4.0 Data Gathering During the Project

4.1 Feedback during the Project

This feedback from officers in the field and those who are monitoring the PI&E efforts is essential to making proper interpretations of the statistical results. An excellent example of this is given in Section 1.3.3, and will not be repeated here. It dealt with how the tornadoes that hit the Tuscaloosa, Alabama area during the time frame of the project delayed the project and may have caused the results to be skewed one way or the other. Generally what should be documented here should be restricted to that which has not been anticipated in the normal course of the TACT project (e.g., a sudden road closure due to weather).

4.2 Gathering Crash, Citation, Survey and Observational Data during Project

Example details documenting this data gathering have been covered above in Sections 3.4-3.7. The major point of this methodology step is that there are valuable aspects of the TACT project that should be obtained and documented throughout the project. This is especially true if there were any abnormalities encountered that would affect the interpretation of the statistical analyses.

4.3 Gather Administrative Data during the Project

4.3.1 PI&E Administrative Data

Billboards

The following presents an example of the administrative data for a small targeted PI&E effort that responds to the questions posed in Section 3.8. These examples are from the TACT project that was started with a PI&E effort in the last two weeks of April. The selective enforcement effort was initiated on Monday June 13, 2011. The PI&E efforts involving news media, billboards and posters were continued from June 13 through July1, 2011.

The vendor that provided the billboards was Lamar Texas LP, which has offices in Birmingham, Alabama and controls several billboards along this corridor and throughout the state. They provided the billboards at a cost of $8,700 for the two billboards for the duration of one month (although the billboards were allowed to stay up slightly over the one month period beginning on April 25, 2011. Billboards were installed in both the northbound and southbound directions along I-20/59 between mileposts 79 and 81. The following presents an image of one of the two identical billboards that were constructed. Display 4.3.1 illustrates the billboard presentation.

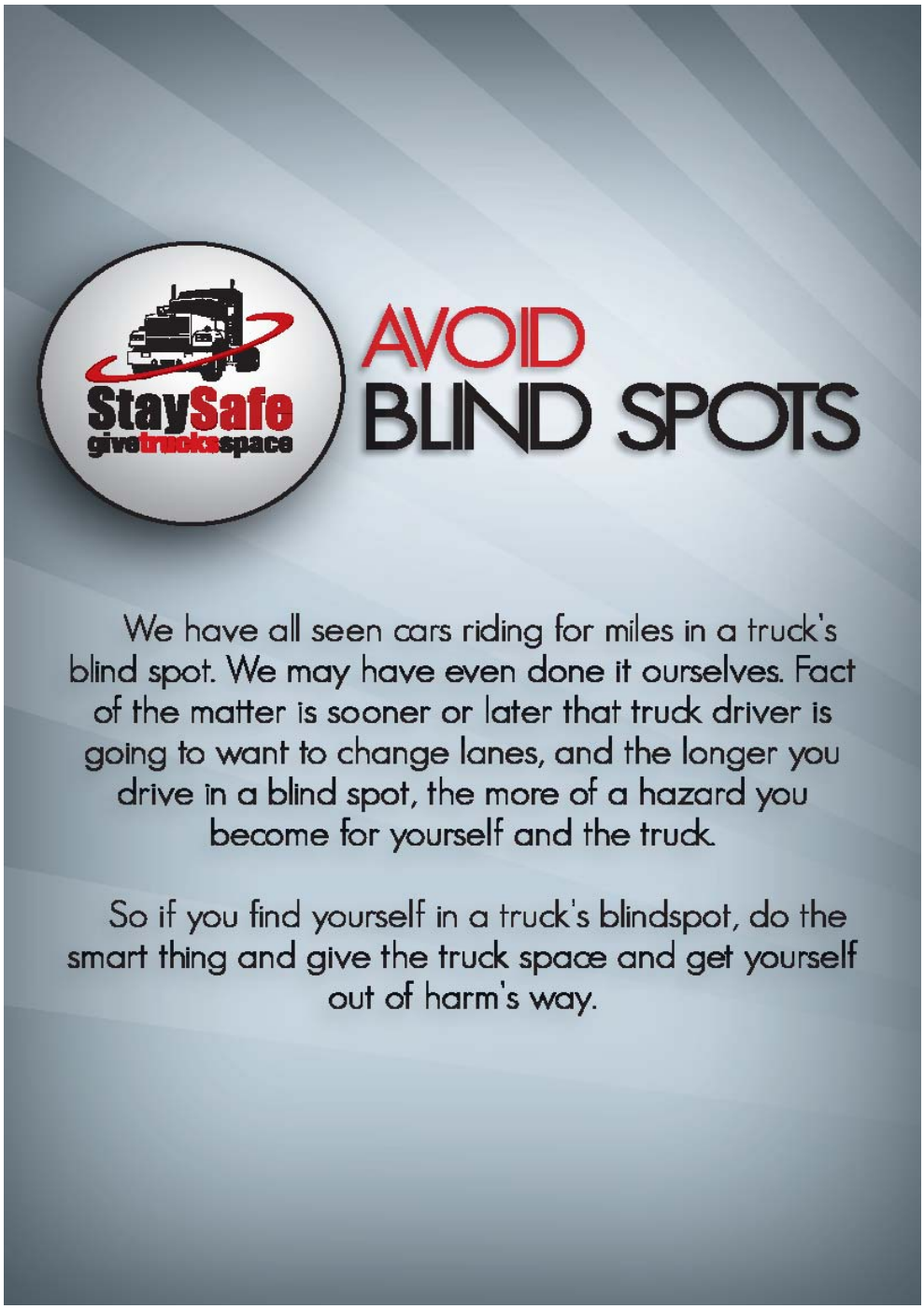
Display 4.3.1 Billboard Presentation

Posters

Posters were designed and produced within the University at nominal cost. Approximately 125 posters were produced. These were used for general publicity of the program, with the exception of the Driver's Licensing Offices where the surveys were being conducted. More specifically, these informational posters were used to compliment the billboards, and they were delivered between April 16 – 20, 2011 to drivers' education teachers for display in 11 high schools located near the test corridor to inform students of the dangers of driving in truck blind spots. The following were the high schools that were covered: Holy Spirit, Central, Paul W Bryant, Pelham, Bessemer, Hueytown, Midfield, Wenonah, A.H. Parker, George Washington Carver, Huffman, and P. D. Jackson-Olin high schools. These informational posters were also placed in student activity and recreational buildings on the Tuscaloosa and Birmingham campuses of the University of Alabama. Display 4.3.1a presents the poster demonstration.

Flyers were also placed around The University of Alabama and The University of Alabama at Birmingham. These were placed in high traffic areas on the campuses by team members.

Display 4.3.1a Image of Poster Demonstration



Display 4.3.1b TACT Project News Release

NEWS RELEASE

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June 6, 2011

Trooper Efforts on I-59 to Prevent Car-Truck Fatalities

MONTGOMERY —The Department of Public Safety is taking the steps to prevent car-truck crashes by renewing its efforts on an initiative known as TACT: Ticketing Aggressive Cars and Trucks, according to Col. Hugh B. McCall, Public Safety director. McCall said the enforcement and educational program is made possible by a grant DPS received from the Federal Motor Carrier Safety Administration.

McCall announced that this particular initiative will be conducted along the I-59 corridor between Tuscaloosa and Birmingham. It will include intensive enforcement, the use of billboards, and news media involvement.

TACT focuses on the unsafe driving behaviors that contribute to serious and fatal crashes between personal and commercial motor vehicles, said McCall. These include unsafe lane changes, following too closely, failure to signal lane changes, failure to yield the right of way, speeding, and aggressive driving, which is a combination of two or more risky driving behaviors.

Alabama state troopers have been targeting their TACT enforcement on sections of roadways identified as high-risk areas for crashes involving commercial vehicles, McCall said. He said the University of Alabama's Center for Advanced Public Safety is conducting pre- and post-initiative analysis of serious and fatal crashes involving commercial vehicles both to guide enforcement activities and to gauge their effectiveness.

Studies, both nationally and in Alabama, show that automobile driver-related causal factors are indicated for the automobile driver in more than 80 percent of the fatal crashes involving a car and a commercial motor vehicle.

The Alabama Department of Transportation and the Alabama Trucking Association have partnered with the Department o Public Safety in the TACT program, helping educate motorists about sharing the road safely through posters, electronic message boards, and displays on commercial motor vehicles.

The Federal Motor Carrier Safety Administrative initiated TACT in 2004 as a pilot program in Washington state. Based on the success of the pilot, FMCSA has encouraged other states to participate, and Alabama is now one of 15 states that have received federal funding to implement a TACT program.

End of June 6, 2011 News Release

News Media Activities

The news release for the example TACT project is given in Display 4.3.1b. It was released shortly after it was produced on June 6, 2011. This was used as the basis for several articles and TV time spots. Ride-along invitations were also sent out to the Tuscaloosa News and the Birmingham News.

The following presents a sample list of some of these presentations by the news media:

ABC 33/40: "Initiative to reduce car-truck fatalities along I-59," June 14, 2011, http://www.abc3340.com/story/14905214/initiative-to-reduce-car-truck-fatalities-along-i-59

WBRC FOX6: "Troopers cracking down on dangerous drivers along I-59 corridor ," June 14, 2011, http://westjeffersoncounty.myfoxal.com/news/news/troopers-cracking-down-dangerous-drivers-along-i-59-corridor/89299

Tuscaloosa News: "Aggressive I-20/59 drivers targeted," June 18, 2011, http://www.tuscaloosanews.com/article/20110618/NEWS/110619706/1007/news02?Title=Aggressive-I-20-59-drivers-targeted

Tuscaloosa News: "Troopers stepping up enforcement on I-20/59" (ride along), June 17, 2011, http://video.tuscaloosanews.com/video/1000721527001

Tuscaloosa News: "State Troopers stepping up enforcement on Interstate 20/59," June 17. 2011, http://www.tuscaloosanews.com/article/20110617/NEWS/110619729/1007?Title

Also given a sound spot on WVUA, the local Tuscaloosa TV station (not documented on their web site), http://www.wvua7.com/

Generally, these media spots occurred slightly before the TACT selective enforcement effort that was initiated on June 20th, which enabled some data to be gathered on just the effect of the Pi&E efforts.

4.3.2 Officer Activity Administrative Data

4.3.2.1 Officer Activity Administrative Data for First TACT Project

This section will first cover the details of officer activity and the citations issued during the TACT project. Descriptive narratives and tables illustrate the administrative information that was collected. The example given is from the first Alabama TACT project.

The selective enforcement (SE) component of the first TACT project was conducted by the Alabama Department of Public Safety and 12 local police agencies, all of which have commercial motor vehicle (CMV) certification. TACT efforts generally followed the basic pattern of most patrol selective enforcement programs with the emphasis in this case being on the types of offenses outlined above. Both marked and unmarked cars were used in the effort; of the 280 DPS vehicles employed, approximately 80 (close to 30%) were unmarked.

Unmarked vehicles were also used in the three CMV ride-along details that took place on September 10th, October 28th, and November 17th, 2009 as part of the overall TACT effort. This involved a trooper riding in the CMV in radio contact with a number (3, 5 and 4, respectively) of unmarked cars following the CMV. Violations observed by the riding trooper were relayed to the unmarked patrol units which then stopped the violator and issued the citation. This effort resulted in a total of 180 contacts of which 16 were classified as aggressive drivers (evidence of multiple offenses caused by negative driver attitude).

Concurrent with the public information and educational component, the SE component was conducted in three phases over the following dates:

PHASE	DURATION (2009)
1	September 6th – 12th
2	October 4th – 17th
3	November 15th – December 12th

Each of the police agencies that participated were required to submit a report for each time that each person participated, including the location, time and types of citations given.

A *submission* to the TACT officer activity database is defined to be one group of data on activity by a given individual officer. There are generally several contacts for any given submission.

The following gives a listing of the number of these submissions for the eight DPS troops and the 12 local law enforcement agencies that participated.

