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Dear Friends:

This letter transmits the 2003 Spare The Air Evaluation report, prepared for the Cleaner Air Partnership by Aurora Research Group of Sacramento, California. This report was funded by the air districts of the Sacramento Region, and provides valuable information about how the region's drivers respond to the campaign to reduce driving on poor air quality days.

#### Five Year Study

This study combines data from five years of evaluation (1999-2003). It provides a remarkable record of driver response to episodic pollution control. As we look ahead, can we expect people to change their habits in response to climate and weather? The interface of people, technology and meteorology is a challenging one. This study provides clues and raises questions.

#### The Health Standard and The Spare The Air Program

In the nine years since the Cleaner Air Partnership began systematic evaluation of a Sacramento region episodic driving reduction program, the federal health standard for air has changed. The episodic approach to driving reduction for air quality benefit was promoted by the Cleaner Air Partnership, beginning in 1988, in order to achieve the one hour ozone standard. The present deadline for that standard is 2005. Meanwhile a new healthy air goal has been established, the federal 8 hour ozone standard. In preparing plans to reach the 8 hour standard, the value of episodic driving reduction will again be evaluated in terms of its potential contribution.

#### Extension of Spare The Air Program to 2006

The Sacramento Area Council of Governments recently approved the extension of the regional Spare The Air program to be funded with federal transportation funds. The program is scheduled now to continue through the smog seasons of 2004, 2005 and 2006.

#### Links to Annual Cleaner Air Partnership Air Quality and Transportation Survey

The "Sacramento Region Air Quality Basin: 'Spare the Air' Campaign 2003 Evaluation" report stands alone as the definitive quantitative analysis of the campaign's impact. However, the Partnership's other annual survey typically provides additional information about the same issues from the same population. I recommend that you also read that report, available on our web site (<http://www.cleanerairpartnership.org>). For example, in 2003,

residents were asked about their sources of information and about whether they needed additional information about days with poor air quality. These findings help shape the program. The report also provides trend data on use of alternatives to driving by drivers that is relevant to the issue of whether Spare The Air is having an impact beyond episodic driving reduction.

Data from the Cleaner Air Partnership Air Quality and Transportation Survey tells us that 30 to 35 percent of the drivers in our region *say* they reduced trips on smoggy days during the summer to improve air quality. This pool has not changed in size since 1995. This pool likely contains the drivers who routinely drive less because of air quality and are never counted as Spare The Air reducers.

### **Is Spare The Air Participation a Moving Target?**

The Spare The Air evaluation report for 2003 is designed to measure only driving reduction directly attributable to the Spare The Air program. Those drivers who are voluntarily reducing driving on a regular basis to avoid air pollution do not count as “Spare the Air reducers,” since our methodology specifically asks whether the driver drove less than he or she usually does. Drivers who routinely cut back on their driving would typically answer “no” to the question whether they drove less. To the extent that drivers have a regular program of cutting back on driving during the summer smog season, their contributions to air quality go unrecognized in this evaluation.

The five-year study of Spare The Air behavior does not show growth in the proportion of drivers who are reducing driving on Spare The Air days. However, there is some evidence from the Cleaner Air Partnership 2003 Air Quality and Transportation Public Opinion Survey that more habitual driving reduction has occurred. This survey shows that drivers in the region, and especially in Sacramento County, have increased their use of modes other than driving since the Spare The Air program began in 1995 (though not for the usual commute trip). Notably, drivers reporting that they never use alternatives to driving when they could drive have decreased. Between 1995 and 1997, an average of 56 percent of the drivers said they never used alternatives. In the last three years, that number has averaged 44 percent. Similarly, those who said they used alternatives to driving more than twice a week increased from 12 percent in the mid nineties to 17 percent in the early 2000s, a small but statistically significant trend.

This suggests that Spare The Air may be a kind of entry level program for driving reduction or at least a motivational tool. Drivers are introduced to the idea of cutting back on driving on the worst air pollution days. They may then see benefits to changing modes for some trips that become habits. These are habits that help reduce air pollution, but are not counted as part of the Spare The Air program benefit.

In fact, if a Spare The Air driver becomes a regular driving reducer, he falls outside of the Spare The Air program. In that sense, the program’s objective can be a moving target.

Ideally, the program would continue to reach new participants and over time convert them from episodic reducers to seasonal reducers. If the program did operate this way, it could contribute to 8 hour ozone attainment as well as maintenance of the one hour ozone standard.

### **Cleaner Air Partnership Adds DriveLess Web Survey**

In 2003, the Cleaner Air Partnership, at the urging of the Sacramento Metropolitan Chamber of Commerce, added a web survey for the use of Spare The Air participants ([www.driveless.net](http://www.driveless.net)). Drivers interested in supporting the Spare The Air program were invited to register online. Each driver received a Spare The Air alert through the AirAlert system (<http://www.myAirAlert.net/>), a personalized air quality information service. The day following the Spare The Air day, participants received an email link to record the trips reduced (if any) on the previous day.

These data provided information about the individual variability of willing and aware participants' ability to make driving changes on short notice. This reminds us that on any given Spare The Air day, participation will be a portion of the willing, aware and able participants. The success of the program depends on a pool of participants which is larger than the number participating on an average day.

### **Unusual Findings in the 2003 Report**

There were a few unusual findings in the 2003 Spare The Air Evaluation Report that I will consider provisional until they are replicated.

*Weekend vs. Weekday Awareness.* First of all, the 2003 season had many more Friday Spare The Air days than any other prior season. This dramatically increased the number of weekend STA days, that is Friday, Saturday or Sunday Spare The Air days. For the period 1999-2002, for the region (weighted interviews), only 15 percent of the Spare The Air day interviews were conducted about weekend STA days. In 2003, nearly 30 percent were conducted about weekend STA days. For Sacramento County, the comparison is 10 percent (1990-2002) compared to nearly 30 percent. What was new in 2003 was that the awareness of Spare The Air did not differ significantly between weekend and weekday interviews. In every other year, there has been a difference, with weekend awareness significantly lower.

*Spare The Air 'Reducers' Trend Line Flat.* The analysis presented in the 2003 STA Evaluation report finds that Spare The Air participation, as measured by aware and purposeful reducers, has not varied significantly between 2000 and 2003. Since the data in the report did not include 1999, I wanted to make a note of it here. In 1999, one two-day episode was studied in Sacramento County only. Aware purposeful reducers in Sacramento County in 1999 were 3.1 percent of all drivers. Another 1 percent reduced trips without being aware that they were being asked to drive less on that day. The total of purposeful reducers in 1999 of 4.0 in Sacramento County can be compared to 1.6 percent in 2003. This looks like a downward shift and we will revisit this issue after the 2004 season.

Employees Whose Employers Inform Them About Spare The Air Are Not More Likely to Reduce Driving.

The California Air Resources Board in November 2002, reported (“Quantification Methods for Identifying Emission Reductions Resulting From Seasonal and Episodic Public Education Programs”) that “Survey respondents who report that their employer notifies them about poor air quality days are about 1.6 times more likely to report being STA reducers compared to employees whose employer does not notify them of poor air quality days.” The 2003 Cleaner Air Partnership Evaluation of the Spare The Air program did not find this relationship.

Difference in Driving Less Reported Between Spare The Air Days and Control Days No Longer Significant.

One of the most fascinating analyses provided by Aurora Research Group in the 2003 research report compares Sacramento County respondents’ reports of driving less between STA and Control days for the last four years (page 26). In 2000, there was an eleven percent difference in reported “driving less than usual” and in 2003, that difference had dropped to 3 percent and for the first time not statistically significant. Dr. Holobow notes that this may be an indicator that the Spare The Air program is losing potency.

One other thing to consider is that drivers in the summer of 2003 may have been driving less overall because of the increase in gasoline prices. Focus group interviews early in the year indicated that some drivers sensitive to gas prices were seeking carpool partners. Also the 2003 Cleaner Air Partnership Air Quality and Transportation Survey indicated that in Sacramento County specifically, pooling by drivers had increased compared to the prior five years. In 2003, 22.7 percent of all drivers reported they carpooled twice a week or more, compared to 18.5 percent of all drivers who said in the prior five years (1998-2002 average). Some drivers in 2003 may have been dampening travel compared with prior years because of higher gasoline prices. If so, that may have depressed the contrast in driving behavior between Spare The Air and other days.

- **Is the Analysis Sufficiently Subtle to Adequately Capture the Effects?**

In reviewing the results of the 2003 Evaluation Report submitted by Aurora Research a number of questions have been raised about the subtlety of our review.

For example, why not look at median trips rather than mean trips to measure impacts of Spare The Air Day versus Control Day trip making? It is true that the median number of trips reported is lower on Spare The Air Days than on Control Days. But the statistical procedures to test differences between the two types of days require the mean to be used.

In 2003, in an effort to provide more information about solo driver commuters, the Spare The Air survey included an additional subsample of 84 such drivers. The added sample would allow us to estimate with greater precision what these drivers are likely to do on Spare The Air days. However, the additional information actually did not result in added depth to the analysis of program impact.

We will continue to look for ways to make the most of the data we have and gather more information that could help understand and improve the impact of the program.

- **More People are Suffering from Poor Air Quality Than Are Doing Something About It.**

The bottom line result of this evaluation is not positive. The 2003 STA Evaluation shows that more people report suffering specifically on days with poor air quality (28,500) than report driving reductions to reduce air pollution on those days (17,440). The challenge to turn around that fact is complex and will continue to preoccupy the Cleaner Air Partnership. Please visit our web site at [www.cleanerairpartnership.org](http://www.cleanerairpartnership.org) for updates.

For more information about the Spare The Air Program, visit [www.sparetheair.com](http://www.sparetheair.com). The Spare The Air program is part of the Sacramento Area Council of Government's Regional Air Quality Funding program for the Metropolitan Transportation Plan ([www.sacog.org](http://www.sacog.org)).



Judith Lamare Ph.D., Project Manager, Cleaner Air Partnership

*The Cleaner Air Partnership is a joint project of the American Lung Association of Sacramento-Emigrant Trails and the Sacramento Metropolitan Chamber of Commerce.*



**SACRAMENTO REGION AIR QUALITY BASIN:  
"SPARE THE AIR"  
CAMPAIGN 2003 EVALUATION**

**JANUARY, 2004**

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# Sacramento Region Air Quality Basin: “Spare the Air” Campaign 2003 Evaluation

## Executive Summary

*This is the eighth annual evaluation of the “Spare the Air” public education program which started in 1995. In general, this year’s findings are consistent with the averaged results of the previous four years -- and indicate that levels of awareness of Spare the Air and driving reduction, while stable, are not increasing as a result of the program. This year, although the **majority** (about 60%) of driving respondents in the Sacramento Air Basin region were aware of the air pollution episode, only 30 percent got the message not to drive, and only **1.4%** translated this into action by purposefully making fewer driving trips on Spare the Air days in order to improve air quality.*

*The percentage is small, but significantly higher than Control days thereby indicating that the program **IS** successful in getting some drivers, in fact, an estimated **17,440 drivers in the region**, to make fewer trips specifically for air quality reasons on bad air days. Over the last four years, drivers purposefully reduced between 2 to 4 single trips on Spare the Air days. This year’s average was **2.6** single trips avoided, which translates into an estimated **reduction of 0.84 tons of ozone precursors per day** attributable specifically to the Spare the Air program. This estimate is consistent with ARB-recommended methodology, and uses the recently-approved model for estimating emission factors, the EMFAC2002.*

*Households consistently **report** more health problems **attributed to poor air quality** on Spare the Air days than on non-Spare the Air days. This year 13% of respondents in the Sacramento region claimed that someone in their household experienced breathing problems **due to poor air quality** – extrapolated to the entire population, and correcting for Control days, this means that an additional **28,500 households** experienced breathing problems during Spare the Air days, specifically due to ozone air pollution on Spare the Air days.*

*Although the program has been effective in terms of educating the public in general, it has been less effective in changing actual driving behavior. Commute trips are rarely reduced on Spare the Air days, and employed drivers are less likely to participate in trip reduction of any type trip than are unemployed drivers. The anticipated employer involvement to encourage employees to drive less on Spare the Air days has not yet had a noticeable effect in the region. Only **15% of employed drivers are encouraged by their employer to drive less**, and only **2%** were asked to sign up for AirAlert, an obvious area for improvement.*

# Sacramento Region Air Quality Basin: Spare the Air Campaign 2003 Evaluation

## Project Background

Air pollution in the Sacramento region during the summer months is a major concern – the area is designated a severe ozone non-attainment area by the U.S. Environmental Protection Agency (US EPA). This means that the region fails to meet the federal health based standard for ozone, thus affecting the quality of life and health of residents.

