



Ohio State Highway Patrol
Office of Strategic Services
Statistical Analysis Unit

2008 Metropolitan Traffic Safety Initiative Final Analysis & Report





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Executive Summary

Between March 15 and September 30, 2008, the Ohio State Highway Patrol developed and implemented targeted traffic enforcement plans within five of Ohio's largest metropolitan areas (Cincinnati, Cleveland, Columbus, Dayton, and Toledo). These plans were aimed at effecting significant reductions in serious crashes, fatalities, and injuries by focusing operations where these events occur with the greatest frequency and concentration. On the selected dates and roadways identified in the five plans, OSHP troopers:

- Conducted 11,830 traffic stops, of which 8,530 (72%) resulted in a citation.
- Issued 5,710 speeding citations (67% of all enforcement stops). Of the total speeding citations, one in five (21%) violators was traveling 20 miles per hour or more over the posted speed limit.
- Issued 2,026 citations involving aggressive driving, representing nearly one-quarter (24%) of all citations.
- Issued 3,413 traffic safety warnings and conducted 1,268 motorist assists.

Crash data was collected for the same dates and roadways, and compared with previous years' data to determine if OSHP's 2008 enforcement activities had a significant positive impact in reducing serious crashes in the five metropolitan areas. Results of an analysis of activity and crash data indicate that:

- Serious crashes decreased more on roads where OSHP troopers conducted enforcement activities (-15%), compared to roads not worked by OSHP (-11%). The 15% reduction on enforcement roadways was found to be statistically significant¹, while the 11% reduction on non-enforcement roads was not. Moreover, the difference in serious crash reductions between the two sets of roads was also found to be statistically significant.
- The total number of people injured in traffic crashes decreased 17% on enforcement roads (compared to 11% on non-enforcement roads), and the total number of people killed decreased 40% on enforcement roads (compared to 9% on non-enforcement roads). The injury and fatality reductions on enforcement roads were found to be statistically significant, while the reductions on non-enforcement roads were not. Moreover, the differences in injury and death reductions between the two sets of roads were also found to be statistically significant.
- A statistically significant correlation was observed between the number of traffic stops and the number of serious crashes on enforcement roads. Specifically, an increased number of traffic stops was associated with a decreased number of serious crashes, and vice-versa.

¹ The term "statistically significant" indicates that reported results were tested mathematically (independent 2-sample t-tests), and that the results would not likely have occurred by chance or coincidence; rather, repeated observations would likely yield similar results.



Introduction

Traffic-Related Fatalities and Injuries – A National Perspective

Across the United States and in Ohio, fatalities and injuries resulting from traffic crashes continue to impact far too many lives each year. Nationally, there were an average of 42,381 traffic-related fatalities and over 2.5 million traffic-related injuries annually from 2005 to 2007 (NHTSA 2006; 2007; 2008[1]). To put this into perspective, consider that those figures calculate to 116 traffic deaths every day – or *nearly five deaths every hour of every day* – on our nation’s roads. In addition to the daily fatality toll, 7,091 traffic injuries also occur, or 295 per hour. In both the US and in Ohio, motor vehicle crashes are the leading overall cause of death for people age 5 to 34 (CDC). The economic costs associated with traffic crashes are staggering, reaching into the billions of dollars each year. The message conveyed by these facts should be strikingly clear: motor vehicle crashes represent both a public health issue and a serious economic concern.

Traffic-Related Fatalities and Injuries in Ohio

Within the national context, Ohio ranks as a top ten state in several important demographic and traffic-related categories:

- Ohio is home to America’s **10th largest highway network**. (ODOT)
- Ohio has the **7th largest population** of any state. (US Census Bureau)
- Ohio has the **5th largest number of registered vehicles** in the nation. (NHTSA 2006; NHTSA 2007)
- Ohio has the **7th largest number of licensed drivers** in the nation. (NHTSA 2006; NHTSA 2007)
- Ohio contains the **8th largest number of total lane miles** in the nation. (NHTSA 2006; NHTSA 2007)
- Ohio supports the **4th largest amount of truck freight**. (ODOT)
- Ohio has the **6th largest number of vehicle miles traveled**. (FHWA 2008).
- Ohio has the **8th largest number of annual fatal crashes** of any state. (NHTSA 2006; NHTSA 2007)

Ohio has not remained immune to the public health impact of serious traffic crashes, with 3,824 fatalities and 370,987 injuries occurring on Ohio roadways from 2005 to 2007 (an average of 1,275 traffic-related fatalities and 123,662 traffic-related injuries each year) (ODPS 2006; 2007; 2008). This calculates to 3.5 fatalities and 339 injuries every day on Ohio roadways. Table 1 on the following page provides traffic-related statistics for Ohio.



Table 1. Ohio Traffic-Related Statistics

Population (2008 estimate) ¹	11,485,910
Licensed Drivers (2005-07 average) ²	7,937,640
Registered Vehicles (2005-06 average) ³	11,052,000
Total Lane Miles ⁴	265,940
Total Vehicle Miles Traveled (2005-07 average) ³	111,565,529,588
Average Annual Fatal Crashes (2005-2007) ⁵	1,177
Average Annual Injury Crashes (2005-2007) ⁵	83,835
Average Annual Traffic Deaths (2005-2007) ⁵	1,275
Average Annual Traffic Injuries (2005-2007) ⁵	123,662

¹ US Census Bureau

² Ohio Bureau of Motor Vehicles (OBMV 2005; 2006; 2007)

³ National Highway Traffic Safety Administration (NHTSA 2006; 2007)

⁴ Federal Highway Administration (FHWA 2008)

⁵ Ohio Department of Public Safety (ODPS 2007; 2008)

The OSHP Metropolitan Traffic Safety Initiative (Metro Initiative)

Since its inception in 1933, the Ohio State Highway Patrol (OSHP) has served the state by protecting life and property on Ohio roadways through the use of enforcement, education, roadside assistance, and a variety of informational and other tools. With over 1,500 troopers stationed at more than fifty Patrol Posts across Ohio, OSHP troopers positively impact roadway safety in a great diversity of geographic, climatic, and social environments throughout the state. Until recent years, OSHP has not maintained a significant traffic safety presence in close proximity to Ohio’s largest metropolitan areas. Unfortunately, a large proportion of serious (fatal or injury) crashes occurs within these areas. In an effort to reduce serious traffic crashes statewide, OSHP developed and implemented targeted high-visibility enforcement programs, in conjunction with local law enforcement agencies, in areas where traffic volume is highest and crashes occur with the greatest frequency – Ohio’s large metropolitan areas. The OSHP Metropolitan Traffic Safety Initiative (Metro Initiative) was launched in 2006 and continues into the present.

Using Geographic Information System (GIS) technology and a range of additional data-driven techniques, OSHP’s Statistical Analysis Unit identifies and analyzes high-frequency crash locations in and around Ohio’s large cities. Related influences such as time of day and day of week; traffic congestion and commuting patterns; seasonal factors; and risky driving behaviors (e.g., excessive speed; aggressive driving²) are also routinely identified. Resulting “hot-spot”³ maps and related information are then forwarded to the appropriate District-level staff in each of the selected metropolitan areas to serve as a primary resource in developing detailed Metro Initiative enforcement plans in collaboration with local police departments. Through these plans, OSHP troopers provide increased visibility and enforcement on high-volume, high-risk roadways in order to decrease the frequency of problematic driving behaviors – and to reduce the number of serious crashes as a result. The Metro Initiative is a vital component of the *24/7 Initiative*, OSHP’s larger strategic goal for reducing serious traffic

² The concept of aggressive driving is explained in detail on p.12.

³ This GIS-based technique identifies and illustrates clusters of activity (e.g., crashes), and is used to help guide development of effective policies.



crashes and apprehending criminal elements through high-visibility, intensive traffic enforcement, and increased public awareness through the use of the media (OSHP 2009[1]).

The 2008 Metro Initiative Analysis

The following analysis examines the impact of 2008 OSHP Metro Initiative enforcement activities in and around five Ohio cities: **Cincinnati, Cleveland, Columbus, Dayton, and Toledo**. These five metropolitan areas were selected for analysis based on the number of serious crashes occurring annually in the counties within which they are situated (Hamilton, Cuyahoga, Franklin, Montgomery, and Lucas, respectively). They represent the top five of Ohio’s 88 counties, in terms of number of both fatal and injury crashes. Together, the five counties are home to one-quarter (25%) of the 1,200 average fatal crashes and 40% of the 85,000 average injury crashes that occur each year in Ohio.⁴

In each of the selected metropolitan areas, OSHP partnered with major police agencies to plan and execute targeted traffic safety enforcement programs. One major focus for OSHP troopers across the metropolitan areas was to reduce the frequency of two particular driving behaviors strongly related to serious crashes: speeding and aggressive driving. The purpose of the analysis that follows is to highlight the Highway Patrol’s enforcement activities; to discover whether the selected metropolitan areas experienced a significant overall reduction in serious crashes and total traffic-related injuries and deaths; to determine whether the reductions (if any) were greater in areas where OSHP worked when compared with areas where OSHP activity was minimal or non-existent; and to explore a possible association, or pattern, between OSHP activity and reductions in serious crashes. The research questions that this analysis attempts to answer are summarized in Table 2 below.