AGENCY OR TROOP	SUBMISSIONS
Arab PD	3
Baldwin County Sherriff	18
Birmingham PD	56
Decatur PD	2
DPS - Troop A	231
DPS - Troop B	889
DPS - Troop C	146
DPS - Troop D	509
DPS - Troop E	726
DPS - Troop G	537
DPS - Troop I	1053
DPS - Troop K	45
Guntersville PD	1
Hoover PD	7
Mark Neilson	6
MCSU North*	137
MCSU South*	181
Oneonta PD	11
Pelham PD	20
Vestavia Hills PD	3
TOTAL	**4,582**

* MCSU = Motor Carrier Safety Unit, a unit within the Department of Public Safety (DPS).

The total SE effort consisted of 19,224 hours, making the average duration per submission to be about 4.2 hours per submission (ranging from a few minutes to 24 hours per submission). There were 26,137 citations issued over the 19,224 hours, which is about 1.4 citations per hour.
The total of 29,823 contacts, nearly all of which resulted in issued citations or warnings, in the total of 19,224 hours of effort, or about 1.5 contacts per hour. About 2,249 hours were funded by overtime which was used to supplement the effort statewide. A total of 30,557 citations and warnings were issued as part of the TACT program. Of these, the vast majority (94%) were issued to private motorists and only about 10% of the contacts resulted in warnings as opposed to citations.

In Display 4.3.2.1 the violation types are generally subdivided four ways: (1) citations given to a commercial motor vehicle (CMV); (2) warnings given to a CMV; (3) citations given to a non-

CMV; and (4) warnings given to a non-CMV. These are indicated under the Violation Type column heading. The numbers under the Contacts heading indicate either the number of citations or the number of warnings given. The Average column gives the average number of contacts given per submission (recall that submissions may vary dramatically in their durations – from a few minutes to 24 hours). The final column (Maximum) contains the maximum number of contacts of the indicated type for any submission. The minimum number of submissions for all of the violation categories was universally zero.

Display 4.3.2.1 Summary of Citations Issued

VIOLATION TYPE	CONTACTS	AVERAGE	MAXIMUM
CMV Speeding Citation	730	0.16	20
CMV Speeding Warning	104	0.02	4
CMV Following Too Close C	43	0.01	4
CMV Following Too Close W	12	0.00	1
CMV Improper Lane Change C	11	0.00	1
CMV Improper Lane Change W	11	0.00	2
CMV Failure To Signal Citation	6	0.00	1
CMV Failure To Signal Warning	5	0.00	1
CMV Aggressive Driving Cit	53	0.01	4
CMV Seatbelt Citation	228	0.05	10
CMV Seatbelt Warning	4	0.00	1
CMV No Insurance Citation	141	0.03	8
CMV No Insurance Warning	6	0.00	1
CMV DL Citation	82	0.02	3
CMV DL Warning	5	0.00	2
CMV Improper Passing Citation	2	0.00	1
CMV Improper Passing Warning	2	0.00	2
NonCMV Speeding Citation	11591	2.53	28
NonCMV Speeding Warning	1525	0.33	11
NonCMV Following Too Close C	375	0.08	6
NonCMV Following TooClose W	165	0.04	6
NonCMVImproperLaneChangeC	220	0.05	4
NonCMVImproperLaneChangeW	158	0.03	8
NonCMV Failure To Signal C	120	0.03	3
NonCMV Failure To Signal W	129	0.03	5
NonCMV Aggressive Driving C	772	0.17	12
NonCMV Seatbelt Citation	3022	0.66	13

Display 4.3.2.1 Summary of Citations Issued, continued

NonCMV Seatbelt Warning	49	0.01	4
NonCMV No Insurance Citation	2948	0.64	9
NonCMV No Insurance Warning	174	0.04	6
NonCMV DL Citation	1287	0.28	7
NonCMV DL Warning	165	0.04	8
NonCMV Improper Passing C	61	0.01	3
NonCMV Improper Passing W	21	0.00	4
Level 1 Driver Violation Cit	18	0.00	6
Level 2 Driver Violation Cit	302	0.07	14
Level 3 Driver Violation Cit	320	0.07	10
Level 1 Vehicle Violation Cit	32	0.01	13
Level 2 Vehicle Violation Cit	1079	0.24	32
Level 3 Vehicle Violation Cit	31	0.01	9
Level 1 Driver Out of Service	2	0.00	1
Level 2 Driver Out of Service	39	0.01	2
Level 3 Driver Out of Service	34	0.01	2
Level 1 Vehicle Out of Service	3	0.00	2
Level 2 Vehicle Out of Service	105	0.02	3
Level 3 Vehicle Out of Service	3	0.00	1
CMV Other Citation	314	0.07	6
CMV Other Warning	98	0.02	6
Non CMV Other Citation	2349	0.51	15
Non CMV Other Warning	867	0.19	10
TOTAL	**29,823**		

Display 4.3.2.1a gives a more elaborate description of each of the violations noted above.

Display 4.3.2.1a Explanation of Contact Descriptors

DESCRIPTOR	FURTHER DESCRIPTION
Level 1 Driver Violation	Violations from the lowest level of driver investigation, considering things such violations as irregularities in the driver's license, absence of medical examiner's certificate, improperly kept record of duty status, etc.
Level 2 Driver Violation	Violations from the middle level of driver investigation, considering most of the same violations as in Level 1 but in a much more intensive way.
Level 3 Driver Violation	Violations from the highest level of driver investigation.
Level 1 Vehicle Violation	Violations from the lowest level of vehicle inspection, considering things such as lights, windshield wipers, tire pressure, air and electrical lines, exhaust system and fuel tanks, steering and brakes.
Level 2 Vehicle Violation	Violations from the middle level of vehicle investigation, considering most of the same violations as in Level 1 but in a much more intensive way.
Level 3 Vehicle Violation	Violations from the highest level of vehicle investigation.
Level 1 Driver Out of Service	Driver not allowed to continue with the trip due to a Level 1 driver violation.
Level 2 Driver Out of Service	Driver not allowed to continue with the trip due to a Level 2 driver violation.
Level 3 Driver Out of Service	Driver not allowed to continue with the trip due to a Level 3 driver violation.
Level 1 Vehicle Out of Service	Vehicle not allowed to continue with the trip due to a Level 1 vehicle violation.
Level 2 Vehicle Out of Service	Vehicle not allowed to continue with the trip due to a Level 2 vehicle violation.
Level 3 Vehicle Out of Service	Vehicle not allowed to continue with the trip due to a Level 3 vehicle violation.
CMV Other Citation	Citation not covered above to a CMV.
CMV Other Warning	Warning not covered above to a CMV.
Non CMV Other Citation	Citation not covered above to a non-CMV.
Non CMV Other Warning	Warning not covered above to a non-CMV.

4.3.2.2 Officer Activity Administrative Data for the recent TACT Project

The details for the most recent TACT Project did not need to be nearly as extensive as the original since it was a project that was greatly restricted in scope, involving only a few officers for less than two weeks. This provides an example of a much smaller and highly-targeted TACT project. It covered only one roadway segment (I20/59 between milepost 63 and 73). This was specified because it was found to be a high CMV crash area, but also to facilitate the evaluation project. The selective enforcement component of the project involved three officers working during their normal hours (Monday through Friday) over a period of time from June 20 through July 1, 2011. This involved one officer who is assigned to Tuscaloosa County and two officers from other counties who were brought in just for this project.

5.0 Data Gathering After the Project

5.1 Use of Data Gathering After the Project

This section in the Methodology Manual emphasized the importance of using the data gathered for such things as determining the length of any "halo effect," and determining the size and duration of selective enforcement "waves." This type of research is beyond the scope of the current project, and no examples were produced. However, all available data and analyses should be applied to make the best possible judgments as to resolving these tactics for future programs. The idea of "thinking outside of the box" is encouraged along with trying new and different approaches as opposed to working future projects according to traditionally established guidelines.

5.2 Gather Crash, Citation, Survey and Observational Data after Project

Examples are presented in Section 6.

5.3 Gathering and Summarizing Administrative Data after Project

Examples are presented in Section 4.3.2.

6.0 Analytical Techniques and Statistical Analysis

To compare numbers without the use of statistical analytical tools is often quite misleading. Sometimes, for example if there is a 100% increase or decrease, the results might seem so obvious that statistical analyses are not necessary. However, such huge increases or decreases are extremely suspect, since they are not typical of any traffic safety countermeasures, especially those involving driver behaviors. Those who are informed on this subject will have an immediate negative reaction to extravagant claims. In addition, while a major obvious increase or decrease probably does not need statistical analysis to determine its validity, analytical techniques are required to estimate the extent of the expected gain or loss. It is not enough to say – this countermeasure works, since most all countermeasures work to some extent. It is essential that the extent to which an individual countermeasure works be determined (i.e., to answer the question: how many crashes were reduced and how does this project into future reductions of fatalities and injuries?). The concept that "if we saved one life it was all worth it" may not be valid because the project could have consumed valuable limited resources that could have been employed on alternative countermeasures. Optimal safety policies depend upon being able to compare alternative countermeasures, and that can only be done by estimating the degree of benefit (e.g., lives saved and injuries reduced).

The above paragraph is not intended to discourage those who are not statistical experts from performing evaluations. There are a variety of ways that a law enforcement staff might move forward with the statistical analyses; among those that should be considered, in order of in-house expertise:

- Assuming that an in-house capability exists, perform the analyses with existing staff;
- If some minimal capability exists, perform the analysis in-house with the techniques recommended below, with the possibility of having it checked by a statistical expert either from an outside consultant or from a sister agency of government (minimal involvement);
- If no capability exists, consider training a staff member who is interested and has some mathematical ability and interests, and then apply the alternative directly above;
- Retain a consultant of expertise from a sister governmental agency to handle the analysis.

In the sections that follow a special effort is made to keep the analyses as simple as possible while maintaining their validity. A few analytical techniques will be used to keep the analysis methodology simple. These procedures are given in the Methodology Manual, and only the results illustrating the use of these techniques will be presented here.

The evaluation of the Alabama TACT programs were conducted in four parts: (1) crash data comparisons, (2) electronic citation issuance comparisons, (3) officer, trucker and driver surveys, and (4) observational data comparisons. These are covered in the following sections.

6.1 Crash Data Analysis

This section (6.1) presents two crash data analysis examples; from the first Alabama TACT project (6.1.1), and from the more recent project (6.1.2).

6.1.1 Example from Alabama First TACT Project

The purpose of this section is to provide an example crash data analysis of a TACT project evaluation. The results provide insight as to the potential effect of TACT upon CMV-involved crashes in general and CMV-car crashes in particular. Generally, it is important to establish the best possible control areas so that the comparison can provide meaningful information. However, since this implementation of TACT was statewide there was no way that a meaningful control area could be established. The only comparison that could be made was to past crash data.

CMV-involved crashes declined dramatically in Alabama in 2008 from its average in 2006 and 2007 of 3,189 to 2,696 (over 15% reduction). Fatal crashes declined from their 2006-7 average of 93 to 76 (over 18% reduction). A major cause of these reductions was the economy. While clearly there was not a 15-18% reduction in miles traveled, those who are first and most affected by a downturn in the economy tend to be the most crash-prone drivers (e.g., younger ages). So, although this has not be well documented to date as to the exact cause and relationships, the data support the intuition that minor shifts in the economy affect crash outcomes.

Clearly it would be unfair to expect that a TACT program would further diminish the crash numbers of 2008, especially in a rebounding economic situation. (The degree and effect of any rebound is beyond the scope of this report, but there tends to be an immediate over-reaction to most down-turns, which must be followed by a replenishment of inventories, so the CMV rebound might well be greater than that measured in the economy itself.) At this point there seemed to be three alternatives for defining the (before) control time:

- Skip 2008 and use 2006 and 2007 as the before period;
- Go back even further and use, for example, the past five years to buffer out the 2008 effect; or
- Use the 2006-2008 time period.

