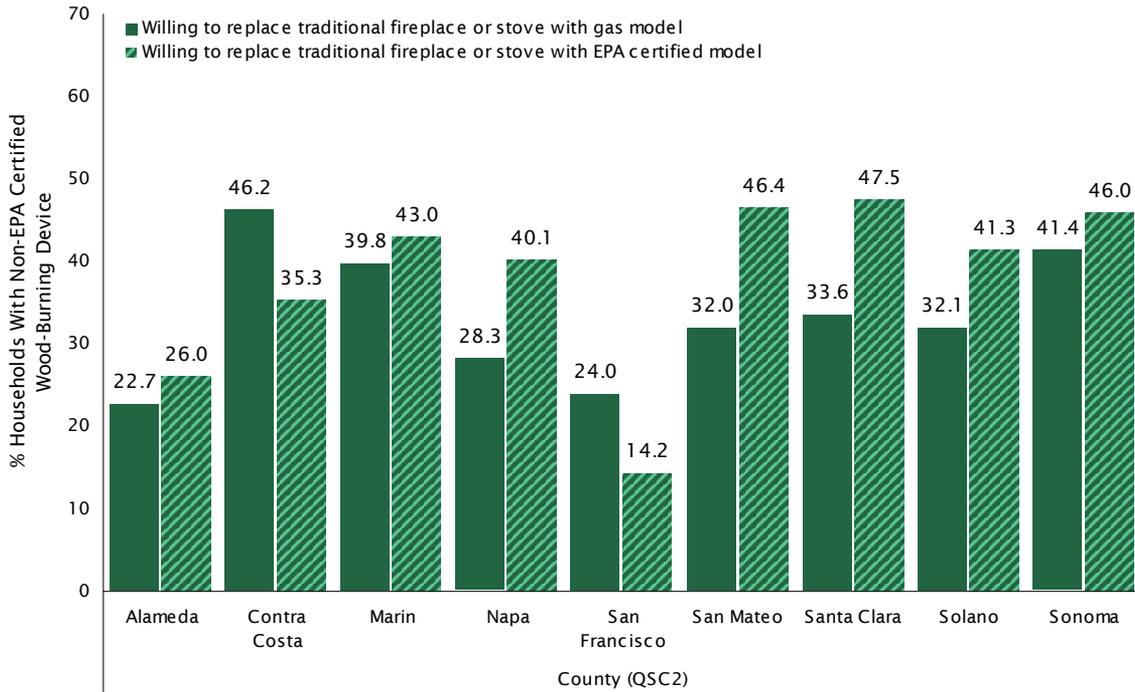
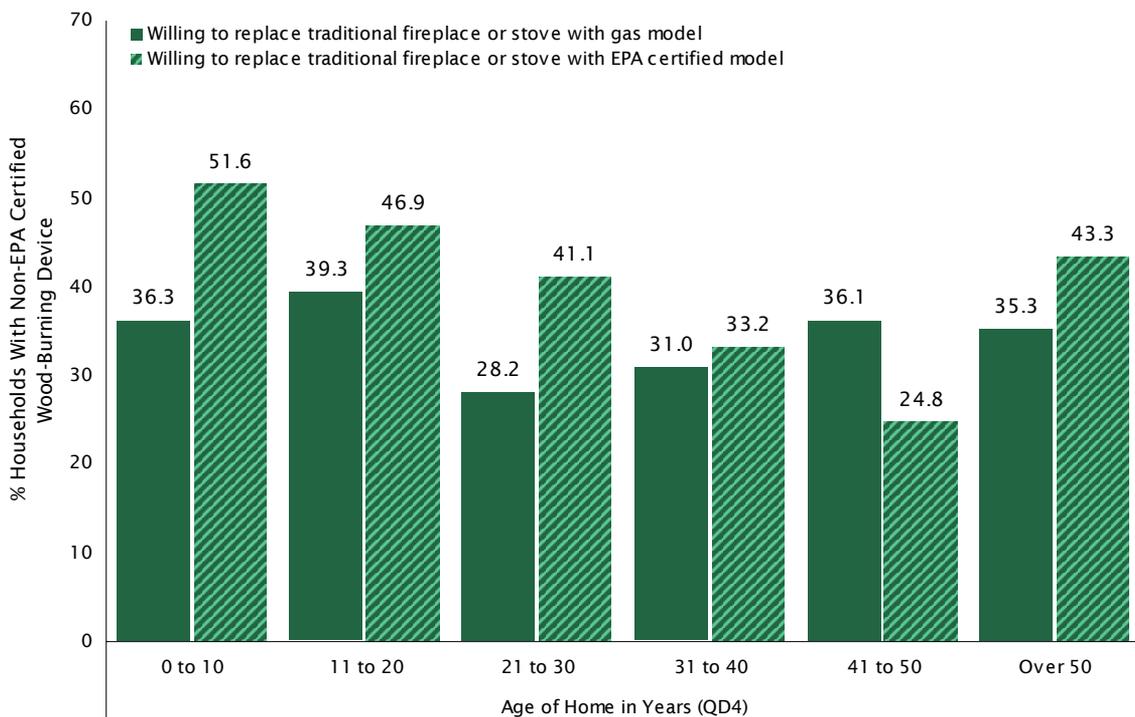


FIGURE 48 WILLINGNESS TO REPLACE FIREPLACE OR STOVE WITH EPA CERTIFIED MODEL BY AGE OF HOME IN YEARS (N = 405)

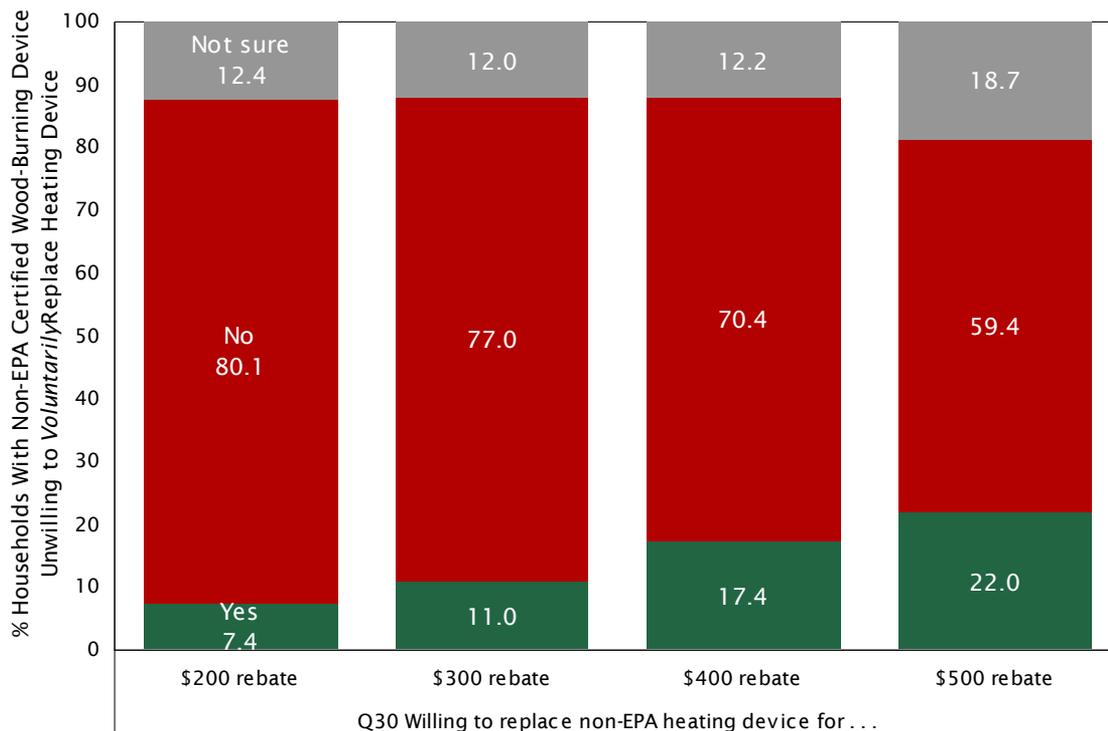


Questions 28 and 29 measured respondents' willingness to replace their current heating devices *in the absence* of a financial incentive to do so. For those respondents who were unwilling to replace their current device in this context, the survey next inquired as to whether they would do so if they were offered a financial incentive.