Table 2. Primary Research Questions

Q1 - Were there significant changes in serious crashes, injuries, and deaths in 2008 (compared with previous years) on metropolitan roadways worked by OSHP?
Q2 - Were the decreases (if any) significantly greater or lesser than those experienced on roadways NOT worked by OSHP during the same time periods?
Q3 - Does a significant relationship exist between the number of traffic stops and the number of serious crashes in a given area and time period?

The analysis and results that stem from the above questions are intended to provide insight into the overall impact of OSHP traffic safety efforts in Ohio’s large metropolitan areas.

The remainder of this report is structured as follows:

⁴ For the purposes of this study, the “metropolitan area” associated with each of the five selected cities is defined by the county in which they are each situated.



- A **literature review** section explains 1) economic costs associated with serious traffic crashes; 2) the magnitude of the urban crash problem; 3) common contributing circumstances in serious traffic crashes; 4) the efficacy of traffic enforcement in helping to reduce serious crashes; and 5) the value of multi-jurisdiction cooperation and partnership among police agencies.
- A **methodology** section details how the analysis was conducted; how the research questions were addressed; what data was collected and what variables were measured; and how results were obtained.
- A **results** section describes the outcomes of the analysis. Numbers for overall enforcement activities will be provided, as well as the results of focused analyses comparing crash outcomes on selected dates between roadways where OSHP did and did not work, and whether evidence exists to support a relationship between number of traffic stops and number of crashes.
- A **discussion and conclusion** section summarizes the study’s findings and explains their implications for traffic safety in Ohio.

Literature Review

Economic Costs of Serious Crashes

Many studies have attempted to estimate the direct and indirect economic costs associated with fatal and injury motor vehicle crashes (FHWA 2005; NHTSA 2000; NSC 2006). A variety of components have been utilized in developing estimates, including related costs of emergency services; medical costs; lost market productivity; lost wages; lost household productivity; travel delays (particularly on urban interstates), workplace or employer costs; insurance administrative costs; motor vehicle and other property damage costs; legal costs; and monetized quality-of-life measures (FHWA 2005; NHTSA 2000; NSC 2006). Cost estimates calculated in these studies have ranged from approximately one to five million dollars for each traffic fatality. Injury cost estimates differ according to the severity of the injury.

Using the most conservative of the crash cost estimate indexes reviewed in this study (NSC 2006), motor vehicle fatality and injury cost values were calculated for multiple years. According to the National Safety Council’s 2006 estimates, each traffic fatality has an average associated cost of \$1,210,000. Each “incapacitating” injury resulting from a motor vehicle crash averages \$62,500; “non-incapacitating” injuries average \$50,400 each and “possible” injuries average \$24,400 each (NSC 2006). For estimating annual crash costs in Ohio, the NSC figures are adjusted for multiple years. See Table 3 below.

Table 3. Motor Vehicle Fatality and Injury Crash Cost Estimates¹

Average Cost per:	2005	2006	2007	2008
Fatality	\$1,172,102.80	\$1,210,000.00	\$1,246,300.00	\$1,283,689.00
Incapacitating Injury	\$60,542.50	\$62,500.00	\$64,375.00	\$66,306.25
Non-Incapacitating Injury	\$19,664.20	\$20,300.00	\$20,909.00	\$21,536.27
Possible Injury	\$11,139.82	\$11,500.00	\$11,845.00	\$12,200.35

¹ 2006 cost estimates are provided in NSC article: “Estimating the Costs of Unintentional Injuries, 2006.” The Gross National Product Implicit Price Deflator (IPD) was used to index 2005, 2007, and 2008 cost estimates. The multiplier for 2006 to 2007, and 2007 to 2008, was 1.03. The multiplier for 2006 to 2005 was .96868. The cost estimates presented above do not include quality-of-life measures, which would increase the estimates substantially.



The injury severity categories utilized by NSC correspond precisely with those used in Ohio’s standardized statewide crash reporting form, the *OH-1*. Using the adjusted cost estimates and Ohio crash data (ODPS 2006; 2007; 2008), estimated costs were calculated for motor vehicle fatalities and injuries in Ohio from 2005 to 2007. Even by the conservative estimates indicated in the table below, the economic burden to Ohioans generated from motor vehicle fatalities and injuries reaches into the billions of dollars each year. Traffic fatalities alone cost Ohio over \$1.5 billion annually, while other injury types combined comprise nearly an additional \$2.5 billion, for an annual average cost of almost \$4 billion. These costs may be widely distributed, affecting not only the victims and their families, but also employers, coworkers, clients, fellow commuters, and many others. The costs are manifested as rising insurance rates, legal fees, medical costs, and so on. Ultimately, all citizens bear a portion of the costs associated with serious motor vehicle crashes. Table 4 (below) presents the total and average costs of crash-related injuries, by severity, in Ohio from 2005 to 2007.

Table 4. Number and Estimated Costs of Injuries in Ohio by Severity, 2005-2007

Injury Severity	2005		2006		2007		3-Year Total		Average per Year	
	#	Est.Cost	#	Est.Cost	#	Est.Cost	#	Est.Cost	#	Est.Cost
Fatal	1,328	\$1,556,551,456	1,239	\$1,499,190,000	1,257	\$1,566,599,100	3,824	\$4,622,340,556	1,275	\$1,540,780,185
Incapacitating	11,082	\$670,937,526	10,714	\$669,625,000	10,477	\$674,456,875	32,273	\$2,015,019,401	10,758	\$671,673,134
Non-Incapacitating	52,703	\$1,036,351,792	49,163	\$998,008,900	47,594	\$995,142,946	149,460	\$3,029,503,638	49,820	\$1,009,834,546
Possible	67,682	\$753,977,480	63,202	\$726,823,000	58,370	\$691,392,650	189,254	\$2,172,193,130	63,085	\$724,064,377
Total:	132,795	\$4,017,818,254	124,318	\$3,893,646,900	117,698	\$3,927,591,571	374,811	\$11,839,056,725	124,937	\$3,946,352,242

Urban Crashes

Population Change

Three-quarters of the US population lives in urban areas, and the majority of population growth anticipated over the next twenty-five years is predicted to occur in metropolitan areas (IIHS 2008[3]). Ohio closely mirrors the national population figures, with 77.4% of the state’s population residing in urban areas (US Census Bureau).

In the selected metropolitan counties, population growth was minimal between 1990 and 2000 – less than 1%. In fact, four of the five counties declined slightly in population (only Franklin County gained residents). During the same time period, however, Ohio counties immediately *adjacent* to each of the five core metropolitan counties averaged 15% population growth (US Census Bureau), suggesting a strong possibility of increased numbers of Ohioans living in surrounding areas and commuting to jobs in core metropolitan counties.

Traffic Volume and Vehicle Miles Traveled

A trend of increasing commuting times and distances to work greatly increases the number of vehicles on the roads and, as a result, the number of annual vehicle miles traveled (VMT) on arterial roadways in and around large metropolitan areas. In fact, annual VMT increased 20% in the selected metropolitan counties from 1990 to 2007. In many of the adjacent “commuter” counties the increase was even more dramatic (e.g.,



65% in Delaware; 44% in Warren; 39% in Medina; and 35% in Wood). Although the sharpest increases in VMT did not take place in the core metropolitan counties themselves, those counties (combined) still account for over one-third (35%) of the state's total VMT. Moreover, 36% of Ohio's registered drivers reside in those five counties (OBMV 2005; 2006; 2007).

Serious Urban Crashes

The large (and increasing) traffic volume into and away from urban centers contributes to a significantly increased risk of being involved in a traffic crash. Nationally, "crashes that cause injury and/or property damage occur at the highest rates in urban areas" (IIHS 2008[3]). Additionally, insurance claims for injury and collision occur 39% more often in the most densely populated areas when compared to the least dense areas (IIHS 2008[3]).

Ohio is no exception. An average of 85,012 serious (fatal or injury) crashes took place annually on Ohio roads from 2005 to 2007, resulting in an average of 1,275 fatalities and 123,662 injuries each year (ODPS 2006; 2007; 2008). Despite a majority of fatal traffic crashes occurring in rural areas (nationally and in Ohio), a full one-quarter of Ohio traffic fatalities from 2005 to 2007 took place in just the five selected metropolitan counties. Further, nearly two in five (39%) crash injuries occurred in those five counties. See Table 5 below.