The region must improve air quality. The 2005 deadline for meeting the federal **one hour ozone** standard is rapidly approaching. In order to show that the region has met the standard, it must average no more than one violation per year for three years at any one ozone monitoring station. In other words, the countdown has begun and each year from now until 2005 is important in terms of compliance. Lack of compliance will have financial (including the potential withdrawal of federal transportation funding) as well as quality of life implications.

The region's air quality management districts and the California Air Resources Board (ARB) have developed and implemented plans aimed at improving air quality; including educational and community outreach efforts, higher emission standards for new cars, smog check programs, cleaner burning gasoline, solvent regulations, other state and federal regulations, improved measurement tools and models, and incentive programs to reduce heavy duty vehicle emissions.

The Sacramento Metropolitan Air Quality Management District (SMAQD) estimates that about 70% of the Sacramento region's air pollution is caused by emissions from internal combustion engines<sup>1</sup> and 45% specifically from on-road vehicles<sup>2</sup>. This indicates that the residential driving population is a large contributor to the air quality problem in the region. A good way to improve air quality is to reduce vehicle exhaust by having fewer vehicles on the road. Unfortunately, the region's demographics work against this, as the population in the Sacramento area continues to grow and with it, increasing numbers of vehicles. An alternative to reducing the actual number of vehicles is to request that the existing vehicles make fewer trips, particularly on hot still summer days when ozone production is maximized. This is what the **Spare the Air** program, now in its ninth year, attempts to do and is the focus of the current report.

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<sup>1</sup> Spare the Air website: [www.sparetheair.org/faq.html#faq5](http://www.sparetheair.org/faq.html#faq5)

<sup>2</sup> Source: Sacramento Region 2005 Mobile Source Emissions Inventory: <http://www.airquality.org/cleanairplan/2005OzoneEI.shtml#2005MSROG>

## The 2003 Season: Ozone Violations

The Sacramento Federal non-attainment area for ozone includes all of Sacramento and Yolo Counties, and portions of El Dorado<sup>3</sup>, Placer, Sutter and Solano Counties. The map below outlines the region and identifies the 24 ozone-monitoring sites. The ozone season is May to October when the region has a six month dry season and is known for long hot days.



Ozone formation depends on sun, heat, lack of ventilation (i.e. a high pressure ridge over the area) and long days. Clouds, wind, and milder temperatures therefore interfere with the formation of ozone. The Sacramento area experienced “near normal” temperatures<sup>4</sup> during the summer of 2003. In other words, the weather during this season may have been less likely to trigger Spare the Air advisories than it has in seasons of exceptionally hot and dry conditions.

In terms of the number of days of ozone-violations, this summer was more similar to the 2001 season than to 2002’s exceptional season which was full of multi-day episodes and the most (22) Spare the Air days in four years.

### The Region

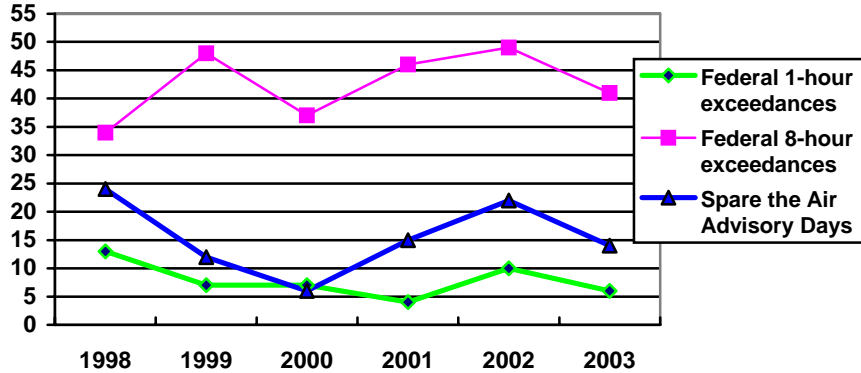
The number of days when air quality violated federal one and eight-hour ground-level ozone air quality standards in the Sacramento region air quality basin as a whole<sup>5</sup> since 1998 are presented in the next graph.

<sup>3</sup> Residents in El Dorado and Sutter, comprising less than 8 percent of the region’s population, were not included in the current evaluation and have not been included in most previous evaluations.

<sup>4</sup> National Climatic Data Center: [http://www.ncdc.noaa.gov/img/climate/research/2003/aug/06\\_08\\_2003\\_DvTempRank\\_pg.gif](http://www.ncdc.noaa.gov/img/climate/research/2003/aug/06_08_2003_DvTempRank_pg.gif)

<sup>5</sup> This also includes El Dorado County.

### Sacramento Region Air Quality Basin: Exceedences and STA advisory days



It can be seen that air quality in the region as a whole improved this summer compared to last year -- the number of federal exceedence<sup>6</sup> days is down, with 6 exceedences of the federal 1-hour standard<sup>7</sup> compared with 10 last year, and 41 exceedences of the 8-hour federal standard compared with 49 last year. Fourteen Spare the Air day advisories were issued this year, compared with 22 last year. It can also be seen that in terms of 1-hour violations, this year's numbers were more similar to those of 2000 and 2001, and in terms of the number of Spare the Air days, this year was similar to 2001. In terms of 8-hour violations, this year resembled 1998 and 2000, which had fewer violations than other years.

### Individual Jurisdictions

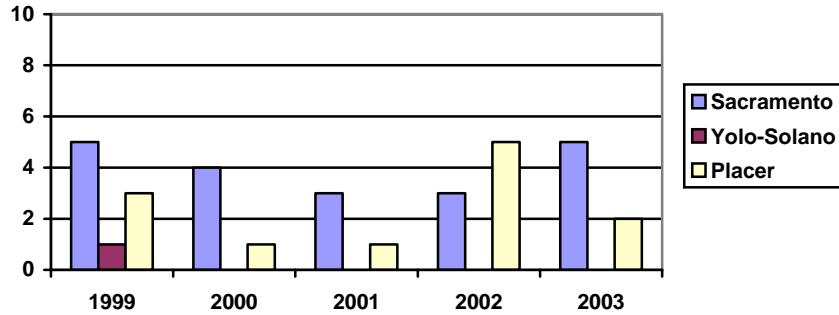
The number of 1-hour and 8-hour federal violations since 1999 in the three individual sub-areas surveyed are presented in the two charts which follow. It can be seen, first of all, that in terms of federal 1-hour violations, Sacramento County has generally experienced more violations than the other two counties, with one exception (Placer County in 2002). Yolo/Solano Air Quality Management District experienced the fewest exceedences – in fact, there have been no federal 1-hour exceedences in the last four years. YSAQMD experiences the best air quality in the Sacramento basin. Placer County recorded 2 violations this year, down from 5 during last year's bad season, and up from 1 violation in both 2000 and 2001.

It is interesting to note that in contrast to the region as a whole, where the number of exceedences had dropped, there were more exceedences in Sacramento County this year than last year: 5 violations of the federal 1-hour standards as compared with 3 last year. These data highlight the variability in the location of ozone "hot spots."

<sup>6</sup> "Exceedence" refers to a violation of the federal standard, that is, the number of days where the ozone concentration in the air as measured in parts per million (ppm) is greater than (or "exceeds") federal 1- (0.12 ppm) or 8- (0.08 ppm) hour standards.

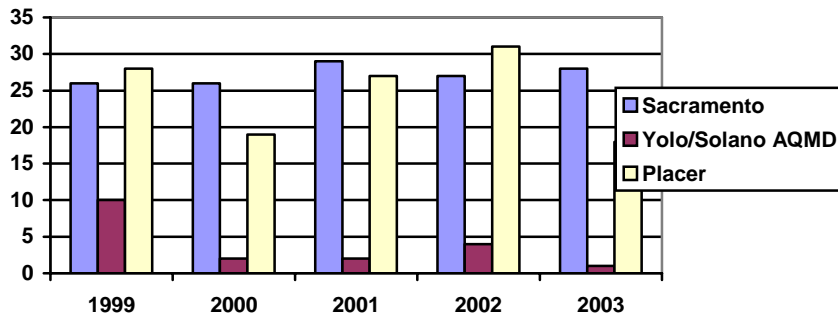
<sup>7</sup> Regional exceedence figures were provided by Sonoma Technology, Inc. in a power-point presentation entitled "Summary of 2003 Ozone Forecasting, Ozone Mapping, and AirAlert." Presented to the Air Districts of the Sacramento Region at the Air Pollution Control Officers Meeting held on December 15, 2003 in Sacramento. County exceedence figures were obtained from the new Historical Data section on the Spare the Air website: <http://www.sparetheairnow.com/sacdata/index.cfm?page=yearlytrends>. For 2003 the figures may be preliminary.

**Individual Counties: Number of 1-hour federal ozone violations**



In terms of 8-hour federal standard violations, it can be seen in the next chart that in Sacramento County, the numbers have remained relatively stable (between 26 and 29) over the last five years. Yolo/Solano AQMD again has experienced the fewest violations. In Placer County, the number of 8-hour violations was the lowest this year compared to the four previous years, at 18.

**Individual Counties: Number of 8-hour federal ozone violations**



## The Spare the Air Program

Spare the Air was created as an outreach program to engage the general public in helping to solve the problem of air pollution. It provides residents in the Sacramento region with information and resources to protect their health during the summer smog season by encouraging them to be aware of ozone levels and asking motorists to reduce their driving on days when the monitoring stations around the region predict unhealthy air.

## The Spare the Air Trigger

An important policy decision is made by the Sacramento Metropolitan Air Quality Management District's Community Education Office when it determines when a Spare the Air day is called. This trigger has varied over the years and a number of factors are considered in defining the trigger. The trigger is based on meteorological forecasts provided to the District by Sonoma Technology Inc. The forecast for the next day is available by 11 a.m. each day. For the past two and a half years, if the next day's ozone forecast predicted a .095 parts per million<sup>8</sup> level of ozone anywhere in the region for at least one hour, then a Spare the Air day was triggered.

The public is notified of a Spare the Air advisory the day before, using a variety of communication channels including paid-for announcements on radio and television, electronic signs, e-mail alerts, news broadcasts, the Spare the Air website, employer alert systems, and the Weather Channel.

## The 2003 Spare the Air Campaign

The Spare the Air season in the Sacramento region ran between May 1 and September 30, 2003. Residents were asked to take action to help Spare the Air on **fourteen** (14) days during the season. There were no Spare the Air advisories issued in May, but multi-day episodes were recorded in both June and July. There was one Spare the Air day in August and another in September.

Spare the Air campaign expenses this year totaled approximately \$290,000<sup>9</sup>. By far the greatest expense (nearly a third of the budget) involves mass media advertisements, aimed at the population in general. The specific components of the campaign involved:

### *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 placement costs of \$58,120, as well as media buyer services, radio and TV production costs of an additional \$45,000. This year, according to Kerry Shearer of the Sacramento Metropolitan Air Quality Management District, most of the television advisory buys were on Sacramento's Comcast Cable system (which covered the County of Sacramento, West Sacramento, and parts of Roseville) rather than broadcast television. (In previous years, more buys were for broadcast television than for cable.) The district felt it could reach people more efficiently via cable, by buying many more ads per dollar. This year's campaign did not include any increase in media expenditures and started later in the season. Because there was only one Spare the Air day in August, the campaign might have been shorter in duration than previous years. The next table shows that, with the exception of 2002, the total dollar amount allocated to media buy each year has stayed about the same.

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<sup>8</sup> Kerry Shearer, SMAQMD: e-mail memo dated Monday, May 12, 2003.

<sup>9</sup> Figures provided by Kerry Shearer, SMAQMD, e-mail dated October 23, 2003 and updated February 3, 2004

Year	Media Placement Costs
2000	\$58,900
2001	\$64,000
2002	\$85,000
2003	\$58,120

In addition to paid advertising, television and radio news, and newspapers such as the Sacramento Bee, covered air quality stories on Spare the Air days.

#### Website

This year more improvements were made to the Spare the Air website [www.sparetheair.com](http://www.sparetheair.com) : "We've improved navigation, added a brand new historical data section, provided easy links to Bay Area, San Joaquin and national air quality information, and tied AirAlert in to a local 'Drive Less' site that allows motorists to voluntarily report their driving reductions," said Air Pollution Control Officer Norm Covell of the Sacramento Metropolitan Air Quality Management District<sup>10</sup>.