In Question 30, respondents who indicated that they were unwilling to replace their current heating device for a cleaner alternative (Questions 28 and 29) were first informed that there is a government sponsored program that offers rebates to residents who replace their traditional fireplace or non-EPA certified stove with a gas fireplace or EPA certified wood stove or pellet stove. They were then asked if they would participate in this program knowing that they would receive a \$200 rebate. For those who remained unwilling at \$200, rates of \$300, \$400 and \$500 were tested in sequential order.

Question 30 *There is a government sponsored program that offers rebates to residents who replace their traditional fireplace or non-EPA certified wood stove or pellet stove with a gas fireplace or EPA certified wood stove or pellet stove. If you knew you could receive a rebate of \$_____, would you participate in this program?*

FIGURE 49 WILLINGNESS TO PARTICIPATE IN GOVERNMENT-SPONSORED REBATE PROGRAM (N = 219)



As shown in Figure 49, 7% of those who were initially unwilling to replace their heating device for a cleaner alternative were willing to do so if a \$200 rebate were offered. As the amount of the rebate increased to \$300, \$400 and \$500, the proportion of respondents who indicated that they would participate in the program increased to 11%, 17% and 22%, respectively. Combining residents who are willing to replace their current devices without a financial incentive (see Figure

46) with those who require \$200 suggests that 40% to 45% of the target population would be receptive to a modest rebate program.

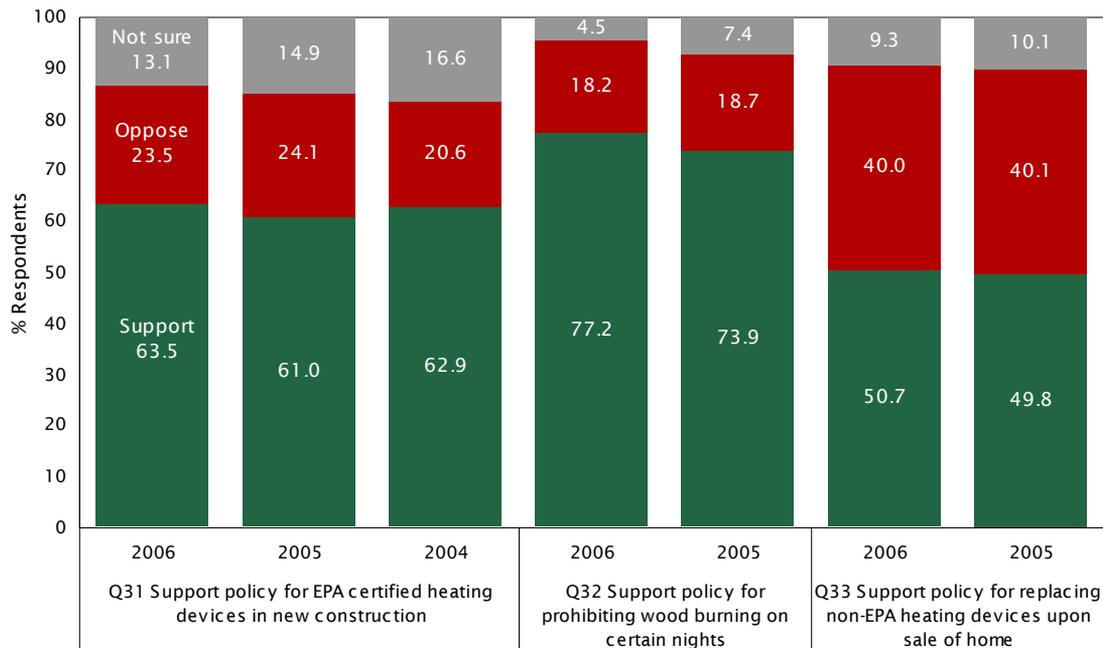
POLICY ATTITUDES The final three questions in this series measured residents' support for several policy changes designed to improve the air quality in the region. In Question 31, all respondents were asked whether they would support a local policy that would require all new housing construction to use only gas fireplaces or EPA certified fireplace inserts, wood stoves or pellet stoves. Question 32 measured respondent support for a local policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels. Finally, Question 33 inquired as to residents' willingness to support a policy that would require older wood stoves to be removed or replaced with a less polluting model when a home is sold to a new owner. The answers to all three questions have been combined in Figure 50.

Question 31 *Local governments throughout the Bay Area are considering a policy that would require all new housing construction to use only gas fireplaces or EPA certified fireplace inserts, wood stoves or pellet stoves. Would you support or oppose this policy?*

Question 32 *In some areas, local governments have a policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels. Would you support or oppose a policy like this in your area?*

Question 33 *some areas, local governments require that when a home that contains an older wood stove is sold to a new owner, the stove must be removed-or replaced with a new stove or fireplace that causes less pollution. Would you support or oppose a policy like this in your area?*

FIGURE 50 SUPPORT FOR PROPOSED POLICY CHANGES: 2004 ~ 2006 (N = 988)



For each of the policies tested, the predominant position was one of support for the policy. Sixty-four percent (64%) supported requiring all new housing construction to use only gas or EPA certified models, 77% favored prohibiting wood burning on nights when air pollution is expected to reach unhealthy levels, and 51% favored requiring the replacement of older wood stoves with a cleaner burning model when a home is sold to a new owner (see Figure 50). The public's support for these policies has not changed significantly since 2005. For the interested reader, Figures 51-53 display how support for each policy varied by county, age, and household income.

FIGURE 51 SUPPORT FOR PROPOSED POLICY CHANGES BY COUNTY (N = 988)

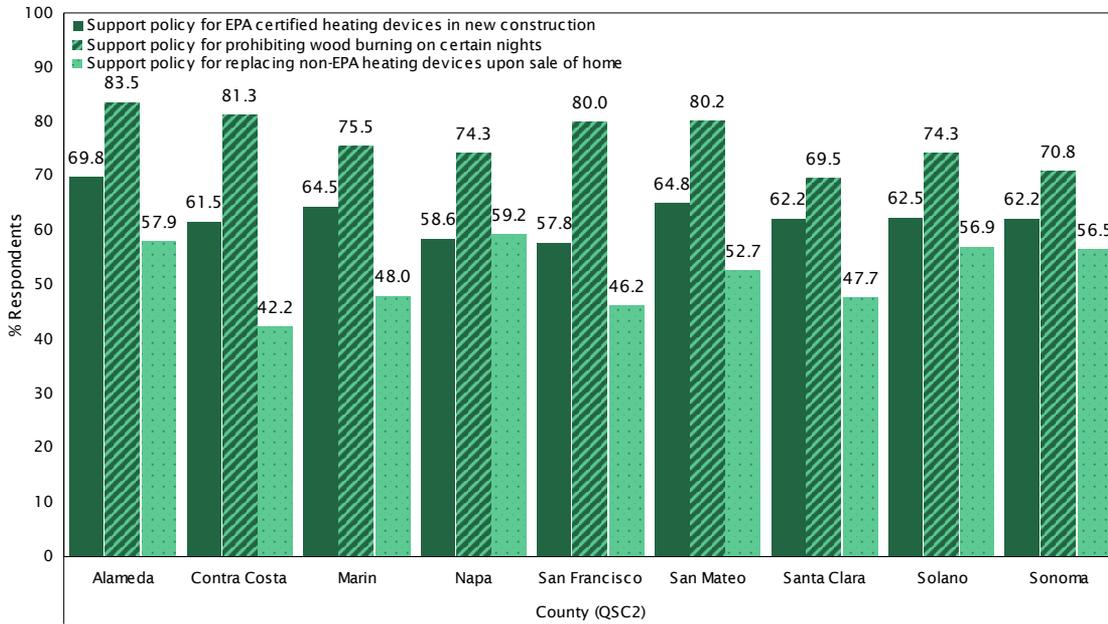


FIGURE 52 SUPPORT FOR PROPOSED POLICY CHANGES BY AGE (N = 988)