The first of these would not take into consideration the fact that the recession was not over at that point, and so this would not make a fair comparison. The second of these had the same problem, and past studies have determined that three years is the optimal amount of time for forecasting location hotspots in the succeeding year. Thus, the third alternative was felt to be best in mixing two back years with a recent economic downturn year to provide a fair comparison. Note that this third alternative places the heaviest burden of proof on TACT. It should be clear that if

significant differences are found when comparing the TACT months to comparable months in 2006-8, then these differences would be even more pronounced when comparing to 2006-7 or 2004-2008.

Alabama uses the Critical Analysis Reporting Environment (CARE) for obtaining data summaries from the crash database. In order to make these comparisons, 12 CARE runs were required to accommodate the following combinations:

- Two crash types (all CMVs; CMV-personal vehicle crashes);
- Three severity levels (all crashes, injury-fatality crashes, and fatal crashes); and
- Two runs for each of the above to accommodate the before and during periods.

Of these, the first is the only one that warrants further explanation. It was determined that the following two crash types should be run to get as much insight into the crash effects as possible:

- *All* crashes that involved a CMV *in any way*. Since the TACT program specifically involved CMVs, it was felt that there would be an impact on all CMV crashes. This would include single vehicle CMV, CMV-CMV, and all multi-vehicle crashes that involved a CMV regardless of causal vehicle or other involved vehicle.
- All two-vehicle crashes that involved *both* a CMV and a personal vehicle (car). Which of the two involved vehicles was causal is irrelevant to this particular study. So the combination can either be CMV causal and car=Vehicle 2, or car causal and CMV=Vehicle 2. Multiple vehicle crashes above two vehicles were excluded since the CMV might just have been a victim vehicle in these crashes (i.e., neither the CMV nor any interaction with it had anything to do with the cause of the crash).

The months that the TACT projects of this example were in effect included September through December of 2009. While CARE could have gone down to a week by week, or day by day, comparison for the specific times that the program was in effect, it is clear that the goals of the program were not to reduce crashes *only* during the times that officers were performing selective enforcement. The goal included spill-over effects from the combined public education and selective enforcement that should have at least covered the four months that the program was in effect. Finally, only DPS-reported crashes were considered for these analyses. The vast majority of CMV crashes are investigated by DPS, resulting in a consistent sample size that is more than adequate for evaluating the program.

This led to the CARE analyses given in the table that follows:

CRASH TYPES	SEVERITIES	TIME FRAMES
CMV-Involved Crashes Reported by DPS	All Crashes	Before: Sep.-Dec. 2006-2008
		During: Sep.-Dec. 2009
	Injury and Fatal Crashes	Before: Sep.-Dec. 2006-2008
		During: Sep.-Dec. 2009
	Fatal Crashes Only	Before: Sep.-Dec. 2006-2008
		During: Sep.-Dec. 2009
CMV-Car Two-Vehicle Crashes Reported by DPS	All Crashes	Before: Sep.-Dec. 2006-2008
		During: Sep.-Dec. 2009
	Injury and Fatal Crashes	Before: Sep.-Dec. 2006-2008
		During: Sep.-Dec. 2009
	Fatal Crashes Only	Before: Sep.-Dec. 2006-2008
		During: Sep.-Dec. 2009

The results of these analyses will be presented in the following sections.

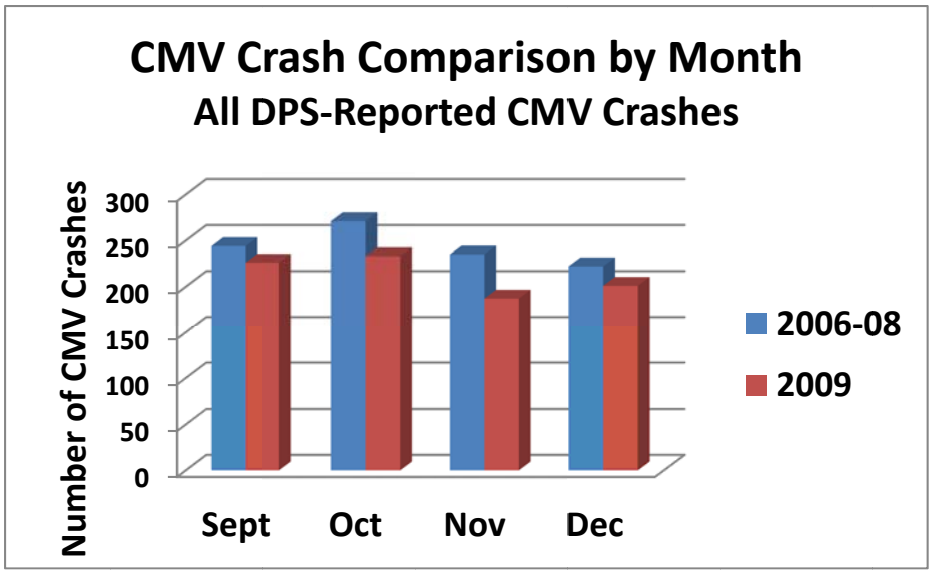
6.1.1.1 CMV Involved Crashes

A standard Student's-t test was performed for all of the analyses to compare the monthly number of crashes in the before control period against those in the during test period (i.e., during which the TACT program was in effect). The "level of significance" that will be reported is the alpha level of a single-tail test, or in other words, the probability of concluding that there is a significant reduction in the two subsets of data when in fact, the two are either equal, or the test is larger than the control. The various subsets of data upon which these tests were run are given in the table above, and they will be documented in the following subsections in that same ordering.

6.1.1.1.1 Example 1: All Crashes

The average number of crashes per month of this type in the before months was 243.25 crashes per month. The number observed in the "TACT" months was 211.75. This comparison found a difference of 31.50, which was significant at the 0.031 level. The estimate of the number of this type of crashes that were reduced monthly during the term of the project (i.e., September through December, 2009) is 31.5 crashes per month. The following bar chart shows the data graphically, where the before bar height was calculated as the average of the corresponding months over the three years (2006-2008), and the 2009 bar height is just the number of crashes during the duration of the TACT program.

Display 6.1.1.1



Detailed Method for the Excel "TTEST" Analysis. (The information in this section is included in the Methodology Manual (6.1), and is repeated here for convenience.) The data for comparing the 12-months (Sep-Oct over three years 2006-2008) to the comparable "during" period (Sep-Oct 2009) is given below:

Before	During	
278	226	
289	233	
264	187	
256	201	
229		
292		
255		
209		
226		
233		
187		
201		
243.25	211.75	Averages
0.030629		Probability of Difference due to Chance

Of interest here is the method for computing the probability that the difference between the two averages ("before" and "during") are merely due to chance. These raw numbers were in an Excel spreadsheet in the following rows and columns:

- D3-D14 for the 12 monthly "before" crash frequency numbers.
- E3-E6 for the four "during" crash frequency numbers.

The Excel function applied to obtain the Student's t-test probability was:

=TTEST(D3:D14,E3:E6,1,3)

where:

D3:D14,E3:E14 are the data ranges explained above,

1 = number of tails = the specification for a one-tailed test, and

3 = type = the type of test that has two samples with unequal variances

Alternatives for number of tails. A two-tailed test would be used when the analysis is not concerned with which of the two (in the case the "before" and "during") samples is the larger, only with whether they are different. In most traffic safety comparisons, the objective is to establish whether the "during" (or "after") sample is strictly *less than* the "before" sample, and therefore a one-tailed test is most appropriate.

Alternatives for type. There are three alternatives for type, as follow:

1. Used for a "paired" t-test, when there are the same number of samples in the two sets of data being compared.
2. Used for two (generally unequally numbered) samples with the assumption that the variance of the two samples is equal.
3. Used for two (generally unequally numbered) samples with the assumption that the variance of the two samples is not equal.

A Type specification 3 was used since there were unequal sample sizes and no basis on which to make any assumption about the underlying population variances.

The above procedure was applied in all cases in the analyses that follow where it is stated that a Student's t-test was applied.

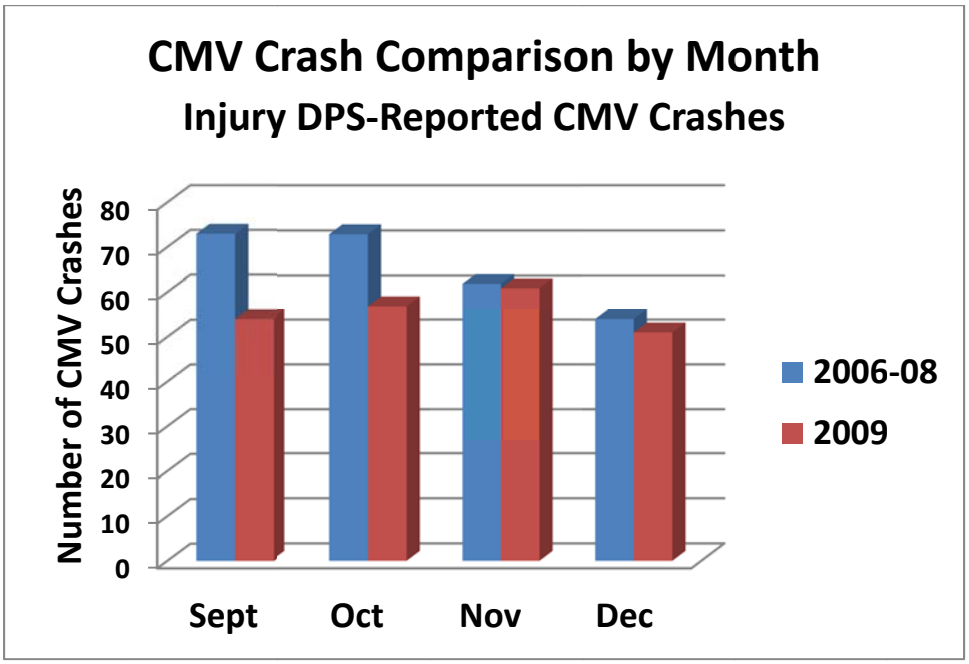
6.1.1.1.2 Example 2: Injury and Fatal Crashes

Overall crashes are just an initial indicator, and they should not be as instrumental in determining policy as injury and fatal crashes. This subsection considers this metric. The next subsection considers only fatal crashes. Generally injury crashes, and especially the more severe classification of injury crashes, are as effective in predicting fatal crashes as are fatal crashes,

especially when it comes to determining crash locations. The reason for this is the low sample size and the many other factors that affect fatalities.

The average number of crashes per month of this type in the before months was 65.50 crashes per month. The number observed in the "during" months was 55.75. This comparison found a difference of 9.75, which was significant at the 0.035 level. The estimate of the number of this type of crashes that were reduced monthly during the term of the project (i.e., September through December, 2009) is 9.75 crashes per month. The following bar chart shows the data graphically, where the before bar height was calculated as the average of the corresponding months over the three years (2006-2008), and the 2009 bar height is just the number of crashes during the duration of the TACT program.

