

Field Test of the Impact of Setting and Enforcing Rational Speed Limits in Gulfport, Mississippi

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16. Abstract To address concerns regarding the need to restore credibility to speed limits, the National Highway Traffic Safety Administration (NHTSA) and the Federal Highway Administration (FHWA) jointly undertook tests of "rational speed limits," which have been established by a formal engineering review that starts with the 85 th percentile speed of free flowing traffic, but could be set as low as the 50 th percentile, depending on roadway geometry, land use, access, etc. The objective of these tests was to determine whether speed limits so set, when combined with well-publicized and targeted enforcement, result in greater compliance, more uniform speeds, and improved safety. This report presents results of the demonstration and evaluation of rational speed limits on a 7.5 mile segment of U.S. Route 49 in Gulfport, Mississippi. Following data collection and engineering analyses, the speed limits on various portions of the demonstration road in Gulfport were variously raised from 5 to 15 mph. The increases in limits were accompanied by public information and education and a stricter enforcement of the raised limits. Data on speeds, crashes, citations and enforcement hours were collected in both Gulfport and a comparison community, prior to, and quarterly during the one-year demonstration period. The principal findings from the Gulfport, Mississippi, demonstration follow. <ul style="list-style-type: none"> o Although a small proportion of drivers continued to violate the rational limits by more than 10 mph after the rational limits were implemented, the number of such speed violations was reduced by three quarters. Thus, rational limits resulted in better compliance with the law. o The small increases observed in both mean and 85th percentile speeds in the demonstration community, but not in the comparison community, suggest that implementing rational speed limits may not lead to increases all the way up to the newer raised limits, but that some increases in speeds are to be anticipated. o The small changes observed in the standard deviation of speeds in the demonstration community (increases of 1-3 mph in 4 locations) and similar changes in the coefficient of variation suggests that raising the speed limit, even with strict enforcement, may not result in decreased speed variation. o A reduction in the proportion of extreme speeders (95th percentile speeders) was observed only on the road segment where the limit was increased the most (+15 mph). The reasons the proportion of extreme speeders did not decline on the roadways where limits were increased by smaller amounts are not clear. o The average monthly frequency of crashes in the demonstration community was lower during the demonstration year when compared to crashes in just the year immediately preceding the demonstration. However, the average monthly frequency of crashes was higher in the demonstration year than it was in the <i>three</i> year period preceding the demonstration year. Similar changes were observed in the comparison community where the speed limits were not changed, but the availability of just 2 years of baseline data there limited assessment of the demonstration site effect. Further studies (ongoing in 6 other communities) are required to determine the full impact of rational speed limits.					
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TABLE OF CONTENTS

<u>Chapter</u>		<u>Page</u>
	EXECUTIVE SUMMARY	1
1	INTRODUCTION	6
	1.1 Background.....	6
	1.2 Speed Limits	7
	1.3 Rational Speed Limits.....	8
2	METHODS	8
	2.1 Selecting Communities and Roadways.....	8
	2.2 Measuring Speeds	9
	2.3 Obtaining Local Government, Police, and Judicial Support.....	10
	2.4 Determining New Speed Limits	10
	2.5 Posting and Enforcing Revised Speed Limits.....	11
	2.6 Public Information and Education Activities.....	12
	2.6.1 PI&E Campaign	12
	2.6.2 Assessing Public Knowledge	13
	2.7 Enforcement Data	14
	2.8 Enforcing Speeds	15
3	RESULTS	16
	3.1 Speeds	16
	3.1.1 Demonstration Community - US 49 Speeds	16
	3.1.2 Comparison Community - MS 302 Speeds.....	20
	3.2 Crashes.....	23
	3.2.1 Demonstration Community - US 49 Crashes	23
	3.2.2 Comparison Community - MS 302 Crashes.....	25
	3.3 Citations.....	27
	3.3.1 Demonstration Community - US 49 Citations	27
	3.3.2 Comparison Community - MS 302 Citations.....	31
	3.4 Public Information and Education	32

TABLE OF CONTENTS (CONTINUED)

<u>Chapter</u>		<u>Page</u>
3.5	Public Knowledge and Attitudes	32
3.5.1	Demonstration Community - US 49 Public Knowledge and Attitudes	33
3.5.2	Comparison Community - MS 302 Public Knowledge and Attitudes	34
3.6	Enforcement Activity – Demonstration Community	34
3.7	Traffic Volume	35
4	FINDINGS.....	37
4.1	Findings	37
4.2	Findings Summary	39
	REFERENCES	41

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Demonstration Communities	7
2	Description of Selected Roadways	9
3	Original and Revised Speed Limits Along US 49	11

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Installing updated regulatory speed limit signs	12
2	Mississippi PI&E campaign logo	13
3	85 th percentile speeds for predemonstration and demonstration period by calendar quarter; demonstration community.....	16
4	Percentage of vehicles with speeds greater than 10 mph over posted speed limit by site number and period; demonstration community	18
5	Percentage of vehicles with speeds greater than 10 mph over posted speed limit by site number and quarter; demonstration community	19
6	85 th percentile speeds for redemonstration and demonstration period by calendar quarter; comparison community	20
7	Percentage of vehicles with speeds greater than 10 mph over posted speed limit by site number and period; comparison community	22
8	Percentage of vehicles with speeds greater than 10 mph over posted speed limit by site number and quarter; comparison community	23
9	Annual crashes by type; demonstration community	24
10	Monthly crashes by type; demonstration community	25
11	Annual crashes by type; comparison community	26
12	Monthly crashes by type; comparison community	27
13a	Monthly citations by type, zone 1; demonstration community	28
13b	Monthly citations by type, zone 2; demonstration community	29
13c	Monthly citations by type, zone 3; demonstration community	29
13d	Monthly citations by type, zone 4; demonstration community	30
13e	Monthly citations by type, zone 5; demonstration community	30

TABLE OF CONTENTS (CONTINUED)

<u>Figure</u>		<u>Page</u>
14a	Monthly citations by type, zone 1; comparison community	31
14b	Monthly citations by type, zone 2; comparison community	32
15	Person hours of enforcement on US 49 in demonstration community during demonstration period	35
16	Daily traffic volume at demonstration community measurement sites	36
17	Daily traffic volume at comparison community measurement sites	36

LIST OF APPENDICES

<u>Appendix</u>		<u>Page</u>
Appendix A	Tables of Speed Distribution, Crashes, Citations, and Public Awareness in Demonstration and Comparison Communities	42
A-1	Mean and 85 th Percentile Speeds on US 49 – Demonstration Community (mph).....	43
A-2	Coefficient of Variation of Speeds at Demonstration and Comparison Community Sites.....	43
A-3	Percentage of Vehicles Traveling Over the Posted Speed Limit by Site and Period; Demonstration Community.....	44
A-4	Mean and 85 th Percentile Speeds on MS 302; Comparison Community (mph).....	45
A-5	Percentage of Vehicles Traveling Over the Posted Speed Limit by Site and Period; Comparison Community.....	46
A-6	Speed-related and Other Crashes in Demonstration and Comparison Community.....	47
A-7	Speeding and Other Citations in Demonstration and Comparison Community.....	47
A-8	Results of Public Awareness and Attitudes Survey by Community and Period..	48
A-9	24-Hour Traffic Counts by Site and Quarter.....	50

TABLE OF CONTENTS (CONTINUED)

<u>Appendix</u>		<u>Page</u>
Appendix B	Figures Showing Mean, 85 th , 90 th Percentile Demonstration and Comparison Community Speeds by Quarter	51
B-1	Demonstration community Site 1 speed distribution over time.....	52
B-2	Demonstration community Site 2 speed distribution over time.....	52
B-3	Mean and 85 th percentile speeds on MS 302; Comparison Community (mph)..	53
B-4	Demonstration community Site 6 speed distribution over time.....	53
B-5	Demonstration community Site 10 speed distribution over time.....	54
B-6	Demonstration community Site 13 speed distribution over time.....	54
B-7	Comparison community Site 1 speed distribution over time.....	55
B-8	Comparison community Site 2 speed distribution over time.....	55
B-9	Comparison community Site 3 speed distribution over time.....	56
B-10	Comparison community Site 4 speed distribution over time.....	56
B-11	Comparison community Site 5 speed distribution over time.....	57
B-12	Comparison community Site 6 speed distribution over time.....	57

Executive Summary

Background

In an effort to address concerns regarding the need to restore credibility to speed limits, the National Highway Traffic Safety Administration and the Federal Highway Administration (FHWA) jointly undertook tests of speed limits that have been established by a formal engineering review that starts with the 85th percentile speed of free-flowing traffic, but could be set as low as the 50th percentile, depending on roadway geometry, land use, access, pedestrian activity, parking turnover, and crash history. This approach of setting limits is based on research showing the 85th percentile to be an acceptable limit from a safety perspective, as well as the assumption that most motorists will select a safe speed on their own when given the opportunity.¹ Speed limits set using this approach will be referred to as “Rational Speed Limits” in this report. The overall objective of conducting these tests was to determine whether speed limits so set, when combined with well-publicized and targeted enforcement, result in greater compliance, more uniform speeds, and improved safety.

