

Bifurcated Goals and Appropriate Evaluative Measures of Air Quality Programs: Examples from Ohio (draft)

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ABSTRACT

Air quality programs, and their comparable namesakes, are but one small component of the extensive and sweeping federal Clean Air Act (CAA). Although these programs to warn the public of “poor air quality” through episodic *air quality alerts* are voluntary, they are still considered part of the overall effort to achieve “clean air.”

My assumption at the outset of this research was that the nature of these programs would likely assume two roles or identities -- a means to reduce emissions and aid in CAA compliance and as a public information campaign (PIC). Based upon analysis of the intergovernmental environment and the evaluative efforts of these programs, this assumption was ultimately borne out. With this in mind, the purpose of this project was twofold: 1) to examine whether Ohio’s programs, as a critical case, also operated with bifurcated identities and, and 3) to examine whether Ohio’s air quality programs are congruent with this intergovernmental environment.

Based upon semi-structured interviews with representatives of Ohio’s air quality programs, I have uncovered evidence that these programs do, indeed, maintain goals, activities and evaluative efforts that result in the programs maintaining two distinct “identities.” Of course, this dual identity is not problematic in of itself. However, the intergovernmental environment surrounding these programs decidedly emphasizes that these programs fulfill the emission-reducer identity, which is problematic. This is problematic not because of the fact of a conflict exists; rather the problem lies in the fact that fulfilling the emission-reducer identity relies upon a dubious causal mechanism. The mechanism that links air quality programs to realizing emissions reductions is *pro-environmental* behavior. The theory stipulates that an individual will hear a message telling them what they could personally do to improve air quality

and they will then be inclined to act on it and modify their behavior in some way, such as carpooling.

Although this is a possible – and hopeful – result of these programs, ascertaining this result is evasive and difficult to quantify. With this in mind, my central point is that air quality programs in Ohio have distinct value as PIC's and they should be funded, administered and evaluated on the basis of being a PIC and not a means to reduce emissions. This recognition should also preference qualitative methods over quantitative methods when assessing the effectiveness of these programs.

BACKGROUND OF CAA/NAAQS/AQI/OZONE/PM

The original CAA (PL 91-604) was passed in 1970 in an effort to regulate emissions from stationary and mobile sources. An extensive piece of legislation, CAA also created the National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. Initially, these NAAQS were to be met by 1975. However, these goals were not met and the CAA was amended in 1977 with the hopes of achieving NAAQS compliance. After passage of the 1990 CAA (PL 101-549) it was administratively modified in 1997 to address problems such as acid rain, ground-level ozone, stratospheric ozone depletion, and air toxics.

The current NAAQS set limits for carbon monoxide, lead, nitrogen dioxide particulate matter (PM), ozone, and sulfur oxides. There are two sets of standards, primary and secondary. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to

protect general public welfare. The current United States Environmental Protection Agency (USEPA) NAAQS standards for PM and Ozone are as follows:¹

Table 1 – Ozone and PM Standards			
Pollutant	Primary Standards	Averaging Times	Secondary Standards
PM₁₀	50 µg/m ³	Annual ¹ (Arithmetic Mean)	Same as Primary
	150 µg/m ³	24-hour ²	
PM_{2.5}	15 µg/m ³	Annual ³ (Arithmetic Mean)	Same as Primary
	65 µg/m ³	24-hour ⁴	
Ozone	0.08 ppm	8-hour ⁵	Same as Primary
	0.12 ppm	1-hour ⁶	Same as Primary

¹ To attain this standard, the expected annual arithmetic mean PM₁₀ concentration at each monitor within an area must not exceed 50 µg/m³.

² Not to be exceeded more than once per year.

³ To attain this standard, the 3-year average of the annual arithmetic mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15 µg/m³.

⁴ To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 µg/m³.

⁵ To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

⁶ (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

(b) The 1-hour NAAQS will no longer apply to an area one year after the effective date of the designation of that area for the 8-hour ozone NAAQS. The effective designation date for most areas is June 15, 2004. (40 CFR 50.9; see Federal Register of April 30, 2004 (69 FR 23996).)

Under the CAA, states must create state implementation plans (SIP's) that explain how each state intends to achieve NAAQS. Under these SIP's, states must monitor air quality, but are not required to maintain an "air quality program." Air quality programs are relatively new, most arriving in the wake of the 1990 CAA.² Air quality programs throughout the United States have several namesakes but they all essentially exist to inform the public that ozone levels (and now particulate matter for many programs) have exceeded acceptable levels.

To aid in informing the public about air quality, the USEPA established the air quality index (AQI). The USEPA calculates the AQI for five major air pollutants regulated by the CAA

¹ United States Environmental Protection Agency. (2004).

² Henry, G. T. and C. S. Gordon (2003). "Driving Less for Better Air: Impacts of a Public Information Campaign." *Journal of Policy Analysis and Management* 22(1): 45-63.

and addressed by NAAQS -- ozone, PM, carbon monoxide, sulfur dioxide, and nitrogen dioxide. Air quality programs in Ohio, typically forecast and issue warnings for two pollutants – ozone and Particulate Matter (PM).

