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Vacant
Large City

Seyed Sadredin
Executive Director
Air Pollution Control Officer

Northern Region Office
4800 Enterprise Way
Modesto, CA 95356-8718
(209) 557-6400 • FAX (209) 557-6475

Central Region Office
1990 East Gettysburg Avenue
Fresno, CA 93726-0244
(559) 230-6000 • FAX (559) 230-6061

Southern Region Office
34946 Flyover Court
Bakersfield, CA 93308-9725
(661) 392-5500 • FAX (661) 392-5585

DATE: January 18, 2018

TO: SJVUAPCD Governing Board



FROM: Seyed Sadredin, Executive Director/APCO
Project Coordinator: Jessica Olsen

RE: **ITEM NUMBER 10: RECEIVE FINAL
RESIDENTIAL WOOD BURNING SURVEY
RESULTS AND CONSIDER OPTIONS FOR
PROGRAM ENHANCEMENTS**

RECOMMENDATION:

Review the residential wood burning survey results and provide guidance on future actions and policy recommendations.

BACKGROUND:

Given the significant localized health impacts associated with residential wood smoke, your Board has shown great leadership in addressing wood smoke emissions from residential fireplaces and wood burning devices. Today, the District has the toughest and most effective residential wood burning strategy in the nation. The District's Rule 4901 (Wood Burning Fireplaces and Wood Burning Heaters) in conjunction with the District's Burn Cleaner grant program have proven to be extremely effective in advancing the District's objectives to attain the PM2.5 federal standards and protect public health. This approach that combines regulatory and incentive based strategies is designed to improve public health by reducing toxic wood smoke emissions in Valley neighborhoods during the peak PM2.5 winter season (November through February).

Currently, the District is engaged in an extensive public process to develop a new PM2.5 attainment strategy to address the latest PM2.5 standards. Despite achieving significant emission reductions through decades of implementing the most stringent regulatory control program in the nation, attainment of the latest PM2.5 standards by the pre-2025 federal deadlines will require significant additional emission reductions. Given the significant public health benefits that can be realized cost-effectively from reductions in wood smoke emissions and to ensure continued effectiveness of the current strategy and explore potential

enhancements, on June 15, 2017, your Board approved a contract with Gomez Research to conduct a bilingual scientific survey in late 2017 to assess residential wood burning behaviors in the Valley. The purpose of this item is to review the significant findings from this survey and discuss the recommended enhancements to the District's comprehensive residential wood burning programs based on the survey results.

RESIDENTIAL WOOD BURNING SURVEY:

The residential wood burning telephone survey was designed to gauge the District's current efforts, including the *Check Before You Burn* and *Burn Cleaner* programs, and evaluate potential future strategies that will continue to reduce pollution from residential wood burning. Specifically, the survey obtained:

- Information to guide District's public education and outreach
- Information to gauge participation in *Burn Cleaner* incentive program and how public participation could be enhanced
- Information to understand public sentiments and acceptance relating to potential changes to District's wood burning curtailment regulations
- Enhanced inventory data and understanding of spatial and temporal pattern of wood burning device usage
- Information to gauge current rule effectiveness and compliance rate
- Basic demographics

Despite a delay in beginning the survey due to low answering rates, Gomez Research surveyed over 1,500 Valley residents by November 2017. The survey consisted of both a general, random population of residents throughout the Valley as well as a supplemental sample, or "high-incidence area," of 500 residents living in targeted zip codes believed to have higher concentrations of wood burning devices in Fresno and Kern Counties, where the Valley's peak PM_{2.5} air monitoring stations are located. The general sample was designed to capture a broad understanding of public awareness and perception of the District's wood burning program, while the supplemental sample was designed to elicit more information about regional wood burning control strategies. Overall, the large survey response by Valley residents provides statistically significant results that can be relied upon to enhance our understanding of residential wood burning behavior in the San Joaquin Valley.

Upon compiling and analyzing the 1,500 survey responses, Gomez Research summarized their findings in a final report. District staff independently analyzed the extensive survey data and reviewed Gomez Research's findings to develop a list of recommended actions for enhancing the District's residential wood burning curtailment strategy for your Board's consideration as discussed below.

SURVEY SIGNIFICANT FINDINGS:

The significant findings from the survey are categorized and summarized as follows:

A. Public Knowledge and General Beliefs about Wood Smoke

1. A total of 36% of residents who use their wood-burning devices reported that they believe wood smoke is dangerous. One-in-five Valley residents (20%) who burn do not believe wood smoke is dangerous to their health, and 8% believe it actually provides health benefits.
2. Ten percent of residents believe that someone in their household experiences health problems as a result of wood burning.
3. Findings suggest that residents who know that wood smoke is dangerous to their health tend to be English-speakers with above median incomes (greater than \$50,000), although a larger sample would be needed to confirm this demographic profile statistically.

B. Presence and Use of Wood Burning Devices

1. A total of 29% of the general population surveyed reported having some type of wood burning device.
2. A total of 41% of residents living in the supplemental sample zip codes in Fresno and Bakersfield urban areas reported having some type of wood-burning device. Of this population, 88% reported having an open-hearth fireplace.
3. For residents who have a wood burning device, 52% do not use their device, followed by 16% who use their device less than once a week, 14% several days a week, 9% nearly every day, and 7% once a week.
4. A total of 18% of residents living in the Fresno and Bakersfield metropolitan areas reported that they burn wood once a week or more, compared to 34% among the general population, a statistically significant difference.
5. Most residents typically burn in the evenings. Nearly two-thirds of residents typically burn in the evening (63%), followed by 17% who typically burn throughout the day, 8% who typically burn in the morning, and 7% who typically burn in the afternoon.
6. Once started, wood-burning devices in the Fresno and Bakersfield metropolitan areas were used for 3.96 hours, compared to 6.16 hours in other areas.

7. Nearly a third (32%) of all English speakers reported having a wood-burning device at their residence compared to 11% among Spanish speakers.
8. One third (33%) of residents with household incomes of \$50,000 or higher were more likely to report that they had wood-burning devices compared to 23% of those below-median income.
9. Only 9% of the respondents in the general population who use a wood burning device indicated that it is their sole source of heat.

C. Awareness and Compliance with District Wood Burning Prohibitions

1. Among residents in the Fresno and Bakersfield metropolitan areas, 85% reported that they had heard of Check Before You Burn, compared to 63% among residents living elsewhere in the Valley.
2. More than half of all residents surveyed (58%) are aware of checking the burn day status using the toll-free hotline or website. Over one third (36%) of all residents were aware of email and text notifications for burn status. These figures do not include a larger segment of the population that obtains burn status information from television, radio, and other mass media.
3. Nearly 97% of the respondents who checked for no-burn restrictions “all the time” or “most of the time” replied that they always comply with the rule. The sample size for this question was smaller and therefore the statistical significance is questionable.

D. Awareness and Interest in District *Burn Cleaner* Incentive Program

1. A total of 61% of Valley residents believe the District should provide financial assistance to encourage people to switch to cleaner-burning devices rather than institute a Valleywide ban on residential wood-burning.
2. A total of 29% of higher-income residents were aware of the Burn Cleaner incentive program, compared to 17% among lower-income residents.
3. More than 27% of English-speakers were aware of the Burn Cleaner incentive program, compared to 10% of Spanish-speakers.
4. Approximately 17% of residents with wood-burning devices would participate in the Burn Cleaner incentive program if the rebate were offered at 25%.
5. An additional 12% of residents with wood-burning devices would participate in the Burn Cleaner incentive program if the incentives was at least 50%.

6. An additional 15% of residents were willing to participate in the Burn Cleaner Burn Cleaner incentive program if a 75% rebate level was offered, for a total of 44% of residents willing to participate at or below this incentives level. Similar results were seen for the supplemental sample.

E. Public Opinion and Sentiments Related to Possible Changes to Wood Burning Program

1. Two-thirds of Valley residents (67%) believe the current burn restrictions are reasonable, followed by 14% believing current restrictions are too aggressive and should be relaxed, and 10% believing that current restrictions are too lenient.
2. Less than one third (29%) of residents surveyed in the Fresno and Bakersfield areas say they would be willing to replace their traditional devices if they could burn wood on some no-burn days, compared to 39% of residents in the rest of the Valley.
3. Only 6% of residents in the Northern Region reported that the “current restrictions don’t go far enough” compared to 12% of residents in the Central Region and 13% in the Southern Region, a statistically significant difference.
4. Residents who believe wood smoke causes air pollution are more likely to support tougher burn restrictions. Among residents who recognize a correlation between wood burning and air quality, 15% reported that the current burn restrictions “don’t go far enough,” compared to 6% among other residents.

CONCLUSIONS AND RECOMMENDATIONS:

Scientific studies show that prolonged inhalation of wood smoke contributes to lung disease, pulmonary arterial hypertension, and pulmonary heart disease, which can eventually lead to heart failure. However, survey findings suggest that of Valley residents that engage in wood burning, only 36% are aware of the detrimental health impacts associated with wood smoke. It is reasonable to conclude that with enhanced public education, more Valley residents could be persuaded to refrain from wood burning. The survey findings also suggest that of Valley residents who have a wood burning device, the majority (by a 3 to 1 margin) are English speaking and most (by a greater than 2 to 1 margin) have above-median income. Therefore, the following actions are recommended:

- **Increase emphasis on health impacts of wood smoke in *Check Before You Burn* outreach through messaging within paid advertisements, educational videos, brochures and other outreach collateral.**

- **Hold community meetings and workshops to discuss health impacts of wood smoke including its cost effectiveness in meeting federal mandates as compared to costly regulations imposed on Valley businesses.**
- **Target a greater share of the outreach at the Valley's English-speaking population with above-median incomes.**

The Burn Cleaner Incentive Program remains a critical part of the District's overall residential wood burning strategy by providing resources to assist Valley residents in upgrading their older, high-polluting wood burning devices to significantly cleaner devices. Since 2009, the Burn Cleaner incentive program has successfully obligated over \$19.2 million to install more than 13,800 clean burning devices in homes throughout the Valley.

Survey results indicate that the District has made significant gains in educating the public about the *Burn Cleaner* program over the past few years. Twenty-four percent of the general population residents surveyed reported that they had heard of the *Burn Cleaner* incentives program, a statistically significant increase over the 17% reported in 2014. Furthermore, the number of Valley residents willing to switch to a cleaner device has increased from 29% in 2014 to 36%. Despite these improvements, smoke from residential wood burning is still a significant source of particulate matter in the Valley during the winter. Increasing the turnover of old, polluting wood-burning devices is still a key component of the District's PM2.5 control strategy, so the District must continue to look for ways to increase program participation. More respondents were willing to purchase with at least a 75% incentive than they were initially without an incentive, indicating that increased, targeted incentives funding in this region would be more effective than targeting other regions. Therefore, the following actions are recommended:

- **Increase the incentive amount offered in the Valley's hot-spot areas.**
- **Increase the use of clean wood burning units through continued regulatory incentives by offering residents who switch to clean burning units more days to use their devices.**
- **Continue to offer greater financial incentives for natural gas conversion.**

With respect to Valley residents' compliance with the District's burn prohibitions, the survey results, although sample size is limited, are in line with the District's observations through extensive field enforcement activities that illustrate a high compliance rate. The overwhelming majority of the Valley residents (85%) believe that the current rule restrictions are either appropriate or too aggressive. As the District contemplates future changes to the rule, these survey results may indicate that continued high compliance rate might diminish resulting in a negative impact on air quality. However, attaining the

latest federal standards is not possible without additional reductions from residential wood burning devices. As public acceptance is a key factor in achieving the desired compliance rate and resulting emission reductions, for the changes to be effective, incorporating all of the following components in the program is imperative:

- **Meaningful financial incentives for upgrading to cleaner units.**
- **Maintaining regulatory incentives for Valley residents who switch to clean burning units.**
- **Strong public education regarding adverse health effects of wood smoke.**
- **Strong public education highlighting the effectiveness and low cost associated with residential wood burning curtailment regulations as compared to alternative regulations with great direct or indirect cost to Valley businesses and residents.**
- **Continue strong enforcement.**

In addition to the above policy recommendations, the District will also use the survey results to guide the District's ongoing work in updating and refining the emissions inventory for residential wood burning devices.

*Attachment:
2017 Residential Wood Combustion (RWC) User Activity Survey Final Report (58 pages)*

San Joaquin Valley Unified Air Pollution Control District
Meeting of the Governing Board
January 18, 2018

**RECEIVE FINAL RESIDENTIAL WOOD BURNING SURVEY
RESULTS AND CONSIDER OPTIONS FOR PROGRAM
ENHANCEMENTS**

Attachment:

**2017 RESIDENTIAL WOOD COMBUSTION (RWC) USER ACTIVITY
SURVEY FINAL REPORT**

(58 pages)

2017 Residential Wood
Combustion (RWC) User Activity
Survey
Final Report

January 2018

Submitted to:

San Joaquin Valley Air
Pollution Control District



Submitted by:

Gomez Research, Inc.
Pasadena, California

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EXECUTIVE SUMMARY

As part of its mission to bring the San Joaquin Valley into compliance with federal and state clean air standards, the San Joaquin Valley Air Pollution Control District contracted with Gomez Research Inc., an independent research and consulting firm, to conduct a survey of residents to help evaluate residential wood-burning patterns and awareness of the District's *Check Before You Burn* and *Burn Cleaner* programs. The current study builds on previous research conducted in 2014 and compares changes in behavior and awareness over time. In addition to a general population survey, the 2017 study included a supplemental sample of residents living in 20 targeted zip codes in areas of Fresno and Kern counties, known to have a higher incidence of wood-burning devices and where the PM2.5 Design Value air monitoring stations are located. The supplemental sample was designed to provide additional information about wood-burning behaviors and assess the feasibility of more regionally targeted strategies that may optimize results for meeting clean air standards. Findings from both components of the research will be used to inform future outreach strategies and provide data for estimating the emission produced by wood-burning devices.

The general population sample included 1,001 telephone interviews and was conducted using a dual-frame random-digit dialing (RDD) design. Surveys were conducted in English and Spanish with owners and renters of single-family homes in San Joaquin, Stanislaus, Merced, Kings, Fresno, Madera, and Tulare counties and the Valley portion of Kern County. The supplemental sample targeted owners and renters living in selected zip codes and was collected using a hybrid of RDD and listed sample. A total of 203 of the surveys came from the RDD sample and an additional 500 were collected randomly from publically listed numbers for a total of 703 completed interviews. Both samples included landline and cell phones. The study was conducted September 5 through October 28, 2017. The average survey length was 9 minutes. The margin of error for both the general population sample and supplemental sample was +/-4 percent at the 95 percent confidence interval, which takes into account the design effects of weighting. The margin of error for sub-populations was higher.

Key findings are presented for Valley residents overall, followed by results for the high-incidence areas.

Key Findings: San Joaquin Valley Overall

Presence and Use of Wood-Burning Devices

- Nearly one-third (29 percent) of all residents surveyed reported having a wood-burning device in their home, similar to findings from 2014. Among those residents with wood-burning devices, 9 percent were identified as exempt from mandatory no-burn restrictions.
- **One-out-of-three residents who use their devices (30 percent) reported lighting their fireplace or stove once a week or more. Once started, fires were burned for 5.6 hours on average, statistically equivalent to 6.3 hours recorded in 2014.**

- **Nearly three-fourths of residents surveyed (72 percent) burn seasoned firewood, followed by 27 percent who use manufactured logs, such as Duraflame, and 9 percent who use pellets, similar to findings from 2014.** A total of 10 percent of residents surveyed reported that they burn trash, magazines, newspapers and/or other household materials.
- Nearly two-thirds of residents burn in the evenings (63 percent), followed by 17 percent who burn throughout the day.
- **The primary reason residents choose to burn wood is for heat (66 percent), followed by the atmosphere it creates (35 percent). Nearly one-out-of-five residents surveyed (18 percent) reported that they burn wood to save money on utilities.**
- **English-speaking residents and those with above median incomes were more likely than others to report that they had a wood-burning fireplace or stove.¹** Specifically, 32 percent of all English speakers reported having a wood-burning device at their residence compared to 11 percent among Spanish speakers. In addition, residents with incomes of \$50,000 or higher were more likely to report that they had wood-burning devices compared to those with lower incomes (33 percent compared to 23 percent, respectively).

Awareness and Compliance with No Burn Restrictions

- **The *Check Before You Burn* program continues to be widely recognized by residents.** There were no statistical changes in the proportion of residents who reported hearing of the program (77 percent in 2017 compared to 80 percent in 2014, statistically equivalent).
- **More than half of all residents surveyed (58 percent) were aware of the toll-free hotline or website and one-third (36 percent) were aware of email and text notifications.**
- Although a greater sample would be necessary to confirm findings, results suggest that there is high compliance among residents with knowledge of the *Check Before You Burn* program. Of the 44 respondents who had wood-burning devices and knew how to check for air status warnings, 35 reported that they check “all of the time” or “most of the time.” Moreover, among the 35 respondents who reported that they check to see if it is a no-burn day, nearly all (34 out of the 35 respondents) comply with the no-burn restrictions.
- **Just under half of all residents surveyed (46 percent) reported that they would be “somewhat likely” or “very likely” to report a neighbor who was violating burning restrictions.** Moreover, residents who believe wood smoke is a major source of air pollution are more likely to say they would report their neighbors, 58 percent compared to 34 percent respectively (“somewhat likely” and “very likely” combined.)

¹ Median income for the San Joaquin Valley was estimated at \$50,000 based on U.S. Census data for the each of the eight counties.

Awareness and Interest in the *Burn Cleaner* Rebate Program

- **One quarter of all residents surveyed (24 percent) reported that they had heard of the *Burn Cleaner* program, a statistically significant increase over 17 percent in 2014.** Residents with wood-burning devices were more likely to be aware of the program compared to other residents; 28 percent compared to 22 percent, respectively.
- **English-speaking residents and those with above median incomes were more likely to be aware of the *Burn Cleaner* program compared to other residents. This pattern was consistent for the Valley as a whole and within the high-incidence areas of Fresno and Kern County.** A total of 29% residents with incomes above \$50,000 were aware of the *Burn Cleaner* program, compared to 17% among lower-income residents. In addition, more than a quarter of English-speakers (27%) were aware of the program, compared to 10% of Spanish-speakers.
- **A total of 36 percent of residents surveyed reported that they would be willing to switch devices if they could use those devices on some no-burn days, up from 29 percent in 2014, a statistically significant increase.** The study found that residents who believe wood smoke is a significant source of air pollution are more willing to replace their traditional fireplace or stove, 42 percent compared to 30 percent, respectively.
- **Findings suggest that approximately 17 percent of residents with wood-burning devices would participate in the program if the rebate were offered at 25 percent.** Approximately 29 percent of residents with wood-burning devices would participate in the program if the rebate were offered at 50 percent (combined totals for 25 and 50 percent levels) and 44 percent would be willing to participate if the rebate was as high as 75 percent (combined totals for 25, 50, and 75 percent levels).