The ozone movies, 1-hour (new this year) and 8-hour daily ozone 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 all available. A link to an educational interactive air pollution simulator called Smog CityR is also provided ([www.smogcity.com](http://www.smogcity.com) ). In addition, visitors can subscribe to the AirAlert service. This year Sonoma Technology hosted and maintained the website.

#### AirAlert

AirAlert is a free service that automatically notifies subscribers by e-mail, text pager, and/or digital cell phone text message 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, Spare the Air Day alerts are automatically sent to all subscribers a day in advance, to notify them of a Spare the Air day. Improvements made this year were based on feedback from last year's on-line survey included adding yesterday's maximum AQI to AirAlert forecast e-mails; adding five-day forecasts, and allowing real-time AirAlert notifications to be disabled. In addition, a tool for employer network subscriptions was added.

During the 2003 season, there were 4,882 subscribers to the AirAlert program, an increase of 30% (about 1,100 additional subscribers) from last year. An online survey evaluation of the program was conducted again this year, asking subscribers a series of questions. There were 767 respondents, indicating a

<sup>10</sup> From SMAQMD website: <http://www.airquality.org/new/shtml>

response rate of 16%. Results still have to be tabulated but a quick examination of some of the comments<sup>11</sup> indicates generally positive responses to the program among these subscribers. This is not surprising, as the group of subscribers is self-selecting and interested in air quality. The following comments give a flavor of the attitudes expressed towards the AirAlert program:

- “I look for it daily during the season and actually plan my outdoor time according to its reading. Thank you.
- I really appreciate the email alerts since my son is very active but can also have unknown breathing problems. We are also Jehovah's Witnesses and drive around to a lot of houses to study the Bible with people, so on those days we use less cars with more people per car.
- A very good program with essential information.
- Keep it up ! I commute to work by bicycle and use the air alert messages to help me decide if I should reduce my physical effort on bad air days or simply work from home if things get really bad.
- Excellent service, and concept of informing the people with breathing or allergy problems. I have rhinitis, and my wife suffers from mild COPD, so we are very interested in the air quality in the area.
- My husband and son both have asthma and Air Alert lets me know when to make them stay inside. Especially my son.
- I wish it were more widely used by people. I wish more employers took Spare the Air alerts seriously in this area - and looked for ways their employees could work at home. I think new ways of showing the Alerted Days should be used - Banners on buses, placards on cars, etc. People ignore it too much, generally.
- It's a great tool and I wish more people are exposed to this website as well as the information it contains. More media exposure is needed, many people are still unaware of this website and as well as health concerns.
- Nice improvements for 2003 over previous years. Liked the 5 day forecasts and the alerts.”

### Community Partners

This summer the Sacramento County Department of Transportation partnered with the AQMD and made its electronic Changeable Message Signs available to the Spare the Air program free of charge, to publicize Spare the Air days. There were five of these signs on four major thoroughfares: Sunrise Blvd south of Folsom, Madison Avenue east of Sunrise Blvd, Sunrise Blvd. north of Greenback, and Madison Avenue west of Auburn Blvd. According to Kerry Shearer<sup>12</sup>, “about 135,103 vehicles pass these signs every day, resulting in about 1,756,339 driver impressions during the 14 Spare the Air days through October 2, 2003.” The AQMD advised the County as to when to put up the messages and when to take them down. The messages themselves included versions of “Spare the Air (today, tomorrow, this weekend, etc.)” and the words “Reduce Driving.”

### Employer Network

The Employer Network was designed to encourage Sacramento region businesses

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<sup>11</sup> Links to survey results provided in e-mail message dated December 11, 2003 from Kerry Shearer, SMAQMD.

<sup>12</sup> Kerry Shearer, SMAQMD in an e-mail message to Dr. Jude Lamare dated January 26, 2004

to participate in the program by communicating Spare the Air advisories to their work forces. In the past this included over 500 businesses in the region, representing over 200,000 employees. However, although many businesses received faxes about Spare the Air days, organizers were not convinced that they passed the message on to their employees. This year, an effort was made to reinvigorate the Employer Network by asking for businesses to sign up again and use e-mail. Currently 118 employer companies are subscribed under the new all-electronic system and are confirmed participants in encouraging their employees to reduce driving. Subscribing companies receive notification of the current Spare the Air episode and they in turn have a choice as to whether to inform their employees directly through e-mail, or through signs about Spare the Air days, or to ask them to sign up individually with AirAlert.

During the 2003 season, the Metropolitan Chamber of Commerce made a commitment to educate their members about the employer benefits of participating in Spare the Air and AirAlert education. The Chamber sent out e-mail and paper mail alerts as well as education pieces to their members, encouraging them to educate and motivate their employees to use AirAlert and reduce driving where possible on Spare the Air days.

#### *Banners and Other Promotional Items*

In Woodland, the mayor helped hang Spare the Air banners from streetlight poles in the downtown area. The season kicked off in May of 2003 with a “Clean Air Night” and a “Try Transit Night” at River Cats games. Spare the Air information was distributed to River Cats fans and low- and zero-emission vehicles were displayed. “The City of Roseville focused its quarterly Transportation System Management Training workshop April 2 on air quality and Spare the Air rewards information for 30 employer transportation coordinators.”<sup>13</sup> Roseville Transit used the Spare the Air message on buses. Placer County Air Pollution Control District set up a store front information center at the Loomis Chamber of Commerce. Other items included electronic message board advertisements, exhibits, displays, print projects, and Century Theatre tickets.

## Research Methodology

### Research Objectives

Annual evaluations (with the exception of 1997) have been conducted since 1995 to assess the effectiveness of the Spare the Air program. Numerous discussions over the past two years between the Cleaner Air Partnership and staff of the California Air Resources Board (ARB) have taken place in an effort to arrive at an evaluation procedure acceptable to both. Many ARB recommendations have been incorporated in this year’s report, including their definition of what qualifies as a “reduced” trip<sup>14</sup>. The changes, however, do not affect the basic methodology,

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<sup>13</sup> “News” Cleaner Air Partnership, Spring 2003, page 2.

<sup>14</sup> The ARB recommends that only trip reductions from drivers who were aware of the Spare the Air program and purposefully reduced the number of trips they made on Spare the Air days specifically for air quality reasons should be counted in the measurement of the emissions reductions attributable to the program.

which remains consistent over time – but it does affect the interpretation of certain results.

This year’s evaluation also includes a special focus on employee commuting behavior and employer involvement in the program. The number of drivers commuting alone to work each day is not declining (due in part to population growth), making it even more difficult to meet the 2005 deadline for federal air quality standards.

The specific research objectives of this year’s evaluation were to:

1. measure general awareness and specific understanding of the Spare the Air program among drivers in the Sacramento region air quality basin,
2. measure the effectiveness of the Spare the Air program in terms of reduced driving among drivers who were aware of the program and purposefully reduced the number of trips they made due to air quality reasons,
3. estimate emission reductions from the trips reduced during Spare the Air episodes<sup>15</sup>,
4. compare awareness of the Spare the Air campaign and driving reduction among three individual jurisdictions within the basin,
5. track awareness and behavioral changes over time using a consistent methodology, and
6. conduct additional analyses of employed commuters.

## Research Design

### *Spare the Air and Control Groups*

As has been done in the past, two groups of respondents were interviewed, one following Spare the Air days, and the other following non-Spare the Air (or Control) days. This type of experimental design was first introduced by Dr. J. Lamare<sup>16</sup> in case there is a tendency for individuals to overstate their driving reduction on Spare 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 and 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. Including Control day data provides the most conservative (and probably more accurate) estimates of program effectiveness. Control data also have provided other insights into driving behavior.

### *Interviewing Strategy*

The goal was to interview a total of 600 drivers in Sacramento County, 600 drivers in Yolo/Solano AQMD, and 500 drivers in that portion of the Placer

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<sup>15</sup> Methods for estimating ozone precursor reductions based on the survey data have been used in all evaluations conducted since 1999 but were based on either EMFAC 7G or EMFAC 2000 (Emission Factor) models. The preferred methodology was only approved this year, and uses a third model, the EMFAC 2002 proposed by the California Air Resources Board (ARB). EMFAC 2002 is the latest update to the EMFAC model, and the one officially released (April 1, 2003) by the EPA for state and local government use in California to meet Clean Air Act requirements. EMFAC2002 calculates air pollution emission factors. Source: <http://www.epa.gov/fedrgstr/EPA-AIR/2003/April/Day-01/a7815.htm>

<sup>16</sup> Judith Lamare, Ph.D. The Cleaner Air Partnership, Sacramento, CA.

County that is in the Sacramento Air Basin. At the end of the season, the number of interviews was 128 short of the goal. However, the samples obtained nevertheless provide for less than a 5 percent margin of error.

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 (proportional to county), 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 June through September 2003. For Spare the Air episodes, interviewing took place the day after the advisory. Control day interviews took place in June, August, and October.

The table that follows shows the 14 Spare the Air days that occurred during the 2003 season and indicates whether interviewing was conducted on the next day. It can be seen that interviewing took place following all but two Spare the Air days and can be considered representative of the season. Multi-day episodes are shaded the same color – there were two three-day episodes this year, one in June and one in July.

	Tues	Wed	Thurs	Fri	Sat	Fri	Fri	Mon	Tues	Sun	Mon	Tues	Mon	Tues
<b>Spare the Air Day</b>	Jun	Jun	Jun	Jun	Jun	Jul	Jul	Jul	Jul	Jul	Jul	Jul	Aug	Sep
	3	4	5	27	28	11	18	21	22	27	28	29	18	23
<b>Interview on following day (x)</b>	X	X	X	X	X	X	X	X	X		X	X		X

## Respondents

Using random-digit dialing (RDD) procedures, respondents included a total of 2,678 drivers within Sacramento County, Yolo/Solano AQMD, and Placer County air quality management districts<sup>17</sup>. (Only respondents who had driven a car, truck or van within the last week were interviewed.) Results for the Sacramento air basin region as a whole were weighted proportionally<sup>18</sup>. The next

<sup>17</sup> Quotas were established (using the latest 2003 estimates of population size from the 2000 Census) for the three counties (Sacramento, Yolo/Solano, and Placer) as well as for gender and age in order to ensure that respondents were representative of the population as a whole. It is well-known in survey research that certain groups (such as elderly females) are more likely to respond to telephone interviews than others (such as young males). In order to avoid potential unbalanced and biased samples and to better ensure generalizability, quotas were set.

<sup>18</sup> Weights were calculated, proportional to the population size of each county and based on 2003 estimates from the 2000 Census: Sacramento: 71%; Yolo/Solano: 16% ; and Placer: 13%. Sacramento County was given a weight of 1, and therefore the other counties were down-weighted accordingly.

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>516</b>	+/- 4.3%	<b>403</b>	+/- 4.9%	<b>919</b>	+/- 3.2%
<b>Yolo-Solano AQMD</b>	<b>519</b>	+/- 4.3%	<b>401</b>	+/- 4.9%	<b>920</b>	+/- 3.2%
<b>Placer County</b>	<b>437</b>	+/- 4.7%	<b>402</b>	+/- 4.9%	<b>835</b>	+/- 3.4%
<b>Total Regional (Unweighted)</b>	<b>1,472</b>	+/- 2.6%	<b>1,206</b>	+/- 2.8%	<b>2,678</b>	+/- 1.9%
<b>Total Regional (Weighted)</b>	<b>727</b>	+/- 3.6%	<b>568</b>	+/- 4.1%	<b>1,295</b>	+/- 2.7%

It can be seen in the previous table that a total of 1,472 interviews were conducted on days following Spare the Air episodes and 1,206 interviews were conducted on Control days. The regional weighted total of completed interviews was 1,295. The margin of error affiliated with a sample of this size is +/- 2.7% (at the 95% confidence level).

## The Questionnaire

The main body of the questionnaire has remained the same for the past four years in order to maintain consistency, although slight modifications have occurred each year, due to information needs. Last year, for example, a question about Spare the Air awareness that was worded by the Air Resources Board (ARB)<sup>19</sup> was added (and is again included). This year we wanted an additional focus on employee driving behavior and so questions specific to commuter trip reduction and employer involvement in encouraging driving reduction were added. The interviews lasted approximately 3 - 4 minutes on average, depending on responses.

### Questions about Driving Behavior on the Previous Day

The questionnaire begins by asking respondent drivers how many times they entered a vehicle to drive the preceding day, and then whether they had driven the “same”, “more” or “less” than usual. Respondents who reported driving less were then asked what they did instead of driving and why they reduced driving. Those who drove less for air quality reasons were then asked to describe how many single trips they avoided, whether any were commute trips to or from work, and if so, what they did instead of driving. Similarly, respondents who drove more were

<sup>19</sup> ARB memo dated April 26, 2002 by J. Weir, J. Lu, & E. Schreffler sent to J. Lamare, Cleaner Air Partnership.

asked to estimate the number of additional trips they made and why they made them.