Methods

In 2001, NHTSA and FHWA entered into a Cooperative Agreement with the Traffic Engineering Division of the Mississippi Department of Transportation (MDOT) which, in partnership with the Public Affairs Division of MDOT and the cities of Gulfport and Southaven, Mississippi, conducted this project. MDOT implemented a rational speed limits program for one year in Gulfport, the demonstration community, on a 7.5-mile segment of US 49, the principal north-south arterial through the city. Speeds were measured at 14 locations to determine key variables needed to set rational speed limits, including mean, median, and 85th percentile speeds. MDOT also gathered data on crashes, traffic speed enforcement, and public knowledge and attitudes. Speed limits were determined using the rational process in five separate zones on the test segment of US 49, and they were raised in four of the five zones. The new speed limits were set to a value between the median and 85th percentile speed, consistent with current engineering guidelines, and using the rational process.

Identical measurements were made on a similar road in Southaven, the control community; however, no changes of speed limits or enforcement were introduced. This allowed us to better judge whether any change observed in the demonstration community during the study period may have occurred even without a shift to rational speed limits. Westat, Inc., assisted MDOT in implementing the project in Gulfport, and Westat was fully responsible for collecting all the data in the control community. Westat also was responsible for data analysis directed at examining the effects of the rational speed limits demonstration on speeds, crashes, citations, and public awareness.

Results

Principal findings regarding the independent variables of speed limit change, citations, and public awareness, and the dependent variables associated with speeds and crashes, are described below.

Demonstration Community (Gulfport, Mississippi)

- Speed Limit Changes
 - Speed limits were raised by 5 to 15 mph in 5 zones along US 49. The speed limit in one additional zone was evaluated but not raised.
- Citations
 - The average monthly rate of speeding citations issued during the demonstration period increased substantially compared with the predemonstration period. Speed limit violations constituted 32% of all moving citations issued prior to the demonstration and increased to 42% during the demonstration.
- Public Awareness
 - Public awareness of both the raised speed limits and the heightened enforcement increased during the demonstration. The proportion of drivers who said they always see enforcement went from 25% prior to the demonstration to 68% during the demonstration. More people felt that speeding might always or sometimes cause them to be stopped or ticketed during the demonstration (40%) than prior to it (27%).
- Speeds
 - Mean and 85th percentile speeds on the test road in the demonstration community increased slightly (1 to 2 mph) after speed limits were raised. While this was statistically significant because of the large number of sample measurements, it is of no practical significance.
 - Even though enforcement increased and the threshold for ticketing was reduced during the demonstration period, 23 to 51% of traffic continued to exceed the revised speed limits. Nevertheless, this did represent an improvement over the predemonstration period when 55 to 92% of vehicles exceeded the speed limit.
 - The proportion of vehicles exceeding the speed limit by more than 10 mph at sites where the speed limit was changed decreased from a range of 8.1% to 38.3% before the demonstration period to a range of 3.4% to 6.9% averaged across four calendar quarters during the demonstration.
 - Speed variability, as measured by the standard deviation (SD), ranged from 6.5 mph to 11.5 mph at the six sites during the predemonstration period. Variability increased to a range of 7.9 mph to 12.2 mph averaged across the four quarterly measurements at each site during the demonstration. This represented an increase of 1 to 3 mph at four sites and a change of less than 1 mph at two sites. SD expressed as a percentage of the mean, which is the coefficient of variation (CV), increased at four of six sites and decreased at one site, with the proportional change in CV about the same as the proportional change in SD.

- Crashes
 - Comparing the number of crashes during the one-year demonstration period to just the year prior to the demonstration, both the average number of speed-related crashes per month and average number of crashes of all types per month decreased.
 - However, when the number of crashes during the one-year demonstration period is compared to the prior three years, both the average number of speed-related crashes per month and average number of crashes of all types per month increased following the increase in speed limits.
- Traffic Volume
 - Demonstration community sites revealed quarter-to-quarter variation in traffic volume but little overall change in volume over five quarters at most sites.

Comparison Community (Southaven, Mississippi)

- Speed Limit Changes
 - Not applicable. Speed limits were not changed.
- Citations
 - There was an increase in the number of citations issued by the Southaven Police Department during the demonstration period. However, the increase was due to an intensified local traffic law enforcement campaign about midway through the demonstration period. This was contrary to MDOT's understanding with Southaven that the enforcement level would not change during the demonstration period.
- Public Awareness
 - Forty-two percent of drivers in the control community claimed to always see enforcement along the comparison roadway prior to the raising of speed limits in the demonstration community. This level is 17 percentage points higher than was observed in the demonstration community and suggests a higher initial level of enforcement. During the same (predemonstration) period, 54% felt that speeding might sometimes or always cause them to be stopped or ticketed. Although MDOT had planned to measure public awareness in the comparison community during the demonstration period, there were data from only a few interviews, and these data were not sufficient for analysis.
- Speeds
 - Mean and 85th percentile speeds on the control road in Southaven did not change substantially during the period of time corresponding to either the predemonstration period or demonstration period in Gulfport.

- There was little change in the proportion of vehicles exceeding the speed limit by more than 10 mph (range from 0.6% to 23.1% prior to the demonstration to 1.1% to 27.8% in the period corresponding to the demonstration).
- Speed variance as measured by the SD was virtually unchanged (i.e., increased by less than 1 mph) from the period corresponding to the predemonstration to the period corresponding to the demonstration at three measurement sites, and increased slightly (1 to 2 mph) at three of the six measurement sites. CV increased at four of six sites and was unchanged at two sites.
- Crashes
 - The average number of crashes of all types per month was higher during the period corresponding to the demonstration than during the predemonstration period. However, the average number of speed-related crashes per month actually declined slightly in the demonstration year from the previous year.
- Traffic Volume
 - Comparison community sites revealed quarter-to-quarter variation in traffic volume and a possible reduction in volume over five quarters at most sites.

Findings Summary

Conclusions regarding the impact of rational speed limits will be withheld until data from all of the seven test sites have been analyzed. Presented below is a summary of findings from the present study.

- Although a small proportion of drivers continued to violate the rational limits by 10 mph or more after the rational limits were implemented, the number of such speed violations was reduced by three quarters. Thus, rational limits resulted in better compliance with the law.
- Small increases observed in both mean and 85th percentile speeds in the demonstration community, but not in the comparison community, suggest that implementing rational speed limits may not lead to increases all the way up to the newer raised limits, but that some increases in speeds are to be anticipated.
- The small increases observed in SD (1 to 3 mph) and CV (1 to 8 percentage points) of speeds at four of six measurement locations in the demonstration community suggests that raising the speed limit, even with strict enforcement, may not result in decreased speed variation.
- A reduction in the proportion of extreme speeders (95th percentile) was observed only on the road segment where the limit was increased the most (+15 mph). It is not clear why the proportion of extreme speeders did not decline on the roadways where limits were increased less.

- The average monthly frequency of crashes in the demonstration community was lower during the demonstration year when compared to crashes in just the year immediately preceding the demonstration. However, the average monthly frequency of crashes was higher in the demonstration year than it was in the 3-year period preceding the demonstration year. Similar changes were observed in the comparison community where the speed limits were not changed. The availability of only 2 years of predemonstration period data at the comparison site limited the assessment of the extent to which the change in crashes over time on the comparison road could explain the change in crashes on the demonstration road.
- The effects on crash severity are unknown as measures of severity were not consistently available on police reports from either the demonstration or comparison community.

Further studies (currently ongoing in six other communities) are required to determine the full impact of rational speed limits.

1 Introduction

In an effort to address concerns regarding the need to restore credibility to speed limits, the National Highway Traffic Safety Administration and the Federal Highway Administration jointly undertook tests of speed limits that have been established by a formal engineering review that starts with the 85th percentile speed of free-flowing traffic, but could be set as low as the 50th percentile, depending on roadway geometry, land use, access, pedestrian activity, parking turnover, and crash history. This approach of setting limits is based on research showing the 85th percentile to be an acceptable limit from a safety perspective, as well as the assumption that most motorists will select a safe speed on their own, when given the opportunity.¹ Speed limits set using this approach will be referred to as “Rational Speed Limits” in this report. The overall objective of conducting these tests was to determine whether speed limits so set, when combined with well-publicized and targeted enforcement, result in greater compliance, more uniform speeds, and improved safety.

Rational speed limits are determined through a formal engineering review that uses the 85th percentile speed of free-flowing traffic combined with information on roadway geometry, crash characteristics, land use, and access. These speed limits are distinguished from others in that they are based on engineering analysis of prevailing speeds and road conditions rather than on State or local statutes that do not consider prevailing speeds. This procedure is intended to establish speed limits that seem reasonable to most drivers and thereby result in greater compliance, more uniform speeds, and improved safety. The objective of this study was to measure the effects of introducing strictly enforced and publicized rational speed limits on compliance, traffic speeds, and highway safety.