Display 6.1.1.1a



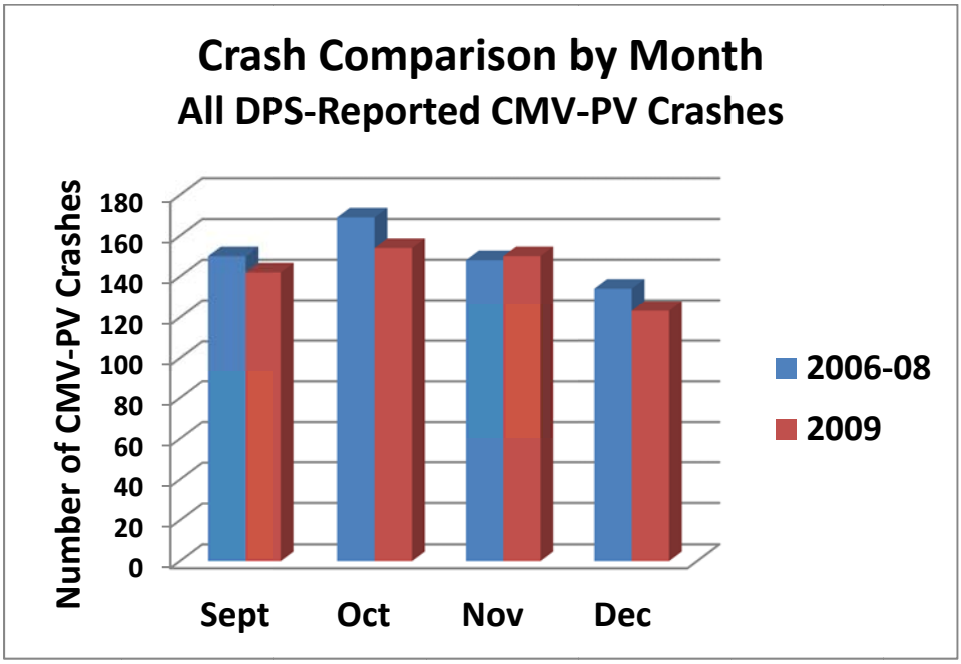
6.1.1.2 CMV-Car Two-Vehicle Crashes

6.1.1.2.1 Example 1 All Crashes

The average number of crashes per month of this type in the before months was 150.50 crashes per month. The number observed in the "during" months was 142.25. This comparison found a difference of 8.25, which was significant at the 0.220 level (not considered to be highly significant). The estimate of the number of this type of crashes that were reduced monthly during the term of the project (i.e., September through December, 2009) is 8.25 crashes per month. The following bar chart shows the data graphically, where the before bar height was

calculated as the average of the corresponding months over the three years (2006-2008), and the 2009 bar height is just the number of crashes during the duration of the TACT program.

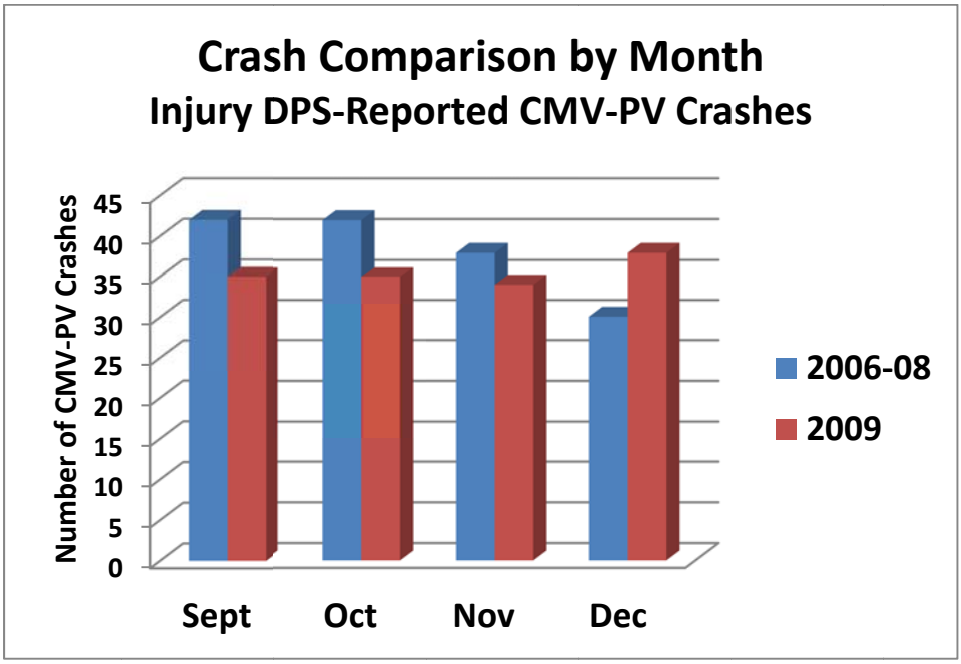
Display 6.1.1.2.1



6.1.1.2.2 Example 2: Injury and Fatal Crashes

The average number of crashes per month of this type in the before months was 38.00 crashes per month. The number observed in the "during" months was 35.50. This comparison found a difference of 2.5, which was significant at the 0.235 level (not considered highly significant). The estimate of the number of this type of crashes that were reduced monthly during the term of the project (i.e., September through December, 2009) is 2.5 crashes per month. The following bar chart shows the data graphically, where the before bar height was calculated as the average of the corresponding months over the three years (2006-2008), and the 2009 bar height is just the number of crashes during the duration of the TACT program.

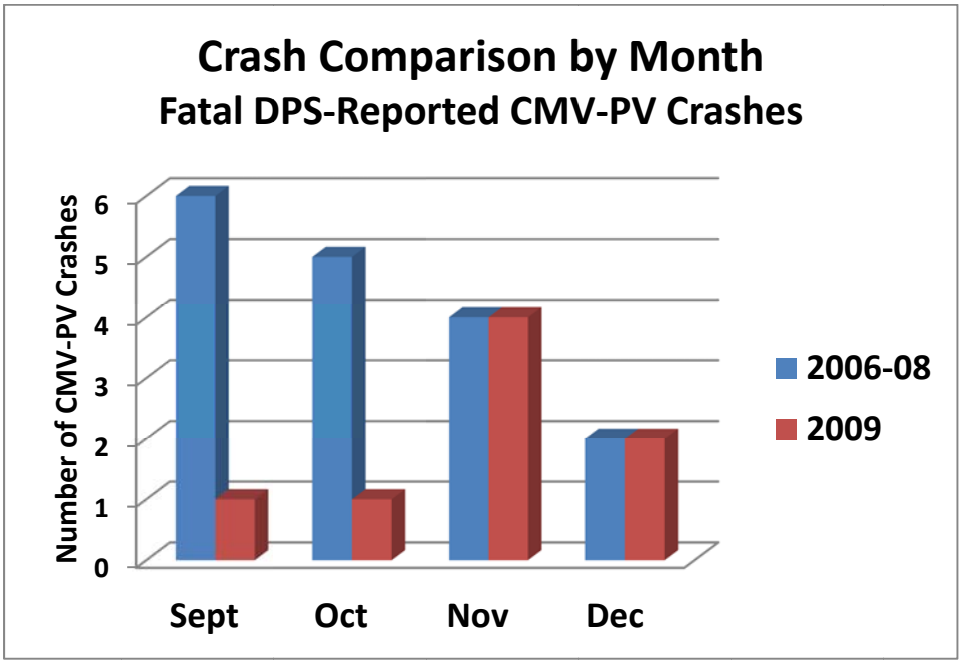
Display 6.1.1.2.2



6.1.1.2.3 Example 3: Fatal Crashes

The average number of crashes per month of this type in the before months was 4.25 crashes per month. The number observed in the "during" months was 2.00. This comparison found a difference of 2.25, which was significant at the 0.021 level. The estimate of the number of this type of crashes that were reduced monthly during the term of the project (i.e., September through December, 2009) is 2.25 crashes per month. The following bar chart shows the data graphically, where the before bar height was calculated as the average of the corresponding months over the three years (2006-2008), and the 2009 bar height is just the number of crashes during the duration of the TACT program.

Display 6.1.1.2.3



6.1.1.3 Summary and Discussion of Results from Alabama First TACT Evaluation

Comparing the analyses of the two types of crashes, it is clear that more significant findings were in the overall CMV crashes than in the two vehicle case where a CMV and a car were involved. This is a reasonable result in that the awareness of the program to CMV drivers would be much higher than that of the general public. In all cases a reduction in crashes was found. The following table presents a summary of the crash-reduction results and an averaging of the two, which might provide a more reasonable overall reduction estimate.

Display 6.1.1.3 Estimates of Crash Savings per Month for TACT Program Months

SEVERITY	CMV-INVOLVED	CMV-car	AVERAGE
All Crashes	31.50	8.25*	19.88
Injury and Fatal	9.75	2.50*	6.13
Fatal Only	3.33	2.25	2.79

* Not highly significant

As a final potential metric of effectiveness, it might be beneficial to compare crashes during the TACT period as opposed to some other comparable period of time. Alabama is somewhat limited in the amount of data that can be compared here because of the change in its reporting system to eCrash as of June 1, 2009. In order to assure that the two subsets of data were using the same reporting system, the June-August time period was compared to the October-December

time period, both in 2009. A three month "during" time period was chosen to make the number of months comparable for a more intuitive comparison. It was also reasoned that the program would have a greater effectiveness once it was a month in operation rather than to expect any changes on day one.

The particular type of crashes that were compared had the following further restrictions:

- They had to involve at least one CMV;
- They had to be two-vehicle crashes – this was to avoid the CMV just being a victim vehicle and irrelevant to the crash causation; and
- They had to be reported by DPS – DPS started 100% reporting in eCrash on June 1, 2009 but only a relatively few local crash reporting agencies did the same – many of them were added during the rest of the year. Without restricting to DPS these additional reports would be included and the results would not be comparable.

Display 6.1.1.3a produces a comparison of the crashes that had all of these characteristics using a CARE IMPACT analysis.

IMPACT can be used to compare any two subsets of data and it is very easy to run all variables in the dataset to mine out the most significant findings. IMPACT takes into account the differential in the number of reports between the various subsets, in this case time intervals. An explanation of the numeric columns of Display 6.1.1.3a follows:

- Number – the number of crashes recorded during the corresponding time interval;
- % – the percentage that the Number is of the total (see total at the bottom of the table);
- Odds Ratio – the before time period percentage divided by the "during" percentage; this provides a measure of the difference between the percentages; since each percentage is a probability of occurrence in the given time period, then each could be called the "odds" of any given crash having that characteristic (e.g., Crossed Centerline) in that time period; hence the term "odds ratio."
- Max Gain – this is the maximum number of crashes that would be eliminated if the percentage in the before period were reduced to the percentage in the "during" period; it is based on the differential in the percentages and the size of the Number in the before period. The unit of this metric is "potential crashes saved," since the countermeasure (in this case TACT) is in effect in the "during" period (Oct.-Dec., 2009).

Note that because these last two columns are looking at over-representations and not absolute numbers of crashes, there will be a balancing effect. For the combined over-representations there have to be a comparable combined under-representation in other attributes. Since the table is arranged by maximum potential gain, the attributes at the bottom of the table have negative values assigned. This indicates that, proportionately speaking, more of these types of crashes occurred in the "during" period than in the "before" period.

Display 6.1.1.3a Comparison of CMV Crash History for Before and During TACT Months (Primary Contributing Circumstance Comparison)

C015: Primary Contributing Circumstance	June-August 2009		Oct-Dec 2009		Odds	Max
Value of Primary Contrib Circumstance	Number	%	Number	%	Ratio	Gain
Crossed Centerline	20	5.22%	9	2.11%	2.48	11.93
Improper Lane Change/Use	49	12.79%	47	11.01%	1.16	6.84
DUI	19	4.96%	14	3.28%	1.51	6.44
Other Distraction Inside the Vehicle	10	2.61%	5	1.17%	2.23	5.52
Defective Equipment	22	5.74%	19	4.45%	1.29	4.96
Improper Backing	11	2.87%	7	1.64%	1.75	4.72
Ran Traffic Signal	6	1.57%	2	0.47%	3.34	4.21
Failed to Yield Right-of-Way - Left or U-Turn	14	3.66%	11	2.58%	1.42	4.13
Improper Passing	12	3.13%	9	2.11%	1.49	3.93
Wrong Side of Road	3	0.78%	0	0%	0.00	3.00
Unseen Object/Person/Vehicle	19	4.96%	18	4.22%	1.18	2.85
Distracted by Use of Electronic Comm Device	4	1.04%	2	0.47%	2.23	2.21
Distracted by Use of Other Electronic Device	4	1.04%	2	0.47%	2.23	2.21
Swerved to Avoid Vehicle	10	2.61%	10	2.34%	1.11	1.03
Improper or No Signal	1	0.26%	0	0%	0.00	1.00
Other Distraction Outside the Vehicle	5	1.31%	5	1.17%	1.11	0.52
Other - No Improper Driving	4	1.04%	4	0.94%	1.11	0.41
Other Improper Action	5	1.31%	6	1.41%	0.93	-0.38
Vision Obstructed	3	0.78%	4	0.94%	0.84	-0.59
Traveling Wrong Way/Wrong Side	9	2.35%	11	2.58%	0.91	-0.87
Failed to Yield Right-of-Way from Driveway	7	1.83%	9	2.11%	0.87	-1.07
Other Failed to Yield	7	1.83%	10	2.34%	0.78	-1.97
Made Improper Turn	11	2.87%	15	3.51%	0.82	-2.45
Failed to Yield Right-of-Way Making Right Turn	1	0.26%	4	0.94%	0.28	-2.59
Cargo Fell or Load Shift	16	4.18%	21	4.92%	0.85	-2.84
Over Speed Limit	7	1.83%	11	2.58%	0.71	-2.87
Aggressive Operation	1	0.26%	5	1.17%	0.22	-3.48
Driving too Fast for Conditions	10	2.61%	17	3.98%	0.66	-5.25
Fatigued/Asleep	9	2.35%	16	3.75%	0.63	-5.35
Followed too Close	25	6.53%	34	7.96%	0.82	-5.50
Ran Stop Sign	1	0.26%	8	1.87%	0.14	-6.18
Failed to Yield Right-of-Way from Stop Sign	15	3.92%	24	5.62%	0.70	-6.53
Misjudge Stopping Distance	15	3.92%	30	7.03%	0.56	-11.91
TOTALS	**355**		**389**			