### Questions about Air Quality

After the portion of the interview about driving, respondents were asked questions about air quality. Awareness of the Spare the Air program was asked in two questions, and the order of these two was randomized. We have previously demonstrated that the order of the questions does not influence responses. The two questions are:

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

Respondents were also asked whether they typically tried to reduce driving for air quality reasons in the summer. In addition, they were asked whether on the previous day anyone in the household had had trouble breathing because of poor air quality.

### Questions about Employment and Commuter Trips

Respondents who were employed were asked how they usually commute to work (by driving alone; carpooling, transit, biking, or walking; work out of the home; work out of vehicle (delivery, service or sales); or a combination of commuting with working out of vehicle.) Employed respondents were also asked if their employer encouraged them to drive less on poor air quality days, if their employer notified them of poor air quality days, and how that notification occurred (e-mail, signs, asking employees to sign up for Air Alert).

### **Caveat**

The sole purpose of this report is to provide a collection, categorization and summarization of public opinion data. Aurora Research Group 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.

## Results and Conclusions

Results from analyses of the responses of 2,678 telephone interviews conducted with Sacramento region drivers during the summer of 2003 are presented and summarized in this report. There is always more than one way of analyzing data and drawing conclusions. This year, due partly to discussions with the California Air Resources Board (ARB), partly to the availability and use of EMFAC2002<sup>20</sup> to define vehicle emissions, and partly to the fact that we have not seen increases in Spare the Air participation, we are presenting fewer measures of performance and have adopted the restricted criteria recommended by the ARB for classifying trip reductions. In order to be counted as trip reducers, respondents had to:

- 1) be aware of the Spare the Air episode the previous day (using the ARB-worded question), and
- 2) consciously reduce the number of driving trips they took on the STA day, and
- 3) do so specifically for air quality reasons.

This has meant some re-analyses of previous years' data in order to be able to make comparisons over time<sup>21</sup>. Certain percentages presented in previous reports will therefore be different from those presented here. However, the conclusions remain the same.

Overall, the results and conclusions will tend to be conservative and are not likely to overestimate the impact of the Spare the Air program. Over the years, although results have been positive, we have not seen increases in the percentage of individuals choosing to reduce the number of trips they make. Therefore, although we report levels of awareness of Spare the Air alerts, noting that awareness is a necessary but not a sufficient indicator of positive performance. The comparison between Spare the Air and Control day responses remains, and is considered a key methodological component demonstrating that the program has a measurable impact.

The organization of the results within 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 between Spare the Air versus Control responses, or among the three counties, followed by key contrasts with results from previous years. Conclusions are based on results of univariate, bivariate, and multivariate statistical analyses.

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<sup>20</sup> EMFAC2002 is the air pollution Emissions Factor model sanctioned by the federal EPA for use in California.

<sup>21</sup> The ARB-worded question regarding Spare the Air awareness was only introduced in 2002. Re-calculations of the percentage of reducers for 2000 and 2001 were therefore conducted using the original question (specific awareness). They will be even more conservative as levels of awareness using this question are significantly lower than levels using the ARB question.

## RESPONDENT DEMOGRAPHICS

- 1 ➤ *The two samples of respondents came from the same population – those interviewed following Spare the Air days had the same demographic features as those interviewed on Control days.*

The table below shows the demographic features of the two groups of respondents for the weighted Sacramento Region Air Basin as a whole. It can be seen that there were no significant differences between respondents interviewed following Spare the Air days and those interviewed on Control days in terms of age, gender, county of residence, or employment status. We are therefore confident that both samples of respondents come from the same population. Any subsequent response differences between the two groups will therefore not be due to sample differences. Additional analyses comparing the demographics of Spare the Air respondents from the previous three years with the current results showed no significant differences, indicating that our samples of respondents have been consistent over time.

<i>Age of Respondents</i>	<i>Spare the Air</i>	<i>Control</i>	<i>Significant Difference?</i>
<i>18 to 24 years</i>	<b>11 %</b>	<b>8 %</b>	<b>No</b>
<i>25 to 34 years</i>	<b>17 %</b>	<b>18 %</b>	<b>No</b>
<i>35 to 44 years</i>	<b>20 %</b>	<b>22 %</b>	<b>No</b>
<i>45 to 54 years</i>	<b>21 %</b>	<b>19 %</b>	<b>No</b>
<i>55 to 64 years</i>	<b>14 %</b>	<b>14 %</b>	<b>No</b>
<i>65 years &amp; older</i>	<b>15 %</b>	<b>16 %</b>	<b>No</b>
<i>Refused</i>	<b>2 %</b>	<b>3 %</b>	<b>No</b>
<i>Gender</i>			
<i>Males</i>	<b>48 %</b>	<b>49 %</b>	<b>No</b>
<i>Females</i>	<b>52 %</b>	<b>51 %</b>	<b>No</b>

<i>Air Quality Jurisdiction</i>	<i>Spare the Air</i>	<i>Control</i>	<i>Significant Difference?</i>
<i>Sacramento</i>	<b>71 %</b>	<b>71 %</b>	<b>No</b>
<i>Yolo-Solano</i>	<b>16 %</b>	<b>16 %</b>	<b>No</b>
<i>Placer</i>	<b>13 %</b>	<b>13 %</b>	<b>No</b>
<i>Employed?</i>			
<i>Yes</i>	<b>69 %</b>	<b>69 %</b>	<b>No</b>
<i>No</i>	<b>31%</b>	<b>31%</b>	<b>No</b>

## OVERALL AWARENESS OF THE “SPARE THE AIR” CAMPAIGN 2003

### Regional and County Results

- 2 ➤ *General awareness of Spare the Air is relatively high, with approximately six in ten respondents in the region saying they had heard, read, or seen advertisements or news broadcasts about Spare the Air. This means that over a million drivers heard about the air pollution episode on an average Spare the Air day. Specific awareness is lower, at about 30%. Awareness (both types) in Yolo/Solano AQMD was significantly lower than in Sacramento and Placer Counties.*

We have conceptualized awareness of the Spare the Air program at two levels: general awareness (“In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare the Air, or poor air quality, or requests to drive less in this area?”<sup>22</sup>) and specific awareness of the request to not drive (“Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?”). The former is the wording proposed by the ARB and the latter is the wording we have been using for the past eight years.

Results for the individual counties as well as the weighted region as a whole are presented in the next chart<sup>23</sup>. It can be seen that on a regional level, 58% of respondents interviewed following Spare the Air days were aware of Spare the Air when the general question was asked. However, only 30% of these same respondents were aware of Spare the Air when asked to specifically remember the request to not drive. The same pattern was noted in each of the individual counties and was found last year.

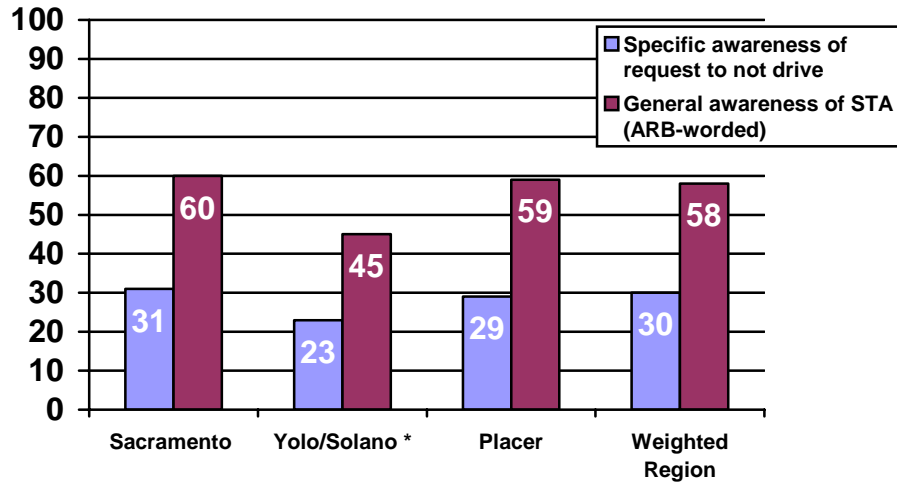
It is interesting that awareness of the Spare the Air program was greater in

<sup>22</sup> The wording of this question was proposed by the Air Resources Board, and was introduced in the 2002 survey.

<sup>23</sup> For this analysis, responses of Undecided/Don’t know were excluded.

the two counties within the Sacramento basin that experienced greater numbers of federal 8-hour ozone standard violations<sup>24</sup> – Sacramento and Placer Counties. Awareness in Yolo-Solano AQMD was significantly lower than in the other two counties and that area experienced the fewest exceedences. It is also the case that the Solano portion of the air basin population may be more likely to be tuned to the media and communications networks of the Bay Area than to the Sacramento media market. We therefore ran additional analyses comparing awareness in Yolo respondents versus Solano respondents, but found that levels were the same in both counties.

**Awareness of Spare the Air Conceptualized Two Ways**



\* significant difference between Yolo/Solano and all others

For the region as a whole, the 58% of respondents who were generally aware of Spare the Air translates into an estimated 1,245,430 drivers.<sup>25</sup> In other words, **over a million** drivers were aware of the Spare the Air alerts. However, as will be seen later in this report, awareness does not necessarily translate into action.

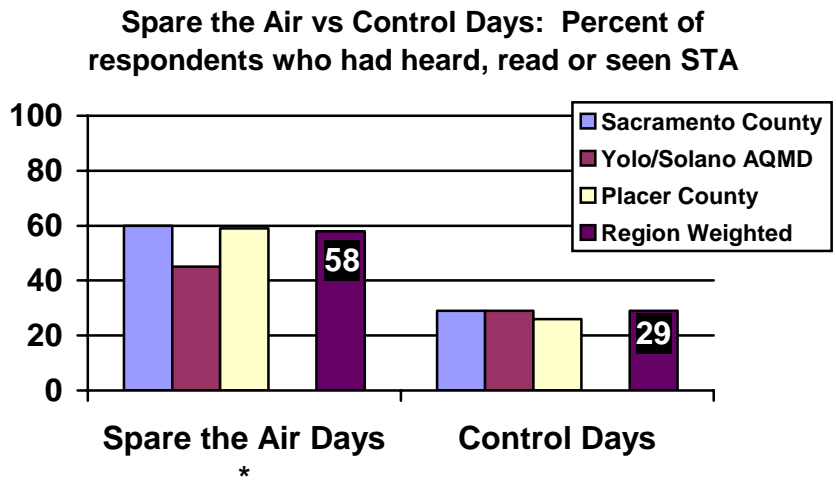
<sup>24</sup> It will be recalled that there were 28 violations of the federal 8-hour standard in Sacramento County, 18 in Placer County, and only 1 in Yolo-Solano AQMD.

<sup>25</sup> See footnote 44 for how drivers are estimated in the region.

Spare the Air versus Control Group Responses

- 3 ➤ *The Spare the Air message is actually being noticed: significantly more respondents heard, read, or saw advertisements about Spare the Air on Spare the Air days than on Control days.*

Significantly more respondents in all counties and the region as a whole had “heard, read, or seen any advertisement or news broadcasts about Spare the Air, or poor air quality, or requests to drive less in this area” (the ARB-worded question.) This indicates that, as in past years, the program is at least effective in reaching drivers about the specific alert days. Percentages are presented in the next graph. It can be seen that while nearly three in ten Control day respondents said they had heard STA advertisements (and thus were wrong), nevertheless about twice that number (six in ten) said they had heard them prior to actual Spare the Air days (and thus were correct.)



