Performance Measures for the Environmental Protection Division's "Partnership for a Smog-Free Georgia"

Methods Used For Developing Measures

Environmental Policy Program
The Andrew Young School of Policy Studies
Georgia State University
Atlanta, Georgia
404-651-3963

October 1, 1999

Performance Measures for the Environmental Protection Division's "Partnership for a Smog-Free Georgia"

Methods Used For Developing Measures

I. Introduction

Two distinct sets of measurements have been developed as a means for measuring the effectiveness of the EPD's voluntary ozone reduction program, the "Partnership for a Smog-Free Georgia." (previously, the "Voluntary Ozone Action Program"). One set of measures is designed to measure the extent to which employees of state government are complying with an Executive Order requiring a reduction in sov commuters by at least 20%. Components of this set of measures are:

Parking lot monitoring program:

Self-reports

Daily tracking survey -- state government

The second set of measures is designed to measure PSG-related reduction in automobile use in the Atlanta metropolitan area. Components of this set of measures are:

Traffic count monitoring program

Daily tracking survey -- general

MARTA ridership

In what follows a brief sketch is provided for the analytical methods used for each of these measurement programs. Examples of results obtained with each method are included with the description of the method. A report documenting results from all methods for the entire 1999 ozone season will be available from the EPD's Air Office by the end of the year.

II. Monitoring Compliance With The Governor's Executive Order

II.A The Parking Lot Monitoring Program. This program is organized in the following way. Twelve state parking facilities with 4,374 parking spaces and one major federal parking facility with 1,613 spaces are monitored on a *daily* basis.[1] Since April, 1998, every week day a survey team riding bicycles have been counting the number of vacant parking spaces at each facility. Given the total number of spaces in each facility, these data provide daily measures for the total number of cars being used by state and federal employees for the purpose of commuting to and from their jobs. Given that the Governor's Executive Order requires sov reductions of at least 20% during the entire 1999 ozone season, data gathered from October, 1998, through April, 1999, are used as baseline measures for vehicle numbers expected in the off-season. Vehicles observed during the May-September, 1999 period are then compared with baseline data for the purpose of estimating the reduction in sov commuters. We also compare vehicle numbers observed during the 1999 ozone season with those observed (on non-action days) during the 1998 ozone season.

II.B Self-reports by state agencies and universities.

II.B.1 State agencies. At the end of each month during the ozone season, a number of state agencies report the number of sov commuters in their agency for each day of the preceding month. These data are compared with the agency's baseline (pre-ozone season) sov commuters for the purpose of determining the percentage reduction in sov commuters. For the 1999 ozone season, the following per cent reductions were reported by agencies.

Month	# of agencies reporting	% reduction in sov
May	51	23%
June	45	25
July	52	35
August	44	32
September	34	22

Methods used by each reporting agency for collecting daily commute modes by employees are given in Figure 1.

II.B.2 Self-reports from GSU. On each Monday, staff and faculty at Georgia State University receive an e-mail message from President Patton requesting that they complete an attached survey describing their daily commuting behavior during the previous week (see Figures 2 and 3). This survey began on January 18, 1999. Data obtained during the period January 18-

[1] At one time, this program included twelve parking facilities used by faculty and staff at Georgia State University with 1,837 parking spaces. These facilities were dropped mid-summer, 1999, due to continuous changes in GSU's academic schedule which then continually invalidated our baseline measures.

April 30, 1999 are used as a baseline. Initial response rates[2] were some 30% during the first few weeks of the survey; over the final four months of the survey the response rate fell to around 24%. The average round-trip commute by GSU faculty and staff is 36 miles.

Given the nature of the university -- classes must be offered at times required by students -- GSU's efforts to reduce sov commuting focuses primarily on *episodic* (Action Day) responses (although efforts are made to encourage alternative commute modes throughout the summer). Thus, during the ozone season, survey data obtained on Action Days are compared with baseline data for the purpose of identifying any change in commuting behavior.

