



**SACRAMENTO REGION AIR QUALITY BASIN:  
“SPARE THE AIR”  
CAMPAIGN 2002 EVALUATION  
FINAL RESEARCH REPORT**

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# Sacramento Region Air Quality Basin: "Spare the Air" Campaign 2002 Evaluation

## Highlights



The poor air quality experienced in the Sacramento air quality basin during the summer of 2002 certainly attracted the attention of the general public. The "Spare the Air" program that asks motorists to reduce driving on days when the area was experiencing unhealthy air was **highly effective in terms of outreach** this year – four in ten of the respondents surveyed were aware of being asked not to drive on Spare the Air days during the 2002 season. This indicates that **over 700,000 residents** in the Sacramento region recalled being asked to reduce driving.



Awareness of Spare the Air increased to **67%** when respondents were asked if they had specifically heard any advertisements about Spare the Air or poor air quality, a new ARB-proposed question introduced this year.



Significantly more respondents in all three counties were aware of Spare the Air this year compared to last year, and in fact awareness in Sacramento County is the highest it has been since the late nineties. Awareness varies over time with the number of Spare the Air days (see page 23.)



This year's season appears to have also promoted more driving reduction than in the past, particularly in the counties surrounding Sacramento. Of the drivers who were aware that the previous day was a Spare the Air day, the percentage of those who said they drove less has significantly increased from last year in Placer County, Yolo County, and the region as a whole.



Over a quarter of respondents in the Sacramento region who were aware of Spare the Air advisories said they drove less on Spare the Air days. This represents over 115,000 drivers in the region who reduced driving.



Self-reported trip reduction estimates are consistent with self-reported driving behavior, in that the number of trips made by respondents who said they drove "less" the previous day was significantly fewer than the number of reported trips made by those who drove the "same" or "more".



The Spare the Air program was successful in reducing air pollution in the Sacramento region: **3.3%** of all respondent drivers reported driving less for air quality reasons on Spare the Air days. This represents over **three-quarters of a million miles** not driven on an average Spare the Air day, due to voluntary driving reduction, and a corresponding estimated reduction of **1.8 to 5.1 tons** of ozone precursors per day.

# Sacramento Region Air Quality Basin: Spare the Air Campaign 2002 Evaluation FINAL RESEARCH REPORT

## Summary Research Objective

*"Spare the Air" is a program that began in 1995 to encourage the public to voluntarily reduce driving on days of unhealthy air quality. In the greater Sacramento region, the air quality management districts in the counties of Sacramento, Yolo/Solano, Placer, and El Dorado participate in the program<sup>1</sup>, with the support of The Cleaner Air Partnership, and other community organizations. The Community Education Officer of the Sacramento Metropolitan Air Quality Management District (SMAQMD) implements the program. An important component of any public education program is to measure its impact. The primary objective of the current research is therefore to assess the effectiveness of the Spare the Air program during the 2002 summer campaign from a public perception point of view. A total of 2,959 interviews were conducted after Spare the Air days in 2002 to perform this assessment.*

## Project Background

### THE PROBLEM: SEVERE OZONE NON-ATTAINMENT AREA

The U.S. Environment Protection Agency has designated the Sacramento region as a severe ozone "non-attainment" area -- during summer months, the region fails to meet the federal health based standard for ozone. Unhealthy levels of ground-level ozone are created when exhaust volatile organic gases (VOG) and nitrogen oxide (NOx), primarily from cars, trucks, on- and off-road construction & agricultural equipment, lawn mowers, and other mobile sources, reacts in the presence of sunlight, and forms ozone in hot weather conditions.

Under the Clean Air Act, the federal government can cut off transportation funding for

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<sup>1</sup> The air quality districts include the Sacramento Metropolitan Air Quality Management District (SMAQMD), the Yolo/Solano Air Quality Management District (YSAQMD), the Placer County Air Pollution Control District (Placer APCD), and the El Dorado County Air Quality Management District (El Dorado AQMD). All districts with the exception of El Dorado contribute towards the evaluation of the program, and no interviews were conducted in

any community that fails to achieve federal clean air standards. For the Sacramento region, this means that up to \$15 billion of federal transportation project funding would be jeopardized.

In terms of public health, the effects of ground-level ozone are well-documented. "It is a strong irritant that can cause constriction of the airways, forcing the respiratory system to work harder in order to provide oxygen. It can also cause other health problems, including:

- Aggravated respiratory disease such as emphysema, bronchitis and asthma
- Damage to deep portions of the lungs, even after symptoms such as coughing or a sore throat disappear
- Wheezing, chest pain, dry throat, headache or nausea
- Reduced resistance in infection, increased fatigue, or weakened athletic performance"<sup>2</sup>

In addition to public health issues, poor air quality harms the environment as well as the local economy, and is transported to downwind areas.

## **THE PLAN: REMOVAL OF NO<sub>x</sub> AND THE ROLE OF VOLUNTARY PARTICIPATION**

In order to address the problem, the air quality management districts in the Sacramento region along with the California Air Resources Board (ARB) have implemented short and long-term plans to reduce air pollution in the region. In addition to increased regulation of business, monitoring, enforcement, and incentive programs, specific goals were set. For example, one part of the plan calls for the removal of 5 tons of nitrogen oxide (NO<sub>x</sub>) each day by the year 2005 from heavy-duty vehicles and on and off road sources.

In the past ten years, air quality has actually **improved** in the Sacramento region<sup>3</sup>, due to higher emission standards for new cars, smog check, cleaner burning gasoline, solvent regulations, and other state and federal regulations. However, because the population in the region is continually growing (and with it the number of vehicles on the road), air quality remains out of compliance with federal and state health standards.

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El Dorado County.

<sup>2</sup> Documented on the AirAlerts website: [www.myairalerts.net](http://www.myairalerts.net)

<sup>3</sup> Report presented by Brigitte Tollstrup, SMAQMD, and summarized in Cleaner Air Partnership NEWS, Fall 2002: [www.cleanerairpartnership.org/images/NEWS10%2002.pdf](http://www.cleanerairpartnership.org/images/NEWS10%2002.pdf)

In addition, according to the Sacramento Metropolitan Air Quality Management District (SMAQD), drivers in the Sacramento region log more miles per driver than in any other portion of the state. They estimate that about 70% of the Sacramento region's air pollution is caused by emissions from internal combustion engines<sup>4</sup>.

The role of the Spare the Air Program is to engage the general public in helping to solve the problem of air pollution. In order to accomplish this, a public education program was created and implemented to help residents understand that every individual is responsible for, and contributes to, the quality of air in the environment. It was felt that a program that could encourage **voluntary** participation in helping to improve air quality would be preferable to enforced participation<sup>5</sup> and was therefore worthy of trying. This was the basis for the "Spare the Air" program, now in its eighth year of operation. It supplements the required pollution reduction programs in the plan.

Annual evaluations (with the exception of 1997) have been conducted since 1995 to assess the effectiveness of the program. Over the years, although results have been positive in terms of public awareness of the campaign and a corresponding reduction in driving on Spare the Air days, declines in both awareness and the percentage of individuals choosing to reduce the number of trips they make have also been noted, particularly in seasons with few Spare the Air days<sup>6</sup>.

## **The Spare the Air Program**

The Spare the Air program provides the Sacramento region's residents with information and resources to protect their health during the summer smog season. It encourages residents to be aware of ozone levels and asks motorists to reduce their driving on days when the monitoring stations around the region predict unhealthy air. An air quality

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<sup>4</sup> Spare the Air website: [www.sparetheair.com/faq.html#faq5](http://www.sparetheair.com/faq.html#faq5)

<sup>5</sup> In some countries, restrictions to driving have been enforced. In Mexico City, for example, residents are only permitted to drive 6 days of the week. Cars are required to have color-coded stickers which indicate which day the vehicle is not permitted to be on the road. Heavy fines are imposed for violations.

<sup>6</sup> "Evaluation of Participation in the Sacramento Air Basin 1999 'Spare the Air' Ozone Day Driving Reduction Program". 1999. Judith Lamare, Ph.D., The Cleaner Air Partnership.  
"Sacramento Region: Spare the Air Campaign 200 Evaluation." December 2000. N. Holobow, Ph.D., MetaResearch. Available online at: [www.cleanerairpartnership.org/images/STAEVAL00.pdf](http://www.cleanerairpartnership.org/images/STAEVAL00.pdf)

index (AQI) of 151 triggers a Spare the Air alert<sup>7</sup>. The public is notified of a Spare the Air advisory the day before, through numerous channels.

## **THE REGION**

The Sacramento region air quality basin consists of all of Sacramento and Yolo Counties, as well as parts of Solano, Placer, Sutter and El Dorado Counties. The map below outlines the region and identifies the 24 ozone-monitoring sites.



Residents in El Dorado and Sutter, comprising less than 8 percent of the region's population, were not included in the current evaluation.

## **THE 2002 SEASON**

The Sacramento area experienced higher than normal temperatures during the summer of 2002. In addition, it was the driest recorded June through September period in 108 years.<sup>8</sup> The high temperatures and light westerly winds created favorable conditions for ozone episodes, and the area as a whole experienced a high number of ozone exceedence days.

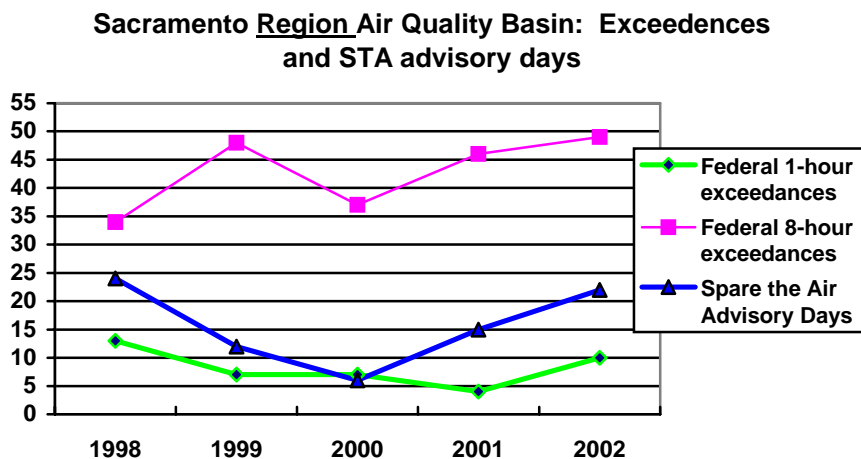
<sup>7</sup> The Air Quality Index (AQI) ranges from 0 to 300. The unhealthy range starts at 151 and the very unhealthy category begins at 201. The criterion for triggering a Spare the Air alert is an AQI of 151. The criterion was lowered in 2001 from an AQI of 174 to an AQI of 151 in order to increase the potential number of Spare the Air days as it was felt that there too few STA days were occurring in previous years to sustain public awareness and involvement.

<sup>8</sup> National Climatic Data Center: <http://lwf.ncdc.noaa.gov/oa/climate/research/2002/sep/st004dv00pcp200209.html>  
*MetaResearch Inc.* December, 2002

## Number of Exceedence Days

### The Region

The graph that follows plots the number of exceedence days of federal one and eight-hour standards in the Sacramento region air quality basin as a whole<sup>9</sup> for the last five years<sup>10</sup>.



It can be seen that in 2002 there were more exceedence days than in 2001, and in general, more exceedence days than in any season during the past five years. There were 10 exceedences of the federal 1-hour standard, and 49 exceedences of the 8-hour federal standard. Twenty-two Spare the Air day advisories were issued this year, compared with 15 last year (using the same criterion for triggering a Spare the Air alert<sup>11</sup>).

### Individual Counties

The number of exceedence days since 1999 in the three individual counties surveyed are presented in the next three graphs<sup>12</sup>. Sacramento County exceedences are presented

<sup>9</sup> This also includes El Dorado County.

<sup>10</sup> Previous regional exceedence numbers were obtained from the California Air Resources Board website: [www.arb.ca.gov/adam/cgi-bin/db2www/ozonereport\\_annual.d2w/start](http://www.arb.ca.gov/adam/cgi-bin/db2www/ozonereport_annual.d2w/start). The 2001 estimates were revised using the actual numbers for the season presented by Sonoma Technology Inc on Dec. 6, 2001. The 2002 exceedence figures were obtained from Kerry Shearer, SMAQMD in a report titled: May 1 – Sept 30, 2002: Air Quality Statistics.