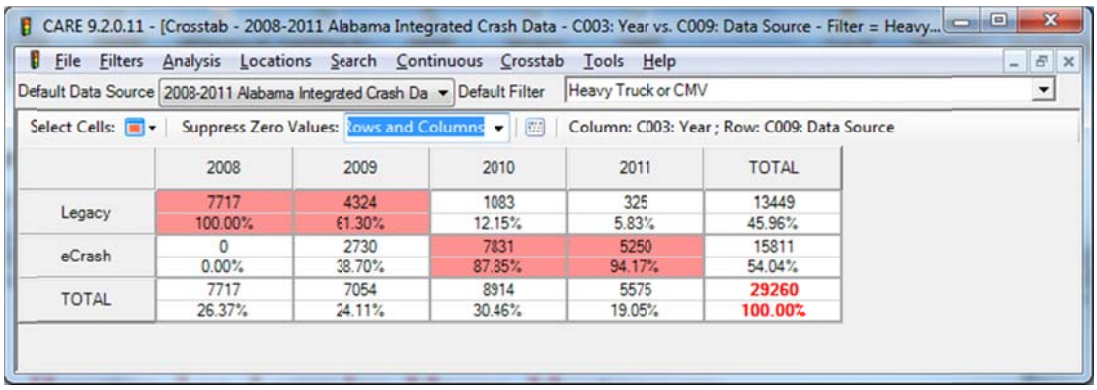
To further exemplify how IMPACT works, consider the Improper Lane Change attribute in Display 6.1.1.3a. See the Max Gain in the right column of about 7 crashes. In addition, the Odds Ratio indicates a 16% reduction in the proportions (12.79%/11.01% = 1.16), or in other words, 12.79 exceeds 11.01 by a factor or 1.16 or about 16%. Note that the totals at the bottom of the table indicate that the "during" number of crashes is about 10% higher than the before (389-355 = 34, which is about 10% of 355). If this 10% is applied to adjust the "during" number of crashes (47), this produces an adjustment of about 47-5 = 42. The raw difference between the before number of 49 and 42 is 7, which is close to the Max Gain (6.84). These approximations are stated to give a feel for the interpretation of the IMPACT output.

None of the differences given in Display 6.1.1.3a were statistically significant even at the 10% level, mainly because of the low probabilities and the low sample sizes. However, they do provide the best indicators that are available and thus have practical if not statistical significance. The following are potential explanations for the findings with regard to the TACT attributes (those given with a yellow background in Display 6.1.1.3a):

- Improper Lane Change/Use – this was the most successful reduction found, with nearly seven crashes saved by the 16% proportional reduction. There is a good chance that this attribute was the most effective of the TACT program because it is easily detected and something that personal vehicle drivers can easily perceive of and control.
- Improper Passing – this showed a reduction of close to four crashes by a 49% reduction in the proportion of these crashes.
- Improper or No Signal – there was only one crash caused by this factor in the before period. Due to these low numbers, no conclusions should be drawn concerning this attribute.
- Speed – there are two speed causal indicators in the table: Over the Speed Limit and Driving too Fast for Conditions. Neither of these had many crashes either in the before or "during" periods. It is reasonable to conclude that the effect of the TACT program upon speed caused crashes would be minimal due to the large number of vehicles on the roadways that are exceeding the speed limits.
- Aggressive Operations – this is defined in the eCrash Data Element Manual to be the presence of at least two offences that would lead the officer to believe that there was an attitude problem on the part of the driver. The very few occurrences of crashes from this cause in both the before and during periods would lead us to see these findings as inconclusive.
- Following too Close – relatively speaking this offense is the least likely to have been affected by the TACT program, leading perhaps to a greater (or different) emphasis on it in the future. While the change in the numbers was not statistically significant, the raw numbers in both the before and during periods is indicative that this is a continuing issue with regard to CMV-private vehicle collisions.

6.1.2 Example Crash Analysis from Alabama Interim TACT Projects

"Interim" in this context is January 2010 through May 2011. The original TACT program was evaluated using crashes on a before-and-after basis. This was not possible for the interim period because of a major change in the way that CMV crashes were recorded in the new Alabama electronic crash reporting system (eCrash). The actual implementation of eCrash was on June 1, 2009. The following illustrates how the transition to eCrash affected CMV reporting.



	2008	2009	2010	2011	TOTAL
Legacy	7717 100.00%	4324 61.30%	1083 12.15%	325 5.83%	13449 45.96%
eCrash	0 0.00%	2730 38.70%	7831 87.85%	5250 94.17%	15811 54.04%
TOTAL	7717 26.37%	7054 24.11%	8914 30.46%	5575 19.05%	29260 100.00%

While all of DPS went to eCrash in June 2009, all state reporting did not go to eCrash at once. The ramp-up is clear from the cross tabulation above. Note also the significant increase in CMV reporting between 2009 and 2010. There was over a 26% increase in the number of reported heavy trucks reported. Clearly this does not reflect the reality of the CMV crashes since there would be no reason to expect any cause other than the change in the reporting procedures to cause such an increase. While a discussion of the reporting procedures are outside of our scope, one major difference that is present with eCrash that was not in effect in the paper-based "Legacy" data is the fact that eCrash determines for the officer whether or not a crash now qualifies as a CMV based on other data that the officer enters.

Several attempts were made to adjust the data for this change in reporting, but none could be supported from the point of view of analytical integrity. At that point the best that could be done was to compare the "TACT months" during the interim period with the "Non-TACT" months. This will be further defined in the next section.

Finally, the best crash metric to use in this evaluation was determined to be statewide CMV crashes. The reasons for this are as follow:

- The counties and particular corridors that were worked in the various months had considerable variation.
- The attempts to look at specific areas cut the data so thin as to make the determination of statistical significance all but impossible.

- The TACT implementations were primarily enforcement based, and the enforcement was performed on corridors considered to be hotspots by the problem identification methods documented above; as such, they represented fairly heavy traffic areas.
- The effects of the TACT enforcement at this hotspots was not intended to be localized to just that location; while there is no way to determine how far this influence would extend, it was determined that a statewide analysis of the data would, if anything, provide a conservative estimate of the effects.

For these reasons crashes in the TACT and non-TACT months were compared on a statewide basis.

6.1.2.1 Interim CMV Crash Analysis

For the time period January 2010 through May 2011 the number of TACT enforcement hours worked are shown in Display 6.1.2.1, along with the number of CMV crashes statewide. Two approaches to the statistical analysis are presented. The first approach is to do a simple correlation of the TACT hours vs. the CMV crashes. The second approach is to break the months into two categories for the purposes of statistical analysis. A month is considered a “TACT Month” if there were 100 or more TACT enforcement hours worked during that month and is considered a “non-TACT Month” otherwise.

Display 6.1.2.1 Comparison of TACT Hours Worked and CMV Crashes

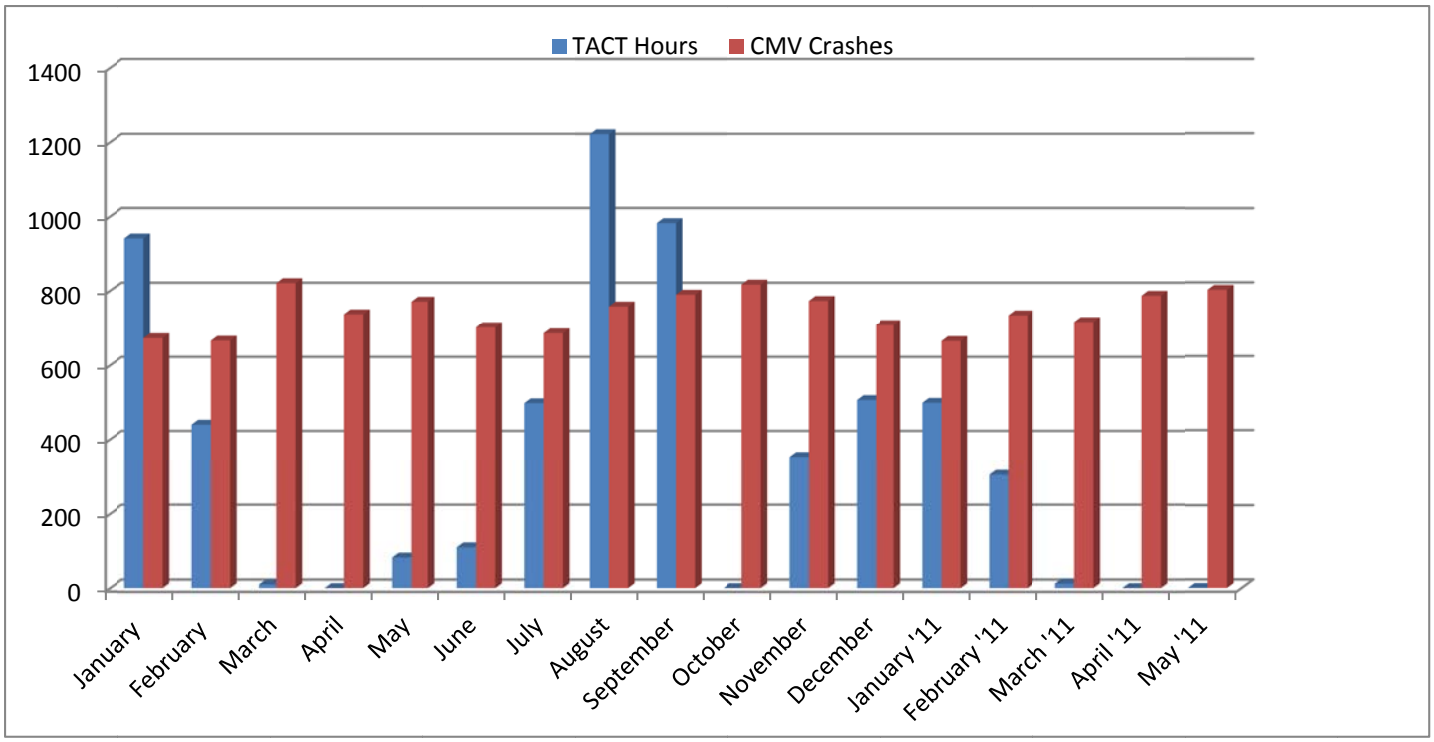
Month	TACT Hours	CMV Crashes	TACT Month	Non-TACT Month
January 2010	942	674	✓	
February 2010	440	667	✓	
March 2010	10	822		✓
April 2010	0	738		✓
May 2010	83	772		✓
June 2010	110	703	✓	
July 2010	498	687	✓	
August 2010	1222	759	✓	
September 2010	983	791	✓	
October 2010	0	818		✓
November 2010	353	774	✓	
December 2010	507	709	✓	
January 2011	499	666	✓	
February 2011	304	735	✓	
March 2011	12	717		✓
April 2011	0	788		✓
May 2011	0	803		✓

Using the data from this table, the Excel function *CORREL* can be applied to the two columns, TACT Hours and CMV Crashes. In this particular case, the *CORREL* function returns a coefficient of -0.32. This indicates a moderate correlation of the two columns such that when the number of TACT Hours increases, the number of CMV crashes decreases.

