



Evaluation of the 2017 Sacramento Region Spare The Air Campaign

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Table of Contents

Background	4
Spare The Air 2017 Season.....	5
Media Buy	6
Research Objectives.....	6
Research Methodology.....	7
Sampling Frames	7
Sampling Design	8
Interviewing Strategy.....	8
Respondents.....	9
The Questionnaire	10
Statistical Significance	10
Caveat.....	10
AWARENESS OF THE 2017 SPARE THE AIR CAMPAIGN.....	11
General Awareness	11
Specific Awareness: Request Not to Drive	12
Year-To-Year Comparisons of Awareness: Sacramento Nonattainment Area.....	13
Year-To-Year Comparisons by Air District.....	14
Sacramento Metropolitan AQMD	14
Yolo-Solano AQMD.....	14
Placer County APCD	15
El Dorado County AQMD	15
Spare The Air vs Control Days	17
Estimating the Number of Spare The Air-Aware Drivers.....	19
Awareness of General Media Campaign	21
PURPOSEFUL DRIVING REDUCTION.....	22
Driving Behavior Yesterday	22
Year-to-Year Comparisons: Percent Who Drove Less.....	25
Percentage of Purposeful Reducers.....	27
Percentage of Purposeful Reducers: Year-To-Year Comparisons	29



Estimated Number of Purposeful Reducers.....	31
Estimated Number of Single Trips Avoided by Purposeful Reducers	32
Percentage of Purposeful Reducers: Spare The Air Days vs. Control Days.....	33
ESTIMATED EMISSION REDUCTIONS.....	34
Calculation of Estimated Emission Reductions	34
2017 Emissions Reduction Estimate by Air District:.....	37
Comparison with Previous Years: Sacramento Metropolitan AQMD (only)	39
SUMMERTIME SEASONAL TRIP REDUCTIONS.....	40
Seasonal Driving Reducers	40
Number of Reduced Trips	41
Seasonal Trip Reduction: Estimated Emission Reductions	42
How They Reduce Driving	43
SUMMER 2017 HEALTH ISSUES.....	47
Perceived Health Problems: Spare The Air Days vs. Control Days	47
Year-To-Year Comparisons.....	49
Individual Air Quality Districts	50
Air Quality Districts: Year-To-Year Comparisons.....	52
APPENDIX A	53

2017 Spare The Air Evaluation

Research Methodology

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Background

The Sacramento region's public outreach program **Spare The Air** was created in 1995 to engage the general public in voluntarily helping to solve the problem of ozone air pollution. The U.S. Environmental Protection Agency (EPA) designated the Sacramento region a **severe nonattainment area** for the 1997 and 2008 federal eight-hour ozone standards. The respective deadlines for these standards are 2019 and 2027. These health based standards affect the quality of life and health of area residents, particularly during the summer months. The region is on track to attain these health based standards by the deadlines, provided the district continues to maintain key efforts like the Spare The Air campaign. The Sacramento Nonattainment Area includes Sacramento County, Yolo County, and parts of Placer, Solano, El Dorado and Sutter Counties.

The Sacramento Metropolitan Air Quality Management District (SMAQMD) estimates that about 70% of the Sacramento region's air pollution is caused by emissions from vehicles and other mobile sources. Unhealthy levels of ground-level ozone are created when volatile organic compounds (VOCs) and nitrogen oxides (NOx), primarily from cars, trucks, construction and agricultural equipment, lawn mowers, and other mobile sources, react in the presence of sunlight and form ozone in hot weather conditions. Ozone pollution is lowest in the morning and reaches its highest levels in the afternoon and early evening hours. The residential driving population is therefore a large contributor to the air quality problem in the region.

The Spare The Air program provides residents in the Sacramento region with information and resources to protect their health during the summer smog season (May to October) by encouraging them to be aware of ozone levels and by asking motorists to reduce their driving on days when unhealthy air is predicted. 2017 Spare The Air outreach efforts included radio, television, digital and outdoor billboard advertising featuring various air quality tips, a website (www.SpareTheAir.com) including "Scooter's World" for children, daily social media posts (Facebook, Twitter, Instagram and Pinterest), the Sacramento Region Air Quality app, as well as Scooter's appearance at community events, distribution of newsletter articles and other materials to over 3,700 business and community partners.

The trigger for alerting the population of a Spare The Air day for the next day is based on forecasted estimates of the Air Quality Index (AQI), which are provided by Sonoma Technology, Inc. Estimates are derived using mathematical predictive modeling procedures on actual measurements obtained by local air districts and the California Air Resources Board at air quality monitoring sites throughout the region. If it is estimated that the AQI will be above the threshold of 126 (0.078 parts per million) the next day, a Spare The Air alert is issued by the Sacramento Metropolitan AQMD by 12:00 p.m. The Spare The Air alert communication involves notifying the public through a variety of channels, including social media, paid radio, television and digital outdoor billboard advertising, email Air Alerts, news broadcasts, the Spare The Air website, the Sacramento Region Air Quality app and The Sacramento Bee.

Spare The Air days are called for the Sacramento Nonattainment Area as a whole, but all air quality districts within the area may not have the same conditions. For example, foothill districts (such as Placer and El Dorado) sometimes experience poorer air quality than the central plain district of Yolo-Solano. To some extent this is due to the fact that ozone precursors emitted by vehicles throughout the region take time to convert into ground-level ozone pollution, and that pollution can be transported into the foothills. The pollutants can also get "trapped" if there are stagnant, stable conditions, which would prevent flow uphill.

It is, therefore, important that the Spare The Air message continue to involve everyone in the basin, although the air pollution readings in individual districts on specific days may not be the same.

Spare The Air 2017 Season

There were **17** Spare The Air days called during the 2017 summer smog season, which is the same total of days called in 2016. This increase in Spare The Air days was due to the trigger level being lowered in 2016. The region's air pollution control officers lowered the trigger to .078 parts per million (126 on the Air Quality Index) in response to the 2015 federal ozone standard of .070 ppm . In comparison, the 2015 season's Spare The Air trigger level of .086 ppm resulted in five Spare The Air days.

<i>Spare The Air date</i>	<i>Forecast AQI</i>	<i>Actual Maximum AQI</i>	<i>Health Level for Actual AQI</i>	<i>Reporting Station of Actual Maximum AQI</i>
June 21	126	112	Unhealthy for Sensitive Groups	Cool
June 23	126	129	Unhealthy for Sensitive Groups	Auburn
July 1	126	90	Moderate	Cool
July 6	126	87	Moderate	Sloughhouse
July 21	126	97	Moderate	Placerville
July 22	136	100	Moderate	Placerville
July 23	129	105	Unhealthy for Sensitive Groups	Cool
July 27	133	90	Moderate	Folsom
August 1	133	154	Unhealthy	Cool
August 2	126	126	Unhealthy for Sensitive Groups	Colfax
August 3	126	126	Unhealthy for Sensitive Groups	Colfax
August 28	129	108	Unhealthy for Sensitive Groups	Folsom
August 29	129	136	Unhealthy for Sensitive Groups	Auburn
September 1	133	144	Unhealthy for Sensitive Groups	Woodland
September 2	140	150	Unhealthy	Elk Grove
September 3	133	147	Unhealthy for Sensitive Groups	Folsom
September 4	129	135	Unhealthy for Sensitive Groups	Woodland

Media Buy

To educate a broad audience about the campaign and its message to reduce driving on a Spare The Air day, the 2017 Spare The Air campaign's paid advertising for general outreach consisted of radio, TV, outdoor billboards, online banner ads, and paid social media advertising on Facebook and Twitter. For episodic advisories, alerts were issued the day before and the day of each Spare The Air day. The 2017 season used a variety of mediums to communicate the alert, including Spare The Air alert TV and radio commercials, digital outdoor billboard advertising, news broadcasts, social media, the Spare The Air website, The Sacramento Bee, plus online advertising.

General Media Buy

In 2017, a total of \$166,710 was spent on the Spare The Air general awareness campaign. It ran from May through September, 2017, and used radio and television commercials, outdoor billboards, transit bus advertising, social media, and online ads to reach residents throughout the Sacramento region. The commercials had a health focus this season and asked residents "Would you care to Spare The Air?" and reduce the number of car trips they take and download the Sacramento Region Air Quality app.

Specific Spare The Air Alert Episodic Media Buy

This year, a total of \$89,478.21 was spent on episodic TV and radio commercials, and digital outdoor billboards for advertising on 15 of the 17 Spare The Air days:

1.	6/21/2017	\$ 7,761.25
2.	6/23/2017	\$ 7,772.50
3.	7/1/2017	\$ 4,795.00
4.	7/6/2017	\$ 6,515.25
5.	7/21/2017	\$ 7,561.50
6.	7/22/2017	\$ 7,130.00
7.	7/23/2017	\$ 7,130.00
8.	7/27/2017	\$ 6,452.70
9.	8/1/2017	\$ 6,454.04
10.	8/2/2017	\$ 6,904.97
11.	8/3/2017	\$ 4,497.50
12.	8/28/2017	\$ 5,090.00
13.	8/29/2017	\$ 5,017.50
14.	9/1/2017	\$ 4,896.00
15.	9/2/2017	\$ 1,500.00

Research Objectives

Annual evaluations (with the exception of 1997) have been conducted since 1995 to assess the effectiveness of the Spare The Air program. Levels of awareness, driving behaviors, health issues, and estimated emission reductions have been measured and tracked. In the early 2000s, numerous discussions took place between the Cleaner Air Partnership and staff of the California Air Resources Board (ARB) to arrive at an evaluation procedure acceptable to both. In 2002 an ARB-suggested question about general awareness was incorporated into the questionnaire in order to be able to calculate their definition of what qualifies as a "reduced" trip.¹

¹ The ARB recommended that only trip reductions from drivers who were aware of the Spare The Air program and purposefully reduced the number of trips they made on Spare The Air days specifically for air quality reasons should be counted in the measurement of the emission reductions attributable to the program. This is the definition of a purposeful reducer.

The specific evaluation objectives were to:

1. Measure general awareness and the specific episodic request not to drive on Spare The Air days among drivers in the Sacramento Nonattainment Area.
2. Measure the effectiveness of the Spare The Air program in terms of reduced driving among drivers who were aware of the program and purposefully reduced the number of trips they made due to air quality reasons.
3. Estimate emission reductions from the trips reduced during Spare The Air episodes.²
4. Compare awareness of the Spare The Air campaign and driving reduction among the individual air quality districts in the Sacramento Nonattainment Area.
5. Measure the percentage of drivers who habitually drive less during the summer season to improve air quality, and estimate the emission reductions from this group of seasonal reducers.
6. Track awareness and behavioral changes over time.

Research Methodology

Since 1995, two groups of respondents have been interviewed, one following Spare The Air days, and the other following non-Spare The Air (or Control) days, matched for the same day of the week as the Spare The Air interviews. A further control is that no interviews are conducted on rainy days. This type of experimental design adjusts for any overstatements individuals might make about their reported driving reduction on Spare The Air days (social desirability response bias), by providing a means of calculating a correction or adjustment factor. More accurate estimates about the number of drivers and households impacted by the Spare The Air program and the amount of emissions reduced are therefore obtained by subtracting this correction factor from the results. Including Control day data provides the most conservative estimates of program effectiveness. Control day data also have provided other insights into driving behavior.

Sampling Frames

In previous years, telephone interviews were conducted with samples of residents throughout the air basin, using Random Digit Dialing (RDD) procedures in which a computer generates phone numbers from known landline area codes and prefixes. Prior to 2011, these samples have only included landline numbers and not cell phone numbers. Although Spare The Air interviewing has always set quotas based on geography, age, and gender, it has become more and more difficult to survey young adults in the U.S. aged 18 to 34 years via a landline-only frame. In 2017, a 50/50 ratio was used due to the inability to reach target demographics without substantial use of mobile phones. This in turn substantially affected cost as dialing mobile phones is more expensive than dialing landline phones.

Moreover, increasing regulation of Computer Assisted Telephone Interviewing (CATI) has rapidly inflated the cost of interviewing in the past decade. To maintain this evaluation's accuracy within budget parameters that have not expanded as quickly as costs, it has become necessary to random sample from Listed frames, meaning that a computer draws from known working numbers within set area codes and prefixes. In so doing, costs are reduced by avoiding dialing dead numbers, businesses, fax machines, or something else.

² Methods for estimating ozone precursor reductions based on the survey data have been used in all evaluations conducted since 1999 but were based on different Emission Factor models over the years. Estimates were based on the Summer On-Road Inventory - EMFAC 2014 model, for the summer of 2016 accessed from <https://www.arb.ca.gov/emfac/2014/>.

Sampling Design

The next table summarizes the targeted goal of completed interviews in each air district area for both Spare The Air days and Control days.³ The goal was to conduct up to 1,200 interviews following Spare The Air days and 1,200 following Control days. The margin of error associated with a sample of 1,200 is +/- 2.5%, at a 95% confidence level.

Air District	Spare The Air interviews	Control day interviews
Sacramento Metropolitan AQMD:	400	300
Yolo-Solano AQMD	300	300
Placer County APCD	300	300
El Dorado County AQMD	200	300
Maximum Total	1,200	1,200

Within each air district, quotas were set with respect to geographic area, age, and gender.⁴ Not all areas of each county are included in the Nonattainment Area. Some residents in Yolo, Solano, Placer and El Dorado counties are excluded from interviews because they do not reside in a zip code contained in the Nonattainment Area boundary. Additionally, respondents were screened so that only those who had driven within the last week were interviewed.

Interviewing Strategy

A continuing challenge in terms of methodology is trying to estimate the number of Spare The Air days each season so that interviewing days and the number of completed interviews can be representative of the season and still provide adequate statistical precision. A field house needs advance notification and a target of a certain minimum number of interviews on a given day in order to maximize efficiency and contain costs. Given the expected increase in alert days during the 2017 season due to a lower Spare The Air threshold that was implemented in response to EPA's lower 2015 ozone health standard, the strategy adopted was to conduct approximately 80-100 interviews throughout the region (proportionally representative of the population in general by county), starting with every occurrence of a Spare The Air alert, and then deciding on an episode-by-episode basis whether to conduct interviews, taking into consideration the month within the season, the day of the week, and whether the event was single or multi-day, until the maximum number of budgeted interviews and the best coverage was obtained.

Interviewing took place the day following each Spare The Air day except for three episodes. By the September 1, 2, and 3rd episodes, a substantial number of interviews were already completed and actual costs of interviewing were exceeding predictions, warranting an exclusion of these episodes from the evaluation. Control day interviewing took place in August and September. Control day interviews were matched in terms of the day of the

³ It should be noted that the sampling design is for the maximum number of interviews to be completed. Due to the uncertainty about the number of Spare The Air days in each season, the actual number of completed interviews is often less than the targeted maximum.

⁴ Interviewing took place only in the relevant zip codes within certain counties (i.e. in Placer County, zip codes north or east of Auburn were excluded as well as those west of Vacaville in Solano County and those east of Placerville in El Dorado County). In order to avoid potential unbalanced and biased samples quotas were set for gender and age in order to ensure that respondents were representative of the population as a whole. In survey research, certain groups (such as elderly females) are more likely to respond to telephone interviews than others (such as young males); so, for example, no more than 13% of the 400 interviews conducted in Sacramento County were to have been with females aged 65 years and older; and no fewer than 10% were to be conducted with males aged 18 to 24. It has also been the case that residents in Davis are more likely to answer surveys than residents in other areas of the Yolo-Solano Air Quality Management District and so a quota of no more than 20% of interviews were to be conducted with Davis residents.

week of the Spare The Air day interviews, and took place on August 11, 12, 13, 14, 16, 17, 24, 25, 26, 27, 29, 30 and September 15 and 19.

Respondents

In Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD, interviews were conducted with a random representative sample of listed landline and cellular telephone numbers.

Respondents included a total of **2,056 drivers**, following both Spare The Air days as well as Control days. Results for the Sacramento Nonattainment Area as a whole were weighted proportionally.⁵ The next table lists the number of completed interviews for each group along with their affiliated margins of error (at the most conservative level).

A total of **1,118** interviews were conducted on days following Spare The Air days. Control day calling completed **938** interviews. When weighted,⁶ the total number of completed interviews is 573 following Spare The Air days, and 378 on Control days in the Sacramento Nonattainment Area as a whole.