II.C The Daily Tracking Survey - state government. Each day from February 1, 1999 through the end of the 1999 smog season, staff of GSU's Applied Research Center interview residents of the Atlanta metro region. Interviews include questions about behaviors that produce ground level ozone, respondent knowledge about ozone and smog, attitudes about smog and related issues, as well as number of trips and milage driven during the previous day. Each day a new probability sample is made available for calling. The goal is to obtain 50 usable responses per day. Because each day is a probability sample, results can be aggregated by month or week to produce more reliable estimates. This type of survey is known as a "Tracking Survey." Another benefit of the tracking method is that responses to Smog Action Day alerts can be observed on the day of the alert and sampling bias does not influence the estimates of differences on those days.

A monthly report is prepared for the EPD with provides a progress report on a few key variables that are important for smog policy development. Each month graphic reports are provided concerning the following variables.

Perceptions of community importance of smog, air quality, and the environment;

Perceptions of personal importance of smog, air quality, and the environment;

Average trips reported in the previous 24 hours;

Average miles driven in the previous 24 hours.

While these data are collected from a random sample of the entire population in the 13-county non-attainment area, respondents are asked to identify the sector of their employment -- where state government is one of the included sectors. Thus, number of daily trips and miles driven by state employee households can be separately tracked.

---

[2] Reference is made to responses as a percent of e-mail *opened*; opened e-mail as a percent of total mailings fell from 70% in the first week to less than 30% over the last four months of the survey.

III. Measuring Program Effects In The Atlanta Metro Area

III.A The Traffic Count Monitoring Program. The objective of this program is to compare (i) traffic volumes that would occur on any day *in the absence* of the PSG with (ii) actual, observed traffic counts. The measure for (i) is obtained from GSU's Traffic Estimation Model that was developed in the following manner.

Georgia's Department of Transportation has made available to the GSU researcher hourly traffic counts for each day of the six-year period from 1994 to the present. These are obtained from 32 Automatic Traffic Recording (ATR) stations that are located at strategic points on Interstate highways and major arterial streets throughout the Atlanta metropolitan area. This *enormous* panel data set -- more than 80,000 records each containing 24 hours of volume data -- was used by the authors to develop a forecasting model for hourly and daily traffic counts for the pre-PSG period.

The Traffic Count model is essentially a statistical (ARIMA) model that estimates daily total traffic counts at each ATR station controlling for all aspects of vehicle travel except the existence of the PSG (e.g., the model controls for such things as growth in vehicle registration, weather, and seasonal changes). We model the traffic flow at an ATR station during a particular hour as a function of traffic volumes in previous hours at that station, weather conditions, the number of vehicles registered annually in the various counties in the non attainment area, a time trend, seasonal dummy variables, and the fixed effects dummies. In order to obtain traffic volume predictions for a full day or for a block of time such as rush hour, we simply aggregate across all stations and the relevant hours. A detailed description of the model is given in a paper authored by R. Cummings and M. Walker.[3]

The Traffic Count model is extraordinarily accurate in forecasting traffic counts in the Atlanta metro area. The correlation coefficient between actual and predicted volumes is above .98 for most months. A graphic example of the model's capability of estimating traffic count is seen in Figure 4 wherein we compare daily predictions (estimates) of traffic volumes with actual traffic counts for a month in the period before the PSG was initiated: June, 1997. The average estimation error for June, 1997, is less than 1%.

III.B The Daily Tracking Survey -general. As noted above in section II.C the Daily Tracking Survey is based on random samples from the population in the 13-county metropolitan area. We will not repeat the basic description of the Survey method given above.

III.B Monitoring MARTA ridership. Daily ridership on MARTA for the last six years have been made available to GSU researchers for the purpose of attempting to identify changes in

[3] Cummings, Ronald G. and Mary Beth Walker, "Estimating Changes in Peak and Off-Peak Traffic Patterns Attributable To Voluntary Mobile Source Emission Reduction Programs, *Applied Economics*, forthcoming 1999.

ridership that might be attributed to the PSG (Figure 5). Efforts were made to develop a model that could be used to predict daily ridership along lines similar to those used for the Traffic Count model. These efforts were unsuccessful given the relative stability of inter-annual daily ridership. Thus, we are left with average measures for ridership on Monday-Thursday, and Fridays. There is little prospect of these data yielding statistically significant measures of PSG-related changes in daily ridership unless such changes are quite large -- on the order of 15%-+. We have thus far been unable to identify changes attributable to the PSG.