Table 5. Crashes, Fatalities, and Injuries in Five Selected Metro Areas, 2005-2007

Metropolitan Area	2005			2006			2007			3-Year Total			3-Year Average		
	Serious Crashes	Deaths	Injuries	Serious Crashes	Deaths	Injuries	Serious Crashes	Deaths	Injuries	Serious Crashes	Deaths	Injuries	Serious Crashes	Deaths	Injuries
Cincinnati (Hamilton County)	7,036	61	9,589	6,571	62	8,952	5,977	59	8,006	19,584	182	26,547	6,528	61	8,849
Cleveland (Cuyahoga County)	9,577	58	14,293	9,179	68	13,520	8,783	68	12,971	27,539	194	40,784	9,180	65	13,595
Columbus Franklin County)	9,844	82	14,589	9,478	67	13,871	9,311	81	13,564	28,633	230	42,024	9,544	77	14,008
Dayton (Montgomery County)	4,164	59	6,105	4,089	49	6,026	3,868	52	5,575	12,121	160	17,706	4,040	53	5,902
Toledo (Lucas County)	4,376	56	6,575	4,302	42	6,352	3,968	60	5,799	12,646	158	18,726	4,215	53	6,242
Metro Total:	34,997	316	51,151	33,619	288	48,721	31,907	320	45,915	100,523	924	145,787	33,508	308	48,596
State Total:	89,760	1,328	131,467	84,439	1,239	123,079	80,837	1,257	116,441	255,036	3,824	370,987	85,012	1,275	123,662
Percent of State's Total in Metro Areas	39%	24%	39%	40%	23%	40%	39%	25%	39%	39%	24%	39%	39%	24%	39%

The economic burden resulting from metropolitan traffic crashes is also quite substantial. Using the same cost multipliers as those used previously for Ohio, cost estimates by injury type were calculated for crash injuries occurring in the five selected metropolitan counties (Hamilton, Cuyahoga, Franklin, Montgomery, and Lucas). As Table 6 (below) indicates, crash-related injuries in those counties (combined) cost an estimated \$1.26 billion per year from 2005 to 2007 – thirty-two percent (32%) of Ohio's total annual crash cost.

Table 6. Number and Estimated Costs of Injuries in Selected Metro Areas by Severity, 2005-2007

Injury Severity	2005		2006		2007		3-Year Total		Average per Year	
	Injuries	Est.Cost	Injuries	Est.Cost	Injuries	Est.Cost	Injuries	Est.Cost	Injuries	Est.Cost
Fatality	316	\$370,384,232	288	\$348,480,000	320	\$398,816,000	924	\$1,117,680,232	308	\$372,560,077
Incapacitating	3,513	\$212,687,559	3,572	\$223,250,000	3,295	\$212,115,625	10,380	\$648,053,184	3,460	\$216,017,728
Non-Incapacitating	17,876	\$351,513,664	16,718	\$339,375,400	16,076	\$336,133,084	50,670	\$1,027,022,148	16,890	\$342,340,716
Possible	29,762	\$331,548,680	28,431	\$326,956,500	26,544	\$314,413,680	84,737	\$972,918,860	28,246	\$324,306,287
Total Injuries	51,467	\$1,266,134,135	49,009	\$1,238,061,900	46,235	\$1,261,478,389	146,711	\$3,765,674,424	48,904	\$1,255,224,808



Fortunately, many serious crashes “...happen in predictable locations and involve predictable sequences of contributing events” (IIHS 2005). Two important examples of common “contributing events” include excessive speeding and aggressive driving.

Speeding/Excessive Speeds

Speeding, driving at excessive speeds, and driving too fast for roadway conditions, represent one of the most important behavioral factors leading to serious motor vehicle crashes. In fact, speed is a causal factor in approximately one-third of all traffic crashes nationwide (IIHS 2008[2]; NHTSA 2008[2]). Speed “reduces a driver’s ability to react to emergencies created by driver inattention, by unsafe maneuvers of other vehicles, by roadway hazards, by vehicle system failures (such as tire blowouts), or by hazardous weather conditions” (NHTSA 2000).

Not only can speed contribute to the likelihood or frequency of crash occurrences, it can also lead to greater crash severity. While speed can compromise a driver’s ability to react to emergencies, raising their crash risk, the force of impact that is relational to the vehicle’s traveling speed increases the likelihood that the crash will result in severe injuries or death (IIHS 2008[1]; IIHS 2008[2]).

Speeding is a pervasive behavior. In one national survey, three-quarters of respondents reported that they exceeded the speed limit on all kinds of roads during the month prior to taking the survey (NHTSA 2005). In Ohio, 37% of fatal crashes and 47% of injury crashes from 2005 to 2007 were speed-related (ODPS 2006; 2007; 2008).

Aggressive Driving

There is little doubt that the increased stress levels often associated with the roadway setting can evoke aggressive attitudes and behaviors among drivers. A number of conditions may be simultaneously present while driving that may contribute to driver aggression and resultant action, including crowding or congestion, a sense of anonymity, frustration, provocation by other drivers (Vanlaar et al.), and a decreased level of personal restraint among solo drivers, of which the numbers have increased substantially since the 1990’s (Pisarski).

The concept of aggressive driving remains somewhat amorphous; however, a common set of behaviors or tendencies have emerged from literature in recent years. Characteristics frequently associated with aggressive driving include:

- Excessive speeding and/or driving well over the speed limit (GHSA; NHTSA 2009[1]; Vanlaar et al; Zwahlen & Suravaram)
- Following too closely (GHSA; NHTSA 2009[1]; Zwahlen & Suravaram)
- Running red lights and/or speeding up to get through the light (GHSA; NHTSA; Vanlaar et al.; Zwahlen & Suravaram)
- Failure to yield (GHSA ; NHTSA 2009[1])
- Erratic or unsafe lane changes/improperly signaling lane changes (GHSA; NHTSA 2009[1]; Zwahlen & Suravaram)
- Cutting across one or more lanes in front of other vehicles (Shinar & Compton)
- Failure to stop for a school bus (GHSA)



- Improper passing/passing on the shoulders (GHSA; NHTSA 2009[2]; Shinar & Compton)
- Swearing, making rude signs or gestures at other drivers (Vanlaar et al.)
- Using the horn when annoyed (Shinar & Compton; Vanlaar et al.)

The National Highway Traffic Safety Administration (NHTSA) also characterizes aggressive driving more generally as occurring “when individuals commit a combination of moving traffic offenses so as to endanger other persons or property” (NHTSA 2009[1]). The Ohio State Highway Patrol considers any of the following to be aggressive driving offenses: speed 20 mph or greater above the posted limit; failure to yield; following too closely; improper passing; illegally passing a stopped school bus; reckless operation of a vehicle; and all violations in work zones.

The varied combinations of actions identified as aggressive driving play a major role in contributing to serious traffic crashes. An estimated one-third of motor vehicle crashes and two-thirds of traffic fatalities can be attributed to aggressive driving (GHSA).

Public concern over the issue of aggressive driving is on the rise. Across the United States and in Canada, the motoring public views aggressive driving as a considerable problem and a threat to personal safety (NHTSA 2009[1]; Vanlaar et al.). In a statewide survey conducted by OSHP, eighty-five percent (85%) of respondents considered aggressive driving to be a “very important” traffic safety issue, while another 13% considered the issue to be “somewhat important.” Only the issue of drunk or drug-impaired driving elicited a stronger response among Ohioans (OSHP 2009[2]).

Traffic Congestion

Strongly associated with driver aggression is the issue of increasing traffic congestion in and around large metropolitan areas. As large cities tend to expand outward, drawing commuters from ever more distant locales (Pisarski), it becomes increasingly difficult for aging or outdated infrastructures to support the growing traffic volume comfortably or efficiently. As the traffic demand approaches or exceeds the system’s capacity, congestion frequently results. The problems are further exacerbated by a variety of factors such as weather events, construction zones, and traffic crashes (FHWA 2009).

Restricted traffic flow is associated with more crashes for a variety of reasons. On congested roadways, vehicles are often spaced more closely to one another; vehicles are more prone to overheating or other mechanical failures, especially during periods of extreme weather; the likelihood of a distracted or unaware driver approaching stopped traffic too quickly to stop in time is far greater (Cambridge Systematics Inc. 2005); finally, congestion levels are a significant contributor to aggressive driving (NHTSA 2009[1]). Increased congestion levels contribute to a greater sense of frustration among drivers, and the frequency of aggressive driving behaviors increase as a result. As aggressive driving increases, so does the risk of being involved in a serious crash which, in turn, contributes to further congestion and potentially to more crashes. Although infrastructure plays an important role in contributing to initial congestion levels, effective traffic safety enforcement is imperative for deterring aggressive driving and other dangerous driving behaviors in order to limit or prevent serious crashes from occurring.



The Role of Enforcement

A multifaceted approach to reducing crash-causing driver behaviors in large urban areas is critical for success. Statutory approaches; public education campaigns; effective training, particularly for novice drivers; advances in engineering and infrastructure; and applied technologies are all examples of measures that may contribute positively to traffic safety levels in metropolitan areas.

Effective law enforcement is also essential for limiting the frequency of dangerous driving behaviors such as speeding and aggressive driving. Numerous studies have shown that focused law enforcement efforts, particularly those that target speeding and aggressive driving in large metropolitan areas, were effective not only in reducing the instance of violations, but also in reducing the number of crashes – and serious crashes – in those areas (Davis et al.; Nerup et al.; Scott et al.; Thomas et al.; Yannis et al.; Zwahlen & Suravaram). In areas where speeding and aggressive driving (and subsequent crashes) proliferate, a relative shortage of (and need for additional) law enforcement activity has been noted (Fakhry & Salaita; NHTSA 2005; Retting & Teoh).