In 2001, the Traffic Engineering Division of the Mississippi Department of Transportation joined with the Public Affairs Division of MDOT and the cities of Gulfport and Southaven, Mississippi, to participate in a program of cooperative agreements with the U.S. Department of Transportation to demonstrate setting and enforcing rational speed limits. Mississippi led the nation in the number of fatal crashes per vehicle miles of travel from 1996 through 1999, and the number of fatalities in Mississippi increased in 2000. In 2001, MDOT deemed increasing safety on Mississippi roadways to be of the highest importance and concluded that the rational speed limits demonstration project presented an opportunity to accomplish this. MDOT sought to develop a model program combining sound traffic engineering principles, close partnership with local law enforcement, and a high-profile public information and education campaign (PI&E) to set, enforce, and educate the public on rational speed limits. This report presents a summary of the procedures, findings, and conclusions associated with the MDOT demonstration of setting and enforcing rational speed limits in Gulfport.

1.1 Background

The National Highway Traffic Safety Administration and the Federal Highway Administration have jointly funded seven cooperative agreements with States and local governments to field test the impact of setting and enforcing rational speed limits. The goal of the project is to understand how these rational speed limits can be implemented and to determine how well the project’s engineering, enforcement, and education activities manage traffic speeds. Each cooperative

agreement awardee is implementing a rational speed limits program for one year in a demonstration community and gathering data on speeds, crashes, traffic speed enforcement, and public knowledge and attitudes. Identical measurements are being made on similar roads in a comparison community where there are no changes of speed limits or enforcement, so that it can be determined whether the observed changes in the demonstration community may have happened anyway. The participating agencies and communities are shown in Table 1.

Table 1. Demonstration Communities	
Cooperative Agreement Recipient	Demonstration Community
Mississippi Department of Transportation	Gulfport, MS
Connecticut Department of Public Safety; Connecticut State Police	Hebron, CT
Commonwealth of Massachusetts; Governor's Highway Safety Bureau	Natick, MA
South Central Planning and Development Commission; Houma, LA	Houma, LA, Metropolitan Statistical Area (Assumption, Lafourche, St. Charles, St. James, St. John the Baptist, and Terrebonne Parishes)
City of Taylor Police Department, Taylor, MI	Taylor, MI
Tippecanoe County Highway Department, Tippecanoe County, IN	Tippecanoe County, IN
Virginia Transportation Research Council; Virginia Department of Transportation	Martinsville (Henry County) and Altavista (Campbell County/ Pittsylvania County), VA

Westat's role in this project was to assist each cooperative agreement recipient in implementing rational speed limits in the demonstration community. Westat also was responsible for collecting speed, crash, and enforcement data in each comparison community, and analyzing all data. The cooperative agreement awardees were responsible for collecting public knowledge and attitude data in both the demonstration and comparison communities. Summaries of the remaining six rational speed limit demonstrations will be prepared as each community's cooperative agreement is completed.

1.2 Speed Limits

Speed limits are intended to promote public safety by informing drivers of the reasonable and prudent speeds that are proper for the traffic, roadway, and weather conditions. Properly designed speed limits should represent a balance between safety and travel efficiency. Lower speeds reduce stopping distance and crash severity. Higher speeds may reduce safety under certain conditions. Within a road segment, speeds that are more uniform (i.e., lower variance in speed distribution) promote smoother, more efficient traffic flow and possibly reduce crash risk. Posted speed limits should be the result of engineering analyses coordinated with enforcement and education activities. When combined, these activities help confine speeds beneath an appropriate upper bound, and can be expected to produce a relatively uniform speed distribution. Speed limits implemented in this manner provide a rational basis for enforcement to target violators traveling at unsafe speeds.

1.3 Rational Speed Limits

Rational speed limits are determined through a formal engineering review that uses the 85th percentile speed of free-flowing traffic combined with information on roadway geometry, crash characteristics, land use, and access. The approach initially proposes the speed limit as the 85th percentile of travel speeds on the road segment in question, rounded to the nearest 5 mph. That speed may then be adjusted downward, and could be set as low as the 50th percentile, based on road geometry, land use, traffic patterns, access, pedestrian activity, parking turnover and crash history. The procedure should result in speed limits that seem reasonable to most drivers, and thereby result in greater compliance and more uniform speeds. Previous research has suggested that speed uniformity is associated with lower crash risk.^{1 2 3} Rational speed limits could help to establish a reasonable standard for enforcement and permit authorities to concentrate enforcement efforts on high-risk drivers who are likely to create unsafe situations. Consequently, strict enforcement of rational speed limits, focused on flagrant speed limit violators and designed to minimize speed variance, needs to be an integral component of a speed management program based on rational speed limits. Achieving such high compliance requires an effective combination of PI&E and dedicated enforcement. An effective PI&E campaign should also help citizens understand how the speed limits were determined and the reason for their strict enforcement.

For this cooperative agreement program, MDOT was required to determine rational speed limits using the engineering study procedure described in “Guidelines for Setting Safe and Reasonable Speed Limits.”⁴ MDOT conducted the following steps:

- identify target road segment;
- inventory road conditions and identify roadway and roadside factors (e.g., curves, hills, intersections, driveways);
- select measurement sites;
- collect speed data;
- analyze speed and other data; and
- select speed limits.

2 Methods

2.1 Selecting Communities and Roadways

MDOT selected the city of Gulfport as the demonstration community and Southaven as the comparison community. Factors considered in selecting the demonstration and comparison communities include similarities in population demographics and road design features, and distance between communities. MDOT considered communities that were far enough apart so that PI&E programs and media attention in the demonstration community would not influence driving behavior in the comparison community. Southaven met these criteria. It is approximately 350 miles north of Gulfport, well outside the Gulfport media market. Southaven officials agreed

to refrain from changing current speed limits or enforcement levels during the demonstration period.

Within the Gulfport demonstration community, US 49 was selected as the demonstration road. MS 302 was selected as the comparison road in Southaven. Both the demonstration and comparison roadways had similar geometric design features, adjacent land use, traffic volumes, and number of traffic crashes. Also, both US 49 and MS 302 are urban principal arterials with heavy commercial development. Table 2 shows the major characteristics of each of the selected roadways in the demonstration and comparison communities.

Table 2. Description of Selected Roadways		
	Demonstration Community	Comparison Community
County	Harrison County	De Soto County
City	Gulfport	Southaven
Roadway	US 49	MS 302
Roadway Direction	North-South	East-West
Project Limits	From US 90 to North of MS 53	From eastern I-55 ramp termini to intersection with US 78
Project Length	Approximately 7.5 miles	Approximately 8 miles
Function Class	Principal Arterial	Principal Arterial
Roadway Geometrics	No Access Control (except at US 49/I-10 Interchange)	No Access Control (Five-lane undivided and some four-lane divided sections)
Predominant Land Use	Commercial, Retail	Commercial, Retail
Average Daily Traffic	43,000 (estimated in 1999)	26,000 (estimated in 1999)

2.2 Measuring Speeds

Speed data were collected for both the demonstration and comparison roads one to three months before the new speed limits were posted, and then quarterly for one year after new speed limits signs were installed on the demonstration road.

The US 49 demonstration segment extended from US 90 at the southern extreme to a point just north of MS 53. Prior to adjusting the speed limits, MDOT selected 14 traffic count and speed measurement stations along US 49. MDOT divided the roadway into homogeneous sections, where the roadside development (residential versus commercial; type and frequency of businesses and driveways, etc.) and roadway features (lane widths, medians, shoulders, surface roughness, curvature, intersection spacing, etc.) were consistent. Speed measurement stations were not located within 500 feet of a speed transition zone (intersection approach, horizontal curve, etc.). Speeds and other characteristics of the traffic flow were measured in each direction at each count station. After the revised speed limits were determined, MDOT measured speeds at a subset (6) of the original 14 sites. These 6 sites provided representative speed data for travel in each of the five new speed zones.

Westat selected 6 comparison count stations along the 8-mile section of MS 302 in the control community, Southaven. The count station locations in Southaven community were based on

changes in road geometry, land use, speed limits, and comparability to the count stations along US 49 in Gulfport.

Both MDOT and Westat used NC-97 Hi-Star Traffic Counters, manufactured by Nu-Metrics for speed data acquisition. The counters were placed on the center line of each of the through-travel lanes at each of the count stations and were anchored to the roadway using a protective cover and mastic tape. The counters were deployed for 24-hour periods during which they continuously measured and recorded a record of speed for each vehicle that traveled in the lane. Speed data were organized into files for each measurement period and location. In addition to individual vehicle speed, each observed vehicle's record included measurement site location, date and time of observation, vehicle length, and vehicle headway. MDOT and Westat assumed that speeds were not influenced by the devices because they do not emit any detectable signal (e.g., that might trigger a radar detector) and are small, self-contained, and generally unnoticeable to most drivers.

2.3 Obtaining Local Government, Police, and Judicial Support

MDOT organized several meetings with the Gulfport mayor, City Council, law enforcement officials, prosecutors, and judges to inform them of the rational speed limit program; obtained police, prosecutorial, and judicial support; and coordinate the implementation schedule. Although the mayor's office and police chief had indicated support for the project when first proposed by MDOT, the police department and City Council were reluctant to support the project near the time that the speed limits were to be raised. The primary concern was whether raising speed limits would reduce safety, increase crashes, and diminish respect for law enforcement in Gulfport. MDOT requested a special meeting with the mayor, City Council members, the police chief, other public safety officials, DOT project team members, and key Westat project staff to determine whether the project should proceed. After presentations by DOT and Westat representatives and much discussion, the mayor determined that the project was in the best interest of Gulfport and should proceed.