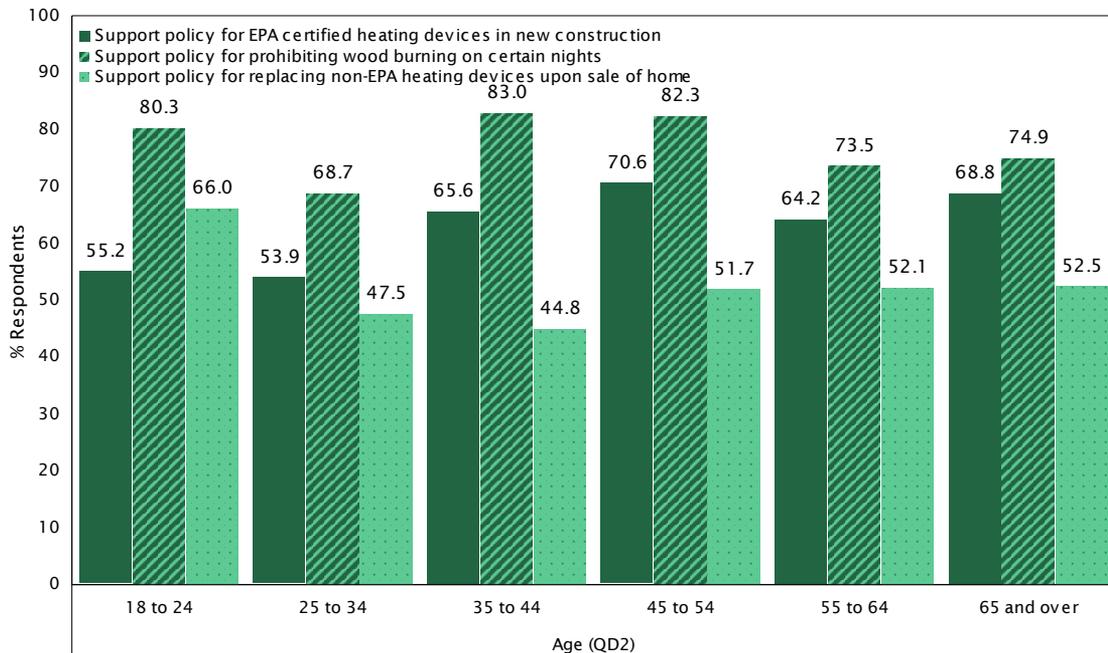
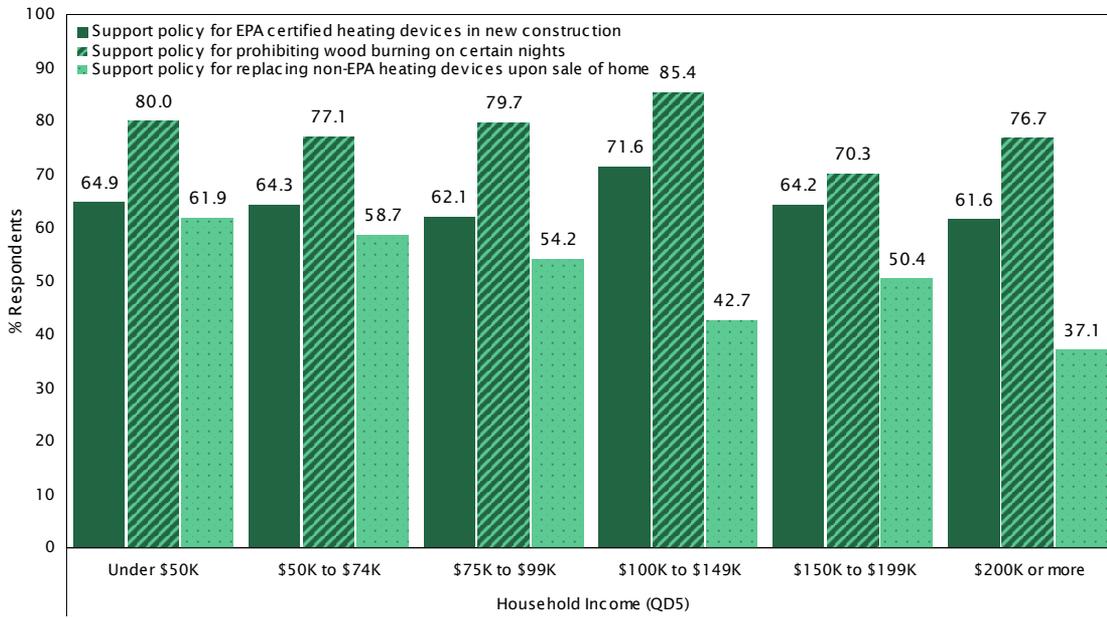


FIGURE 53 SUPPORT FOR PROPOSED POLICY CHANGES BY HOUSEHOLD INCOME (N = 988)



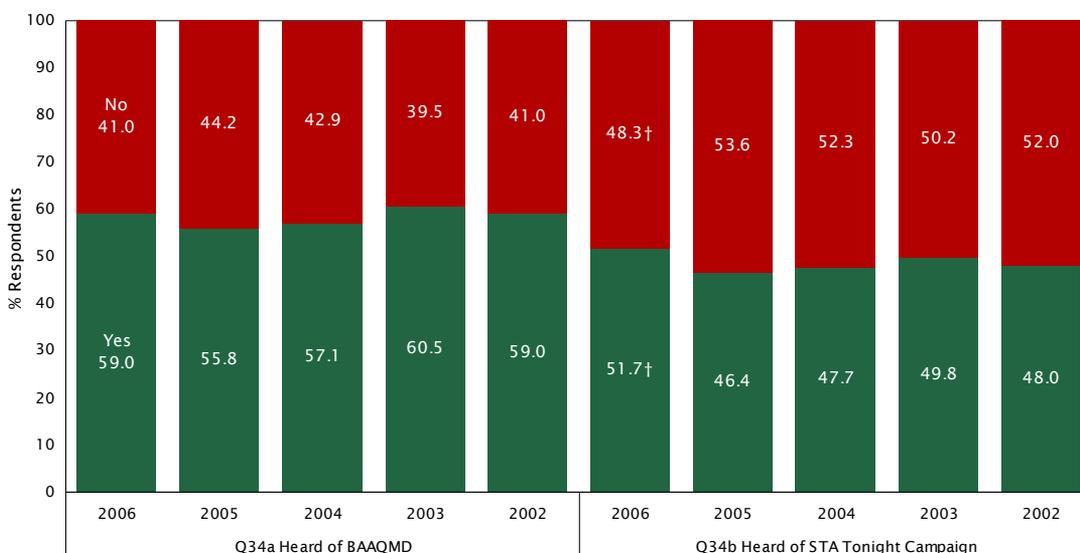
PERCEPTIONS OF ENTITIES

To identify and track perceptions of the BAAQMD and the Spare the Air Tonight Campaign, 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 54 shows that awareness of the BAAQMD (59%) remained statistically similar to awareness of the agency in prior years, although awareness of the Spare the Air Tonight Campaign (52%) increased significantly in the past year.