Table 2 – AQI/Ozone & PM Concentrations					
AQI	AQI Category	Meaning	Concentration		
			Ozone (ppb), 8 hour	PM_{2.5} (ug/m³), 24 hour	PM₁₀ (ug/m³), 24 hour
0-50	Good	Air pollution poses little or no risk.	0-64	0-15.4	0-54
51-100	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern.	65-84	15.5-40.4	55-154
101-150	Unhealthy for sensitive groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.	85-104	40.5-65.4	155-254
151-200	Unhealthy	Everyone may begin to experience health effects when AQI values are in this range. Members of sensitive groups may experience more serious health effects.	105-124	65.5-150.4	255-354
201-300	Very Unhealthy	AQI values in this range trigger a health alert, meaning everyone may experience more serious health effects	125-374	150.5-250.4	355-424
301+	Hazardous	AQI values over 300 trigger health warnings of emergency conditions. The entire population is more likely to be affected.	405-604 ¹	250.5-500	425-604

Source: www.epa.gov

¹ (when 8-hour ozone concentration exceeds .374 ppm, AQI values of 301 or greater must be calculated with 1-hour ozone concentrations)

Ozone is formed by the photochemical reaction of nitrogen oxides (NO_x) volatile organic compounds (VOC), and sunlight. NO_x and VOC are produced by a variety of man made and naturally occurring sources. The ozone that resides in the earth’s upper atmosphere (stratosphere) is necessary to protect the earth from the harmful effects of the sun. However, ground level ozone is a secondary pollutant and is dangerous to humans. It has been established that high levels of ground level ozone are damaging to children, the elderly, and adults with extensive outdoor exposure. Scientific research suggests that ground level ozone exacerbates (or possibly causes) a variety of illnesses including shortness of breath, coughing, wheezing, lung inflammation, decreased lung function, asthma, and chronic respiratory problems. Generally

speaking, high ground level ozone concentrations are caused by three factors: 1) pollution emissions, 2) transport of ozone, and 3) meteorological influences.³

Particulate matter (PM) is a general term to describe the mixture of solid particles in the air. There are two classifications used by the USEPA – PM_{2.5} and PM₁₀. PM_{2.5} refers to “fine” PM that are less than or equal to 2.5 µm in diameter and PM₁₀ refers to “course” PM and includes all particles less than or equal to 10 µm in diameter. Generally speaking, PM₁₀ comes from “primary sources” such as dust from roads. PM_{2.5} is formed in the atmosphere when ammonia reacts with SO₂ (to form sulfates) and NO_x (to form nitrates). The primary sources of SO₂ and NO_x emissions are power plants, industrial facilities, automobiles, and other types of combustion sources.

Both of these particles are small enough to get into the lungs and numerous health effects can be traced to PM, although the most serious health conditions are associated with PM_{2.5}. PM articles can aggravate respiratory conditions such as asthma and bronchitis and have been associated with cardiac arrhythmias and heart attacks. People with heart or lung disease, the elderly, and children are at highest risk from exposure to PM.⁴

THE INTERGOVERNMENTAL ENVIRONMENT

Air quality programs in Ohio operate within a complex intergovernmental environment consisting of federal legislation implemented by the USEPA, program funding distributed by two other federal agencies, and the actual programs being implemented by a myriad of fragmented and independent entities at a regional or local level.

³ United States Environmental Protection Agency. (2004).

⁴ United States Environmental Protection Agency. (2004).

The previous section of this paper established that the USEPA maintains primary responsibility for setting the standards for air quality. However, the basic elements of the federally mandated SIP do not directly address air quality programs.⁵ In other words, there is no legal justification for air quality programs. Despite this, the USEPA maintains a policy of allowing emission reductions credit of up to 3% for states that incorporate air quality programs in their SIP.⁶ Since the USEPA grants emission reductions for maintaining these voluntary programs, states have the incentive to adopt these programs and include them in their SIP. As of now, Ohio does not have language covering air quality programs in its SIP, so it is not able to take emission reduction credit with the USEPA. However, this may change. According to Bill Spires in the Ohio EPA division of Air Pollution Control, Ohio plans to incorporate voluntary measures (including air quality programs) into Ohio's SIP within the next three years.⁷

Further, consider the nature of the 1997 ozone and PM standards themselves. These standards are calling for clean air by 2010 but the focus relies heavily on technology requirements.⁸ Research by James M. Lents suggest that the effort to clean air has been a failure, and this failure can be attributed to the various factors, but notes that "it is technological solutions that have provided the clean air success realized to date."⁹ Stephen DeVito echoes this sentiment and speculates that "control technology for particulate size will become increasingly important."¹⁰ Air quality programs, as they are structured now, do not fit into this technologically dominated philosophy.

⁵ Wyman, Jr., R.A., Kato, D.M, and Alexander, J.S. in Martineau, J., Robert and D. P. Novello, Eds. (2004). The Clean Air Act Handbook. Chicago, IL, American Bar Association, 45.

⁶ Wilson, R. (1997). Guidance on Incorporating Voluntary Mobile Source Emission Reduction Programs in State Implementation Plans (SIP's): A Letter to EPA Regional Administrators.

⁷ Spires, B. (2004). Telephone Interview.

⁸ Hays, S. P. (1998). Explorations in Environmental History. Pittsburgh, PA, University of Pittsburgh Press, 252.

⁹ Lents, J. M. (1998). "Making Clean Air Programs Work." Environmental Science and Policy 1: 211-222.

¹⁰ DeVito, S. (1999). "Present and Future Regulatory Trends of the United States Environmental Protection Agency." Progress in Organic Coatings: 55-61.

Although the USEPA sets nationwide NAAQS and AQI, the primary funding for most air quality programs, including those in Ohio, is derived from the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). This Act authorized the Congestion Mitigation and Air Quality Improvement Program (CMAQ) and Surface Transportation Program (STP). The CMAQ/STP program is jointly administered by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA). The funds were reauthorized in 1998 under the Transportation Equity Act for the 21st Century (TEA-21). In 2003, the TEA-21 CMAQ program provided over \$8.1 billion dollars in CMAQ funds to State Departments of Transportation, Metropolitan Planning Organizations (MPOs), and transit agencies to invest in projects that aid in complying with NAAQS.¹¹ Entities with air quality programs apply for CMAQ/STP funds through a yearly formalized process. In Ohio, once these funds are approved, they are distributed initially to the Ohio Department of Transportation (ODOT) and then to seven Metropolitan Planning Organizations (MPO's) with air quality programs in Ohio including the six as part of this study.