In many large metropolitan police departments, competing demands and shrinking operating budgets often serve to substantially limit available resources. Traffic safety initiatives are frequently given lower priority compared to issues such as increasing rates of homicide and gang violence, and the proliferation of illegal narcotics (Rueker). As a result of these and other competing priorities, traffic safety programs are often not adequately staffed nor pursued. This is unfortunate, because in addition to the established traffic safety benefits, traffic enforcement serves as an effective visible deterrent to a variety of illegal or criminal behaviors (Mueck & Dyer). Moreover, traffic stops play a vital role in the identification and apprehension of criminals, drug and firearm interdiction, and various other crime reduction efforts (Mueck & Dyer; Ruecker; Weiss & Morckel). Together, the direct and residual benefits of an aggressive traffic enforcement program illustrate the need for prioritizing such programs, as well as the potential advantages to supplementing those efforts in large metropolitan areas.

Multi-jurisdictional Partnership

The Ohio State Highway Patrol recognizes the traffic safety benefits that can result from building sustainable, effective partnerships with other agencies. The Division has a rich history of collaborating with various groups committed to improving traffic safety. Examples include a diverse range of education and awareness campaigns developed with local communities; coordinated efforts with local and national organizations which have focused traffic safety interests (e.g., impaired driving, safety around commercial trucks, motorcycle safety, etc.); collaborations with other government agencies; collaborations with universities and other research organizations; and many more.

OSHP has also partnered frequently with other law enforcement agencies and personnel around the state. These collaborative efforts have included such enforcement operations as impaired driving checkpoints and saturation patrols; response to critical incidents such as locating escaped inmates or other suspected criminals; identification and recovery of stolen vehicles; interdiction of drugs and other illegal contraband; and many other traffic safety and criminal patrol endeavors.



Table 7 (below) summarizes key concepts described in the literature review.

Table 7. Summary Points from the Literature Review

1) Economic Costs: the economic cost to Ohio resulting from serious traffic crashes is steep – nearly \$4 billion per year.
2) Urban Crashes: urban areas are home to a large proportion of serious crashes. Current and projected population and migration patterns may contribute to this proportion increasing.
3) Speeding is a frequent cause of serious crashes, contributing to approximately 37% of fatal crashes and 47% of injury crashes statewide from 2005 to 2007.
4) Aggressive driving is characterized by a combination of dangerous driving behaviors, and is associated with a large proportion of serious crashes.
5) Congestion: high levels of traffic congestion in urban areas contribute to, and are aggravated by, the number of crashes as well as risky driving behaviors such as speeding and aggressive driving.
6) Role of Enforcement: traffic enforcement is vital for 1) reducing the frequency of speeding, aggressive driving, and resulting crashes; and 2) for deterring and/or uncovering various criminal activities.
7) Multi-jurisdictional Partnership: higher levels of cooperation among law enforcement agencies can lead to increased opportunities for sharing resources such as equipment, officers, and key knowledge.

Analysis Methodology

The ultimate goal of this analysis is to determine whether OSHP’s Metro Initiative enforcement strategies had a significant overall impact on improving roadway safety in Ohio. To accomplish this, the analysis addresses three main questions (as stated previously):

- Q1** - Were there significant changes in serious crashes, injuries, and deaths in 2008 (compared with previous years) on metropolitan roadways worked by OSHP?
- Q2** - Were the decreases (if any) significantly greater or lesser than those experienced on roadways NOT worked by OSHP during the same time periods?
- Q3** - Does a significant relationship exist between the number of traffic stops and the number of serious crashes in a given area and time period?

Data Sources

To answer the above questions, three key data sources were utilized:

- **District-level Metro Initiative Plans:** as mentioned earlier, OSHP District level staff members were tasked with developing and implementing traffic safety plans, in coordination with other law enforcement agencies, for their respective metropolitan areas. Using results of “hot-spot” mapping and analysis techniques performed by OSHP’s Statistical Analysis Unit, District staff members identified 1) the dates, the specific days of the week, and the locations (particular roadways) troopers would work; 2) the number of officers and the shifts they would work; and 3) the primary targets of the enforcement efforts (e.g., speeding, aggressive driving). Activity dates and roadways included in the analysis are based on those identified in the District



plans. Additional roadways not identified in the District plans, but where a substantial number of traffic stops occurred, were also included in the analysis.

- **Enforcement/Activity Data:** data generated from OSHP traffic stops are captured electronically in OSHP’s Computer Aided Dispatch (CAD) system. This database system holds records of all OSHP traffic stops (approximately 1.5 million annually) and captures multiple data fields including the date and location of traffic stops, as well as enforcement and non-enforcement (e.g., warnings, traffic assists) outcomes. These data were used to identify the number and associated characteristics of all traffic stops occurring on the selected dates and roadways, within the selected five metropolitan counties.
- **Serious Traffic Crashes:** all serious (fatal or injury) crash data were extracted from Ohio Department of Public Safety (ODPS) and OSHP electronic fatal and injury crash databases. These data were used to identify the number and associated characteristics of all serious traffic crashes occurring on the selected dates and roadways, within the selected five metropolitan counties.

Data Preparation

Crash and activity records collected for analysis from the sources mentioned above were limited according to several key dimensions:

- **Crash Severity:** because serious (fatal or injury) crashes were of particular interest to the present study, only those crashes were included. Traffic crashes resulting in damage to property only (i.e., in which no physical injuries were sustained) were not included in the analysis.
- **Counties:** serious crash and traffic stop records were limited to the five selected metropolitan counties – Hamilton (Cincinnati); Cuyahoga (Cleveland); Franklin (Columbus); Montgomery (Dayton); and Lucas (Toledo). Table 8 (below) provides basic population characteristics for the metropolitan areas examined in the analysis.

Table 8. Population Characteristics of Selected Metropolitan Areas

Cincinnati		
City of Cincinnati	Hamilton County Population	Cincinnati MSA ¹ Population
332,458	842,369	2,133,678
Cleveland		
City of Cleveland	Cuyahoga County Population	Cleveland MSA ¹ Population
438,042	1,295,958	2,096,471
Columbus		
City of Columbus	Franklin County Population	Columbus MSA ¹ Population
747,755	1,118,107	1,754,337
Dayton		
City of Dayton	Montgomery County Population	Dayton MSA ¹ Population
155,461	538,104	835,537
Toledo		
City of Toledo	Lucas County Population	Toledo MSA ¹ Population
295,029	441,910	650,955

¹MSA = Metropolitan Statistical Area. All figures are US Census Bureau 2007 estimates.



- **Dates:** activity dates were based on those identified in District metropolitan enforcement plans. No additional dates were included, however, dates on which OSHP activity in the selected areas was determined to be minimal or non-existent were not included as enforcement roadways. Activity dates and days of the week varied by metropolitan area. The numbers of total activity dates included in the analysis are presented in Table 9 (below) by metropolitan area and month.

Table 9. Number of 2008 Enforcement Dates per Month for each Metro Area

Month	Cincinnati (Hamilton County)	Cleveland (Cuyahoga County)	Columbus (Franklin County)	Dayton (Montgomery County)	Toledo (Lucas County)
March	4	*	*	*	*
April	16	*	8	9	15
May	12	*	7	*	3
June	3	15	21	8	*
July	4	*	9	*	*
August	4	*	11	*	*
September	4	*	*	18	*
Total:	47	15	56	35	18

In order to examine possible changes in serious crash numbers over time, a set of comparison dates was constructed for previous years. For each 2008 activity/crash date in each metropolitan area, corresponding dates were calculated for 2007, 2006, and 2005. The comparison sets were designed to replicate the day of the week from previous years.⁵ Serious crash data were then obtained for each of the previous years' comparison dates.

An additional note regarding crash dates included in the analysis: because ODPS electronic crash data are entered manually, there exists a lag period between dates when crashes occur and when they are entered into the system. At the time crash data were being collected for analysis, it was estimated that 2008 fatal and injury crash data were complete through approximately 09/30/08. Therefore, crash and activity dates included in the analysis are limited to events occurring on or before that date.

- **Roadways:** activity routes selected for analysis were based on those identified in District enforcement plans. Additional roadways were included for some counties when it was discovered that substantial numbers of traffic stops took place on those roads, despite their not being included in District plans. Locations identified as having a high frequency of serious crashes consisted primarily of major arterial roadways such as Interstates, US Routes, and State Routes. Table 10 on the following page presents the roadways in each metropolitan area that are included in the analysis.

⁵ For example, the activity date 06/02/2008 was the first Monday in June of that year. Corresponding dates, then, would include 06/04/2007 (2008 was a leap year), 06/05/2006, and 06/06/2005. Each of the comparison dates represents the first Monday in June of their respective years.