General Beliefs and Awareness Regarding Wood Smoke

- **One-in-five Valley residents (20 percent) who use wood-burning devices do not believe wood smoke is dangerous to their health and 8 percent believe it actually provides health benefits.** A total of 36 percent of residents who burn in the winter reported that they know wood smoke is dangerous but they either cannot afford other heating alternatives or simply enjoy burning wood.
- Ten percent of residents believe that someone in their household experiences health problems as a result of wood burning.
- **Two-thirds of Valley residents (67 percent) believe the current burn restrictions are reasonable and 61 percent believe the District should provide financial assistance to encourage people to switch to cleaner-burning devices rather than institute a Valley-wide ban on residential wood burning.** Only 6 percent of Valley residents would support a valley-wide ban on the use of wood-burning devices. Ten percent of all residents surveyed believe current restrictions are too lenient.

- **Residents from the Central and Southern regions (including Fresno, Kings, Madera, Kern, and Tulare) were more likely to support strict burn restrictions compared to residents from the Northern Region.** Only 6% of residents in the Northern Region reported that the “current restrictions don’t go far enough” compared to 12 percent of residents in the Central Region and 13 percent in the Southern Region, a statistically significant difference.
- **Residents who believe wood smoke causes air pollution are more likely to support tough burn restrictions.** Among residents who recognize a correlation between wood burning and air quality, 15 percent reported that the current burn restrictions “don’t go far enough,” compared to 6 percent among other residents.
- **Findings suggest that English-speakers and those with incomes above \$50,000 are more likely to know that wood smoke is dangerous to their health, although a larger sample would be needed to confirm these observed differences statistically.**²

Key Findings: Supplemental Sample/High-Incidence Areas

Presence and Use of Wood-Burning Devices

- **A total of 41 percent of residents living in the high-incidence zip codes reported having some type of wood-burning device, including 36 percent who report having a wood-burning fireplace, significantly higher than other areas of the Valley.** The exact proportion of households in the high-incidence areas that have wood-burning devices is likely closer to two-thirds (as estimated by the American Household Survey and other U.S. Census data that use housing construction data in addition to survey questionnaires).
- **Although a greater proportion of residents in the high-incidence areas have wood-burning devices, they use those devices less often compared to other residents and for shorter periods of time.** A total of 18 percent of residents living in the high-incidence areas reported that they burn wood once a week or more compared to 34 percent among the general population, a statistically significant difference. Once started, fires in the high-incidence areas were burned for 3.96 hours, compared to 6.16 hours in other areas.
- Other wood-burning patterns between the two populations were similar, including the type of fuel burned, the time of day residents reported burning, and reasons for burning wood

² Respondents who reported using a wood-burning device in the winter (n=147) were read a list of five statements and asked which one best described their views. Two of the five statements included the phrase, “I know wood smoke is dangerous to my health.” The demographic profile of respondents who selected either statement (n=52) were then analyzed. A total of 61% of those respondents had an income of \$50,000 or higher and 90% were English speakers. Due to the extremely small sample size, results should be interpreted with caution.

Awareness and Compliance with No-Burn Restrictions

- **Findings suggest that residents in the high-incidence areas tend to be better informed than other residents about the *Check Before You Burn* program, including how to access sources of information regarding no-burn days.** Among high-incidence residents, 85 percent reported that they had heard of *Check Before You Burn*, compared to 63 percent among residents living elsewhere in the Valley.
- Residents living in the high-incidence areas were more likely than other residents to know that they could call the District's toll-free hotline or visit the website to determine if it is safe to burn wood based on current air quality. More than two-thirds (69 percent) of residents in the high-incidence areas were aware of toll-free hotline or website compared to just over half (55 percent) of residents living in other parts of the valley.
- Residents living in the high-incidence areas were also more likely to be aware of that they could sign-up for email and text notifications alerting them when a no-burn day has been issued, 46 percent compared to 34 percent, respectively.
- No statistically significant differences were found between residents living in the high-incidence areas and the general population in terms of compliance with no-burn restrictions or their willingness to report neighbors who violate burn restrictions.

Awareness and Interest in the *Burn Cleaner* Rebate Program

- **Residents living in the high-incidence areas were no more likely to be aware of the *Burn Cleaner* program than were other Valley residents.** A total of 26 percent of high-incidence residents were aware of the program, compared to 23 percent of the general population, statistically equivalent.
- **While residents living in high-incidence zip codes had similar awareness levels compared to the general population, findings suggest that they are less willing to replace their current wood-burning fireplaces or stoves with cleaner devices.** Just over one-quarter of residents living in the high-incidence areas (29 percent) say they would be willing to replace their traditional devices if they could burn wood on some no-burn days, compared to 39 percent of residents living in other areas.
- **No differences were found in the proportion of residents who reported that they would upgrade from their current wood-burning device at each rebate level (25 percent, 50 percent, and 75 percent) in high-incidence areas compared to the rest of the Valley.** Findings suggest that approximately 15 percent of residents with wood-burning devices in the high-incidence areas would upgrade if the rebate were offered at 25 percent and 26 percent of residents would participate in the program if the rebate were offered at 50 percent (combined totals for 25 and 50 percent levels). Approximately 41 percent of residents living in the high-incidence areas said they would participate in the *Burn Cleaner* program if the rebate were offered at 75 percent, compared to 42 percent among residents living outside the high-incidence areas.

General Beliefs and Awareness Regarding Wood Smoke

- **The study found that residents living in the high-incidence zip codes have similar beliefs regarding wood smoke when compared to the general population**, including perceived health effects of breathing wood smoke, the incidence of household members suffering health problems as a result of wood burning, and current restrictions on wood burning.

Conclusions

Study findings suggest that the District has made significant gains educating the public about its *Burn Cleaner* program. Both the proportion of residents aware of the *Burn Cleaner* rebate program and the proportion of residents willing to switch to cleaner burning devices has increased since 2014 for the Valley overall.

Despite these achievements, further work is needed. Half of Valley residents still do not believe wood smoke is a significant source of air pollution and one-in-five do not believe wood smoke is dangerous to their health (8 percent believe it provides health benefits). Awareness of the effects of wood smoke matter because residents who believe wood smoke is a significant source of air pollution are more willing to replace their wood-burning devices, are more supportive of restrictions on wood burning, and are more likely to report a neighbor who violates regulations. Currently, only about one-third of residents who burn in the winter believe that wood burning is dangerous to their health.

For the targeted zip codes where air quality is of particular concern, a more targeted incentives campaign may be a more effective strategy for reducing emissions in this region. People living in the targeted areas actually use their fireplaces and wood-burning devices less often and for shorter periods of time compared to other residents. These residents are also more likely to be aware of the *Check Before You Burn* program, including how to access information regarding no-burn days. Despite their high level of awareness, people living in targeted areas are *less* willing to replace their wood-burning devices with cleaner alternatives without incentives compared to other residents. Given that the most important difference contributing to higher pollution in these targeted areas appears to be the sheer volume of traditional wood-burning devices, continued efforts to increase participation in the District's rebate programs will likely have the greatest impact on air quality.

Finally, study results suggest that the *Burn Cleaner* program may benefit from marketing that targets not only geographic areas but demographic segments as well. English-speaking residents and those with household incomes of \$50,000 or higher are significantly more likely to own a wood-burning fireplace or stove, and already tend to be more aware of the *Burn Cleaner* program, compared to other residents. This pattern was consistent for the region overall and within the targeted areas of Fresno and Kern counties, even though some zip codes in those areas may be low income. (The demographic profile of residents is only one factor determining whether homes have wood-burning fireplaces, such as the year of construction.) Moreover, other research indicates that higher-income households are generally more likely to make energy efficient investments and participate in public rebate programs. A demographic profile of existing users of the District's rebate program, coupled with an analysis of the current research findings, may prove useful for refining the District's marketing approach.

INTRODUCTION

The San Joaquin Valley Air Basin, which spans 25,000 square miles and is home to over four million residents, is unusually susceptible to air pollution. The Valley's surrounding mountain topography, hot summers, foggy winters and frequent temperature inversions help form and retain a variety of air pollutants. While air quality in the Valley has improved significantly, the Valley continues to be one of the more polluted regions in the nation for both ozone and fine particulate matter. During the winter season, the San Joaquin Valley Air Pollution Control District estimates that residential wood-burning contributes significantly to particulate pollution.

To gain insight on residential wood combustion and its contribution to poor air quality, the District contracted with Gomez Research Inc. to conduct two waves of survey research with Valley residents, beginning in 2014. The purpose of the research was to document residents' wood-burning patterns and measure awareness of the District's *Check Before You Burn* and *Burn Cleaner* programs. Findings from the research will be used to track changes in awareness and wood-burning behavior over time, inform future outreach strategies, and provide data for estimating the emissions produced by wood-burning devices.

The following report presents findings from the 2017 survey effort and compares results to data collected in 2014. In addition to the general population sample, which was conducted in both 2014 and 2017, a supplemental sample was added this year with residents living in targeted zip codes within the San Joaquin Valley that have higher concentrations of wood-burning devices and where the Valley's PM2.5 Design Value air monitoring stations are located. The supplemental sample was designed to provide additional information about wood-burning behaviors and to assess the feasibility of more regionally targeted strategies that may optimize results for meeting federal standards.

The remainder of this report presents the survey methodology and findings that emerged from the data analyses and is organized as follows:

- The **Methodology** section, which describes data collection and statistical methods;
- The **Findings** section, documenting awareness and behaviors;
- **Conclusions**; and,
- The **Appendices**, which include the survey instrument, frequencies for each question for the region overall and for high-incidence areas, and a demographic profile of residents surveyed compared to known population estimates.

METHODOLOGY

Overview

The study included two separate samples. The general population sample was collected using the same methodology applied in 2014 to ensure that results could be reliably compared. To generate data for the Valley population overall, 1,001 telephone surveys were conducted in English and Spanish with owners and renters of single-family homes³ in San Joaquin, Stanislaus, Merced, Kings,

³ The sample was limited to single-family units to ensure that the greatest number of respondents would be able to answer questions regarding wood combustion. Based on U.S. Census data, we estimate that more than 80 percent of housing units

Fresno, Madera, and Tulare Counties and the Valley portion of Kern County. Respondents were selected using a dual-frame, random-digit dialing (RDD) design whereby telephone prefixes were matched to zip codes for the San Joaquin Valley geographical area and the remaining digits were randomly generated. (A telephone prefix is the first three digits of a seven-digit telephone number after the area code.) The provider of the sample was Survey Sampling International (SSI) and interviews were conducted by Interviewing Service of America (ISA). Within households, the oldest/youngest method was used to randomly select one adult aged 18 years or older. (For a copy of the survey instrument and screening questions, see **Appendix A.**) A total of 43 percent of all telephone interviews for the general sample were conducted on cell phones.

The supplemental sample targeted owners and renters living in 20 selected zip codes in Fresno and Kern counties known to have a higher incidence of wood-burning devices. A total of 203 respondents living in these areas were drawn from the general population RDD sample and an additional 500 respondents were selected randomly from telephone numbers listed in public directories. This hybrid approach, combining RDD and listed sample, was necessary to ensure a reasonable incidence rate (the likelihood of finding people who qualified for the study, namely residents living in single-family homes who lived within one of the 20 targeted zip codes). A total of 17 percent of all telephone interviews for the supplemental sample were conducted on cell phones.

Fieldwork was initiated in July 2017; however, due to extremely low contact rates (less than 5 percent of numbers dialed were answered) the study was suspended after 100 completes and postponed until after the summer vacation season. The study was restarted on September 5 and continued through October 28, 2017. Surveys were conducted using a computer-assisted telephone interview (CATI) system in which interviewers read questions from a computer screen and typed respondents' answers directly into a database. The average length of the survey was 9 minutes.⁴

The margin of error for both the general population sample and the supplemental sample was +/-4 percent at the 95 percent confidence interval, which takes into account the design effects of weighting. The margin of error for sub-populations may be higher. A margin of error of +/-4 percent at the 95 percent confidence level means if the study were conducted repeatedly, 95 times out of 100 the results would be the same give or take 4-percentage points (or less) on any given question.

Weighting

The general population sample was weighted to reflect the population based on the following dimensions: age, race/ethnicity, gender, telephone use, and county of residence. Data were not weighted on income due to non-response bias. Weighting target values were based on the average (population-adjusted) characteristics of the eight-county area. Characteristics were derived from the U.S. Census 2016 population estimates and the 2015 U.S. Census American Community Survey. Telephone use estimates are averages for the state of California and were obtained from the estimates released by the Center for Disease Control (CDC). Estimates were adjusted for adults living in households with no telephone service (2.5%). Weighting was conducted through iterative proportional fitting, also known as raking. Of 1,001 total completions, 849 had adequate item

in the San Joaquin Valley service are single-family units. In some communities, such as Madera, nearly 90 percent of the units are single family.

⁴ For additional questions regarding the study methodology, please contact Sophia Gomez at Gomez Research 626-795-4880.

responses for all weighting parameters. The weights for the remaining 152 cases were set to the mean (1) in order to preserve cases. The design factor of the weighting was 1.17.

The supplemental sample was weighted to reflect the 20 zip code region based on the proportion of the population that lives in each zip code. Zip code population estimates were derived from the U.S. Census American Community Survey. Weighting was conducted through iterative proportional fitting, also known as raking. Of the 703 total completions within the target area, all had adequate item responses for all weighting parameters. The design factor of the weighting was 1.12.

Caveats

It should be noted that the residential survey, like all surveys, has self-reporting bias and should be used in conjunction with results from air pollution reports to determine the extent to which residents are participating in activities that reduce air pollution. Survey research depends on respondents providing truthful and accurate reports of their activities. In addition, the proportion of households reporting that they have wood-burning devices likely underestimates the actual proportion of wood-burning devices that exist in the San Joaquin Valley. Respondents were asked if they had a wood-burning device to provide a basis for questions regarding wood-burning habits. Other sources of information for estimating the actual number of wood-burning devices, such as data from U.S. Census Bureau, are more complete measures.

Comparing Data

The general population survey is considered a representative sample of Valley residents and reflects the demographic composition of the actual population across a variety of parameters including gender, age, and race/ethnicity. The general RDD sample, which includes 203 respondents from the targeted/high-incidence zip codes, is reliable for comparing public opinion and wood-burning practices across years for the Valley as a whole and for comparing public opinion among residents living in the high-incidence zip codes with residents living elsewhere.

The supplemental sample, which was added in 2017 to provide more details on residents with wood-burning devices, is considered representative of residents with wood-burning devices living in the high-incidence zip codes and is useful for drawing conclusions about wood-burning patterns and for comparing those wood-burning patterns to residents living elsewhere. The supplemental sample, is not, however, as useful for examining public opinion since the sample skews toward older, white respondents. Older residents are much more likely to have listed telephone numbers and landline numbers (which make up the majority of the supplemental sample) and white residents are more likely to have wood-burning fireplaces. Although weighting factors could have been applied to correct for these demographic differences, such weights would have distorted other variables. A heavy weighting scheme was not necessary since the general population survey was available for public opinion analyses. (See **Appendix B** for sample demographics compared to population estimates).

Statistical tests were conducted for all comparative analyses to identify whether observed differences across years or among demographic groups were statistically significant.⁵ All significant differences

⁵ A statistically significant difference means that the difference between years or among groups is not by chance, and that a real difference likely exists.

reported here are significant at the 90 percent confidence level or higher. The margin of error for these comparisons was not adjusted for design effects.

Report Organization

This report has been organized around the following topical areas:

- Wood-Burning Patterns
- Awareness and Compliance with Burning Restrictions;
- Awareness and Interest in the *Burn Cleaner* Rebate Program; and,
- General Beliefs and Awareness Regarding Wood Smoke.

The next section of this report presents study findings.

FINDINGS: SAN JOAQUIN VALLEY OVERALL

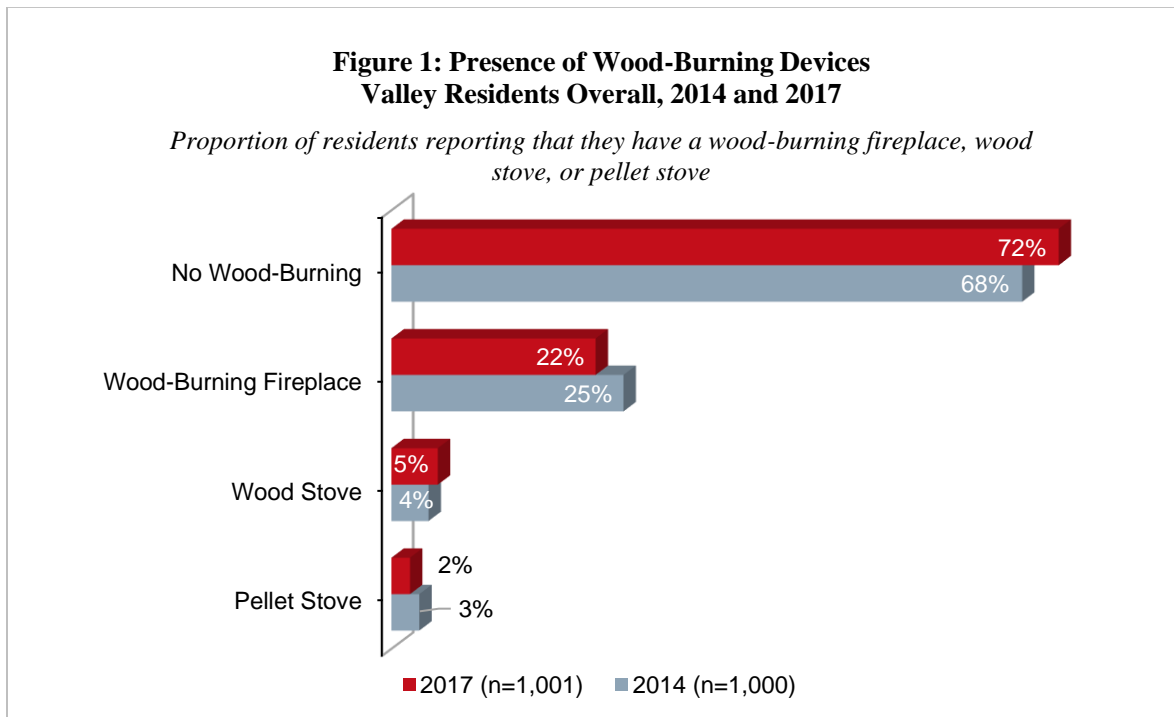
The following section presents survey findings for San Joaquin Valley residents overall, followed by results for the supplemental sample of residents living in targeted zip codes with higher concentrations of wood-burning devices and located near the Valley’s PM2.5 Design Value air monitoring stations.