Specifically, the primary purpose of the CMAQ program is to “fund transportation projects and programs in nonattainment and maintenance areas which reduced transportation-related emissions”.¹² Section 10 of the Program Guidelines do state that outreach and marketing (“public information”) programs in support of this goal are eligible. STP funds are directed to projects and programs for a broad variety of transit and highway work..¹³ The support of STP funds for air quality programs is even more ambiguous, but likely allowed under activities that

¹¹ Federal Highway Administration. (2004).

¹² The Congestion Mitigation and Air Quality Improvement Program (CMAQ) Under the Transportation Equity Act for the 21st Century (TEA-21) Program Guidance. (1999).

¹³ Local Programs Procedures. (2001). Division of Local Assistance, California, 4-1.

“enhance transportation.”¹⁴ Overall, the grant requirements *officially* appear to endorse the policy that these programs should aid in emission reduction but *unofficially* recognize the value of the programs as a PIC since grantors have not held these programs to establishing quantifiable emissions reductions. With written goals conflicting with practiced goals, support of air quality programs as an emission reducer or PIC is a bit ambiguous. Suffice it to say, however, CMAQ/STP funds clearly *officially* recognize these programs as a means to reduce emissions.

Although the perspective of these actors is somewhat mixed, it appears that the perception that these programs are – or should be – *able to* quantify emissions reductions is dominant (outside of the actual program itself).

EVALUATION METHDOLOGY FOR AIR QUALITY PROGRAMS

Since these programs desire to modify human behavior in some way and “behavior is adaptive only when people obtain feedback from the environment”¹⁵ I felt it was necessary to examine the literature regarding evaluative efforts for air quality programs. Based upon this examination, I have found that the primary methodology to evaluate the effectiveness of these programs is typically through some sort of public survey.

A 1997 report by the USEPA entitled “Quantification of Episodic Control Programs” summarizes the final phase of a three-phase study on air quality programs throughout the nation. One of the conclusions reached in this phase of the study is that surveys of the general public and participating organizations are the most common methodology to evaluate the effectiveness of

¹⁴ Ibid.

¹⁵ Posavack, E. J. and R. G. Carey (1989). Program Evaluation: Methods and Case Studies. Engelwood Cliffs, NY, 14.

these programs.¹⁶ In this report, air quality programs in Baltimore, Sacramento, San Francisco, Cincinnati and Dallas were presented as case studies of how this methodology was employed. In other reports, the USEPA has recommended that that these programs use surveys as the means to evaluate these programs.¹⁷

This report also concluded that surveys of air quality programs, are not developed enough to use quantifiable emission reductions as a standard for program success. The USEPA writes, “In short, no program has yet invested the resources necessary to develop a rigorous survey instrument and analytical methodology to quantify the reductions in vehicle travel, and emissions, that may be occurring.”¹⁸ Although implicit, USEPA seems to recognize that that air quality programs must be evaluated on their performance as a PIC. Specifically the report states that gauging public awareness of air pollution issues and the seasonal/episodic program itself can be used as a criterion of effectiveness.

The evidence of surveys as a tool to measure the effectiveness of air quality programs are also present in the literature. For example, a 2003 study by Gary Henry found that increasing awareness had “no significant effect on miles driven – the most aware were neither more nor less likely to drive less.”¹⁹ However, he did find that air quality alerts are effective in raising awareness if air quality.²⁰ Likewise, a study by Blanken, Dillon and Wismann found that commuter travel was not altered as a result of air quality alerts and that these alerts are also not

¹⁶ United States Environmental Protection Agency. 1997. Quantification of Episodic Control Programs. Washington, DC: The United State Environmental Protection Agency, v.

¹⁷ United States Environmental Protection Agency. 1998. Index of Transportation Measure Quantification Efforts: Methodology Matrix: United States Environmental Protection Agency.

¹⁸ United States Environmental Protection Agency. 1997. Quantification of Episodic Control Programs. Washington, DC: The United State Environmental Protection Agency, vi.

¹⁹ Henry, G. T. and C. S. Gordon (2003). "Driving Less for Better Air: Impacts of a Public Information Campaign." Journal of Policy Analysis and Management 22(1): 45-63.

²⁰ Henry, G. T. and C. S. Gordon (2003). "Driving Less for Better Air: Impacts of a Public Information Campaign." Journal of Policy Analysis and Management 22(1): 45-63.

successful in changing well-established behaviors, such as driving.²¹ Their study also concluded that program awareness was high.²²

In conclusion, the USEPA and the literature suggests that these programs are typically evaluated using some kind of public survey. More specifically, these surveys are geared toward understanding the effectiveness of air quality programs as emission-reducers and PIC's.

THEORIES OF PRO-ENVIRONMENTAL BEHAVIOR

The literature suggests that campaigns to distribute information and their effects on human behavior can generally be understood within the context of one of two models. The first model, the "risk factor" model, is concerned with changing individual behavior. Essentially, this model is premised on the fact that individuals will engage in activities out of concern their health or the health of others. This model hinges upon anthropocentrism, or an instrumental -- not intrinsic -- valuing of nature. Additional literature does suggest that ecocentrism, or the intrinsic valuing of nature, is actually a necessary pre-requisite in order to modify environmentally related human behavior.²³ The second model, the "social diffusion" model has more to do with the catalytic effect of the interaction of component parts.²⁴ Under this model, the goal is to change the social context to produce an environment where a favorable outcome could occur. In essence, the role of the campaign is to create the social contexts that will lead toward desired outcomes.