<i>Number of Completed Interviews (unweighted)</i>	<i>Spare The Air Days</i>	<i>Margin of Error</i>	<i>Control Days</i>	<i>Margin of Error</i>
Sacramento Metropolitan AQMD:	363	+/- 5.1%	240	+/- 6.3%
Yolo-Solano AQMD	283	+/- 5.8%	221	+/- 6.6%
Placer County APCD	276	+/- 5.9%	267	+/- 6.0%
El Dorado County AQMD	196	+/- 7.0%	210	+/- 6.8%
Total Regional (Unweighted)	1118	+/- 2.9%	938	+/- 3.2%
Total Regional (Weighted)	573	+/- 4.1%	378	+/- 5.0%

⁵ Based on the 2010 US Census available at: <http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>. The total population in the entire Sacramento Nonattainment Area [including El Dorado AQMD] is 2,272,658: [Sacramento Metropolitan AQMD (63%) - 1,418,788; Yolo-Solano AQMD (15%) - 338,226 (this includes the total 200,849 from Yolo County and 129,377 from the Dixon, Rio Vista and Vacaville areas of Solano County); Placer County APCD (15%) - 338,613 (this figure represents the 87% of Placer County's 348,432 residents who do not live in zip codes north or east of Auburn), El Dorado AQMD (7%) - 150,515 (this figure represents 67% of El Dorado County's 181,058 residents, and includes residents from El Dorado Hills, Placerville, Shingle Springs, Georgetown, Cool, and the following unincorporated ZIP codes: 95613, 95619, 95623, 95633, 95635, 95651, 95664, and 95672).

⁶ Since the beginning evaluation in 1995, the methodology for weighting has been to set Sacramento Metropolitan AQMD interviews as 1, and down-weight interviews from all other counties appropriately, adjusted proportionally to the population within each air district. (Sacramento Metropolitan AQMD represents 63% of the entire population, Yolo-Solano AQMD is 15%, Placer County APCD is 15%, and El Dorado County AQMD is 7%). This is why the weighted total number of completed interviews (i.e. 577) is less than the sum of the total number of interviews conducted in all air districts (i.e. 1,078).

The Questionnaire

The main body of the questionnaire has remained the same to maintain consistency, although slight modifications have sometimes occurred, due to information needs or budget constraints. All surveys were conducted using a Computer Assisted Telephone Interviewing (CATI) system. The questionnaire was translated into Spanish and approximately 1% of all interviews were conducted in that language. The average interview lasted just over four minutes. A copy of the 2017 questionnaire is included as Appendix B.

Questions about Driving Behavior on the Previous Day

The questionnaire begins by asking respondent drivers how many times they entered a vehicle to drive the preceding day, and then whether they had driven the “same, more, or less” than usual. Respondents who reported driving “less” were then asked how many trips they avoided and why they avoided those trips.

Questions about Air Quality

After the portion of the interview about driving, respondents were asked questions about air quality. Awareness of the Spare The Air program was asked in two questions, and the order of these two was randomized so as to eliminate any possible order-response bias. The two questions are:

- 1) General awareness: “In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare The Air, or poor air quality, or requests to drive less in this area?” (the ARB-worded question)
- 2) Specific awareness of the request not to drive: “Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?” (original question)

Respondents were also asked whether they typically tried to reduce driving for air quality reasons in the summer, and if so, what they had done specifically this past summer to avoid adding to air pollution.

Statistical Significance

The level of significance for each statistical test is set to a p value of less than .05, which equates to at least 95% assurance in the integrity of an identified significant relationship. That is, a significant relationship is one that cannot be accounted for by chance alone. Because the relationship cannot be accounted for by chance alone it is instead 95% likely due to differences in the subpopulations being compared. It is assumed this relationship holds for members of the population who are not part of the sample, but who share the quality being used to compare subpopulations. For example, it may be determined that a significant difference arises in the driving reduction between Yolo-Solano AQMD and El Dorado County AQMD respondents such that Yolo-Solano residents reduced driving to a greater degree than El Dorado residents. This means researchers are 95% sure that a difference in reported driving reduction between residents of these regions is due to their location, and not to chance.

Caveat

The sole purpose of this report is to provide a collection, categorization and summary of public opinion data. Meta Research intends to neither endorse nor criticize the Spare The Air program, the Sacramento Metropolitan Air Quality Management District (SMAQMD); Yolo-Solano AQMD; Placer County APCD; El Dorado County AQMD; or Prozio Communications or their policies, products, or staff. The Client (SMAQMD) shall be solely responsible for any modifications, revisions, or further disclosure/distribution of this report.

Results & Conclusions

AWARENESS OF THE 2017 SPARE THE AIR CAMPAIGN

Objectives

The specific objectives of the current section are to:

- a. Measure awareness of the 2017 Spare The Air campaign and determine if awareness was similar or different among drivers in four air quality districts in the Sacramento Nonattainment Area (Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD).
- b. Determine if awareness during annual summer Spare The Air seasons has increased, decreased, or stayed the same from 2010 to the present.
- c. Compare levels of awareness between respondents interviewed following Spare The Air days and those interviewed on Control (non-Spare The Air) days.
- d. Extrapolate the results to the population by estimating the number of **drivers** who were aware of the 2017 Spare The Air campaign (correcting for Control days).
- e. Identify which media and/or outreach mediums most noticeably communicated Spare The Air information.

RESULTS

General Awareness

- 1 ➤ *In 2017, 28% of respondents in the entire Sacramento region had heard, read, or seen the Spare The Air advertisements. The 28% translates into an estimated **613,618** residents in the Sacramento Nonattainment Area who were aware of the 2017 Spare The Air campaign.*

The Spare The Air season runs from May through October of each year. This year there were 17 Spare The Air days.⁷ Levels of general awareness of Spare The Air have been measured since 2002 with the following question:

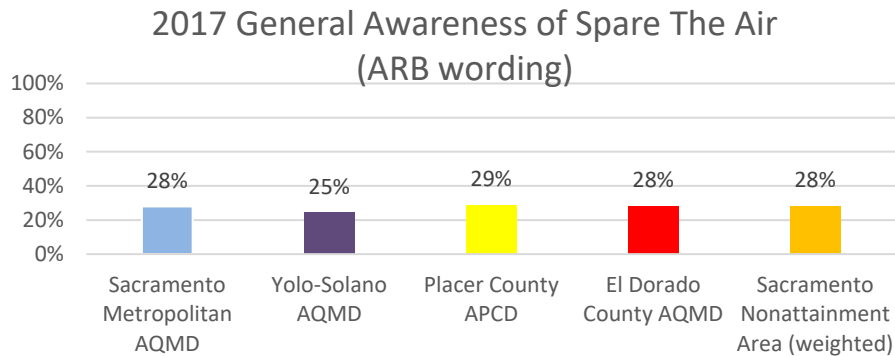
“In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare The Air, or poor air quality, or requests to drive less in this area?”

The next chart displays 2017 general awareness levels for residents in the individual air districts as well as in the entire Sacramento Nonattainment Area as a whole (weighted results⁸). On average, 28% of respondents in the entire region were aware of Spare The Air in general, translating to **613,618** residents⁹. In terms of the individual air quality districts, general awareness varied vary little, from 25% in Yolo-Solano AQMD to 29% in Placer County APCD.

⁷ See Methodology section for a complete list of 2017 Spare The Air episodes.

⁸ See Methodology section for a complete description of weighting methods.

⁹ Based on the 2010 US Census available at: <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>. The total population in the entire Sacramento Nonattainment Area [including El Dorado AQMD] is 2,272,658: [Sacramento Metropolitan AQMD (63%) - 1,418,788; Yolo-Solano AQMD (15%) - 330,226 (this includes the total 200,849 from Yolo County and 129,377 from the Dixon, Rio Vista and Vacaville areas of Solano County); Placer County APCD (15%) - 338,613 (this figure represents the 87% of Placer County's 348,432 residents who do not live in zip codes north or east of Auburn), El Dorado AQMD (7%) - 150,515 (this figure represents 67% of El Dorado County's 181,058 residents, and includes residents from El Dorado Hills, Placerville, Shingle Springs, Georgetown, Cool, and the following unincorporated ZIP codes: 95613, 95619, 95623, 95633, 95635, 95651, 95664, and 95672).



Specific Awareness: Request Not to Drive

- 2 ➤ *After weighting, 13% of respondents in the Sacramento region were aware of the specific request not to drive on Spare The Air days. When extrapolated to the entire population, this means that an estimated **295,446** residents were aware of Spare The Air alerts.*

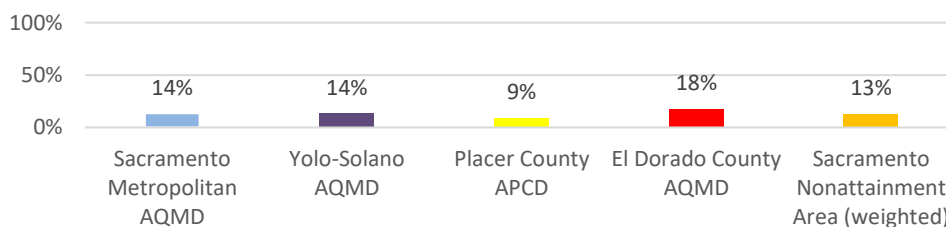
Since 1995, specific awareness of the request not to drive has been measured every survey year with the following question:

“Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?”¹⁰

The specific episodic alert that is sent to Air Alert subscribers and radio, television and print media says: *“This is a Spare The Air alert. Today’s air pollution is high. Here’s what you need to do. Reduce your driving or don’t drive. Share a ride or use public transportation. Help stop air pollution. Avoid heavy outdoor exertion in the afternoon when pollution is at its worst. Protect your health. Get current air pollution readings by downloading the free Sacramento Region Air Quality app today.”*

The next chart shows 13% of respondents in the region (weighted results) were aware of this specific request not to drive.¹¹ Specific awareness has always been statistically lower than general awareness. The 13% translates into an estimated **295,446** residents in the Sacramento region who heard the specific request not to drive on Spare The Air days. Levels of specific awareness ranged from 9% in Placer County APCD to 18% in El Dorado County AQMD.

2017 Specific Awareness of Spare The Air (ARB wording)



¹⁰ The order of the specific and general awareness questions was randomized to eliminate any possible order-response bias.

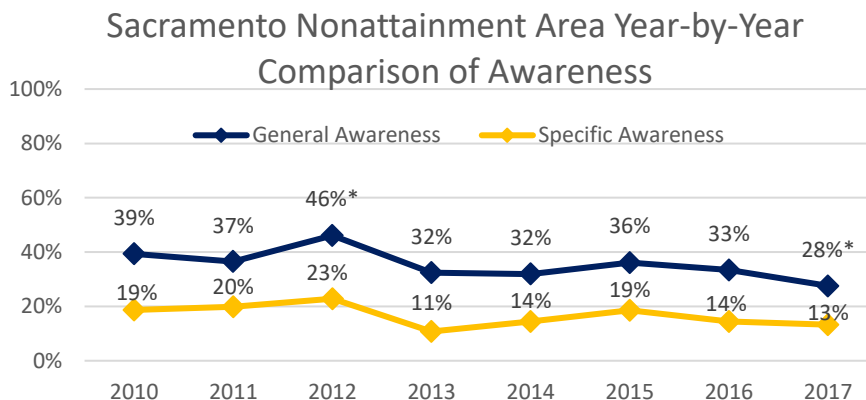
¹¹ See methodology section for review of weighting procedures.

Year-To-Year Comparisons of Awareness: Sacramento Nonattainment Area

- 3 ➤ *The level of general awareness for 2017 in the Sacramento Nonattainment Area (28%) is significantly lower than the average (36%), and the lowest of the last eight seasons. Specific awareness remains consistent with previous seasons, at 14% in 2017, which does not differ significantly from the eight-year average of 16%.*

The next chart displays annual percentages of general and specific awareness of Spare The Air in the Sacramento Nonattainment Area from the past eight seasons. General awareness in 2017 deviates significantly from the 2010-2017 mean (\bar{x} =36%). The 2017 general awareness levels are the lowest they've been since 2014. Though this is the first year the decrease is significant, levels have trended downward since 2012 when they reached a high of 46%.

Specific awareness levels in 2017 do not differ significantly from the average (\bar{x} =16%). The 23% of aware respondents in 2012 is significantly higher than other years, while the 11% of respondents in 2013 is significantly lower. That 2017 specific awareness levels do not differ from the mean is an indication that residents this year were as aware of the specific request not to drive as they have been in previous years.



To explain the variation in awareness levels from season to season, the 2013, 2014, and 2015 data all found strong correlations between awareness and the number of episodes in a season.¹² Those seasons also experienced fewer episodes. In stark contrast, the 2016 and 2017 seasons each included 17 Spare The Air episodes. Yet, in 2016 awareness levels did not differ from the average and in 2017, awareness is at its lowest. Consequently, the conclusions drawn based on the 2013-2015 are called into question. Future reports should continue to evaluate a relationship between number of episodes and awareness levels as the differing results from season to season are currently insufficient to draw conclusions. Additionally, future reports must adapt the survey to begin considering the rapidly changing media landscape and its impact on awareness levels.

¹² The 2013 report found a correlation between number of episodes and general ($r = .73, p < .05$) and specific ($r = .84, p < .05$) awareness, the 2014 report found a correlation between general ($r = .80, p < .05$) and specific ($r = .92, p < .05$) and the 2015 report found a correlation between general ($r = .79, p < .05$) and specific ($r = .92, p < .05$).

Year-To-Year Comparisons by Air District

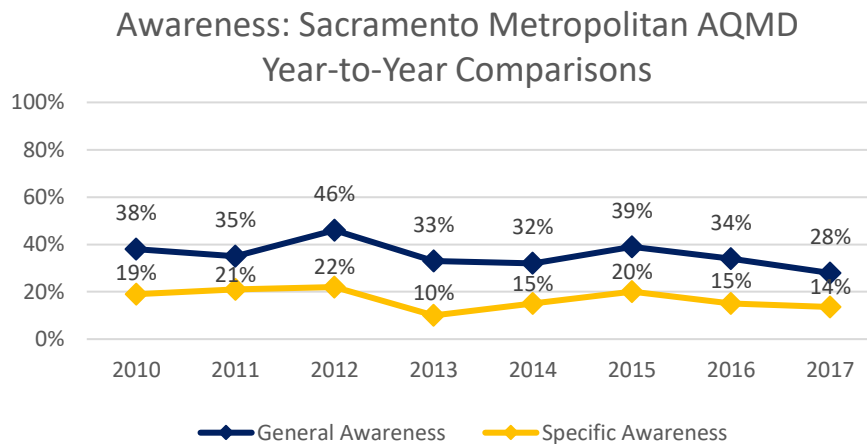
- 4 ➤ *In all but Placer County APCD, levels of general awareness are at their lowest in eight years. Specific awareness levels in each area do not differ from the eight-year average except in Placer County APCD, where specific awareness is at 9%, down from 14% in 2016.*

Year-to-year comparisons of the annual levels of general and specific awareness for the individual air districts from the most recent eight seasons are presented in the next graphs.

Sacramento Metropolitan AQMD

As can be seen in the next graph, the highest levels of general as well as specific awareness in Sacramento Metropolitan AQMD between 2010 and 2017 occurred in 2012. A Chi Square analysis confirms a significant relationship between year and general awareness such that 2012 general awareness (46%) is significantly higher than the mean (\bar{x} =36%), while 2017 is significantly lower (28%).

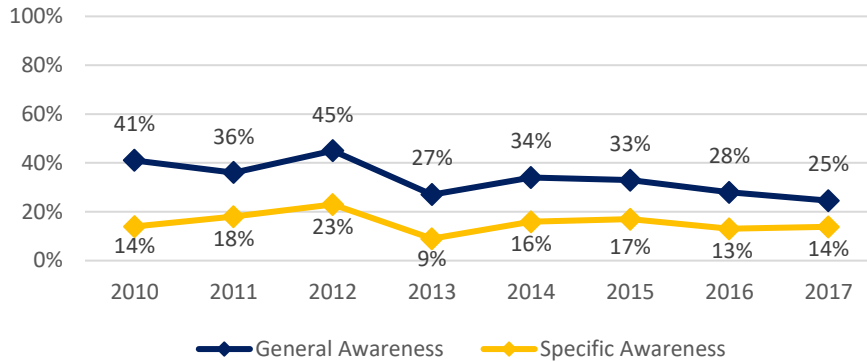
There is also a significant relationship between year and specific awareness, such that 2013 (10%) is a significant low for the eight seasons depicted. The 2017 season, with specific awareness at 14%, does not differ significantly from the eight-year average of 17%.