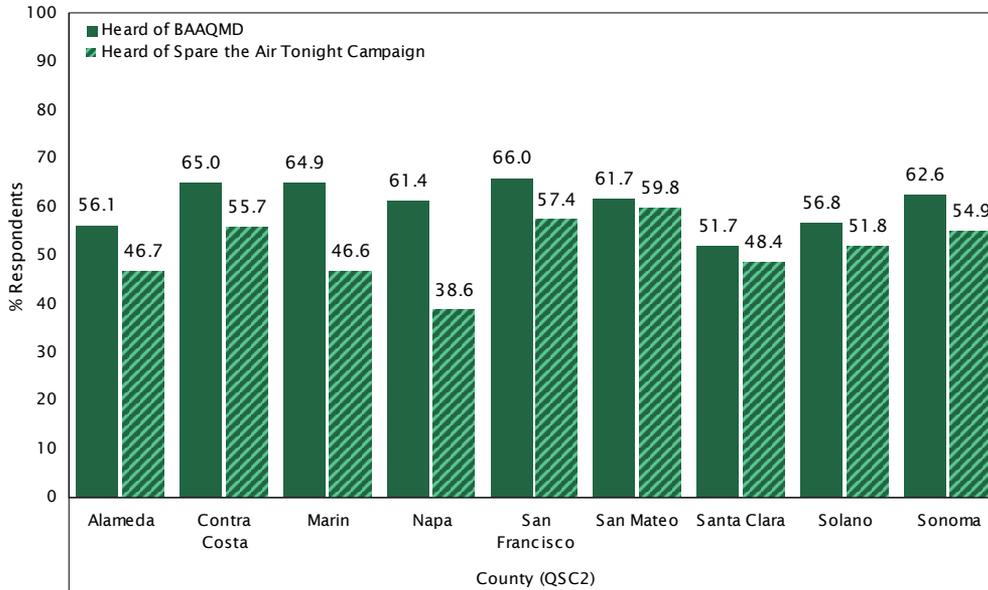
Question 34 *Let's change gears a bit. Have you ever heard of the _____?*

FIGURE 54 AWARENESS OF BAAQMD & SPARE THE AIR TONIGHT CAMPAIGN: 2002 ~ 2006 (N = 988)



Across the nine member counties, awareness of the BAAQMD was highest in San Francisco (66%), Marin (65%) and Contra Costa (65%) counties, and lowest in Santa Clara County (52%). Awareness of the Spare the Air Tonight Program, on the other hand, ranged from a high of 60% in San Mateo County to a low of 39% in Napa County (see Figure 55 on page 50).

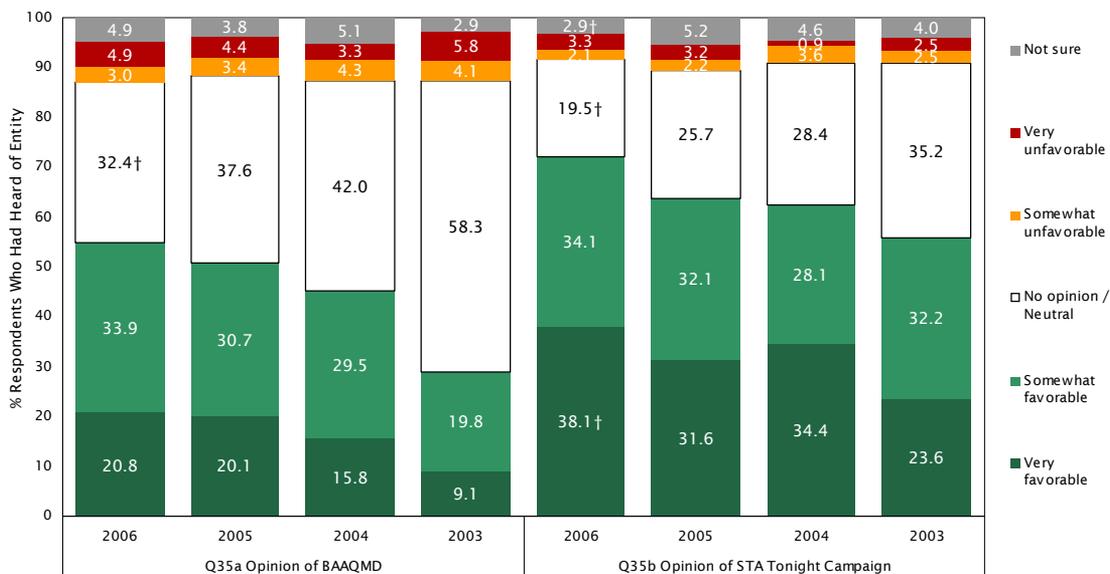
FIGURE 55 AWARENESS OF BAAQMD & SPARE THE AIR TONIGHT CAMPAIGN BY COUNTY (N = 988)



OPINIONS Respondents who had heard of an entity were next asked whether their opinion of the entity was favorable, unfavorable, or neutral. Figure 56 displays the findings of these questions in 2006, as well as the findings from the 2005, 2004 and 2003 studies.¹²

Question 35 *Generally speaking, would you say you have a favorable or unfavorable opinion of the _____, or do you have no opinion either way?*

FIGURE 56 OPINIONS OF BAAQMD & SPARE THE AIR TONIGHT CAMPAIGN: 2003 ~ 2006 (BAAQMD N = 582; STA TONIGHT CAMPAIGN N = 511)



12. The response options for these questions were more limited in the 2002 study, so comparisons are not provided in Figure 56.

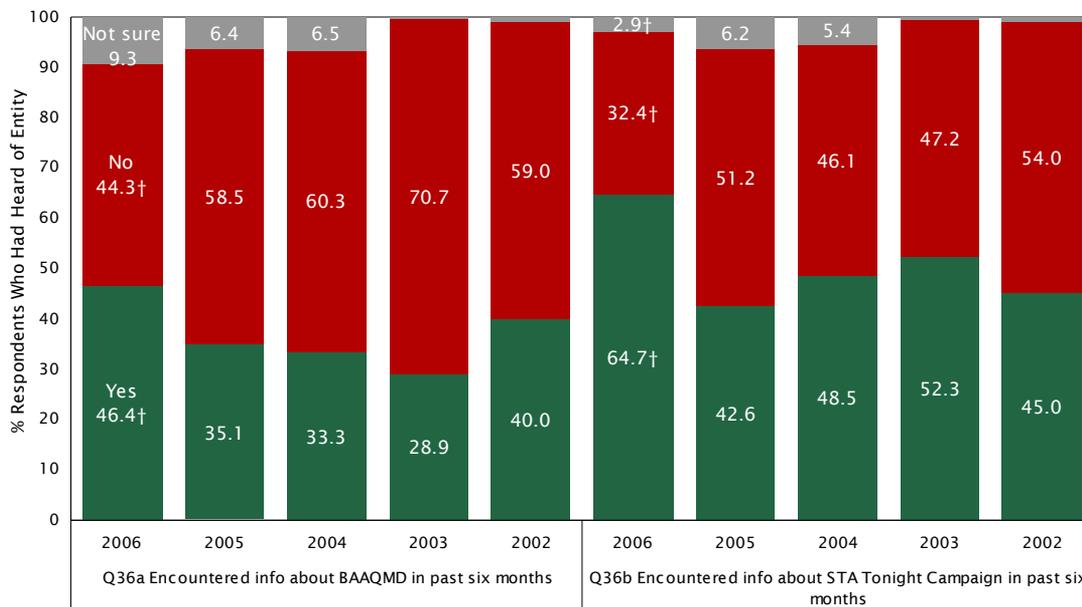
Of the individuals who received the question in 2006, more than half (55%) held a favorable opinion of the BAAQMD, whereas 32% held a neutral opinion and just 8% held an unfavorable opinion. When compared to the opinions recorded in the previous studies, opinions of the BAAQMD have become increasingly favorable—from 29% favorable in 2003 to 55% favorable in 2006.