²¹ Blanken, P. D., J. Dillon, et al. (2001). "The Impact of an Air Quality Advisory Program on Voluntary Mobile Source Air Pollution Reduction." *Atmospheric Environment* **35**: 2417-2421.

²² Blanken, P. D., J. Dillon, et al. (2001). "The Impact of an Air Quality Advisory Program on Voluntary Mobile Source Air Pollution Reduction." *Atmospheric Environment* **35**: 2417-2421.

²³ Johnson, Pamela C. 1996. Development of an Ecological Conscience: Is Ecocentrism a Prerequisite. *The Academy of Management Review* 21 (3):607-611.

²⁴ Wellings, Kaye, and Wendy Macdowall. 200. Evaluating Mass Media Approaches. In *Evaluating Health Promotion: Practice and Methods*, edited by M. Thorogood and Y. Coombes. New York: Oxford University Press, 115.

Based upon my survey of the intergovernmental environment of air quality programs and how they should be and have been evaluated, it appears that the programs in general tend to hinge hopeful emissions reductions on the first model, that individuals will engage in pro-environmental behavior out of anthropocentric concern for their health and the health of others, although ecocentrism may be a driving force as well. Regardless of the driving force, research suggests that the relationship between attitude and behavior is moderated by effort.²⁵ In other words, the more effort required, the less likely it is the individual will act. When it comes to ingrained behaviors such as driving, air quality programs face a formidable challenge. Suffice it to say, air quality programs that operate on this first model may not be effective: “If mass media interventions are effective, it is likely because they activate a complex process of change in social norms rather than because they directly change the explicit behaviour of individuals.”²⁶

Another way to conceptualize this within the context of air quality programs is to state that the causal mechanism between air quality programs and emissions reductions is dubious. The mechanism that is supposed to be at work here is that these programs alert the public of poor air quality, and the public will act in a *pro-environmental* fashion (for anthropocentric or ecocentric reasons) and will then take steps (such as carpooling) that result in emissions reductions, reductions which are quantifiable.

The USEPA recognizes and endorses this mechanism through their policy of allowing emissions reductions for states that have air quality programs.²⁷ The crux of the memo that articulates this policy is mechanistic – it details the *procedure* of how to attain credit for

²⁵ Schultz, P. Wesley, and Stuart Oskamp. 1996. Effort as a Moderator of the Attitude-Behavior Relationship: General Environmental Concern and Recycling. *Social Psychology Quarterly* 59 (4):375-383.

²⁶ Johnson, Pamela C. 1996. Development of an Ecological Conscience: Is Ecocentrism a Prerequisite. *The Academy of Management Review* 21 (3):607-611.

²⁷ O'Connor, K., B. Keonig, M. Naud, M. Preheim, and L. Duvall. 1998. Quantification of episodic control programs: United States Environmental Protection Agency.

emission reductions in the SIP process. The only guidance offered as to “how” voluntary programs should quantify emission reduction estimates is that the process should “contain a good faith estimate.” This lack of elaboration of what constitutes a “good faith estimate” underscores the fact that it is difficult to pin down what effect individual behavior has on emissions. Laura Loges of MVRPC seemed to indicate awareness of this dilemma when she stated that she wanted “guidance on *logical* emission reductions” (emphasis in original). Although the lack of guidance by the USEPA is certainly an issue, the more striking issue is that the USEPA allows emission reduction credits for these programs even though the Agency itself has essentially concluded that holding these programs to emission reductions standards is not appropriate at this time. The situation, then, phrased more bluntly, is that the USEPA sanctions air quality programs as emission reducers even though there is no evidence to suggest that they actually reduce emissions.

THE VALUE OF PUBLIC INFORMATION

However, just because it is difficult to pin emissions reductions on pro-environmental behavior, does not mean that these programs are without value. The value of these programs can be elucidated within the context of the “social diffusion” model to explain human behavior. Recall that under the social diffusion model the emphasis of behavioral change hinges upon changing the social context to produce an environment where a favorable outcome could occur. A mechanism, then, that is capable of producing this environment is information itself. In this respect, the value of air quality programs is actually the information they produce. In short, it is this information from the campaign that is a vital policy instrument in and of itself.²⁸ For

²⁸ Weiss, J. and M. Tschirhart (1994). "Public Information Campaigns as Policy Instruments." Journal of Policy Analysis and Management **13**(1): 82-119.

example, PIC's can be used by government officials to "shape public perception of problems by creating common understandings and bridging differences in perspective among ethnic, regional, political, religious or socioeconomic groups."²⁹

Of course, in the United States, there is a tendency to view PIC's as "propaganda."³⁰ Further, suspicion of PIC's mount when they attempt to institute change beyond the individual level.³¹ However, safeguards that mitigate the negative and emphasize the positive consequences of PIC's can be employed.³² Mitigating the negative involves building and cultivating institutional safeguards such as fragmentation of authority in the executive branch, congressional and judicial oversight, and the First Amendment. Emphasizing the positive is more proactive, and involves activities such as raising the ethical awareness of people who implement information campaigns, an building into the campaign provisions for debate from the target audience.

THE PROBLEM/RESEARCH QUESTION/METHODOLOGY

Laurie Koprowski, Senior Communications Coordinator with MORPC highlighted a dilemma when she anticipated that there would be more intrastate competition for federal funds as the result of the new 1997 PM and ozone standards.³³ But competition based upon what criteria? Certainly, a "successful" program may have more of an edge when it comes to securing funds. In order to understand if a program is successful or not, it is necessary to understand the

²⁹ Weiss, Janet, and Mary Tschirhart. 1994. Public Information Campaigns as Policy Instruments. *Journal of Policy Analysis and Management* 13 (1):82-119.

³⁰ Graber, D. A. *Public Sector Communication: How Organizations Manage Information*. Washington, DC, Congressional Quarterly, Inc., 240.