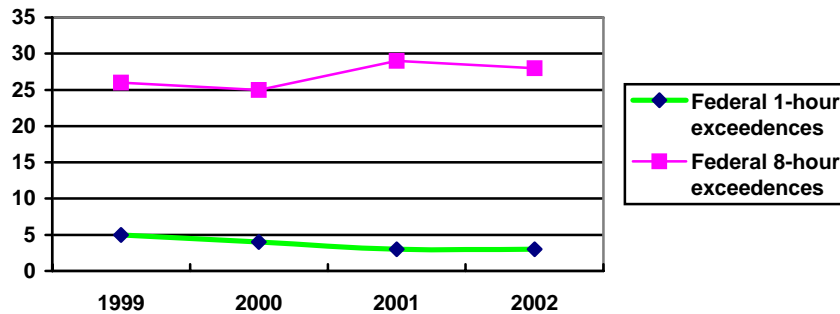
<sup>11</sup> The criterion for triggering a Spare the Air alert is based on the Air Quality Index (AQI), which ranges from 0 to 300. The unhealthy range starts at 151 and the very unhealthy category begins at 201. In 1999, an AQI of 174 was needed to trigger an alert. The criterion changed in 2001, when the criterion was lowered to an AQI of 151.

<sup>12</sup> Taken from the summaries of the ozone seasons on the Sonoma Tech website at:

[http://www.sonomatech.com/Sacramento/Forecasting/summary\\_2001.htm](http://www.sonomatech.com/Sacramento/Forecasting/summary_2001.htm). It should be noted that the results from the counties for the years prior to

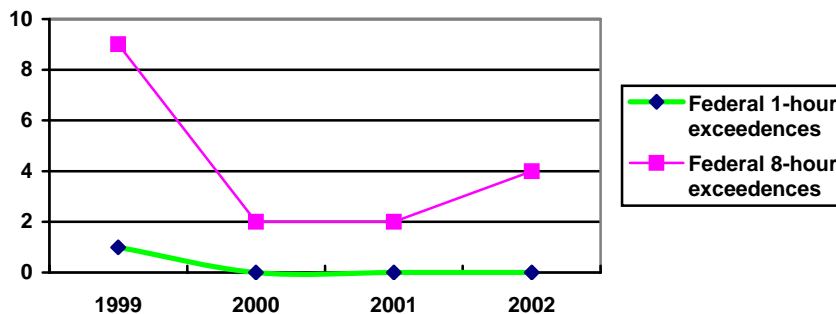
first. It can be seen that in the 2002 season, there were 3 violations of the federal 1-hour standards, and 28 of the federal 8-hour standards. In Sacramento County, the ozone exceedence pattern was nearly identical for 2001 and 2002.

**Sacramento County: Exceedences**



Yolo/Solano county exceedences are presented in the next graph. In general, it can be seen that Yolo/Solano County experiences the best air quality in the Sacramento basin: although considered part of the Sacramento region air basin, the number of exceedences of both the 1-hour and the 8-hour federal standards is very low. In fact, there have been no federal 1-hour exceedences in the past three years, and only one in 1999. As far as 8-hour violations are concerned, once again Yolo/Solano county has experienced very few: 4 occurred this year, and only 2 the previous two years in a row.

**Yolo County: Exceedences**

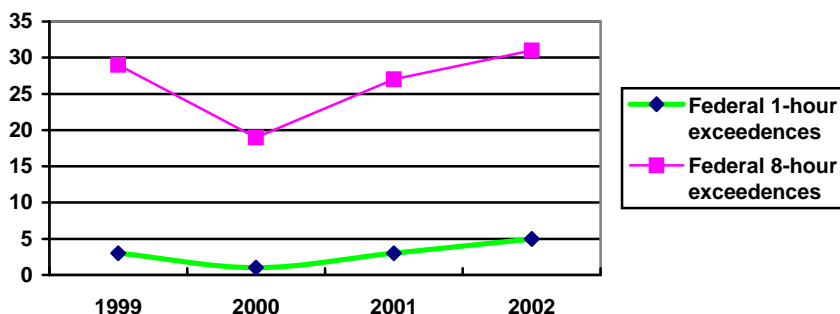


Placer County, in contrast, has experienced some of the highest numbers of exceedence

2002 have not yet been updated on the website and thus must still be considered preliminary data. The 2002 data were provided by SMAQMD on October 1, 2002.

days, relative to the other two counties<sup>13</sup>. These are presented in the next graph. In 2002, there were 5 violations of the federal 1-hour standard, and 31 of the 8-hour standard. Ozone was a greater problem in 2002 than in 2001 for Placer County.

Placer County: Exceedences



## Number of Spare the Air Days

The 2002 The Spare the Air season in the Sacramento region ran between May 1 and October 31, 2002. Citizens were advised not to drive on **twenty-two** (22) days when the Air Quality Index (AQI) level was estimated to be higher than 151.<sup>14</sup> When the advisory was issued, motorists were asked to reduce driving because the added ozone caused by vehicle emissions contributes even more to the unhealthy quality of the air. There were no Spare the Air alerts in either May or June, but six were recorded in July. In August there was an extended multi-day period consisting of eight consecutive Spare the Air days (August 9 through August 16). September also had eight Spare the Air days, with two multi-day episodes: September 11 through 13; and September 21 through 24. No research was conducted in September and none of these alert days experiences a one-hour ozone exceedence.

<sup>13</sup> It is well documented that the foothill communities, because of their geography, have higher average ozone levels. Within the Sacramento air quality basin, El Dorado County actually experiences the highest number of violations – more than Placer County. However, El Dorado is not part of the current evaluation and so for the purposes of this report, Placer County has the highest number of violations.

<sup>14</sup> The Air Quality Index (AQI) ranges from 0 to 300. The unhealthy range starts at 151 and the very unhealthy category begins at 201. The criterion for triggering a Spare the Air alert is an AQI of 151. (The criterion changed in 2001. Previously an AQI of 174 was needed to trigger a Spare the Air alert.)

## **The 2002 Spare the Air Campaign**

### **Paid advertising on television and radio**

The Sacramento Metropolitan Air Quality Management District aired Spare the Air advisory media spots on both television and radio, for a placement cost of \$85,125<sup>15</sup>, up 33% from last year's media buy of \$63,746. This expenditure was to be expected, given that there was a 46% increase in the number of Spare the Air days this year over last (22 versus 15). In addition to paid advertising, television and radio news, and newspapers such as the Sacramento Bee also covered air quality stories on Spare the Air days.

### **Website**

The Spare the Air website ([www.sparetheair.com](http://www.sparetheair.com)) provides information and resources that encourage residents to be aware of ozone levels on a daily basis. Ozone movies, daily forecasts, 5-day forecasts, forecasts by county, AQI real time readings, state and national air quality news and information, as well as interactive tools for children (Just for Kids) are available. A link to an educational interactive air pollution simulator called Smog City<sup>®</sup> is also provided ([www.smogcity.com](http://www.smogcity.com)). In addition, visitors can subscribe to the AirAlert service.

### **AirAlert**

AirAlert is a free service that automatically notifies subscribers by e-mail, text pager, and/or digital cell phone any time ozone reaches unhealthy levels in the Sacramento region. Subscribers ([www.myairalert.net](http://www.myairalert.net)) can choose the level of notification they require ("unhealthy for sensitive groups," "unhealthy," or "very unhealthy"). In addition, AirAlerts are automatically sent to all subscribers to notify them of a Spare the Air day.

During the 2002 season, there were 3,758 subscribers to the Air Alert program, about the same as last year. An online survey evaluation of the program is currently being conducted and results are not yet tabulated. Based on preliminary comments from the 25% of subscribers who have already completed the survey, it would appear that the

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<sup>15</sup> Advertising figures provided by Kerry Shearer, SMAQD in report: May 1 – Sept 30, 2002: Air Quality Statistics. Figures for July updated by

positive findings of last year's survey<sup>16</sup> will likely continue again this year, indicating that using the Internet and other electronic means of informing a targeted public is effective. The following comments are taken from this year's survey database<sup>17</sup> and are included to give just a flavor of the attitudes respondents have towards the AirAlert program:

- "I mainly used AirAlert to regulate my daughter's outdoor activity during the summer. She has respiratory problems. I also shared this website with parents of children with asthma.
- I enjoyed receiving this very useful information. I would pass it on to others at work to prepare them on how to schedule their days, so that we may do our part to prevent air pollution.
- I found it to be a great tool to keep air quality on the minds of the crews at work and to challenge them to think of ways to reduce air pollution.
- It was a great service and I look forward to the continued use of it in the future. It helped save me from several possible asthma attacks and I feel I was more able to contribute to lowering air pollution in my area.
- The service is great. It is important for our students' health to know when to reduce time on the playground. I informed the classroom teachers of the danger when the AQI hits the unhealthy range.
- The five day forecasts were helpful. Nice improvements on previous years.
- I enjoyed the information and hope it will continue. I am sensitive to air quality. And your information allowed me to plan my day around the best air times. Thank you."

### Employer Network

Over 550 Sacramento region businesses also help communicate advisories to their work forces, via the Employer Network, which represents over 200,000 employees. Subscribing companies receive notification of the current Spare the Air episode and they in turn notify their employees, encouraging them to reduce driving.

### Unitrans Spare-the-Air Program

In Davis, a program that was started last year with Unitrans, the public transit provider, continued again this Spare the Air Season. As an effort "to provide an attractive alternative to driving, no fares are charged for bus service on any summer day designated as a "Spare the Air" day."<sup>18</sup> Their assessment about the effectiveness of the program indicated an overall increase of 5% in typical summer daily ridership. "This

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additional e-mail.

<sup>16</sup> The 2001 online survey of Air Alert subscribers indicated that 93% of respondents said they found the Air Alert Spare the Air advisories helpful, and 64% said they used the information "to take personal action to reduce my contribution to air pollution." Results provided by Kerry Shearer, SMAQMD.

<sup>17</sup> Preliminary access provided by Kerry Shearer, SMAQMD.

indicates that the program was quite successful in attracting people to transit service who are not regular riders.”

## Research Methodology

### Research Objectives

MetaResearch, Inc. was selected to conduct the evaluation of the 2002 Spare the Air campaign. Specifically, the research objectives were to:

1. measure the awareness of the Spare the Air program among residents in the Sacramento region air quality basin,
2. measure the effectiveness of the Spare the Air program in terms of reduced driving among residents,
3. estimate emission reductions from the trips reduced during Spare the Air episodes<sup>19</sup>,
4. compare awareness of the Spare the Air campaign and behavioral change among the individual counties within the basin, and
5. track awareness and behavioral change over time.

### Research Design

#### Use of Control Day Interviewing

The experimental design first introduced by Dr. J. Lamare<sup>20</sup> that included interviewing respondents following Spare the Air days, and comparing their responses with a similar group of respondents interviewed on non-Spare the Air (or Control) days was again adopted. Random-digit-dialed (RDD) telephone interviews were conducted with residents of Sacramento County, Yolo/Solano County, and Placer County. Days of the week on which Spare the Air interviews were conducted were matched with Control interviews conducted later in the season when ozone was not elevated and no alert was announced. That is, Control day interviews took place on the same days of the week as Spare the Air interviews.

In case there is a tendency for individuals to overstate their driving reduction on Spare

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<sup>18</sup> Document titled "Unitrans Spare-the-Air Program Summer 2002", written by A. Palmere, and sent to J. Lamare on October 29, 2002.

<sup>19</sup> Two methods for estimating ozone precursor reductions based on the survey data have been used in all evaluations conducted since 1999. However, the preferred methodology has not been officially chosen and approved. This year, in addition to the two methods of estimation, two ways of calculating ROG and NOx emission reductions have also been used. The first calculations are included so as to be able to compare with previous years' results and are based on EMFAC 7G. The newer calculations are based on EMFAC 2000, from the ARB's 2002 Edition of "Methods to Find the Cost-Effectiveness of Funding Air Quality Projects." Memo June 2002 written by J. Lamare regarding ARB Quantification Study.

<sup>20</sup> Judith Lamare, Ph.D. The Cleaner Air Partnership, Sacramento, CA.

the Air days, the use of Control day interviewing provides a means of calculating a correction or adjustment factor. More accurate estimates about the number of drivers/households impacted by the Spare the Air program and the amount of emissions reduced are therefore obtained by subtracting the correction factor from the results. The use of Control day data therefore provides the most conservative (and probably more accurate) estimates of program effectiveness.

### Interviewing Days

As was the case in previous evaluations, 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.

It was decided to conduct approximately 100 interviews throughout the region, starting with every occurrence of a Spare the Air advisory, 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 from July – October, 2002. On Spare the Air days, interviewing took place the day after the announcement, and started in Sacramento County after the first Spare the Air advisory was called (July 1). By the seventh day of the long multi-day episode in August, the budgeted number of Spare the Air interviews was completed. No interviewing therefore took place following the Spare the Air days in September<sup>21</sup>. However the episodes that occurred in July were similar in length as well as temperature to the ones that occurred in September.

The following table indicates the Spare the Air days during the 2002 season and whether interviewing was conducted in each of the three counties. Multi-day episodes are shaded the same colour.

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<sup>21</sup> The episodes that occurred in September more closely resembled those of July in terms of length and temperatures than did August episodes. The results from July interviews could therefore be considered a proxy for September.