The same is also true of public opinion regarding the Spare the Air Tonight Campaign, although the trend is less pronounced. Whereas 56% of respondents who had heard of the campaign held a favorable opinion of it in 2003, the corresponding percentage for 2006 was substantially higher at 72%.

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 Spare the Air Tonight Program in the six months prior to the interview. As shown in Figure 57, the proportion of respondents who recalled being exposed to information about the BAAQMD during this period was 46%, up significantly from 35% in 2005. The proportion of respondents who recalled exposure to the Spare the Air Tonight Program was also substantially higher in 2006 (65%) when compared to 2005 (43%).

Question 36 *In the past six months, have you heard, read, or seen any news stories, advertisements, or public service announcements about the _____?*

FIGURE 57 ENCOUNTERED INFORMATION ABOUT BAAQMD & SPARE THE AIR TONIGHT CAMPAIGN IN PAST SIX MONTHS: 2002 ~ 2006 (BAAQMD N = 582; STA TONIGHT CAMPAIGN N = 511)



For the interested reader, Figures 58 and 59 display the percentage of *all* respondents who recalled hearing, reading or seeing information about the BAAQMD and the Spare the Air Tonight Program—not just among those who had heard of the agency or program as shown in Figure 57. Among all respondents, recalled exposure was greatest for the agency among Alameda County residents, those with wood-burning heating devices in the home, and respondents over the age

of 44. Recalled exposure to information about the Spare the Air Tonight program was highest among Contra Costa County residents, those with wood-burning heating devices in the home, and respondents over the age of 34.

FIGURE 58 ENCOUNTERED INFORMATION ABOUT BAAQMD & SPARE THE AIR TONIGHT CAMPAIGN IN PAST SIX MONTHS BY COUNTY (N = 988)

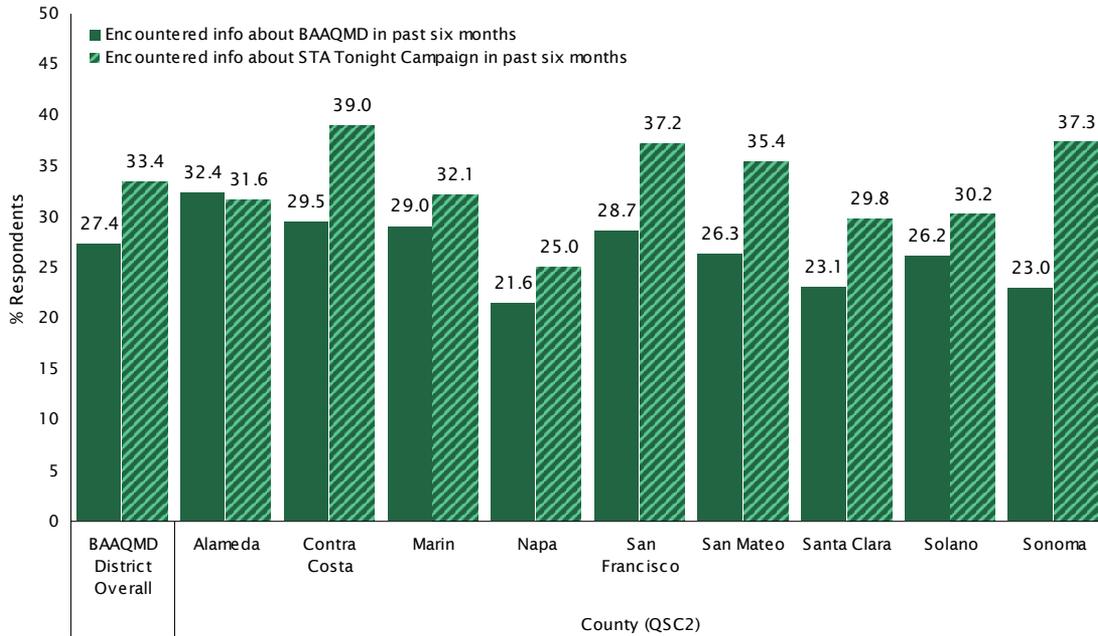
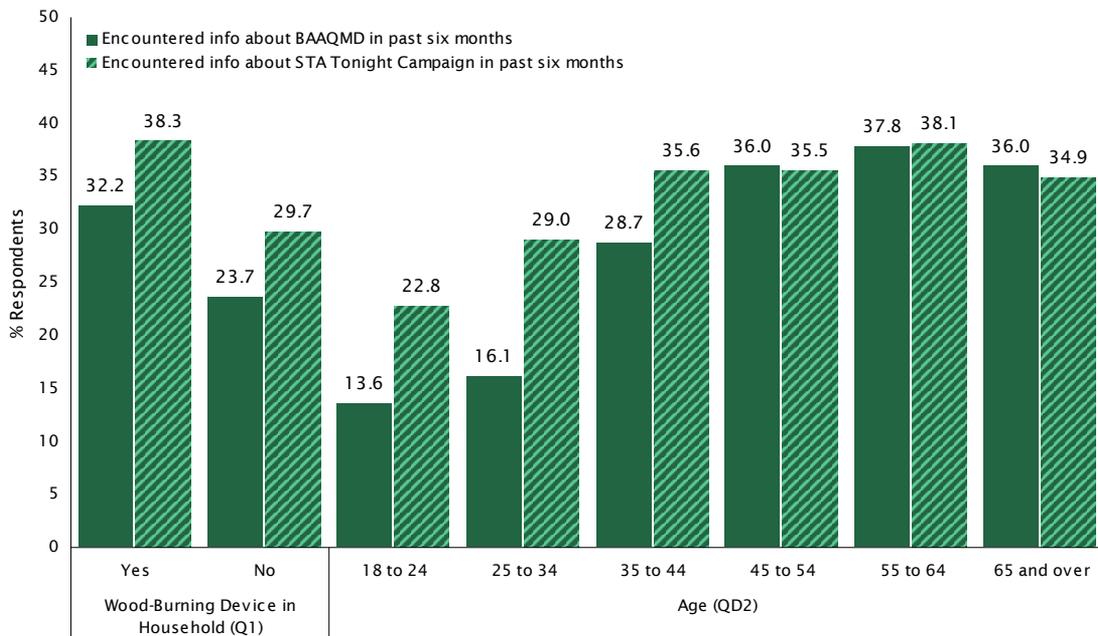


FIGURE 59 ENCOUNTERED INFORMATION ABOUT BAAQMD & SPARE THE AIR TONIGHT CAMPAIGN IN PAST SIX MONTHS BY WOOD-BURNING DEVICE IN HOUSEHOLD & AGE (N = 988)





BACKGROUND & DEMOGRAPHICS

TABLE 4 DEMOGRAPHICS OF SAMPLE

	Study Year				
	2006	2005	2004	2003	2002
Total Respondents	988	2,625	700	400	400
Drivers in Household	%	%	%	%	%
Zero to one	27	27	27	31	32
Two to three	63	64	65	59	60
Four or more	8	7	7	10	8
Refused	2	2	2	1	1
Age					
18 to 29	19	20	11	16	15
30 to 39	25	22	19	19	18
40 to 49	18	20	23	21	18
50 to 64	21	19	18	25	27
65 and over	14	14	21	13	18
Refused	3	5	8	7	5
Home Type					
Apartment	20	21	20	21	16
Condo	5	6	4	5	2
Town home	7	8	8	5	4
Single-family detached	63	60	63	66	73
Mobile home	3	2	2	2	4
Refused	2	4	3	3	1
Age of Home					
0 to 10 years	12	11	10	14	20
11 to 20 years	10	14	10	9	18
21 to 30 years	12	13	12	14	20
31 to 40 years	15	13	13	15	10
41 to 50 years	13	10	11	14	8
Over 50 years	28	27	30	18	10
Not sure / Refused	11	13	14	16	15
Household Income					
Under \$50,000	20	21	22	24	33
\$50,000 to \$74,999	16	16	18	17	20
\$75,000 to \$99,999	15	15	16	16	13
\$100,000 to \$149,999	16	17	14	15	9
\$150,000 to \$199,999	7	6	6	3	3
\$200,000 or more	8	7	4	6	2
Not sure / Refused	18	18	19	20	21
Gender					
Male	52	48	43	45	44
Female	48	52	57	55	56
County					
Alameda	21	21	23	22	-
Contra Costa	13	14	15	14	-
Marin	4	4	4	4	-
Napa	2	2	2	2	-
San Francisco	13	13	14	14	-
San Mateo	11	11	10	11	-
Santa Clara	24	24	23	23	-
Solano	6	6	3	5	-
Sonoma	6	5	5	6	-

Table 4 displays the 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 sub-groups of adults.