2.4 Determining New Speed Limits

MDOT followed the procedures in "Guidelines for Setting Safe and Reasonable Speed Limits," provided by the FHWA as Appendix A of the Cooperative Agreement Federal Register Notice and Application, to determine the new speed limits on US 49.⁴ The procedure included the following initial steps:

- determine the median (50th percentile) and 85th percentile speeds for free-flow vehicles at each measurement site.
- round the median up to the nearest 5-mph increment; round the 85th percentile to the nearest 5-mph increment (up or down).
- select the 85th percentile speed rounded to the nearest 5-mph increment as first approximation for the speed limit.

Where there were mitigating factors (speed-related crash history, heavy nonmotorized road user presence), the selected speed limit was reduced to a more appropriate level for the conditions in

that particular segment. This strategy was used to adjust the speed limit in the most urbanized southern segment between US 90 and 19th Street (see Table 3, Site 1). Wherever there was a difference of more than 5 mph between two measurement sites, a separate speed zone was created.

2.5 Posting and Enforcing Revised Speed Limits

In December 2002, following engineering review and public safety council approval, MDOT replaced the speed limit signs along US 49 with the revised speed limits at 13 of 14 measurement sites. Although the 85th percentile speed warranted a higher speed limit, it was not changed at Site 1 due to high pedestrian traffic volume, frequent parking turnover, and closely spaced intersections. Table 3 outlines the original speed limit, as well as the 50th and 85th percentile speeds measured at each site along US 49 during the predemonstration period, and the revised speed limit used during the demonstration period.

Table 3. Original and Revised Speed Limits Along US 49					
Site Number	Original Speed Limit	Sample Size	50th Percentile	85th Percentile	Revised Speed Limit
1*	35	10,102	34	41	35
2	35	11,430	38	44	40
3	35	16,734	44	51	45
4	35	17,189	47	54	50
5	35	19,065	50	57	50
6	35	19,084	44	51	50
7	45	16,994	42	50	50
8	45	18,622	51	59	50
9	45	18,055	45	53	50
10	45	20,471	47	54	50
11	45	19,567	49	56	50
12	55	12,732	56	64	60
13	55	11,399	56	64	60
14	55	12,272	57	65	60

* Speed limit not changed.

As shown in Figure 1, each new regulatory speed limit sign was supplemented with a “Strictly Enforced” placard to emphasize that the new speed limits would be more strictly enforced than conventional speed limits on other streets in Gulfport.



Figure 1. Installing updated regulatory speed limit signs

The Gulfport Police Department agreed to increase the hours of enforcement and to provide stricter enforcement of the US 49 corridor speed limit during the demonstration period. The Gulfport Police Department also agreed to start with a threshold for enforcement at the 95th percentile of speed and gradually reduce the threshold to no more than 5 mph above the revised speed limit. MDOT analyzed speed data and provided results to the Gulfport Police Department on a regular basis to support the enforcement efforts.

2.6 Public Information and Education Activities

MDOT developed and implemented a PI&E campaign to inform the public of the program, heighten awareness of the expected benefits and stricter enforcement, and encourage compliance with the new speed limits. The expectation was that with a more comprehensive understanding of the basis for the speed limits, drivers would be more likely to comply and there would be less community opposition. MDOT measured the change in public awareness following the start of the campaign during the demonstration period.

2.6.1 PI&E Campaign

The PI&E campaign for the demonstration community incorporated a number of elements recommended in “Guidelines for Public Information and Education Programs for Rational Speed Limits.”⁵ On December 2, 2002, MDOT kicked off the program with a press conference in Gulfport and unveiled the new regulatory speed limit signs with “Strictly Enforced” placards.

Representatives of MDOT were present for the press conference, as well as the mayor of Gulfport and chief of police. All voiced their support for the program.

In coordination with the press conference, MDOT informed Gulfport residents that the new speed limits were reasonable based on careful engineering study and that they would be strictly enforced by the local police. The PI&E program was implemented during the first two weeks of the revised speed limit program and used the following media:

- advertisements in the local paper;
- mailing flyers to all community leaders; and
- radio spots and public service announcements (PSAs).

The ad and flyers included the program logo shown in Figure 2 and gave a brief but detailed explanation of the new speed management techniques.

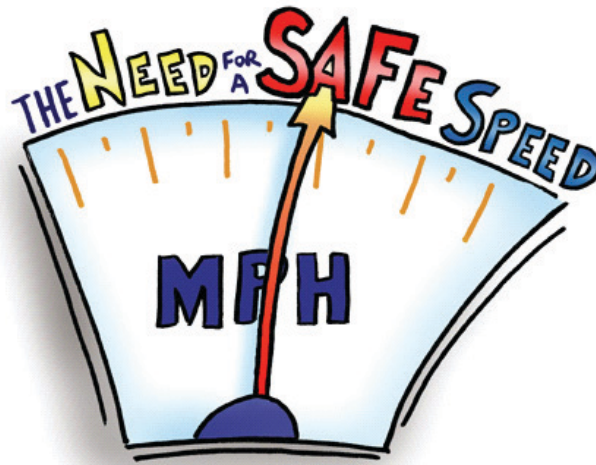


Figure 2. Mississippi PI&E campaign logo

2.6.2 Assessing Public Knowledge

MDOT assessed public awareness and perceptions in the demonstration community prior to and following speed limit and enforcement changes. A brief multiple-choice questionnaire was distributed to customers in local Department of Motor Vehicles (DMV) customer service centers in both the demonstration and comparison community several months prior to implementing the revised speed limits. The questions examined frequency of respondent's travel along US 49, awareness of current speed limit, awareness of speed enforcement along US 49, and awareness of the rational speed limit campaign developed specifically for the program. Several weeks after the revised speed limits were implemented MDOT once again distributed the questionnaire to customers in local DMVs in the demonstration community. The same questions were asked in the comparison community for travel on MS 302 prior to the demonstration but insufficient data were collected there to assess public knowledge and awareness during the demonstration period.

Responses to the questions enabled MDOT to assess the success of the program in terms of measures of public awareness, and also to determine if and how public opinions and attitudes changed over the course of the program.

In the demonstration community, 91 respondents completed surveys during the predemonstration survey wave in June, 2002. Sixty-three respondents completed the follow-up survey, which was conducted in October and November 2003 near the end of the demonstration period.

Respondents were nearly evenly split on gender during the predemonstration period: 48% female and 51% male. The mean age of respondents was 37, with a range from 16 through 72. About three quarters of the respondents were White, and slightly less than one quarter were Black. Most of the respondents were at the DMV to renew their driver licenses. The proportion of men and women in the demonstration period sample was nearly the same as the predemonstration period sample. Respondents were again nearly evenly split on gender: 46% female and 53% male. The mean age of respondents was nearly the same as well, at 39 years. Once again, about three quarters of the respondents were White, and about one sixth were Black. Less than half of the respondents were at the DMV to renew their driver licenses.

Ninety percent of the respondents said they traveled on US 49 at least two to four times a week during the predemonstration wave. Only about 65 percent said they drove on US 49 at least two to four times a week during the demonstration period.

In the comparison community, 138 respondents completed surveys at the DMV office prior to the demonstration period. Sixty-two percent of all the respondents were female and 38% were male. Although the gender split was more heavily female than in comparison community, other demographic characteristics were similar. Mean respondent age was 39 years and ranged from 16 to 78. More than three quarters of the respondents were White, and 15% were Black. Most of the respondents were at the DMV to renew their driver licenses, or to obtain their first driver licenses. Almost three quarters of the respondents traveled along MS 302 at least two to four times a week.

2.7 Enforcement Data

Enforcement and safety-related measures were collected from both the comparison and demonstration communities for analysis of the impact of the level of enforcement on speeds and safety. The data included information from all crash reports and citations written along US 49 prior to the one-year demonstration period and for one year following the speed limit adjustments. Both Westat and MDOT worked with the Gulfport and Southaven police departments to obtain the following data:

- crashes (by crash type);
- number of speed violation warnings and speeding citations (with cited speeds); and
- traffic enforcement person hours (demonstration community only¹).

¹ MDOT was unable to obtain traffic enforcement hours from Southaven

Data were obtained for more than 3,600 crashes that occurred in the demonstration community on US 49 during the three-year period preceding the demonstration and the one-year demonstration period. Data on more than 1,000 crashes on MS 302 were obtained for the comparison community, although only two years of crash data were available for the predemonstration period in that location.

Data on more than 15,000 citations for moving violations issued by the Gulfport Police Department on US 49 and the Southaven Police Department on MS 302 were obtained. Gulfport provided citation data for the three-year period prior to the demonstration, while Southaven had data available only for 27 months preceding the demonstration, and both provided data for the 12-month demonstration period. Data were organized according to the demonstration period speed zones on the treatment and comparison road segments. There were five speed zones in Gulfport and two speed zones in Southaven. Citations were divided into two groups, “speed-related” and “other,” based on the cited traffic code and analyzed in terms of both the number of speed-related citations per month and the proportion of all citations for speeding. The number of speed-related citations per month measures the amount of speed enforcement activity, while the proportion of speed-related citations measures the level of focus on speed enforcement.