Yolo-Solano AQMD

In Yolo-Solano AQMD, the 2017 level of general awareness (25%) is not significantly different from the eight-year average of 34%. This year's level of specific awareness (13%) is also not different from the mean (\bar{x} =16%). In Yolo-Solano AQMD, like Sacramento, 2012 shows a significantly high general awareness. It appears general awareness in Yolo-Solano AQMD is trending downward but has not yet reached a significant threshold.

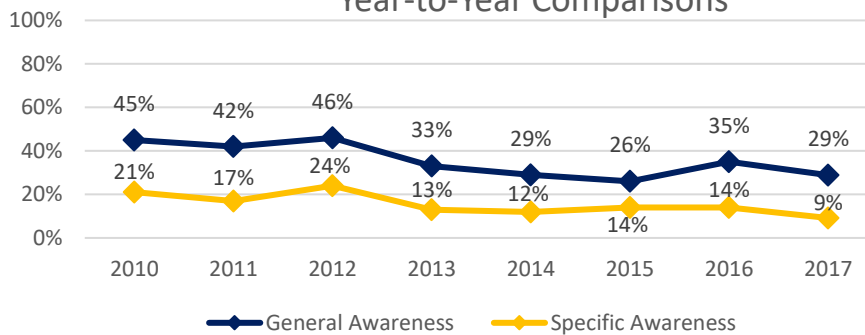
Awareness: Yolo-Solano AQMD Year-to-Year Comparisons



Placer County APCD

General awareness in Placer County APCD decreased marginally in 2017, to 29%, which is not significantly different from the eight-year average of 36%. Specific awareness at 9% marks a significant deviation from the mean (\bar{x} =16%). The 2012 season, at 24%, is a significant high for Placer County APCD.

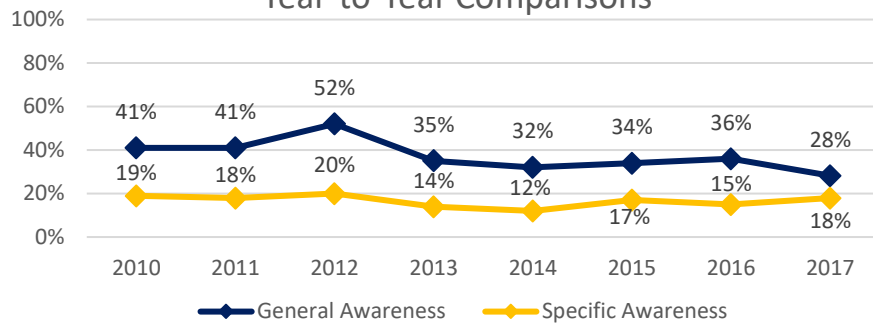
Awareness: Placer County APCD Year-to-Year Comparisons



El Dorado County AQMD

In El Dorado County AQMD, the 28% general awareness in 2017 is a significant low. In contrast, the 52% level in 2012 is still a significant high compared to later seasons. Specific awareness in El Dorado County AQMD has remained relatively constant, with no significant difference between years. The 18% specific awareness in 2017 is comparable to the eight-year average of 17%.

Awareness: El Dorado County AQMD Year-to-Year Comparisons





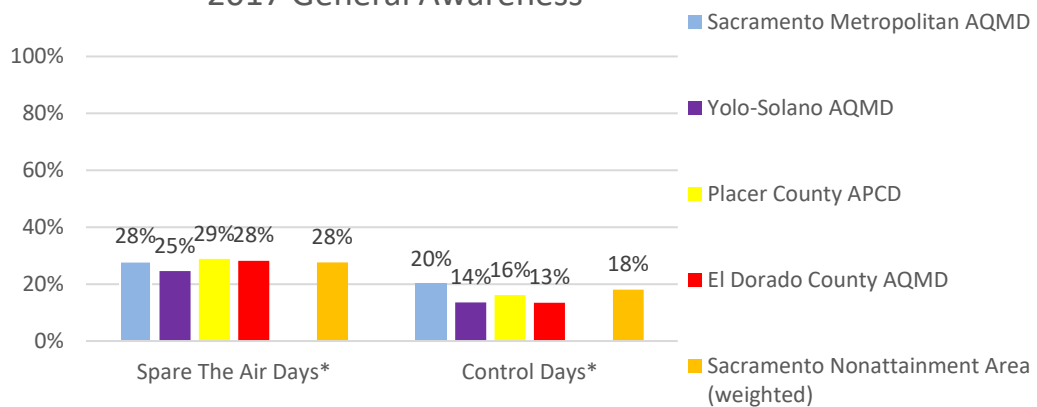
Spare The Air vs Control Days

- 6 ➤ *Levels of both general and specific awareness of Spare The Air were significantly higher when respondents were interviewed following Spare The Air days than on Control days, an indication that the episodic announcements are heard.*

Control day interviews were conducted on non-Spare The Air days with random samples of landline residents representative of all air districts in the Nonattainment Area. Control interviews took place on the same days of the week as the Spare The Air interviews, but on a day that wasn't a Spare The Air day. The same questionnaire as the one used following Spare The Air days was used for Control day calling. The use of a Control group ensures that any positive results attributed to the Spare The Air program are indeed due to the program itself and not to a possible social desirability response bias.

Results for general awareness are presented in the next chart and indicate that 18% of area respondents interviewed on Control days said they had seen or heard Spare The Air announcements. Significantly more (28% vs 18%) of those interviewed after Spare The Air days remembered seeing or hearing them. Thus, the paid episodic media buy was effective at reaching the Sacramento region's residents throughout the summer. This was particularly evident following Spare The Air days, when respondents also had the opportunity to witness an episodic advertisement, which is included in the general awareness measure. Results in each of the individual air districts were similar and each is supported by a significant difference between Spare The Air and Control days. While awareness levels are lower this year than on average, these data show that **the Spare The Air program is still able to use the media to effectively reach the Sacramento region population**. A rapidly changing media landscape, a highly politicized populace, and an especially attention competitive media market may explain, at least in part, the lower awareness levels in 2017.

Spare The Air vs. Control Days:
 2017 General Awareness



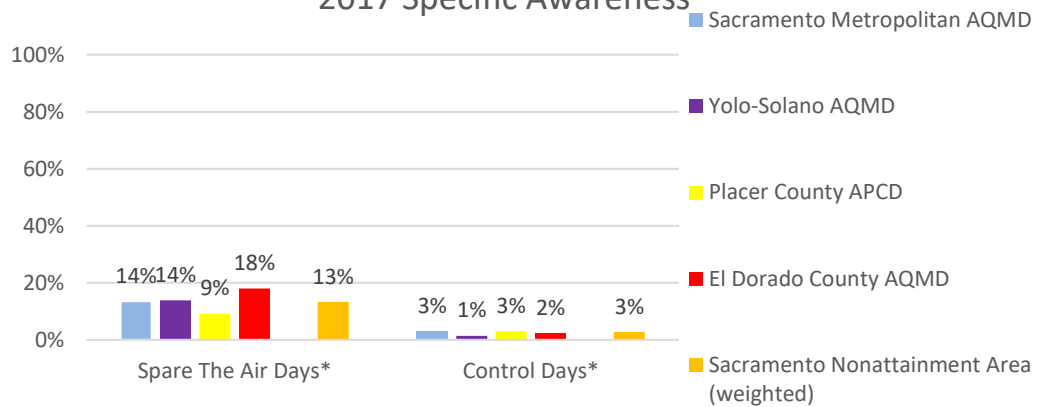
* indicates statistically significant differences between Spare The Air and Control percentages.

In terms of specific awareness, 3% of Control day respondents in the area incorrectly heard a request not to drive versus the 13% of respondents who correctly remembered the request following Spare



The Air days. As can be seen in the following chart, the difference between Spare The Air and Control day interviewing in each individual air district was likewise significant. These results indicate once again that **the Spare The Air program is still effective in reaching area residents with episodic announcements.**

Spare The Air vs. Control Days: 2017 Specific Awareness



* indicates statistically significant differences between Spare The Air and Control percentages.



Estimating the Number of Spare The Air-Aware Drivers

- 7 ➤ *The percentage of respondents who were aware of Spare The Air in general translates into an estimate of **461,570 drivers** in the Nonattainment Area who were aware of a Spare The Air day during the 2017 season.*

There were an estimated 1,648,467 drivers in the entire Sacramento Nonattainment Area in the summer of 2017.¹³ With the level of general awareness of Spare The Air at 28%, this translates into an estimated **461,570 drivers in the Sacramento Nonattainment Area who were aware of the 2017 Spare The Air campaign in general**. The next table displays the calculations and the estimated number of drivers who heard, read or saw Spare The Air media in each individual air district.

<i>Air District</i>	<i>Total Estimated Number of Drivers</i>	<i>Percent Aware of STA (General Awareness) STA</i>	<i>Estimated Number of Drivers Aware of STA in General ¹⁴</i>
Sacramento Metropolitan AQMD	1,011,962	28%	283,349
Yolo-Solano AQMD	230,682	25%	57,671
Placer County APCD	281,954	29%	81,767
El Dorado County AQMD	123,869	28%	34,683
Sacramento Nonattainment Area¹⁵	1,648,467	28%	461,570

¹³ The number of drivers in the Sacramento Nonattainment Area for 2017 was estimated using the number of driver licenses by county for 2016, obtained from the California Department of Motor Vehicles database found at <https://www.dmv.ca.gov/portal/wcm/connect/90a04dc3-ac0d-4528-a6a3-4797d0842689/DL+By+County+2016.pdf?MOD=AJPERES>.

The estimated number of licensed drivers for the total Sacramento Nonattainment Area in 2017, therefore, was 1,648,467. Sacramento Metropolitan AQMD: total 1,011,962 + Yolo-Solano: total of 230,682 (136,852 in Yolo County + Solano County: 302,677 * 31% for the proportion located within the air district = 93,830) + Placer County: total of 281,954 (290,674 * 97% for the air district) + El Dorado County: total of 123,869 (149,240 * 83% for the air district). The proportion of drivers in each district also corresponds to the residential population proportions used in the calculation of weights for the region.

¹⁴ In previous seasons, Control day respondents who said they were generally aware of the campaign were subtracted from the total generally aware Spare The Air day respondents to make these calculations. It was decided in a meeting on April 2, 2014 between Lori Kobza of SMAQMD and Joe Hanson of Meta Research that for general awareness, a correction factor to extrapolate to the resident population is unnecessary because Control day respondents can reasonably be generally aware of the campaign even if they do not recall a specific request not to drive because there are Spare The Air outreach efforts taking place from May through October. Reducing estimates of generally aware residents by subtracting Control day responses greatly underreports total awareness estimates.

¹⁵ The results for the Sacramento Nonattainment Area are not the simple sum of the individual air districts, but rather, are weighted results that reflect the relative proportional distribution of residents in the area.



8 ➤ In terms of specific awareness, and correcting for Control day responses, 161,246 drivers in the region heard the episodic request not to drive on Spare The Air days in 2017.

The estimated numbers of drivers who were aware of the specific request not to drive are presented in the next table. For the entire Sacramento Nonattainment Area, and correcting for Control day responses, the 13% aware, less the 3% erroneously aware Control respondents, translates into an estimated **161,246 drivers who were specifically aware of the requests not to drive on Spare The Air days.**

Air District	Total Estimated Number of Drivers	Percent Aware of STA (Specific Awareness) STA / Control	Estimated Number of Drivers Aware of STA Specific Request Not to Drive (STA - Control)
Sacramento Metropolitan AQMD	1,011,962	14% / 3%	141,675 – 30,359 = 111,316
Yolo-Solano AQMD	230,682	14% / 1%	32,295 - 2,307 = 29,989
Placer County APCD	281,954	9% / 3%	25,376 – 8,459 = 16,917
El Dorado County AQMD	123,869	18% / 2%	22,296 - 2,477 = 19,819
Sacramento Nonattainment Area ¹⁶	1,648,467	13% / 3%	209,619 – 48,374 = 161,246

¹⁶ The results for the Sacramento Nonattainment Area are not the simple sum of the individual air districts, but rather are the weighted results, which reflect the relative proportional distribution of residents in the area.

Awareness of General Media Campaign

9 ➤ *News or weather broadcasts, television commercials, and radio commercials were the most cited sources of air quality information in the Sacramento Nonattainment Area.*

Respondents were asked to identify the medium(s) through which they heard, read, or saw a message about air quality after indicating that they received such a message. That is, after stating yes to the general awareness item, respondents were asked:

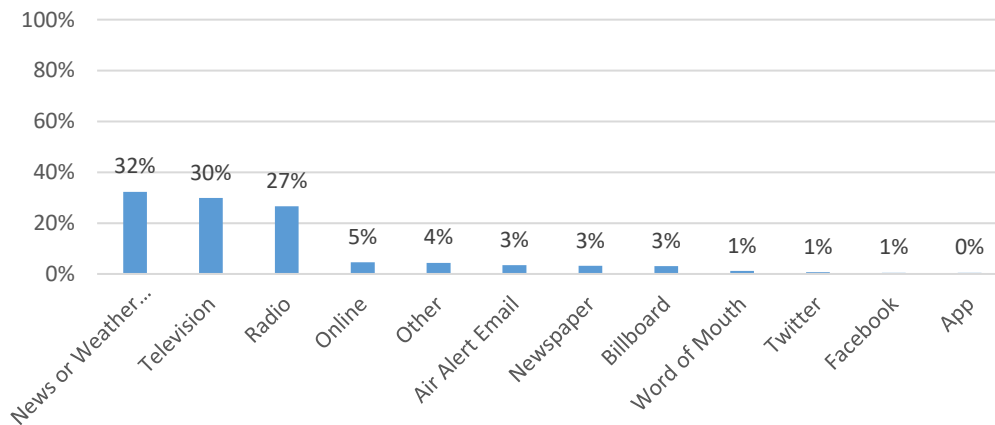
“Where do you recall seeing/hearing/reading that information?”¹⁷

The data resulting from this survey item may help coordinators reallocate funds and effort during subsequent seasons to maximize message dissemination. The next table illustrates the percentage of respondents who identified any of 11 mediums through which they received a message about air quality in general for the Sacramento Nonattainment Area.

The most cited sources of Spare The Air information are news or weather broadcasts (32%), television commercials (30%) and radio commercials (27%). The next most cited sources are nearly equally distributed among the other media and are infrequent. Respondents who were aware because of something ‘other’ than the 11 categorized media mention things like their employer alerting them through their work intranet.

No significant differences arose between geographic locations and, therefore, no data is presented for the individual air districts. The most accurate representation of media sources is accounted for by the Nonattainment Area as a whole.

2017 Sacramento Nonattainment Area
 General Media Awareness
 (weighted)



¹⁷ Seeing/hearing/reading syntax dependent upon answer to general awareness item.

PURPOSEFUL DRIVING REDUCTION

Objectives

One measure of the effectiveness of the Spare The Air public education program in the Sacramento Nonattainment Area is to examine actual changes in driving behavior. Since 2002, following discussions with the Air Resources Board (ARB), the following standard for measuring behavioral driving reductions was implemented – it requires that drivers be aware of Spare The Air, make fewer vehicle trips on Spare The Air days, and further, that they do so purposefully to help reduce air pollution on Spare The Air days. These drivers are called “purposeful reducers.”

The broad objectives of the current section are to calculate purposeful driving reduction within the Sacramento Nonattainment Area using the strict ARB standard, and to see whether driving reduction will be lower this year compared with previous years. Specifically, the objectives are to:

- a. report the percentage of respondents who reported driving “less” the previous day and statistically compare with annual results from 2010 to the present;
- b. calculate the percentage of purposeful “reducer” drivers, that is, those who:
 - i. made fewer vehicle trips on Spare The Air days, and
 - ii. did so purposefully to help reduce air pollution in the region, and
 - iii. were aware of the Spare The Air advisories (general awareness)and determine if the percentage of reducers is similar or different among four air quality districts in the Sacramento Nonattainment Area (Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD);
- c. determine if the percentage of purposeful reducers in the Sacramento Core Region (excluding El Dorado County AQMD) has increased, decreased, or stayed the same from 2010 to the present;
- d. extrapolate to the population by estimating the number of **drivers** in the Sacramento Nonattainment Area who purposefully reduced the number of trips they made on Spare The Air days in 2016;
- e. estimate the number of **single trips** avoided by purposeful reducers on Spare The Air days; and
- f. compare the percentage of reducers found in the group of respondents interviewed about Spare The Air days with that of the group interviewed on Control (non-Spare The Air) days.