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 With the questionnaire used in 2005 as a starting point, Dr. McLarney of True North Research worked closely with the BAAQMD to develop and refine an improved survey instrument for the 2006 study. In the interest of improving the *validity* and *reliability* of select opinion and behavior measures, the 2006 study continued several questionnaire changes that were first implemented in the 2004 season. The most notable of these changes addressed how the questionnaire measured the impacts of the Spare the Air Tonight 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 EPA¹³—to measure the impacts of the summer Spare the Air Program on driving behavior.¹⁴

Based on the 2005 results, several additional refinements were made to the 2006 questionnaire with respect to measuring ownership of wood-burning heating devices (as opposed to those that use natural gas or propane) 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 2006 survey with previous surveys for select measures.

CATI & PRE-TEST Before fielding the survey, the questionnaire was CATI (Computer Assisted Telephone Interviewing) programmed to assist the live 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 happen 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. Two training sessions were conducted to familiarize interviewers with the study and to answer questions and clarify details of the study.

SAMPLE & WEIGHTING Because the primary focus of the study was to gather information from adults who reside within the District, households were 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 gen-

13. 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, as well as Thomas Higgins and Dr. Will Johnson of K.T. Analytics.

14. 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: 2005 Summer Ozone Season* report prepared for the BAAQMD by True North & ESTC.

erated 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.

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.

The final raw data were weighted by age groups within each County to exactly match updated demographic projections for 2006 based on Census and California Department of Finance 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 an RDD probability-based sample and monitoring the sample characteristics as data collection proceeded, True North ensured that the 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. Because not every adult or household in the District participated, however, 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 988 households for a particular question and what would have been found if all of the estimated 2,432,147 households in the District had been interviewed.

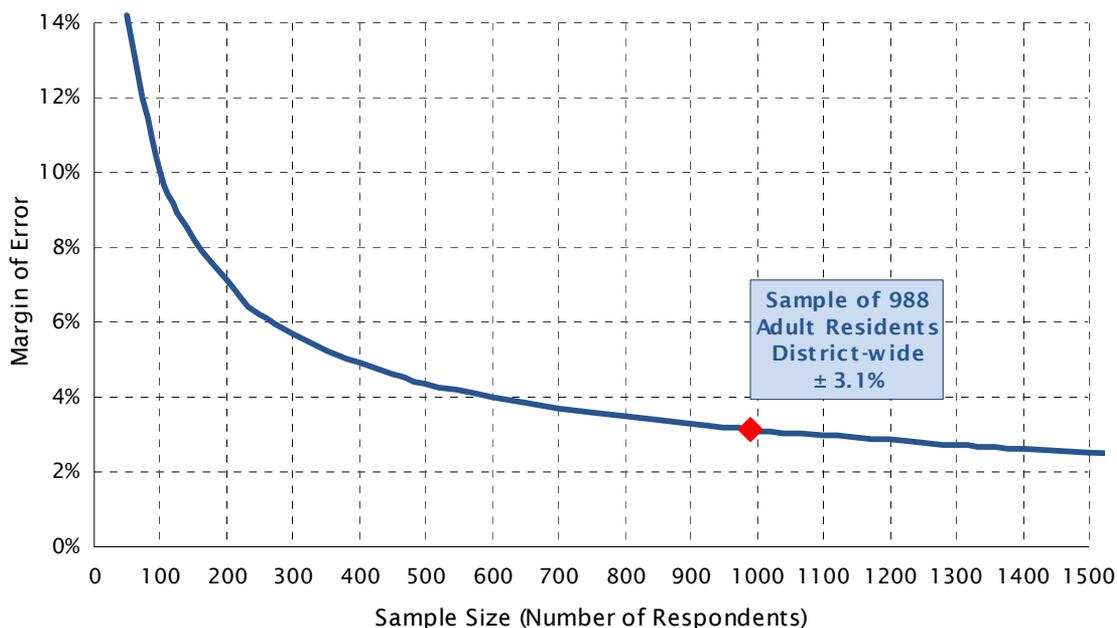
For example, in estimating the percentage of households who have an outdoor fireplace, firepit or chiminea that they have used in the past 12 months, the margin of error can be calculated if one knows the number of households in the District, the size of the sample, a chosen confidence level, and the 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 that they possess and have used their outdoor fireplace, firepit or chiminea during this period (0.09 for 9%, for example), N is the total number of households in the District (2,432,147), n is the sample size that received the question (988), and t is the upper $\alpha/2$ point for the t-distribution with $n - 1$ degrees of freedom (1.96 for a 95% confidence interval). Solving this equation using these values reveals a margin of error of $\pm 1.79\%$. This means that, with 9% of sampled households indicating that they own and have used an outdoor fireplace, firepit or chiminea in the past 12 months, one can be 95 percent confident that the actual percentage is between 7% and 11%.

Figure 60 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 3.1% for District-wide estimates.

FIGURE 60 MAXIMUM MARGIN OF ERROR PLOT



Within this report, figures and tables show how responses to certain questions varied by county, as well as by demographic characteristics such as presence of a heating device, respondent age, etc. Because the margin of error grows exponentially as the sample size decreases (see the left side of Figure 60), 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 Interviews were conducted via telephone during weekday evenings (5:30PM to 9PM) and on weekends (10AM to 5PM) between December 2, 2006 and February 12, 2007. Interviews were conducted on randomly selected evenings ($n=259$), as well as targeted for

Spare the Air Tonight episodes throughout the season (n=729). 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.

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 2006 results with those of prior studies, where appropriate, True North also accessed and processed data from the 2005, 2004, 2003 and 2002 winter season surveys to allow for meaningful comparisons.

STATISTICAL SIGNIFICANCE Many of the figures and tables in this report present the results of questions asked in 2006 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 2006.

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 & TOPLINES



**Winter 06-07 Spare the Air Survey
Designed by True North Research
Toplines
988 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 no more than 15 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.

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.

<i>Record 5-digit ZIP code</i>	<i>Data on file</i>
--------------------------------	---------------------

SC2 County of Residence [988]

7	Alameda	21%
9	Contra Costa	13%
4	Marin	4%
8	Napa	2%
2	San Francisco	13%
3	San Mateo	11%
1	Santa Clara	24%
6	Solano	6%
5	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* [988]	
	None	59%
	One	35%
	Two	5%
	Three or more	1%
B	Natural gas or propane fireplace [988]	
	None	81%
	One	15%
	Two	3%
	Three or more	1%
C	Pellet stove* [988]	
	None	97%
	One	3%
	Two	0%
	Three or more	0%
D	Woodstove* [988]	
	None	96%
	One	4%
	Two	0%
	Three or more	0%

If Q1.1a, Q1.1b, Q1.1c AND Q1.1d = (2, 98), skip to Q20.