Table 10. Roadways Included in Analysis of Traffic Stops and Serious Crashes

	Interstate Routes		US Routes		State Routes		County Roads or Named Streets
Cincinnati (Hamilton County)	IR 71 IR 74	IR 75 IR 275	US 22 US 27 US 42	US 50 US 52 US 127	SR 32 SR 125 SR 126 SR 128	SR 264 SR 561 SR 562	Harrison Ave.
Cleveland (Cuyahoga County)	IR 71 IR 90	IR 480 IR 490	*	*	*	*	*
Columbus (Franklin County)	IR 270		*	*	*	*	*
Dayton¹ (Montgomery County)	IR 75		US 35		SR 4 SR 49		E. Third St. Gettysburg Ave. Salem Ave.
Toledo¹ (Lucas County)	IR 75 IR 280 IR 475		US 23 US 24		*		Oregon Ave. (Wood County)

¹ Additional activity and crash data were included from IR 75 in Miami County, just north of Dayton, and IR 75 and IR 475 in Wood County, just south of Toledo

Although OSHP troopers routinely record geolocation information for all traffic stops and crash investigations they conduct, many major police agencies do not provide this information. Because precise location of serious crashes occurring in the five metropolitan counties was a critical component to the study, OSHP staff were required to manually geolocate over 4,000 injury crashes occurring on the selected dates and roadways, within the selected metropolitan counties (OSHP already routinely geolocates all fatal crashes in Ohio).

After all serious crashes in the five metropolitan counties had been precisely located, GIS specialists applied “buffer zones” of .10 mile to each of the roadways included in Table 10 (above). This purpose of this procedure was to “recapture” any traffic stops that may have been initiated on the selected roadway but were concluded in an immediately adjacent location. In order to hold analysis zones the same, the .10 mile buffer zone was also applied to crash data. Finally, fields were added to the crash data sets indicating whether the incident took place on roadways where OSHP worked (Metro Roads) or where there was little or no OSHP activity (Non-Metro Roads).⁶ Following the processes just described, preparation of the final data sets for analysis was complete.

Crash Analysis

In order to address the first research question, whether there were significant changes in serious crashes, deaths, and injuries on Metro Roads in 2008 (Q1), average values were calculated for the preceding three-year period (2005-2007). The 2008 figures were then compared with the previous three-year average to 1) determine if there was an overall reduction in the total number of crashes, injuries, and deaths among the five metropolitan areas; and 2) to calculate the percent change for each of the pairs of

⁶ “Metro Roads” describe roads where OSHP worked (also called “activity roads” or “enforcement roads”). “Non-Metro Roads” describe roads where OSHP did not work, or where activity was minimal. Both sets of roads are limited to the five selected metropolitan counties.



values. Further, statistical procedures were conducted to determine whether the percent changes were statistically significant.

For the second research question, whether decreases were greater on Metro Roads compared to Non-Metro Roads (Q2), differences between 2008 and previous three-year averages were calculated for each 2008 activity date. The overall percent changes on Metro Roads and Non-Metro Roads were then calculated and compared. Finally, the difference between percent changes on Metro Roads versus Non-Metro Roads were tested for statistical significance.

To address the final research question, whether any relationship exists between number of traffic stops and number of serious crashes in a given area, statistical correlation procedures were conducted using 2008 activity and serious crash data. The resulting correlation coefficient was then tested for statistical significance.

Results

OSHP Activity

The following paragraphs and tables provide summary statistics for 2008 traffic stops on enforcement roadways (Metro Roads). These numbers do not represent the whole of 2008 Metro Initiative activity, but reflect a *focused data set that was limited by selected dates and roadways for analysis purposes.*⁷

OSHP troopers initiated 11,830 traffic stops on the selected 2008 dates and roadways within the five metropolitan areas. This included 8,530 “enforcement” stops, or traffic stops in which one or more citations were issued (72% of traffic stops). Troopers also issued 3,413 warnings to motorists for moving traffic violations (29% of all traffic stops). Additionally, OSHP provided roadside assistance to 1,268 motorists on the selected dates and roads (11% of all traffic stops). Table 11 (below) provides total numbers of enforcement stops, violations warnings, and traffic assists for each metropolitan area included in the analysis.

Table 11. Total 2008 Metro Traffic Stops and Number/Percent Resulting in Citations

Metro Area	Traffic Stops	Enforcement Stops (Citation Issued)	Percent Enforcement	Violation Warnings	Motorist Assists
Cincinnati (Hamilton County)	3,322	2,009	60%	1,131	289
Cleveland (Cuyahoga County)	1,987	1,599	80%	483	145
Columbus (Franklin County)	4,054	3,000	74%	1,255	588
Dayton (Montgomery County)	1,603	1,295	81%	388	136
Toledo (Lucas County)	864	627	73%	156	110
Total	11,830	8,530	72%	3,413	1,268

⁷ Across the five counties, a total of 24,986 traffic stops were coded as “Metro” stops in the Computer-Aided Dispatch (CAD) system in 2008. For tables relating to total (Unlimited) Metro activity, see Appendix A (p.30) and Appendix B (p.33).



The types of moving violations for which motorists were cited varied among the metropolitan areas. For each of the five cities, speeding violations accounted for the highest number of citations. Troopers issued 5,710 speeding citations representing two-thirds (67%) of all enforcement stops. Of the total speeding violations issued, one in five involved a driver traveling at 20 or more miles per hour above the posted speed limit (1,193 violators, or 21% of all speeding violations).

OSHP troopers issued citations to 2,026 motorists for aggressive driving offenses. This represents just under one-quarter (24%) of total enforcement stops. Additionally, troopers issued 2,366 safety belt citations and arrested 123 motorists for operating a vehicle while alcohol- or drug-impaired (OVI). Table 12 (below) provides total numbers of selected enforcement types for each metropolitan area included in the analysis.

Table 12. Select 2008 Metro Enforcement by Metropolitan Area

Metro Area	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
Cincinnati (Hamilton County)	2,009	1,101	262	361	104	617
Cleveland (Cuyahoga County)	1,599	1,296	188	224	8	317
Columbus (Franklin County)	3,000	1,927	418	990	3	945
Dayton (Montgomery County)	1,295	942	229	338	7	319
Toledo (Lucas County)	627	444	96	113	1	168
Total:	8,530	5,710	1,193	2,026	123	2,366

Activity also varied by roadway type among the five metropolitan areas. The highest proportion of stops took place on Interstate Routes (75%), followed by US Routes (17%), State Routes (5%), and County Roads (3%). Speeding and aggressive driving violations occurred most frequently on Interstates (85% and 84%, respectively). Locations for OVI arrests were more evenly distributed, with 40% taking place on US Routes; 24% on Interstates; 22% on State Routes, and 14% on County Roads. Table 13 on the following page provides total numbers of selected enforcement types by type of roadway for each metropolitan area included in the analysis.



Table 13. Select 2008 Enforcement by Type of Roadway and Metropolitan Area

Metro Area	Traffic Stops	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
Cincinnati							
Interstate Route(s)	1,058	729	543	120	147	14	78
US Route(s)	1,628	981	437	118	183	47	409
State Route(s)	492	262	117	22	26	27	120
County Road(s)	144	37	4	2	5	16	10
Cleveland							
Interstate Route(s)	1,987	1,599	1,296	188	224	8	317
Columbus							
Interstate Route(s)	4,054	3,000	1,927	418	990	3	945
Dayton							
Interstate Route(s)	1,176	952	759	148	227	4	162
US Route(s)	171	146	105	70	83	2	44
State Route(s)	81	58	30	1	3	0	24
County Road(s)	175	139	48	10	25	1	89
Toledo							
Interstate Route(s)	654	466	346	92	104	1	108
US Route(s)	164	120	95	4	8	0	20
County Road(s)	46	41	3	0	1	0	40
Total for All Cities							
Interstate Route(s)	8,929	6,746	4,871	966	1,692	30	1,610
US Route(s)	1,963	1,247	637	192	274	49	473
State Route(s)	573	320	147	23	29	27	144
County Road(s)	365	217	55	12	31	17	139
Total:	11,830	8,530	5,710	1,193	2,026	123	2,366

June was the busiest month, overall, for most types of enforcement. Nearly half (48%) of all enforcement stops, 54% of speeding citations, and 61% of aggressive driving citations were issued during that month. April was also busy, with 24% of enforcement stops, 22% of speeding citations, 20% of aggressive driving citations, and nearly one-third (32%) of OVI arrests taking place during that month. Table 14 (below) provides total numbers of selected enforcement types by month for the combined metropolitan areas included in the analysis.