RESULTS

Driving Behavior Yesterday

- 1 ➤ *One in five (20%) respondents in the Sacramento Nonattainment Area as a whole said they drove less on Spare The Air days. This 20% is exact to the eight-year average.*

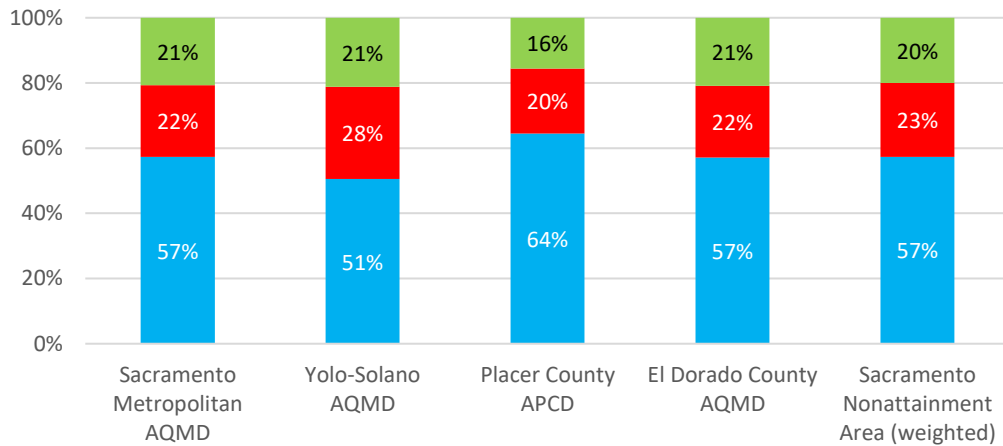
At the beginning of the survey, respondents were asked to think about their driving behavior the previous day and say whether they drove the “same, more, or less frequently” than they normally did on that particular day of the week. Results from each of the four individual air quality districts and the entire Sacramento Nonattainment Area (weighted results) are presented in the next chart.

Most respondents did not make any changes in their driving behavior – 57% in the area as a whole said they drove the same as usual. Nearly a quarter (23%) said they drove more, and the remaining **20% said they drove less**. This pattern was seen within each of the individual air quality districts such that

the majority of respondents drove the same, the next greatest portion drove more, and the final portion drove less.

Variability between geographies was minimal, with Sacramento Metropolitan AQMD, Yolo-Solano AQMD and El Dorado County AQMD all showing 21% of respondents driving less than usual for the previous day. The lowest percentage is in Placer County APCD, where 16% drove less.

Driving Behavior Yesterday: 2017 Spare The Air Responses by Air Quality District



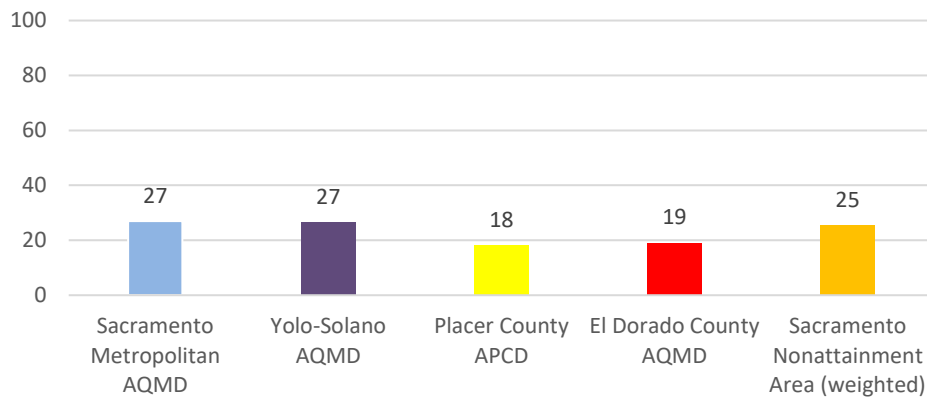
Note: Percentages may not add to 100% due to rounding

■ Same ■ More ■ Less

Vehicle Miles Traveled

Respondents who drove less were asked “and approximately how many miles less than normal did you drive?” The data for the 2017 season are displayed in the table below for each air district and for the Sacramento Nonattainment Area¹⁸ as a whole. The average number of fewer miles driven by those who said they drove less on a Spare The Air day ranged from 18 miles in the Yolo-Solano AQMD to 27 miles in El Dorado County AQMD.

2017 Vehicle Miles Traveled:
Driving Less



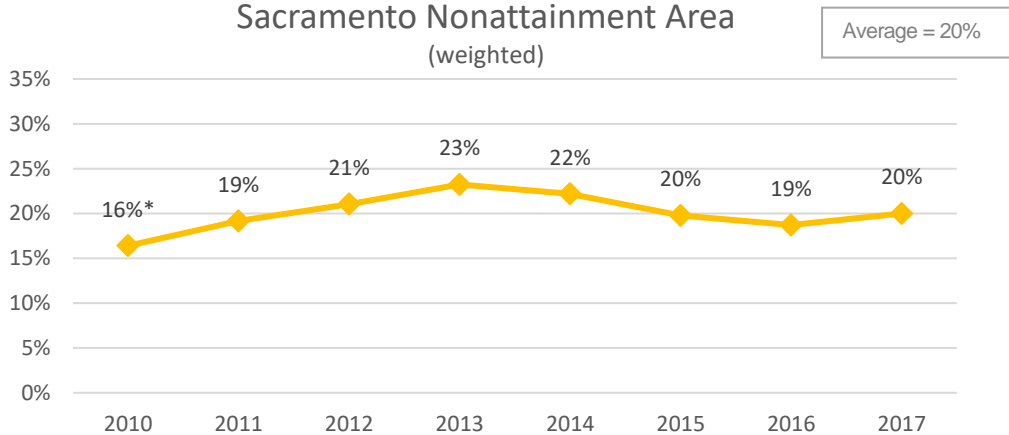
¹⁸ Weighted results

Year-to-Year Comparisons: Percent Who Drove Less

- 2 ➤ *Over the last eight years, the highest percentage of those who drove less on Spare The Air days in the Sacramento Nonattainment Area occurred in 2013 (23%), and the lowest percentage occurred in 2010 (16%). This year's 20% of respondents who said they drove less on Spare The Air days is the same as the eight-year average.*

The next graph plots the percentages of drivers from 2010 to the present who said they drove less on Spare The Air days in the Sacramento Nonattainment Area. With only a few exceptions, the percentage of respondents who said they drove less on Spare The Air days has remained relatively stable at about 20%, which is the seven-year average. In 2010, driving reduction was at its lowest with levels at a significantly low 16%. The 2017 season, at 20%, is no different from the eight-year average.

Year-by-Year Comparison: Percent of Respondents Who Drove "Less" on Spare The Air Days: Sacramento Nonattainment Area (weighted)



* indicates statistically significant differences between Spare The Air and Control percentages.

- 3 ➤ *In the individual air districts, the percentage of respondents who drove less this year is not significantly different from the average, except in Yolo-Solano AQMD, where 21% of respondents said they drove less, compared to its 17% eight-year average.*

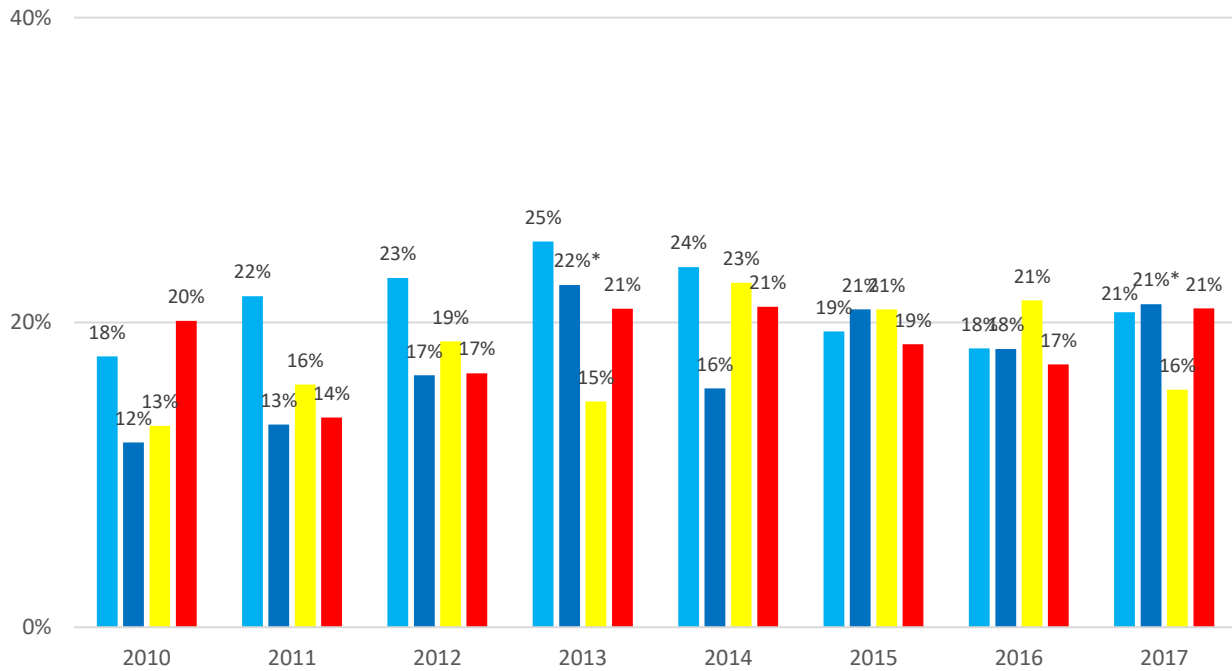
The annual percentage of respondents who drove less the previous day in the individual air districts from 2010 to the present are presented in the next chart. In **Sacramento Metropolitan AQMD** the percentage of residents who said they drove less on Spare The Air days ranged from a low of 18% in 2010 and 2016 to a high of 25% in 2013. This year's percentage of 21% is the same as the average.

Results in **Yolo-Solano AQMD** ranged from a low of 12% in 2010 to a significantly greater high of 22% in 2013. This year's 21% exceeds the eight-year average of 17% in that air district. In **Placer County APCD**, the 16% of respondents this year who said they drove less does not differ from the eight-year average of 18%. In **El Dorado County AQMD**, the 21% of respondents who reported driving less is not significantly different from the eight-year average of 19%.



Year-to-Year Comparison of Percent of STA Respondents Who Drove Less on Spare The Air Days: Individual Air Districts

■ Sacramento Metropolitan AQMD ■ Yolo-Solano AQMD ■ Placer County APCD ■ El Dorado County AQMD



Percentage of Purposeful Reducers

- 5 ➤ *In 2017, 0.1% of respondent drivers were classified “purposeful reducer” -- they drove less on Spare The Air days because they heard the Spare The Air alerts and wanted to improve air quality in the region.*

The definition of a purposeful driving reducer is quite strict: it includes only those interviewed following a Spare The Air day who said they drove less the previous day, specifically for air quality reasons, and who heard announcements about Spare The Air (general awareness using the ARB question¹⁹). Results from each air quality district and for the weighted Sacramento region are presented in the next table.

For the Sacramento Nonattainment Area, 0.1% of Spare The Air respondents met the **strict ARB standard** for purposeful driving reduction. Individually, no respondents in **Sacramento Metropolitan AQMD**, no respondents in **Placer County APCD**, and no respondents in **El Dorado County AQMD** can be classified as a purposeful reducer. One respondent, in **Yolo-Solano AQMD** qualified as a **purposeful reducer**.

Sacramento Metropolitan AQMD is used as the baseline during the data weighting procedure²⁰ and all other air districts are weighted down according to their respective population relative to Sacramento County. Therefore, after weighting, **0.29 purposeful reducers are recorded for the Sacramento Nonattainment Area**.

¹⁹ There were two questions in the survey that measured awareness of Spare The Air. The one referred to here measured general awareness and was proposed by the ARB (i.e. “In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare The Air, or poor air quality, or requests to drive less in this area?”). It was introduced in 2002. Comparisons of reducers with years prior to 2002 used another question to measure awareness, which was more specific (i.e. “Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?”) It has been included in all evaluations from 1999 to the present. Typically, more respondents indicate general awareness of Spare The Air than specific awareness of the request not to drive the previous day.

²⁰ See Methodology section for full description of weighting procedure.



<i>Spare The Air: Purposeful Reducers in 2017</i>	<i>Number of Respondents Who Reduced Driving For Air Quality Reasons and Were Aware of STA Alerts</i>	<i>Total Number of Respondents Interviewed on Days Following Spare The Air</i>	<i>Sampling Error²¹</i>	<i>% of Total Respondents Who Reduced Driving for Air Quality Reasons and Were Aware of STA Alerts</i>
Sacramento Metropolitan AQMD	0	363	+/- 5.1%	0.0%
Yolo-Solano AQMD	1	283	+/- 5.8%	0.4%
Placer County APCD	0	276	+/- 5.9%	0.0%
El Dorado County AQMD	0	196	+/- 7.0%	0.0%
Sacramento Nonattainment Area²²	0.29	573	+/- 4.1%	0.1%

²¹ Sampling error is a measure of the range of possible difference between the characteristics of the sample and the population from which the sample was drawn. For example, the average weight of a sample of 1,000 individuals from a population of 1,000,000 will likely not be exact to the average weight of the entire population. Though the precise difference cannot be determined it is estimated to be within a range of values extending from the sample value (e.g. +/- 10%). See the Methodology section for a thorough description of sampling error.

²² Weighted includes El Dorado County AQMD. Since the beginning evaluation in 1995, the methodology for weighting has been to set Sacramento Metropolitan AQMD interviews as 1, and down-weight interviews from all other counties appropriately, adjusted proportionally to the population within each air district. (Sacramento Metropolitan AQMD represents 63% of the entire population, Yolo-Solano AQMD is 15%, Placer County APCD is 15%, and El Dorado County AQMD is 7%.) This is why the weighted total number of completed interviews (i.e. 573) is less than the sum of the total number of interviews conducted in all air districts (i.e. 1,115).

Percentage of Purposeful Reducers: Year-To-Year Comparisons

- 7 ➤ *The percentage of purposeful reducers in each air district for 2017 is low, but not significantly different from the average.*

The next table lists the annual proportions of purposeful reducers from 2010 to the present. In the Sacramento Nonattainment Area, this year’s percentage of **0.1% reducers** is less than but not significantly different from the eight-year average of 0.7%.

In terms of the **Sacramento Metropolitan AQMD**, the 0% of reducers is significantly lower than the 2015 season, which was high at 4.0%, but no different from the other seasons. In **Yolo-Solano AQMD** the percentage of reducers (0.4%) is the same as other years in which a purposeful reducer was recorded in Yolo-Solano AQMD, but is not different from the average of 0.2%. In **Placer County APCD**, the 0% of purposeful reducers is significantly lower than 2014 season but is not significantly different from the average at 0.6%. Likewise, at 0% in 2017, **El Dorado County AQMD** shows no difference from the eight-year average of 0.5%.

<i>Spare The Air: Purposeful Reducers</i>	2010	2011	2012	2013	2014	2015	2016	2017	<i>Significant Difference Among Years? (see footnotes)²³</i>	<i>Eight-year Average</i>
Sacramento Metropolitan AQMD	0.5%	0.8%	0.0%	0.6%	0.8%	4.0%	0.8%	0.0%	Yes	0.9%
Yolo-Solano AQMD	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%	0.0%	0.4%	No	0.2%
Placer County APCD	0.3%	0.4%	0.0%	0.7%	1.4%	0.8%	1.1%	0.0%	No	0.6%
El Dorado County AQMD	0.5%	0.0%	0.5%	0.9%	0.0%	0.6%	1.1%	0.0%	No	0.5%
Sacramento Nonattainment Area	0.36%	0.5%	0.0%	0.4%	0.8%	2.8%	0.8%	0.1%	Yes	0.7%

One possible explanation for a relatively lower rate of recorded purposeful reduction is explained in the 2016 report and remains true now. Employment in the Sacramento Nonattainment Area continues

²³ In Sacramento Metropolitan AQMD the percentage of purposeful reducers in the 2015 season is significantly greater than 2010, 2011, 2012, 2013, 2014, 2016, and 2017. In the Sacramento Nonattainment Area (weighted) the percentage of purposeful reducers in the 2015 season is significantly greater than 2010, 2011, 2012, 2013, 2014, 2016, 2017.

to improve and resembles pre-2008 employment rates.²⁴ Driving reduction may not have been an option for many Sacramento Nonattainment Area residents.