Spare the Air Day	Mon	Tue	Wed	Thu	Sat	Sun	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Mon	Wed	Thu	Fri	Sat	Sun	Mon	Tue
	Jul 1	Jul 2	Jul 10	Jul 11	Jul 13	Jul 28	Aug 9	Aug 10	Aug 11	Aug 12	Aug 13	Aug 14	Aug 15	Aug 16	Sep 2	Sep 11	Sep 12	Sep 13	Sep 21	Sep 22	Sep 23	Sep 24
Sacramento Interview on following day (x)	X	X	X	X							X	X	X									
Yolo/Solano Interview on following day (x)			X	X	X		X	X	X	X	X	X	X									
Placer Interview on following day (x)			X	X	X		X	X	X	X	X	X										

**Sample Size: Number of Completed Interviews**

MetaResearch Inc. conducted a total of 2,959 telephone surveys with random samples of residents in Sacramento, Yolo/Solano, and Placer County<sup>22</sup>. Results for the region as a whole were then weighted proportionally<sup>23</sup>. The next table lists the number of completed interviews for each group along with their affiliated margins of error (at the most conservative level).

<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>	<i>Total</i>	<i>Margin of Error</i>
<b>Sacramento County</b>	<b>611</b>	+/- 4.0%	<b>407</b>	+/- 4.9%	<b>1,018</b>	+/- 3.1%
<b>Yolo-Solano County</b>	<b>604</b>	+/- 4.0%	<b>420</b>	+/- 4.8%	<b>1,024</b>	+/- 3.1%
<b>Placer County</b>	<b>506</b>	+/- 4.4%	<b>411</b>	+/- 4.8%	<b>917</b>	+/- 3.2%
<b>Total Regional (Unweighted)</b>	<b>1721</b>	+/- 2.4%	<b>1238</b>	+/- 2.8%	<b>2,959</b>	+/- 1.8%
<b>Total Regional (Weighted)</b>	<b>849</b>	+/- 3.4%	<b>565</b>	+/- 4.1%	<b>1,414</b>	+/- 2.6%

It can be seen in the table above that a total of 1,721 interviews were conducted on days following Spare the Air episodes and 1,238 interviews were conducted on Control days.

<sup>22</sup> Quotas were established for the three counties (Sacramento, Yolo/Solano, and Placer) as well as for gender and age.

<sup>23</sup> Weights were calculated, proportional to the population size of each county: Sacramento: 72%; Yolo-Solano: 17%; and Placer: 11%. Sacramento County was given a weight of 1, and therefore the other counties were down-weighted accordingly.

The regional weighted total of completed interviews was 1,414. The margin of error affiliated with a sample of this size is +/- 2.6% (at the 95% confidence level).

### **The Questionnaire**

The questionnaire used during the last three years was again used this year, with slight modifications. Respondent drivers were first asked how many times they had entered a vehicle to drive, and then whether they had driven the same, more or less during the preceding day. If they reported driving less, additional questions were asked about what they did instead of driving, why they drove less, and how many trips they reduced. This year we asked respondents to estimate how many single trips they avoided (instead of round trips which was asked before), and a question was added about how many of these were work trips<sup>24</sup>. The interviews lasted approximately 3 - 4 minutes on average, depending on responses.

### *Measuring Awareness of Spare the Air: Test of Two Questions*

This year it was decided to test the effect of question wording by including an ARB proposed question<sup>25</sup> for measuring Spare the Air awareness in addition to the original question that has been used in all the previous evaluations. The original question asks: "Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?" The ARB proposed question asks: "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?" All respondents answered both questions, which were presented in rotated order such that half the respondents heard the original question first and half heard the new question first. This was done to counter any order effects that might emerge.

### **Caveat**

The sole purpose of this report is to provide a collection, categorization and summarization of public opinion data. MetaResearch Inc. intends to neither endorse nor criticize The Cleaner Air Partnership, the SMAQMD, or their policies, products, or staff. The Client (Cleaner Air Partnership) shall be solely responsible for any modifications, revisions, or further disclosure/distribution of this report.

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<sup>24</sup> This information will be used to calculate another way of estimating emission reductions, according to ARB recommendations. While beyond the scope of the current report, this information will be incorporated in a forthcoming report of a test performed this summer.

<sup>25</sup> ARB memo dated April 26, 2002 by J. Weir, J. Lu, & E. Schreffler sent to J. Lamare, Cleaner Air Partnership.

## Results and Conclusions

The results summarized in this report describe major findings from analyses of data from the telephone interviews. The organization of each section is as follows: first, the main findings from the region as a whole (weighted results) will be described, followed by any significant differences in results among the individual counties, followed by key contrasts with results from previous years. Conclusions are based on results of univariate, bivariate, and multivariate statistical analyses.

There is always more than one way of analyzing data and drawing conclusions. Our analysis, this year as in the past, has been to take a multidimensional, exploratory approach by examining and presenting different ways of using different methods for measuring the effectiveness of the program. So, for example, if it were found that a higher percentage of respondents drove less on Spare the Air days than on Control days, this could be considered a measure of the success of the program. However, it could also be argued that any respondents who drove less on Spare the Air days should also have done so purposely in order for the program to have been considered effective; that is; they should have said that the reason for driving less was to reduce air pollution. This is a more stringent criterion, and the percentage of respondents who reduced driving on Spare the Air days would be less than in the previous analysis. Both types of analyses are included in this report. We show ranges of estimated emission reductions based on different measurements, including comparisons of the number of times respondents entered their cars. Other types of analyses are also included in this report, including a number of ways of measuring awareness of the program – that is, how many respondents “knew” about Spare the Air. The reader is therefore provided with a more complete picture about the overall effectiveness of the program than if only one or two measures of success were used.

## OVERALL AWARENESS OF SPARE THE AIR CAMPAIGN 2002

### Comparison of Two Questions for Measuring Awareness

#### Regional Results

- I ➤ Awareness of Spare the Air was significantly higher when the new ARB proposed question (67%) was used than when the original question was used (40%). This was so despite the order in which the questions were heard.*

This year, in addition to the original question<sup>26</sup> used to measure awareness of the Spare the Air program, an additional question proposed by the Air Resources Board (ARB) was also included<sup>27</sup>. The two questions were asked in rotated order, and each respondent answered both questions. It was felt that the information derived from such a test would be useful in terms of providing another perspective with additional data to bring to the ongoing discussions with the ARB concerning the best ways of estimating emission reduction on Spare the Air days.

Chi-square analyses were first run to determine whether there was an order effect – that is, were responses to the second-heard question affected by which question came first? Results indicated that there were in fact no effects due to the order of presentation: the 68% of respondents interviewed following Spare the Air days who responded affirmatively when the ARB proposed question was asked first did not differ significantly from the 65% of respondents who responded affirmatively when it was asked second. Similarly, the 41% of respondents who responded affirmatively when asked the original question was asked first, did not differ significantly from the 40% who responded affirmatively when it was asked second.

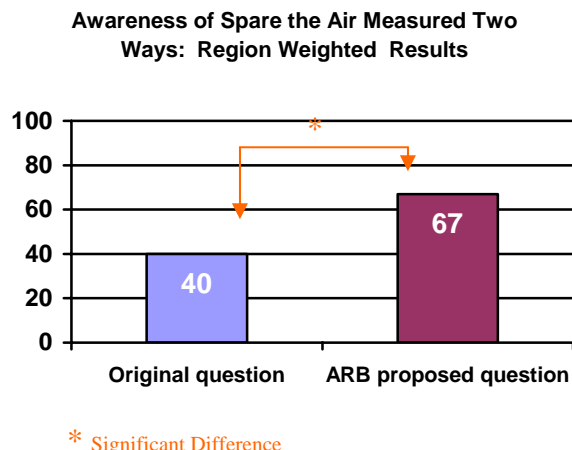
Tests of proportion indicated that there were significant differences in awareness of Spare the Air, depending on which question was asked. Results for the

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<sup>26</sup> The wording of the original question was: "Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?"

<sup>27</sup> The wording of the ARB proposed question was: "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?"

weighted region as a whole are presented in the next chart<sup>28</sup>. It can be seen that 40% of respondents interviewed following Spare the Air days were aware of Spare the Air when the original question was asked and yet 67% of the same respondents were aware of Spare the Air when the ARB proposed question was asked.



### Individual Counties

- 2 ➤ *Within each of the counties, awareness of Spare the Air was also significantly higher when the ARB proposed question was used than when the original question was used. Awareness in Sacramento and Placer Counties was significantly higher than awareness in Yolo/Solano County.*

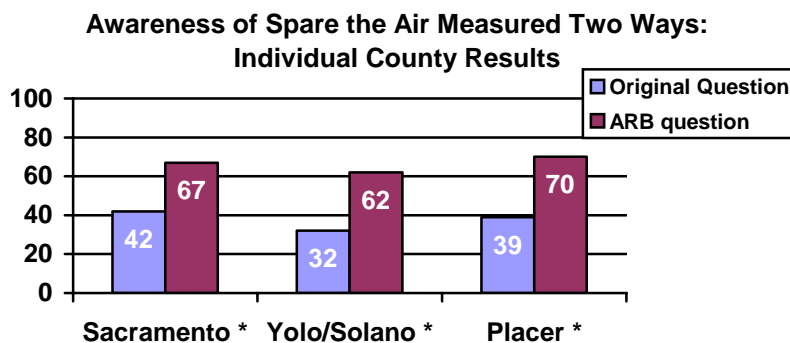
This next graph shows the percentage of respondents who answered affirmatively to the two Spare the Air awareness questions. It can be seen, first of all, that awareness measured with the new ARB proposed question was significantly higher than awareness measured with the original question, in all three counties.

Secondly, awareness in Sacramento and Placer Counties, measured using either question was significantly higher than in Yolo/Solano County. So, for example, using the original question, 42% of Sacramento County respondents and 39% of Placer County respondents were aware of Spare the Air. These percentages were significantly higher than the 32% of respondents in Yolo/Solano County

<sup>28</sup> For this analysis, responses of Undecided/Don't know were excluded.  
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who answered affirmatively. It is interesting that awareness of the Spare the Air program was greater in the two counties within the Sacramento basin that experienced greater numbers of federal exceedences<sup>29</sup>.

Awareness measured with the new ARB question followed the same pattern: the 70% of Placer County respondents and 67% of Sacramento County respondents was significantly higher than the 62% of Yolo/Solano County respondents who were aware of Spare the Air.



\* Significant Difference between original and ARB question

## Spare the Air Awareness (Original Question)

### Regional Results

- 3 ➤ Awareness of Spare the Air (measured with the original question) was significantly higher this season (40%) than last season (27%). For the region as a whole, this means that **over 700,000 residents** heard the requests for reduced driving on an average Spare the Air day, up from just under half a million last year.

For the 2002 season, when the original question was used to measure Spare the Air awareness, 40% of respondents in the region said they had heard the request for reducing driving. Translated into population estimates for the Sacramento region as a whole<sup>30</sup>, this means that approximately 707,500 residents were

<sup>29</sup> It will be recalled that there were 28 violations of the federal 8-hour standard in Sacramento County, 31 in Placer County, and only 4 in Yolo/Solano County.

<sup>30</sup> Estimated city and county population 2002 figures were obtained from the California Department of Finance and were based on 2000 Census data: "State of California, Department of Finance, E-1 Report 2002: City/County/State Population Estimates, with Annual Percent Change, January 1, 2001 and 2002. Sacramento, California". Website: ([www.dof.ca.gov/HTML/DEMOGRAP/e-1table.xls](http://www.dof.ca.gov/HTML/DEMOGRAP/e-1table.xls)). For air quality purposes, the Sacramento region consists of: 100% of Sacramento County; 75% of Placer County; 100% of Yolo County; and from Solano County, the cities of Dixon, Rio Vista, & Vacaville. The estimated population for the Sacramento region is therefore 1,768,675 (Sacramento County: 1,279,900 + Placer County: 198,675 + Yolo-Solano: 290,100.)

aware of the Spare the Air alerts<sup>31</sup>.

Taking the sampling margin of error into account (+/- 3.2%) this means that had we interviewed all Sacramento region residents, we could expect (with 95% confidence) that the actual percentage of residents who were aware of the 2002 Spare the Air campaign would lie somewhere between 36.8% and 43.2%. Translated into population estimates of the Sacramento region, this means that between 650,872 and 764,068 residents were aware of the Spare the Air alerts.

**Individual Counties**

- 4 ➤ *About four in ten respondents in Sacramento and Placer Counties were aware of the Spare the Air message (as measured with the original question.) In Yolo/Solano, about three in ten respondents were aware.*

For the 2002 season, when the original question was used to measure Spare the Air awareness, 42% of respondents in Sacramento County, 39% in Placer County, and 32% in Yolo/Solano County said they had heard the request for reducing driving. Translated into population estimates for the counties, and taking the margins of error into account, the next table indicates the estimated possible numbers of residents who were aware of the Spare the Air alerts in 2002.