Table 14. Select 2008 Enforcement by Month, All Cities Combined

Month (2008)	Traffic Stops	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
March	196	133	59	8	24	4	49
April	2,879	2,021	1,267	280	402	39	627
May	1,196	713	380	103	124	29	227
June	5,125	4,132	3,109	630	1,237	14	955
July	989	644	330	53	78	7	260
August	648	356	184	42	56	8	132
September	797	531	381	77	105	22	116
Total:	11,830	8,530	5,710	1,193	2,026	123	2,366



Traffic and enforcement stops were fairly evenly distributed across days of the week, although Wednesday through Friday were somewhat busier compared to Monday and Tuesday. Fifty-eight percent (58%) of speeding and aggressive driving citations were issued Wednesday through Friday. The majority (77%) of OVI arrests took place on Friday, Saturday, and Sunday. Table 15 (below) provides total numbers of selected enforcement types by day of the week for the combined metropolitan areas included in the analysis.

Table 15. Select 2008 Enforcement by Day of Week, All Cities Combined

Day of Week (2008)	Traffic Stops	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
Sunday	547	314	159	38	54	27	98
Monday	1,692	1,281	911	193	325	10	338
Tuesday	1,675	1,280	910	172	292	1	334
Wednesday	2,102	1,613	1,097	225	382	4	472
Thursday	1,944	1,460	1,008	195	354	13	382
Friday	2,684	1,853	1,181	261	469	30	555
Saturday	1,186	729	444	109	150	38	187
Total:	11,830	8,530	5,710	1,193	2,026	123	2,366

Traffic enforcement in the Metro areas was heaviest during the afternoon “commuting” hours of 3:00 p.m. to 7:00 p.m. During those hours troopers issued 38% of all speeding citations and 34% of all aggressive driving citations. The late morning and early afternoon hours (11:00 a.m. to 3:00 p.m.) were also busy: another 33% of speeding and 38% of aggressive driving violations were administered during those hours. OVI arrests were more frequent at night: nearly two-thirds (64%) of OVI arrests took place between 11:00 p.m. and 3:00 a.m. Table 16 (below) provides total numbers of selected enforcement types by hour for the combined metropolitan areas included in the analysis.

Table 16. Select 2008 Enforcement by Time of Day, All Cities Combined

HOUR	Traffic Stops	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
7:00 am - 10:59 am	1,627	1,386	1,032	227	321	5	321
11:00 am - 2:59 pm	2,900	2,407	1,867	370	763	2	501
3:00 pm - 6:59 pm	4,837	3,526	2,158	399	697	12	1,146
7:00 pm - 10:59 pm	1,759	949	545	163	188	25	322
11:00 pm - 2:59 am	668	241	93	32	52	79	74
3:00 am - 6:59 am	39	21	15	2	5	0	2
Total:	11,830	8,530	5,710	1,193	2,026	123	2,366



Crashes, Deaths, and Injuries on Metro Roads

From 2005 to 2007, there were 2,719 serious crashes on the selected analysis dates and roadways, resulting in a total of 31 deaths and 3,857 injuries. In order to identify possible crash reductions in 2008, three-year average (2005-2007) numbers of serious crashes, deaths, and injuries were calculated for both Metro and Non-Metro Roads. A basic comparison of actual numbers reveals that serious crashes, deaths, and injuries did in fact decrease on Metro Roads in 2008, compared to the previous three-year averages. Table 17 (below) indicates actual and average numbers for serious crashes, deaths and injuries on Metro Roads.

Table 17. Serious Crashes, Deaths, and Injuries on Metro Roads, 2005-2008

Metro Roads	2008 Total	2005-2007 Total	2005-2007 Average per Year
Serious Crashes	775	2,719	906
Traffic Deaths	6	31	10
Traffic Injuries	1,082	3,887	1,296

Further analysis reveals that all five metropolitan areas experienced individual reductions in serious crashes and injuries on Metro Roads in 2008, although the level of decrease varied in each of the areas. Overall, serious crashes on Metro Roads decreased by 15%, fatalities decreased by 40%, and Injuries decreased by 17% in 2008 when compared to the previous three-year averages. See Table 18 below.

Table 18. Serious Crashes, Deaths, and Injuries on Metro Roads by City, 2005-2008

	2008 Total			2005-2007 Average per Year			Percent Change 2005-2007 (Avg.) to 2008		
	Serious Crashes	Total Killed	Total Injured	Serious Crashes	Total Killed	Total Injured	Serious Crashes	Total Killed	Total Injured
Cincinnati	390	2	533	440	3	611	-11%	-26%	-13%
Cleveland	83	2	118	92	2	142	-10%	18%	-17%
Columbus	123	0	178	138	2	198	-11%	-100%	-10%
Dayton	136	1	195	180	4	258	-24%	-73%	-24%
Toledo	43	1	58	57	0	87	-25%	100%	-33%
All Metro Areas	775	6	1,082	907	10	1,296	-15%	-40%	-17%

To lend support to the above findings, independent sample t-tests were generated for comparing the decreases between the two time periods (2008 versus 2005-2007 average values).⁸ The reductions Metro Areas experienced in the overall number of serious crashes⁹, as well as the reductions in total deaths and injuries¹⁰, were each found to be statistically significant.

⁸ "T-tests" are mathematical procedures used to determine that reported results would not likely have occurred by *chance*, i.e., repeated observations would likely yield similar results.

⁹ t = 1.570. Significant at the p=.10 level, one-tailed test

¹⁰ t = 1.419. Significant at the p=.10 level; t = 1.979. Significant at the p=.05 level, one-tailed tests



An additional interesting finding concerns the decreases in serious crashes and injuries on Interstate Routes, in particular. Analysis of crash data revealed that Interstate Routes, which accounted for three-quarters (75%) of all OSHP Metro traffic stops in 2008, experienced a serious crash decrease of 20% and a decrease in total injuries of 24%. Decreases on other road types were comparatively more moderate. The crash and injury decreases on Interstates were also subjected to independent sample t-tests, and were also found to be statistically significant.¹¹

Metro Roads versus Non-Metro Roads

Across the five metropolitan areas, both the Metro and Non-Metro Roads experienced reductions in serious crashes, deaths, and injuries (when comparing the 2005-2007 average to 2008). There are some important differences to note, however, regarding changes on the two sets of roads. First, Metro Roads experienced larger percent decreases than Non-Metro Roads in each of the categories (-15% versus -11% for serious crashes; -40% versus -9% for total killed; and -17% compared to -11% for total injuries). Table 19 (below) presents the numbers and percent changes in serious crashes, fatalities, and injuries on Metro and Non-Metro Roads.

Table 19. Serious Crashes, Fatalities, and Injuries by Metro and Non-Metro Road

	2008 Total	2005-2007 Total	2005-07 to 2008 Percent Change
METRO Roads			
Serious Crashes	775	906	-15%
Traffic Deaths	6	10	-40%
Traffic Injuries	1,054	1,286	-17%
NON-METRO Roads			
Serious Crashes	2,805	3,167	-11%
Traffic Deaths	21	23	-9%
Traffic Injuries	4,068	4,582	-11%
Total for All Roads			
Serious Crashes	3,580	4,073	-12%
Traffic Deaths	27	33	-19%
Traffic Injuries	5,122	5,867	-13%

Second, the reductions in all three categories were (as previously mentioned) statistically significant for the Metro Roads. By contrast, none of the decreases in crashes, deaths or injuries on Non-Metro Roads were found to be statistically significant.

Finally, not only were the decreases in serious crashes on Metro Roads statistically significant (while those on Non-Metro Roads were not), but the difference between the percent reductions on Metro and Non-Metro Roads was also found to be statistically significant.¹² Likewise, the difference between the percent reductions for combined

¹¹ t = 2.234. Significant at the p=.05 level; t = 2.338. Significant at the p =.01 level, one-tailed tests

¹² t = 2.787. Significant at the p=.01 level, one-tailed test



deaths and injuries on Metro Roads versus Non-Metro Roads was also found to be statistically significant.¹³

Relationship between Traffic Stops and Serious Crash Decreases

A final set of analytical procedures were conducted to examine a possible statistical association between the number of traffic stops conducted by OSHP on Metro Roads, and the number of serious crashes occurring on those roadways. More specifically, traffic stop and serious crash data for Metro Roads were combined and grouped by date to test for a possible inverse, bivariate correlation between the two, i.e., whether the number of serious crashes per date decreased when the number of traffic stops increased. The correlation function returned a Pearson coefficient of $r = -.558$, indicating that a moderate correlation does indeed exist between increases in traffic stops and a decreases in numbers of serious crashes. This relationship was also found to be statistically significant.¹⁴

Estimated Savings

The injury- and death-related cost figures reported in the Introduction (NSC), in combination with 2005-2007 crash data for each of the five selected metropolitan counties (ODPS 2005; 2006; 2007), were used to estimate cost savings resulting from the prevention of serious crashes. Based on the number of additional serious crashes that would have occurred if Metro Road percent decreases had been identical to percent decreases on Non-Metro Roads, OSHP efforts potentially saved Ohioans over \$26 million in 2008. This estimate, it should be noted, considers only the activity taking place on the selected dates and roadways included in the analysis (which accounts for less than one-half, 48%, of total 2008 Metro activity).¹⁵ The overall economic impact of Metro Initiative efforts may be considerably larger. Moreover, the estimate is limited in its focus to injuries and fatalities, and does not include the enormous additional costs associated with non-injury, property damage crashes in Ohio's metropolitan areas. Used cautiously, these figures help to further illustrate the valuable service provided by the Highway Patrol and other law enforcement agencies.