Fewer reducers may also be explained in part by the intense and especially attention competitive media market in the summer of 2017. Political rhetoric was intensely covered by popular media outlets and may have detracted attention away from the Spare The Air message²⁵, deterred residents from the media sources which spread the message, or influenced the willingness of residents to respond to the survey. In other words: sampling error²⁶.

The predicament of an especially competitive media market also means there's a competitive market for attitudes and behavior. The ARB standard for purposeful reducers requires that a respondent state that air quality is the reason they drove less, unprimed and willingly. **It could be that for some respondents to this survey, air quality is a reason for driving less, but not the primary or most accessible reason when the respondent is answering the question.** They are trying to hurry through a phone survey and return to their busy life, so they offer the first thought that comes to mind for why they drove less, but it's not air quality, even though air quality may influence their driving behavior overall. Because of that, **purposeful reduction in the Spare The Air survey reports should be considered conservative estimates.**

²⁴ Data retrieved from the Bureau of Labor and Statistics 11/22/2017 at <http://beta.bls.gov/dataViewer/view/timeseries/LAUCN06067000000003>.

²⁵ Qiu, X.; Oliveira, D.; Shirazi, S.; Flammini, A.; & Menczer, F.: "Limited individual attention and online virality of low-quality information", Nature Human Behaviour 1, Article number: 0132 (2017) doi:10.1038/s41562-017-0132.

²⁶ See Methodology section for a description of sampling error and its importance in results interpretation.

Estimated Number of Purposeful Reducers

- 8 ➤ *After weighting, an estimated 1,649 drivers in the entire Sacramento Nonattainment Area purposefully made fewer trips each Spare The Air day in 2017 in order to reduce air pollution.*

There were an estimated 1,648,467 drivers²⁷ in the entire Sacramento Nonattainment Area in 2017. Estimates of the number of purposeful reducers for the individual air districts as well as for the region (both excluding and including El Dorado County AQMD) are presented in the next table. **In the Sacramento Nonattainment Area, 1,649 purposeful reducers are estimated for the 2017 season.** Among the individual districts, Yolo-Solano AQMD boasts the only recorded purposeful reducers, with 923 estimated reducers in that area.

<i>Air District</i>	<i>Total Number of Drivers</i>	<i>Percent of Purposeful Reducers</i>	<i>Percent of Control 'Reducers'</i>	<i>Estimated Number of Purposeful Reducers in 2017</i> <i>[(Reducers - Control)*Drivers]</i>
Sacramento Metropolitan AQMD	1,011,962	0.0%	0.0%	0
Yolo-Solano AQMD	230,682	0.4%	0.0%	923
Placer County APCD	281,954	0.0%	0.0%	0
El Dorado County AQMD	123,869	0.0%	0.0%	0
Sacramento Nonattainment Area	1,648,467	0.1%	0.0%	1,649²⁸ <i>purposeful reducers</i>

²⁷ The number of drivers in the Sacramento Nonattainment Area for 2017 was estimated using the number of driver licenses by county for 2016, obtained from the California Department of Motor Vehicles database found at <https://www.dmv.ca.gov/portal/wcm/connect/90a04dc3-ac0d-4528-a6a3-4797d0842689/DL+By+County+2016.pdf?MOD=AJPERES>. The estimated number of licensed drivers for the total Sacramento Nonattainment Area in 2017, therefore, was 1,648,467. Sacramento Metropolitan AQMD: total 1,011,962 + Yolo-Solano: total of 230,682 (136,852 in Yolo County + Solano County: 302,677 * 31% for the proportion located within the air district = 93,830) + Placer County: total of 281,954 (290,674 * 97% for the air district) + El Dorado County: total of 123,869 (149,240 * 83% for the air district). The proportion of drivers in each district also corresponds to the residential population proportions used in the calculation of weights for the region.

²⁸ The results for the Sacramento Nonattainment Area not the simple sum of the individual air districts, but rather, are weighted results that reflect the relative proportional distribution of residents in the area.

Estimated Number of Single Trips Avoided by Purposeful Reducers

- 9 ➤ *In the Sacramento Nonattainment Area, 6,592 trips were avoided by purposeful reducers.*

Purposeful driving reducers were asked how many single vehicle trips they had avoided on the Spare The Air day. The mean number of single trips avoided in the entire **Sacramento Nonattainment Area** was **four** resulting in a total of **6,596 trips avoided directly attributed to the Spare The Air program**. Results for the individual air districts as well as for the weighted region are presented in the next table.

<i>Air District</i>	<i>Estimated Number of Purposeful Reducers</i>	<i>Mean # of Trips Avoided for Air Quality Reasons</i>	<i>Estimated Number of Single Trips Reduced</i>
Sacramento Metropolitan AQMD	0	0	0
Yolo-Solano AQMD	923	4	3,692
Placer County APCD	0	0	0
El Dorado County AQMD	0	0	0
Sacramento Nonattainment Area²⁹	1,649³⁰	4	6,596 trips

²⁹ Includes El Dorado County AQMD.

³⁰ The results for the Sacramento Nonattainment Area as a whole are not the simple sum of the individual air districts, but rather, are weighted results that reflect the relative proportional distribution of residents in the area.

Percentage of Purposeful Reducers: Spare The Air Days vs. Control Days

- 10 ➤ *The 0.1% purposeful reducers on Spare The Air days is not significantly greater than the 0.0% on Control days, but still represents marginal behavior change.*

Control day respondents were also asked if they had reduced the number of trips the day before, and if so, why. If the same percentage of drivers claimed to have reduced their driving on Control days for air quality reasons as on Spare The Air days, it is harder to credit the Spare The Air program as the cause of driving reduction.³¹

The next table indicates the results from Control interviews in all the air districts. For the entire Nonattainment Area, no respondents erroneously claimed to have reduced their driving because of a specific request not to drive the previous day. Still, the low percentages of true purposeful reducers are not enough to be distinguished from 0%, meaning no significant differences arose in any of the air districts between Control day and episodic purposeful reducers. No differences arising in these calculations has been common place since 2010.

Air District	% of Respondents Who Reduced for Air Quality Reasons		Significant Difference?
	Who Were Aware On STA Days	On Control Days	
Sacramento Metropolitan AQMD	0.0%	0.0%	No
Yolo-Solano AQMD	0.4%	0.0%	No
Placer County APCD	0.0%	0.0%	No
El Dorado County AQMD	0.0%	0.0%	No
Sacramento Nonattainment Area	0.1%	0.0%	No

³¹ This year the same methodology as was adopted in 2010 was used for Control day interviews: namely, reducers were classified as those respondents who said they drove less the previous day for air quality reasons, and who were not seasonal driving reducers (see 2010 Seasonal Driving Reduction Report for a complete description).

ESTIMATED EMISSION REDUCTIONS

Objective

The main objective of the current section is to estimate how many tons of ozone precursor emissions [Reactive Organic Gases (ROG) and Nitrogen Oxides (NOx)] were reduced during the 2016 season that could be attributed directly to the Spare The Air program. In order not to overestimate possible reductions, a correction factor based on Control day interviewing has been applied. Results, therefore, are conservative.

RESULTS

Calculation of Estimated Emission Reductions

- 1 ➤ *The 2017 Spare The Air voluntary driving reduction program was successful in reducing air pollution in the entire Sacramento Nonattainment Area by an estimated 0.016 tons of ozone precursors per Spare The Air day. This is due specifically to drivers purposefully reducing the number of trips they took on Spare The Air days for air quality reasons. There were 17 Spare The Air days in 2017.*

The methodology used to estimate emission reductions due specifically to the Spare The Air program is very conservative. First, it includes only those drivers who said they drove less the previous day for air quality reasons (we interview respondents the day after a Spare The Air day is called). Thus, purposeful reduction necessitates that air quality is a top of mind accessible reason for driving less at the time a respondent answers the question. Seasonal reducers who normally make fewer trips during the summer to help improve air quality are not (necessarily) included³². Further, any purposeful driving reduction for air quality reasons on non-Spare The Air days (i.e. Control day interviews) is subtracted from the emission reduction estimate.

Results from the Sacramento Nonattainment Area are used to illustrate the procedure for estimating emission reductions according to the following steps:

1. Calculate the percentage of purposeful reducers, that is, drivers who said they were aware of the Spare The Air alerts,³³ and who also said they drove less than usual on Spare The Air days, specifically for air quality reasons. For the Nonattainment Area, this was **0.1%**³⁴ (.29 / 573³⁵) of all respondents interviewed following Spare The Air days.
2. Record the mean (average) number of single trips they avoided for air quality reasons on Spare The Air days. Drivers were asked to estimate the number of single trips they avoided making on the Spare The Air day. For the Nonattainment Area, the mean was **four** single trips avoided.
3. Extrapolate to the total number of drivers in the region³⁶ this year: the percentage of Spare The Air

³² These respondents are examined in another report on Seasonal Driving Reduction.

³³ Using the ARB-worded question for measuring general awareness of Spare The Air: Q.12b "In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare The Air, or poor air quality, or requests to drive less in this area?"

³⁴ See the Purposeful Driving Reduction section of the 2017 report for a full explanation of these results.

³⁵ Weighted results. See Methodology section for description of weighting procedures.

³⁶ The number of drivers in the Sacramento Nonattainment Area for 2017 was estimated using the number of driver licenses by county for 2016, obtained from the California Department of Motor Vehicles database found at <https://www.dmv.ca.gov/portal/wcm/connect/90a04dc3-ac0d-4528-a6a3-4797d0842689/DL+By+County+2016.pdf?MOD=AJPERES>. The estimated number of licensed drivers for the total Sacramento Nonattainment Area in 2017, therefore, was 1,648,467. Sacramento Metropolitan AQMD: total 1,011,962 + Yolo-Solano: total of 230,682 (136,852 in Yolo County + Solano County: 302,677 * 31% for the proportion located within the air district = 93,830) + Placer County: total of 281,954 (290,674 * 97% for the air district) + El Dorado County: total of 123,869 (149,240 * 83% for the air district). The proportion of drivers in each district also corresponds to the residential population proportions used in the calculation of weights for the region.

reducers therefore represents **1,649** drivers in the Sacramento Nonattainment Area, and the number of single trips avoided was **6,596** (1,649 drivers x 4 trips avoided on average).

4. Multiply the number of trips avoided by a per trip emission reduction average of **2.21 grams of ozone precursors**.³⁷ [This includes a total of Reactive Organic Gases (ROG) emissions (7.64 grams per trip for light duty passenger cars plus two categories of light duty trucks) plus Oxides of Nitrogen (NOx) emissions (4.27 grams per trip for light duty passenger cars and light duty trucks) emissions, based on 2017 models of EMFAC 2014]. EMFAC 2014 is the latest update to the EMFAC model. It is used by California state and local governments to meet Clean Air Act (CAA) requirements. EMFAC 2014 defines trips as vehicle starts and calculates them separately as a function of vehicle population (derived from vehicle registration data), based on ARB and U.S. EPA instrumented vehicle studies. For the Sacramento Nonattainment Area, this amounts to **14,577 grams** of ozone precursors (6,596 single trips avoided x 2.21 grams per trip).
5. Convert to tons.³⁸ For the Sacramento Nonattainment Area as a whole, this translates to an estimated total of **0.016 tons of pollutants reduced** per Spare The Air day.
6. Repeat the process for Control day interviews: record the mean number of trips avoided by the respondents who drove less for air quality reasons on Control days. As there were no recorded purposeful reducers on control days, this step was skipped.
7. Apply the correction factor. To ensure that only purposeful driving reduction due to the Spare The Air program is counted in the estimate of emission reduction, we subtract the Control day air quality emission reduction from the Spare The Air day reduction. Because Control day emissions reductions in 2017 equal zero, no correction factor is necessary.
8. Result: **0.016 tons of ozone precursors reduced per Spare The Air day directly attributable to the Spare The Air program**. There were 17 Spare The Air days in 2017.

³⁷ Estimates were based on the Summer On-Road Inventory - EMFAC 2014 model, for the summer of 2017, accessed from <https://www.arb.ca.gov/emfac/2014/>. The total ROG tons for a combined total of light duty passenger cars and two categories of light duty trucks (4.32 + 1.25 + 2.07) were converted to pounds (multiplied by 2,000) and then to grams (multiplied by 454) before dividing by the combined total number of trips (i.e. 3,366,125 for light duty passenger cars + 308,473 for light duty trucks1 + 1,193,328 for light duty trucks2) in order to obtain the average grams per trip. The same process was used to calculate NOx grams per trip (2.32 + 0.49 + 145) x 2000 x 454 / (3,366,125 + 308,473 + 1,193,328). ROG grams and NOx grams were then combined (1.42 + 0.79) to obtain 2.21 grams per trip of emission precursors in the region as a whole. These are the figures considered most accurate at the time this report was written.

³⁸ There are 907,200 grams in a ton.



Sacramento Nonattainment Area	Percent of Respondent Drivers Who Drove Less for Air Quality Reasons ³⁹	X Number of Licensed Drivers in Sacramento Nonattainment Area (1,648,46 Total)	X Mean Number of Single Trips Reduced Per Day (4)	X 2.21 Grams of Ozone Precursors Per Trip (EMFAC 2014) 2017 summer	= Estimated Tons per Day of Ozone Precursors Reduced
Spare The Air Days	0.1% (.29/573)	1,649	6,596	14,577 grams	0.016 tons
Control Days	0.0% (0/379)	0	0	0 grams	0.00 tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions minus Control Day Reductions)					0.016 tons

³⁹ In addition, in the case of Spare The Air respondents, these drivers had to say they had heard the Spare The Air alert (the ARB general awareness question - Q12b).

2017 Emissions Reduction Estimate by Air District:

- 2 ➤ *Only Yolo-Solano County AQMD included a purposeful reducer in 2017, resulting in an estimated reduction of 0.01 tons of ozone precursors per Spare The Air day.*

Using the established methodology, emission reductions can only be claimed in Yolo-Solano AQMD, where one respondent qualified as a purposeful reducer. While claiming no emission reduction is not unusual in Placer County APCD and El Dorado County AQMD,⁴⁰ the 2012 season is the only other recent season in which Sacramento Metropolitan AQMD did not find its own area emissions reductions attributable to the campaign. Since this is a function of qualifying purposeful reducers, some possible reasons for lower estimated purposeful reduction are described in the Purposeful Reducers section of this report.

Sacramento Metropolitan AQMD	Percent of Respondent Drivers Who Drove Less for Air Quality Reasons	X Number of Licensed Drivers in Sacramento Metropolitan AQMD (1,011,962 Total)	X Mean Number of Single Trips Reduced Per Day (4)	X 2.21 Grams of Ozone Precursors Per Trip (EMFAC 2014) 2017 summer	= Estimated Tons Per Day of Ozone Precursors Reduced
Spare The Air Days	0.0% (0/363)	0	0	0 grams	0.00 tons
Control Days	0.0% (0/240)	0	0	0 grams	0.00 tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions minus Control Day Reductions)					0.00 tons

Yolo-Solano AQMD	Percent of Respondent Drivers Who Drove Less for Air Quality Reasons	X Number of Licensed Drivers in Yolo-Solano AQMD (230,682 Total)	X Mean Number of Single Trips Reduced Per Day (4)	X 2.21 Grams of Ozone Precursors Per Trip (EMFAC 2014) 2017 summer	= Estimated Tons Per Day of Ozone Precursors Reduced
Spare The Air Days	0.4% (1/283)	923	3,692	8,159 grams	0.00 tons
Control Days	0.0% (0/221)	0	0	0 grams	0.00 tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions minus Control Day Reductions)					0.01 tons

⁴⁰ Weighting responses, in addition to typically collecting fewer responses in Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD, makes it less likely emission reductions will be uncovered.