<i>Original STA question</i>	<i>Percent Aware of STA (number of STA interviews)</i>	<i>Affiliated Margin of Error</i>	<i>Estimated Range of Number of Residents Aware of STA</i>
<b>Sacramento County</b>	42% (n = 608)	+/- 3.9 %	487,641 – 587,474
<b>Yolo-Solano County</b>	32% (n = 600)	+/- 3.7%	82,098 – 103,566
<b>Placer County</b>	39% (n = 501)	+/- 4.3%	68,940 – 86,026

**Comparison with Previous Years**

- 5 ➤ *It appears that the poor air quality experienced in the region during this past summer contributed to a greater awareness of the Spare the Air program and health-related issues. Significantly more respondents in all three counties were*

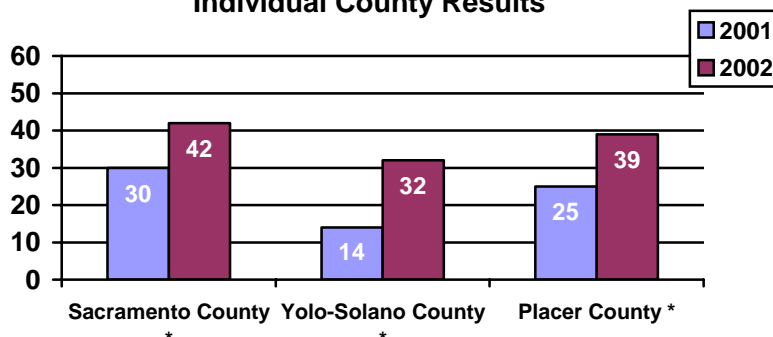
<sup>31</sup> It should be noted that these population estimates probably overestimate awareness as they include children. The same exercise performed on households indicated that approximately **257,520** households in the region were aware of the campaign. The measure used for households was the number of occupied housing units. Reference: State of California, Department of Finance, City/County Population and Housing Estimates, Official State Estimated January 2002. Sacramento, California. Available online at: [www.dof.ca.gov/HTML/DEMOGRAP/e5a.xls](http://www.dof.ca.gov/HTML/DEMOGRAP/e5a.xls) The estimated number of households for the entire Sacramento region air quality basin is 643,801 (Sacramento County: 468,674 + Placer County: 76,677 + Yolo-Solano:

aware of Spare the Air this year compared to last year.

### Comparison With Last Year: All Counties

The percentage of respondents who were aware of Spare the Air in each of the three counties (using the original question) was significantly higher this past summer than during last year's season. It can be seen in the next graph that in Sacramento County, Spare the Air awareness increased from 30% in 2001 to 42% this year. In Yolo/Solano, awareness increased from 14% to 32% this year; and in Placer County awareness increased from 25% in 2001 to 39% this past summer.

**Awareness of Spare the Air (original question):  
Comparison between 2001 and 2002 seasons-  
Individual County Results**



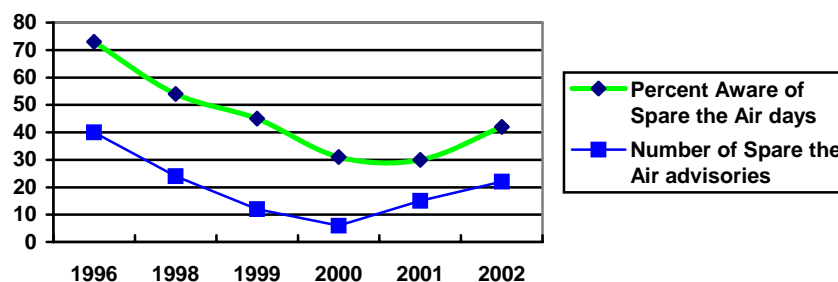
\* Significant Difference between 2001 and 2002 percentage.

### Comparison With Previous Years: Sacramento County Only

- 6 ➤ Awareness of Spare the Air in Sacramento County this year is the highest it has been since the late nineties. Once again, it appears that it has taken a poor air quality summer to make residents sensitive to the issue of a clean air environment and how they can contribute to it through driving reduction.

The next graph plots the measured awareness of Spare the Air (original question) in Sacramento County since 1996 as well as the number of Spare the Air advisories issued each year. (It should be remembered that the criterion for issuing a Spare the Air advisory changed in both 1999 and 2001, and so this line should be treated with caution.) It can be seen that the downward trend of awareness was broken this year and awareness of Spare the Air has increased significantly. It would appear that the general population has become more aware (or concerned) about air quality issues, perhaps largely because of this season's smog. The number of Spare the Air alerts increased to 22 from the 15 that were issued during the 2001 season.

Sacramento County: Year by Year Comparison of Spare the Air Awareness and Number of Advisories



## Spare the Air Awareness and July-August Multi-day Episodes

### Regional Results

- 7 ➤ For the region as a whole, awareness of Spare the Air days was significantly higher in August than in July. In fact, nearly half of all respondents in the region were aware of Spare the Air in August.

It will be recalled that there was a prolonged Spare the Air episode that occurred this summer in August: alerts were issued every day between August 9 and August 16, eight consecutive days in a row. A chi-square analysis comparing awareness of Spare the Air (using the original question) between July and August indicated that significantly more residents were aware in August (46%) than in July (36%). It was also clear that the August episodes created more health problems: significantly more respondents in August (18%) than in July (12%) said that they or members of their household had trouble breathing on Spare the Air days because of unhealthy air. (The household health problems will be covered in more detail later in this report.)

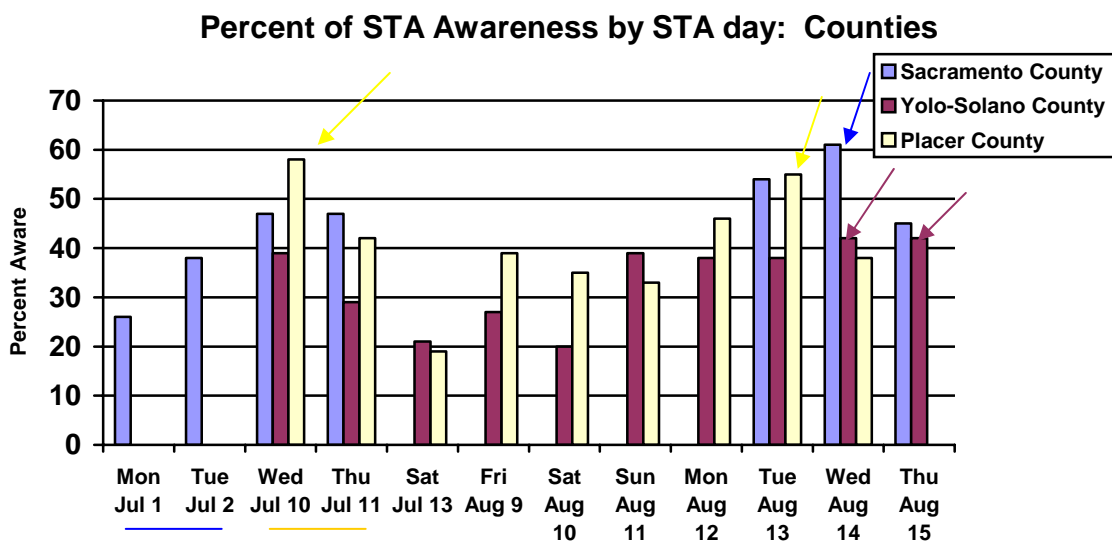
### Individual Counties

- 8 ➤ During the two-day mid-July episode, awareness of Spare the Air was highest after the first day in both Yolo/Solano and Placer Counties, and the same on both days in Sacramento County. During the eight-day episode in mid-August, awareness "peaked" on the sixth day (August 14) for respondents in Sacramento and Yolo/Solano Counties, and peaked on the fifth day (August 13) for respondents in Placer County.

This year there were two two-day Spare the Air episodes in July and a

prolonged multi-day episode in August. However, interviewing was not conducted in every county after every alert day (see interviewing schedule in the introduction), and so the analysis of awareness on two-day versus multi-day episodes is limited. Results of awareness from interviews conducted after Spare the Air days for each county are presented in the next graph.

It can be seen, first of all, that for Sacramento County, awareness during the two-day episode in mid-July was high on both days (47%), and also that awareness "peaked" (was highest) near the end of the multi-day August episode (61% on August 14.) For Yolo/Solano, awareness was higher on the first day of the July two-day episode (39%), and awareness peaked near the end of the August episode (42%). Results in Placer County indicated that the highest levels of awareness occurred on the first day of the two-day July episode (58%) and also near the end of the August episode (55% on August 13).

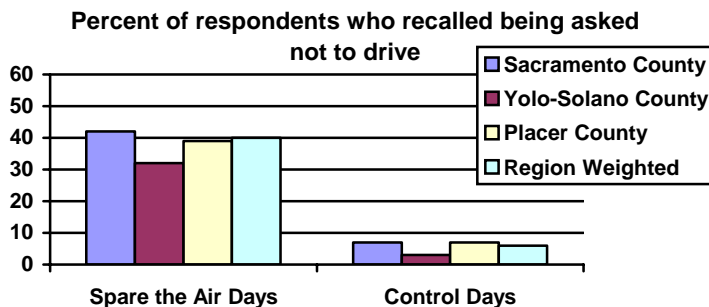


\* Note: Interviews were not conducted on all days. Underlined days indicate multi-day STA episodes.

## Spare the Air Days vs Control Days

- 9 ➤ *The Spare the Air message is effective in reaching drivers: significantly more respondents recalled being asked not to drive on Spare the Air days than on Control days.*

Significantly more respondents in all counties and the region as a whole remembered being asked not to drive on Spare the Air days than on Control days. This indicates that, as in past years, the program is effective in reaching drivers on the specific alert days. Results are presented in the graph below.



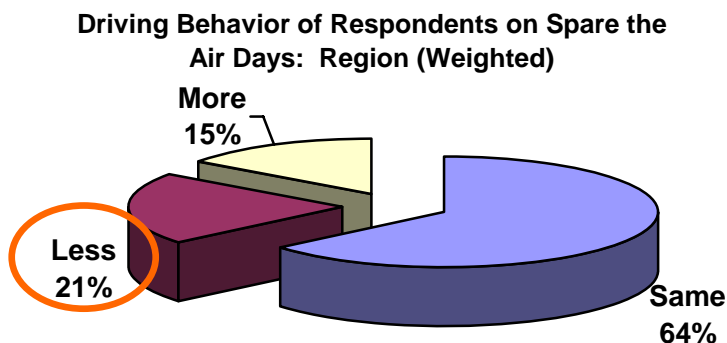
## BEHAVIORAL CHANGE: DRIVING

### Overall Reduction in Driving

#### The Region

- 10 ➤ *Just over one-in-five (21%) respondents in the region as a whole drove less on Spare the Air days.*

Respondents were asked: “Yesterday, did you drive your car, truck or van the same, more, or less frequently than you normally do on a [day of the week]?” Results from respondents interviewed following a Spare the Air day for the Sacramento region as a whole are presented in the next pie chart.

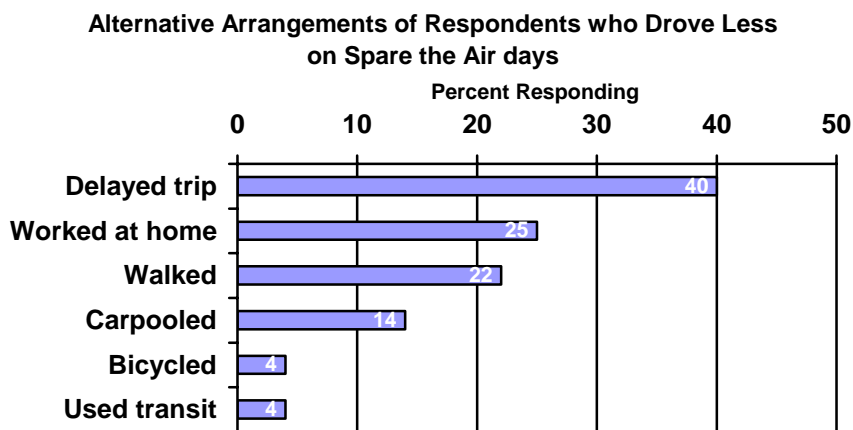


It can be seen, first of all, that the majority of respondents (64%) did not change their driving behavior the previous day. In terms of the percentage who drove “less”, it can be seen that 21% of respondents in the region reduced their driving and 15% said they drove “more.” These percentages are similar last year’s results.

#### *Alternatives to Driving*

- 11 ➤ *Respondents who drove less delayed their trips to another day, worked at home instead of driving to work, or walked instead.*

The 21% of all respondents who said they drove less the previous day were asked a series of questions about what they did instead of driving. Results for the weighted Sacramento region air quality basin are presented in the next graph. It can be seen that delaying trips was the most common explanation, with 40% of these respondents saying they avoided driving by postponing the trips to another day. About a quarter were able to work at home instead, and just over a fifth walked instead of driving. Using transit is still not a popular alternative: for the past three years it has been the least frequently-mentioned alternative, and only 4% of regional respondents used this as an alternative to driving<sup>32</sup>.