Summary of Findings: Table 20 on the following page summarizes the major findings of this analysis.

¹³ $t = 1.942$. Significant at the $p=.05$ level, one-tailed test

¹⁴ $t = 1.504$. Significant at the $p=.10$ level, one-tailed test

¹⁵ Tables containing total (Unlimited) Metro activity can be found in Appendix A (p.30) and Appendix B (p.33).



Table 20. Major Findings of the Analysis.

1) Roads worked by OSHP (Metro Roads): compared to the previous three-year average (2005-2007), serious (fatal and injury) crashes decreased by 15%; total traffic-related deaths decreased 40%; and total traffic-related injuries decreased 17%. All of these decreases were found to be statistically significant.
2) Roads NOT worked by OSHP (Non-Metro Roads): during the same time period, serious crashes, injuries, and deaths also decreased on Non-Metro Roads. But, a) these decreases were all smaller than those on Metro Roads, and b) the decreases on Non-Metro Roads were not statistically significant.
3) Metro Roads versus Non-Metro Roads: the differences in percent reductions in serious crashes, injuries, and deaths between Metro Roads and Non-Metro Roads were also statistically significant.
4) Link between traffic stops and serious crash reduction: a statistically significant inverse correlation was observed between the number of traffic stops and the number of serious crashes on Metro Roads. Specifically, a higher number of traffic stops was associated with a lower number of serious crashes, and vice-versa.
5) Potential Economic Savings: Metro Initiative activities on the selected dates and roadways examined in the analysis may have saved Ohioans an estimated \$26 million or more.

Discussion and Conclusion

Utilizing knowledge relating to the nature and degree of serious crashes occurring in and around Ohio’s large metropolitan areas, the Ohio State Highway Patrol developed and implemented targeted enforcement plans with the overarching goal of reducing traffic-related deaths and injuries, as well as their associated human and economic costs. Based on the research findings summarized above, coordinated traffic enforcement activities did have a significant positive impact in the analyzed metropolitan areas, contributing importantly to OSHP’s statewide efforts to save lives, livelihood, and property on Ohio roads.

Partnerships with metropolitan police departments proved to be a valuable tool in addressing traffic safety issues in each of the metropolitan areas. The collaborative efforts combined state-level and local law enforcement knowledge and resources to determine the nature and extent of problem behaviors, as well as the locations in which they were occurring with the highest frequency. This approach fostered the development of more effective targeted enforcement strategies to create a positive overall impact to traffic safety within the metropolitan areas, as well as the state as a whole.

Future Metropolitan Operations

The Metro Initiative, which began as a pilot project in 2006, has contributed significantly to reducing serious crashes in Ohio since its inception. Due to the program’s success, the Ohio State Highway Patrol intends to integrate metropolitan patrols more permanently into normal operations. As part of Metro Operations, OSHP will continue to:

- Identify and evaluate contributing circumstances, high-frequency locations, offender characteristics, and other major factors associated with serious crashes in and around Ohio’s metropolitan areas.



- Develop and implement enforcement and education plans that target frequent crash-causing behaviors.
- Cultivate and strengthen multi-jurisdictional partnerships with law enforcement and other agencies in and around metropolitan areas, and to devote resources that help to alleviate personnel shortages and competing priorities (e.g., drugs, homicide, other criminal activity) by sharing in the traffic safety enforcement burden.
- Evaluate the impacts of enforcement operations in metropolitan areas, and refine approaches and techniques according to their relative level of success, as well as to the areas' changing needs.

References

- Aarts, Letty and Ingrid Van Schagen. 2006. "Driving Speed and the Risk of Road Crashes: A Review." *Accident Analysis and Prevention*. 38: 215-224.
- Cambridge Systematics, Inc. & M.D. Meyer. 2008. "Crashes vs. Congestion – What's the Cost to Society?" Report prepared for AAA Traffic Safety Foundation.
- Cambridge Systematics, Inc. & Texas Transportation Institute. 2005. "Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation." Report prepared for Federal Highway Administration.
- CDC (US Department of Health and Human Services, Centers for Disease Control). 2009. Web-Based Injury Statistics Query and Reporting System (WISQARS). Online interactive database system. Available at: <http://www.cdc.gov/ncipc/wisqars/>
- Davis, J.W., Bennink, L.D., & D.R. Pepper. 2006. "Aggressive traffic Enforcement: a Simple and Effective Injury Prevention Program." *Journal of Trauma*. 60: 972-977.
- Elvik, Rune. 2005. "Speed and Road Safety: Synthesis of Evidence from Evaluation Studies." *Transportation Research Record*. 1908: 59-69.
- Fakhry, SM & K. Salaita. 2002. "Aggressive Driving: A Preliminary Analysis of a Serious Threat to Motorists in a Large Metropolitan Area." *Journal of Trauma*. 52(2): 223-224.
- FHWA (Federal Highway Administration). 2005. "Crash Cost Estimates by Maximum Police Reported Injury Severity within Selected Crash Geometries." Report (FHWA-HRT-05-051).
- FHWA (Federal Highway Administration). 2008. "Highway Statistics 2007: Selected measures for Identifying Peer States." Available at: <http://www.fhwa.dot.gov/policyinformation/statistics/2007/ps1.cfm>
- FHWA (Federal Highway Administration). 2009. "Focus on Congestion Relief." Online resource. Available at: www.fhwa.dot.gov/congestion/index.htm
- GHSA (Governors Highway Safety Association). "Aggressive Driving." Online resource. Available at: www.ghsa.org/html/issues/aggressive_driving.html
- IIHS (International Institute for Highway Safety). 2005. "One Million Crashes Occur Each Year on Urban, Suburban Roads." News Release. Available at www.iihs.org.
- IIHS (International Institute for Highway Safety). 2008[1]. "Q&A's: Speed and Speed Limits." Online resource, viewed 01/21/09. January. Available at: www.iihs.org/research/qanda/speed_limits.html
- IIHS (International Institute for Highway Safety). 2008[2]. "Hit a Fastball and You Might Score a Run. Hit Something in a Speeding Car and You Might Land in the Hospital or Worse." *Status Report*. 43(1):1-8. January 31.
- IIHS (International Institute for Highway Safety). 2008[3]. "Q&A's: Urban Crashes." Online resource, viewed 01/21/09. February. Available at: www.iihs.org/research/qanda/urban.html
- Mueck, R.P. & Dyer, L. 2007. "Traffic Enforcement is Law Enforcement...And Good Crime Prevention." *Campus Law Enforcement Journal*. 37(2): 17-24
- Nerup, Penny et al. 2006. "Ticketing Aggressive Cars and Trucks in Washington State; High Visibility Enforcement Applied to Share the Road Safely." DOT Report (DOT HS 810 603).



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- NHTSA (National Highway Traffic Safety Administration). 2000. "The Economic Impact of Motor Vehicle Crashes 2000." US Department of Transportation Report (DOT HS 809 446).
- NHTSA (National Highway Traffic Safety Administration). 2005. "Speed Management Strategic Initiative." US Department of Transportation Report (DOT HS 809 924).
- NHTSA (National Highway Traffic Safety Administration). 2006. "2005 Traffic Safety Facts, Final Edition." Annual statistics publication.
- NHTSA (National Highway Traffic Safety Administration). 2007. "2006 Traffic Safety Facts, Final Edition." Annual statistics publication.
- NHTSA (National Highway Traffic Safety Administration). 2008[1]. "2007 Traffic Safety Facts, Early Edition." Annual statistics publication.
- NHTSA (National Highway Traffic Safety Administration). 2008[2]. "Speeding." Traffic Safety Facts 2007 Data Brief. US Department of Transportation Report (DOT HS 810 998).
- NHTSA (National Highway Traffic Safety Administration). 2009[1]. "Aggressive Driving Enforcement: Strategies for Implementing Best Practices." Online resource: <http://www.nhtsa.dot.gov/people/injury/enforce/aggressdrivers/aggenforce/toc.html>
- NHTSA (National Highway Traffic Safety Administration). 2009[2]. National Aggressive Driving Action Guide: A Criminal Justice Approach." Online resource: www.nhtsa.gov.
- NSC (National Safety Council). 2006. "Estimating the Costs of Unintentional Injuries, 2006." Online article. Available at: www.nsc.org/resources/issues/estcost.aspx.
- OBMV (Ohio Bureau of Motor Vehicles). "2005 Ohio License Statistics by County, Age, and Sex: Book 2." Annual statistics publication.
- OBMV (Ohio Bureau of Motor Vehicles). "2006 Ohio License Statistics by County, Age, and Sex: Book 2." Annual statistics publication.
- OBMV (Ohio Bureau of Motor Vehicles). "2007 Ohio License Statistics by County, Age, and Sex: Book 2." Annual statistics publication.
- ODOT (Ohio Department of Transportation). 2004. "Executive Summary: Ohio's Transportation Priorities through 2015." Report summary.
- ODPS (Ohio Department of Public Safety). 2006. "Ohio Traffic Crash Facts 2005."
- ODPS (Ohio Department of Public Safety). 2007. "Ohio Traffic Crash Facts 2006."
- ODPS (Ohio Department of Public Safety). 2008. "Ohio Traffic Crash Facts 2007."
- OSHP (Ohio State Highway Patrol). 2006. "2006 Metropolitan Traffic Safety Initiative." Report.
- OSHP (Ohio State Highway Patrol). 2009[1]. "LifeStat: The 24/7 Initiative." Available at: http://statepatrol.ohio.gov/24_7.htm
- OSHP (Ohio State Highway Patrol). 2009[2]. *Ohio Citizen Survey 2007-2009: Ohioans' Attitudes and Behaviors Related to Traffic Safety Issues and the Ohio State Highway Patrol*. Report of Survey Results. Available at: <http://statepatrol.ohio.gov/publications.stm>
- Pisarski, Alan E. "Commuting in America III: The Third National Report on Commuting Patterns and Trends." NCHRP-TRCP Report.
- Retting, R.A. & E.R. Teoh. 2008. "Traffic Speeds on Interstates and Freeways 10 Years After Repeal of National Maximum Speed Limit." *Traffic Injury Prevention*. 9(2): 119-124.
- Rich, Ricky H. 2008. "Georgia's Traffic Enforcement Network." *Police Chief Magazine*. (7).
- Ruecker, Ronald C. 2007. "Save Lives – Support Traffic Safety Enforcement." *Police Chief Magazine*. (7).
- Scott, A., Darby, P., & Raeside, R. 2007. "Police Enforcement and Road Accident Reduction." Transportation Research Board Annual Meeting 2007 Paper.
- Shinar, David & Richard Compton. 2004. "Aggressive Driving: An Observational Study of Driver, Vehicle, and Situational Variables." *Accident Analysis and Prevention*. 36: 429-437.
- Shrank, David & Tim Lomax. 2007. "The 2007 Urban Mobility Report." Report by the Texas Transportation Institute.