\* indicates statistically significant differences

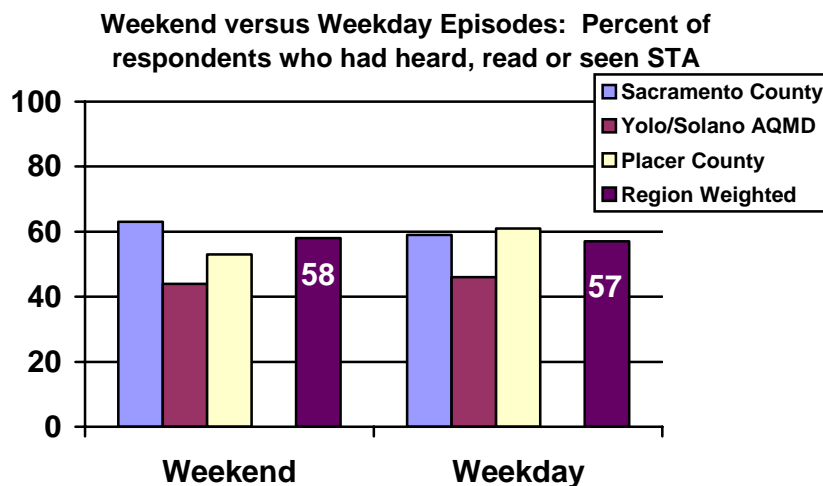
Weekend versus Weekday Episodes

- 4 ➤ *Awareness of Spare the Air was the same, regardless of whether the Spare the Air day occurred on a weekday or a weekend.*

In the past, awareness of Spare the Air varied according to the day of the week, month, and according to the number of consecutive days in the episode. This year, analyses did not show significant differences in awareness according to what day of the week the Spare the Air episode occurred on, whether it was weekend or a weekday, or whether the episode was single, or multi-day. This was true for the region as a whole as well as in the individual counties.<sup>26</sup> Weekday (M-Th) versus weekend

<sup>26</sup> The only exception occurred in Yolo-Solano AQMD where awareness was low even on some multi-day episodes.

results are presented in the chart that follows.

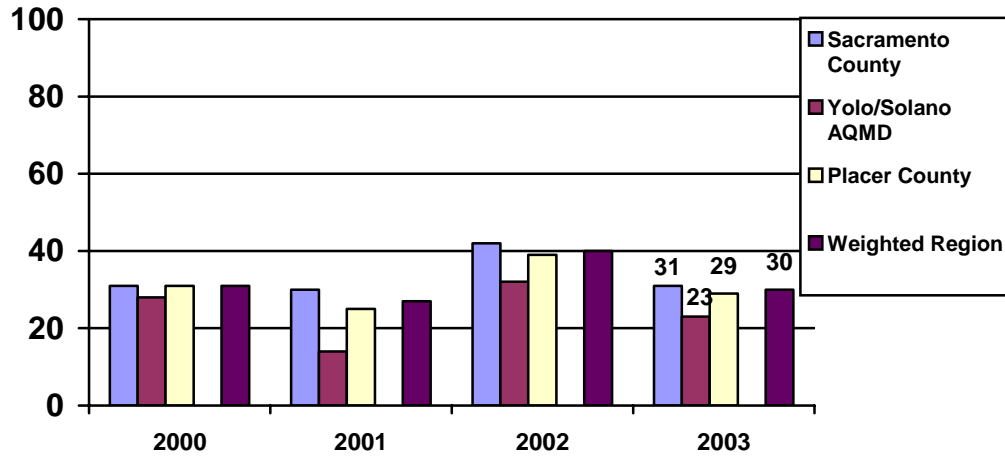


### Year-by-Year Comparisons

- 5 ➤ *Awareness of specific requests to not drive because of poor air quality on Spare the Air days is not increasing. With the exception of 2002 (a poor air quality season) results have not changed in four years, and remain stable at about 30%.*

In order to compare with the past, results from the original question used to measure awareness had to be used (i.e. “Do you recall being asked not to drive yesterday because our area was experiencing a period of unhealthy air?”) The next chart plots the percentage of respondents in each county and the region as a whole who were aware of Spare the Air from 2000 to 2003. In terms of the region as a whole, it can be seen that awareness in 2000, 2001, and this year was stable, at approximately 30%. Awareness was higher last year, but 2002 was an exceptional year with high temperatures and multiple-day Spare the Air episodes. In terms of the individual counties, awareness in Sacramento and Placer Counties mirrored that of the region in that the only significant difference in levels of awareness occurred in 2002. The pattern changes a little in Yolo-Solano AQMD where there were two years that were different from the others – a low level of awareness of only 14% that occurred in 2001, and a high level at 32% in 2002.

**Year-by-Year Comparison of Percent of STA respondents who were "aware" of STA using original question**



**SELF-REPORTED DRIVING CHARACTERISTICS**

**Number of Vehicle Starts**

- 6 ➤ *The reported number of times drivers entered their vehicles is stable and consistent with previous years' results; an average of 3.7 times per day. There was no difference between respondents interviewed following Spare the Air days and those interviewed on Control days in terms of the number of vehicle starts reported.*

The very first question of the survey asked respondents to estimate how many different **times** they entered a vehicle the previous day to drive<sup>27</sup>. Answers to this question were therefore not influenced by any subsequent questions having to do with air quality or awareness of Spare the Air alerts. Results for the Sacramento Air Basin weighted region as a whole are presented in the next table.

	<i>Mean # Times Entered Vehicle</i>	<i>Standard Deviation</i>	<i>Range<sup>28</sup></i>
<i>Spare the Air</i>	3.65	4.6	0-50 times
<i>Control</i>	3.83	5.1	0-50 times
<i>Total</i>	3.73	4.8	0-50 times

An analysis of variance indicated no difference between the mean number of times respondents entered their vehicles on a Spare the Air day versus a

<sup>27</sup> This measure is consistent with EMFAC2002 model guidelines, which calculate vehicle starts separately.

<sup>28</sup> The two respondents who said they entered more than 50 times were changed to 50. In previous years the maximum was also 50.

Control day<sup>29</sup>. This means that overall, Spare the Air has not been successful in reducing the number of trips reported by the population of drivers as a whole. However, these numbers are not inconsistent with those obtained in previous years, indicating that it is probably unrealistic to expect changes of a magnitude that would shift the average for the entire population.

### Driving Behavior on Previous Day

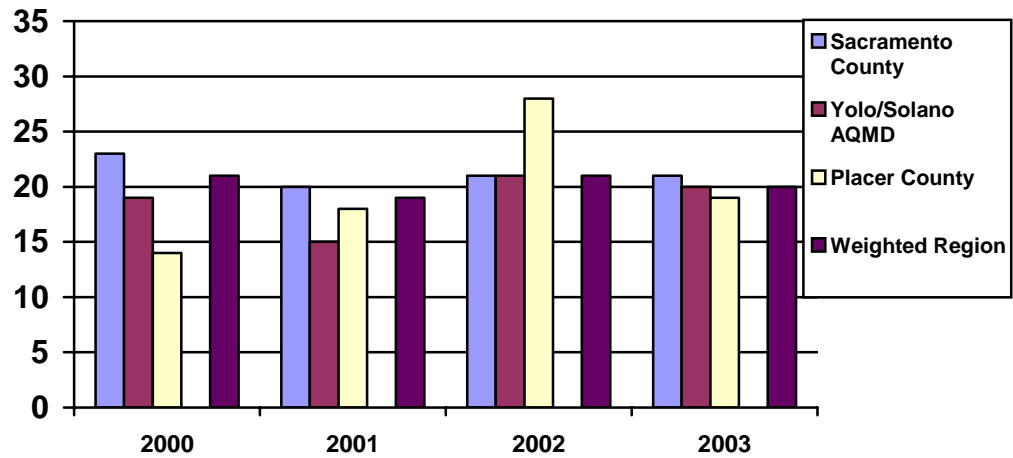
- 7 ➤ *The percentage of respondents interviewed following a Spare the Air day who claim to have driven “less” remains stable at about **one in five** respondents for the average Spare the Air day. This means that despite differences in seasonal temperatures, differences in the number of Spare the Air days, differences in spending dollars devoted to the campaign, and differences in outreach efforts, the percentage of drivers claiming to drive less on Spare the Air days has not changed substantially in four years.*

The second question of the survey 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]?” The next graph plots the percentage of drivers interviewed following Spare the Air days from the region as a whole, as well as from each county who said they drove “less” during each of the past four years. It can be seen, first of all, that in terms of the region as a whole and Sacramento County in particular, there has been very little fluctuation in the percentage of drivers saying they drove “less” on a Spare the Air day: it remains at approximately 20%. It can also be seen that although there were some fluctuations in the other two counties, the differences were not huge, with one exception -- last year a notable 28% of drivers in Placer County claimed to have driven less. Finally, it can be seen that this year in 2003 there were no differences among the counties - approximately one in five respondents (20%) in all three counties claimed to have driven “less” on a Spare the Air day.

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<sup>29</sup> F (1,1287) = 0.42, p >.10.

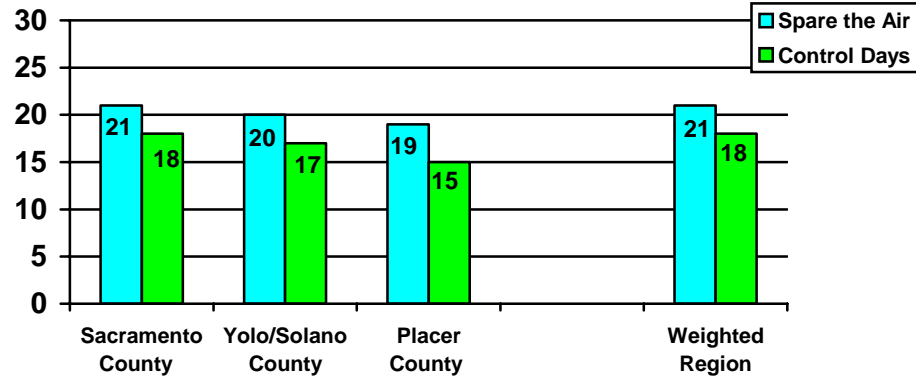
### Year-by-Year Comparison of Percent of STA respondents who drove "less" on Spare the Air days



- 8 ➤ *Although more drivers said they drove “less” on STA days than on Control days, the difference was not significant . This was true for the region as a whole as well as in all three counties, and could be an indication that the effectiveness of the program might be fading.*

In previous evaluations, one analysis compared percentages of Spare the Air respondents versus Control respondents who reported driving “less” the day before than they usually do on that day of the week. In last year’s evaluation, this was considered a measure of success as significantly more respondents on Spare the Air days than on Control days said they drove “less” in all counties (although this difference was only found in Sacramento County in both the 2000 and 2001 evaluations.) This year for the first time, although the percentages who said they drove less were consistently lower among Control day respondents than among Spare the Air respondents in all three counties, the differences were not significant. Percentages for 2003 are presented in the next chart.

**2003 Self-Reported Driving Behavior of Respondents on Spare the Air versus Control Days: Percent who Drove "Less" the Previous Day**



It is too early to say whether this trend will continue, but it could be an indication that the effectiveness of the program is fading. The percentage differences between Spare the Air and Control respondents in Sacramento County who drove “less” in previous years are presented in the next table. It can be seen that the “gap” between the two groups appears to be getting smaller. (This was true regardless of differences in sample sizes.)

<i>Year</i>	<i>Percentage of Spare the Air respondents who drove “less” yesterday: Sacramento County</i>	<i>Percentage of Control respondents who drove “less” yesterday: Sacramento County</i>	<i>Difference</i>	<i>Statistically Significant Difference?</i>
<i>2000</i>	<b>23%</b>	<b>12%</b>	<b>11%</b>	<b>Yes</b>
<i>2001</i>	<b>20%</b>	<b>14%</b>	<b>6%</b>	<b>Yes</b>
<i>2002</i>	<b>21%</b>	<b>17%</b>	<b>4%</b>	<b>Yes</b>
<i>2003</i>	<b>21%</b>	<b>18%</b>	<b>3%</b>	<b>No</b>

This analysis also reinforces why the research design of including Control day interviewing is such a good idea – it helps prevent overstatements of the effectiveness of the program.

- 9 ➤ *Self-reported trip estimates are, at the very least, consistent with self-reported driving behavior: respondents who said they drove “less” the previous day also reported making fewer trips than those who drove the “same” or “more”.*

One of the concerns expressed by the California Air Resources Board (ARB) is that in a telephone survey, respondents might be very inaccurate in estimating the number of trips they make unless they are asked to specifically describe each and every trip. However, the cost of conducting such “diary” studies on an ongoing basis is prohibitive. Within the current survey instrument, we were able to at least test the consistency (if not the validity) of self-reported estimates by comparing the results of the first question (“How many times did you get into a car, truck, or van to drive?”) with those from our second question (“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 each group of respondents for the region as a whole are presented in the next table.