*Self-Reported Driving Trips*

- 12 ➤ *Self-reported trip reduction estimates are consistent with self-reported driving behavior: respondents who said they drove “less” the previous day also reported significantly fewer trips than those who drove the “same” or “more”.*

The very first question of the survey asked of respondents was to estimate how many different **times** they entered a vehicle the previous day. Therefore, answers to this question were not influenced by any subsequent questions having to do with air quality or awareness of reduced driving notification.

Separate analyses of variance were conducted, first with Spare the Air respondents and then with Control respondents. The mean number of times respondents said they entered their cars was compared with their responses as to whether they said they drove the “same”, “less”, or “more” the previous day. Results indicated that respondents actually did what they say they did (insofar as

<sup>32</sup> Although the percentage of respondents who substituted driving with using public transit was very small on a regional basis, a report from Unitrans, the public transit provider that serves Davis and the UC Davis campus indicated that the free service offered on Spare the Air days “was quite successful in attracting people to transit service who are not regular riders”: Document titled “Unitrans Spare-the-Air Program Summer 2002” ,written by A. Palmere, and sent to J. Lamare on October 29, 2002. In light of this, a separate analysis of Davis-only respondents was conducted, and although the total number of drivers who said they drove less was small (n=26), of these 26 drivers, 4, or 15% said they used public transit instead of driving. This finding lends support to the Unitrans report and suggests that this program, and others like it, should continue.

both measures are still self-reports, they are nevertheless consistent.) In other words, drivers who said they drove less reported making statistically significantly<sup>33</sup> fewer trips than drivers who said they drove more. Results for the Sacramento region air quality basin as a whole are presented in the next table.

**Mean number of Driving Trips for Respondents in Sacramento Region Air Quality Basin**

	Spare the Air		Control	
	Mean number of times entered car yesterday	# of Respondents	Mean number of times entered car yesterday	# of Respondents
Drove "less" yesterday	2.29	181	2.34	94
Drove "same" yesterday	3.62	538	3.95	373
Drove "more" yesterday	5.43	127	4.58	94
<b>Total</b>	<b>3.61</b>	<b>846</b>	<b>3.78</b>	<b>562</b>

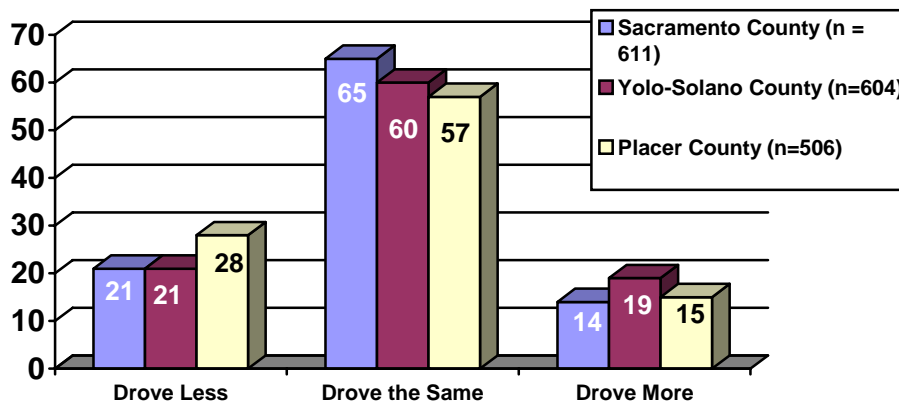
Individual Counties

- 13 ➤ Significantly more drivers in Placer County said they drove "less" on Spare the Air days than in Sacramento or Yolo/Solano counties.

The table that follows indicates the results from each of the individual counties. It can be seen that 21% of drivers in both Sacramento and Yolo/Solano counties drove "less" on Spare the Air days. This was significantly less than the 28% of drivers in Placer county who drove less.

<sup>33</sup> For these analyses, responses of don't/know were excluded. For weighted regional STA respondents: F=15.55, p<.001. The mean number of trips for those who drove less (2.29) was significantly different from the two other means (3.62 (same) as well as 5.43 (more). For Control respondents: F=8.16, p<.001. The mean number trips for those who drove less was significantly lower than the other two means.

**Driving Behavior of Respondents on Spare the Air Days:  
 Individual Counties**

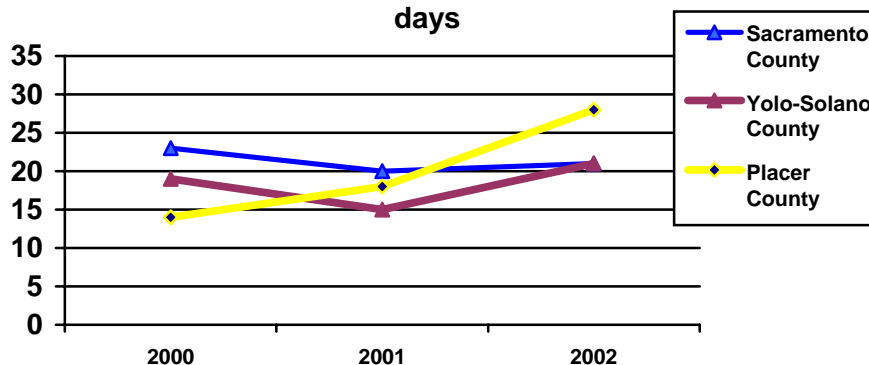


Comparison with Previous Years

- 14 ➤ Reported driving reduction was up in two counties, compared to last year. Significantly more drivers in both Yolo/Solano and Placer counties said they drove "less" on Spare the Air days in 2002 than in 2001.

The next graph plots the percentage of drivers from each county who drove "less" in the past three years. Driving reduction in Yolo/Solano is up this year from last year, but is about the same as in 2000. Placer county drivers showed significant increases in driving reduction this year, compared to both 2000 and 2001. The percentage of Sacramento county drivers has remained relatively stable over the years. (Because of the influence of the larger population in Sacramento county, results for the weighted region as a whole also did not show changes in driving behavior from one year to the next.)

**Year-by-Year Comparison of Percent of  
 respondents who drove "less" on Spare the Air  
 days**



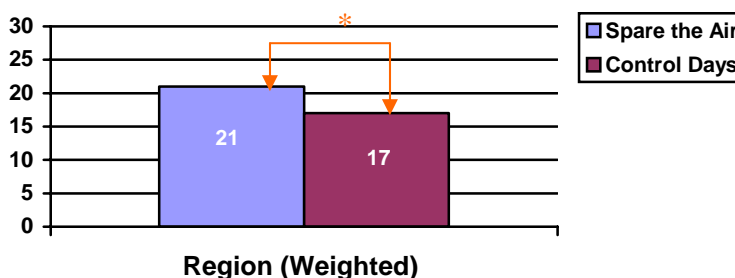
## Spare the Air vs Control Day Driving

### The Region

- 15 ➤ Significantly more drivers said they drove "less" following STA days than on Control days in the region as a whole. This indicates that the campaign this year was successful in terms of reducing self-reported driving.

Another way of evaluating the success of the Spare the Air campaign has been to determine if there was a reduction in driving on Spare the Air days, relative to Control days. The same question as presented in the previous section was also asked of respondents on Control days. Results for the region are presented in the next graph. It can be seen that 21% of respondents said they drove "less" on Spare the Air days compared with 17% of respondents who drove less on Control days. This difference is statistically significant and indicates that the 2002 campaign was successful in terms of reducing driving in the region as a whole, at least as far as this self-reported measure is concerned.

Reduced Driving Behavior of Respondents on Spare the Air versus Control Days: Percent who Drove "Less" the Previous Day: Regional Results



\* = Significant difference

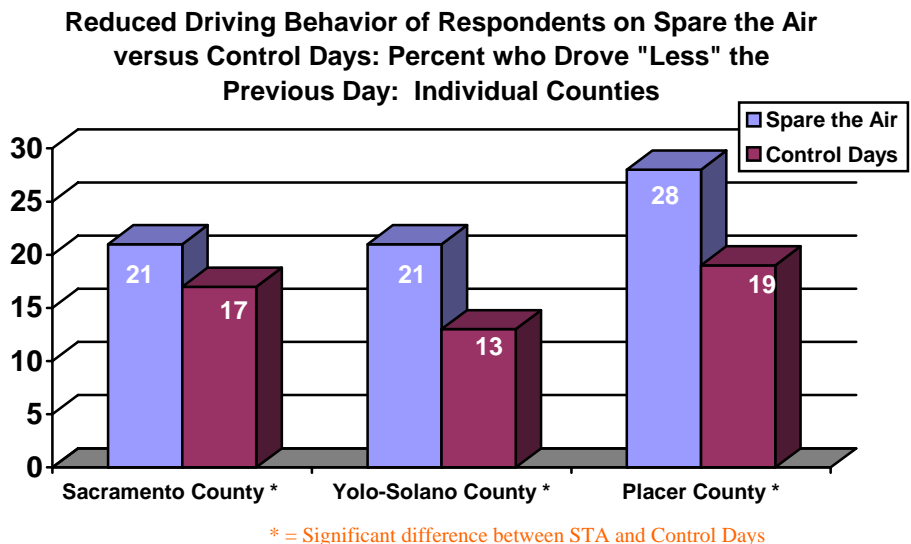
### Individual Counties

- 16 ➤ Significantly more drivers said they drove "less" following STA days than on Control days in each of the counties as well.

The graph that follows indicates the percentage of drivers in each of the counties who said they drove "less" the day before on both Spare the Air and Control days. It can be seen that 21% of respondents in Sacramento County drove less on Spare the Air days compared with 17% of those on Control days who drove less<sup>34</sup>. There was a greater difference among Yolo/Solano County respondents: 21% drove less on STA days, compared with only 13% on Control

<sup>34</sup> This difference is statistically significant, using a one-tailed test.  
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days; and the largest difference occurred in Placer County where 28% of respondents said they drove less on STA days compared with 19% on Control days. These differences are statistically significant<sup>35</sup>. Once again, would appear that the campaign was successful in reducing self-reported driving in the individual counties.



### Comparison with Previous Years

- 17 ➤ *This year's season appears to have promoted driving reduction more than in the past, particularly in the counties surrounding Sacramento.*

In the past two seasons (2000 and 2001), the only significant difference between STA and Control days in terms of the percentage of respondents who said they drove "less" occurred in Sacramento County<sup>36</sup>. This year, all counties showed significant differences. In other words, it would appear that the severity of the summer of 2002 in terms of the number of days of poor air quality influenced self-reported driving reduction on a regional basis.

<sup>35</sup> In order to see whether these differences in driving behavior were mainly due to the exceptional multi-day episode in August, a separate analysis was conducted to see if the same differences existed between Spare the Air and Control days, using only July Spare the Air interviews. Results indicated that significant differences existed between Spare the Air (July only) and Control days in the region as a whole (22% vs 17%), in Yolo/Solano (24% vs 13%), and in Placer Counties (30% vs 19%). The difference in Sacramento County approached, but was not significant (20% vs 17%). In general, then, it can be said that significantly more drivers reported driving less on Spare the Air days than on Control days, and that this was not simply due to the prolonged August episode of poor air quality, as these differences generally were found even in July.

<sup>36</sup> The weighted region also showed a significant difference, but this was due to the influence of Sacramento County.

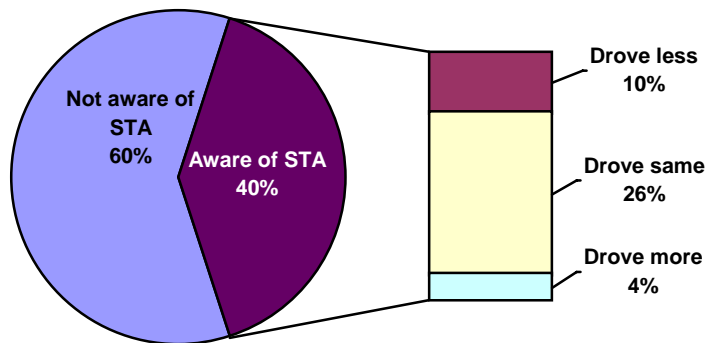
## Driving Reduction and Spare the Air Awareness (calculated two ways)

### The Region

- 18 ➤ *Over a quarter of those respondents who were aware of being asked to reduce their driving (using the original question) said they drove less. This represents only 10% of the total number of respondents interviewed following Spare the Air days, and while this is a significant increase from last year, it still indicates that it will take more than making people aware of poor air quality days to get the majority to change their behavior and reduce their driving.*

For the region as a whole, 10% of the total number of respondents interviewed after Spare the Air days said they drove "less" the previous day and also knew it was a Spare the Air day<sup>37</sup> (in response to the original question used to measure awareness<sup>38</sup>). [This is up significantly from last year, when only 5% of all respondents drove less and were aware.] Results are presented in the next pie chart. This means that over a quarter (26%) of the 40% of respondents who said they were **aware** that the previous day was a Spare the Air day, claimed to have driven **less** the previous day.