Wood-Burning Patterns

Presence of Wood-Burning Devices

A key objective of the research was to provide data on residential wood-burning patterns, including how often residents use their fireplaces and wood-burning stoves during the winter, how many days they burn, and for how long.

Respondents were first asked if they had a wood-burning fireplace, wood stove, or pellet stove in their home. **As seen in Figure 1, nearly one-third (29 percent) of all residents surveyed reported having a wood-burning device, similar to findings from 2014.** Among those residents with wood-burning devices, 9 percent were identified as exempt from mandatory no-burn restrictions.⁶

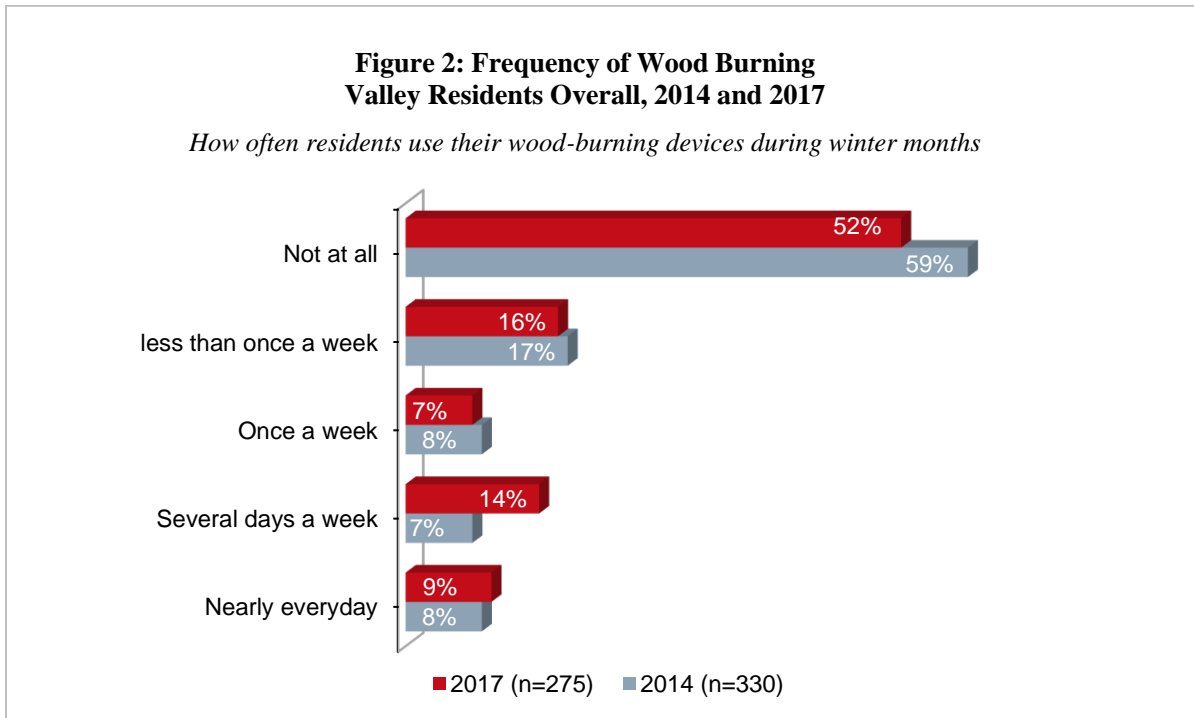


*Figure based on Q2: “I’d like to ask you about the heating devices you may have in your home. Do you have a wood-burning fireplace, wood stove, or pellet stove in your home?” Don’t know/refused not charted.

⁶ Residents with wood-burning devices are exempt from burn restrictions if those devices provide the sole source of heat at a residence.

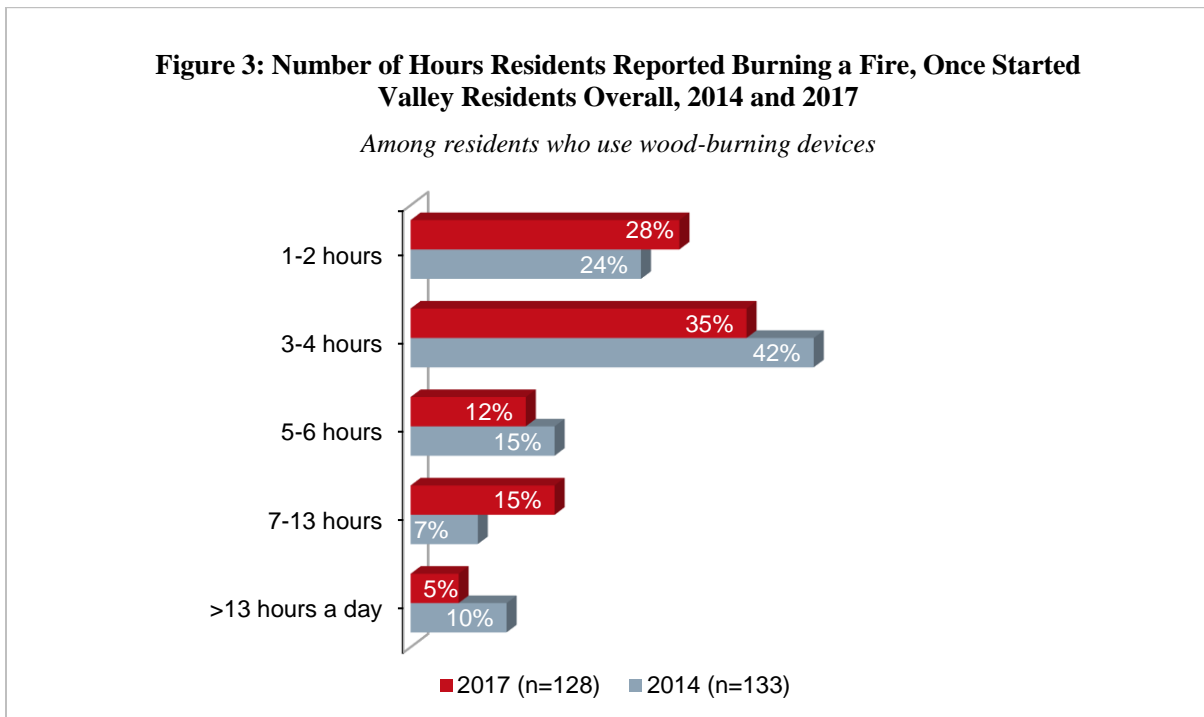
Use of Wood-Burning Devices

Respondents who reported having a wood-burning device were asked how often they use their fireplace or stove during the winter months. Results are presented in **Figure 2**. **In 2017, more than half of all residents with a wood-burning fireplace or stove reported that they do not use their devices (52 percent), statistically unchanged from 2014.** One-out-of-three residents who use their devices (30 percent) reported lighting their fireplace or stove once a week or more. A total of 9 percent of residents reported using their fireplace or stove nearly every day.



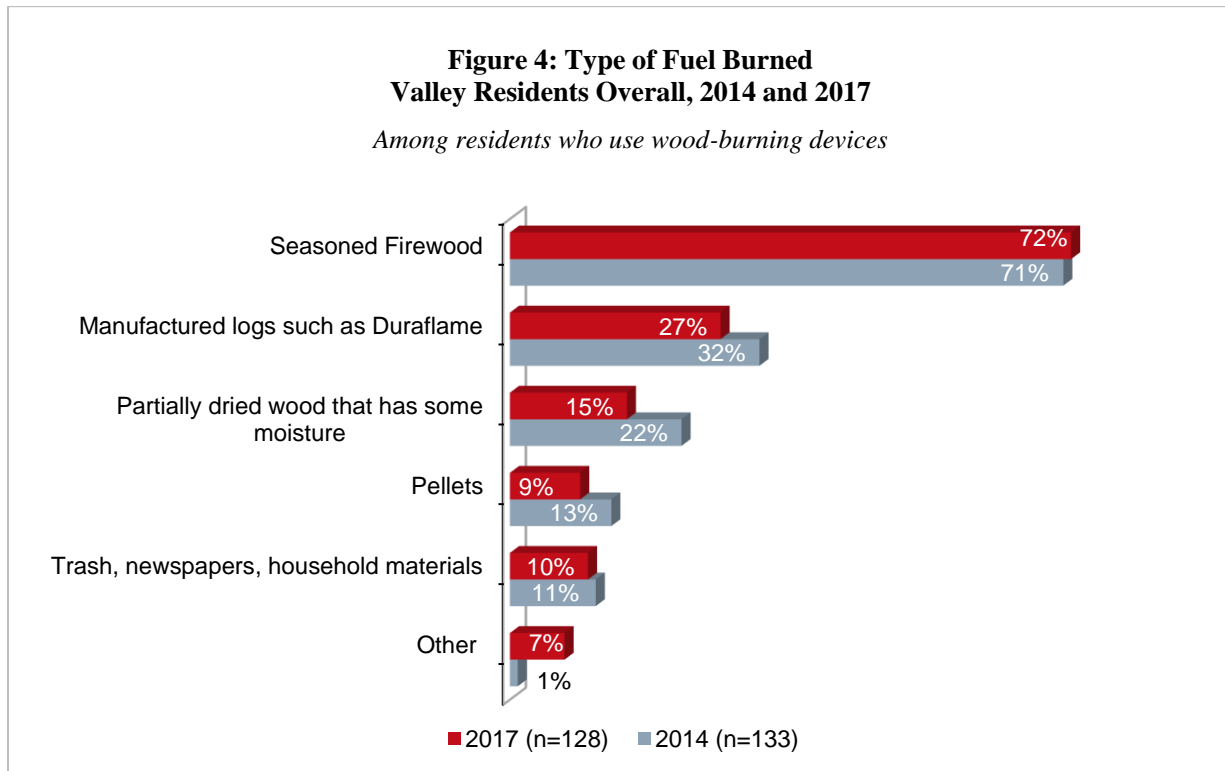
*Figure based on Q5: "How often do you use your fireplace/stove in the winter? Nearly every day, several days a week, once a week, less than once a week, or not at all?" Don't know/refused not charted.

To help estimate the volume of wood-smoke produced during the winter season, residents who reported using their fireplaces or stoves were asked how many hours they typically burn a fire once started. **As seen in Figure 3, nearly two-thirds of residents (63 percent) burn their devices for four hours or less.** Once started, fires were burned for 5.6 hours on average, statistically equivalent to 6.3 hours recorded in 2014.



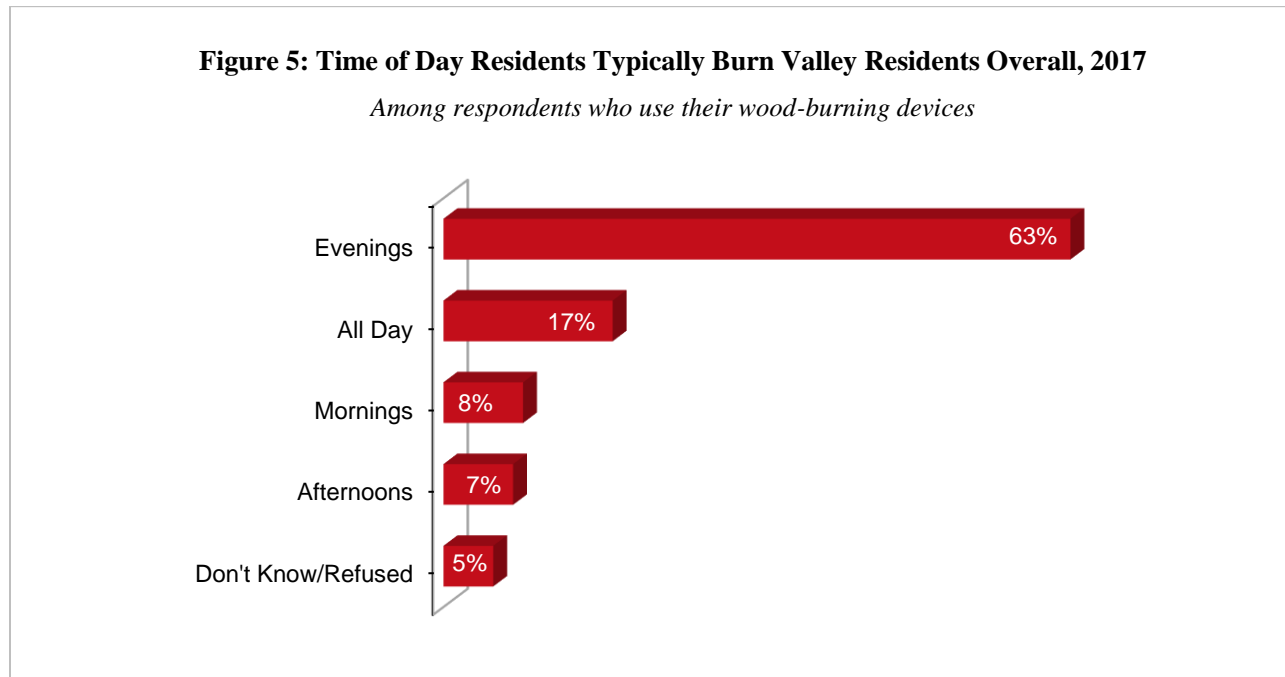
*Figure based on Q6: "Once started, how many hours does your fire usually burn?" Don't know/refused not charted.

Next, respondents who use their wood-burning devices were asked what type of fuel they typically burn. **As seen in Figure 4, nearly three-fourths of residents surveyed (72 percent) burn seasoned firewood, followed by 27 percent who use manufactured logs, such as Duraflame and 9 percent who use pellets, similar to findings from 2014.** A total of 10 percent of residents surveyed reported that they burn trash, magazines, newspapers and/or other household materials.



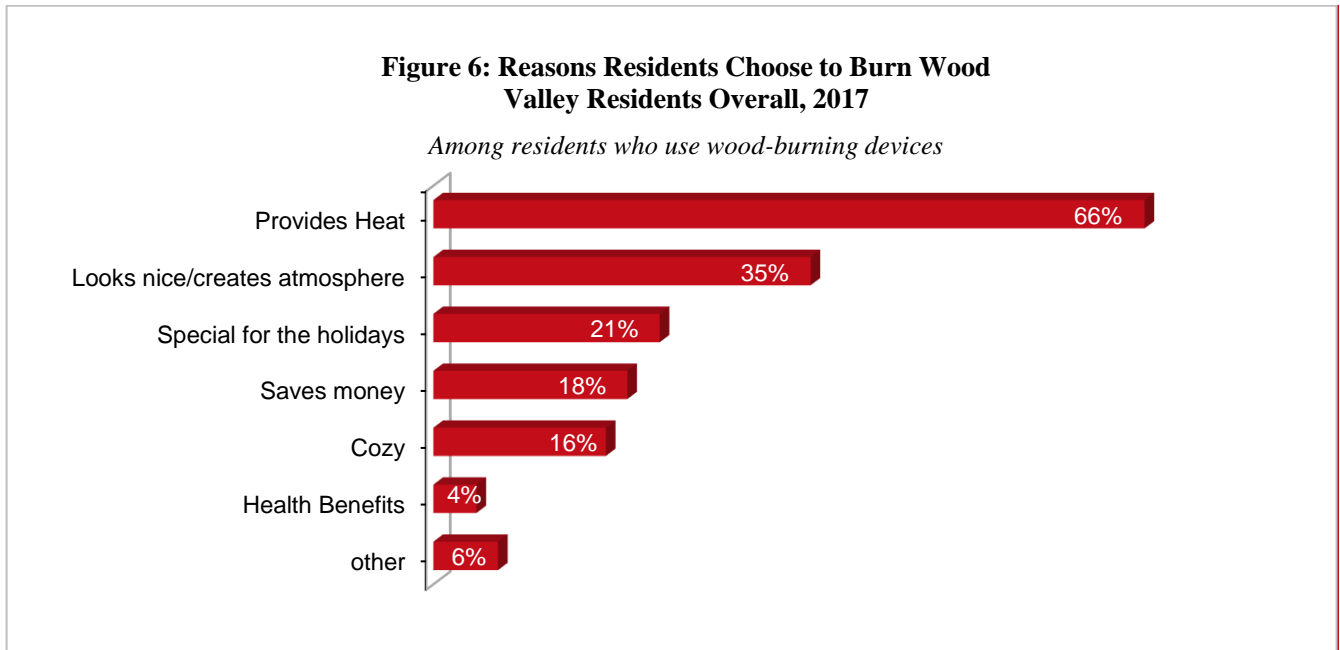
*Figure based on Q7: "Which of the following types of fuel do you typically burn? Check all that apply." Figures may not add to 100% since this was a multiple-response question. The category of "other" included gas and propane.

As seen in **Figure 5**, most residents burn in the evenings. Nearly two-thirds of residents burn at night (63 percent), followed by 17 percent who burn throughout the day.



*Figure based on Q8: "What time of day do you typically burn wood?" Don't know/refused not charted.

The primary reason residents choose to burn wood is for heat (66 percent), followed by the atmosphere it creates (35 percent). Nearly one-out-of-five residents surveyed (18 percent) reported that they burn wood to save money on utilities. Results are presented in **Figure 6**.



*Figure based on Q9: “What would you say is the main reason you choose to burn wood?” Since this was a multiple response question, results do not total 100%. Don’t know/refused responses (3%) are not charted. Totals may not add to 100% since this was a multiple-response question.