- Thomas, D.F. et al. 2008. "Evaluation of a High Visibility enforcement Project Focused on Passenger Vehicles Interacting with Commercial Vehicles." *Journal of Safety Research*. 39: 459-468.
- US Census Bureau. 2009. "American Factfinder." Online Resource. Available at: http://factfinder.census.gov/home/saff/main.html?_lang=en
- Vanlaar, W., Simpson, H., Mayhew, D., & R. Robertson. 2008. "Aggressive Driving: A Survey of Attitudes, Opinions, and Behaviors." *Journal of Safety Research*. 39: 375-381.
- Weiss, A. & Morckel, K. 2007. "Strategic and Tactical Approaches to Traffic Safety." *Police Chief Magazine*. 74(7).
- WHO (World Health Organization). 2004. "World Report on Road Traffic Injury Prevention: Summary." Report.
- Williams, A. F., Kyrychenko, S.Y., and R.A. Retting. 2006. "Characteristics of Speeders." *Journal of Safety Research*. 37: 227-232.
- Yannis, G., Papadimitriou, E., & C. Antoniou. 2008. "Impact of Enforcement on Traffic Accidents and Fatalities: A Multivariate Multilevel Analysis." *Safety Science*. 46: 738:750.
- Zwahlen, H.T. & K.R. Suravaram. 2007. "Crash Reduction Factors for Education and Enforcement." Report for the Ohio Department of Transportation.



Appendix A

Total (Unlimited by Date or Road) 2008 OSHP Enforcement in Five Selected Metro Counties



Table 21. Total 2008 Metro Traffic Stops and Number/Percent Resulting in Citations (UNLIMITED)

Metro Area	Traffic Stops	Enforcement Stops (Citation Issued)	Percent Enforcement	Violation Warnings	Motorist Assists
Cincinnati (Hamilton County)	7,543	4,106	54%	2,853	695
Cleveland (Cuyahoga County)	2,504	1,864	74%	710	191
Columbus (Franklin County)	11,691	7,381	63%	4,247	2,317
Dayton (Montgomery County)	2,201	1,743	79%	556	203
Toledo (Lucas County)	1,047	729	70%	231	125
Total	24,986	15,823	63%	8,597	3,531

Table 22. Select 2008 Metro Enforcement by Metropolitan Area (UNLIMITED)

Metro Area	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
Cincinnati (Hamilton County)	4,106	2,206	491	720	295	1,192
Cleveland (Cuyahoga County)	1,864	1,339	195	247	15	445
Columbus (Franklin County)	7,381	4,008	779	1,572	26	2,767
Dayton (Montgomery County)	1,743	1,191	271	444	9	480
Toledo (Lucas County)	729	471	99	126	3	218
Total:	15,823	9,215	1,835	3,109	348	5,102

Table 23. Select 2008 Enforcement by Month, All Cities Combined (UNLIMITED)

Month (2008)	Traffic Stops	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
January	911	469	234	32	49	4	165
February	771	435	237	20	34	3	157
March	1,135	673	321	38	80	11	270
April	4,054	2,780	1,576	320	483	57	995
May	2,475	1,376	590	125	197	60	525
June	5,502	4,357	3,196	667	1,287	17	1,053
July	1,603	992	474	79	132	11	417
August	1,202	691	322	71	103	10	284
September	1,562	992	579	134	188	29	320
October	2,649	1,449	755	189	269	74	506
November	2,124	1,154	702	117	217	52	271
December	998	455	229	43	70	20	139
Total:	24,986	15,823	9,215	1,835	3,109	348	5,102



Table 24. Select 2008 Enforcement by Day of Week, All Cities Combined (UNLIMITED)

Day of Week (2008)	Traffic Stops	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
Sunday	1,008	500	230	56	91	72	161
Monday	3,767	2,504	1,535	292	480	18	848
Tuesday	3,029	2,039	1,230	225	390	11	644
Wednesday	3,834	2,694	1,577	305	514	9	956
Thursday	4,890	3,130	1,871	352	609	32	976
Friday	5,817	3,518	1,986	417	743	99	1,138
Saturday	2,641	1,438	786	188	282	107	379
Total:	24,986	15,823	9,215	1,835	3,109	348	5,102

Table 25. Select 2008 Enforcement by Time of Day, All Cities Combined (UNLIMITED)

HOUR	Traffic Stops	Enforcement Stops (Citation Issued)	Speeding Violations	Speeding 20+ Violations	Aggressive Driving Violations	OVI Arrests	Safety Belt Violations
7:00 am - 10:59 am	1,900	1,578	1,135	260	374	6	386
11:00 am - 2:59 pm	3,841	3,061	2,183	426	877	4	780
3:00 pm - 6:59 pm	11,649	7,794	4,116	703	1,252	33	2,890
7:00 pm - 10:59 pm	5,579	2,712	1,508	358	465	72	874
11:00 pm - 2:59 am	1,950	638	253	84	133	227	163
3:00 am - 6:59 am	67	40	20	4	8	6	9
Total:	24,986	15,823	9,215	1,835	3,109	348	5,102



Appendix B

Analysis Activity and Total (Unlimited) Activity Comparison Table



Table 26. Analysis Activity and Total (Unlimited) Activity Comparison Table

	Cincinnati	Cleveland	Columbus	Dayton	Toledo	TOTAL
Metro Activity (Limited for Analysis)¹						
Total Traffic Stops	3,322	1,987	4,054	1,603	864	11,830
Enforcement Stops	2,009	1,599	3,000	1,295	627	8,530
Violation Warnings	1,131	483	1,255	388	156	3,413
Motorist Assists	289	145	588	136	110	1,268
Speeding Citations	1,101	1,296	1,927	942	444	5,710
20+ Speeding Citations	262	188	418	229	96	1,193
Aggressive Violations	361	224	990	338	113	2,026
OVI Arrests	104	8	3	7	1	123
Safety Belt Citations	617	317	945	319	168	2,366
Commercial Truck Citations	40	25	219	165	72	521
Crashes Handled	5	2	12	1	3	23
Unlimited Metro Activity²						
Total Traffic Stops	7,543	2,504	11,691	2,201	1,047	24,986
Enforcement Stops	4,106	1,864	7,381	1,743	729	15,823
Violation Warnings	2,853	710	4,247	556	203	8,569
Motorist Assists	695	191	2,317	203	125	3,531
Speeding Citations	2,206	1,339	4,008	1,191	471	9,215
20+ Speeding Citations	491	195	779	271	99	1,835
Aggressive Violations	720	247	1,572	444	126	3,109
OVI Arrests	295	15	26	9	3	348
Safety Belt Citations	1,192	445	2,767	480	218	5,102
Commercial Truck Citations	165	26	702	272	77	1,242
Crashes Handled	17	2	103	2	5	129

¹ Analysis data is limited to specific dates and roads identified in District Metro Initiative plans.

² "Unlimited" Metro Activity includes all 2008 traffic stops coded as "Metro" in the CAD system, regardless of date or location of the stop.