³¹ Salmon, Charles T., L.A. Post, and Robin E. Christensen. 2003. *Mobilizing Public Will for Social Change*. Lansing, MI: Communications Consortium Media Center.

³² Weiss, Janet, and Mary Tschirhart. 1994. Public Information Campaigns as Policy Instruments. *Journal of Policy Analysis and Management* 13 (1):82-119.

³³ Koprowski, L. (2004.). Telephone Interview.

program's goals and activities and to assess what has already been done in an effort to determine success. Since these programs operate in a complex intergovernmental environment, it is also necessary to determine if these programs goals, activities and evaluative efforts seem congruent with the "general operating environment," if you will. In this respect, the two basic questions and the questions driving this research project are, 1) *do Ohio's programs maintain goals, activities and evaluative efforts that would indicate that they operate as both an emission reducer and as a PIC?*, and 2) *are the goals, activities, and evaluative efforts of Ohio's programs congruent with the intergovernmental environment surrounding them?*

As of 1998 there were approximately only thirty-six programs of this sort nationwide³⁴ but I chose Ohio to focus my efforts. Although Ohio cannot be assumed to be representative of the United States as a whole, it is a critical case.³⁵ According to September 2004 report issued by the Ohio Public Interest Research Group (PIRG), Ohio ranks as the third worst state in terms of unhealthy levels for ozone 2001-2003, and ranked sixth nationwide for the worst smog pollution in 2003 with nineteen smog days. Furthermore, Ohio exceeded the annual standard for fine PM in 2003 and ranks fifth nationwide for the worst year-round PM pollution.³⁶ In addition, one of Ohio's programs, the Cincinnati program, has already been the focus of advanced study by the USEPA, thereby suggesting that other programs in Ohio may be worthy of continued exploration.³⁷

The target population of the study is air quality programs in Ohio that receive federal funds for their programs. Receipt of federal funds is what contributes to intergovernmental

³⁴ O'Connor, K., B. Keonig, M. Naud, M. Preheim, and L. Duvall. 1998. Quantification of episodic control programs: United States Environmental Protection Agency.

³⁵ Yin, Robert K. 2003. *Case Study Research: Design and Methodology*. Third ed. Thousand Oaks, CA: Sage Publications.

³⁶ Figdor, Emily, and Lara Chausow. 2004. *Danger in the Air: Unhealthy Levels of Air Pollution in 2003*. Columbus, OH: Ohio Public Interest Research Group.

³⁷ United States Environmental Protection Agency. 1997. *Quantification of Episodic Control Programs*. Washington, DC: The United State Environmental Protection Agency.

complexity. Since CMAQ/STP is the primary source of revenue for these programs, the target population, therefore, includes only air quality programs in Ohio that receive these funds. These programs and their level of CMAQ/STP funds are detailed in the following table.

Table 3 – Air Quality Program Funding/Budget		
Ohio MPO	FY 05 CMAQ and STP Funding	FY 05 Total Funding
The Toledo Metropolitan Area Council of Governments (TMACOG)	\$70,000	\$85,500
Northeast Ohio Areawide Coordinating Agency (NOACA)	\$40,400	\$40,400 (excluding staff time)
Eastgate	\$112,189	\$112,189
The Mid-Ohio Regional Planning Commission (MORPC)	\$165,000	\$175,000
Miami Valley Regional Planning Commission (MVRPC)	\$319,000	\$329,000
The Ohio-Kentucky-Indiana Regional Council of Governments (OKI) ³⁸	\$784,624	\$784,624

Ultimately, the sample actually includes six of the eight air quality programs in Ohio. The two excluded programs include Springfield and Hamilton County. Hamilton County is excluded from the sample because they do not receive CMAQ/STP³⁹ funds for their air quality program and representatives of Springfield did not respond to inquiry.

To explore the research questions I spoke directly with representatives of the air quality programs in Ohio. Specifically, I spoke with the following individuals because they had primary and immediate responsibility over the air quality program:

- Pamela Davis, Senior Environmental Planner, Northeast Ohio Areawide Coordinating Agency (NOACA).
- David Gedeon, Transportation Project Manager, The Toledo Metropolitan Area Council of Governments (TMACOG).

³⁸ OKI is an interstate program that maintains authority for the air quality programs in the region.

³⁹ Although OKI relies on the technical expertise of Hamilton County as to when to issue an alert.

- Laura Koprowski, Communications Manager, The Mid-Ohio Regional Planning Commission (MORPC).
- Laura Loges, Manager of Marketing and Public Affairs, Miami Valley Regional Planning Commission (MVRPC).
- Lisa Pompeo, Public Information Administrator, Eastgate.
- Sarah Woller Communications Coordinator, The Ohio-Kentucky-Indiana Regional Council of Governments (OKI).⁴⁰

Telephone interviews were conducted during July and August 2004. Questions were prepared in advance and sent to interviewees prior to the conversation.⁴¹ The interviews were conducted in a semi-structured fashion. Although each interviewee was asked the same questions, the interviews, for the most part, progressed conversationally. As a result, questions may have been asked in a different order. Most interviews lasted less than one hour.

As interviewees responded to questions, I took notes. Supplemental information was also obtained from organizational documents (when available) and e-mail follow-ups when necessary. When analyzing all accumulated information, I noted the regularities and patterns with the data.

PRESENTATION AND ANALYSIS OF PROGRAM GOALS, ACTIVITIES AND EVALUATIVE EFFORTS

Each program in Ohio utilizes individualized identification terminology. The traditional terminology seems to be “ozone action program” and alerts issued are referred to as “ozone alerts.” With the addition of PM monitoring, some programs have renamed themselves “air

⁴⁰ OKI is an interstate program that maintains authority for the air quality programs in the region.