Only ask Q2 if Q1.1a = 1 OR Q1.1d = 1, otherwise skip to instruction preceding Q3.

*45% 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? [424]			
1	Natural wood log	42%	Ask Q3
2	Manufactured log/Duraflame/Presto	26%	Skip to Q7
3	Scrap wood	1%	Skip to Q7
4	Pallets (not pellets)	0%	Skip to Q7
5	Never use fireplace	27%	Skip to Q7
6	Other	1%	Skip to Q7
98	Not sure	2%	Skip to Q7
99	Refused	1%	Skip to Q7
Only ask Q3 if (Q1.1a = 1 and Q2 = 1) OR (Q1.1d = 1 and Q2 = 1), otherwise skip to Q7.			
Q3 What type of natural wood do you typically burn? [178]			
1	Ash	0%	
2	Eucalyptus	1%	
3	Oak	50%	
4	Pine (Cedar)	9%	
6	Almond	8%	
7	Fruitwood	4%	
5	Other	7%	
98	Not sure	20%	
99	Refused	0%	
Q4 Do you typically purchase your wood from a wood supplier, the local store, or do you gather your own wood? [178]			
1	Wood supplier	33%	
2	Local store	13%	
3	Gather own wood	44%	
4	Other	5%	
98	Not sure	4%	
99	Refused	0%	
Q5 Do you tend to burn dry, seasoned wood or wood that is fresh-cut and somewhat moist? [178]			
1	Dry, seasoned wood	92%	
2	Fresh-cut & moist	3%	
98	Not sure	5%	
99	Refused	0%	

Q6	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? [178]					
	1	Heat	46%			
	2	Ambiance	50%			
	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 Q7 for each appliance where Q1.1 = 1.</i>						
Q7	Will you use your _____ this winter?					
<i>Do Not Randomize</i>		Yes	No	Not Sure	Refused	
A	Wood-burning fireplace [407]		56%	43%	2%	0%
B	Natural gas or propane fireplace [187]		72%	27%	1%	0%
C	Pellet stove [32]		68%	32%	0%	0%
D	Woodstove [39]		81%	16%	3%	0%
<i>Only ask Q8 for each appliance where Q7 = 2.</i>						
Q8	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 [173]		17%	32%	8%	52%
B	Natural gas or propane fireplace [50]		0%	12%	10%	83%
C	Pellet stove [10]		0%	5%	0%	95%
D	Woodstove [6]		32%	48%	0%	23%
<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 Q9 if Q7a = 1, Q7c = 1 or Q7d = 1. Otherwise, skip to Q20.</i>						
Q9	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> [252]					
	1	At least once per week	53%	<i>Skip to Q11</i>		
	2	Less often than once per week	47%	<i>Ask Q10</i>		
	98	Not sure / Refused	0%	<i>Skip to Q12</i>		

Q10	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> [119]		
	1	Two to three times per month	32% Skip to Q12
	2	Once per month	32% Skip to Q12
	3	Less often than once per month	35% Skip to Q12
	98	Not sure	1% Skip to Q12
	99	Refused	0% Skip to Q12
Q11	In a typical winter week, how many days do you expect to burn wood? <i>If unsure, ask them to estimate.</i> [133]		
	1	One day	19%
	2	Two days	32%
	3	Three days	15%
	4	Four days	7%
	5	Five days	7%
	6	Six days	4%
	7	Seven days	14%
	98	Not sure	1%
	99	Refused	1%
Q12	Did you burn wood in the past seven days? [252]		
	1	Yes	51% Ask Q13
	2	No	49% Skip to Q14
	98	Not sure	0% Skip to Q14
	99	Refused	0% Skip to Q14
Q13	Did you burn wood yesterday or last night? [129]		
	1	Yes	44%
	2	No	56%
	98	Not sure	0%
	99	Refused	0%
Q14	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> [252]		
	One		5%
	Two		23%
	Three		33%
	Four		21%
	Five or more		17%

Only ask Q15 if Q7a = 1 or Q7d = 1.		
Q15	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> [244]	
	One	23%
	Two	8%
	Three	10%
	Four	12%
	Five	15%
	Six	8%
	Seven or more	24%

Section 4: Changes in Wood Burning Behavior

Only ask Q16 if Q7a = 1, Q7c = 1 or Q7d = 1. Otherwise, skip to Q20.

Q16	This winter, do you expect that you will burn wood more often, less often, or about the same frequency as you did last winter? [252]		
	1	More often	15%
	2	Less often	18%
	3	About the same	65%
	98	Not sure	3%
	99	Refused	0%
Q17	Were there occasions this winter when you normally would have burned wood, but decided not to? [252]		
	1	Yes	37%
	2	No	59%
	98	Not sure	4%
	99	Refused	0%
Q18	Why did you decide not to burn wood on these occasions? <i>Do NOT Read Response Options. Multiple Responses OK.</i> [93]		
	1	Spare the Air Tonight campaign/ advertisements asking people not to burn wood/Don't Light the Night campaign	27%
	2	Air quality reason/health reason	17%
	3	Other	54%
	98	Not sure	3%
	99	Refused	0%

Q19	So far this winter, how many times did you choose not to burn wood because of air quality or health-related reasons? <i>If respondent is unsure, ask them to estimate.</i> [41]
	Total number of times
	161 (Average of 3.92 times)

17.6% of households with at least one wood-burning device reported not burning wood this winter (Q7) or a reduction in burning wood this winter (Q17) because of STA Campaign / Air quality info, or because of health concerns paired with encountering STA Campaign / Air quality info.

Section 5: Awareness of Campaign			
Q20	During this winter, have you heard, read, or seen any news stories, advertisements, or public service announcements about Spare the Air Tonight, poor air quality, or requests not to use your fireplace, pellet stove, or woodstove? [988]		
	1	Yes	56%
	2	No	43%
	98	Not sure	1%
	99	Refused	0%
Q21	Where did you see or hear the news story, advertisement or public service announcement? <i>Don't read choices. Multiple responses OK.</i> [552]		
	1	Television	57%
	2	Radio	40%
	3	Newspaper	10%
	4	Website	2%
	5	Billboard	3%
	6	E-mail/E-mail Air Alert	3%
	7	Fax/Fax Alert	0%
	8	Bus signs	1%
	9	Other	5%
	98	Not sure	4%
	99	Refused	0%
<i>Only ask Q22 if interviewing the day after a Spare the Air event. Otherwise, skip to Q23.</i>			
Q22	Prior to taking this survey, were you aware that there was a "Spare the Air Tonight" advisory yesterday? [762]		
	1	Yes	16%
	2	No	83%
	98	Not sure	1%
	99	Refused	0%

Section 6: Attitudes about Wood Smoke			
Q23	Do you think there are any negative health effects associated with breathing wood smoke? [988]		
	1	Yes	74% Ask Q24
	2	No	16% Skip to Q25
	98	Not sure	11% Skip to Q25
	99	Refused	0% Skip to Q25
Q24	What are the negative health effects associated with breathing wood smoke? <i>Don't read options. Multiple response OK.</i> [728]		
	1	Lung Disease (general reference)	32%
	2	Asthma	28%
	3	Allergies	6%
	4	Bronchitis	3%
	5	Cancer	14%
	6	Emphysema	8%
	7	Chemicals/Carcinogens/Toxins in wood	15%
	8	Carbon monoxide	10%
	9	Other health issue	22%
	98	Not sure	15%
	99	Refused	0%
Q25	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? [988]		
	1	Yes	24% Ask Q26
	2	No	66% Skip to Q27
	98	Not sure	10% Skip to Q27
	99	Refused	0% Skip to Q27
Q26	Would you say that periodic air pollution from wood smoke in your neighborhood is a big problem, medium problem, or a small problem? [234]		
	1	Big problem	12%
	2	Medium problem	30%
	3	Small problem	58%
	98	Not sure	0%
	99	Refused	0%