	<i>Spare the Air</i> <i>Mean # of times entered vehicle yesterday</i>	<i>Control</i> <i>Mean # of times entered vehicle yesterday</i>
<i>Drove “less” yesterday</i>	<b>2.12</b>	<b>2.22</b>
<i>Drove “same” yesterday</i>	<b>3.76</b>	<b>3.97</b>
<i>Drove “more” yesterday</i>	<b>5.25</b>	<b>5.10</b>
<i>Total</i>	<b>3.65</b>	<b>3.83</b>

It can be seen that respondents who said they drove “less” the day before reported making fewer driving trips than those who said they drove “the same” or “more”. Similarly, those who said they drove “more,” also reported making a greater number of trips than those who drove “the same” or “less”. In other words, there is consistency between these two self-reported measures – and in fact those drivers who said they drove “less” reported entering their vehicles significantly<sup>30</sup> fewer times than those drivers who said they drove “more”. We are therefore reasonably confident that drivers are able to estimate the number of trips they may have avoided.

<sup>30</sup> For these analyses, responses of don’t/know were excluded. For weighted regional STA respondents: F=16.02, p<.001. The mean number of trips for those who drove less was significantly lower than the other two means. For Control respondents: F=7.95, p<.001. The mean number trips for those who drove less was significantly lower than the other two means.

Although the mean number of trips made by those who said they drove “less” on Spare the Air days (2.12) was less than their Control day counterparts (2.22), this difference was not significant except on weekend days. This finding, although disappointing, at least indicates that respondents do not seem to be giving what might be considered more “socially acceptable” answers by claiming to drive less following Spare the Air days.

***Respondents who Drove “the Same”***

The majority of respondents (over 60% in all counties) were unaffected by the announcements to reduce driving in that they said they drove “the same” as usual on Spare the Air days. This is not a new finding as the percentage of respondents who said they drove “the same” has been over 60% the last four years. As can be seen in the previous table, the average number of trips taken by those who drove “the same” this year was 3.76 for Spare the Air respondents and 3.97 for Control respondents – a difference that was not significant.

***Respondents who Drove “More”***

- 10** ➤ *The ARB has hypothesized that people may actually drive “more” on Spare the Air days (perhaps because the air quality is too unhealthy to walk or bicycle.) Our data over the past four years do not support this hypothesis.*

Although the mean number of trips made by those who said they drove “more” on Spare the Air days (5.25) was higher than their Control day counterparts (5.10), this difference was not statistically significant<sup>31</sup>. The table below shows results from the last four years for the region as a whole. Last year’s results also did not show a difference<sup>32</sup>, nor was there a difference in either 2001<sup>33</sup> or in 2002<sup>34</sup>. In other words, there is nothing in our survey data to support the hypothesis that drivers may make more trips on Spare the Air days than on non-Spare the Air days.

	<b><i>Spare the Air: respondents who drove “more” yesterday</i></b>	<b><i>Control: respondents who drove “more” yesterday</i></b>	
<b><i>Year</i></b>	<b><i>Mean # of times entered vehicle</i></b>	<b><i>Mean # of times entered vehicle</i></b>	<b><i>Significant Difference</i></b>

<sup>31</sup> F(1,192) = 0.08, p >.10 for the weighted region.

<sup>32</sup> F(1, 219) = 1.70, p >.10 for the weighted region.

<sup>33</sup> F(1, 168) = 0.17, p >.10 for the weighted region.

<sup>34</sup> F(1, 154) = 0.15, p >.10 for the weighted region.

	yesterday	yesterday	?
2000	5.11	4.86	No
2001	4.88	5.22	No
2002	5.43	4.58	No
2003	5.25	5.10	No

## PURPOSEFUL DRIVING REDUCTION

### Regional and County Results

- 11 ➤ *It is clear that additional efforts to influence actual driving behavior are needed: only 1.4% of all respondent drivers purposefully reduced their driving on Spare the Air days because they heard the announcement and wanted to improve air quality in the region. This means that only 17,440 drivers in the region specifically reported reduced driving on Spare the Air days for air quality reasons. The average number of single trips reduced was 2.56 per day.*

The California Air Resources Board requires that the only driving reductions that are eligible to be “counted” in the evaluation of the Spare the Air program are those done by drivers who make a conscious choice to drive less for air quality reasons and who are aware of the program. For this calculation, therefore, among Spare the Air respondents, we included only those respondents who were aware of the program (using the ARB-worded question), and who said they drove less the previous day, specifically for air quality reasons. [Among Control respondents, we obviously dropped the awareness of Spare the Air criterion and included only those respondents who said they drove less for air quality reasons.]

Results for the weighted region as a whole indicated that only **1.4%** of all respondent drivers (i.e. 10 of the 727 respondents) interviewed following a Spare the Air day reduced driving specifically for air quality reasons. Extrapolated to the population of the region, this means that an estimated **17,440 drivers** in the region<sup>35</sup> purposefully reduced the number of trips they made on Spare the Air days during the 2003 summer season in order to help improve air quality. These respondents claimed to have avoided an average of **2.56 single trips**<sup>36</sup> the previous day, which, extrapolated to the estimated number of drivers in the region, means that approximately **44,650 trips were avoided** on Spare the Air days, specifically for air

<sup>35</sup> The number of drivers in the Sacramento region for 2003 was estimated, using the number of driver licenses by county for 2002, obtained from the California Department of Motor Vehicles database at [http://www.dmv.ca.gov/about/profile/dl\\_outs\\_by\\_county.htm](http://www.dmv.ca.gov/about/profile/dl_outs_by_county.htm), and calculating the percentage increase, based on county population figure increases from 2002 to 2003 (<http://www.dof.ca.gov/HTML/DEMOGRAP/e-1table.xls>). The estimated number of licensed drivers for the total Sacramento region in 2003 was 1,245,430: Sacramento County: total 867,700 + Placer County: 215,500 \* 86% for Air Quality district = 185,330; Yolo/Solano: total of 192,400 (116,200 in Yolo + 76,200 in Solano.)

<sup>36</sup> Responses ranged from 0 to 5 single trips avoided, with a mean of 2.56, standard deviation of 1.31, and a median of 2.2.

quality reasons. [As an added quality-control measure, we insured that any individual who claimed to have avoided more than 12 trips was excluded from the analyses. This was as a result of discussions with the ARB who felt it unlikely that respondents would be able to describe more than 12 trips, based on their research. Previous years' results were also re-analyzed using this criterion.] Respondents were further asked how many of the trips they avoided were commute trips to or from work, and what they did instead. Results indicated that 2 respondents avoided 2 commute trips each on a Spare the Air day. One respondent walked instead.

- 12** ➤ *In the individual counties, the percentage of all respondents who met our strict criterion for driving reduction ranged from 1.2% in Sacramento and Yolo-Solano AQMD Counties to 2.3% in Placer County (not a significant difference). The average number of single trips reduced was 2.8 per day in Sacramento County, and 2.2 in both Yolo-Solano AQMD and Placer Counties.*

“Reducer” results from the individual counties and the weighted region as a whole are summarized in the next table.

<b><i>Spare the Air: purposeful reducers</i></b>	<b><i>% of total respondents who reduced for air quality reasons and were aware</i></b>	<b><i>Estimated number of drivers who reduced</i></b>	<b><i>Mean # of trips avoided for air quality reasons</i></b>	<b><i>Estimated number of single trips reduced</i></b>
<b><i>Sacramento County</i></b>	<b>1.2%</b>	<b>10,400</b>	<b>2.8</b>	<b>29,120</b>
<b><i>Yolo-Solano AQMD</i></b>	<b>1.2%</b>	<b>2,300</b>	<b>2.2</b>	<b>5,060</b>
<b><i>Placer County</i></b>	<b>2.3%</b>	<b>4,260</b>	<b>2.2</b>	<b>9,372</b>
<b><i>Weighted Region</i></b>	<b>1.4%</b>	<b>17,440</b>	<b>2.6</b>	<b>44,650</b>

There were no significant differences among the areas in terms of the percentage of reducers. It can be seen in the previous table that the 2003 Spare the Air program was effective in getting an estimated 10,400 drivers in Sacramento County, 2,300 in Yolo-Solano AQMD, and 4,260 in Placer County<sup>37</sup> to reduce driving. These estimated numbers of drivers were aware of Spare the Air and specifically reduced the number of trips they made on advisory days in order to improve air quality.

<sup>37</sup> Extrapolated to the number of drivers in each county, using the number of driver licenses by county for 2002, obtained from the California Department of Motor Vehicles database at [http://www.dmv.ca.gov/about/profile/dl\\_outs\\_by\\_county.htm](http://www.dmv.ca.gov/about/profile/dl_outs_by_county.htm), and calculating the percentage increase, based on county population figure increases from 2002 to 2003 (<http://www.dof.ca.gov/HTML/DEMOGRAP/e-1table.xls>). The estimated number of licensed drivers for the total Sacramento region in 2003 was therefore 1,245,430: Sacramento County: total 867,700 + Placer County: 215,500 \* 86% for Air Quality district = 185,330; Yolo/Solano: total of 192,400 (116,200 in Yolo + 76,200 in Solano.)

Spare the Air versus Control Groups

- 13 ➤ Significantly more drivers reduced driving for air quality reasons on Spare the Air days than on Control days. This argues well for the continuation of the Spare the Air program, in that although overall percentages are not high, at least some drivers are reducing the number of trips they take on Spare the Air days.

Drivers interviewed on Control days were also asked if they had reduced the number of trips they made the day before. If the same percentage of drivers claimed to have reduced their driving on Control days for air quality reasons as on Spare the Air days, we can hardly assert that it is the Spare the Air program that is causing driving reduction. Control day interviewing therefore provides a validation check and results are also used in the calculation of emission reductions as a correction factor. The percentage of Control day drivers who reduced driving the day before specifically for air quality reasons is presented in the next table, along with the percentages of already-described Spare the Air reducers. In fact, there was only one individual in all of the Control day interviewing who reduced driving for air quality reasons, the lowest number in all the years we have been evaluating Spare the Air. Statistical tests of proportion within each county and the region as a whole indicated that significantly more drivers reduced driving for air quality reasons on Spare the Air days than on Control days. This argues well for the continuation of the Spare the Air program, in that although overall percentages are not high, at least some drivers are reducing the number of trips they take on Spare the Air days.

<i>Purposeful reducers</i>	<i>% of total respondents who reduced for air quality reasons and were aware on STA days</i>	<i>% of total respondents who reduced for air quality reasons on Control days</i>	<i>Significant difference?</i>
<i>Sacramento County</i>	<b>1.2%</b>	<b>0.2%</b>	<b>Yes</b>
<i>Yolo-Solano AQMD</i>	<b>1.2%</b>	<b>0%</b>	<b>Yes</b>
<i>Placer County</i>	<b>2.3%</b>	<b>0%</b>	<b>Yes</b>
<i>Weighted Region</i>	<b>1.4%</b>	<b>0.2%</b>	<b>Yes</b>

Year-by-Year Comparisons

- 14 ➤ When previous years' results were re-calculated using the strict criterion for measuring trip reducers, results indicated that the percentage of reducers in Sacramento County and the region as a whole have **not** changed significantly in the last four years. On average over the past four years, the Spare the Air program has been successful in reducing the number of trips taken by just under 2% of the driving population.

The last three years' data were re-analyzed to include the requirement that drivers have been aware of the request not to drive. The caveat here is that the test of awareness did change in 2002 and the earlier test was much harder to meet. In that sense the measurements are not strictly comparable.

Tests of proportion were run comparing each year with every other year, within each county. Results are presented in the next table. It can be seen, first of all, that in terms of the weighted region as a whole and Sacramento County in particular, the percentage of reducers has **not** changed significantly from one year to the next. **For the region, the average percentage of all respondent drivers who reduced driving specifically for air quality reasons on Spare the Air days over the past four years is 1.9%.**

Although the percentages of all respondent drivers who reduced driving were higher during last summer's poor air quality season (2002), the only significant difference between last year and this year was found in Yolo-Solano AQMD. Also, in Yolo-Solano AQMD this year's percentage of reducers is the same as in 2000. In Placer County results this year do not differ from any previous years, but percentages in both 2000 and 2001 were significantly lower than in 2002.

<i>Spare the Air: purposeful aware reducers<sup>38</sup></i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>Significant Differences between years?</i>
<i>Sacramento County</i>	<b>2.0%</b>	<b>2.1%</b>	<b>2.3%</b>	<b>1.2%</b>	No
<i>Yolo-Solano AQMD</i>	<b>1.3%</b>	<b>0.2%</b>	<b>3.5%</b>	<b>1.2%</b>	Yes – 2001 significantly lower than all others; 2002 significantly higher than 2003
<i>Placer County</i>	<b>1.0%</b>	<b>0.9%</b>	<b>3.9%</b>	<b>2.3%</b>	Yes – 2002 significantly higher than 2000 and 2001
<i>Weighted Region</i>	<b>1.8%</b>	<b>1.7%</b>	<b>2.7%</b>	<b>1.4%</b>	No

*Note: in 1999, interviews were conducted only in Sacramento County for one episode.*

<sup>38</sup> For 2000 and 2001, awareness of Spare the Air was measured using the original (more conservative) question.