Placer County APCD	Percent of Respondent Drivers Who Drove Less for Air Quality Reasons	X Number of Licensed Drivers in Placer County APCD (281,954 Total)	X Mean Number of Single Trips Reduced Per Day (3)	X 2.21 Grams of Ozone Precursors Per Trip (EMFAC 2014) 2017 summer	= Estimated Tons Per Day of Ozone Precursors Reduced
Spare The Air Days	0.0 % (0/276)	0	0	0 grams	0.00 tons
Control Days	0.0% (0/267)	0	0	0 grams	0.00 tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions minus Control Day Reductions)					0.00 tons

El Dorado County AQMD	Percent of Respondent Drivers Who Drove Less for Air Quality Reasons	X Number of Licensed Drivers in El Dorado County AQMD (123,869 Total)	X Mean Number of Single Trips Reduced Per Day (3)	X 2.21 Grams of Ozone Precursors Per Trip (EMFAC 2014) 2017 summer	= Estimated Tons Per Day of Ozone Precursors Reduced
Spare The Air Days	0.0% (0/196)	0	0	0 grams	0.00 tons
Control Days	0.0% (0/210)	0	0	0 grams	0.00 tons
Estimated Tons of Ozone Precursors Reduced Per Day: (STA Day Reductions minus Control Day Reductions)					0.00 tons



Comparison with Previous Years: Sacramento Metropolitan AQMD (only)

- 3 ➤ *Emission reductions in 2017 are less than other recent years. The 2015 season claims the greatest reductions per Spare The Air day of the last eight seasons.*

A comparison of estimated emission reductions⁴¹ due to the Spare The Air program from 2010 to 2017 in the Sacramento Metropolitan AQMD⁴² is presented in the next table. It is important to point out that the factors that contribute to the estimates (i.e. differences in yearly estimated ROG and NOx emission factors per trip,⁴³ changes in the number of drivers, the percentage of purposeful reducers, the average number of trips reduced, the severity of air quality conditions and the number of Spare The Air days experienced during each summer season, among many other reasons) vary from one year to the next.

The estimated emission reductions per Spare The Air day in Sacramento Metropolitan AQMD ranged from a low of .00 tons in the 2012 and 2017 seasons to a high of 0.28 tons in 2015. Overall, the data are evidence of the success of the program in reducing ozone precursors in the Sacramento Metropolitan AQMD on Spare The Air days, despite some years reflecting no reductions.

Year	2010	2011	2012	2013	2014	2015	2016	2017
Sacramento Metropolitan AQMD:	0.07	0.08	0.00	0.02	0.07	0.28	0.09	0.00
<i>Average emission reductions attributed to Spare The Air (tons)</i>								

⁴¹ The estimated emission reductions shown in the current table were based on accepted EMFAC models for each year. This year, estimates were based on the EMFAC 2014 model, 2017 summer.

⁴² Over the years, reductions could often not be calculated for Placer County APCD, Yolo-Solano AQMD, and El Dorado County AQMD as there were often no significant differences between Spare The Air day and Control day drivers who said they drove less, or no purposeful reducers were identified.

⁴³ Nearly each year, motor vehicle emissions have lowered, because cleaner burning vehicles produce fewer emissions.

SUMMERTIME SEASONAL TRIP REDUCTIONS

Objectives

There is a group of residents who usually drive less to help improve air quality in the region during the summer months who are not necessarily included in emission reduction estimates as they may have not driven less on a Spare The Air day because they have already reduced their driving behavior. Specific objectives of the current report are to:

- a. test whether those drivers who say they usually reduce the amount of driving they do during the summer to avoid adding to air pollution actually do report making fewer trips than those who say they do not seasonally reduce driving;
- b. compare the percentage of seasonal trip reducers and the mean number of trips they have avoided over the past; and
- c. estimate emission reductions from these voluntary driving reducers.

RESULTS

Seasonal Driving Reducers

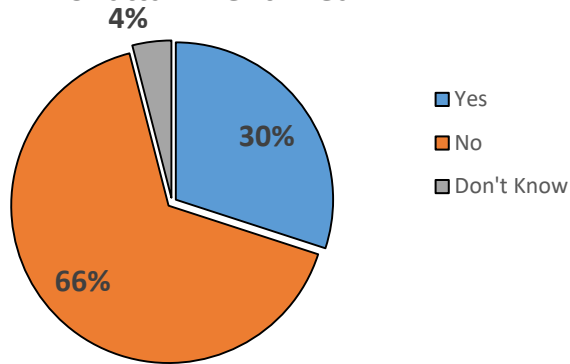
- 1 ➤ *In the Sacramento Nonattainment Area, 30% of the 2017 season respondents are seasonal reducers – that is, they usually reduce the amount of driving they do during the summer to avoid adding to air pollution.*

Seasonal driving reducers are defined as those who say they usually reduce the amount of driving they do during the summer months to avoid adding to air pollution. **In large part, they can be considered Spare The Air “success” stories** – they understand that driving is a significant contributor to air pollution particularly through the summer months, and have incorporated it into their actual driving behavior by reducing the number of vehicle trips they make during the summer. For the entire Sacramento Nonattainment Area, 30% of all⁴⁴ respondents in 2017 can be considered seasonal driving reducers. **That 30% translates into an estimated 494,540⁴⁵ drivers in the Sacramento Nonattainment Area who regularly reduce their driving during the summer months to avoid adding to air pollution.**

⁴⁴ For the purpose of this report, results from respondents interviewed following Spare The Air days have been combined with those interviewed on Control days as the issue under discussion applies equally to both groups of respondents.

⁴⁵ The number of drivers in the Sacramento Nonattainment Area for 2017 was estimated using the number of driver licenses by county for 2016, obtained from the California Department of Motor Vehicles database found at <https://www.dmv.ca.gov/portal/wcm/connect/90a04dc3-ac0d-4528-a6a3-4797d0842689/DL+By+County+2016.pdf?MOD=AJPERES>. The estimated number of licensed drivers for the total Sacramento Nonattainment Area in 2017, therefore, was 1,648,467. Sacramento Metropolitan AQMD: total 1,011,962 + Yolo-Solano: total of 230,682 (136,852 in Yolo County + Solano County: 302,677 * 31% for the proportion located within the air district = 93,830) + Placer County: total of 281,954 (290,674 * 97% for the air district) + El Dorado County: total of 123,869 (149,240 * 83% for the air district). The proportion of drivers in each district also corresponds to the residential population proportions used in the calculation of weights for the region.

Percent Who Usually Reduce Driving in
 the Summer for Air Quality Reasons: 2017
 Results for the Sacramento
 Nonattainment Area



Number of Reduced Trips

- 2 ➤ *Summertime driving reducers made fewer trips than those who did not change their driving habits during the summer: on average, they made .85 fewer trips per day.*

This percentage of seasonal reducers reported that they entered their cars the previous day an average of 3.00 times. The 70% who said they did not usually reduce the amount of driving they do during the summer self-reported entering their cars more frequently, an average of 3.85 times. **On average, seasonal driving reducers made 0.85 fewer trips per day** than did non-reducers (3.85 – 3.00 = 0.85 trips). An analysis of variance indicated that these means are significantly different from each other.⁴⁶ Continued significant difference between seasonal reducers and non-reducers is another indication of Spare The Air's success.

	<i>Seasonal Driving Reducers: Mean # Times Entered Vehicle</i>	<i>Non-Reducers: Mean # Times Entered Vehicle</i>	<i>Statistically Significant Difference?</i>
<i>Sacramento Nonattainment Area (weighted results)</i>	3.00	3.85	Yes

⁴⁶ F (1, 948) = 4.26, p < .05. See the Methodology section for a description of statistical significance.

Seasonal Trip Reduction: Estimated Emission Reductions

- 3 ➤ *In 2017, nearly half a million (494,540) drivers were seasonal reducers. The number of trips they avoided translated into a reduction of 1.02 tons per day of ozone precursors during the summer of 2017.*

Respondents who habitually drive less in the summer represent a substantial proportion of the general population of drivers who are helping to improve air quality in the region by reducing emissions. The 30% of 2017 seasonal reducers translates into nearly half a million drivers (494,540) in the entire Sacramento Nonattainment Area. It is possible to estimate the amount of ozone precursors that have been reduced due to respondents habitually driving less during the summer for air quality reasons. The methodology is the same as that used to estimate emission reductions on Spare The Air days⁴⁷ and is summarized in the next table. **The average of 0.85 of a trip per day that seasonal reducers avoided translates into an estimated 1.02 tons of ozone precursors reduced per summer day in 2017.**

Sacramento Nonattainment Area	Percent of Respondent Drivers Who Usually Drive Less During the Summer for Air Quality Reasons	x Number of Licensed Drivers in Sacramento Nonattainment Area (1,648,467 Total)	x Mean Number of Trips Reduced Per Day Compared to Non-Reducers	x 2.21 Grams of Ozone Precursors Per Trip (EMFAC 2014) 2017 Summer Model ⁴⁸	= Estimated Tons ⁴⁹ Per Day of Ozone Precursors Reduced
Spare The Air and Control Day Interviews Combined	30%	494,540	x 0.85 = 420,359	928,993 grams	1.02 tons

⁴⁷ For a full explanation of the methodology, see report titled “Estimated Emission Reductions during the 2017 Spare The Air Season”, Joseph Hanson, December 2017.

⁴⁸ Estimates were based on the Summer On-Road Inventory - EMFAC 2014 model, for the summer of 2017, accessed from <https://www.arb.ca.gov/emfac/2014/>. The total ROG tons for a combined total of light duty passenger cars and two categories of light duty trucks (4.32 + 1.25 + 2.07) were converted to pounds (multiplied by 2,000) and then to grams (multiplied by 454) before dividing by the combined total number of trips (i.e. 3,366,125 for light duty passenger cars + 308,473 for light duty trucks1 + 1,193,328 for light duty trucks2) in order to obtain the average grams per trip. The same process was used to calculate NOx grams per trip (2.32 + 0.49 + 145) x 2000 x 454 / (3,366,125 + 308,473 + 1,193,328). ROG grams and NOx grams were then combined (1.42 + 0.79) to obtain 2.21 grams per trip of emission precursors in the region as a whole. These are the figures considered most accurate at the time this report was written.

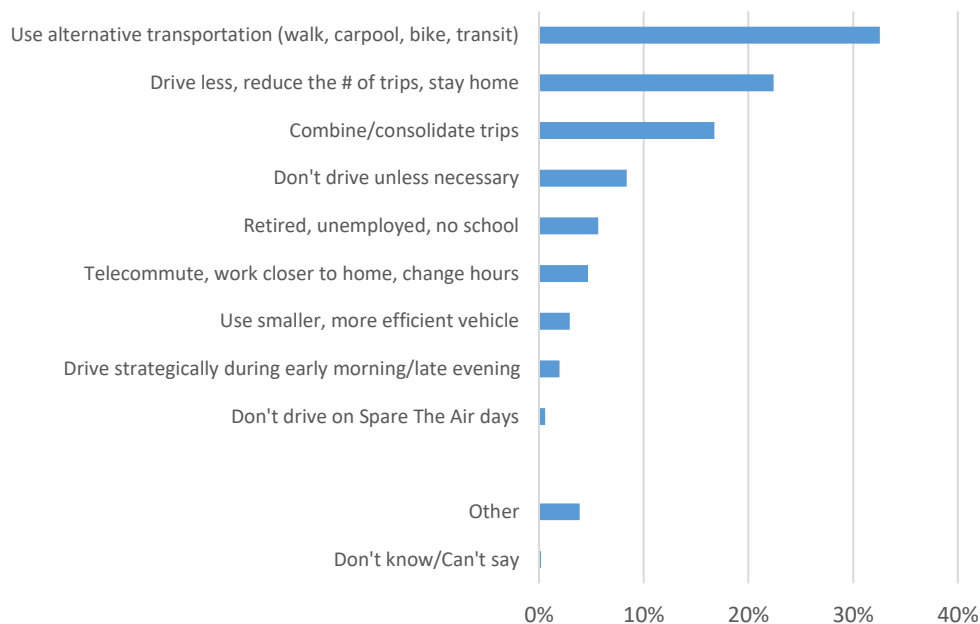
⁴⁹ There are 907,200 grams in a ton.

How They Reduce Driving

4 ➤ *Seasonal reducers used alternative transportation, made fewer trips or stayed home, and planned and consolidated errands to reduce the amount of driving they did during the summer months.*

Those who said they usually reduce the amount of driving during the summer months were then asked to elaborate. Verbatim comments were captured and later categorized, and the results are presented in the next graph. One third (33%) of seasonal reducers said they used alternative transportation, such as walking, carpooling, biking, or public transit to avoid driving during the summer. Almost a quarter (22%) of seasonal reducers said they “just drove less,” often by staying home or by avoiding joy rides and extra trips. Nearly one fifth (17%) said they made combined or consolidated trips. Less frequently, respondents said they don’t drive unless necessary (8%), are retired, unemployed, teachers or parents, and so have no school (6%). Some telecommute more frequently or have a change of hours (5%) enabling their reduction. The remaining respondents use smaller more efficient vehicles (3%), drive at strategic times of the day to avoid adding to air pollution (2%), specifically said they don’t drive on Spare The Air days (1%), or reduce their driving in a way that doesn’t fall into one of these categories (4%).

How Have You Reduced Driving This Summer?



A few representative comments⁵⁰ from those who used alternative transportation include:

- Usually there are at least two of us in the car.
- I'll just walk.
- I am walking more.
- I took a trip by plane and walked all over without a car.
- Use public transit.

⁵⁰ The complete transcripts of all responses are available in the statistical file.

- Use the bus to commute to work
- Walked to store.
- By using my bicycle.
- I use my bicycle rather than my car whenever I can.
- Rode my bike.
- Carpool.
- Tried to walk in the morning.
- Public transit.
- Ride bike.
- If I can walk I will walk and I carpool.
- Walk more often.
- I bike to work.
- Carpool with son.
- I drive in a carpool. Also, I avoid driving during high-traffic periods.
- Take a vanpool.

A few representative comments by those who drove less include:

- Staying in. Not driving.
- I refrain from driving, or if I'm going somewhere, I ask my husband to do the errand. That way there aren't two cars on the road.
- Stayed inside.
- Stay in the house don't drive extra.
- Stayed home.
- Leave home less.
- Less shopping. I try to go to doctors' appointment three times a month.
- I drive less.
- I don't drive as much or not at all.
- Limit trips to the store. Try to stay home or limit our travel.
- Stay home more often and go to and from work.
- Have not gone on any trips.
- Limiting trips.
- Reducing number of trips.
- No vacations. No driving trips.

A few representative comments from those who said they combined or consolidated trips include:

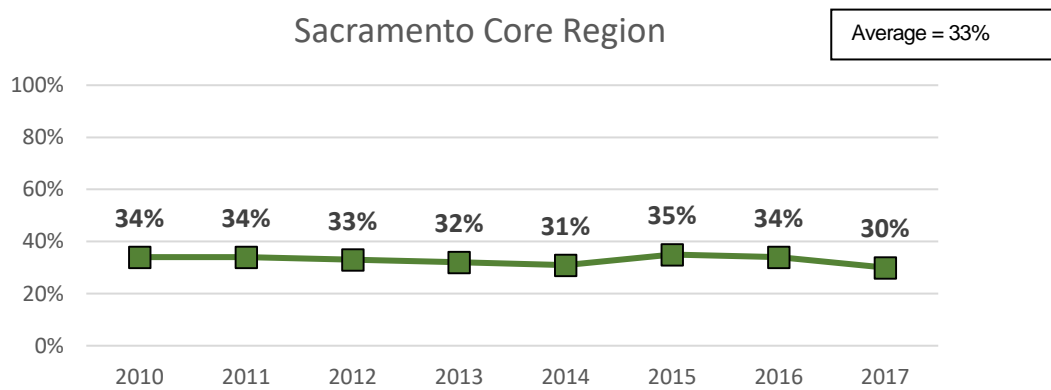
- All errands are run on the same day.
- I group all my errands together, so I only do it once.
- I try to make my trips all in one. I combine my trips, so I go to the store and go see my friends.
- Combined trips to town. I do a whole bunch of things at once.
- I combine my running around together.
- Run errands all in one trip to maximize efficiency.
- Grocery shopping I try to do once a week. Try to be friendly with the environment.
- I try to plan my trips in a circle rather than going out each individual time.
- By making lists and consolidating trips.
- Longer weekend trips and less short trips.
- Trying to do all errands in one trip.