Section 7: Willingness to Change Heating Device					
<i>If Q1.1a, Q1.1c AND Q1.1d = (2, 98), skip to Q31.</i>					
<i>Only ask Q27 if Q1.1c = 1 or Q1.1d = 1. Otherwise, skip to instruction preceding Q28.</i>					
Q27	Is your woodstove or pellet stove EPA certified? <i>If not sure, clarify: Most woodstoves and pellet stoves manufactured after 1992 are EPA certified, whereas older ones are not.</i> [68]				
	1	Yes, EPA certified	54%	Skip to Q31	
	2	No, not EPA certified	22%	Go to Q28	
	98	Not sure	24%	Go to Q28	
	99	Refused	0%	Skip to Q31	
<i>Only ask Q28 if Q1.1a = 1, (Q1.1c = 1 and Q27 = 2, 98), or (Q1.1d = 1 and Q27 = 2, 98). Otherwise, skip to Q31.</i>					
Q28	Gas fireplaces and EPA certified woodstoves, inserts or pellet stoves burn much cleaner and are less polluting than traditional fireplaces or old woodstoves. Would you be willing to replace your traditional fireplace, non-EPA certified woodstove or pellet stove with a gas fireplace? [405]				
	1	Yes	33%		
	2	No	60%		
	98	Not sure	7%		
	99	Refused	0%		
Q29	Would you be willing to replace your traditional fireplace, non-EPA certified woodstove or pellet stove with an EPA certified woodstove or pellet stove? [405]				
	1	Yes	38%		
	2	No	53%		
	98	Not sure	8%		
	99	Refused	0%		
<i>If Q28 = 1 OR Q29 = 1, skip to Q31. Otherwise, ask Q30.</i>					
Q30	There is a government sponsored program that offers rebates to residents who replace their traditional fireplace or non-EPA certified woodstove or pellet stove with a gas fireplace or EPA certified woodstove or pellet stove. If you knew you could receive a rebate of \$____, would you participate in this program?				
<i>If respondent says 'yes', record 'yes' for all higher dollar amounts and go to Q31.</i>					
Do Not Randomize		Yes	No	Not sure	Refused
A	200 [219]	7%	80%	12%	0%
B	300 [219]	11%	77%	12%	0%
C	400 [219]	17%	70%	11%	1%
D	500 [219]	22%	59%	17%	2%

Section 8: Policy Attitude		
Q31	Local governments throughout the Bay Area are considering a policy that would require all new housing construction to use only gas fireplaces or EPA certified fireplace inserts, woodstoves or pellet stoves.	
	Would you support or oppose this policy? [988]	
	1 Support	63%
	2 Oppose	23%
	98 Not sure	13%
	99 Refused	0%
Q32	In some areas, local governments have a policy that prohibits wood burning on nights when air pollution is expected to reach unhealthy levels.	
	Would you support or oppose a policy like this in your area? [988]	
	1 Support	77%
	2 Oppose	18%
	98 Not sure	5%
	99 Refused	0%
Q33	In some areas, local governments require that when a home that contains an older woodstove is sold to a new owner, the stove must be removed—or replaced with a new stove or fireplace that causes less pollution.	
	Would you support or oppose a policy like this in your area? [988]	
	1 Support	51%
	2 Oppose	40%
	98 Not sure	9%
	99 Refused	0%

Section 9: BAAQMD and Spare the Air Tonight Name Recognition		
Q34	Let's change gears a bit. Have you ever heard of the _____? Code 'Not sure' as 'No'.	
	Randomize	Yes No
A	Bay Area Air Quality Management District [988]	59% 41%
B	Spare the Air Tonight Campaign [988]	52% 48%

Only ask Q35 and Q36 for each item in Q34 that respondent had heard of (ask if Q34 = 1).

Q35	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 [582]	21%	34%	32%	3%	5%	5%
B	Spare the Air Tonight Campaign [511]	38%	34%	20%	2%	3%	3%
Q36	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 [582]	46%	44%	9%			
B	Spare the Air Tonight Campaign [511]	65%	32%	3%			

Section 10: Off-Season Burning

Q37	Do you have an outdoor fireplace, firepit or chiminea (chim-uh-nay-uh) that you've used to burn wood in the past 12 months? [988]			
	1	Yes	9%	
	2	No	91%	
	99	Refused	0%	
Q38	Do you ever burn wood indoors or outdoors in non-winter months, between March and October? <i>If no, record. If yes, ask: Which months during this period to you tend to burn wood? Check all months that apply.</i> [988]			
	1	March	3%	Ask Q39
	2	April	3%	Ask Q39
	3	May	3%	Ask Q39
	4	June	6%	Ask Q39
	5	July	7%	Ask Q39
	6	August	7%	Ask Q39
	7	September	4%	Ask Q39
	8	October	3%	Ask Q39
	9	No non-winter burning	85%	Skip to D1
	98	Not sure	1%	Skip to D1
	99	Refused	0%	Skip to D1

Q39	How often do you burn wood in non-winter months? At least once per week or less often than that? <i>If unsure, ask them to estimate.</i> [130]			
	1	At least once per week	18%	<i>Skip to Q41</i>
	2	Less often than once per week	80%	<i>Ask Q40</i>
	98	Not sure	2%	<i>Skip to D1</i>
	99	Refused	0%	<i>Skip to D1</i>
Q40	In non-winter months, would you say that you 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> [104]			
	1	Two to three times per month	15%	<i>Skip to D1</i>
	2	Once per month	25%	<i>Skip to D1</i>
	3	Less often than once per month	59%	<i>Skip to D1</i>
	98	Not sure	0%	<i>Skip to D1</i>
	99	Refused	1%	<i>Skip to D1</i>
Q41	In a typical week during non-winter months, how many days do you expect to burn wood? <i>If unsure, ask them to estimate.</i> [23]			
	1	One day	10%	
	2	Two days	42%	
	3	Three days	4%	
	4	Four days	0%	
	5	Five days	5%	
	6	Six days	0%	
	7	Seven days	2%	
	98	Not sure	28%	
	99	Refused	9%	

Section 11: Background / Demographics

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

D1	Including yourself, how many licensed drivers live in your household? [988]	
	None	3%
	One	24%
	Two	51%
	Three or more	20%
	Refused	2%

D2	In what year where you born? Recoded into age below. [988]	
	18 to 24	11%
	25 to 34	21%
	35 to 44	22%
	45 to 54	18%
	55 to 64	11%
	65 and over	14%
	Refused	3%
D3	Do you live in an apartment, condo, townhome, single-family detached home, or mobile home? [988]	
	1 Apartment	20%
	2 Condo	5%
	3 Townhome	7%
	4 Single-family detached home	63%
	5 Mobile home	3%
	99 Refused	2%
D4	Approximately how many years ago was your home built? [988]	
	1 0 to 10 years	12%
	2 11 to 20 years	10%
	3 21 to 30 years	12%
	4 31 to 40 years	15%
	5 41 to 50 years	13%
	6 Over 50 years	28%
	98 Not sure	10%
	99 Refused	1%
D5	This last question is for statistical purposes only. As I read the following income categories, please stop me when I reach the category that best represents your household's total annual income before taxes. [988]	
	1 Under \$50,000	20%
	2 \$50,000 to \$74,999	16%
	3 \$75,000 to \$99,999	15%
	4 \$100,000 to \$149,999	16%
	5 \$150,000 to \$199,999	7%
	6 \$200,000 or more	8%
	7 Not sure / Refused	18%

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

D6 Gender [988]		
1	Male	52%
2	Female	48%
D7 Month of Interview		
12	December	39%
1	January	44%
2	February	17%