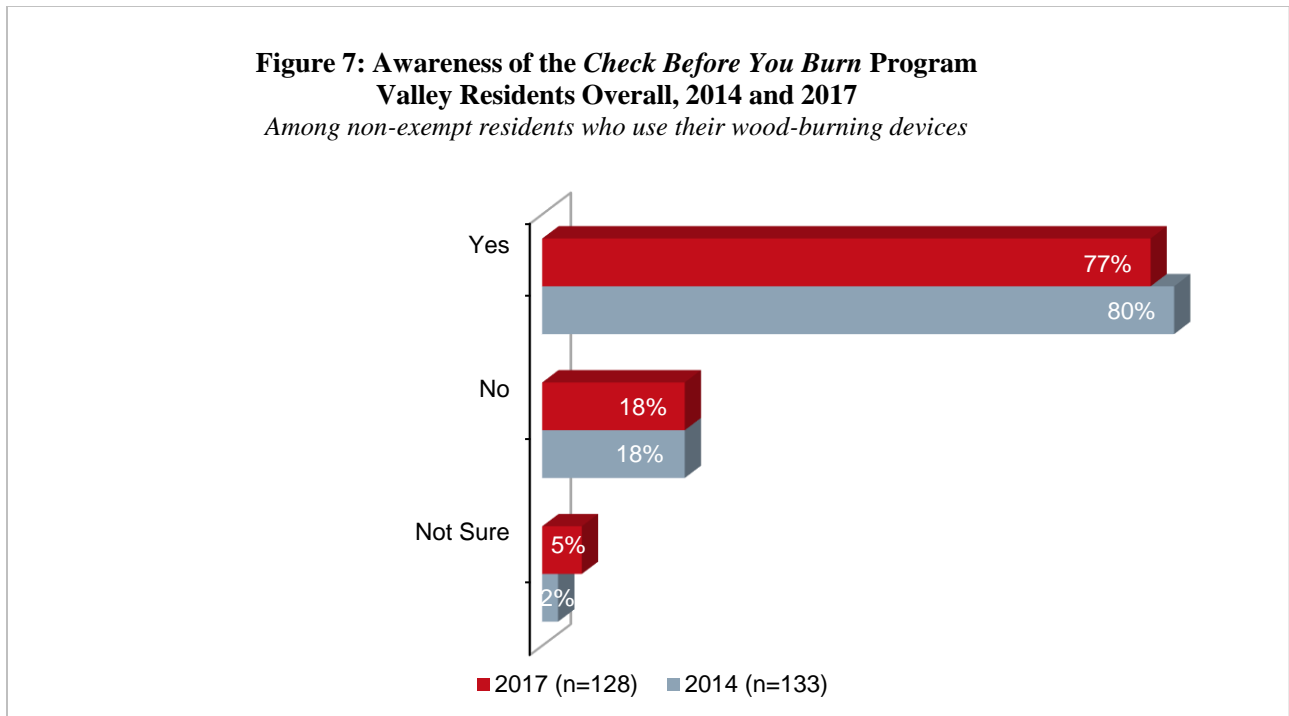
Demographic Differences

Differences were found by language spoken, income, and other demographics. English-dominant speakers (defined as those who chose to conduct the survey in English) were more likely to report that they had a wood-burning fireplace or stove compared to Spanish speakers. Specifically, 32 percent of all English speakers reported having a wood-burning device at their residence compared to 11 percent among Spanish speakers. In addition, residents with above median incomes were more likely to report that they had wood-burning devices compared to those below-median income (33 percent compared to 23 percent, respectively). Finally, homeowners were more likely to report having a wood-burning device compared to renters.

Awareness and Compliance with Burning Restrictions

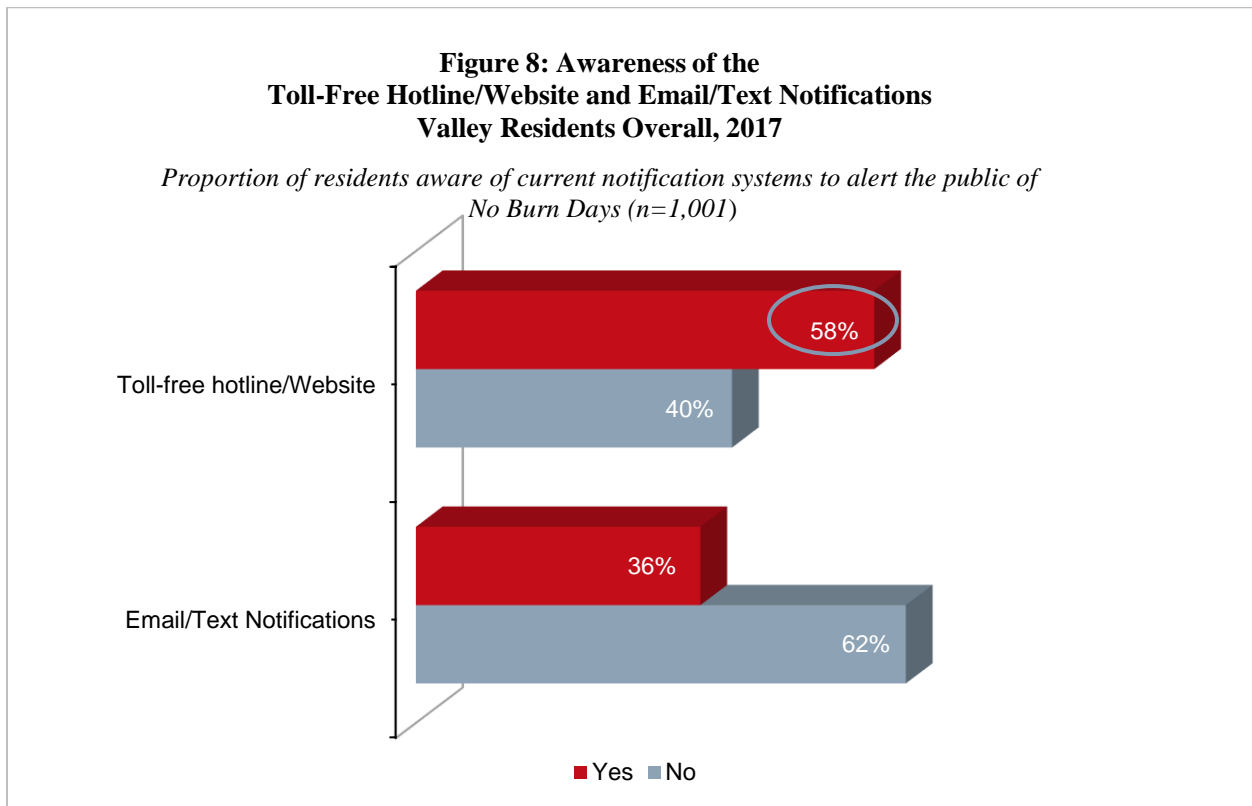
Awareness of the Check Before You Burn Program

Beginning in 2014, awareness questions regarding the *Check Before You Burn* program were specifically asked of residents who use their wood-burning devices and are not exempt from mandatory no-burn restrictions to provide a more accurate picture of the potential impact of program awareness on air quality. As seen in **Figure 7**, the *Check Before You Burn* program continues to be widely recognized by residents. There were no statistical changes in the proportion of residents who reported hearing of the program (77 percent in 2017 compared to 80 percent in 2014, statistically equivalent).



*Figure based on Q10: "Check Before You Burn runs from November through February each year, and prohibits wood burning in fireplaces, wood or pellet stoves, and outdoor fire pits during certain days when it is determined that air quality levels will be most impacted. Have you ever heard of the Check Before You Burn program?"

Next, residents were asked if they were aware that the District has a toll-free hotline and website they can access to determine if a no-burn day has been issued based on current air quality. Residents were also asked if they were aware that they could receive email and text notifications of daily wood-burning status. **As seen in Figure 8, residents were much more likely to be aware of the toll-free hotline and website than they were the email and text notification system.** More than half of all residents surveyed (58 percent) are aware of the toll-free hotline or website compared to one-third (36 percent) who were aware of email and text notifications.

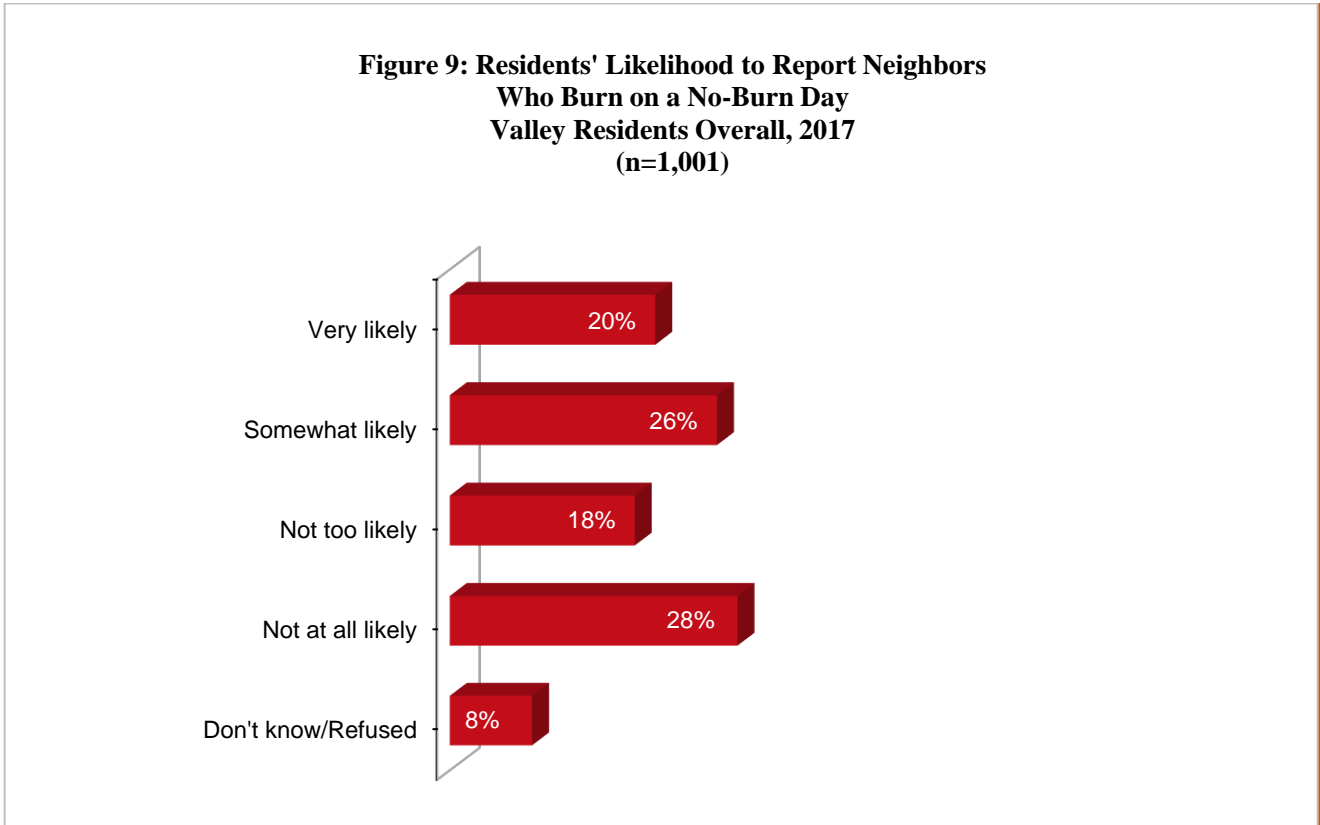


*Figure based on Q11 and Q12: "Are you aware that there is a toll-free hotline that you can call or a website that you can visit in the winter to determine if it is OK to burn wood in a fireplace, stove, or backyard fire pit based on current air quality? Are you aware that you can sign up for email or text notifications of No Burn Days during the winter?" Statistically significant differences at the 95% confidence level are circled. Awareness for the toll-free hotline/website was statistically higher than awareness of email/text notifications. Don't know/refused not charted.

Compliance with No-Burn Restrictions

To help evaluate the relationship between program awareness and behavior, residents with wood-burning devices who were aware of the toll-free hotline, website, or email/text notification system were asked how often they check to see if burning restrictions have been issued before they burn wood. Of the 44 respondents who had wood-burning devices and knew how to check for air status warnings, 35 reported that they check "all of the time" or "most of the time." Moreover, among the 35 respondents who reported that they check to see if it's a no-burn day, nearly all (34 out of the 35 respondents) comply with the no-burn restrictions. Although a greater sample would be necessary to confirm findings, results suggest that there is high compliance among residents with knowledge of the *Check Before You Burn* program.

Finally, residents were asked how likely they would be to report a neighbor who was burning wood on a no-burn day. Results are presented in **Figure 9**. Just under half of all residents surveyed (46 percent) reported that they would be “somewhat likely” or “very likely” to report a neighbor who was violating burn restrictions. **The study found that residents who believe wood smoke is a major source of air pollution where they live are more likely to say they would report their neighbors, 58 percent compared to 34 percent respectively (“somewhat likely” and “very likely” combined).**



*Figure based on Q15: “If you knew one of your neighbors was burning wood on a no-burn day how likely would you be to report them to the District?”

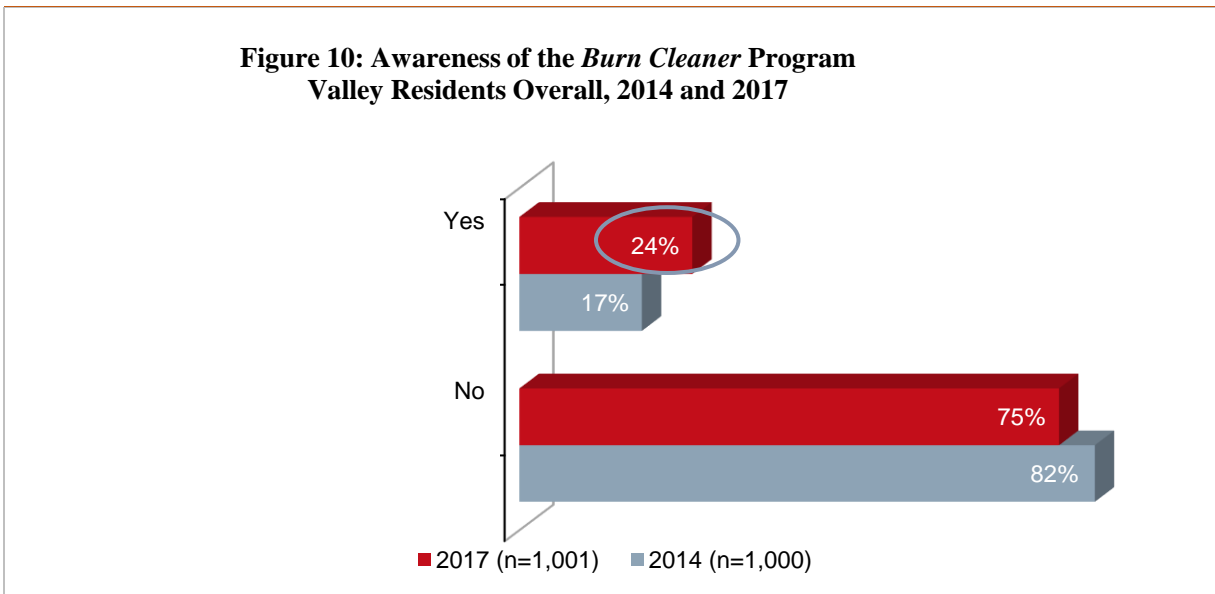
Demographic and Differences

Residents with above median incomes, English speakers, and those over the age of 35 were more likely to be aware of the *Check Before You Burn* program compared to other residents.

Awareness and Interest in the *Burn Cleaner* Rebate Program

Awareness of the *Burn Cleaner* Program

In addition to measuring awareness of the *Check Before You Burn* Program, the study asked all respondents if they were aware of the *Burn Cleaner Rebate* Program which offers rebates to residents who replace their traditional fireplace or stove with a cleaner-burning device. Results are presented in **Figure 10. One quarter of all residents surveyed (24 percent) reported that they had heard of the *Burn Cleaner* program, a statistically significant increase over 17 percent in 2014.**

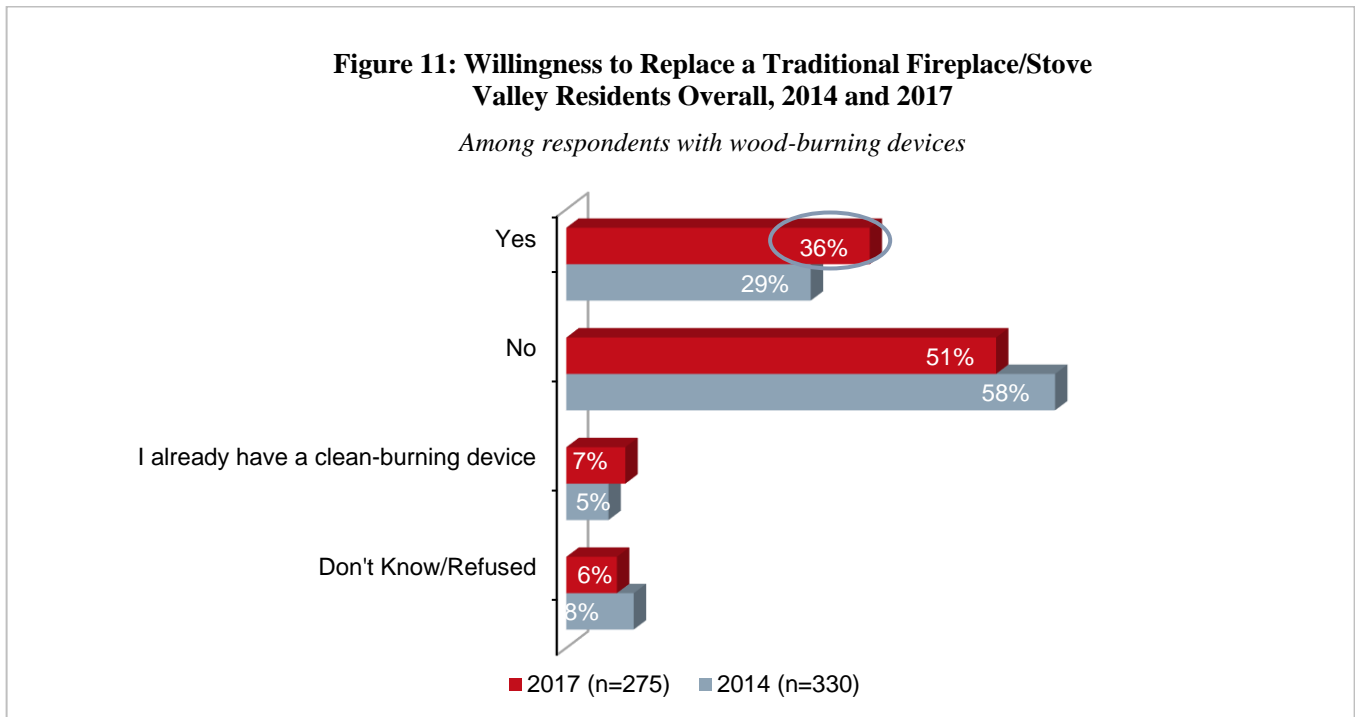


*Figure based on Q16: “To encourage cleaner burning in the Valley, there is a grant program that offers rebates to residents who replace their traditional fireplace or stove with a cleaner-burning device such as a certified wood stove or a gas fireplace. Are you aware of this grant program, it is called *Burn Cleaner*?” Statistically significant changes at the 95% confidence level are circled. Refused/don’t know not charted, but included in the percentage base.

Willingness to Replace a Traditional Fireplace or Stove

Respondents who reported that they owned a wood-burning device were asked if they would be willing to replace their current wood-burning fireplace or stove with a cleaner device if they could use it on some no-burn days. **As seen in Figure 11, 36 percent reported that they would be willing to switch devices if they could use it on some no-burn days, up from 29 percent in 2014, a statistically significant increase.**

The study found that residents who believe wood smoke is a significant source of air pollution are more willing to replace their traditional fireplace or stove, 42 percent compared to 30 percent, respectively.