Year-To-Year Comparisons

- 5 ➤ *This year's percentage of seasonal reducers in the Sacramento Core Region is not significantly different from the eight-year average of 33%. That the program continues to inspire seasonal reduction is testament to the efforts spent keeping Spare The Air effective.*

The year-to-year analysis shows the percentage of respondents who said they usually reduce their driving during the summer to avoid adding to air pollution has remained relatively stable, with a six-year average of 33%. The 2017 season finding 30% seasonal reducers is welcome consistency. The evaluation program reaches a similar percentage of residents in the Sacramento Nonattainment Area each year who are self-reported seasonal reducers. The program continues to inspire seasonal reduction, testament to the efforts spent keeping Spare The Air effective.

Year x Year Comparison of Percent of Respondents Who Seasonally Reduce Driving to Avoid Adding to Air Pollution: Sacramento Core Region



- 6 ➤ *The eight-year average number of trips avoided on a summer day by seasonal reducers is 0.85. This varied from a high of 1.12 trips avoided in 2012 to a low of 0.3 trips in 2013.*

The next table shows the average number of self-reported trips made by seasonal reducers versus non-reducers from 2010 to the present. The average number of additional trips avoided by seasonal reducers (that is, the difference between reducers and non-reducers) ranged from 0.3 of a trip per day to just over 1 trip per day (1.12 trips). **In other words, a substantial subset of the population of respondents to the Spare The Air phone survey habitually reduce the amount of driving they do during the summer months.** Some of these individuals may not qualify as purposeful (episodic) reducers on specific Spare The Air days for methodological reasons (i.e. they may not have driven less on a specific Spare The Air day because they already had reduced their driving as much as they could), but they nonetheless contribute to voluntary emissions reductions during the summer months.



<i>Year</i>	<i>Seasonal Driving Reducers: Mean # Times Entered Vehicle</i>	<i>Non-Reducers: Mean # Times Entered Vehicle</i>	<i>Difference (Mean Number of Daily Single Trips Avoided by Seasonal Reducers)</i>	<i>Statistically Significant Difference?</i>
2010	2.94	3.84	0.9	Yes
2011	2.88	3.26	0.4	No
2012	2.55	3.67	1.12	Yes
2013	2.40	2.70	.3	Yes
2014	2.92	3.43	.51	No
2015	2.8	3.37	.57	Yes
2016	2.75	3.38	.63	Yes
2017	3.00	3.85	.85	Yes

SUMMER 2017 HEALTH ISSUES

Objectives

The main objective of the current section is to document the relationship between air quality and the health effects experienced by households in the Sacramento Nonattainment Area during the summer of 2016. More specific objectives are to:

- a. compare levels of perceived health effects due to poor air quality between respondents interviewed following Spare The Air days and those interviewed on Control (non Spare The Air) days;
- b. estimate the number of households in the Sacramento Nonattainment Area whose health was affected by poor air quality specifically due to ozone air pollution on Spare The Air days in 2016;
- c. determine if levels of reported health problems during summer Spare The Air seasons have increased, decreased, or stayed the same from 2010 to the present in the Sacramento Core Region (excluding El Dorado County AQMD); and
- d. compare the incidence of reported health problems among the four air quality districts in the Sacramento Nonattainment Area (Sacramento Metropolitan AQMD, Yolo-Solano AQMD, Placer County APCD, and El Dorado County AQMD).

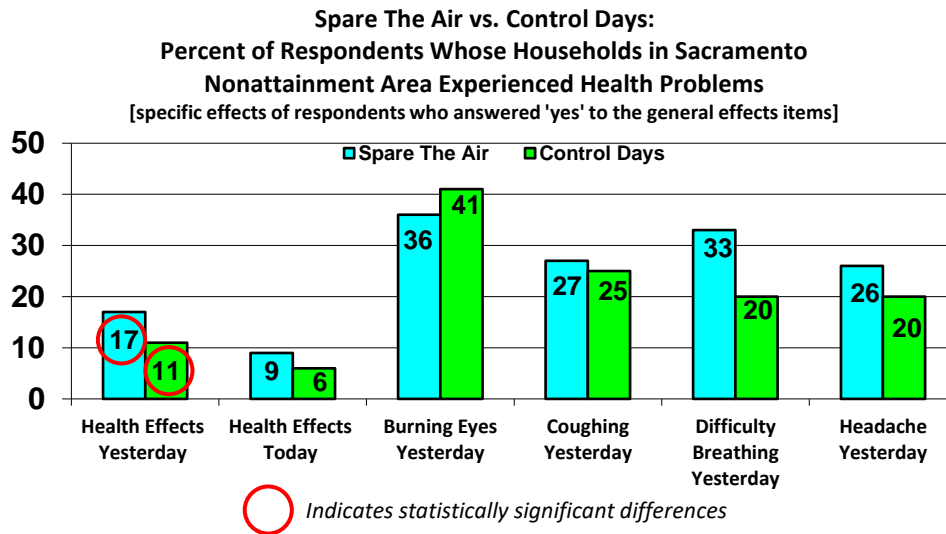
RESULTS

Perceived Health Problems: Spare The Air Days vs. Control Days

- 1 ➤ *Seventeen percent (17%) of households in the entire Sacramento Nonattainment Area reported breathing problems on Spare The Air days in 2017.*

For both Spare The Air and Control day respondents, respiratory health of individuals within the household was measured using two items at the end of the survey, each with a follow-up item to gather more specific information. First, respondents were asked if they or anyone else in their household experienced any health effects, such as burning eyes, headaches, coughing, or difficulty breathing the day before the interview due to unhealthy air, which was the actual Spare The Air day. If yes, a secondary question solicited open ended responses as to what, specifically, they experienced (burning eyes, headaches, coughing, difficulty breathing, or other). Next, respondents were asked a similar question that was specific to the day of the interview. If yes, open ended responses were solicited regarding what, specifically, they experienced.

Percentages of specific health effects are reported only for respondents who experienced any effects at all. For health effects yesterday, Spare The Air day respondents (17%) experienced significantly more discomfort than Control day respondents (11%). On the day of the interview, Spare The Air day respondents (9%) experienced marginally more distress than Control day respondents (6%), but this difference is not significant. Coughing, headaches, and burning eyes were experienced by both groups of households.



An estimated⁵¹ 151,604 households experienced health effects due to poor air quality on the days of Spare The Air Interviews. After subtracting for Control days (98,097), **a total of 53,507 households in the Sacramento Nonattainment Area experienced health discomfort due to poor air quality on the days of their interview.**

⁵¹ The measure used for households was the “total housing units” column, to be consistent with previous years’ evaluations. Starting 2016 the dataset includes a new column for “total households,” not previously present. Reference: State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties, and the State, 2010-2017, with 2010 Benchmark. Online source <http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/>. The estimated number of households for the entire Sacramento Nonattainment Area is **891,787** ((Sacramento Metropolitan AQMD: 567,281) + (Placer County APCD: 162,489* 87% = 141,365) + (Yolo-Solano AQMD: 121,701 (Yolo: 76,449; Solano (Dixon, Rio Vista & Vacaville: 45,252)) + (El Dorado County AQMD: 90353 * 68% = 61,440)).

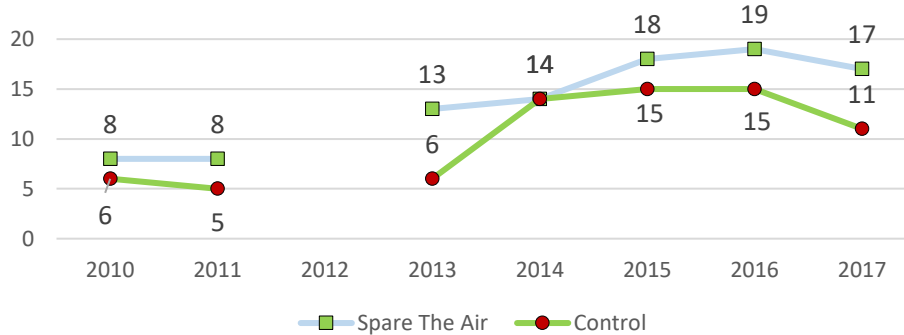
Year-To-Year Comparisons

- 2 ➤ *The percentage of reported health effects in 2017 does not differ significantly from the past four years, but is significantly greater than 2010 and 2011.*

The percentages of respondents who said someone in their household experienced health effects due to air quality the previous day on Spare The Air and Control days from 2010 to the present, excluding 2012 when health effects were not surveyed, are plotted in the next graph. Reported health effects have increased from the low 2010 and 2011 levels (8%) to the present 17%. In terms of Control day interviewing, the percentage of households who reported breathing difficulties remained relatively stable and consistently lower, until 2014 when it reached 14%. This year it is marginally lower at 11%.

While serious wildfire smoke in 2014 and 2015 at least partially explained the high percentage on Control days, it's possible that in 2017 the timing of Control day interviews also impacted results. In 2017, Control day interviews began in early August instead of September as in the previous years. It's quite possible that many Control respondents may have also legitimately experienced health effects from poor summer air even when it wasn't a Spare The Air day.

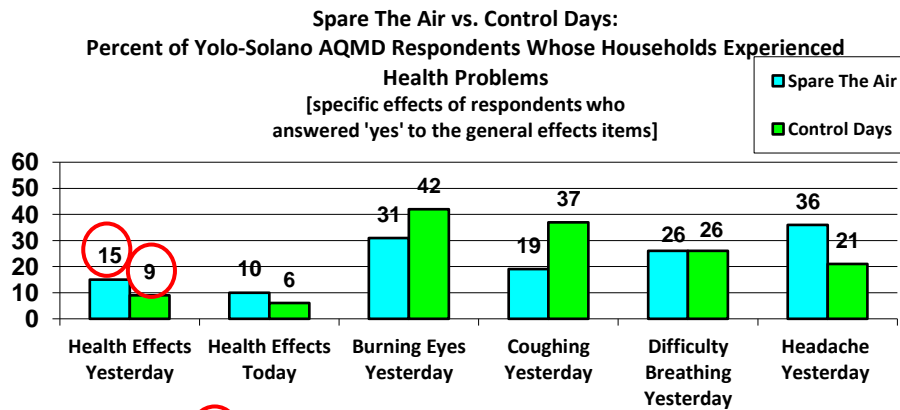
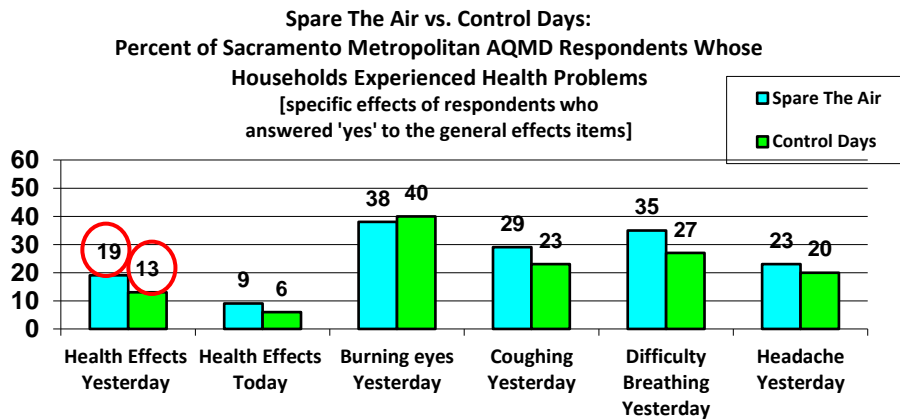
Year-to-Year Comparison of Percent of Respondents Whose Households Experienced Breathing Difficulties Yesterday: Sacramento Nonattainment Area



Individual Air Quality Districts

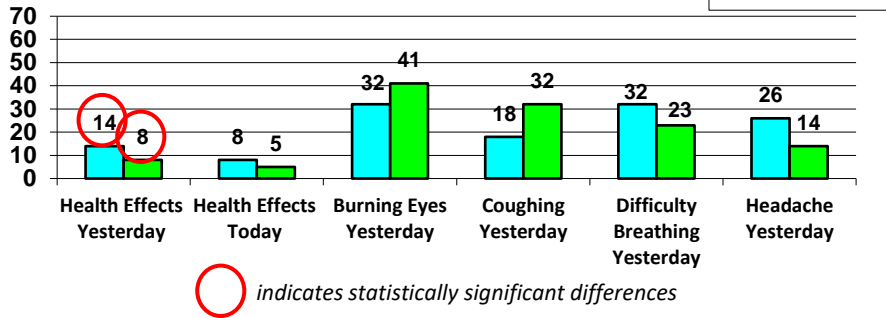
- 3 ➤ Each air district shows a significant difference between Spare The Air and Control day respondents. Discomfort on a Spare The Air day is greater than discomfort on Control days.

The next four graphs indicate the percentages of household health issues experienced by Spare The Air and Control day respondents in each of the individual air quality districts. In each district, discomfort is significantly greater on Spare The Air days than on Control days. Yet among those who report discomfort, the specific impact on health results is no significant difference. Note that these percentages fluctuate greatly between seasons, as well as geographies, and are a function of sample size. Meaning if there are very few respondents who experienced health effects, like on Control days, percentages of respondents experiencing specific effects will appear inflated.

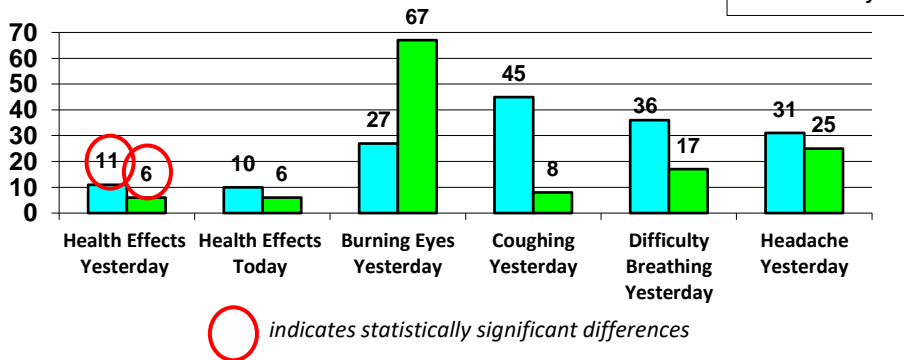


indicates statistically significant differences

**Spare The Air vs. Control Days:
 Percent of Placer County APCD Respondents Whose Households
 Experienced Health Problems**
 [specific effects of respondents who
 answered 'yes' to the general effects items]



**Spare The Air vs. Control Days:
 Percent of El Dorado County AQMD Respondents Whose Households
 Experienced Health Problems**
 [specific effects of respondents who
 answered 'yes' to the general effects items]

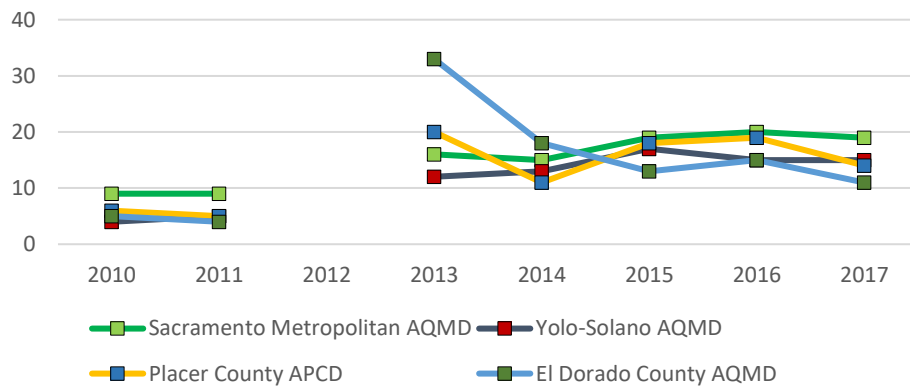


Air Quality Districts: Year-To-Year Comparisons

- 4 ➤ *Reports of health concerns in each of the individual air districts have remained consistent since 2014. Frequency of concerns from 2013 through 2017 suggests a greater sensitivity to air pollution than what respondents experienced in 2010 and 2011. Health effects were not surveyed in 2012.*

The percentages of households who reported health problems on Spare The Air days from 2010 to present in the individual air districts are displayed in the next graph. Aside from El Dorado County AQMD in 2013, reports of health concerns are consistent from 2013 through 2017. When compared to 2010 and 2011, the most recent five years of respondents are markedly more impacted by poor air quality on Spare The Air days, teetering around 15% experiencing health effects during episodes.