2.8 Enforcing Speeds

MDOT decided to establish the enforcement threshold by targeting only the most flagrant violators. This strategy was adopted so that the law enforcement officers, the prosecutors, or the court system would not be overwhelmed, and to promote public and court acceptance of enforcement. In coordination with the Gulfport Police Department, MDOT measured speeds at the selected road segments to determine the speed distributions. This information was used to set the initial enforcement threshold. The policy for the initial enforcement threshold was established as the 95th percentile speed, which was consistent with DOT guidelines “Guidelines for Enforcement of Safe and Rational Speed Limits.”⁶ The policy also ensured the enforcement threshold would never be less than 5 mph above the new posted speed limit.

To promote public awareness that the new speed limits would be strictly enforced, highly visible and highly publicized enforcement efforts were deployed. The Gulfport Police Department committed additional resources above the norm for speed enforcement efforts at the selected roadway segments, which enabled an increased patrol frequency by marked police vehicles.

Officers involved in speed enforcement were encouraged to comply with the enforcement and operational procedures presented the DOT guidelines.⁶ Traffic officers assigned to patrol the selected roadway segments were instructed to devote a significant portion of their shift to speed enforcement. Also, MDOT ensured that speeders were adjudicated quickly with a high likelihood of significant penalties by coordinating closely with local judges and prosecutors to ensure their understanding and support of the project.

3 Results

Principal findings regarding the independent variables of speed limit change, citations, and public awareness, and the dependent variables of speeds and crashes, are described below.

3.1 Speeds

Speeds were measured as described in Section 2.2 and analyzed for both the demonstration and comparison community during the predemonstration and demonstration periods. The analysis focused on the speeds of freely flowing vehicles that were unconstrained by interaction with other vehicles around them. Free-flow vehicles were defined as those with at least a 5-second separation (headway) from the preceding vehicle in the measured lane.

3.1.1 Demonstration Community - US 49 Speeds

Eighty-fifth Percentile Free-Flow Speeds

Speeds were measured on US 49 in the demonstration community during the calendar quarter prior to the demonstration year and each quarter during the demonstration year at six sites (one representative site for each zone that had a unique combination of predemonstration speed limit and revised speed limit). Eighty-fifth percentile speeds generally increased slightly from the predemonstration period through the fourth quarter of the demonstration, in most cases by no more than 2 mph. The exception occurred at Site 6, where the speed limit was raised from 35 mph to 50 mph and the 85th percentile speed increased 3 to 5 mph over the baseline speed. Free-flow 85th percentile speeds are illustrated in Figure 3 for each of the six representative sites.

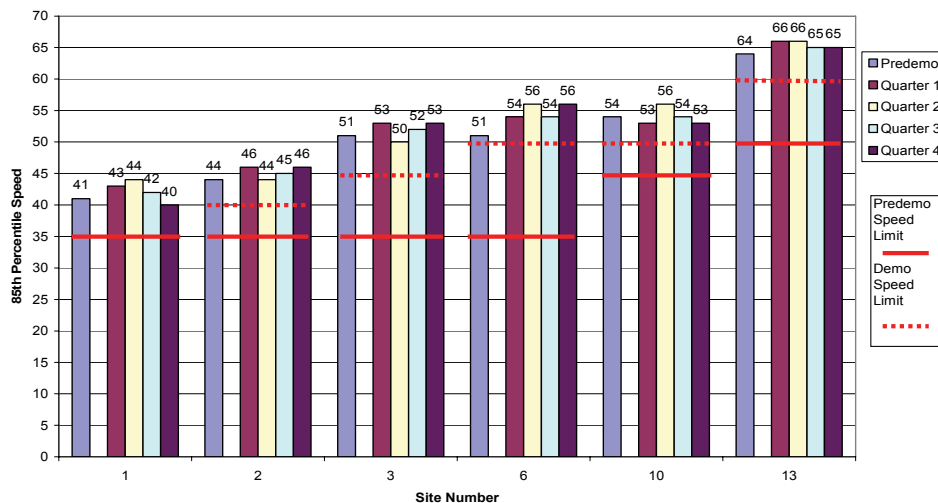


Figure 3. 85th percentile speeds for predemonstration and demonstration period by calendar quarter; representative sites in demonstration community

Mean speeds, standard deviation (SD), and 85th percentile speeds are shown in Appendix A, Table A1. Tabulated speeds and SDs of speeds represent measurements combined across lanes and flow directions for each site.

Standard Deviation

Standard deviation of speed was in the range of 7-to 12 mph during both the predemonstration and demonstration periods. Standard deviation is of interest because some research has shown that speed variation is associated with crash risk.^{1 2 3} Standard deviation expressed as a percentage of the mean, which is the coefficient of variation (CV), was generally in the range of 17 to 27% over the same period. Coefficient of variation is a better indicator of potential conflict because it is more closely associated with the likelihood of vehicle interactions. Following the speed limit adjustments SD increased slightly (an average of 1 to 3 mph over all four quarters) at four of the six measurement locations, and changed less than 1 mph at two locations. The greatest variation occurred at Site 6, where the speed limit was raised the most of any site – by 15 mph to 50 mph. The least change in variation was exhibited at Site 13, where the highest speed limit existed both before and after the demonstration period began. Coefficient of variation increased an average of 1 to 8 percentage points at four of six sites and decreased at one site, with the proportional change in CV about the same as the proportional change in SD. Coefficient of variation is tabulated in Appendix A, Table A2.

Speeding Behavior under the Raised Limits

Comparison of Overall Speeds Before and After the Limits Were Raised

Overall, one effect of raising speed limits was to reduce the number of violators. Prior to the speed limit adjustments, approximately 55 to 90% of vehicles exceeded the speed limits on US 49. After the speed limits were increased, the proportions exceeding the new speed limits were substantially lower, but still in the range of 25 to 50%. At site 2, where the speed limit was raised from 35 mph to 40 mph, 69% of vehicles exceeded the speed limit during the predemonstration, but speeding was reduced to a range of 25 to 45% during the demonstration year. At site 3, more than 90% of vehicles exceeded the speed limit prior to the increase, but after it was raised by 10 mph, only about 40 to 50% exceeded the limit. At site 6, where the speed limit was raised 15 mph, 85% exceeded the speed limit during the predemonstration period but just 30% sped during the demonstration. Site 10 was raised by 5 mph to 50 mph, and the incidence of violations dropped from about 60% to the range of 25 to 35%. At site 13, on the more open road north of the interchange with I-10, the speed limit was raised to 60 mph, but the incidence of speeding dropped only 10 to 15 percentage points, from the predemonstration level of 55% to the range of 40 to 45% after the speed limit was raised. The proportion of vehicles exceeding the speed limit prior to and after the limits were raised for all sites is shown in Appendix A, Table A3.

Proportions Exceeding Limits by More Than 10 mph Before and After the Limits Were Raised

Proportions exceeding the speed limit by more than 10 mph (a common threshold for speed enforcement) are of particular interest. The proportion of drivers exceeding the speed limits by more than 10 mph was reduced at all sites except Site 1, following the start of the demonstration period. At Site 1, where the speed limit was not adjusted, the proportion of 10+ mph violators nearly doubled across the entire demonstration period. However, at the remaining five sites, the proportion of 10+ mph violators decreased by about half at three sites and by about five-sixths at the remaining two sites. Figure 4 shows the percentages of vehicles traveling more than 10 mph over the speed limit during the predemonstration period and averaged across all quarters of the demonstration period.