**Regional Results: Awareness (Original Question)  
and self-reported driving behavior**



- 19 ➤ *When Spare the Air awareness was measured using the new ARB question, there was a higher percentage of drivers (15%) who claimed to have driven less and*

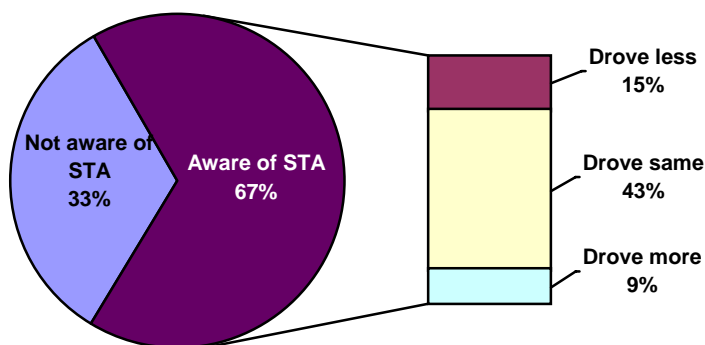
<sup>37</sup> Responses of Undecided/Don't Know were excluded from this analysis.

<sup>38</sup> It will be recalled that the original awareness question was worded: "Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?"

were aware of STA. This represents approximately 174,300<sup>39</sup> drivers in the Sacramento region as a whole who reduced driving.

When awareness of the Spare the Air program was calculated using the new ARB question<sup>40</sup> tested this year, the percentage of all respondents who were aware of Spare the Air **and** said they drove less increased to 15% (as compared with 10% when the original awareness question was used.) Results are presented in the next pie chart.

**Regional Results: Awareness (ARB Question) and self-reported driving behavior**



The 312 respondents from the weighted Sacramento region who were aware that the previous day was a Spare the Air day (answering in the affirmative to either awareness question) but said they drove the “same” or “more” were asked: “What is the main reason why you did not reduce driving yesterday to help reduce air pollution?” Among those who gave reasons<sup>41</sup>, the vast majority (86%) said they simply “could not reduce” their driving. A few other comments included:

- “I didn't know about it until I heard it on the radio just a block from where I was going.
- I had to go to church.
- I don't have anybody else to car pool with.
- I was lazy. I could have ridden my bike, but it was too hot. And for fear of breathing in the air. Mainly because it was hot.

<sup>39</sup> The number of drivers in the Sacramento region for 2002 was estimated, using the numbers of licensed drivers from 1999 statistics, available in 2001 from the California Highway Patrol database at <http://www.chp.ca.gov/pdf/99-8b-8m.pdf>, and calculating the percentage increase, based on county population figure increases from 1999 to 2002 (2000 US Census). The estimated number of licensed drivers for the total Sacramento region was 1,161,783: Sacramento County: total 826,049 + Placer County: 205,065 \* 75% for Air Quality district = 153,799; Yolo-Solano: total of 181,935 (114,188 in Yolo + 67,747 in Solano.)

<sup>40</sup> The wording of the ARB question was: “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?”

<sup>41</sup> Responses of Refusal, Don't Remember, or Don't Know are excluded from this analysis.

- My son was at camp, my sister doesn't have a car, my daughter was at work, and my other son had football practice, which we do car pool for.
- My son has asthma, so we could not bike.
- I wasn't interested.
- Because public transportation stinks.
- Wasn't in the front of my mind."

### Individual Counties

**20** ➤ *The percentage of drivers in the individual counties who were both aware of Spare the Air and who claimed to have reduced their driving the previous day varied according to how awareness was calculated. Regardless of how awareness was calculated, however, the percentage of aware reducers was highest in Placer County, the county that also experienced the greatest number of exceedence days. In Placer County, between **20,000 and 32,000** drivers were estimated to have driven less the previous day and have been aware that it was a Spare the Air day.*

*In Sacramento County, either 10% or 14% of all respondents were aware of Spare the Air and reported driving less on Spare the Air days, depending on how awareness was calculated. In Yolo/Solano, the corresponding percentages were either 9% or 15%, and in Placer County, either 13% or 21% of all respondents were aware of Spare the Air and claimed to have driven less the previous day.*

The table that follows summarizes the percentage of all respondents interviewed following Spare the Air days who were aware of STA (both methods) and who said they drove less the previous day, for each individual county. Also included in the table is the estimated number of drivers represented by these percentages. So, for example, in Sacramento County, the 10% of all respondents who were both aware of Spare the Air (calculated from responses to the original question) and who said they drove less the previous day represents approximately **82,600 drivers**<sup>42</sup> in Sacramento County. When awareness is calculated using responses to the ARB question, the estimated number of drivers who reduced driving and were aware of STA increases to about **115,600**.

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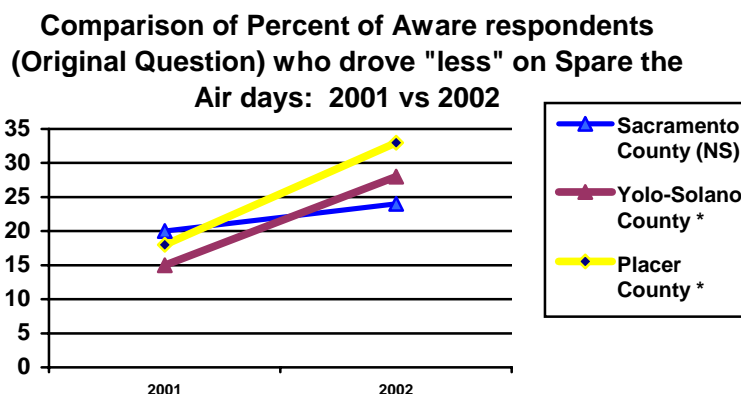
<sup>42</sup> The number of drivers in the Sacramento region for 2002 was estimated, using the numbers of licensed drivers from 1999 statistics, available in 2001 from the California Highway Patrol database at <http://www.chp.ca.gov/pdf/99-8b-8m.pdf>, and calculating the percentage increase, based on county population figure increases from 1999 to 2002 (2000 US Census). The estimated number of licensed drivers for the total Sacramento region was 1,161,783: Sacramento County: total 826,049 + Placer County: 205,065 \* 75% for Air Quality district = 153,799; Yolo-Solano: total of 181,935 (114,188 in Yolo + 67,747 in Solano .)

	<i>Percent of Total Respondents Aware of STA (original question) and who drove "less" on STA days</i>	<i>Percent of Total Respondents Aware of STA (ARB question) and who drove "less" on STA days</i>	<i>Estimated Number of Drivers Aware of STA (original question) and Driving Less on STA days</i>	<i>Estimated Number of Drivers Aware of STA (ARB question) and Driving Less on STA days</i>
<i>Sacramento County</i>	<b>10%</b> (n = 63 / 608)	<b>14%</b> (n = 86 / 611)	82,604	115,647
<i>Yolo-Solano County</i>	<b>9%</b> (n = 54 / 600)	<b>15%</b> (n = 88 / 604)	16,374	27,290
<i>Placer County</i>	<b>13%</b> (n = 64 / 501)	<b>21%</b> (n = 105 / 503)	19,994	32,298

Comparison with Last Year

- 21 ➤ *Of the drivers who were aware that the previous day was a Spare the Air day, the percentage of those who said they drove less has significantly increased from last year in Placer County, Yolo County, and the region as a whole.*

Comparisons between this year's results and last year's indicate that, of the drivers who said they were aware that the previous day was a Spare the Air day (using the original question as the means of calculating awareness), the percentage of those who also said they drove less has increased. Results are presented in the next chart. It can be seen, for example, that in Placer County, the percentage of aware drivers who reduced driving increased from 18% in 2001 to 33% this year. Similarly in Yolo/Solano, the percentage increased significantly from 15% to 28% in 2002. In Sacramento County, although the percent also increased, it was not statistically significant.



\* = Significant difference. NS= Not significant

## Driving Reduction for Air Quality Reasons

### The Region

- 22 ➤ Only 3.3% of **all** respondent drivers specifically reported reducing driving for air quality reasons on Spare the Air days, up only one percent from last year. However, this nevertheless represents an increase of over **12,000 drivers**<sup>43</sup> in the area who specifically reported reduced driving on Spare the Air days for air quality reasons.

Regardless of whether or not drivers were aware of the advisories, another way of examining results is to see how many of the drivers interviewed following Spare the Air days that said they reduced their driving did so specifically because of air quality. In the Sacramento region as a whole, when the 21% of respondents who reduced were asked to explain why they drove less, 15% of these said it was due to air quality. This means that the percentage of drivers who reduced their driving on Spare the Air days for reasons having to do with air quality, relative to the total respondent base (and not just STA aware drivers) was even less: on a regional basis, only 3.3% (28/849) of all drivers reduced driving specifically for air quality reasons. Although higher than last year's percentage of 2.3% of all respondents, this still represents a relatively small percentage of all the drivers in the area.

Although the percentages are small, nevertheless in terms of actual estimated numbers of drivers and trips, this year's results of 3.3% actually translate into an estimated **38,300 drivers** in the area who met a tough test for reduced driving for reasons of air quality. These respondents claimed to have avoided an average of 3.91 single trips<sup>44</sup> the previous day, which, translated to the estimated number of drivers in the region, means that approximately **150,000 trips** were avoided on Spare the Air days, specifically for air quality reasons.

### Individual Counties

- 23 ➤ *There were no significant county differences in terms of the percentage of all drivers who drove less for air quality reasons on Spare the Air days.*

In Sacramento County, the percentage of all driver respondents who specifically drove less for air quality reasons on Spare the Air days was 2.9% (18/611); in Yolo-Solano, it was 4.1% (25/604), and in Placer County it was 4.3% (22/506). The vast majority of these drivers also knew the previous day was a Spare the Air day.

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<sup>43</sup> Approximately 26,000 drivers in 2001 were estimated to have reduced driving for air quality reasons: (2.3% of the 1,130,655 drivers in the region as a whole.) In 2002, the number is estimated to be approximately 38,300 (3.3% of the 1,161,783 drivers in the region (see footnote 41 for driver calculation reference). The difference between the two years is therefore about 12,300 additional drivers (38,300 - 26,000).

<sup>44</sup> Responses ranged from 1 to 20 single trips avoided, with a mean of 3.91, standard deviation of 3.81, and a median of 3.

### Comparison with Last Year

- 24 ➤ *Driving reduction for air quality reasons was up significantly from last year in both Yolo/Solano and Placer counties.*

Although the percentage of all drivers who reduced trips for air quality reasons in Sacramento County (and the region as a whole) was not significantly different from last year's results, significant increases were found in both Yolo/Solano and Placer counties. Last year less than 1% of all drivers (0.4%) in Yolo/Solano drove less for reasons of air quality. This year, 4.1% did. Similarly in Placer County, only 1.2% of all drivers reduced in 2001, compared with 4.3% this year.

### Summer Self-Reported Driving Reduction

- 25 ➤ *About four in ten respondents claimed that they usually reduced the amount of driving they did during the summer to avoid adding to air pollution.*

Forty-two percent of respondents interviewed after Spare the Air days claimed to reduce their own summertime driving in order to avoid adding to air pollution. About the same percentage (37%) of Control day respondents said they did as well. Although this is undoubtedly an overestimate of the percentage of drivers who actually do reduce driving, it is clear that many people try to reduce driving during hot weather. Other air quality related surveys previously conducted in the area support this idea<sup>45</sup>. For example, in the 2001 Cleaner Air Partnership Public Opinion Survey on Air Quality and Transportation Attitudes in the Sacramento Region, 50% of respondents felt a personal responsibility for changing their behavior in order to help improve air quality in Sacramento.<sup>46</sup>

### ESTIMATING EMISSIONS REDUCTION

#### The Region

- 26 ➤ *The Spare the Air program was successful in reducing air pollution in the Sacramento air basin region by an estimated 1.8 to 5.1 tons of ozone precursors per day. This is due specifically to residents driving less on Spare the Air days.*

In order to be consistent with past years' evaluations, the two methods used in the previous three years for estimating ozone precursor reductions were again

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<sup>45</sup> Cleaner Air Partnership 1999 Annual Report on Air Quality and Transportation Attitudes in the Sacramento Region. 1999. Judith Lamare, Ph.D. Cleaner Air Partnership.  
Cleaner Air Partnership 2000 Annual Report on Air Quality and Transportation Attitudes in the Sacramento Region. 2000. Judith Lamare, Ph.D. Cleaner Air Partnership.

<sup>46</sup> Cleaner Air Partnership 2001 Annual Report on Air Quality and Transportation Attitudes in the Sacramento Region. June 2002. Judith Lamare, Ph.D. Cleaner Air Partnership

calculated this year<sup>47</sup>.

### *Conservative Method*

The first and most conservative method for estimating emission reduction in the Sacramento region as a whole used the driving behavior of a specific subset of drivers, namely, those who not only drove less, but also drove less for air quality reasons.