*Figure based on Q17: “Would you be willing to replace your current wood-burning fireplace or stove with a cleaner, less-polluting wood-burning device if you could use it on some No Burn days?”

Responses to Proposed Rebate Levels

To gauge the level of discount needed to drive residents to purchase a cleaner-burning device, respondents were presented with varying percentage discounts of 25, 50, and 75 percent off the total estimated cost of \$3,000 to purchase a new device. (All respondents who reported owning a wood-burning device or stove were asked the question, even if they reported in the previous question that they were not interested in replacing their device.) **A total of 17 percent of all residents with traditional wood-burning devices reported that they would be willing to make the purchase if given a 25 percent discount.**

Respondents who reported that they would *not* be willing to purchase a cleaner device even if offered a 25 percent discount were asked if they would make the purchase if the discount were increased to 50 percent. A total of 15 percent of respondents who refused a 25 percent discount said they would

be swayed by a discount of 50 percent. Respondents who were not interested in a 25 or 50 percent discount were asked if they would replace their current device for a 75 percent rebate. An additional 22 percent said they would.

Findings suggest that approximately 29 percent of residents with wood-burning devices would participate in the program if the rebate were offered at 50 percent (combined totals for 25 and 50 percent levels) and 44 percent would be willing to participate if the rebate was as high as 75 percent (combined totals for 25, 50, and 75 percent levels).

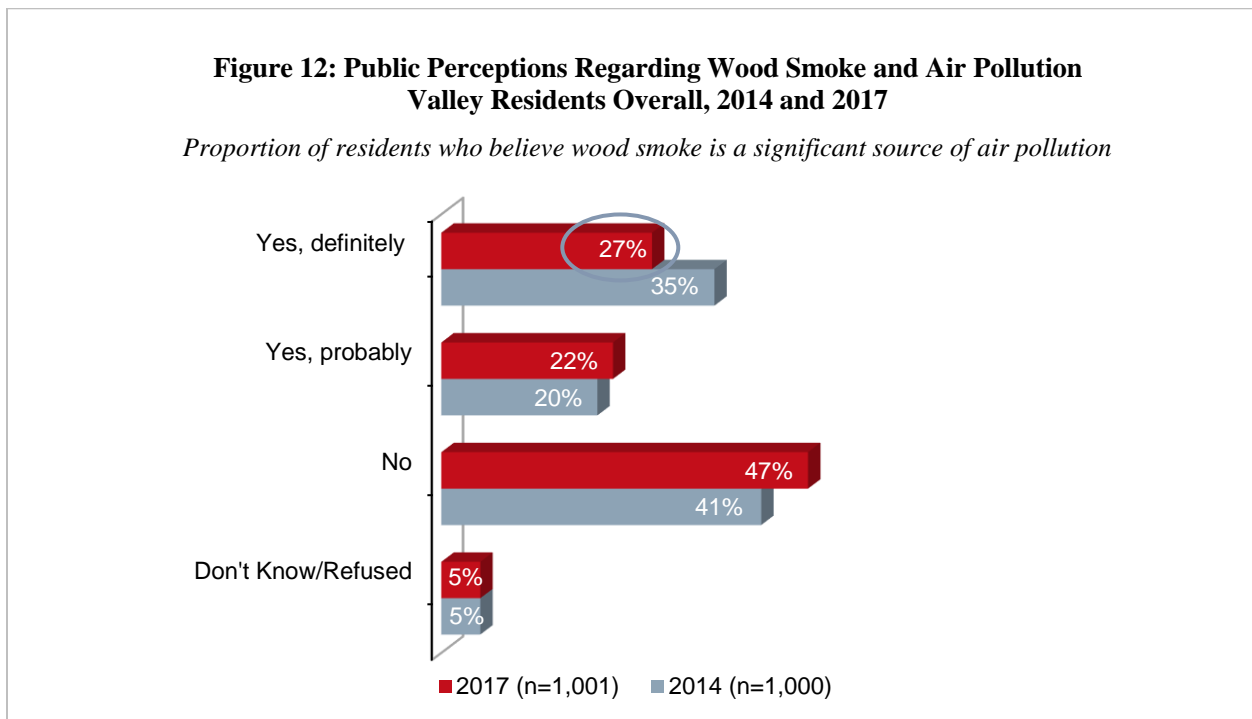
Demographic Differences

Residents with above median incomes, English speakers, and older residents were more likely to be aware of the *Burn Cleaner* program compared to other residents, similar to awareness patterns for the *Check Before You Burn* program. **Although awareness of the *Burn Cleaner* program was highest among older residents, seniors appear less willing to take advantage of the rebate program.** A total of 20 percent of seniors said they would be willing to replace their traditional wood-burning fireplace or stove with a less-polluting device if they could use it on some no-burn days, compared to 41 percent among residents ages 35 to 64, and 46 percent among residents 18 to 34.

General Beliefs and Awareness Regarding Wood Smoke

Understanding of the Effects of Wood Smoke

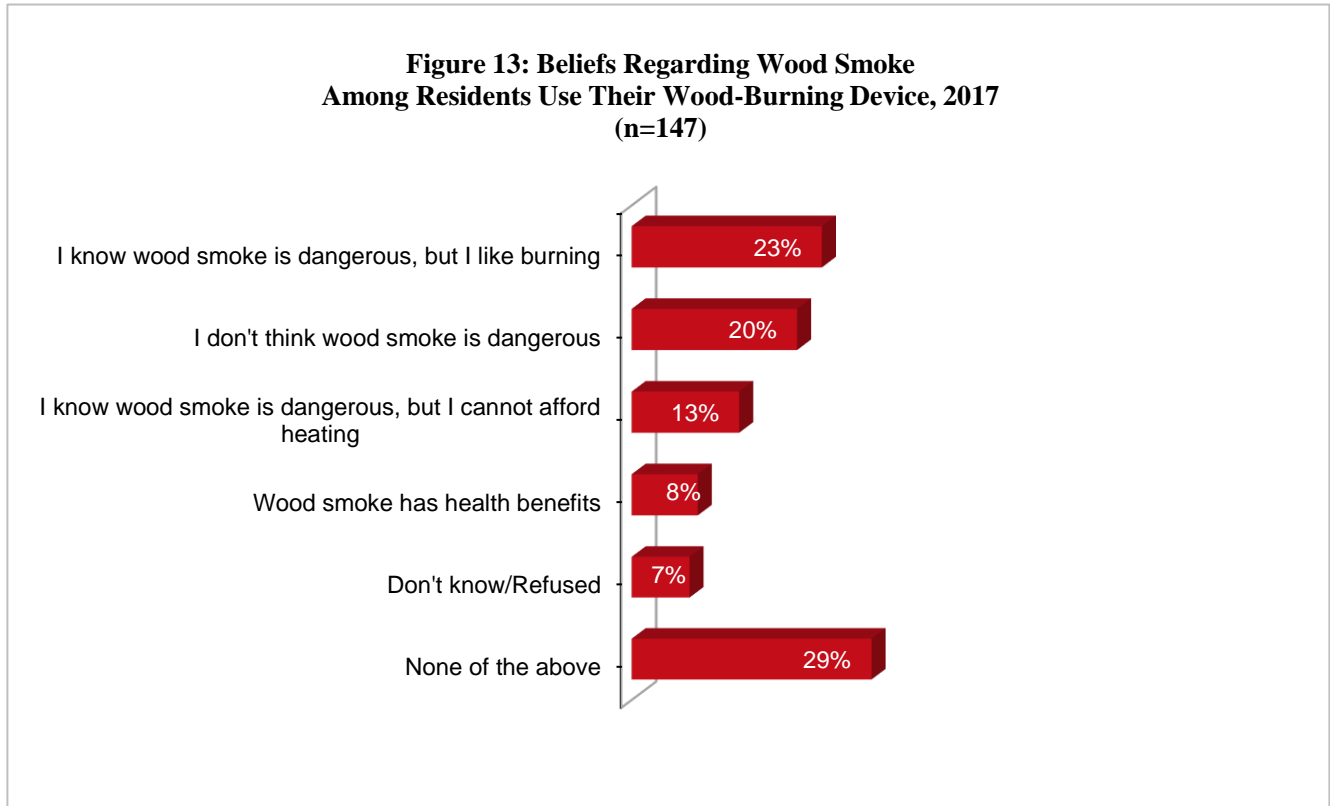
This year, half of all residents surveyed (49 percent) reported that they believe wood smoke is a significant source of air pollution in their neighborhoods (combined totals for “yes, definitely” and “yes, probably”), down 6 percentage-points compared to 2014. The reduced proportion of residents who believe wood smoke is a significant source of air pollution may be due to the fact that the 2017 survey was conducted in the fall, rather than during the winter months when wood-burning is at its peak. Results are presented in **Figure 12**.



*Figure based on Q21: “Do you believe wood smoke is a significant source of air pollution in your neighborhood?” Statistically significant differences at the 95% confidence level are circled.

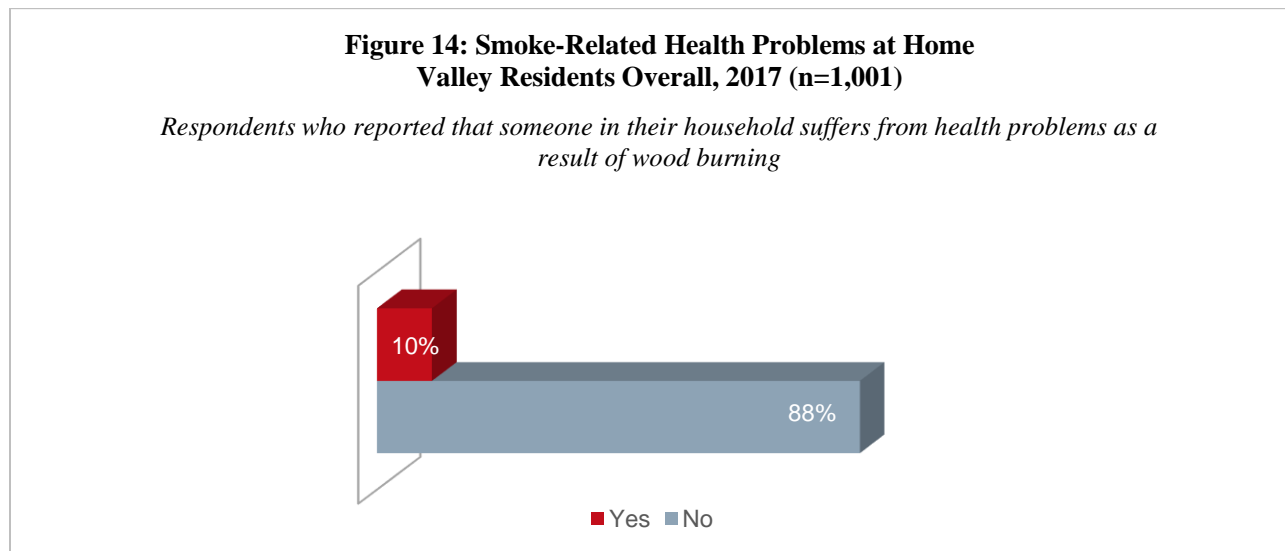
To better understand public perceptions regarding the dangers of wood smoke, residents were read a list of statements and asked which one best described their views. **As seen in Figure 13, one-in-five Valley residents (20 percent) do not believe wood smoke is dangerous to their health and 8 percent believe it actually provides health benefits.** A total of 13 percent of residents reported that they know wood smoke is dangerous but cannot afford other heating alternatives.

Nearly one-third of residents asked this question reported that none of the four statements described their views, suggesting that there are additional opinions regarding wood smoke that are not captured here.



*Figure based on Q22: "Which one of these best describes your views?"

In addition to asking residents to share their views regarding the risks and benefits of wood smoke, respondents were asked if anyone in their household suffers from health problems as a result of wood burning. Results are presented in **Figure 14**. 10 percent of residents believe that someone in their household experiences health problems as a result of wood burning.

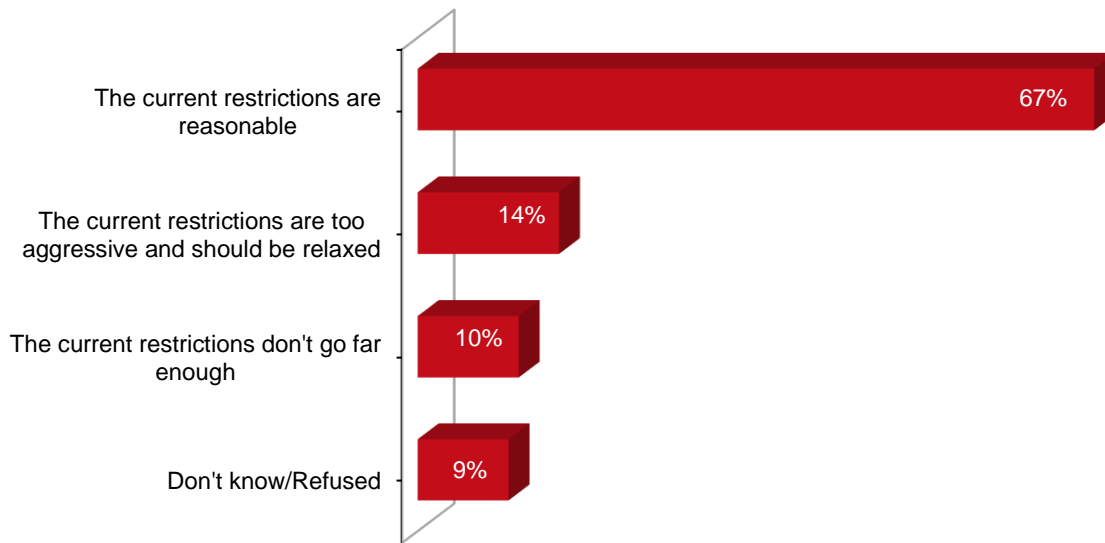


*Figure based on Q23: "Does anyone in your household suffer health problems as a result of wood burning?"

Public Opinion Regarding Restrictions on Wood Burning

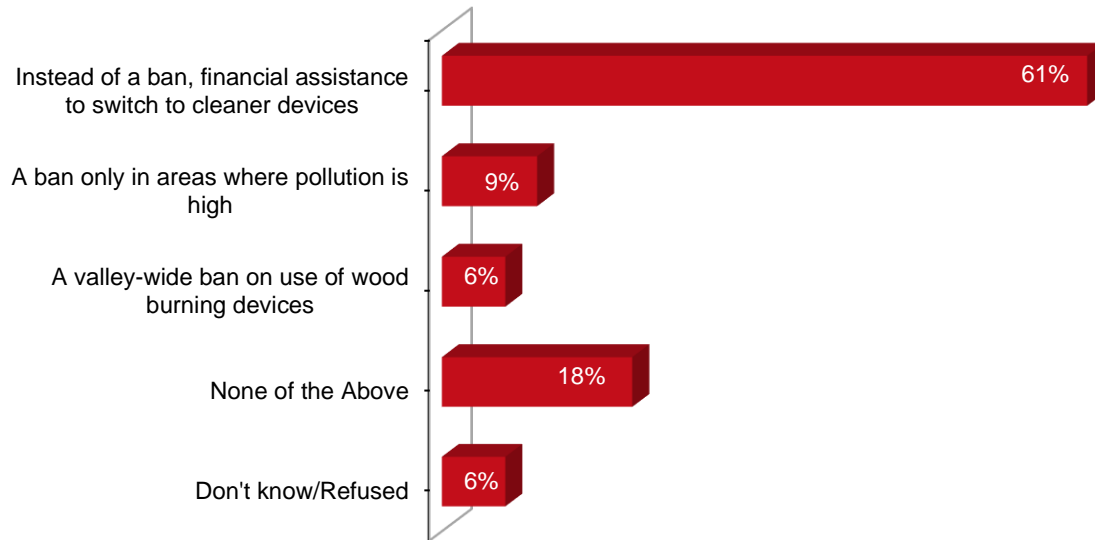
Two-thirds of Valley residents (67 percent) believe the current burn restrictions are reasonable and 61 percent believe the District should provide financial assistance to encourage people to switch to cleaner-burning devices rather than institute a Valley-wide ban. Only 10 percent of all residents surveyed believe current restrictions do not go far enough. Results are presented in **Figures 15 and 16.**

**Figure 15: Public Opinion Regarding Current Burn Restrictions
Valley Residents Overall, 2017 (n=1,001)**



*Figure based on Q24: "Which of the following statements best describes your opinion about these rules:"

**Figure 16: Public Support for Alternative Strategies for Improving Air Quality
Valley Residents Overall, 2017 (n=1,001)**



*Figure based on Q25: "Given the Valley's air quality challenges, as you understand them, which of the following would you support?"

Demographic Differences

Although the majority of residents surveyed agreed that current restrictions on wood burning are reasonable, significant differences were found based on awareness levels, age, and region. Results are presented below.

- Residents who believe wood smoke causes air pollution were more likely to support tougher burn restrictions. Among residents who recognize a correlation between wood-burning and air quality, 15 percent believe current restrictions “don’t go far enough,” compared to only 6 percent among other residents.
- Younger residents (18-34) were more likely than adults 35 and older to say that the current restrictions were reasonable. More than three-fourths of residents 18 to 34 (76 percent) said they agreed with the current restrictions, compared to 66 percent among 35 to 64 year olds, and 62 percent of seniors.
- Residents of the Northern Region, including San Joaquin, Stanislaus, and Merced counties, were more likely to support current restrictions than were residents from the Central and Southern regions who were more likely to support tougher restrictions. A total of 73 percent of residents in the Northern Region reported that the current restrictions were reasonable, compared to 66 percent in the Central Region and 61 percent in the Southern Region.