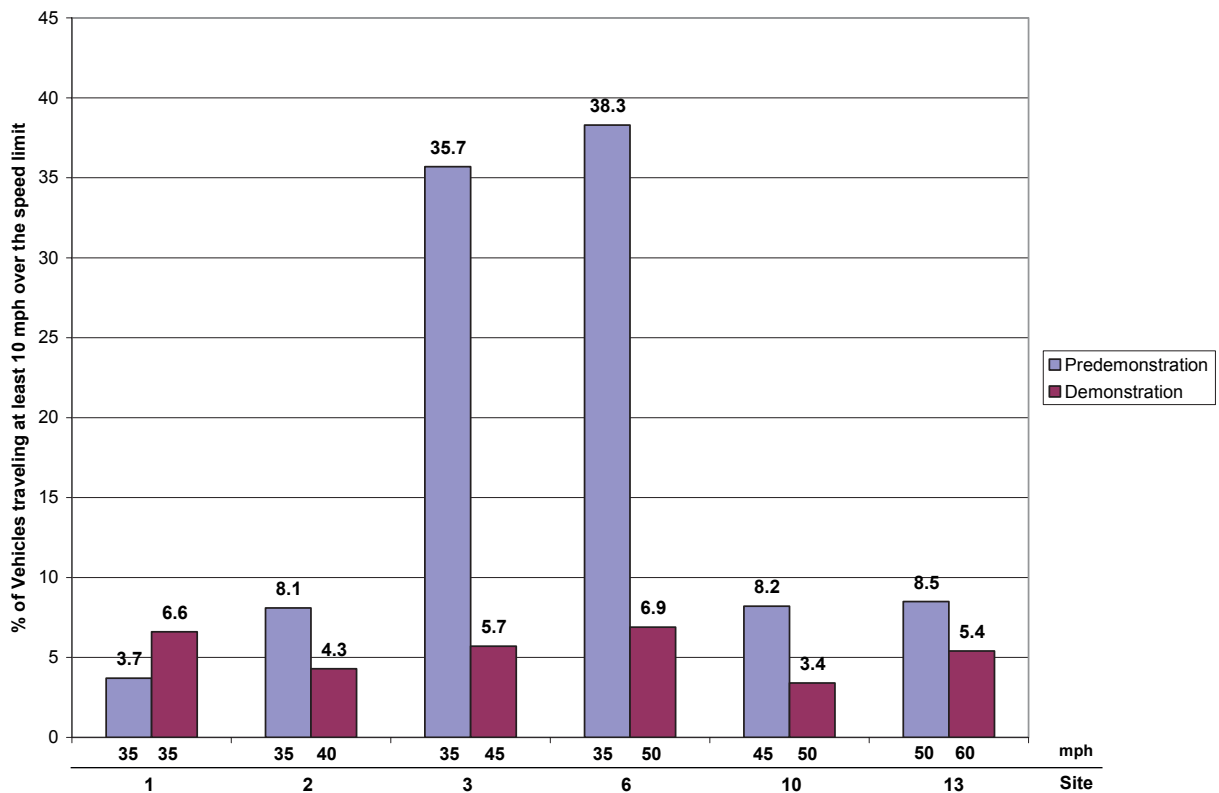


Figure 4. Percentage of vehicles with speeds greater than 10 mph over posted speed limit by site number and period; demonstration community

Presenting the speed data quarter-by-quarter reveals the variation in speeds due to seasonal and other influences, including random fluctuation. The proportion of drivers who exceeded the speed limits by more than 10 mph generally varied only slightly from quarter to quarter at each site during the entire demonstration period. Although the proportion of 10+ mph violators increased at Site 1 during demonstration quarters 1, 2, and 3, it returned to the original level during quarter 4; thus there was no clear trend over the predemonstration and demonstration periods. Figure 5 illustrates the proportions of vehicles with excess speed of more than 10 mph at each site by quarter.

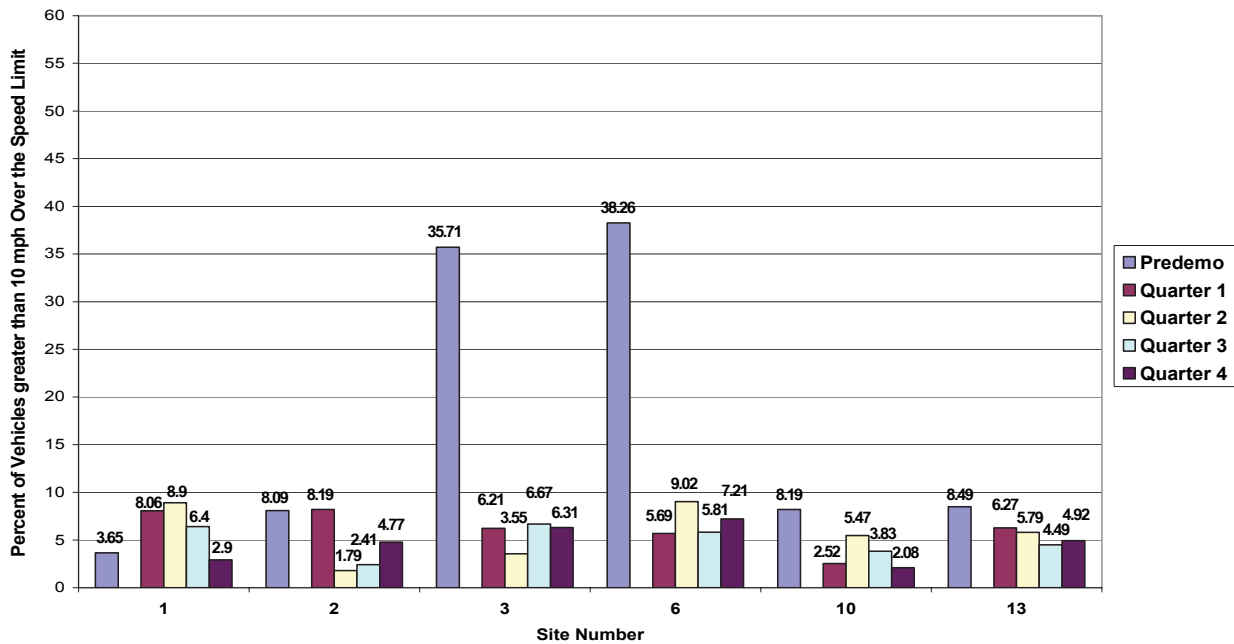


Figure 5. Percentage of vehicles with speeds greater than 10 mph over posted speed limit by site number and quarter; demonstration community

At Sites 2, 10, and 13, 8 to 9% of vehicles exceeded the speed limit by more than 10 mph during the predemonstration period, but just 2 to 6% were 10+ mph violators after speed limits were raised. At Sites 3 and 6, 36 to 38% exceeded the limit by more than 10 mph prior to the demonstration period, and these proportions were reduced substantially to the range of 4 to 9% with the increased speed limits.

After the speed limits were increased at Sites 2, 3, 6, 10, and 13, the proportions exceeding the speed limit by more than 10 mph diminished considerably at the five sites where speed limits were raised. About half to two-thirds as many vehicles exceeded the speed limits by more than 10 mph at Sites 2, 10, and 13 after the speed limits were changed. Much larger reductions in excess speeds occurred at Sites 3 and 6, where the speed limits were substantially raised (by 10 and 15 mph, respectively). After the limits were increased, 4 to 9% exceeded the speed limits by more than 10 mph at those sites, a drop to about one-sixth the previous level.

While Sites 1, 2, 3, and 6 all had 35 mph speed limits prior to the demonstration, speeds at Sites 3 and 6 were probably higher because the road at that point became more like a suburban arterial, with wider lanes and longer distances between intersections than the more urban Sites 1 and 2, which also had 35 mph speed limits.

Proportion of Extreme Speeders Before and After the Limits Were Raised

Extreme speeders (95th percentile and above) represent a higher level of crash risk, and the consequences of a crash at high speed are more severe. The proportions of drivers exceeding the speed limits by more than 20 mph were reduced at Sites 3 and 6, unchanged at Sites 2 and 10, and increased at Sites 1 and 13. The changes over time of the mean, 85th, 90th, and 95th percentile speeds in the demonstration community are shown in Appendix B, Figures B1 to B6.

3.1.2 Comparison Community - MS 302 Speeds

Eighty-Fifth Percentile Free-flow Speeds

Speeds were measured on MS 302 in the comparison community during the calendar quarter prior to the demonstration year and each quarter during the demonstration year at one representative site for each unique combination of speed zone and other roadway characteristics such as number of lanes, roadside development, etc. Eighty-fifth percentile speeds changed very little from the predemonstration period through the fourth quarter of the demonstration, in most cases by no more than 1 to 2 mph. The exception occurred at Site 4 during quarter 1, where the 85th percentile speed increased 4 mph over the baseline and quarter 2, 3, and 4 speeds. Free-flow 85th percentile speeds are illustrated in Figure 6.

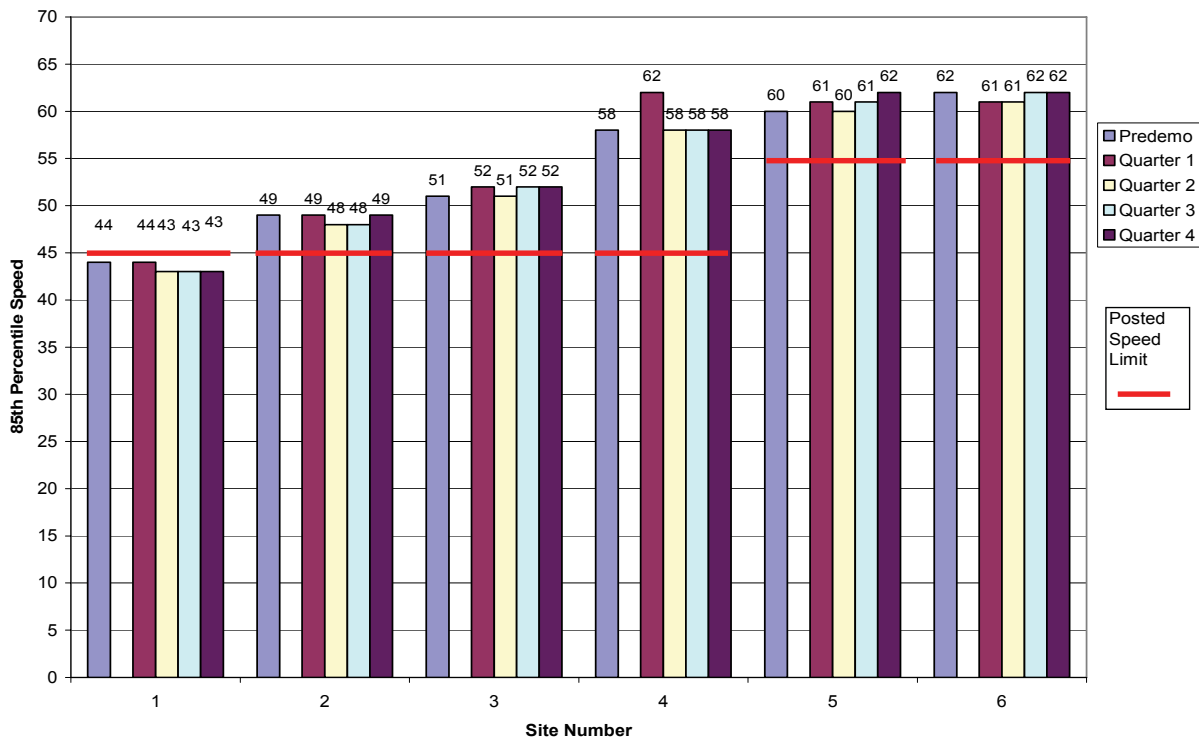


Figure 6. 85th percentile speeds for predemonstration and demonstration period by calendar quarter; comparison community

Mean speeds, SDs, and 85th percentile speeds are shown in Appendix A, Table A4. Tabulated speeds and SDs of speeds represent measurements combined across lanes and flow directions for each site. The changes over time of the mean, 85th, 90th, and 95th percentile speeds in the comparison community are shown in Appendix B, Figures B7 to B12.