For the second type of statistical test, the TACT months were compared to the Non-TACT months. The partition of the months above was used to split the months into two subsets, 10 TACT months and 7 Non-TACT months. Each month is considered as a sample. The average number of CMV crashes for the TACT months is 727 and the average for the Non-TACT months is 780. This amounts to an average difference of 53 crashes per month. When the *TTEST* Excel function is applied to the two sets of samples, using parameters giving a single tailed, two-sample equal variance test (homoscedastic) test, a *p* value of .005 is computed. This indicates a very strong likelihood (99.5%) that the two subsets have different mean values for reasons other than chance.

Display 6.1.2.1a presents a graphical comparison of the hours and crash data given above.

Display 6.1.2.1a Comparison of TACT Hours Worked and Crashes per Month



Given that a statistically significant difference was found between the TACT and non-TACT months, it is possible to estimate an average per-month reduction.

The severity of crashes is shown below for all CMV-involved crashes during the interim period:

Crash Severity	Percentage
Fatal	1.13%
Injury	32.5%
PDO	66.4%

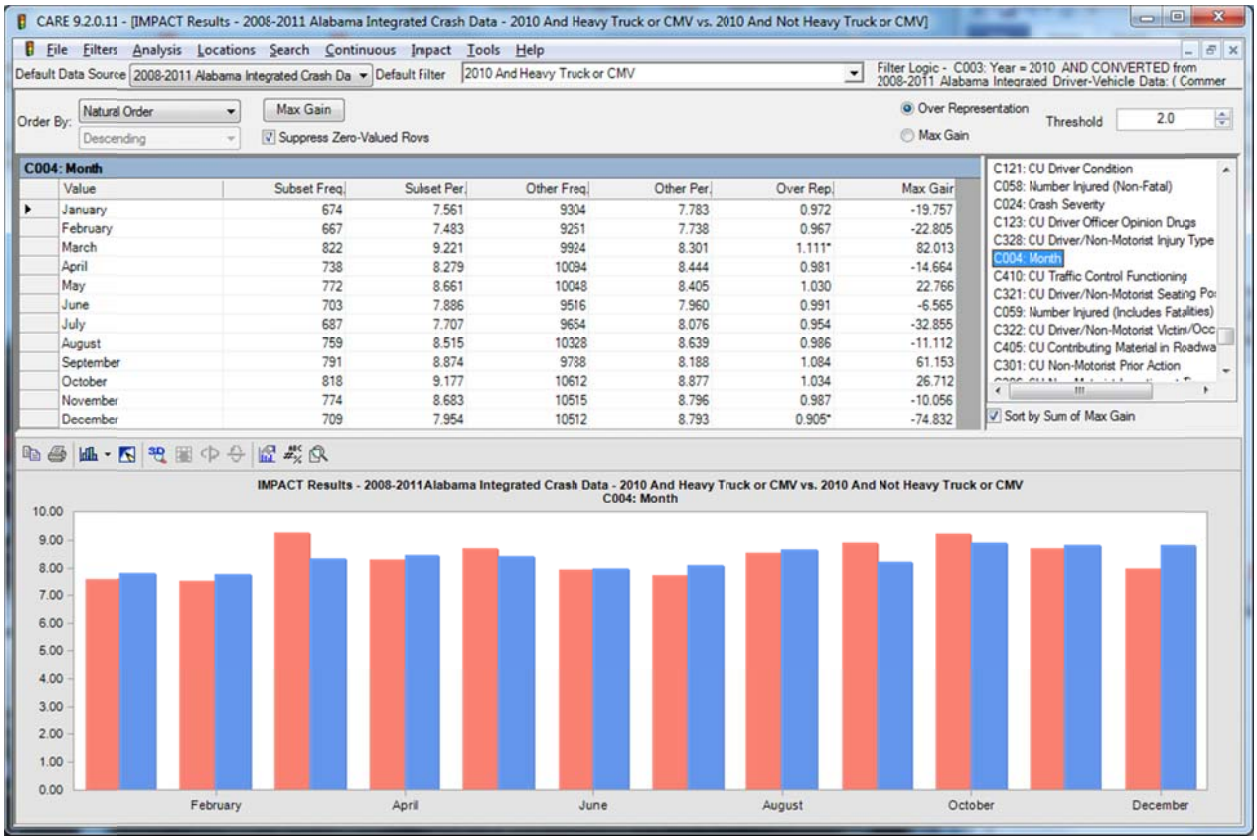
When this distribution is applied to the average reduction of 53 crashes per month, the number of crashes prevented by the TACT program by severity can be predicted:

Severity	Percentage	Crashes Saved per Month	Saving Total TACT Interim Period
Fatal	1.13%	0.6	6
Injury	32.5%	17	170
PDO	76.4%	35	350

6.1.2.2 Further Analysis of the Interim Crash Data

Recall that in addition to assessing the effectiveness of a TACT project in terms of crash reduction, one of the major goals of evaluation is that of continuous improvement. This section will consider some other data from the interim period that could be used to this effect. In a sense this can be considered as follow-on to the problem identification examples given above. Problem identification is not a one-time process; it should be continued and some of the same key reports replicated to assure that the changes are for the better. While dramatic changes are not often seen in traffic safety data, and especially crash data, even subtle changes can indicate the onset of improvement or degradation. Consider Display 6.1.2.2 as an example.

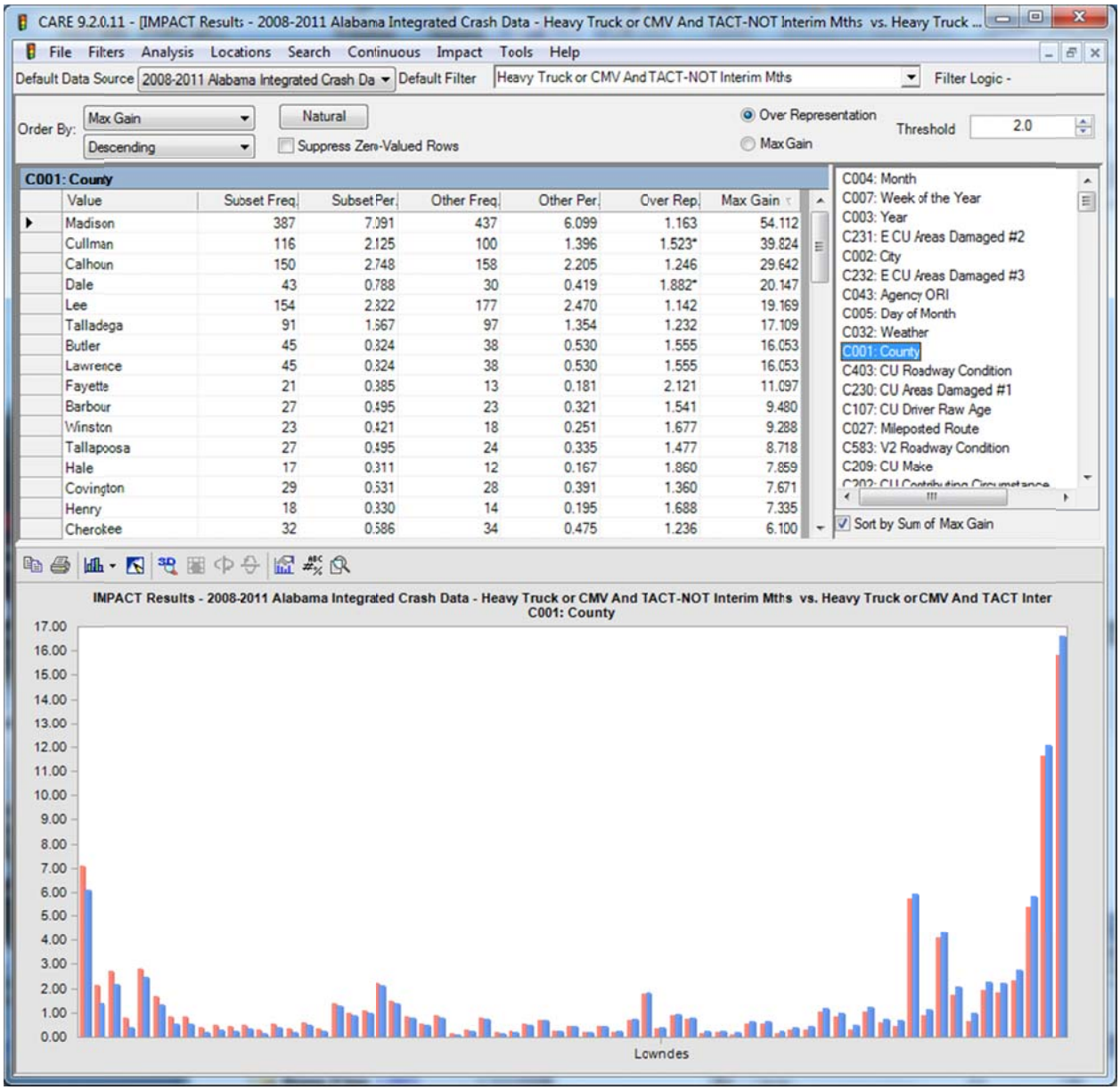
Display 6.1.2.2 Comparison of CMV vs. Non-CMV by Month in the 2010 Interim Period



The interpretation of the various columns was given in Section 6.1.1.3 in conjunction with Display 6.1.1.3a, and it will not be repeated here. The "Subset" here (red bars) are CMV involved crashes, and the "Other" are non-CMV crashes. The ratio of these two subset numbers would tend to buffer out things that affect them both (such as number of days in a month or even common economic factors). Generally it would not be expected that there to be anything but random differences between the ratio of CMV to non-CMV crashes if there were no other factors involved. However in this case, note that there is one significant over-representation for CMV-involved (March 2010) and another significant under-representation (December 2010).

Comparing this with the appropriate table in the previous section will show that the significant over-representation occurred during a non-TACT month, and the under-representation occurred during a TACT month. This output was generated prior to the comparison of TACT and non-TACT months given above, and it was instrumental in motivating that analysis. This is an example of where these types of "problem identification" analyses after the fact can surface information that might not have been considered relevant.