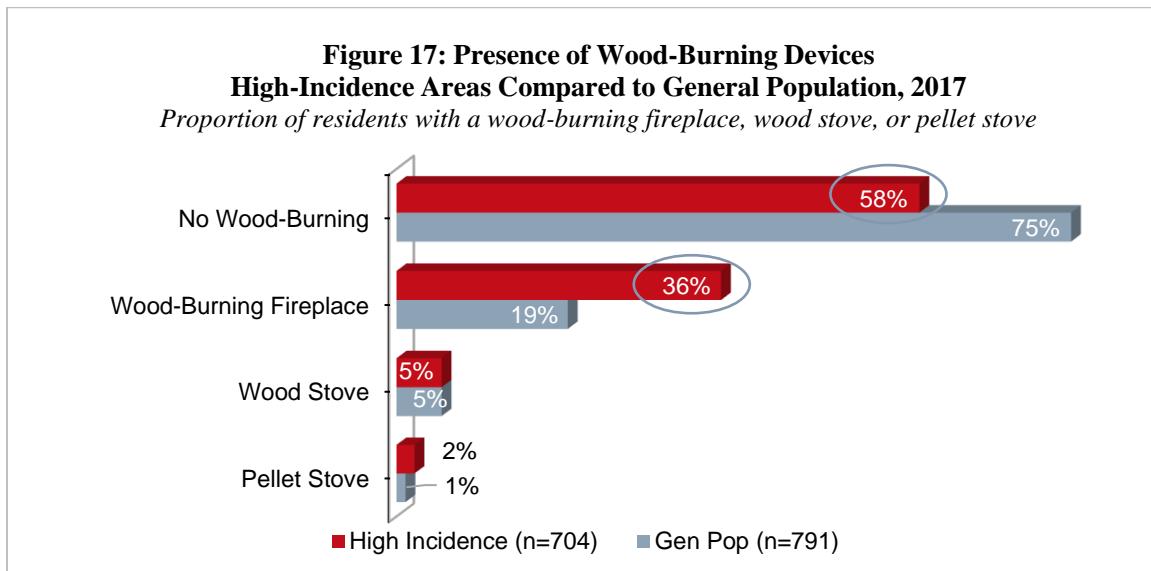
FINDINGS: SUPPLEMENTAL SAMPLE/ HIGH-INCIDENCE AREAS

The following section presents survey findings for the supplemental sample of residents living in 20 targeted zip codes in Fresno and Kern counties, known to have a higher incidence of wood-burning devices, and compares those findings with other areas. When comparing public opinion among residents living in the high-incidence zip codes with residents living elsewhere in the Valley, the general RDD sample was used because it provides a representative sample of both populations. When analyzing wood-burning patterns in the high-incidence zip codes and comparing those patterns to residents living elsewhere, the supplemental sample is used because it includes a greater number of respondents with wood-burning devices and ensures a robust sample size for questions related to wood-burning.

Wood-Burning Patterns

Presence of Wood-Burning Devices

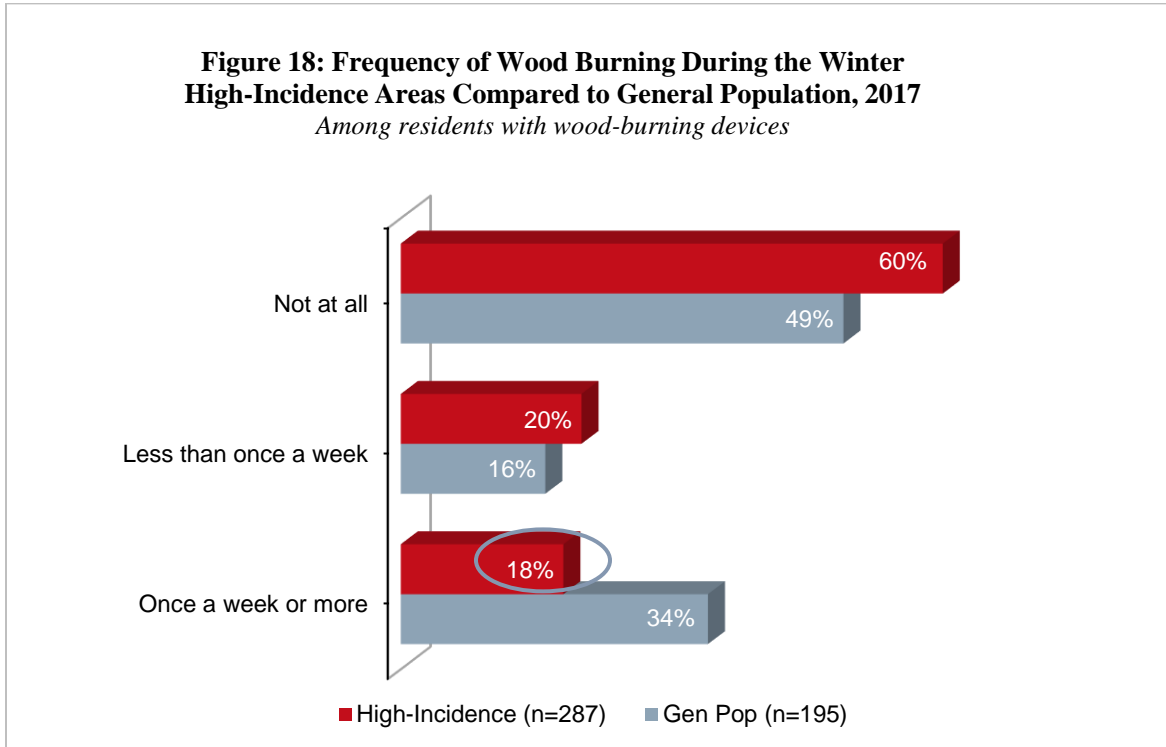
Figure 17 presents the proportion of residents in the high-incidence areas who reported having a wood-burning fireplace, wood stove, or pellet stove. A total of 41 percent of residents living in the high-incidence zip codes reported having some type of wood-burning device, including 36 percent who report having a wood-burning fireplace. While the exact proportion of households in the high-incidence areas that have wood-burning devices is likely closer to two-thirds (as estimated by U.S. Census data that use housing construction data in addition to survey questionnaires), findings confirm that the presence of wood-burning devices in these areas is statistically higher than in other parts of the San Joaquin Valley. Only 25 percent of residents living outside the high-incidence areas reported having a wood-burning device.



*Figure based on Q2: I'd like to ask you about the heating devices you may have in your home. Do you have a wood-burning fireplace, wood stove, or pellet stove in your home? Statistically significant differences at the 95% confidence interval are circled. Residents in the high-incidence areas were more likely to report that they had wood-burning fireplaces. Don't know/refused not charted.

Use of Wood-Burning Devices

The study found that while a greater proportion of residents in the high-incidence areas have wood-burning devices, they use those devices less often compared to other residents and for shorter periods of time. As seen in Figure 18, 18 percent of residents living in the high-incidence areas reported that they burn wood once a week or more compared to just 34 percent among the general population, a statistically significant difference. Once started, fires in the high-incidence areas were burned for 3.96 hours, compared to 6.16 hours in other areas. Other wood-burning patterns between the two populations were similar, including the type of fuel burned, the time of day residents reported burning, and reasons for burning wood (See Appendix B for complete frequencies).

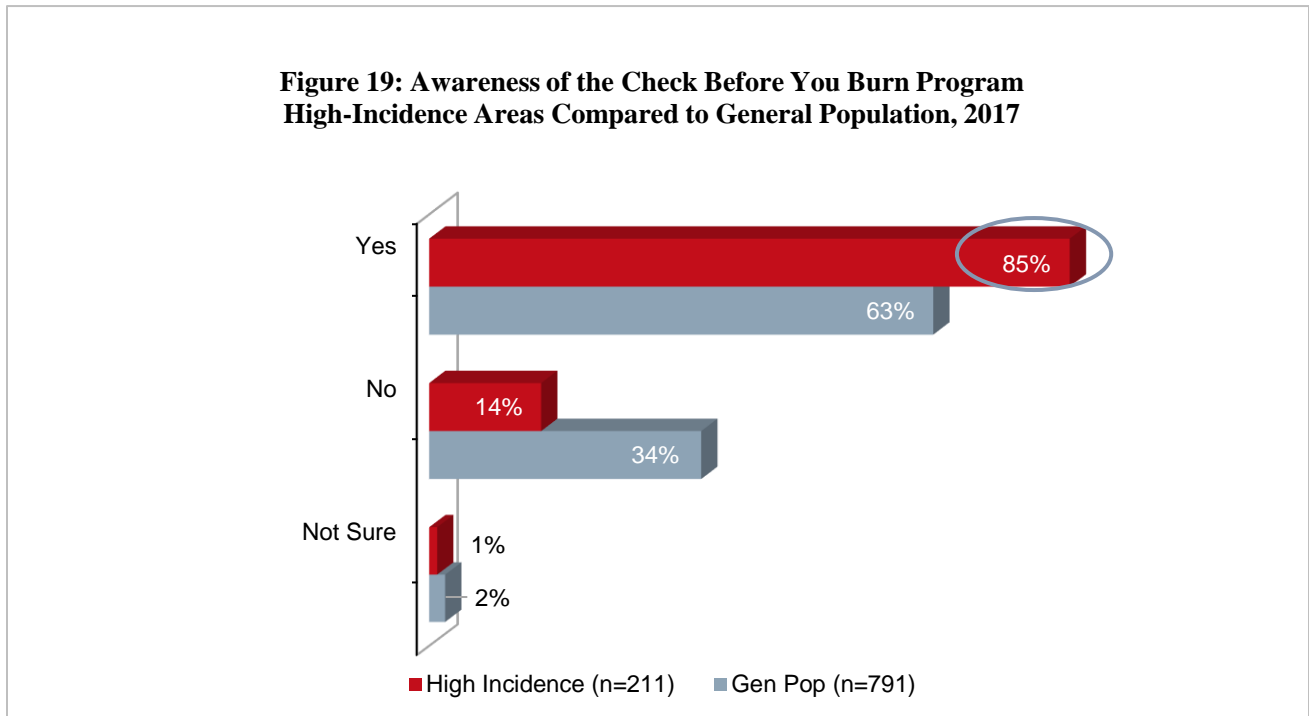


*Figure based on Q5: “How often do you use your fireplace/stove in the winter? Nearly every day, several days a week, once a week, less than once a week, or not at all?” Statistically significant changes at the 95% confidence level are circled. Residents in the higher-incidence areas were less likely to use their wood-burning devices once a week or more, compared to residents in the general population.

Awareness and Compliance with Burning Restrictions

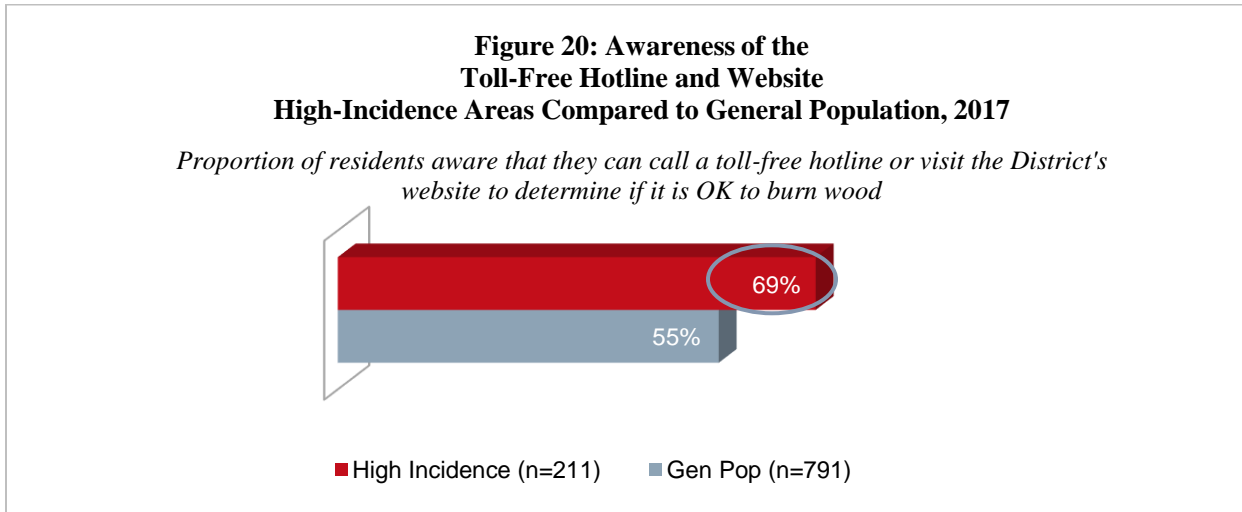
Awareness of the Check Before You Burn Program

Findings suggest that residents in the high-incidence areas tend to be better informed than other residents about the *Check Before You Burn* program, including how to access sources of information regarding no-burn days. Figure 19 presents the proportion of residents aware of the *Check Before You Burn* program in the high-incidence areas and the general population. Among high-incidence residents, 85 percent reported they had heard of *Check Before You Burn*, compared to 63 percent among residents living elsewhere in the Valley.



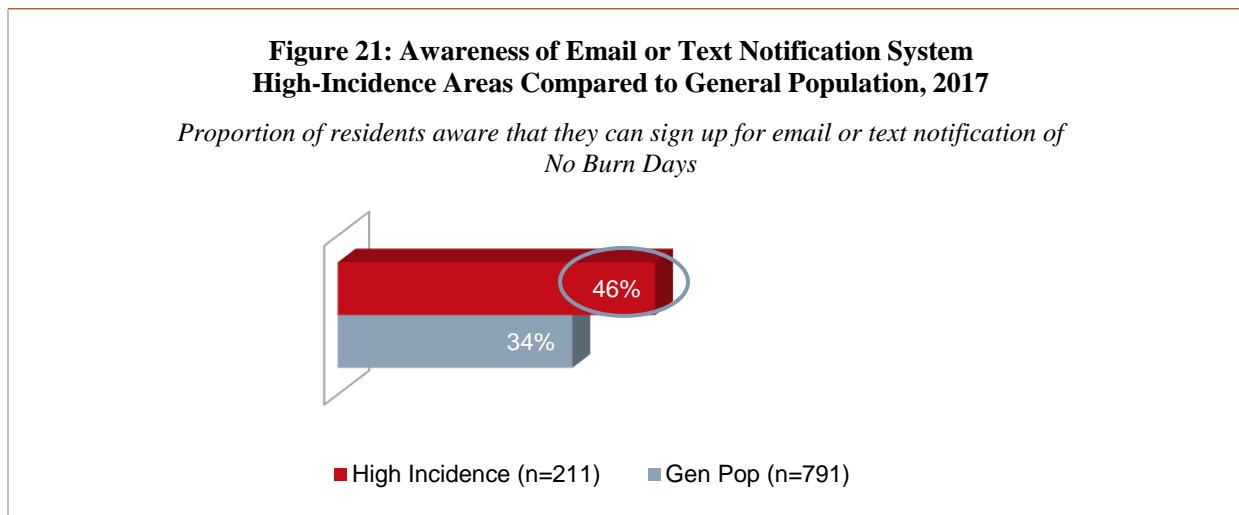
*Figure based on Q10: “Check Before You Burn runs from November through February each year, and prohibits wood burning in fireplaces, wood or pellet stoves, and outdoor fire pits during certain days when it is determined that air quality levels will be most impacted. Have you ever heard of the Check Before You Burn program?” Statistically significant differences at the 95% confidence level are circled.

Awareness of the District’s toll-free number and website are presented in **Figure 20**. Residents living in the high-incidence areas were more likely than other residents to know that they could call the District’s toll-free hotline or visit the website to determine if it is safe to burn wood based on current air quality. **More than two-thirds (69 percent) of residents in the high-incidence areas were aware of toll-free hotline or website compared to just over half (55 percent) of residents living in other parts of the valley.**



*Figure based on Q11: “Are you aware that there is a toll-free hotline that you can call or a website that you can visit in the winter to determine if it is OK to burn wood in a fireplace, stove, or backyard fire pit based on current air quality?” Statistically significant differences at the 95% confidence level are circled.

As seen in **Figure 21**, residents living in the high-incidence areas were also more likely to be aware of that they could sign-up for email and text notifications alerting them when a no-burn day has been issued, 46 percent compared to 34 percent, respectively.



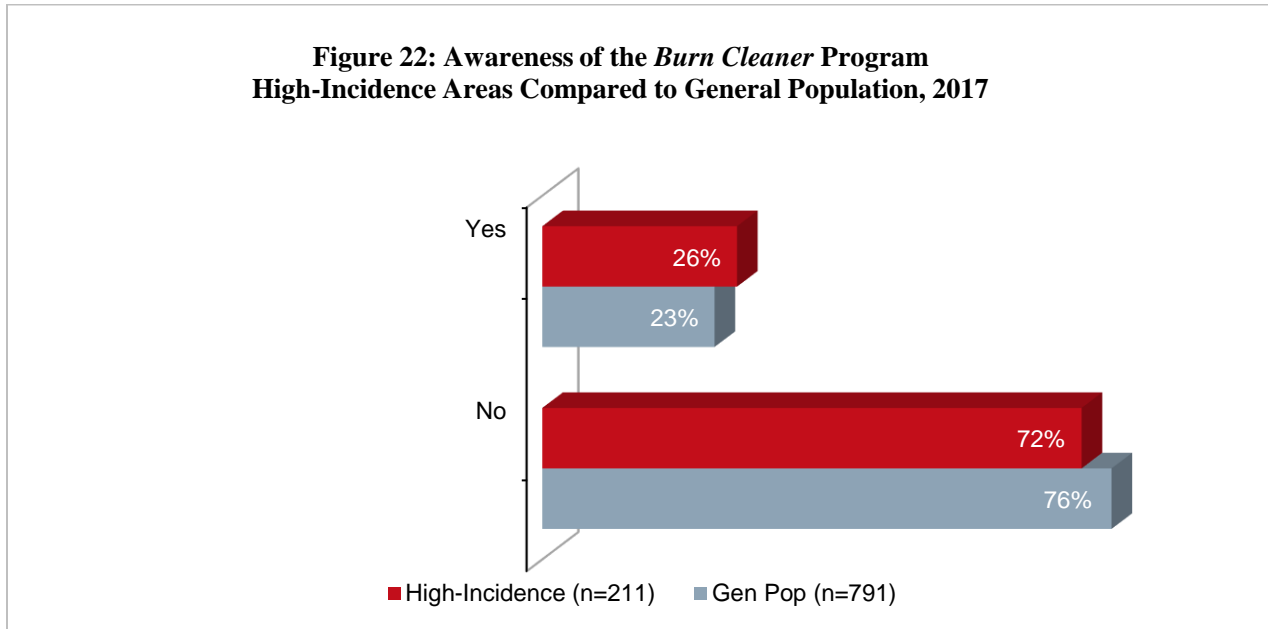
*Figure based on Q12: Are you aware that you can sign up for email or text notifications of No Burn Days during the winter? Statistically significant differences at the 95% confidence level are circled.

Compliance with Burning Restrictions

No statistically significant differences were found between residents living in the high-incidence areas and the general population in terms of compliance with no-burn restrictions or their willingness to report neighbors who violate burn restrictions.