1. The 3.3% of driver respondents in the region who said they drove less than normal on Spare the Air days for air quality reasons were asked to estimate the number of single<sup>48</sup> trips they reduced. The mean (average) number of single trips they avoided for air quality reasons on Spare the Air Days was 3.91, with a standard deviation of 3.81, a median of 3 and a mode of 2 trips. Answers ranged from 1 to 20 single trips avoided.
2. Extrapolated to the total number of drivers in the region<sup>49</sup>, the percentage of STA reducers therefore represents 38,339 drivers in the Sacramento region, and the number of single trips avoided was 149,905 (38,339 drivers x 3.91 trips avoided on average.)
3. The mean number of trips avoided by the .9% of respondents (five individuals) who drove less for air quality reasons on Control days was 1.34, with a standard deviation of .56. Answers ranged from 1 to 2 single trips avoided.
4. Extrapolated to the total number of drivers in the region, the percentage of Control day reducers therefore represents 10,456 drivers, with 14,011 trips avoided.
5. The number of trips avoided (assuming an average of five miles per trip<sup>50</sup>) was then multiplied by a per trip emission reduction average of 12.25 grams of ozone precursors (ARB estimate, EMFAC 7G. ROG and NOx combined, averaged over a five-year period from 1997-2001)<sup>51</sup>. This results in an estimated total of **2.02 tons** of pollutants reduced per Spare the Air day, and **.19 tons** reduced per Control day.

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<sup>47</sup> The ARB has used a different methodology and questionnaire to estimate ozone reductions, and has proposed a modified questionnaire be used in the future and a specific correction factor be applied to the reported number of trip reductions. (In future years, therefore, the current questionnaire used to measure awareness of Spare the Air and driving behavior may be modified. If so, it is obvious that comparisons with results from previous years will not be possible.) Extensive investigations and meetings with the ARB have been conducted comparing the two methodologies, and the general consensus has been that resulting ARB estimates of emission reductions are not dissimilar to the more conservative first method described in this report. In addition, an experimental pretest of the proposed questionnaire was conducted this past summer, supervised by the Cleaner Air Partnership, whereby 200 Spare the Air day interviews were conducted using the ARB questionnaire and an equal number were conducted on the same days, using the original questionnaire. Results will be forthcoming.

<sup>48</sup> This year the questionnaire was changed and drivers were asked how many single trips they avoided making. This was done in part to conform more to an ARB study which was conducted in 1999 and 2000 for the purposes of quantifying emission reductions. In the past, drivers were asked to estimate the number of round trips they avoided and we converted the round trips to single trips for the purposes of estimating emission reduction. The mean number of single trips avoided in Sacramento County this year was 4.5, which is not dissimilar from either last year's conversion (i.e. 2.4 round trips = 4.8 single trips), or the conversion in 2000 (i.e. 2 round trips = 4 single trips). In other words, results from this year indicate that in all years, respondents were listening to the wording of the question and responding appropriately.

<sup>49</sup> The number of drivers in the Sacramento region for 2002 was estimated, using the numbers of licensed drivers from 1999 statistics, available in 2001 from the California Highway Patrol database at <http://www.chp.ca.gov/pdf/99-8b-8m.pdf>, and calculating the percentage increase, based on county population figure increases from 1999 to 2002 (2000 US Census). The estimated number of licensed drivers for the total Sacramento region was 1,161,783: Sacramento County: total 826,049 + Placer County: 205,065 \* 75% for Air Quality district = 153,799; Yolo-Solano: total of 181,935 (114,188 in Yolo + 67,747 in Solano.)

<sup>50</sup> The five mile trip length is the length of the average home/other trip in the region, according to the SACOG 1991 Household survey.

<sup>51</sup> EMFAC 7G estimates were provided by Peter Christensen, SMAQMD.

6. Next, a correction factor is applied which subtracts the Control day air quality emission reduction from the Spare the Air day reduction. "The reasoning is that on Spare the Air days, there are reported emission reductions that would have occurred anyway, or that are reported incorrectly."<sup>52</sup> Subtracting the Control day reductions from the Spare the Air reductions thus provides a more accurate estimate for overall emission reductions on Spare the Air days.
7. The correction for the Control days is .19 tons of ozone precursors, which, when subtracted from the 2.02 tons reduced on Spare the Air days, leaves a balance of **1.83 tons** of ozone precursors reduced per Spare the Air day in 2002.
8. The ARB released new numbers<sup>53</sup> for calculating ROG and NOx emissions for vehicles, and the new EMFAC 2000 version 2.02 estimate for both ROG and NOx combined is 12.0 per trip<sup>54</sup>. Applying the new per trip emission figure results in **1.8 tons** of ozone precursors reduced per day.

The procedure described above is summarized in the following table:

**Emissions Reduction Estimate for 2002 in the Sacramento Region**

Sacramento Region	Percent of all drivers who drove less for Air Quality reasons	x Number of licensed drivers in Sacramento Region (1,161,783)	x Mean Number of single trips Reduced per day	x 12.25 grams of ozone precursor s per trip / 12.0 grams using EMFAC 2000 figures	= Estimated Tons <sup>55</sup> per day of ozone precursors reduced/ Estimated Tons using EMFAC 2000 figures
Spare the Air Days	3.3%	38,339	x 3.91= 149,905	1,836,336 grams/ 1,798,860 grams	2.02 tons/ 1.98 tons
Control Days	.9%	10,456	x 1.34 = 14,011	171,635 grams/ 168,132 grams	.19 tons/ .18 tons
<b>Estimated tons of ozone precursors reduced per day: (STA day reductions – Control day reductions)</b>					<b>1.83 tons/ 1.8 tons</b>

<sup>52</sup> "Evaluation of Participation in the Sacramento Air Basin 1999 'Spare the Air' Ozone Day Driving Reduction Program". 1999. Judith Lamare, Ph.D. , The Cleaner Air Partnership.

<sup>53</sup> "Methods to Find the Cost-Effectiveness of Funding Air Quality Projects." ARB, 2002.

<sup>54</sup> EMFAC 2000 figures provided by Peter Christensen, SMAQMD, in an e-mail to J. Lamare, dated June 6, 2002. ROG starting 2.422 g/trip end; ROG running .834 g/mi; NOx starting .920 g/trip end; NOx running .897 g/mi.

<sup>55</sup> There are 907,200 grams in a ton.

## Second Method

The second method of estimating ozone reduction was obtained by examining the number of different **times** all respondents in the Sacramento region as a whole said they got into a motor vehicle the previous day. The exact question wording was: "Thinking just about yesterday, how many different times did you get into a car, truck, or van to drive?" Results ranged from 0 to 35<sup>56</sup> for all the Spare the Air Day respondents, with a mean of 3.37 times; and between 0 and 30 times, with a mean of 3.7 for the Control respondents<sup>57</sup>. In other words, Control day drivers got into their vehicles 0.33 times more than did Spare the Air day drivers, and so made 383,388 more trips.<sup>58</sup> This number of trips produced either 5.2 tons of ozone precursors (using the older EMFAC 7G assumptions of 12.25 grams of ozone precursors per trip), or **5.1 tons** (using the newer EMFAC 2000 figures.)

Viewed another way, it can be said that an estimated **5.1 tons per day of pollutants** were reduced on Spare the Air days over Control days in the Sacramento region as a whole.

## Individual Counties

- 27 ➤ *In Sacramento County, air pollution was reduced by an estimated 1.3 to 3.4 tons of ozone precursors per Spare the Air day, specifically due to residents driving less. In Yolo/Solano, between .3 and .7 tons of ozone precursors were reduced and in Placer County, the estimates were .2 or 1.2 tons reduced. This is the first year in three years that emissions reductions have also been estimated for Yolo/Solano and Placer Counties as it is the first year that significantly more drivers on Spare the Air days said they drove "less" than on Control days in these counties.*

## Conservative Method

The next three tables summarize the emissions reductions estimates for each of the three counties separately.

### Emissions Reduction Estimate for 2002 in Sacramento County

<sup>56</sup> Responses of forty or more times were treated as outliers and excluded from this analysis. The rationale was as follows: according to SACOG's Travel Survey, the mean number of trips per person in Sacramento County is 3.7. The mean number of times reported by our Control day respondents should therefore be similar. If responses of 40 trips or more are deleted from the analysis, the mean number of trips reported in our data matches the SACOG data, namely, 3.7 trips. Using this as the base, any responses on Spare the Air interview days that 40 or more were also treated as outliers and were eliminated from this analysis.

<sup>57</sup> An analysis of variance that compared the two means indicated that this difference was almost, but not quite significant ( $F=2.68, p=.10$ ).

<sup>58</sup> Calculated on the basis of the total number of licensed drivers (1,161,783) multiplied by .33.

Sacramento County	Percent of all drivers who drove less for Air Quality reasons	x Number of licensed drivers in Sacramento County (826,049)	x Mean Number of single trips Reduced per day	x 12.25 grams of ozone precursor s per trip / 12.0 grams using EMFAC 2000 figures	= Estimated Tons per day of ozone precursors reduced/ Estimated Tons using EMFAC 2000 figures
Spare the Air Days	3%	24,335	x 4.5= 109,509	1,341,485 grams/ 1,314,107 grams	1.48 tons/ 1.45 tons
Control Days	1%	8,118	x 1.33 = 10,797	132,269 grams/ 129,570 grams	.15 tons/ .14 tons
Estimated tons of ozone precursors reduced per day: (STA day reductions – Control day reductions)					<b>1.33 tons/ 1.31 tons</b>

**Emissions Reduction Estimate for 2002 in Yolo/Solano County**

Yolo/Solano County	Percent of all drivers who drove less for Air Quality reasons	x Number of licensed drivers in Sacramento County (181,935)	x Mean Number of single trips Reduced per day	x 12.25 grams of ozone precursor s per trip / 12.0 grams using EMFAC 2000 figures	= Estimated Tons per day of ozone precursors reduced/ Estimated Tons using EMFAC 2000 figures
Spare the Air Days	4.14%	7,530	x 2.96= 22,290	273,053 grams/ 267,481 grams	.3 tons/ .29 tons
Control Days	.5%	866	x 1.5 = 1,300	15,919 grams/ 15,594 grams	.02 tons/ .02 tons
Estimated tons of ozone precursors reduced per day: (STA day reductions – Control day reductions)					<b>.28 tons/ .28 tons</b>

**Emissions Reduction Estimate for 2002 in Placer County**

Placer County	Percent of all drivers who drove less for Air Quality reasons	x Number of licensed drivers in Sacramento County (153,799)	x Mean Number of single trips Reduced per day	x 12.25 grams of ozone precursor s per trip / 12.0 grams using EMFAC 2000 figures	= Estimated Tons per day of ozone precursors reduced/ Estimated Tons using EMFAC 2000 figures
<b>Spare the Air Days</b>	<b>4.35%</b>	<b>6,687</b>	<b>x 2.64 = 17,653</b>	<b>216,255 grams/ 211,841 grams</b>	<b>.24 tons/ .23 tons</b>
<b>Control Days</b>	<b>.2%</b>	<b>374</b>	<b>x 1.0 = 374</b>	<b>4,584 grams/ 4,490 grams</b>	<b>.01 tons/ .00 tons</b>
<b>Estimated tons of ozone precursors reduced per day: (STA day reductions – Control day reductions)</b>					<b>.23 tons/ .23 tons</b>

*Second Method*

The second method for estimating emission reductions in all three counties is summarized in the next table. It will be recalled that this method uses the self-reported number of **times** drivers on both Spare the Air and Control days entered their vehicles. It can be seen that in all counties, Control day drivers said they entered their cars more times than did drivers interviewed following Spare the Air days.

**Less Conservative Method of Estimating Emissions Reduction: Number of Trips Reduced on Spare the Air Days relative to Control Days**

	<i>STA drivers: Mean # times entering car</i>	<i>Control drivers: Mean # times entering car</i>	<i>Difference ( Number of additional times Control drivers entered their cars)</i>	<i>Extrapolated # of additional trips made on Control days that were not made on STA days<sup>59</sup></i>	<i>Estimated Tons of Ozone Precursors reduced on STA days (original)</i>	<i>Estimated Tons of Ozone Precursors reduced on STA days (EMFAC 2000)</i>
<i>Sacramento</i>	3.41	3.72	.31	256,075	3.46	3.39
<i>Yolo/Solano</i>	3.42	3.70	.28	50,942	.69	.67
<i>Placer</i>	3.01	3.61	.60	92,279	1.25	1.22

<sup>59</sup> This figure is obtained by multiplying the difference in the preceding column by the number of drivers in each county.