Figure 2

GSU Survey

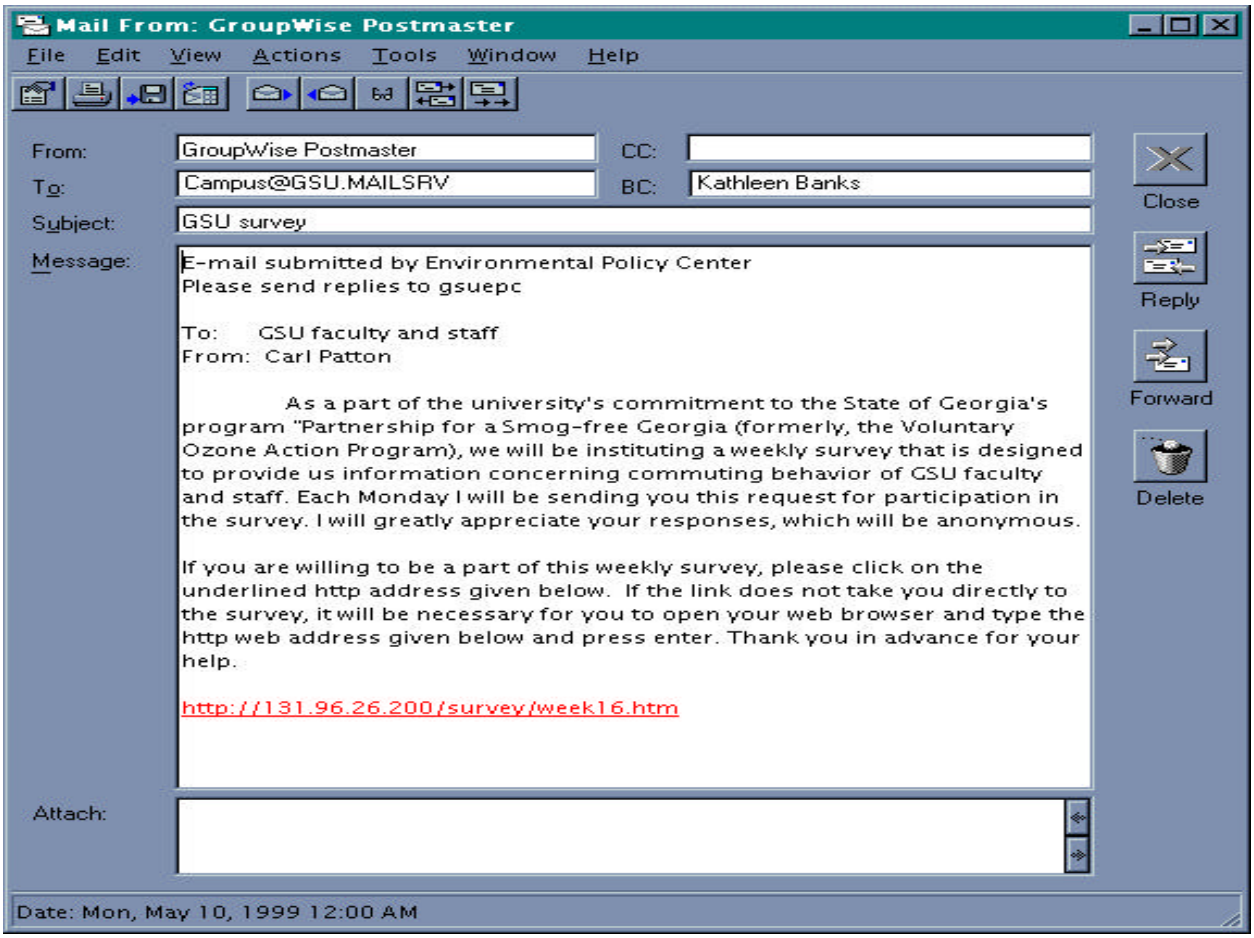

Figure 3

GSU Survey (continued)