⁴¹ A copy of the instrument is provided in Appendix A.

quality programs” and issue “air quality alerts.” OKI has historically used the term “smog” because they feel that this is a familiar and recognizable concept.⁴²

Based upon conversations with MPO representatives and MPO documents, below is a summary of programmatic goals for the Ohio programs included in this study.

Table 4 – Goals of Ohio’s Air Quality Programs	
Ohio MPO	Goals
TMACOG ⁴³	To conduct a program to increase awareness of the impact of individual actions on ground level ozone levels and encourage individual action , especially on high pollutions days, to reduce ozone creation and make the public aware of the consequences of not maintaining federal air quality standards.
NOACA ⁴⁴	To provide information to the public regarding ozone air quality.
Eastgate ⁴⁵	Air quality is seen primarily seen as a transportation issue; as such, goals are to improve air quality by reducing traffic congestion. Educating the public about issues.
MORPC ⁴⁶	<ul style="list-style-type: none"> • To develop and implement a year-round public education program to increase public awareness about air quality and its effects on our environment, health, transportation and economy • To implement a year-round, daily air-quality forecast service to track and report poor air quality to the public and media. • To notify the public about poor air-quality days throughout the year via media, fax, e-mail alerts and the Internet. • To enlist the aid of media to educate the public about health hazards related to poor air quality and inform them of strategies and actions to mitigate hazards. • To collaborate with local initiatives, non-profits, health organizations and other air quality programs for the benefit of maximizing resources to have the greatest impact.
MVRPC ⁴⁷	Integrated into sustainable growth initiative; focuses on getting people to understand how their actions impact the environment .
OKI ⁴⁸	To improve the quality of the air in the Greater Cincinnati and Northern Kentucky area though the year 2005 by continuing to educate the general public, business and the media about smog, their contributions to it, and the voluntary measures they can take to help reduce smog formation.

⁴² Woller, S. (2004). Telephone Interview.

⁴³ Annual Work Program (2005). Toledo Metropolitan Area Council of Governments.

⁴⁴ Davis, P. (2004). Telephone Interview.

⁴⁵ Pompeo, L. (2004). Telephone Interview.

⁴⁶ Mid-Ohio Regional Planning Commission. (2005). Work Element.

⁴⁷ Loges, L. (2004). Telephone Interview.

⁴⁸ Ohio-Kentucky-Indiana Regional Council of Governments. (2003). The Greater Cincinnati Regional Ozone Coalition's "Do Your Share for Cleaner Air" FY 2003, 2004 & 2005 Public Awareness Campaign CMAQ Application Form," 13.

Language of the goals of each program, although using varying terminology, each reflect the desire to engage in these bifurcated goals. For example, TMACOG states that they wish to “encourage individual action” and “make the public aware.” OKI clearly states that they wish to “improve the quality of the air” and to educate the general public the voluntary measures they can take to help reduce smog formation.” The remaining programs use similar language which suggest the same.

In terms of activities, each program essentially issues an alert that the air, as a result of ozone or PM, is forecasted to reach an AQI that is “unhealthy for sensitive groups.” The alerts in Ohio are very similar, generally imploring individuals to do their part to reduce the personal activities that are known to exacerbate poor air quality. These suggestions include, but are not limited to, refraining from mowing the lawn or refueling vehicles until after 7:00 p.m., reducing power demand, decreasing single occupancy vehicles (by means such as carpooling), and limiting solvent usage. Each program has supplemental and individualized activities in addition to the alerts that are issued once predicted AQI reaches the pre-determined level. There are several major components that that can be identified across most of the Ohio air quality programs – these include advertising/public service announcements, notifications, and “special campaigns.”

The tables below present a summary of the activities of the programs under study. Generally speaking “rideshare programs” (carpool and vanpool programs) are distinguished in the funding structure from air quality programs, although they may also be funded with CMAQ/STP funds. Since these programs are an integral part of most air quality programs, their presence is indicated in the “special campaigns” column as well.

The table demonstrates that all air quality programs in Ohio maintain similar activities. Yet, it is necessary to note that although each program may be foundationally similar, they are truly individualized. For example, Pamela Davis of NOACA enthusiastically discussed at length discussing next year's "theme" – an attempt to encourage individuals to take action *on behalf of someone they know*.⁴⁹ Thematic differences go beyond marketing. According to Laura Loges of MVRPC, their program is attempting to maintain a more integrated approach. Their air quality program is now considered part of a newly developed "umbrella" program – the Sustainable Growth Initiative.⁵⁰ The absence or addition of a particular program component should not be interpreted that one program is "better" than another as data were not collected for this purpose.

⁴⁹ Davis, P. (2004). Telephone Interview.

⁵⁰ Loges, L. (2004). Telephone Interview.