Standard Deviation

Standard deviation of speed was in the range of 7 to 10 mph during both the predemonstration and demonstration periods and was generally in the range of 14 to 20% of the 85th percentile speed. Following the point at which the speed limits were adjusted in the demonstration community, SD was unchanged or increased by less than 1 mph at three sites and increased slightly (1 to 2 mph) at three of the six measurement locations.

CV increased at four of six sites and was unchanged at two sites. CV is tabulated in Appendix A Table A2.

Compliance with Speed Limits

The proportion of vehicles exceeding the speed limit by various amounts on MS 302 in the comparison community is shown in Appendix A, Table A5. At most sites, the proportion exceeding the speed limit by more than 10 mph was in the range of 1 to 5% during the predemonstration period. At Site 4, where the speed limit was 45 mph, 23% of vehicles exceeded the speed limit by more than 10 mph during this period. During the demonstration period, the proportions of drivers (averaged across all four quarters) traveling more than 10 mph over the speed limit were slightly higher in five of the six sites and moderately higher at one site compared to the predemonstration period. The proportions of these speeders during the predemonstration and demonstration periods at each site are illustrated in Figure 7.

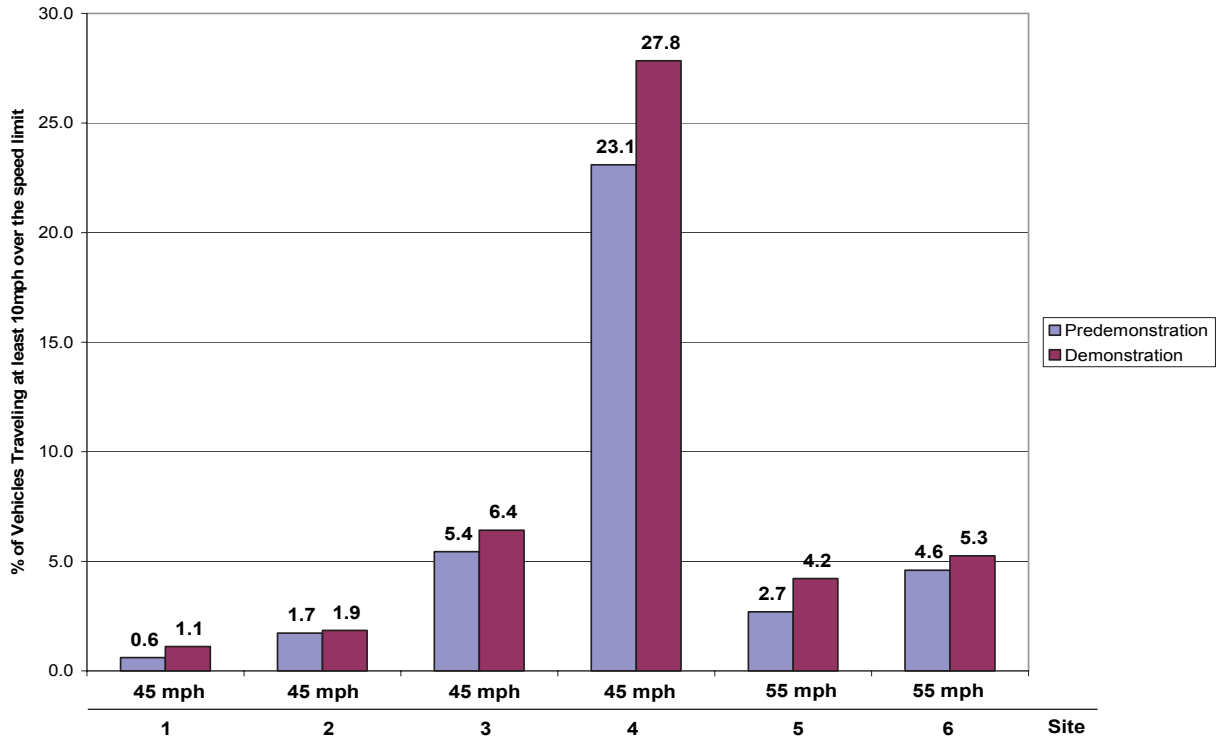


Figure 7. Percentage of vehicles with speeds greater than 10 mph over posted speed limit by site number and period; comparison community

There was little variation in proportions exceeding the speed limit by 10+ mph during the entire five quarters. The only site exhibiting substantial variation was Site 4, where the proportion during quarter 1 was unusually high at 43%. A very slight upward trend was suggested by the data for Sites 5 and 6 at the eastern and more open section of the comparison road segment. Figure 8 illustrates the proportions of vehicles with excess speed of more than 10 mph at each site by quarter.

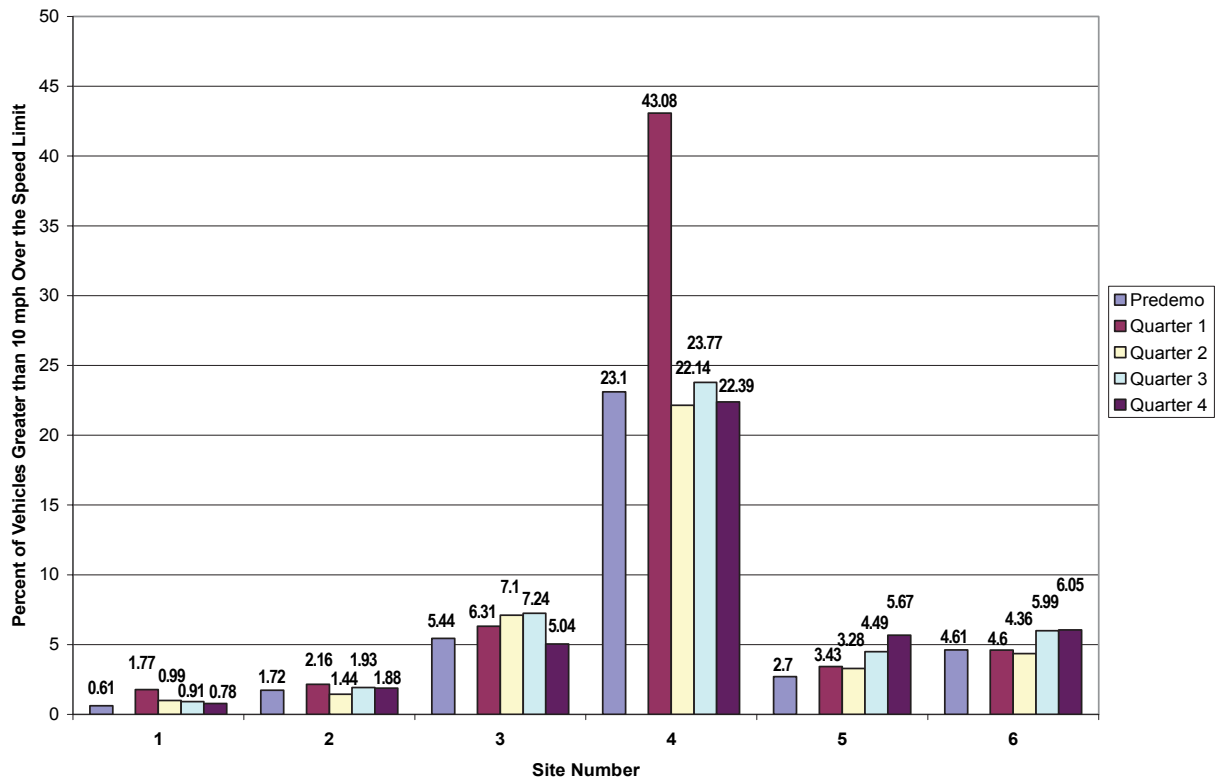


Figure 8. Percent of vehicles with speeds greater than 10 mph over posted speed limit by site number and quarter; comparison community

Taken together, these findings for both communities suggest changes observed in the demonstration community are attributable to the intervention and would not have occurred in its absence.