Awareness and Interest in the *Burn Cleaner* Rebate Program

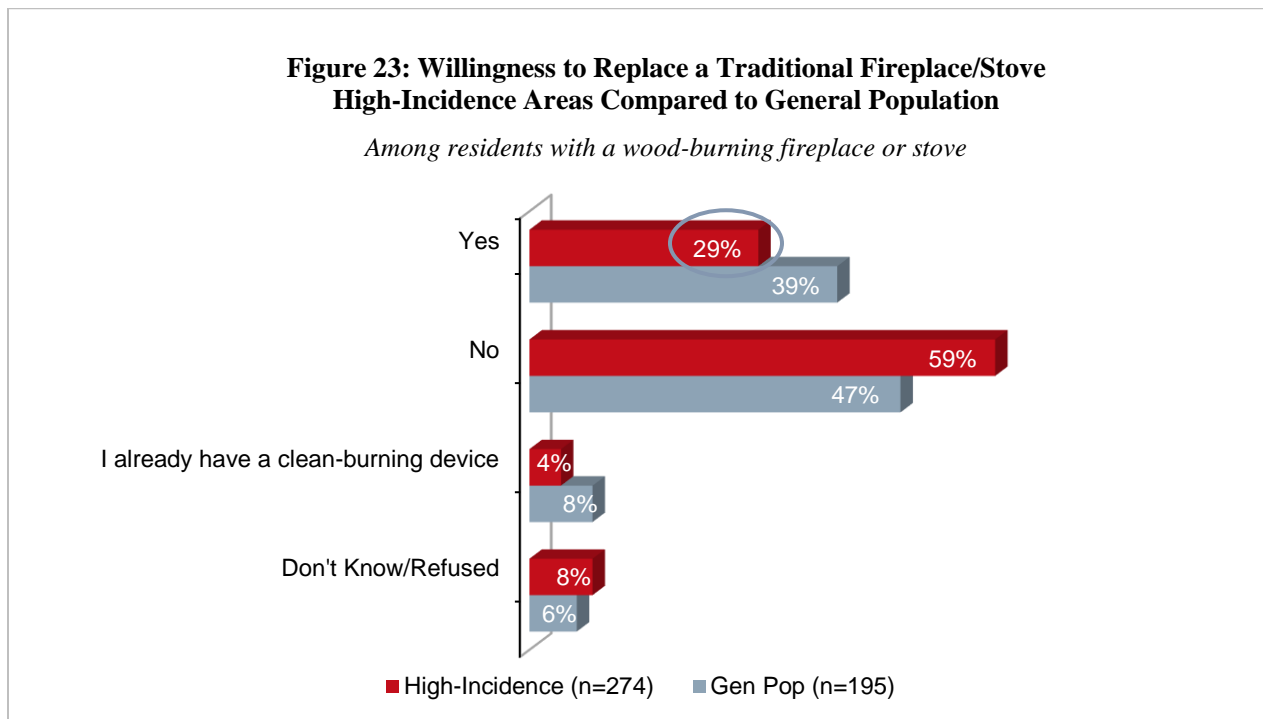
Residents living in the high-incidence areas were no more likely to be aware of the *Burn Cleaner* Program than were other valley residents. A total of 26 percent of high-incidence residents were aware of the program, compared to 23 percent of the general population, statistically equivalent. Results are presented in **Figure 22**.



*Figure based on Q16: "To encourage cleaner burning in the Valley, there is a grant program that offers rebates to residents who replace their traditional fireplace or stove with a cleaner-burning device such as a certified wood stove or a gas fireplace. Are you aware of this grant program, it is called *Burn Cleaner*?"

While residents living in high-incidence zip codes had similar awareness levels compared to the general valley population, findings suggest that they are less willing to replace their current wood-burning fireplace or stove with a cleaner device. Results are presented in Figure 23. Just over one-quarter of residents living in the high-incidence areas (29 percent) say they would be willing to replace their traditional devices if they could burn wood on some no-burn days, compared to 39 percent of residents living in other areas.

No differences were found in the proportion of residents who reported that they would upgrade from their current wood-burning device at each rebate level (25 percent, 50 percent, and 75 percent) based on area. Findings suggest that approximately 15 percent of residents with wood-burning devices in the high-incidence areas would upgrade if the rebate were offered at 25 percent and 26 percent of residents would participate in the program if the rebate were offered at 50 percent (combined totals for 25 and 50 percent levels). Approximately 41 percent of residents living in the high-incidence areas said they would participate in the *Burn Cleaner* program if the rebate were offered at 75 percent, compared to 42 percent among residents living outside the high-incidence areas.



*Figure based on Q17: "Would you be willing to replace your current wood-burning fireplace or stove with a cleaner, less-polluting wood-burning device if you could use it on some No Burn days?" Statistically significant differences at the 95% confidence level are circled.

General Beliefs and Awareness Regarding Wood Smoke

The study found that residents living in the high-incidence zip codes had similar beliefs and attitudes regarding wood smoke compared to the general population, including perceived health effects of breathing wood smoke, the incidence of household members suffering health problems as a result of wood burning, and current restrictions on wood burning. Like other residents, respondents living in these targeted areas prefer a grant program providing financial assistance to encourage people to switch from traditional wood-burning devices over bans on the use of wood-burning devices valley-wide or in high-pollution areas.

Conclusions

Study findings suggest that the District has made significant gains educating the public about its *Burn Cleaner* program. Both the proportion of residents aware of the *Burn Cleaner* rebate program and the proportion of residents willing to switch to cleaner burning devices has increased since 2014 for the Valley overall.

Despite these achievements, further outreach may be needed. Half of Valley residents do not believe wood smoke is a significant source of air pollution and one-in-five residents who use a wood-burning device do not believe wood smoke is dangerous to their health (8 percent of wood-burners believe it provides health benefits). Awareness of the effects of wood smoke matter because residents who believe wood smoke is a significant source of air pollution are more willing to replace their wood-burning devices, are more supportive of restrictions on wood burning, and are more likely to report a neighbor who violates regulations. Currently, only about one-third of residents who burn in the winter believe that wood burning is dangerous to their health.

For the targeted zip codes where air quality is of particular concern, a more targeted incentives campaign may be a more effective strategy for reducing emissions in this region. People living in the targeted areas actually use their fireplaces and wood-burning devices less often and for shorter periods of time compared to other residents. These residents are also more likely to be aware of the *Check Before You Burn* program, including how to access information regarding no-burn days. Despite their high level of awareness, people living in targeted areas are *less* willing to replace their wood-burning devices with cleaner alternatives without incentives compared to other residents. Given that the most important difference contributing to higher pollution in these targeted areas appears to be the sheer volume of traditional wood-burning devices, continued efforts to increase participation in the District's rebate programs will likely have the greatest impact on air quality.

Finally, study results suggest that the *Burn Cleaner* program may benefit from marketing that targets not only geographic areas but demographic segments as well. English-speaking residents and those with household incomes of \$50,000 or higher are significantly more likely to own a wood-burning fireplace or stove, and already tend to be more aware of the *Burn Cleaner* program, compared to other residents. This pattern was consistent for the region overall and within the targeted areas of Fresno and Kern counties, even though some zip codes in those areas may be low income. (The demographic profile of residents is only one factor determining whether homes have wood-burning fireplaces, such as the year of construction.) Moreover, other research indicates that higher-income households are generally more likely to make energy efficient investments and participate in public rebate programs. A demographic profile of existing users of the District's rebate program, coupled with an analysis of the current research findings, may prove useful for refining the District's marketing approach.

**APPENDIX A:
SURVEY INSTRUMENT WITH WEIGHTED FREQUENCIES
OVERALL AND FOR SUPPLEMENTAL SAMPLE**

Valley Air District Residential Wood-Burning Survey 2017
Weighted Frequencies for San Joaquin Valley Overall (n=1,001)

INTRODUCTION

My name is _____. We are conducting a survey with people in the area about issues affecting your community, and I want to include your opinions. We are not trying to sell you anything.

- 01 willing to continue
- 02 refusal
- 03 call back <at specific time>
- 04 call back <no specific time>
- 05 no answer
- 06 busy
- 07 answering machine
- 08 disconnected number
- 09 language barrier (not Spanish or English)
- 10 business number
- 11 fax machine

SCREENER QUESTIONS

Landline

1. May I speak with the [youngest/oldest] adult at home who is 18 years or older? (unweighted n=566)

- 1 Yes, I am that person (continue interview)
- 2 Yes, transferring to the person (restart intro)
- 3 Not available now (If person who answered is an adult, continue interview. If person who answered is under 18 arrange a call-back)
- 9 Refused (Terminate)

Cell Phone

1a. Since you are on a cell phone, I can call you back if you are driving or doing anything else that requires your full attention. Can you talk safely and privately now, or not? (unweighted n=435)

- 1 Yes
- 2 Not right now (try and arrange a time to call-back)
- 9 Refused (Terminate)

1b. Are you 18 years or older? (unweighted n=435)

- 1 Yes 100%
- 2 No (Terminate)

All Respondents

1c. What county do you live in? (Don't Read) (n=1,101)

- 01 Fresno 23%
- 02 Kern 21%
- 03 Kings 3%
- 04 Madera 4%
- 05 Merced 7%
- 06 San Joaquin 18%
- 07 Stanislaus 12%
- 08 Tulare 13%
- 09 Other, outside of San Joaquin Valley area (Terminate) 0%
- 99 Don't know/refused (Terminate) 0%

1d. What is your zip code? [Record 5 digit zip code. Zip code list to be provided. Refused = terminate]

1e. Which of the following best describes the property where you live? (Read) (n=1,101)

- 1 House or duplex 100%
- 2 Apartment (Terminate)
- 3 Condominium (Terminate)
- 4 Townhouse (Terminate)
- 5 Other (Terminate)
- 9 Don't know/Refused (Terminate)

1f. Do you own or rent your home? (n=1,101)

- 1 Own 60%
- 2 Rent 37%
- 9 Refused 3%

WOOD COMBUSTION: BEHAVIOR AND AWARENESS

2. I'd like to ask you about the heating devices you may have in your home. Do you have a wood-burning fireplace, wood stove, or pellet stove in your home? (check all that apply) (n=1,101)

- 1 Yes, wood-burning fireplace 22%
- 2 Yes, wood stove 5%
- 3 Yes, pellet stove 2%
- 4 No (**Skip to Q4**) 72%
- 9 Don't know/Refused (**Skip to Q4**) 1%

3. Is your sole source of heat from a wood-burning device? (n=275)

- 1 Yes 9%
- 2 No 90%
- 9 Refused 1%

4. (Only ask if Q2 = 4 or 9) Does your public utility provide a natural gas connection to your home? (**Skip to Q10**) (n=726)

- 1 Yes 85%
- 2 No 9%
- 9 Don't know/refused 6%

5. How often do you use your fireplace/stove in the winter? Nearly every day, several days a week, once a week, less than once a week, or not at all? (n=275)

- 1 Nearly every day 9%
- 2 Several days a week 14%
- 3 Once a week 7%
- 4 Less than once a week 16%
- 5 Not at all (**Skip to Q10**) 52%
- 9 Don't Know/Refused (Do not read) (**Skip to Q10**) 1%

6. Once started, how many hours does your fire usually burn? [record number, 2 digits; 99 don't know/refused] (n=128)

Mean 5.6 hours; Median 3 hours (statistically comparable to 2014, when mean was 6.3 and median was 3 hours)

- 1-2 hours: 28%
- 3-4 hours: 35%
- 5-6 hours: 12%
- 7-13 hours: 15%
- > 13 hours: 5%
- DK/Refused: 5%

-
7. Which of the following types of fuel do you typically burn? (Read. Check all that apply. Rotate. Yes/No punch. 9= Don't know/refused) (n=128) (statistically unchanged from 2014)
- 1 Seasoned firewood that has been split and dried for a year or more 72%
 - 2 Partially dried wood that has some moisture 15%
 - 3 Pellets 9%
 - 4 Manufactured logs, such as *Duraflame* 27%
 - 5 Trash, magazines, newspapers or other household materials 10%
 - 6 Other (specify) 7% (most frequently cited: gas and propane)
8. What time of day do you typically burn wood? (READ options) (n=128)
- 1 Mornings 8%
 - 2 Afternoons 7%
 - 3 Evenings 63%
 - 4 All day 17%
 - 9 Don't know/refused 5%
9. What would you say is the main reason you choose to burn wood? (DO NOT READ. CHECK ALL THAT APPLY. Ask once, "Anything else?" RECORD FIRST MENTION) (n=128)
- 1 Looks nice, creates a good atmosphere First mention 11%; Total mentions 35%
 - 2 Provides heat First mention 54%, Total mentions 66%
 - 3 Cozy First mention 6%, Total mentions 16%
 - 4 Health benefits First mention 1%, Total mentions 4%
 - 5 Special for the holidays First mention 6%, Total mentions 21%
 - 6 Other (specify) 6%
 - 7 Saves Money First mention 13%, Total mentions 18%
 - 9 Don't know/refused 3%
10. *Check Before You Burn* runs from November through February each year and prohibits wood burning in fireplaces, wood or pellet stoves, and outdoor fire pits during certain days when it is determined that air quality levels will be most impacted. Have you ever heard of the *Check Before You Burn* program? (n=1,001)
- 1 Yes 67% (statistically unchanged from 2014)⁷
 - 2 No 30%
 - 3 Maybe 2%
 - 9 Don't know/Refused <1%
11. Are you aware that there is a toll-free hotline that you can call or website that you can visit in the winter to determine if it is OK to burn wood in a fireplace, stove, or backyard fire pit based on current air quality? (n=1,001)
- 1 Yes 58%
 - 2 No 40%
 - 9 Not sure/Don't know 2%

⁷ Awareness of the *Check Before You Burn* remains high and consistent with findings in 2014. In 2014, this question was asked only of respondents who used a wood burning device and were not exempt from burn restrictions. Looking at the same subset of respondents, 77% of respondents in 2017 reported that they were aware of Check Before You Burn, statistically equivalent to the 80% who said they were aware of the program in 2014.

-
12. Are you aware that you can sign up for email or text notifications of No Burn Days during the winter? (n=1,001)
- 1 Yes 36%
 - 2 No (**Skip to Q15**) 62%
 - 9 Not sure/Don't know (**Skip to Q15**) 1%
13. [If "yes" to Q11 and/or Q12 AND Q2 = 1, 2, or 3 **AND Q5 = 1, 2, 3, or 4**. All others skip to Q15] Before you burn wood, how often do you check to see if it is a No-Burn Day?" READ) (n=44 cases)
- 1 All of the time 30 cases
 - 2 Most of the time 5 cases
 - 3 Some of the time 0 cases
 - 4 Rarely (**Skip to Q15**) 2 cases
 - 5 Never (**Skip to Q15**) 7 cases
 - 9 Don't Know/Refused (**Skip to Q15**) 0%
14. How often do you comply with No Burn restrictions? (READ) (n=35 cases)
- 1 All of the time 29 cases
 - 2 Most of the time 4 cases
 - 3 Some of the time 2 cases
 - 4 Rarely 0
 - 5 Never 1 case
 - 9 Don't Know 0 cases
15. If you knew one of your neighbors was burning wood on a No-Burn Day how likely would you be to report them to the District? (n=1,001)
- 1 Very likely 20%
 - 2 Somewhat likely 26%
 - 3 Not too likely 18%
 - 4 Not at all likely 28%
 - 9 Don't know/refused 8%
16. To encourage cleaner burning in the Valley, there is a grant program that offers rebates to residents who replace their traditional fireplace or stove with a cleaner-burning device such as a certified wood stove or a gas fireplace. Are you aware of this grant program, it is called *Burn Cleaner*? (n=1,001)
- 1 Yes 24% (up from 17% in 2014, a statistically significant increase)
 - 2 No 75%
 - 9 Not Sure/Refused 1%
17. (**ASK only if Q2= 1, 2, 3 otherwise skip to Q21**) Would you be willing to replace your current wood-burning fireplace or stove with a cleaner, less-polluting wood-burning device if you could use it on some No Burn days? (n=275)
- 1 Yes 36% (up from 29% in 2014, a statistically significant increase)
 - 2 No 51%
 - 3 I already have a clean-burning device (don't read) (Skip to Q21) 7%
 - 4 Don't know/Refused (Don't read) 6%
18. Assuming a clean wood-burning device costs about \$3,000, would you upgrade from your current fireplace or stove if you could get a 25% rebate on your purchase? (n=255)
- 1 Yes (**Skip to Q21**) 17%
 - 2 No 69%
 - 3 I would purchase it without a rebate/incentive (Don't read) (**Skip to Q21**) <1%
 - 4 Not interested/no discount would be enough (Don't read) (**Skip to Q21**) 4%
 - 9 Don't know 8%

-
19. How about a 50% rebate? (n=198)
- 1 Yes (**Skip to Q21**) 15%
 - 2 No 75%
 - 3 I would purchase it without a rebate/incentive (Don't read) (**Skip to Q21**) 0%
 - 4 Not interested/no discount would be enough (Don't read) (**Skip to Q21**) 2%
 - 9 Don't know 8%

20. How about a 75% rebate? (n=165)
- 1 Yes 22%
 - 2 No 67%
 - 3 I would purchase it without a rebate/incentive (Don't read) 1%
 - 4 Not interested/no discount would be enough (Don't read) 2%
 - 9 Don't know 7%

GENERAL BELIEFS AND AWARENESS

21. Do you believe wood smoke is a significant source of air pollution in your neighborhood? (n=1,001)
- 1 Yes, definitely 27%
 - 2 Yes, probably 22%
 - 3 No 47%
 - 9 Don't know/Refused 5%
22. (**Ask only if Q5 = 1,2,3,4. All others skip to Q23**). Which one of these best describes your views: (n=147)
- 1 I don't think wood smoke is dangerous to my health 20%
 - 2 I know wood smoke is dangerous to my health, but I like burning wood 23%
 - 3 I know wood smoke is dangerous, but I cannot afford other heating alternatives 13%
 - 4 I believe burning wood has positive health benefits that outweigh any negative health impacts from wood smoke 8%
 - 5 None of the above (Read) 29%
 - 9 Don't know/Refused (Don't read) 7%
23. Does anyone in your household suffer health problems as a result of wood burning? (n=1,001)
- 1 Yes 10%
 - 2 No 88%
 - 9 Don't know/refused (Don't read) 3%
24. Currently, the District prohibits wood burning on those days in the winter when the air quality is poor. There are exceptions for households that depend on wood burning as their sole source of heat and for residents who have replaced their traditional wood-burning fireplaces or stove with cleaner, less-polluting devices. Which of the following statements best describes your opinion about these rules: (Check one) (n=1,001)
- 1 The current restrictions are reasonable 67%
 - 2 The current restrictions are too aggressive and should be relaxed 14%
 - 3 The current restrictions don't go far enough 10%
 - 9 Don't know/refused (Don't read) 9%
25. Given the Valley's air quality challenges, as you understand them, which of the following would you support? [Rotate stems 1 and 2] (n=1,001)
- 1 A valley-wide ban on the use of wood burning fireplaces and stoves 6%
 - 2 A ban on the use of wood burning only in those areas of the Valley with high pollution 9%
 - 3 Instead of a ban, a grant program providing financial assistance to encourage people to switch from traditional wood-burning devices to cleaner units 61%
 - 4 None of the above (read) 18%
 - 9 Don't know/refused (don't read) 6%

DEMOGRAPHICS

Finally, I'd like to ask you a few general questions for statistical purposes. Your answers are confidential.