Year-to-Year Comparison of Percent of Respondents Whose Households Experienced Breathing Problems on Spare The Air Days



APPENDIX A

2016 SPARE THE AIR BEHAVIOR & ATTITUDE TELEPHONE TRACKING SURVEY DRAFT QUESTIONNAIRE ~ 04/11/2016

Field Dates:	Methods:
Sample Size:	<ul style="list-style-type: none">• STA episodes days: May – September, 2016 Control days: June - September, 2016• up to 2,400 completed interviews<ul style="list-style-type: none">- up to 1,200 completes on STA episodes days<ul style="list-style-type: none">- 400 Sacramento Co. residents- 300 Yolo/Solano Co. residents- 300 Placer Co. residents- 200 El Dorado Co. residents- 1,200 completes on Control days<ul style="list-style-type: none">- 300 Sacramento Co. residents- 300 Yolo/Solano Co. residents- 300 Placer Co. residents- 300 El Dorado Co. residents
Unit of Analysis:	<ul style="list-style-type: none">• Household
Sampling Frame:	<ul style="list-style-type: none">• Listed landline (75%) and mobile (25%)
Budgeted Length of Interview:	<ul style="list-style-type: none">• 4 minutes (Average)

• SURVEY INTRODUCTION & REQUEST •

Hello, my name is _____ with Meta Research, a regional public opinion research firm. We are conducting a 4-minute survey regarding your transportation activities yesterday.

If someone is available and has the time, I would like to interview the youngest male driver aged 18 or older who is home now.

[If none available: I would like to interview the youngest female driver aged 18 or older who is home now.] Would that be you? [IF NOT, ASK FOR PERSON WHO IS, REPEAT INTRODUCTION]

Do you have 4 minutes for a confidential interview? Your opinions are very important.

[IF NECESSARY, CONTINUE WITH: This is research, NOT SALES. Your telephone number WILL NOT BE associated with your answers. Your answers will be summarized with other peoples' answers; results will not be reported individually.]

[IF RESPONDENT ASKS FOR NAME OF SURVEY SPONSOR, SAY] In order not to bias your responses, we will be glad to tell you the name of the sponsoring agency at the conclusion of the survey.

• DATA FROM SAMPLE •

DB1. Zip Code

DB2. Geographic Population

- 1) Sacramento County
- 2) Yolo/Solano County
- 3) Placer County
- 4) El Dorado County

DB3A. Geo/Location Population **QUOTAS for landline sample**

[NOTE TO PROGRAMMER: The data files are divided by the category names and should be coded appropriately. Interviews should be completed proportionally. In other words, categories 20, 21, 22, and 23 should be called simultaneously as well as 30 and 31; similarly for 41 to 46.]

- 10) Sacramento – Sacramento
(STA QUOTA: 400 completes)
(CONTROL QUOTA: 300 completes)
- 20) Yolo/Solano – Davis (95616) (20%)
(STA QUOTA: 61 completes)
(CONTROL QUOTA: 61 completes)
- 21) Yolo/Solano – Woodland (95695, 95776),
West Sacramento (95605, 95691), Others
95606, 95607, 95612, 95618, 95627, 95653,
95679, 95694, 95698, 95937) (41%)
(STA QUOTA: 125 completes)
(CONTROL QUOTA: 125 completes)
- 22) Yolo/Solano – Vacaville (30%)
(95687, 95688)
(STA QUOTA: STA 90 completes)
(CONTROL QUOTA: 90 completes)
- 23) Yolo/Solano – Dixon/Rio Vista (8%)
(95620, 945741)
(STA QUOTA: 24 completes)
(CONTROL QUOTA: 24 completes)
- 30) Placer – Auburn and vicinity (22%)
(95602, 95603, 95658, 95663)
(STA QUOTA: 66 completes)
(CONTROL QUOTA: 66 completes)
- 31) Placer – Roseville (95661, 95678, 95747),
Lincoln (95648), Rocklin, Loomis, Other
South Placer (95650, 95677, 95765, 95746,
95681) (78%)
(STA QUOTA: 234 completes)
(CONTROL QUOTA: 234 completes)

41) El Dorado – El Dorado Hills (95762) (23%)
(STA QUOTA: 46 completes)
(CONTROL QUOTA: 69 completes)

42) El Dorado – Placerville (95667) (31%)
(STA QUOTA: 63 completes)
(CONTROL QUOTA: 95 completes)

43) El Dorado – Shingle Springs (95682) (24%)
(STA QUOTA: 49 completes)
(CONTROL QUOTA: 73 completes)

44) El Dorado – Georgetown (95634) (2%)
(STA QUOTA: 4 completes)
(CONTROL QUOTA: 6 completes)

45) El Dorado – Cool (95614) (3%)
(STA QUOTA: 6 completes)
(CONTROL QUOTA: 9 completes)

46) El Dorado – Other (95613, 95619, 95623, 95633, 95635, 95651, 95664) (16%)
(STA QUOTA: 32 completes)
(CONTROL QUOTA: 48 completes)

• **CATI GENERATED** •

DB4. STA / Control Date

DB5. Day of Week (for STA or Control Day)

- 1) Sunday
- 2) Monday
- 3) Tuesday
- 4) Wednesday
- 5) Thursday
- 6) Friday
- 7) Saturday

DB6. Type

- 1) Spare The Air
- 2) Control

• **SURVEY BEGINS** •

I want to inform you that this call may be monitored for quality purposes.

• SCREENING QUESTIONS •

ASK ALL RESPONDENTS

Q1. First, did you drive a car, truck, motorcycle or van within the last week?
 [If no, thank and seek interview with another driver within the household]

- 1) Yes
- 2) No

Q2. To assist in our analysis, please tell me which of the following categories contains your age:

- 1) 18 to 24
- 5) 25-64
- 6) 65 or over
- 8) Refused [terminate]

Q3. Gender [BY OBSERVATION]

- 1) Male
- 2) Female

Data for quotas taken from the American Community Survey.⁵²

1200 COMPLETES FOLLOWING A SPARE THE AIR EPISODES DAYS

400 COMPLETES SACRAMENTO COUNTY RESIDENTS

204 FEMALES (51%) / 196 MALES (49%), OF THESE WE NEED

FEMALE 18 - 24 NO LESS THAN 9%	18	Completes
MALE 18 - 24 NO LESS THAN 10%	20	Completes
FEMALE 65 PLUS NO MORE THAN 13%	27	Completes
MALE 65 PLUS NO MORE THAN 9%	18	Completes

300 COMPLETES YOLO/SOLANO COUNTY RESIDENTS

150 FEMALES (50%) / 150 MALES (50%) , OF THESE WE NEED

FEMALE 18 - 24 NO LESS THAN 13%	20	Completes
MALE 18 - 24 NO LESS THAN 13%	20	Completes
FEMALE 65 PLUS NO MORE THAN 12%	17	Completes
MALE 65 PLUS NO MORE THAN 9%	12	Completes

300 COMPLETES PLACER COUNTY RESIDENTS

153 FEMALES (51%) / 147 MALES (49%), OF THESE WE NEED

FEMALE 18 - 24 NO LESS THAN 13%	20	Completes
--	-----------	-----------

⁵² <http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>



MALE 18 - 24 NO LESS THAN 8%	12	Completes
FEMALE 65 PLUS NO MORE THAN 16%	24	Completes
MALE 65 PLUS NO MORE THAN 14%	21	Completes

200 COMPLETES EL DORADO COUNTY RESIDENTS
100 FEMALES (50%) / 100 MALES (50%), OF THESE WE NEED

FEMALE 18 - 24 NO LESS THAN 7%	7	Completes
MALE 18 - 24 NO LESS THAN 8%	8	Completes
FEMALE 65 PLUS NO MORE THAN 15%	15	Completes
MALE 65 PLUS NO MORE THAN 14%	14	Completes

1200 COMPLETES ON CONTROL DAYS

300 COMPLETES SACRAMENTO COUNTY RESIDENTS
153 FEMALES (51%) / 147 MALES (49%), OF THESE WE NEED

FEMALE 18 - 24 NO LESS THAN 9%	14	Completes
MALE 18 - 24 NO LESS THAN 10%	15	Completes
FEMALE 65 PLUS NO MORE THAN 13%	20	Completes
MALE 65 PLUS NO MORE THAN 9%	13	Completes

300 COMPLETES YOLO/SOLANO COUNTY RESIDENTS
150 FEMALES (50%) / 150 MALES (50%), OF THESE WE NEED

FEMALE 18 - 24 NO LESS THAN 13%	20	Completes
MALE 18 - 24 NO LESS THAN 13%	20	Completes
FEMALE 65 PLUS NO MORE THAN 12%	17	Completes
MALE 65 PLUS NO MORE THAN 9%	12	Completes

300 COMPLETES PLACER COUNTY RESIDENTS
153 FEMALES (51%) / 147 MALES (49%), OF THESE WE NEED

FEMALE 18 - 24 NO LESS THAN 13%	20	Completes
MALE 18 - 24 NO LESS THAN 8%	12	Completes
FEMALE 65 PLUS NO MORE THAN 16%	24	Completes
MALE 65 PLUS NO MORE THAN 14%	21	Completes

300 COMPLETES EL DORADO COUNTY RESIDENTS
150 FEMALES (50%) / 150 MALES (50%), OF THESE WE NEED

FEMALE 18 - 24 NO LESS THAN 7%	11	Completes
MALE 18 - 24 NO LESS THAN 8%	12	Completes
FEMALE 65 PLUS NO MORE THAN 15%	23	Completes
MALE 65 PLUS NO MORE THAN 14%	21	Completes

Q15. Language of interview [BY OBSERVATION]

- 1) English
- 2) Spanish

• **DRIVING BEHAVIOR** •

[ALL RESPONDENTS]

Q4a. Thinking just about yesterday, how many different TIMES did you get into a car, truck, motorcycle or van to drive? [PROBE: "Give me a reasonable approximation --a round number."]
[INTERVIEWER, if needed: for this question, we are interested in just how many times the respondent opened the door and got into the car as the driver, not in how many trips they may have been in a car as the passenger.]

[NOTE TO INTERVIEWER: VALIDATE RESPONSES OVER 50 TIMES]

_____ Specific number
999) Don't know/Refused

[Q4A > 0]

Q4b. And approximately how many miles did you drive yesterday during those trips? [PROBE: "Give me a reasonable approximation --a round number."]

[NOTE TO INTERVIEWER: VALIDATE RESPONSES OVER 500 MILES]

_____ Specific number
999) Don't know/Refused

[ALL RESPONDENTS]

Q5a. Yesterday, did you drive your car, truck, motorcycle or van the same, more, or less frequently than you normally do on a [day of the week yesterday]?

- 1) Same
- 2) Less
- 3) More
- 8) Don't know/Refused [Thank and TERMINATE]

[PROGRAMMER: For each q5=8, we will need a replacement survey]: Note that any surveys answered to this point do not count as a completed interview. If participants have not met the quota criteria then a replacement interview must be completed with another participant who does.

[Q5A = 2: THOSE WHO DROVE LESS]

Q5b. And approximately how many miles less than normal did you drive?

[NOTE TO INTERVIEWER: VALIDATE RESPONSES OVER 100 MILES]

_____ Specific number
999) Don't know/Refused

[Q5=2: THOSE WHO DROVE LESS]

Q7a. Why did you make that change or those changes? [OPEN ENDED-do not read; use for coding only; Record response if not (1) or (2)]

- 1) Air quality; OR reduce pollution; OR concerned about smog; OR Spare The Air campaign
- 2) Multiple INCLUDING air quality related
- 3) RECORD RESPONSE
- 9) Don't know/Refused [PROMPT AGAIN; skip to Q9]

[Q5=2: AND Q7A= 1 OR 2: THOSE WHO DROVE LESS FOR AIR QUALITY REASONS]

Q7b. About how many SINGLE TRIPS in your vehicle did you avoid driving yesterday to reduce air pollution? And by a SINGLE trip, I mean getting in your vehicle, driving from one place to another and then stopping. For example, leaving your house and going to the store is one trip. Leaving the store and coming back home is another trip. [PROBE: "Give me a reasonable approximation --a round number."]

[NOTE TO INTERVIEWER: VALIDATE RESPONSES OVER 12 TIMES]

_____ Specific number
999) Don't know/Refused

[ALL RESPONDENTS]

Q9. Do you usually reduce the amount of driving you do during the summer to avoid adding to air pollution?

- 1) Yes
- 2) No
- 8) Refused/Don't Know/ "depends"

[ASK RESPONDENTS WHO USUALLY REDUCE Q9=1]

Q9b. And how have you reduced driving this summer to decrease air pollution?

- 50) Record response
- 99) Non-response (Don't know / Refused)

[ASK RESPONDENTS WHO USUALLY REDUCE Q9=1]

Q10. And on an average day during the summer, by approximately how many miles do you reduce your driving? [PROBE: "Give me a reasonable approximation --a round number."]

[NOTE TO INTERVIEWER: VALIDATE RESPONSES OVER 100 MILES]

_____ Specific number
999) Don't know/Refused

[ALL RESPONDENTS]

[NOTE TO PROGRAMMER: Please rotate the order of q12a and q12b for every other interview, asking both questions of everyone]

q12. CATI-CALC: Q12 question order

- 1) Q12a asked first
- 2) Q12b asked first

[ALL RESPONDENTS]

Q12a. Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?

- 1) Yes
- 2) No, do not recall that
- 8) Don't know/Refused

[ALL RESPONDENTS]

Q12b. In the past two days have you heard, read, or seen any commercials, news broadcasts or information online about Spare The Air, poor air quality, or requests to drive less in this area?

- 1) Yes
- 2) No, do not recall that [Skip Q12c]
- 8) Don't know/Refused

[Ask if Q12b = 1 (yes)]

Q12c. Where do you recall [Q12b: seeing, hearing, or reading] that information?

CATEGORIES FOR CODING:

- 1) Mentioned
 - 2) Not mentioned
 - 8) Refused
-
- a. Radio Commercial
 - b. Television Commercial
 - c. Facebook
 - d. Twitter
 - e. News or Weather Broadcast
 - f. Word of Mouth
 - g. Newspaper
 - h. Air Alert email
 - i. Outdoor Billboard
 - j. Online (or STA Website)
 - k. Sacramento Region Air Quality App
 - l. Other (Specify)

[READ TO ALL]

Almost finished, I just have a few of questions about your health.

[ALL RESPONDENTS]

Q13a. Thinking just about yesterday, did you or anyone else in your household experience any effects on your health, such as burning eyes, headaches, coughing, or difficulty breathing, due to unhealthy air?

- 1) Yes
- 2) No
- 8) Don't know/Don't recall/Refused

[Ask if Q13a = 1]

Q13b What was it that you experienced? [OPEN ENDED-do not read options; use for coding only]

1. Burning eyes
2. Headaches
3. Coughing
4. Difficulty breathing
5. Other [record response]

Q14a. And what about today, did you or did anyone else in your household experience any effects on your health, such as burning eyes, headaches, coughing or difficulty breathing, due to unhealthy air?

- 1) Yes
- 2) No
- 8) Don't know/Don't recall/Refused

[Ask if Q14a = 1]

Q14b. What was it that you experienced? [OPEN ENDED-do not read options; use for coding only]

1. Burning eyes
2. Headaches
3. Coughing
4. Difficulty breathing
5. Other [record response]

Q15. Finally, and for statistical purposes only, please stop me when I reach the category that best describes your household income before taxes in 2015.

1. Less than \$15,000
2. \$15,000 to less than \$25,000
3. \$25,000 to less than \$50,000
4. \$50,000 to less than \$100,000
5. \$100,000 or more
6. Don't Know/Refused



THIS HAS BEEN A CONFIDENTIAL INTERVIEW CONDUCTED BY _____ AT META RESEARCH ON BEHALF OF THE SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT. YOU MAY BE CALLED BY SOMEONE FROM META RESEARCH TO VERIFY THAT THIS INTERVIEW WAS CONDUCTED. May I have just your first name for verification purposes? THANK YOU VERY MUCH FOR YOUR TIME.