## Comparison with Last Year

- 28 ➤ *Sacramento County was the only county where emission reductions were estimated last year. Using the conservative method for estimating, the estimated 1.3 tons of ozone precursors reduced per Spare the Air day this year is slightly less than the 1.6 tons reduced last year. This is due mainly to the Control day correction factor (which was zero last year as no Control drivers fit the criterion.)*

## HEALTH EFFECTS ON SPARE THE AIR DAYS

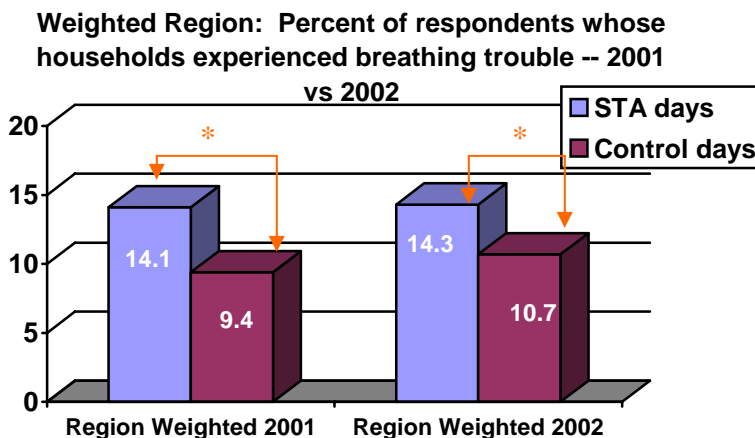
### The Region

- 29 ➤ *Approximately 14% of respondents in the Sacramento basin claimed health problems in their households on an average Spare the Air day, the same percentage as reported experiencing health problems last year. Extrapolated to the household population of the region as a whole, this means that approximately 96,000 households experienced breathing problems. The 14% was significantly more than the 11% of respondents who reported health problems on Control days. Correcting for control days, then, this means that approximately 24,000 additional households in the Sacramento basin experienced breathing problems during Spare the Air days specifically due to air pollution.*

Near the end of the survey respondents on both Spare the Air as well as Control days were asked: "Did you, or did anyone else in your household have trouble breathing yesterday because of unhealthy air?" It can be seen in the next chart that 14.3% of respondents in the region as a whole<sup>60</sup> said they had experienced breathing difficulties when interviewed on Spare the Air days, versus 10.7% of respondents who experienced problems on Control days. (This difference is statistically significant.) The results from both Spare the Air and Control days are similar to the percentages found in 2001.

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<sup>60</sup> Results are weighted for the region and exclude responses of "Undecided/Don't Know."  
MetaResearch Inc.



\* Statistically significant difference

### Correction for Control Day responses:

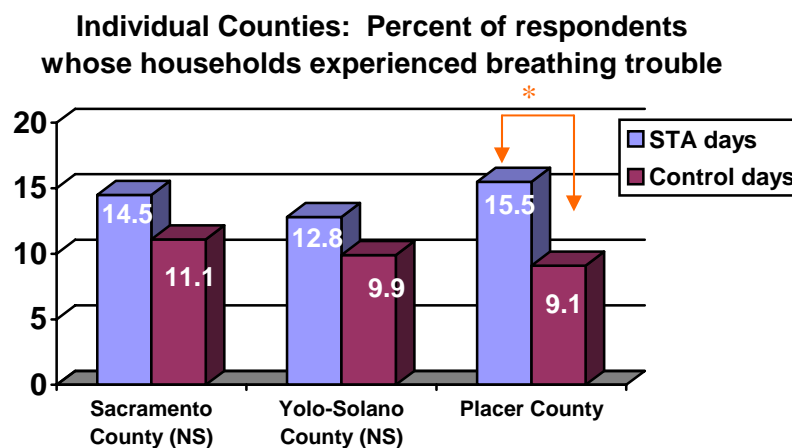
In order not to overestimate the health problems affiliated with Spare the Air days, a correction factor was applied whereby the Control day percentage of those who experienced health problems was subtracted from the Spare the Air day percentage. The resulting percentage was then used as the basis for estimating the actual number of households affected with breathing problems specifically from poor air quality on Spare the Air days. In this instance, in the Sacramento region as a whole, 3.6% more households reported breathing problems due to poor air quality on STA days than on non-STA days (14.3% - 10.7%). With 669,360 households in the Sacramento region<sup>61</sup>, an estimated **24,097** households were specifically affected on an average STA day because of the air pollution present.

### Individual Counties

- 30 ➤ *Placer County respondents experienced the greatest health problems (15.5%), and Yolo/Solano respondents the least (12.8%), although there was no statistically significant difference between the two percentages. The difference between STA and Control day reported health problems was significant in Placer County, and approached significance in Sacramento County. There was no difference between STA and Control day reporting of health problems in Yolo/Solano County, the county that also recorded the lowest number of ozone exceedence days during the season.*

<sup>61</sup> The measure used for households was the number of occupied housing units. Reference: Official State Estimates as of January 1, 2002. State of California, Department of Finance, City/County Population and Housing Estimates. Sacramento, California, 2000 and 2001, July 2001. Available online at: [www.dof.ca.gov/HTML/DEMOGRAP/e5a.xls](http://www.dof.ca.gov/HTML/DEMOGRAP/e5a.xls) The estimated number of households for the entire Sacramento region air quality basin is 669,360 (Sacramento County: 468,674 + Placer County: 102,236 + Yolo-Solano: 98,450).

The next graph shows the percentage of respondents who said their household experienced difficulty breathing on both Spare the Air and Control days, for each individual county. It can be seen, first of all, that the percentage of respondents experiencing household health problems on Spare the Air days was lowest in Yolo/Solano County at 12.8%, followed by Sacramento County at 14.5%, followed in turn by Placer County at 15.5%. Second, although the percentage of health problems reported on Spare the Air days was higher in all counties than the percentage reported on Control days, the difference was only significant in Placer County<sup>62</sup> (although the difference in Sacramento County approached significance.)



\* Statistically significant difference  
NS = Not significant

In terms of objective measures of ozone exceedence, it will be remembered that the eight-hour federal standard was violated on 31 days in Placer County, 28 days in Sacramento County, and on only 4 days in Yolo/Solano County. In other words, there is some support to indicate that in areas where objective exceedences are highest (Placer County), there is a corresponding subjective response indicating that people report experiencing more health problems on exceedence days than on control days. Similarly, the area with the lowest number of exceedence days (Yolo/Solano), did not show a significant difference between health problems reported on STA and non-STA days.

### Correction for Control Day responses:

In terms of estimating the number of households directly affected by air pollution, the same correction factor as was reported above was applied to the individual county results. So, for example, in Sacramento County, 3.4% more households reported breathing problems due to poor air quality on STA days than on non-STA days (14.5% - 11.1%). With 468,674 households in the

<sup>62</sup> In August in Placer County, the difference was even more dramatic: 17% of respondents reported household breathing problems on Spare the Air days in August, significantly higher than the 9.1% of Control day households.

County<sup>63</sup>, an estimated **15,935** households were specifically affected on an average STA day because of the air pollution present. These results and those for the other counties as well as the region as a whole are presented in the table that follows.

**Estimated Number of Households Affected by Air Pollution**

	<i>% of Households Affected (STA – Control)</i>	<i>Total Number of Households (2002 estimates from 2000 Census)</i>	<i>Estimated Number of Households Affected with Breathing Problems</i>
<i>Sacramento County</i>	3.4%	468,674	<b>15,935</b>
<i>Yolo-Solano County</i>	2.9%	98,450	<b>2,855</b>
<i>Placer County</i>	6.4%	102,236	<b>6,543</b>
<i>Total Region (weighted)</i>	3.6%	669,360	<b>24,097</b>

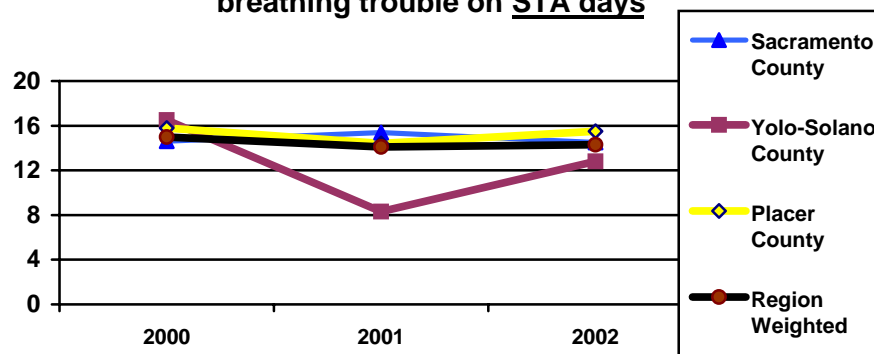
**Comparison with Previous Years**

- 31 ➤ *The percentage of households reporting breathing problems on Spare the Air days has remained relatively stable over the past three years, with the exception of Yolo/Solano County.*

The graph that follows plots the percentage of respondents within each county who reported household health problems during Spare the Air days. It can be seen that, with the exception of Yolo/Solano, the percentages within Sacramento, Placer counties, and the region as a whole have not differed much from one year to the next. (Yolo/Solano is the exception, in that fewer respondents in that county reported breathing difficulties last year than in the year preceding or following.) It can be seen, for example, that in Sacramento County, the percentage of respondents reporting breathing difficulties on STA days was about 15% in all three years, and for Placer County respondents, it was about 16%.

<sup>63</sup> The measure used for households was the number of occupied housing units. Reference: Official State Estimates as of January 1, 2002. State of California, Department of Finance, City/County Population and Housing Estimates. Sacramento, California, 2000 and 2001, July 2001. Available online at: [www.dof.ca.gov/HTML/DEMOGRAP/e5a.xls](http://www.dof.ca.gov/HTML/DEMOGRAP/e5a.xls) The estimated number of households for the entire Sacramento region air quality basin is 669,360 (Sacramento County: 468,674 + Placer County: 102,236 + Yolo-Solano: 98,450).

Year-by-Year Comparison of Percent of respondents whose households experienced breathing trouble on STA days



The ARB has found that the population exposed to peak unhealthy levels of ozone has fallen 70% since the early 90s. Ozone levels have been dropping and the peaks have been moving to foothill locations where the population is lower, and so fewer people in the region as a whole are exposed.

## Summary Conclusions

- ✓ It appears that it took a poor air quality season such as was experienced this summer to significantly affect the attitudes, awareness, and driving behavior of the general public. The 2002 season contained 22 Spare the Air advisory days, an increase from 15 days the summer before. The prolonged multi-day episode in August in particular was difficult to ignore.
- ✓ Significantly more respondents this year (40%) than last year (27%) were aware of the Spare the Air program, in terms of specifically recalling being asked not to drive.
- ✓ When an ARB-proposed question was used to measure Spare the Air awareness, it was found that an even higher percentage, that is, 67% of respondents had heard or seen the message that air quality in the region was poor.
- ✓ The program is effective in terms of outreach – the fact that four in ten respondents were aware of being asked not to drive indicates that the message is being heard by over **700,000** residents in the Sacramento region.
- ✓ Awareness was lowest in Yolo-Solano County, the county that also experienced the fewest number of exceedence days. Awareness was higher in both Sacramento and Placer Counties where a greater number of violations of both the federal 1-hour as well as 8-hour standards occurred.
- ✓ Significantly more respondents recalled being asked not to drive on Spare the Air days than on Control days.

- ✓ Significantly more drivers said they drove "less" following STA days than on Control days in the region as a whole, indicating another measure of the success of the campaign – self-reported driving reduction.
- ✓ Fifteen percent all respondents interviewed in the Sacramento region as a whole were aware of Spare the Air advisories (using the ARB-proposed question) and drove less on Spare the Air days. This represents approximately 175,000 drivers.
- ✓ The percentage of all drivers in the region who reported driving less for air quality reasons on Spare the Air days was up from last year, and although the actual percentage of 3.3 seems small, when extrapolated to estimate the number of drivers in the region, means that 38,000 drivers avoided making **150,000 trips** on Spare the Air days. At an average of 5 miles per trip, this represents over **three-quarters of a million** miles not driven.
- ✓ Respondents who said they drove less the previous day during the Spare the Air season delayed their trips to another day, worked at home instead of driving to work, or walked instead.
- ✓ The Spare the Air program was successful in reducing air pollution in the Sacramento region as a whole by an estimated **1.8 to 5.1 tons** of ozone precursors per day. This is due specifically to residents driving less on Spare the Air days.
- ✓ This was one of the best years for data collection, enabling much more extensive analysis.
- ✓ In conclusion, the Spare the Air program continues to have an impact on driver awareness and driving behavior, and the poor air quality season of the summer of 2002 brought air quality issues to the forefront for residents in the counties of the Sacramento air quality basin.

## Recommendations

- ✓ The criterion for issuing a Spare the Air advisory of an AQI of 151 should continue. Many days are needed to be able to sustain an impact on the public in general, and the driving public in particular.
- ✓ We should continue to include both questions measuring awareness of the Spare the Air program as the data generated are useful in discussions of estimating emission reductions.
- ✓ More effort still is needed towards developing ways of increasing actual driver participation, and not just awareness. Partnership efforts and public transit programs should continue.
- ✓ The Cleaner Air Partnership should consider including El Dorado County in its assessment of Spare the Air and estimates of health effects of Spare the Air day pollution.