Display 6.1.2.2a CMV Crash Comparison for TACT vs. NonTACT Months

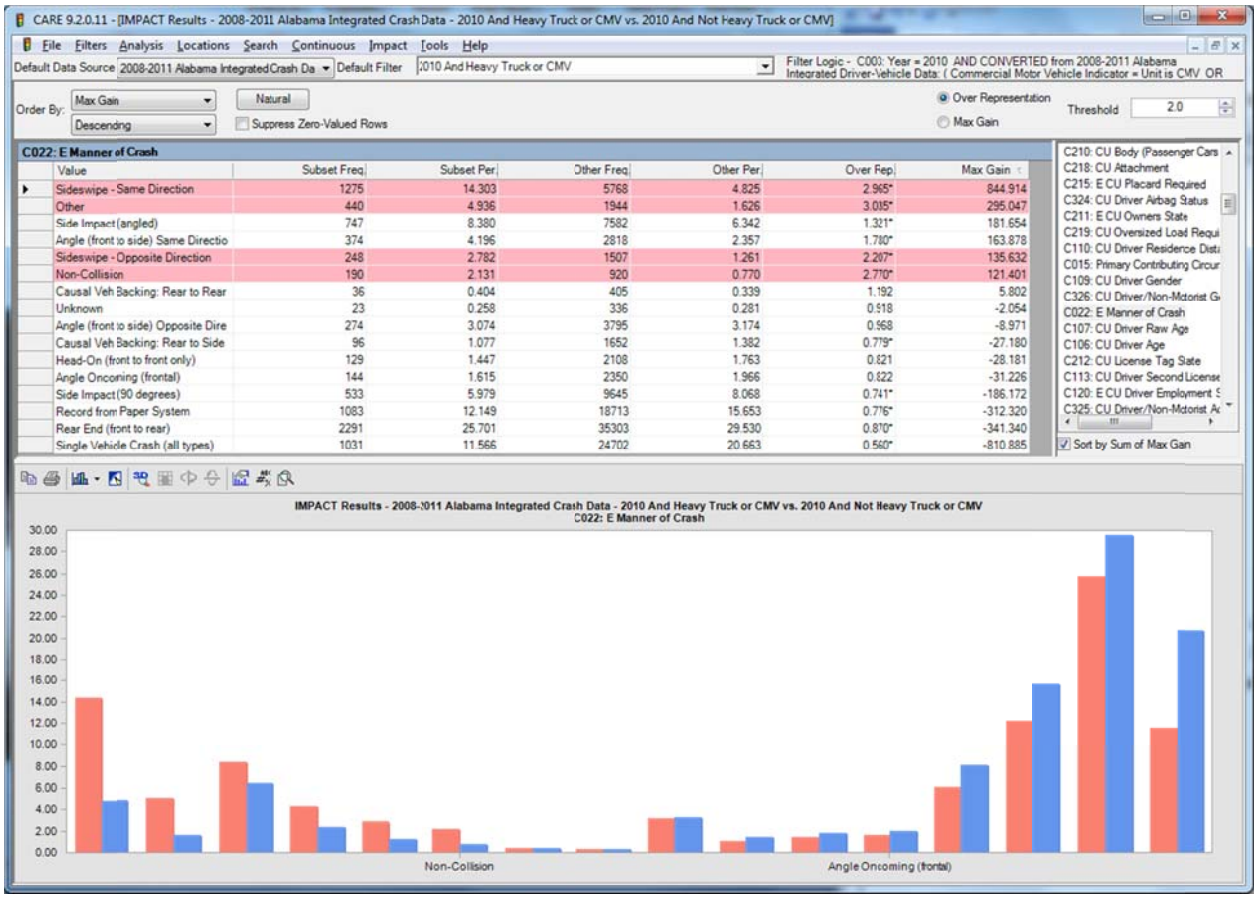


Display 6.1.2.2a is a very much different comparison. It is useful to compare the TACT months and the non-TACT months to see if there are any significant variables here that might be of use. County is given in this illustration, with those counties at the top for which there is the highest "max gain" (the gain that would be obtained if the over-representation were eliminated). The asterisk in the Over Rep (Odds Ratio) column indicates a high level of statistical significance. While Madison shows the highest max gain, the odds ratio is not high enough to be statistically significant (i.e., it cannot be concluded by this statistical test that this was anything but random variation, the large max gain being generated just from the sheer size of the number of crashes that occur in Madison County). On the other hand Cullman and Dale counties both show significant differences, indicating that their changes (proportionately speaking) between the TACT and non-TACT months were significant. These results might cause decision-makers to inquire as to what was done in these two counties to make such a difference. Conversely, the other end of the table (not shown) can surface those counties that actually had a worse CMV crash record in the TACT months than in the non-TACT months, which might be even more in line for inquiry.

The following examples are comparable to Display 6.1.2.2 above, in that they all compare CMV-involved (not necessarily caused by the CMV) against all other crashes, i.e., that did not involve a CMV. These were run over the 2010 (part of the interim) in order to answer the question: How are CMV-involved crashes different from crashes that do not involve a CMV. Many results are intuitively obvious, but in looking at all available attributes within the data, usually some attributes will produce new and unexpected information. Further, as these results change from year to year, they establish trends of either where programs have been effective, or else where the programs need to be strengthened to deal with a particular issue. Since 2011 was only a partial year of data, it was decided to run these analyses over 2010.

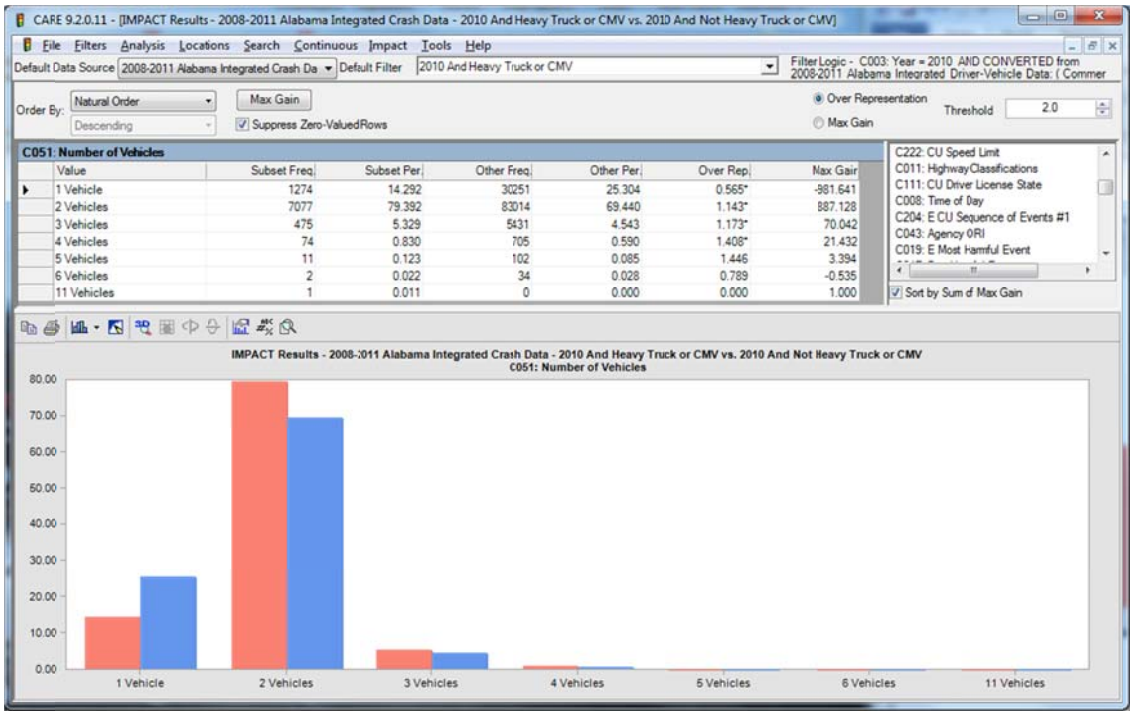
Display 6.1.2.2b is an example of the Manner of Crash variable. The "Subset" (red bars) represent the CMV-involved crashes and the "Other" (blue bars) represent the non-CMV crashes with the same Manner of Crash code. The red highlighting indicates those codes that had over twice their expected values, and the asterisk indicates that the odds ratio is statistically significant from a high level. This table captures all of the codes, so the under-represented can be seen as well as the over-represented. This is of interest as blind-spot types of crash causes are near the top, while the rear-end crashes are significantly under-represented.

Display 6.1.2.2b CMV vs. NonCMV Comparison by Manner of Crash

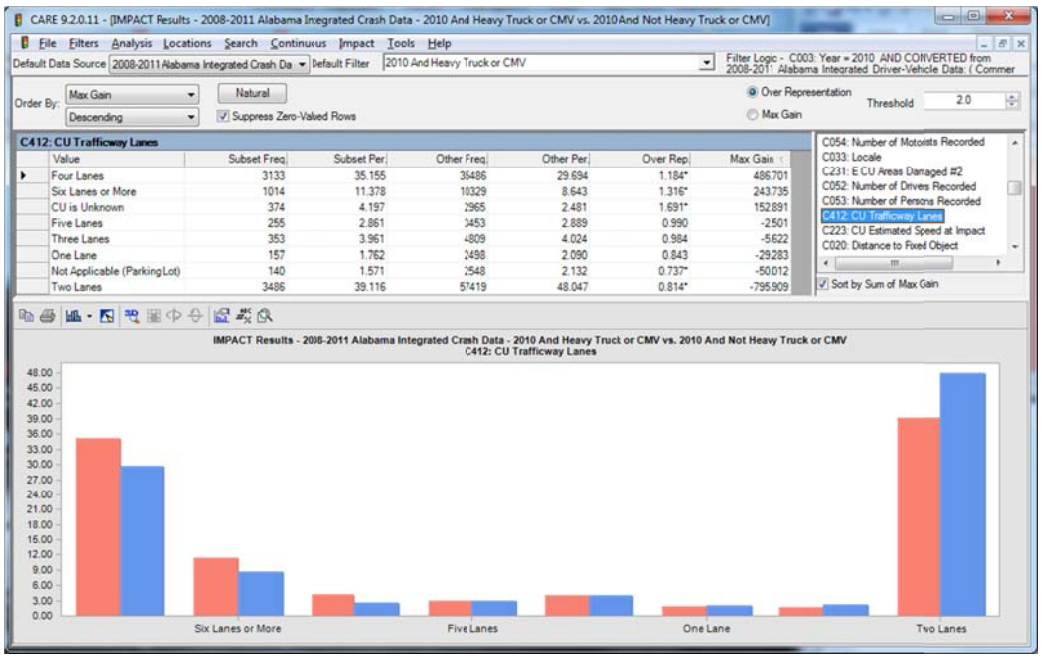


Display 6.1.2.2c compares the number of vehicles involved in CMV-involved crashes with those that are not CMV-involved. The table in this display is not in Max Gain order – it has been rearranged from that default to its natural ordering. Notice that single vehicle crashes are under-represented with a little over half of what would be expected if the CMV-involved crashes were distributed as the non-CMV crashes are. This correlates heavily with the types of roadways CMVs typically use as well as a general absence of drugs and alcohol causation, both of which typify single vehicle crashes. Two-, three- and four-vehicle crashes are all over- represented for the CMV-involved crashes.

Display 6.1.2.2c CMV vs. NonCMV Comparison by Number of Vehicles Involved



Display 6.1.2.2d CMV vs. NonCMV Comparison by Number of Lanes



Display 6.1.2.2d shows the number of lanes. This is presented to qualify the statement made above about the number of lanes. As expected, CMV crashes are significantly over-represented on four lane roadways, and they are significantly under-represented on two lane roadways. While this is good information to know, the chart under the table shows that even while the CMV-involved crashes (represented by the red bars) are under-represented, the crash number on two lane roads is higher than on any other single roadway classification by lanes. How can this be the case? It is because for non-CMV crashes there are even more – significantly more crashes, proportionately speaking. The lesson here is that over-representations do not tell the whole story. Specifically for this example, two-lane roadways need consideration, and the particular type of countermeasures that might be applicable to CMV-involved crashes on two-lane roadways is probably quite different from that of countermeasures on four-lanes and greater.

As a final example, Display 6.1.2.2e presents a similar comparison (CMV-involved against those crashes that did not involve a CMV) by Primary Contributing Circumstance (PCC), which is probably the variable that gets closest to causation. One deficiency of Alabama's eCrash reporting system is the PCC variable, which literally has nearly 100 different codes within it. It is structured to guide the officer into the correct code, but in retrospect, it would have been much better if all of its codes were mutually exclusive. While such structural issues can be annoying, they do not prevent useful information from being obtained, since our comparison method can legitimately claim that any error caused by such structural issues will appear equally as frequently (relatively speaking) in the test as it does the control subset. In this case, the test subset is CMV involved in the crash, and the control subset is CMV not involved. The table has been cut down for illustrative purposes to only include those PCCs that either had a significant over-representation or a significant under-representation for CMV-involved crashes.

Recall that what all of these last few comparisons tell us is the difference between CMV-involved crashes and non-CMV-involved crashes. For example, the PCC with the highest impact is Improper Lane Change/Use. This confirms several other outputs. Some of the over-represented PCCs are certainly intuitively obvious since they do not occur that often in crashes that do not involve CMVs; e.g., defective equipment and cargo falling. Others tend to confirm the types of circumstances that typically cause a CMV crash. There is a commonality between them and in some cases might be just saying the same thing in different ways. On the other end of the spectrum, PCCs, where CMV crashes are under-represented, are also typically what would be expected when from experienced professional drivers. Again, note the most under-represented is "Following too Close," which correlates to rear-end crashes above. This information most certainly should move patrol officers away from tailgating and toward blind spots as the major goal of deterrence.