It could be hypothesized that the consistent percentages of reducers combined with population growth might indicate an increase in the actual number of drivers participating in Spare the Air. This was not found to be the case: for the weighted region as a whole, the percentages were converted to numbers of drivers in each year and are presented in the table. It can be seen that, with the exception of 2002, the actual number of participants is not increasing.

<i>Year</i>	<i>Percentage of Purposeful Reducers</i>	<i>Total Number of Drivers in Region<sup>39</sup></i>	<i>Number of Purposeful Reducers</i>
<b>2000</b>	<b>1.8%</b>	<b>1,079,899</b>	<b>19,440</b>
<b>2001</b>	<b>1.7%</b>	<b>1,130,655</b>	<b>19,220</b>
<b>2002</b>	<b>2.7%</b>	<b>1,161,783</b>	<b>31,370</b>
<b>2003</b>	<b>1.4%</b>	<b>1,245,430</b>	<b>17,440</b>

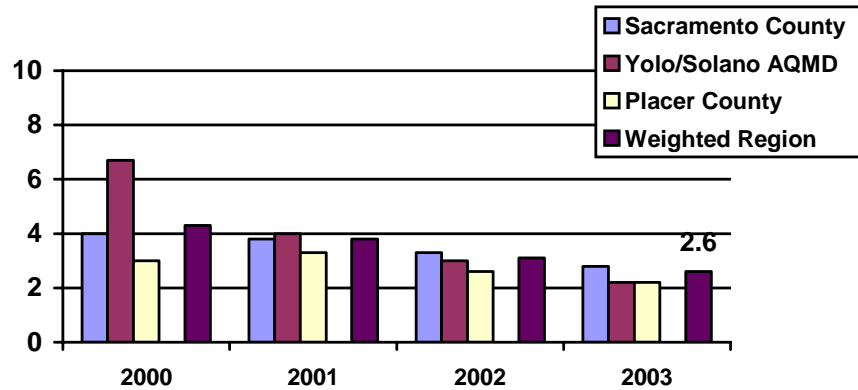
- 15 ➤ *Over the last four years, drivers purposefully reduced between 2 to 4 trips on Spare the Air days.*

The mean number of single<sup>40</sup> trips reduced by drivers purposefully changing their driving behavior on Spare the Air days is presented in the next chart. It can be seen that, with the exception of one year in Yolo-Solano AQMD (2000), results generally ranged from between 2 to 4 single trips avoided. The mean number of trips avoided is important information, as it is used in the calculation of emission reductions, discussed in the next section of the report. This year showed an average of 2.6 single trips avoided on a regional basis.

<sup>39</sup> The number of drivers in the Sacramento region for 2000 to 2002 was estimated, using the numbers of licensed drivers from 1999 statistics, available 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 for each year (2000 US Census). For 2003, figures were obtained from the California Department of Motor Vehicles database at [http://www.dmv.ca.gov/about/profile/dl\\_outs\\_by\\_county.htm](http://www.dmv.ca.gov/about/profile/dl_outs_by_county.htm), and adjusted for county population figure increases (<http://www.dof.ca.gov/HTML/DEMOGRAP/e-1table.xls>).

<sup>40</sup> In 2000 and 2001 the number of single trips was calculated, as the question asked how many round trips they reduced.

Mean Number of Single Trips Avoided by Reducers: Year to Year Comparisons



## ESTIMATING EMISSIONS REDUCTIONS

### The Region

- 16 ➤ *The 2003 Spare the Air program was successful in reducing air pollution in the Sacramento air basin region by an estimated **0.84 tons of ozone precursors per day**. This is due specifically to drivers purposefully reducing the number of trips they took on Spare the Air days for air quality reasons.*

This year the calculations of emissions reductions:

- 1) are based on the most conservative methodology,
- 2) are consistent with ARB methodology, and
- 3) use the latest approved EMFAC2002 figures for ROG and NO<sub>x</sub> starting and running emissions. (In the past, two different methods for estimating reductions were used while discussions with the ARB were ongoing<sup>41</sup>.)

Although emission reduction comparisons with previous years' evaluations will not be possible, it was felt that the current methodology is the most appropriate and most likely to be consistent with Air Resources Board guidelines.

The methodology is conservative as it eliminates many respondents from consideration (such as those who might have reduced their driving but for

<sup>41</sup> See the "Spare the Air Campaign 2002 Evaluation Final Research Report", footnote 47, for a discussion of the issue. Available online at <http://www.cleanerairpartnership.org/images/METAResearchSTACampaign.pdf>

reasons other than air quality, or those who had the habit of driving less to reduce pollution but were not aware of the specific STA request not to drive.) **Note:** *Parts of the following description are redundant with the previous section that described purposeful driving reduction. We have left the redundancies in for those readers who may have wanted to skip directly to the methodology for calculating emission reductions.*

1. Calculate the percentage of drivers who said they were aware of the Spare the Air program<sup>42</sup>, and who also said they drove less than normal on Spare the Air days specifically for air quality reasons. For the weighted region as a whole, this was **1.4%** (10/727) of all respondents interviewed following Spare the Air days.
2. These purposeful reducers were asked to estimate the number of single trips they avoided making on the Spare the Air day. Record the mean (average) number of single trips they avoided for air quality reasons on Spare the Air Days. In our regional example, the mean was 2.56 single trips avoided, with a standard deviation of 1.31, a median of 2.2 and a mode of 4 trips. Answers ranged from 1 to 5 single trips avoided<sup>43</sup>.
3. Extrapolate to the total number of drivers in the region<sup>44</sup>: the percentage of STA reducers therefore represents 17,436 drivers in the Sacramento region, and the number of single trips avoided was 44,636 (17,436 drivers x 2.56 trips avoided on average.)
4. Record the mean number of trips avoided by the respondents who drove less for air quality reasons on Control days. In this case there was only **one** individual who reduced driving on Control days for air quality reasons and this individual declined to estimate the number of trips reduced.
5. Extrapolate to the total number of drivers in the region and the total number of single trips avoided. The percentage of Control day reducers (.2% or 1/568) therefore represents 2,490 drivers. In our example, the number of trips avoided cannot be extrapolated, as the individual did not answer this question.
6. Multiply the number of trips avoided by a per trip emission reduction average of 17.16 grams of ozone precursors<sup>45</sup> [this includes a combined total of ROG (4.06 grams per trip for light duty passenger cars and 4.88 grams per trip for light duty trucks) plus NOx (3.10 grams per trip for light duty passenger cars and 5.12 grams for light

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<sup>42</sup> Using the ARB-worded question for measuring general awareness of Spare the Air: "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>43</sup> In fact, two (weighted) respondents did not answer this question and are therefore excluded from this calculation.

<sup>44</sup> The number of drivers in the Sacramento region for 2003 was estimated, using the number of driver licenses by county for 2002, obtained from the California Department of Motor Vehicles database at [http://www.dmv.ca.gov/about/profile/dl\\_outs\\_by\\_county.htm](http://www.dmv.ca.gov/about/profile/dl_outs_by_county.htm), and calculating the percentage increase, based on county population figure increases from 2002 to 2003 (<http://www.dof.ca.gov/HTML/DEMOGRAP/e-1table.xls>). The estimated number of licensed drivers for the total Sacramento region in 2003 was 1,245,430: Sacramento County: total 867,700 + Placer County: 215,500 \* 86% for Air Quality district = 185,330; Yolo/Solano: total of 192,400 (116,200 in Yolo + 76,200 in Solano.)

<sup>45</sup> Based on EMFAC2002 V2.2 SMAQMD spreadsheet figures provided by Peter Christensen, SMAQMD. Models were run for the summer of 2003. The total ROG as well as NOx tons for light duty passenger cars as well as light duty trucks were converted to lbs. (multiply by 2,000) and then to grams (multiply by 454) before dividing by the total number of trips, in order to obtain the average grams per trip. These are the figures considered most accurate at this point in time.

duty trucks) emissions.] EMFAC2002 is the latest update to the EMFAC model for use by California state and local governments to meet Clean Air Act (CAA) requirements. EMFAC2002 defines trips as vehicle starts and calculates them separately as a function of vehicle population (derived from vehicle registration data), based on ARB and US EPA instrumented vehicle studies. Convert to tons. For the Sacramento region, this results in an estimated total of **0.84 tons of pollutants** reduced per Spare the Air day. (And in this example, **0 tons** reduced per Control day as we were unable to estimate the average number of trips reduced.)

We will describe the next steps in order to outline the correction factor procedure, although with the current example there are no Control day emission reductions to report.

7. Next, apply a correction factor in the form of subtracting the Control day air quality emission reduction from the Spare the Air day reduction. This ensures that only purposeful driving reduction due to the Spare the Air program is counted in the estimate of emission reduction.
8. The correction for the Control days in this instance is 0 tons of ozone precursors (because the respondent did not say how many trips were avoided), which, when subtracted from the .84 tons reduced on Spare the Air days, leaves a balance of **0.84 tons** of ozone precursors reduced per Spare the Air day in 2003.

The procedure described above is summarized in the table that follows:

**Emissions Reduction Estimate for 2003 in the Sacramento Region**

Weighted Sacramento Region	Percent of all respondent drivers who drove less for Air Quality reasons <sup>46</sup>	x Number of licensed drivers in Sacramento Region (1,245,430)	x Mean Number of single trips Reduced per day	x 17.16 grams of ozone precursors per trip (EMFAC 2002)	= Estimated Tons <sup>47</sup> per day of ozone precursors reduced
Spare the Air Days	1.4% (10/727)	17,436	x 2.56= 44,636	765,954 grams/	0.84 tons/
Control Days	.2% (1/568)	2,490	x (no answer)	0	0
<b>Estimated tons of ozone precursors reduced per day: (STA day reductions – Control day reductions)</b>					<b>.84 tons</b>

<sup>46</sup> In addition, in the case of STA respondents, these drivers had to say they were aware that the previous day was a STA day (according to the ARB awareness question).

<sup>47</sup> There are 907,200 grams in a ton.

Individual Counties

- 17 ➤ In Sacramento County, air pollution was reduced by an estimated 0.55 tons of ozone precursors per Spare the Air day, specifically due to residents driving less. In Yolo/Solano, .1 tons of ozone precursors were reduced and in Placer County, the estimate was .18 tons reduced

The next three tables summarize the procedure for estimating emission reductions for each of the three counties separately. It will be noted that the only Control day person who drove less for air quality reasons lived in Sacramento County and did not say how many trips were reduced. [The Control row is included in Yolo/Solano and Placer County tables for the sake of consistency, as in future years, the correction factor may need to be applied.]