Table 5 – Ohio Program Summaries

Ohio MPO	Advertising/PSA	Notifications	“Special Campaigns”
TMACOG	<ul style="list-style-type: none"> • PSA – Newspapers, television, radio • PAID – newspapers, television, radio (total budget FY05 \$50,000) 	<ul style="list-style-type: none"> • At least 300 e-mail alerts (sent by Toledo Environmental Services) • Some Fax alerts • Internet 	<ul style="list-style-type: none"> • “Ozone Target Month,” mid-June to Mid-July. Intensive promotion. • Continuing Gas cap replacement program (\$23,000 total budget with \$15,000 STP funds for FY05) • Small Rideshare Program
NOACA	<ul style="list-style-type: none"> • PSA – Newspapers, television, radio. • PAID – radio, \$26,000 • NOACA newsletter, about 1,000 circulation. 	<ul style="list-style-type: none"> • About 250 e-mail alerts • About 30 fax alerts • Internet 	<ul style="list-style-type: none"> • 1,400 registered in Rideshare Program
Eastgate	<ul style="list-style-type: none"> • PSA – newspaper, television, radio • PAID – television, radio (total budget FY05 \$36,000) • One quarterly organizational Newsletter, ~1,500 circulation 	<ul style="list-style-type: none"> • About 50 e-mail alerts • About 100 fax alerts • Internet 	<ul style="list-style-type: none"> • All campaigns are conducted in-house and consists of maintaining presence at local events • Rideshare and vanpool, 500-700 active participants.
MORPC	<ul style="list-style-type: none"> • PSA - newspaper, television, radio • PAID – Radio (\$35,000) • Several newsletters, printed and electronic combined circulation of ~ 10,000 • Internet banner advertising. 	<ul style="list-style-type: none"> • About 689 e-mail alerts • Fax alerts to media outlets • Internet 	<ul style="list-style-type: none"> • “The Clean Air Challenge” • 443 Active Rideshare participants • 40 active vanpool participants
MVRPC	<ul style="list-style-type: none"> • PSA – newspaper, television, radio. • PAID – newspaper, television, billboards, direct mail (total FY05 budget \$165,000). 	<ul style="list-style-type: none"> • About 450 e-mail alerts. • About 250 fax alerts • Internet 	<ul style="list-style-type: none"> • Offers free downtown parking for carpoolers. • Lawnmower trade-in program. Discount of battery powered mower one week per year.
OKI	<ul style="list-style-type: none"> • PSA – newspapers, television, radio • PAID – newspapers, television, radio (~\$220,000 FY05) • Internet banner advertising 	<ul style="list-style-type: none"> • About 500 e-mail alerts • About 1,000 fax alerts • Internet 	<ul style="list-style-type: none"> • “Breathe Easy” a TV/Radio/print campaign promoting slogan, “Do your share for cleaner air” • Rideshare program • Teacher workshops • Calendar contest (about 1,400 entries).

Activities of each program seem to emphasize the PIC role, but, are comprised of activities that are obviously hopeful means to reduce emissions. Public Service Announcements (PSA) and paid media efforts are a staple of each program as is notifying the public of poor air quality through a variety of mechanisms. However, some “special campaigns” are clearly a hopeful means to engage in activities that are clearly in line with the desired goal of being an emission reducing program as well. For example, Rideshare (carpool) programs aim to reduce the number of cars on the road. TMACOG’S gas cap replacement program is another example.

When asked if any kind of formalized assessment of the program was completed, those that did provided the following information. Several of the air quality programs in Ohio have acted on evaluative interest by conducting surveys.

Table 6 – Evaluative Efforts of Ohio’s Air Quality Programs	
Ohio MPO	Nature of Assessment
TMACOG	Survey August 2002. The purpose of the survey is to evaluate the community awareness and response to the Ozone Action Days Project. ⁵¹
NOACA	Survey October 2002. The purpose of the survey was to “assess awareness and effectiveness of the Ozone Action Day Program in seven counties in Northeast Ohio.” ⁵²
Eastgate	None.
MORPC	None.
MVRPC	Survey of covered counties, December 2002. The purpose of the survey was to assess ⁵³ : <ul style="list-style-type: none"> • Perception of air quality in the Miami Valley • Commuting habits. • Perceptions of the Rideshare program • Wellness to participate in behaviors for reducing smog
OKI	Survey of Greater Cincinnati area, Fall 2002. Gauging awareness and behavior modification.

⁵¹ AZG Research. (2002). Ozone Action Days Awareness Study. Bowling Green, OH.

⁵² Strategy Solutions, Inc. (2002). Northeast Ohio Areawide Coordinating Agency Ozone Action Day Program Survey., vii.

⁵³ Van Wert, K. (2002). Final Analysis: 2002 Regional Ozone Action Program and Rideshare Survey of General Public, Paragon Opinion Research. 4.

Finally, the surveys also reflect the desire to assess the impact on emission reductions, as well as the performance of the program as a PIC. Specific questions of each of the survey center around being informed of the program as well as questions focusing on actions individuals engaged in on alert (and sometimes non-alert) days. These questions are reflected in goals of the surveys, as detailed in previous table.

The surveys questions, of course, vary greatly but generally all reach similar conclusions – that the programs are rather successful in term of being a PIC, but not very successful when it comes to behavior modification aimed toward emission reduction. For example, the MVRP survey found that many of the behavior modifications requested were only undertaken by a small proportion of the respondents (less than 27%).⁵⁴ However, 86.8% are familiar with the term “ozone action day” and 79.6% answered that they do recall being alerted to help reduce smog on ozone action days.⁵⁵ The NOACA survey results seem to indicate more favorable behavior modification success as exemplified by 57.2% of the respondents saying that they did not use lawn equipment when their was an alert.⁵⁶ The NOACA survey also found that roughly three out of four individuals say that they have heard or seen information about what they can do to reduce ground level ozone.⁵⁷ The OKI survey found that only 29% residents of greater Cincinnati avoided filling their gas tanks until evening but 46% of the residents in greater Cincinnati are familiar with the “Do Your Share for Cleaner Air” campaign⁵⁸

⁵⁴ Van Wert, K. (2002). Final Analysis: 2002 Regional Ozone Action Program and Rideshare Survey of General Public, Paragon Opinion Research, 34.

⁵⁵ Van Wert, K. (2002). Final Analysis: 2002 Regional Ozone Action Program and Rideshare Survey of General Public, Paragon Opinion Research, 6.

⁵⁶ Strategy Solutions, Inc. (2002). Northeast Ohio Areawide Coordinating Agency Ozone Action Day Program Survey, 54.

⁵⁷ Strategy Solutions, Inc. (2002). Northeast Ohio Areawide Coordinating Agency Ozone Action Day Program Survey, vii.