26. What year were you born? _____ (n=1,001)
- 1 18-34 30%
 - 2 35-64 45%
 - 3 65+ 16%
 - 9 Refused 10%
27. Would you please tell me what ethnic group you identify with? Are you Hispanic/Latino, Black/African American, Asian, Caucasian, or of some other ethnic or racial background? (n=1,001)
- 1 Hispanic/Latino 46%
 - 2 Black/African American 4%
 - 3 Asian-American 7%
 - 4 White/Caucasian 33%
 - 5 Other (specify) 2%
 - 9 Refused (Don't read) 8%
28. How many people live in your household? _____
- 29a. [Asked of cell phones only] Do you have a landline telephone? (unweighted n=435)
- 1 Yes 24%
 - 2 No 73%
 - 9 Refused 0%
- 29b. [Asked of landline phones only] Do you have a cell phone? (unweighted n=566)
- 1 Yes 77%
 - 2 No 17%
 - 9 Refused 7%
30. [Asked of everyone] Does your household primarily use cell phones or land line phones? (n=1,001)
- 1 Cell 72%
 - 2 Landline 20%
 - 9 Refused 8%
31. What are the major cross streets near your home? _____ [If necessary: "We are not interested in your exact address, just the neighborhood where you live so we can combine your responses with others from the same area."] (84% of respondents provided a verbatim answer)
32. I am going to read some categories of household income. Please stop me when I reach the category of your total 2016 annual household income, before taxes: (n=1,001)
- 1 Less than \$15,000 11%
 - 2 \$15,000 to less than \$35,000 20%
 - 3 \$35,000 to less than \$50,000 14%
 - 4 \$50,000 to less than \$75,000 10%
 - 5 \$75,000 to less than \$100,000 6%
 - 6 \$100,000 to less than \$150,000 6%
 - 7 \$150,000 to less than \$200,000 3%
 - 8 More than \$200,000 2%
 - 9 Refused (Don't read) 27%

-
33. (GENDER BY OBSERVATION-- DON'T READ) (n=1,001)
- 1 Male 50%
 - 2 Female 50%

34. Note Language (English or Spanish) (n=1,001)
- English 79%
 - Spanish 21%

That concludes our survey. Thank you very much for your time.

Valley Air District Residential Wood-Burning Survey 2017
Weighted Frequencies for Supplemental/High-Incidence Areas (n=703 Unweighted; n=704 Weighted)

INTRODUCTION

My name is _____. We are conducting a survey with people in the area about issues affecting your community, and I want to include your opinions. We are not trying to sell you anything.

- 01 willing to continue
- 02 refusal
- 03 call back <at specific time>
- 04 call back <no specific time>
- 05 no answer
- 06 busy
- 07 answering machine
- 08 disconnected number
- 09 language barrier (not Spanish or English)
- 10 business number
- 11 fax machine

SCREENER QUESTIONS

Landline

1. May I speak with the [youngest/oldest] adult at home who is 18 years or older? (unweighted n=583)

- 1 Yes, I am that person (continue interview)
- 2 Yes, transferring to the person (restart intro)
- 3 Not available now (If person who answered is an adult, continue interview. If person who answered is under 18 arrange a call-back)
- 9 Refused (Terminate)

Cell Phone

1a. Since you are on a cell phone, I can call you back if you are driving or doing anything else that requires your full attention. Can you talk safely and privately now, or not? (unweighted n=120)

- 1 Yes
- 2 Not right now (try and arrange a time to call-back)
- 9 Refused (Terminate)

1b. Are you 18 years or older? (unweighted n=120)

- 1 Yes 100%
- 2 No (Terminate)

All Respondents

1c. What county do you live in? (Don't Read) (n=704)

- 01 Fresno 56%
- 02 Kern 44%
- 03 Kings 0%
- 04 Madera 0%
- 05 Merced 0%
- 06 San Joaquin 0%
- 07 Stanislaus 0%
- 08 Tulare 0%
- 09 Other, outside of San Joaquin Valley area (Terminate) 0%
- 99 Don't know/refused (Terminate) 0%

1d. What is your zip code? [Record 5 digit zip code. Zip code list to be provided. Refused = terminate]

1e. Which of the following best describes the property where you live? (Read) (n=704)

- 1 House or duplex 100%
- 2 Apartment (Terminate)
- 3 Condominium (Terminate)
- 4 Townhouse (Terminate)
- 5 Other (Terminate)
- 9 Don't know/Refused (Terminate)

1f. Do you own or rent your home? (n=704)

- 1 Own 77%
- 2 Rent 21%
- 9 Refused 2%

WOOD COMBUSTION: BEHAVIOR AND AWARENESS

2. I'd like to ask you about the heating devices you may have in your home. Do you have a wood-burning fireplace, wood stove, or pellet stove in your home? (check all that apply) (n=704)

- 1 Yes, wood-burning fireplace 36%
- 2 Yes, wood stove 5%
- 3 Yes, pellet stove 2%
- 4 No (Skip to Q4) 58%
- 9 Don't know/Refused (Skip to Q4) 1%

3. Is your sole source of heat from a wood-burning device? (n=287)

- 1 Yes 5%
- 2 No 93%
- 9 Refused 1%

4. (Only ask if Q2 = 4 or 9) Does your public utility provide a natural gas connection to your home? (**Skip to Q10**) (n=417)

- 1 Yes 90%
- 2 No 5%
- 9 Don't know/refused 6%

5. How often do you use your fireplace/stove in the winter? Nearly every day, several days a week, once a week, less than once a week, or not at all? (n=287)

- 1 Nearly every day 2%
 - 2 Several days a week 7%
 - 3 Once a week 9%
 - 4 Less than once a week 20%
 - 5 Not at all (**Skip to Q10**) 60% (compared to 49% in low-incidence areas, statistically significant)
 - 9 Don't Know/Refused (Do not read) (**Skip to Q10**) 3%
- 18% compared to 34% in low-incidence areas, stat. sign

6. Once started, how many hours does your fire usually burn? [record number, 2 digits; 99 don't know/refused] (n=107)

Mean 3.96 hours; Median 3 hours (compared to 6.16 in low-incidence areas, statistically significant)

- 1-2 hours: 33%
- 3-4 hours: 39%
- 5-6 hours: 13%
- 7-13 hours: 8%
- > 13 hours: 1%
- DK/Refused: 6%

-
7. Which of the following types of fuel do you typically burn? (Read. Check all that apply. Rotate. Yes/No punch. 9= Don't know/refused) (n=107)
- 1 Seasoned firewood that has been split and dried for a year or more 70%
 - 2 Partially dried wood that has some moisture 18%
 - 3 Pellets 11%
 - 4 Manufactured logs, such as *Duraflame* 42% (compared to 24% in low-incidence areas, stat. sign.)
 - 5 Trash, magazines, newspapers or other household materials 12%
 - 6 Other (specify) 7% (most frequently cited: fallen wood, branches, and pine cones)
8. What time of day do you typically burn wood? (READ options) (n=107)
- 1 Mornings 6%
 - 2 Afternoons 6%
 - 3 Evenings 74%
 - 4 All day 11%
 - 9 Don't know/refused 3%
9. What would you say is the main reason you choose to burn wood? (DO NOT READ. CHECK ALL THAT APPLY. Ask once, "Anything else?" RECORD FIRST MENTION) (n=107)
- 1 Looks nice, creates a good atmosphere First mention 29%; Total mentions 50%
 - 2 Provides heat First mention 42%, Total mentions 60%
 - 3 Cozy First mention 12%, Total mentions 24%
 - 4 Health benefits First mention 1%, Total mentions 1%
 - 5 Special for the holidays First mention 8%, Total mentions 17%
 - 6 Other (specify) First mention 4%, Total mentions 10%
 - 7 Saves Money First mention 4%, Total mentions 6%
 - 9 Don't know/refused 1%
10. *Check Before You Burn* runs from November through February each year and prohibits wood burning in fireplaces, wood or pellet stoves, and outdoor fire pits during certain days when it is determined that air quality levels will be most impacted. Have you ever heard of the *Check Before You Burn* program? (n=704)
- 1 Yes 81% (higher than in low-incidence areas, statistically significant)
 - 2 No 17%
 - 3 Maybe 1%
 - 9 Don't know/Refused 1%
11. Are you aware that there is a toll-free hotline that you can call or website that you can visit in the winter to determine if it is OK to burn wood in a fireplace, stove, or backyard fire pit based on current air quality? (n=704)
- 1 Yes 63% (higher than in low-incidence areas, statistically significant)
 - 2 No 36%
 - 9 Not sure/Don't know 2%
12. Are you aware that you can sign up for email or text notifications of No Burn Days during the winter? (n=704)
- 1 Yes 39% (higher than in low-incidence areas, statistically significant)
 - 2 No (Skip to Q15) 59%
 - 9 Not sure/Don't know (Skip to Q15) 2%

-
13. [If “yes” to Q11 and/or Q12 AND Q2 = 1, 2, or 3 **AND Q5 = 1, 2, 3, or 4**. All others skip to Q15] Before you burn wood, how often do you check to see if it is a No-Burn Day?” READ) (n=44 cases)
- 1 All of the time 29 cases
 - 2 Most of the time 6 cases
 - 3 Some of the time 0 cases
 - 4 Rarely (**Skip to Q15**) 2 cases
 - 5 Never (**Skip to Q15**) 6 cases
 - 9 Don't Know/Refused (**Skip to Q15**) 1 case
14. How often do you comply with No Burn restrictions? (READ) (n=35 cases)
- 1 All of the time 29 cases
 - 2 Most of the time 4 cases
 - 3 Some of the time 1 case
 - 4 Rarely 1 case
 - 5 Never 1 case
 - 9 Don't Know 1 case
15. If you knew one of your neighbors was burning wood on a no-burn day how likely would you be to report them to the District? (n=704)
- 1 Very likely 15%
 - 2 Somewhat likely 20%
 - 3 Not too likely 20%
 - 4 Not at all likely 39%
 - 9 Don't know/refused 6%
16. To encourage cleaner burning in the Valley, there is a grant program that offers rebates to residents who replace their traditional fireplace or stove with a cleaner-burning device such as a certified wood stove or a gas fireplace. Are you aware of this grant program, it is called *Burn Cleaner*? (n=704)
- 1 Yes 32% (no difference compared to low-incidence areas)
 - 2 No 67%
 - 9 Not Sure/Refused 1%
17. (**ASK only if Q2= 1, 2, 3 otherwise skip to Q21**) Would you be willing to replace your current wood-burning fireplace or stove with a cleaner, less-polluting wood-burning device if you could use it on some No-Burn days? (n=287)
- 1 Yes 29% (less willing to replace wood-burning device compared to low-incidence areas)
 - 2 No 59%
 - 3 I already have a clean-burning device (don't read) (**Skip to Q21**) 4%
 - 9 Don't know/Refused (Don't read) 8%
18. Assuming a clean wood-burning device costs about \$3,000, would you upgrade from your current fireplace or stove if you could get a 25% rebate on your purchase? (n=274)
- 1 Yes (**Skip to Q21**) 15%
 - 2 No 75%
 - 3 I would purchase it without a rebate/incentive (Don't read) (**Skip to Q21**) 0%
 - 4 Not interested/no discount would be enough (Don't read) (**Skip to Q21**) 4%
 - 9 Don't know 6%
19. How about a 50% rebate? (n=222)
- 1 Yes (**Skip to Q21**) 14%
 - 2 No 79%
 - 3 I would purchase it without a rebate/incentive (Don't read) (**Skip to Q21**) 0%
 - 4 Not interested/no discount would be enough (Don't read) (**Skip to Q21**) 3%
 - 9 Don't know 4%

20. How about a 75% rebate? (n=184)

- 1 Yes 22%
- 2 No 67%
- 3 I would purchase it without a rebate/incentive (Don't read) 0%
- 4 Not interested/no discount would be enough (Don't read) 3%
- 9 Don't know 8%

GENERAL BELIEFS AND AWARENESS

21. Do you believe wood smoke is a significant source of air pollution in your neighborhood? (n=704)

- 1 Yes, definitely 28%
- 2 Yes, probably 20%
- 3 No 48%
- 9 Don't know/Refused 4%

22. (Ask only if Q5 = 1,2,3,4. All others skip to Q23). Which one of these best describes your views: (n=111)

- 1 I don't think wood smoke is dangerous to my health 15%
- 2 I know wood smoke is dangerous to my health, but I like burning wood 30%
- 3 I know wood smoke is dangerous, but I cannot afford other heating alternatives 12%
- 4 I believe burning wood has positive health benefits that outweigh any negative health impacts from wood smoke 5%
- 5 None of the above (Read) 33%
- 9 Don't know/Refused (Don't read) 5%

23. Does anyone in your household suffer health problems as a result of wood burning? (n=704)

- 1 Yes 14%
- 2 No 84%
- 9 Don't know/refused (Don't read) 2%

24. Currently, the District prohibits wood burning on those days in the winter when the air quality is poor. There are exceptions for households that depend on wood burning as their sole source of heat and for residents who have replaced their traditional wood-burning fireplaces or stove with cleaner, less-polluting devices. Which of the following statements best describes your opinion about these rules: (Check one) (n=704)

- 1 The current restrictions are reasonable 60%
- 2 The current restrictions are too aggressive and should be relaxed 18%
- 3 The current restrictions don't go far enough 15%
- 9 Don't know/refused (Don't read) 8%

25. Given the Valley's air quality challenges, as you understand them, which of the following would you support? [Rotate stems 1 and 2] (n=704)

- 1 A valley-wide ban on the use of wood burning fireplaces and stoves 8%
- 2 A ban on the use of wood burning only in those areas of the Valley with high pollution 12%
- 3 Instead of a ban, a grant program providing financial assistance to encourage people to switch from traditional wood-burning devices to cleaner units 53%
- 4 None of the above (read) 22%
- 9 Don't know/refused (don't read) 5%

DEMOGRAPHICS

Finally, I'd like to ask you a few general questions for statistical purposes. Your answers are confidential.

26. What year were you born? _____ (n=704)
- 1 18-34 9%
 - 2 35-64 40%
 - 3 65+ 39%
 - 9 Refused 11%
27. Would you please tell me what ethnic group you identify with? Are you Hispanic/Latino, Black/African American, Asian, Caucasian, or of some other ethnic or racial background? (n=704)
- 1 Hispanic/Latino 25%
 - 2 Black/African American 5%
 - 3 Asian-American 5%
 - 4 White/Caucasian 50%
 - 5 Other (specify) 6%
 - 9 Refused (Don't read) 9%
28. How many people live in your household? _____
- 29a. [Asked of cell phones only] Do you have a landline telephone? (unweighted n=120)
- 1 Yes 35%
 - 2 No 61%
 - 9 Refused 4%
- 29b. [Asked of landline phones only] Do you have a cell phone? (unweighted n=583)
- 1 Yes 76%
 - 2 No 19%
 - 9 Refused 4%
30. [Asked of everyone] Does your household primarily use cell phones or land line phones? (unweighted n=703)
- 1 Cell 49%
 - 2 Landline 43%
 - 9 Refused 9%
31. What are the major cross streets near your home? _____ [If necessary: "We are not interested in your exact address, just the neighborhood where you live so we can combine your responses with others from the same area."] (86% of respondents provided a verbatim answer)
32. I am going to read some categories of household income. Please stop me when I reach the category of your total 2016 annual household income, before taxes: (n=704)
- 1 Less than \$15,000 7%
 - 2 \$15,000 to less than \$35,000 17%
 - 3 \$35,000 to less than \$50,000 12%
 - 4 \$50,000 to less than \$75,000 12%
 - 5 \$75,000 to less than \$100,000 8%
 - 6 \$100,000 to less than \$150,000 6%
 - 7 \$150,000 to less than \$200,000 3%
 - 8 More than \$200,000 3%
 - 9 Refused (Don't read) 32%

-
33. (GENDER BY OBSERVATION-- DON'T READ) (n=704)
01 Male 45%
02 Female 55%

34. Note Language (English or Spanish) (n=704)
English 79%
Spanish 21%

That concludes our survey. Thank you very much for your time.

**APPENDIX B:
DEMOGRAPHIC PROFILE OF RESIDENTS SURVEYED COMPARED
TO POPULATION ESTIMATES**

Table 1: Demographic Profile of Residents Surveyed, Valley Residents Overall Compared to Population Estimates and 2014 Sample

Population Characteristic	U.S. Census Population (Across 8 County-Region)	Unweighted Sample	Weighted Sample 2017	Weighted Sample 2014
Fresno	23.5%	22.6%	23.6%	23.1%
Kern	21.2%	19.5%	20.8%	21.2%
Kings	3.6%	4.6%	3.3%	3.8%
Madera	3.7%	5.3%	3.6%	3.7%
Merced	6.4%	6.1%	6.6%	6.5%
San Joaquin	17.6%	15.4%	17.6%	17.8%
Stanislaus	13.0%	13.1%	12.8%	12.6%
Tulare	11.0%	13.5%	11.6%	11.5%
Male	50.3%	46.4%	50.5%	50.0%
Female	49.7%	53.6%	49.5%	50.0%
White	34.8%	46.1%	35.4%	34.6%
Black	4.4%	3.6%	4.3%	5.3%
Hispanic	50.2%	38.6%	49.8%	49.2%
Asian	7.4%	4.0%	7.0%	7.8%
Age <65	84.9%	69.2%	83.8%	85.3%
Age 65+	15.1%	30.8%	16.2%	14.7%

**Table 2: Targeted Sample (High-Incidence Areas) Weighted Distribution by Zip Code
Compared to Population Estimates**

Population Characteristic	U.S. Census Population (Proportion in relation to 20 Zip Code-Region)	Unweighted Sample	Weighted Sample
93305 (zip code)	4.12%	1.71%	4.11%
93307	9.25%	4.69%	9.23%
93308	5.82%	4.98%	5.82%
93309	6.50%	5.69%	6.52%
93311	4.83%	4.98%	4.81%
93312	6.19%	11.38%	6.22%
93313	4.93%	2.99%	4.91%
93314	2.64%	2.13%	2.61%
93611	5.24%	9.10%	5.22%
93612	3.90%	2.42%	3.91%
93703	3.60%	1.71%	3.61%
93704	2.91%	2.42%	2.91%
93705	4.13%	2.28%	4.11%
93710	3.49%	5.83%	3.51%
93711	4.01%	5.97%	4.01%
93720	4.99%	10.67%	5.02%
93722	8.90%	6.26%	8.93%
93726	4.64%	7.40%	4.61%
93727	8.24%	5.97%	8.22%
93728	1.67%	1.42%	1.71%
Age: 65 +	14%	44%	39%
Race: White	39%	55%	50%