**Emissions Reduction Estimate for 2003 in Sacramento County**

Sacramento County	Percent of all respondent drivers who drove less for Air Quality reasons	X Number of licensed drivers in Sacramento County (867,700)	x Mean Number of single trips Reduced per day	x 17.16 grams of ozone precursors per trip (EMFAC 2002)	= Estimated Tons per day of ozone precursors reduced
Spare the Air Days	1.2% (6/516)	10,400	x 2.8= 29,120	499,700 grams	0.55 tons
Control Days	.2% (1/403)	1,735	x (No response)	0	0
Estimated tons of ozone precursors reduced per day: (STA day reductions – Control day reductions)					<b>0.55 tons</b>

**Emissions Reduction Estimate for 2003 in Yolo-Solano AQMD**

Yolo-Solano AQMD	Percent of all respondent drivers who drove less for Air Quality reasons	x Number of licensed drivers in Yolo-Solano AQMD (192,400)	x Mean Number of single trips Reduced per day	x 17.16 grams of ozone precursors per trip (EMFAC 2002)	= Estimated Tons per day of ozone precursors reduced
Spare the Air Days	1.2% (6/519)	2,300	x 2.2= 5,060	86,829 grams	.1 tons
Control Days	0			0	0
Estimated tons of ozone precursors reduced per day: (STA day reductions – Control day reductions)					<b>.1 tons</b>

### Emissions Reduction Estimate for 2003 in Placer County

Placer County	Percent of <u>all</u> respondent drivers who drove less for Air Quality reasons	x Number of licensed drivers in Placer County (185,330)	x Mean Number of single trips Reduced per day	x 17.16 grams of ozone precursors per trip (EMFAC 2002)	= Estimated Tons per day of ozone precursors reduced
Spare the Air Days	2.3% (10/437)	4,260	x 2.2= 9,372	160,824 grams	.18 tons
Control Days	0			0	0
Estimated tons of ozone precursors reduced per day: (STA day reductions – Control day reductions)					<b>.18 tons</b>

## HEALTH EFFECTS ON SPARE THE AIR DAYS

### Regional and County Results

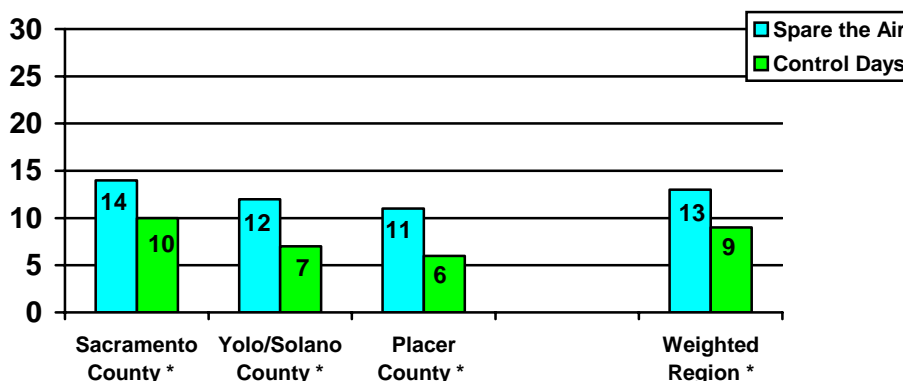
- 18** ➤ *Households consistently experience more health problems on Spare the Air days than on non-Spare the Air days. This year 13% of respondents in the Sacramento basin claimed that someone in their household experienced breathing problems on a Spare the Air day. Extrapolated to the household population of the region as a whole, this means that approximately 92,500 households experienced breathing problems. Nine percent of respondents reported health problems on Control days. Correcting for control days, then, this means that an additional **28,500** 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 13% of respondents in the region as a whole<sup>48</sup> said they had experienced breathing difficulties on Spare the Air days, versus 9% of respondents who experienced problems on Control days.

<sup>48</sup> Results are weighted for the region and exclude responses of “Undecided/Don’t Know.”

Extrapolated to the number of households in the region<sup>49</sup>, this means that an estimated 92,500 households on Spare the Air days and 64,000 on Control days had health problems. As can also be seen in the next chart, the percentages of affected households were similar in the individual counties, and all differences between Spare the Air and Control percentages are statistically significant.

**Spare the Air vs Control Groups: Percent of Respondents whose Households Experienced Breathing Problems**



\* 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, 4% more households reported breathing problems due to poor air quality on STA days than on non-STA days (13% - 9%). With 711,797 households in the Sacramento region<sup>50</sup>, an estimated **28,500 households** were specifically affected on an average STA day because of the air pollution present. This estimate and those for the individual counties are summarized in the next table.

<sup>49</sup> The measure used for households was the number of occupied housing units. Reference: Official State Estimates as of January 1, 2003. State of California, Department of Finance, City/County Population and Housing Estimates. Sacramento, California. Available online at: <http://www.dof.ca.gov/HTML/DEMOGRAP/e5a.xls> The estimated number of households for the entire Sacramento region air quality basin is 711,797 (Sacramento County: 502,207 + (Placer County: 123,302 \* 86% = 106,040) + Yolo/Solano: 103,550 (Yolo: 65,368; Solano (Dixon, Rio Vista & Vacaville: 38,182).

<sup>50</sup> The measure used for households was the number of occupied housing units. Reference: Official State Estimates as of January 1, 2003. State of California, Department of Finance, City/County Population and Housing Estimates. Sacramento, California. Available online at: <http://www.dof.ca.gov/HTML/DEMOGRAP/e5a.xls> The estimated number of households for the entire Sacramento region air quality basin is 711,797 (Sacramento County: 502,207 + (Placer County: 123,302 \* 86% = 106,040) + Yolo/Solano: 103,550 (Yolo: 65,368; Solano (Dixon, Rio Vista & Vacaville: 38,182).

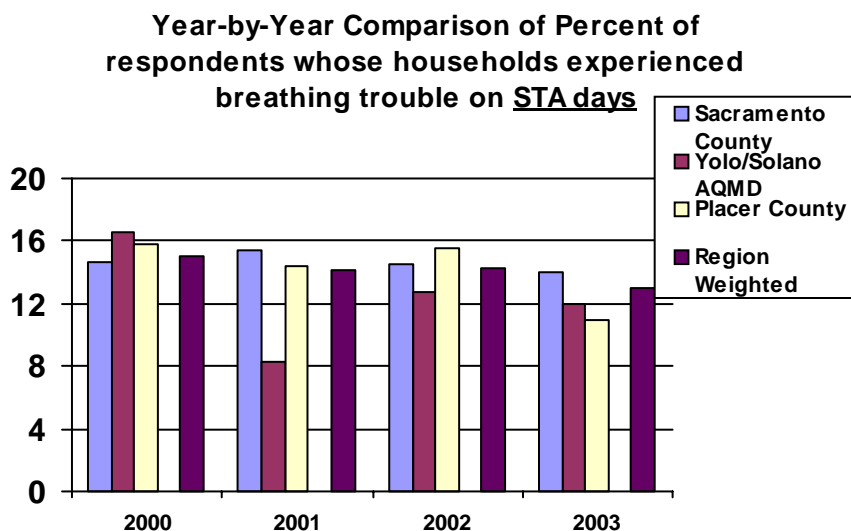
### Estimated Number of Households Affected by Air Pollution

	<i>% of Households Affected (STA – Control)</i>	<i>Total Number of Households</i>	<i>Estimated Number of Households Affected with Breathing Problems</i>
<i>Sacramento County</i>	4%	502,207	<b>20,100</b>
<i>Yolo-Solano AQMD</i>	5%	103,550	<b>5,200</b>
<i>Placer County</i>	5%	106,040	<b>5,300</b>
<i>Total Region (weighted)</i>	4%	711,797	<b>28,500</b>

#### Year-by-Year Comparisons

- 19 ➤ *The percentage of households reporting breathing problems on Spare the Air days has remained relatively stable during the past four years, with the exception of Yolo-Solano AQMD in 2001.*

The next chart plots the percentage of respondents within each county who reported household health problems on Spare the Air days, from 2000 to the present. It can be seen that, with the exception of Yolo-Solano, the percentages within Sacramento and Placer counties, and the region as a whole have not differed much from one year to the next. (Yolo-Solano in 2001 was the exception.)



## EMPLOYED VS UNEMPLOYED RESPONDENTS

### Regional and Individual County Results

- 20 ➤ *Employed drivers remain a good group to target for encouraging driving reduction as they greatly outnumber the unemployed. There was no difference in general awareness between those employed and those not employed, but it was the unemployed who were actually more likely to report driving "less" on Spare the Air days. Employees who get information and motivation at work are more aware of STA, but not more likely to take action than those who do not.*

Spare the Air organizers are increasingly seeing the need to outreach to specific groups in order to increase participation in Spare the Air. The largest group of drivers on the road in the Sacramento region was employed (69% of respondents), and commuted to work alone in a vehicle (71% of these employed respondents). However, although equal numbers of employed (57%) and unemployed (60%) were aware of Spare the Air<sup>51</sup>, significantly more unemployed respondents said they drove "less" following a Spare the Air day. In other words, the mass appeal to the public as a whole seems to be more effective in encouraging the unemployed to drive less, rather than the employed.

## EMPLOYER ENCOURAGEMENT TO REDUCE DRIVING

- 21 ➤ *Only 15% of employed drivers said their employer encourages them to drive less on poor air quality days, and only 2% were asked by their employer to sign up for AirAlert – an obvious area for improvement.*

Companies are also seen as prime groups to target as they have the potential of influencing and motivating large numbers of their employees to participate by directly encouraging them to drive less on Spare the Air days. This was the rationale behind the Employer Network component of the Spare the Air program. However, it appears that the program needs to grow, as only 15% of employed respondents said their employer encouraged them to drive less on poor air quality days; only 9% were notified by the employer of poor air quality days -- 8% by e-mail and 7% via posted signs. **A gap was identified in that only 2% of employed respondents were asked by their employer to sign up for AirAlert notification – yet, this would be a very efficient way for companies to participate in Spare the Air.**

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<sup>51</sup> Using the ARB-worded question of general awareness of Spare the Air.

- 22 ➤ *In Sacramento and Placer Counties, significantly more respondents were aware of Spare the Air days when their employer encouraged them to drive less on poor air quality days. Although this did not extend to differential reduction in the number of trips avoided for air quality reasons, efforts should nevertheless continue to target more employers to “sign on” to the Spare the Air program. Awareness is a precursor to changing behavior.*

The next analyses focused on comparing Spare the Air awareness and driving behavior among employees whose companies encouraged driving reduction on poor air quality days versus those whose companies did not. First, note that companies that encouraged STA driving reduction were also highly likely to provide information to employees about STA. In terms of awareness, there were two significant county differences. Results show that in Sacramento County a significantly higher percentage of employees whose companies encouraged driving reduction were aware of Spare the Air<sup>52</sup> (74%), than was the percentage of employees in companies who did not (58%). This was also true in Placer County (74% vs. 55%). In Yolo-Solano AQMD, however, awareness was the same between the two groups of employees. [This may be due to the relatively good air quality experienced in Yolo-Solano AQMD, relative to the other two.]

However, awareness of Spare the Air did not translate into actual driving reduction: about the same percentages of employees said they drove “less” in all counties (about 17% to 18%), regardless of whether their companies encouraged them to reduce driving or not. Similarly, about the same number of employees in each county said they reduced the number of trips they made for air quality reasons, regardless of employer encouragement. This finding contradicts a finding of the California Air Resources Board analysis of Spare The Air program in Sacramento.

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<sup>52</sup> Awareness was measured using the ARB recommended question (“In the past two days have you heard, read, or seen any advertisements or news broadcasts about Spare the Air, or poor air quality, or requests to drive less in this area?”)

## Summary Conclusions

- ✓ The majority of respondents (60%) were aware of Spare the Air in general. This means that **over a million** residents heard the requests for reduced driving on a Spare the Air day.
- ✓ As in the past, awareness was lowest in Yolo-Solano AQMD, 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, however the percentage of respondents who said they drove “less” following STA days was the same as the percentage interviewed on Control days. This could indicate that the effectiveness of the program might be fading. However, additional analyses indicated a significantly higher percentage of reducers for air quality reasons on Spare the Air versus Control days, an indicator that the program is still working in general.
- ✓ The strict criterion for measuring driving reduction recommended by the ARB was used in this year’s report. The percentage of all drivers in the region who were aware of Spare the Air, and who reported driving less, and did so specifically for air quality reasons on Spare the Air days was **1.4%**. Results from previous years were re-calculated according to the strict criterion. For Sacramento County and the region as a whole, the percentage of reducers each year since 2000 has not changed significantly.
- ✓ This 1.4% translates into an estimated 17,400 drivers who avoided making 44,600 trips on Spare the Air days. The average number of single trips avoided by reducers was 2.56 per day.
- ✓ The percentage of households reporting breathing problems on Spare the Air days has remained relatively stable during the past four years. For the region as a whole, this year’s results indicated that an additional 28,500 households experienced health problems due specifically to air pollution on Spare the Air days.
- ✓ Employers and employees are obvious targets for Spare the Air organizers. Currently, only 15% of employed drivers said their employer encouraged them to drive less on Spare the Air days, and only 2% were asked by their employer to sign up for AirAlert.
- ✓ In Sacramento and Placer, more respondents were aware of Spare the Air when their employer encouraged them to drive less than when the employer did not. Although this did not extend to a differential reduction in driving, efforts should still continue to target more companies to register.
- ✓ The Spare the Air program was successful in reducing air pollution in the Sacramento region as a whole by an estimated **0.8 tons** of ozone precursors per day.

This is due specifically to residents driving less on Spare the Air days for air quality reasons.

- ✓ In conclusion, the Spare the Air program continues to have an impact on driver awareness and driving behavior, although increases in awareness and driving reduction are not being seen. Efforts to target specific groups should continue in order to make the best use of program dollars.

## Recommendations

- ✓ Continue to use the consistent definitions in measuring the effectiveness of the program and for emission reduction estimations so that long term trends can be analyzed.
- ✓ More effort still is needed towards developing ways of increasing actual driver participation, and not just awareness. Partnership efforts, public transit programs, and encouraging enrollment in the AirAlert and Employer Network should continue.