Display 6.1.2.2e CMV vs. NonCMV Comparison by Primary Contributing Circumstance

C015: Primary Contributing Circumstance Value	CMV Involved Frequency	CMV Involved Percentage	CMV Not Involved Frequency	CMV Not Involved Percentage	Statistically Significant	Odds Ratio	Max Gain
CMVs Significantly Over-Represented							
Improper Lane Change/Use	828	9.29%	4181	3.50%	TRUE	2.66	516.25
Defective Equipment	365	4.09%	1798	1.50%	TRUE	2.72	230.93
Made Improper Turn	325	3.65%	1852	1.55%	TRUE	2.35	186.91
Cargo Fell or Load Shift	194	2.18%	279	0.23%	TRUE	9.33	173.20
Unseen Object/Person/Vehicle	818	9.18%	9182	7.68%	TRUE	1.19	133.35
E Crossed Centerline	204	2.29%	977	0.82%	TRUE	2.80	131.15
Improper Passing	172	1.93%	977	0.82%	TRUE	2.36	99.15
Improper Backing	295	3.31%	2775	2.32%	TRUE	1.43	88.08
CMVs Significantly Under-Represented							
E Failed to Yield Right-of-Way from Stop Sign	290	3.25%	4982	4.17%	TRUE	0.78	-81.48
Over Speed Limit	103	1.16%	2563	2.14%	TRUE	0.54	-88.11
E Ran off Road	100	1.12%	2670	2.23%	TRUE	0.50	-99.09
E Failed to Yield Right-of-Way Making Left or U-Turn	221	2.48%	4348	3.64%	TRUE	0.68	-103.21
P Driver Not in Control	82	0.92%	2732	2.29%	TRUE	0.40	-121.71
Driving too Fast for Conditions	219	2.46%	4620	3.86%	TRUE	0.64	-125.49
DUI	158	1.77%	4631	3.87%	TRUE	0.46	-187.31
Misjudge Stopping Distance	607	6.81%	11996	10.03%	TRUE	0.68	-287.47
Followed too Close	874	9.80%	16401	13.72%	TRUE	0.71	-348.93

In concluding this section, two important factors deserve further emphasis. First of all, the specific outputs given above are strictly examples. A good assessment will look at all of the variables that are available within the database. Sometimes those that would seem not to contain any useful information can be quite informative. A second factor to emphasize is that it is the *change* in such outputs over time that is as important as the immediate results. Replicating the problem identification on a regular basis not only provides information for moving forward, but it also provides a metric by which the areas of success and failure can be gauged. Numbers do not become information until they are compared with other numbers. In this case the comparison is one of how these various metrics are changing over time.

6.1.3 Discussion of Crash Analysis from Alabama Recent TACT Project

The most recent TACT effort took place in one study corridor (I-59 in Tuscaloosa county), focused mainly on the short stretch of roadway in the study area described for the observational studies (see Section 3.1.4.2.1), with only a few patrol officers added to the normal DPS detail in that area. This is a good example of an extremely small project which cannot be evaluated in terms of reduced crashes. This is not to say that the particular detail did not in and of itself reduce crashes, both by its immediate and residual effects. However, the number of CMV crashes in this very limited area would not allow for any meaningful statistical test of significance. Small projects like this one that introduce new innovations (e.g., in this case the presence of billboards in the vicinity of the enforcement) are best evaluated by observational studies and considered to be pilot projects. If the observational studies prove positive (as this one did – see Section 6.4), then the innovation might be extended statewide depending on its cost and benefit relative to other traffic safety countermeasures.

6.2 Citation Data Analysis

6.2.1 Citation Analysis of Alabama First TACT Project

The first Alabama TACT project citation comparison used data available from the state's electronic issuance system (eCite). Data from 2009 were compared for the four-month period before the TACT program and the four months during the program (Sept.-Dec. 2009). The comparison was for the purpose of determining the extent to which the program had increased the *proportion* of citations in the TACT categories. Generally, the number of all citations written decreased by about 18% between the before and during periods. Thus, an overall adjustment was made by this factor to make the raw frequency numbers comparable so that they could be compared directly as far as their representative proportions are concerned.

The reason for looking at the entire September through December 2009 time frame is because it was desirable to measure not just the citations issued during the selective enforcement program, but any spill-over effects that may have come out of the program. The tables in Section 4.3.2 above present how many citations of each type were issued with the program waves, it is obvious that since this concentration was on these types of citations that there would be a larger number issued. What is not so obvious, and what is being measured here is the comprehensive effect of the program over the entire four month period. Display 6.2.1 presents these changes with regard to the TACT violation types specified above.

Display 6.2.1 Changes in Citations Issued

VIOLATION TYPE	May-Aug 2009*	Sep-Dec 2009	% Inc (+)/Dec (-)
Speeding	60,730	61,928	+2.0%**
Following Too Close	1,847	1,966	+6.4%**
Improper Lane Change	901	1,258	+39.6%**
Failure To Signal	443	628	+41.9%
No Seatbelt	28,941	25,589	-11.6%**
No Insurance	15,401	16,062	+4.3%**
Drivers License	10,599	11,432	+7.9%**
Improper Passing	262	260	-0.8%

* Adjusted to make the two four-month periods are comparable.
** Statistically significant increases at alpha less than 0.01.

All of the violation type categories showed statistical significant increases or decreases at the alpha level of 0.01 or less with the exception of Failure to Signal and Improper Passing. The following presents some potential reasons for the findings:

- Speeding – there was only a relative increase in speeding citations of 2.0%, but because of the large sample sizes, this turned out to be a significant increase.
- Following Too Close and Improper Lane Change – these were significant despite their low sample sizes due to the large increases. It is clear that the TACT program may have had a significant effect in increasing the numbers of these types of citations.
- Failure to Signal – this increase was significant at the 0.13 alpha level, and it had the largest percentage increase. Its counts, however, were quite low, which accounts for the relatively low level of significance.
- No Seatbelt – this was the only TACT offense that had a significant reduction. It would be reasonable that if officers are looking for private vehicle offenses around CMVs, and CMV offenses interacting with passenger vehicles, that they would not be as likely as they generally are to detect seatbelt violations.
- No Insurance and Driver's License – these offences had large sample sizes and so their percentage increases did not need to be as high in order for them to be considered as statistically significant. Both of these offenses are typically secondary offenses, i.e., they are issued in conjunction with another (usually moving) offence.
- Improper Passing – there was virtually no change in this category.

Generally it can be concluded that most of the citation types associated with the TACT program increased in the four months in which the TACT program was conducted.

The measure of increased citations during the TACT program implementation is more of an administrative evaluation metric than an effectiveness metric. It has been noted in the literature that the mere increase in citations does not infer anything about safety. The question that must be answered is: does this increase in citation issuance translate into a modification of driver behavior? The effectiveness metrics discussed in this document are essential to answering that question. However, it is essential to the proper interpretation of the effectiveness metric results that the qualitative and quantitative aspects of the selective enforcement component of the project be thoroughly documented.

6.3 Survey Results

Examples of two sets of surveys will be presented in this overall section: (1) the most recent TACT effort, which involved a small area in Tuscaloosa County over a short time frame, and (2) the first TACT effort performed in Alabama, which involved the entire state. The most recent will be presented first since it exemplifies test and control areas before and after the PI&E effort. However, some useful information was derived from the first round of surveys, and they are included for this reason. The following lists the subject headings for the subsections within this part of the report:

- 6.3.1.1 – Recent Law Enforcement Officer Survey
- 6.3.1.2 – Recent Trucker Surveys
- 6.3.1.3 – Recent Driver Survey
- 6.3.2.1 – Original Officer Survey
- 6.3.2.2 – Original Trucker Survey

See Sections 3.1.3.2 through 3.1.3.4 for details of the survey plans.

6.3.1 Surveys from Most Recent TACT Effort

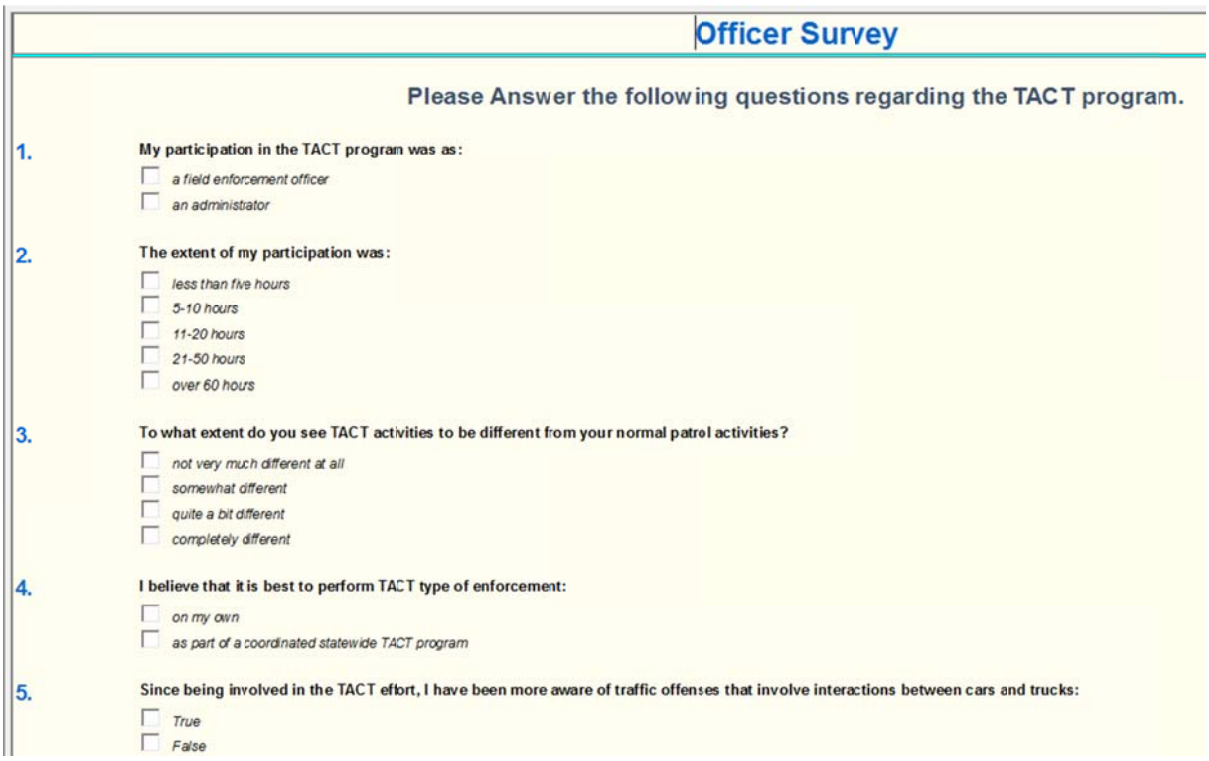
The examples within the next three sections will present the results of the surveys that accompanied the most recent TACT project.

6.3.1.1 Recent Law Enforcement Officer Survey

Alabama DPS officers involved in the TACT program were invited to participate in an internet-based survey. The survey was posted on the Safe Home Alabama website and officers were directed to it via an e-mail from a commanding officer in charge of the TACT program. The Participation in the survey was completely voluntary and totally anonymous. Display 6.3.1.1 is a screenshot of the website where the surveys were housed online. Display 6.3.1.1a shows a screenshot of the Officer online survey.

Display 6.3.1.1 Safe Home Alabama TACT Survey Web Page

Display 6.3.1.1a Screenshot of Officer Survey



Officer Survey

Please Answer the following questions regarding the TACT program.

1. My participation in the TACT program was as:
   - a field enforcement officer
   - an administiator

2. The extent of my participation was:
   - less than five hours
   - 5-10 hours
   - 11-20 hours
   - 21-50 hours
   - over 60 hours

3. To what extent do you see TACT activities to be different from your normal patrol activities?
   - not very much different at all
   - somewhat different
   - quite a bit different
   - completely different

4. I believe that it is best to perform TACT type of enforcement:
   - on my own
   - as part of a coordinated statewide TACT program

5. Since being involved in the TACT effort, I have been more aware of traffic offenses that involve interactions between cars and trucks:
   - True
   - False

SEE PART 5