⁵⁸ Shaw, T. C. (2003). Greater Cincinnati Survey, Institute for Policy Research, University of Cincinnati, 2.

In conclusion, upon examination of the goals, activities and evaluative efforts of these programs, it appears they, as anticipated, engage in two overarching agendas. As such, I assert that Ohio air quality programs do indeed maintain two distinct identities – a hopeful means to reduce emissions in support of CAA compliance and as a PIC. Furthermore, with this bifurcated identity, Ohio’s programs are not congruent with the intergovernmental environment that is biased toward the emission-reducer role.

CONCLUSIONS AND RECCOMENDATIONS

It is not necessarily problematic in and of itself that air quality programs operate with two identities and conflict with the intergovernmental environment. It is, however, problematic that the federal government – either the USEPA or the FHWA and the FTA (administrators of CMAQ/STP funds) may be inclined to require these programs to submit evidence of emissions reductions. At the present time, there is no immediate threat of these programs in Ohio being held emission-reduction standards, but based upon the dominance of the federal government in air quality policy and their preferences as established in this paper, this scenario is certainly plausible – in Ohio and elsewhere.

With this in mind, Ohio’s air quality programs might be required to “find a way” to successfully define, implement and evaluate their capability of producing emissions reductions. However, this paper has also established that the causal mechanism that rests between air quality programs and individual behavior cannot be relied upon to produce accurate and quantifiable emissions reductions. Of course, individuals may *choose* to behave in a pro-environmental fashion that may lead to emissions reductions – provided the social and institutional context facilitates this choice. In this respect, providing individuals information about air quality is the

value that results from these programs whether or not these individuals choose to act in accordance with the suggestions. Therefore, I suggest that the USEPA and FHWA and FTA fully recognize these programs as PIC's. This would involve funding, administering and evaluating these programs in terms of public awareness of air quality issues, changes in public opinion or other changes in the social context. Furthermore, moving away from the preoccupation with emissions reductions toward understanding the success of the program as a PIC opens up more opportunities for methodological pluralism during the evaluation process. Prioritizing qualitative over quantitative methods may create a richer understanding of the impacts of air quality programs. The process of understanding how public information realizes outcomes is complex, and therefore, requires a methodology that can address this complexity.

Appendix A
Questionnaire from Angela Ugran – Ohio Air Quality programs
updated 08/17/04

These questions will be asked in a personal interview (in-person or phone), but have been sent in advance for your convenience and preparation. If the forced responses do not appropriately characterize your program, please feel free to create your own category or provide additional explanations.

Prior to actually speaking with you, I will be searching your website to see what questions may be answered with the information you already have posted. It will be very helpful if I could have a copy of your current **budget**, your **work program plan**, and any recent **formal evaluation** reports (including surveys). This may eliminate some basic questions and make future conversations more interesting – and quicker! If this information is not online, it may be sent to me at augran@kent.edu or 4729 Lander Road, Chagrin Falls, OH 44022.

~Please do not worry about returning this questionnaire to me ~
I will be following up with a phone call.

Budget, Funding, Resources, coverage

What counties does your Air Quality program cover?

Do you know the total population of this area?

What is the funding structure of your Air Quality program?

CMAQ Amount _____

STP Amount _____

Other amount _____

How many people do you have involved in the direct implementation of your Air Quality program (Including immediate directors)? Please indicate if they are full-time or spend only part of their time on the Air Quality Program.

Program components/Structure

What are the major goals of your program?

What do you advise people to do on an Air Quality alert day?

Please indicate which of the following components are present in your plan.

a. ___ Newspapers

If checked, do you use

___public service announcements ___ paid media?

b. ___ television

If checked, do you use

___ public service announcements ___ paid media?

c. ___ radio

If checked, do you use

___ public service announcements ___ paid media?

d. ___ newsletter ___ e-mail/internet updates ___ USPS

If either are checked, roughly what is the circulation? _____

e. ___ e-mail air quality alerts

How many people are signed up? _____

f. ___ fax air quality alerts

How many people are signed up? _____

g. ___ automated phone calls

How many people are signed up? _____

h. ___ PR campaigns

Please explain the nature of your “largest” campaign, and a notable smaller one if you wish. (The name of the campaign, when it occurs, how long it has been going on, who it reaches, etc). How much does this campaign cost?

Do you have any other Air Quality Program components that are worthy of note? Do you think that any of these are “unique” for Ohio?

Do you have a rideshare program? Although I am not focused on the rideshare program per se, I am interested in how this may relate to and support your Air Quality Program.

Air Quality Detection

Is your forecasting done in-house, or, is it contracted out? What is the amount of this contract?

Do you do a seven day forecast, or a five day forecast?

For what, specifically, do you forecast? (Ozone, particulate matter?)

Program effectiveness

Have you performed any kind of systematic and formal evaluation of your Air Quality program? If so, please explain the nature of the evaluation. Was this done in-house or contracted out?

What were the major findings, conclusions and recommendations of this evaluation? Were any changes implemented as a result? What was done specifically?

The future of the program

Are any counties in threat of being considered non-attainment under new National Ambient Air Quality (NAAQS) standards?

How do you think the new NAAQS standards will affect your program in terms of funding, program content, administration, etc?

What do you feel will be the biggest challenge to your Air Quality Program that results directly from the adoption and implementation of these new standards?

Do you think your Air Quality Program needs to be changed/modified/improved in fundamental ways in order to communicate information regarding these new standards?

Is there anything else that you would like to add?

Please feel free to add any pertinent information regarding the operation, structure, funding, content, etc. of your program.

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All recommendations made are my opinions based upon research, and should not be considered the opinions of these individuals or the organizations they represent.

All errors and omissions, of course, are my sole responsibility