3.2 Crashes

Crash data from the 36-month period prior to the demonstration and during the 12 months of demonstration of rational speed limits were obtained from the demonstration community (Gulfport Police Department) via MDOT and MDOT’s statewide digital crash records database. Only 24 months of predemonstration period crash data were available from the comparison community (Southaven Police Department). Crashes were categorized into speed-related and other crashes according to the coded variables and narrative provided on each crash record.

3.2.1 Demonstration Community - US 49 Crashes

The effect on crash occurrences is not clear. If the frequency of demonstration period crashes is compared to the *prior year*, the number of speed-related crashes was lower during the

demonstration year, and the total number of all types of crashes changed very little. However, if the comparison of demonstration period to baseline crashes is made with the prior *three-year average*, then the demonstration year indicates an increase in crashes. A summary of total and average monthly frequencies of crashes for the entire road segment in the demonstration community is shown in Appendix A, Table A6. The number of speed-related and total crashes for each year is shown graphically in Figure 9.

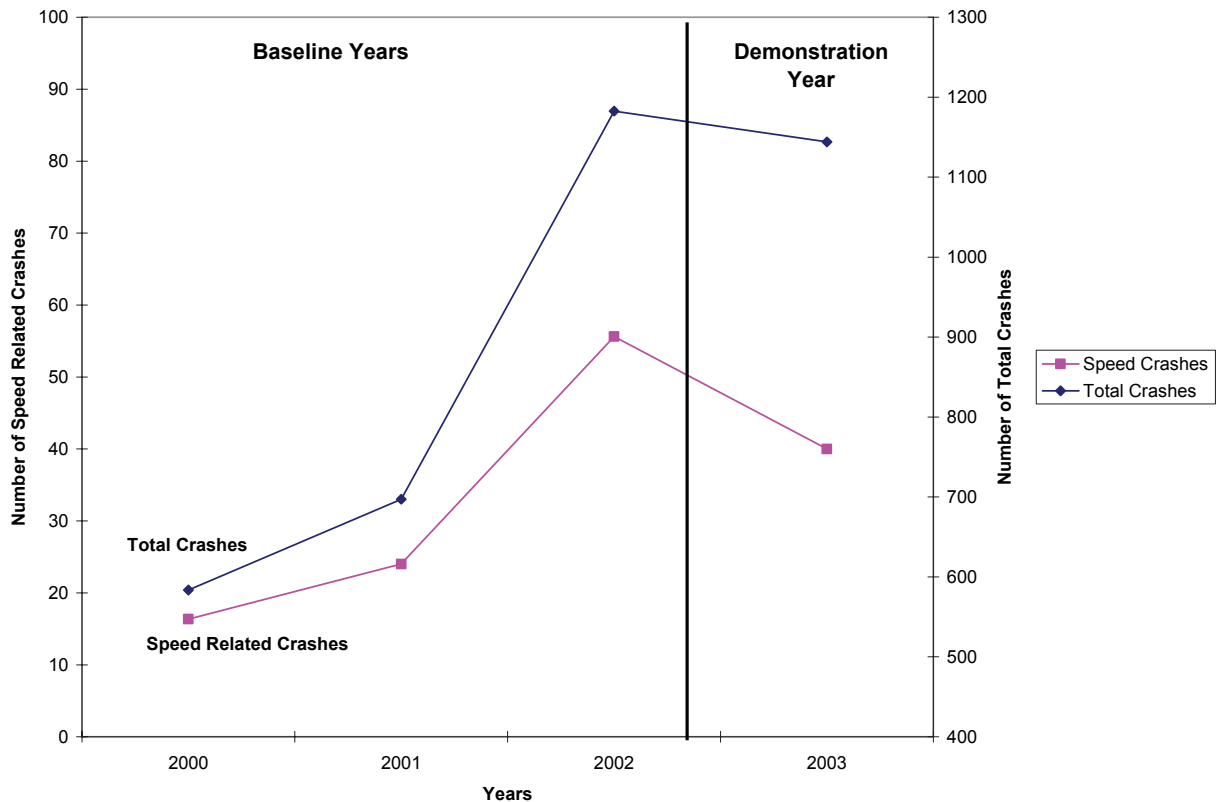


Figure 9. Annual crashes by type; demonstration community

The monthly crash frequencies normally varied from about 30 to 60 per month during the first two years of the predemonstration period but sharply increased to the range of 80 to more than 110 per month in the year prior to and during the demonstration period. For the entire predemonstration period, there were 68.4 crashes of all kinds per month prior to the demonstration, including 2.7 speed-related crashes per month on US 49. The average monthly number of crashes increased to 95.3 during the demonstration period, an increase of nearly 40%. The average monthly number of non-speed-related crashes increased from 65.8 to 92.0, an increase of about 40% during the demonstration period. Further, the average monthly number of speed-related crash rate also increased from 2.7 to 3.3, an increase of about 20 percent. However, focusing on just the year prior to the demonstration, there were 98.5 crashes of all kinds including 4.6 speed related crashes per month. The average monthly number of crashes of all kinds declined by about 3% while the speed-related crashes declined by almost 30 percent, based on a comparison to just the predemonstration year. The monthly frequency distribution of speed-related and other crash types are shown in Figure 10.

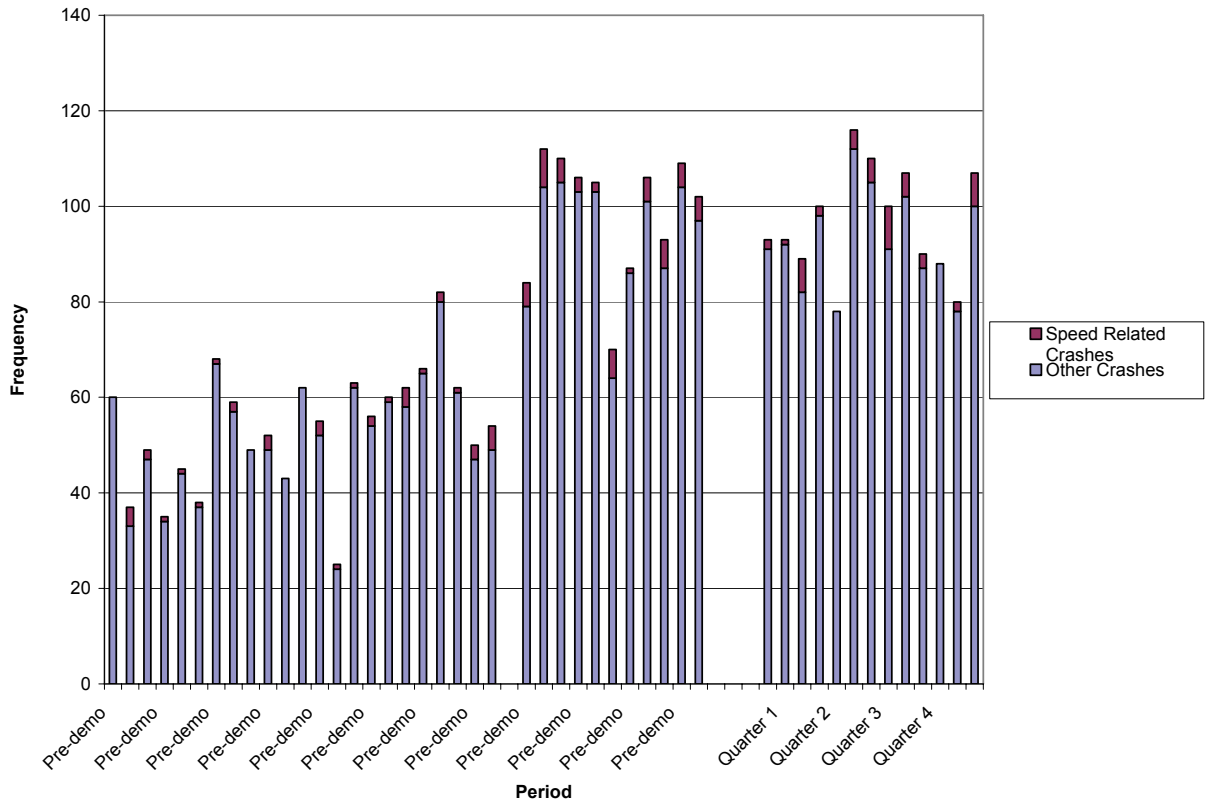


Figure 10. Monthly crashes by type; demonstration community

Often, what appears to be a change in the monthly number of crashes is the result of a change in the crash reporting system, but there was no indication from MDOT of any such change. However, our interpretation of monthly crash occurrences attempted to account for that possibility by dividing the data into three periods: predemonstration years 1 and 2, predemonstration year 3, and demonstration.

3.2.2 Comparison Community - MS 302 Crashes

Although the number of demonstration period speed-related crashes changed little from the two-year predemonstration period average, there was an increasing trend in total crashes. The number of speed-related crashes during the demonstration year was slightly lower than the preceding year but slightly higher than the year before that. The total number of crashes of all types increased monotonically over the three year period for which data were available. A summary of total and average monthly frequencies of crashes for the entire road segment in the comparison community is shown in Appendix A, Table A6. The number of demonstration period speed-related crashes for each year is shown in Figure 11.

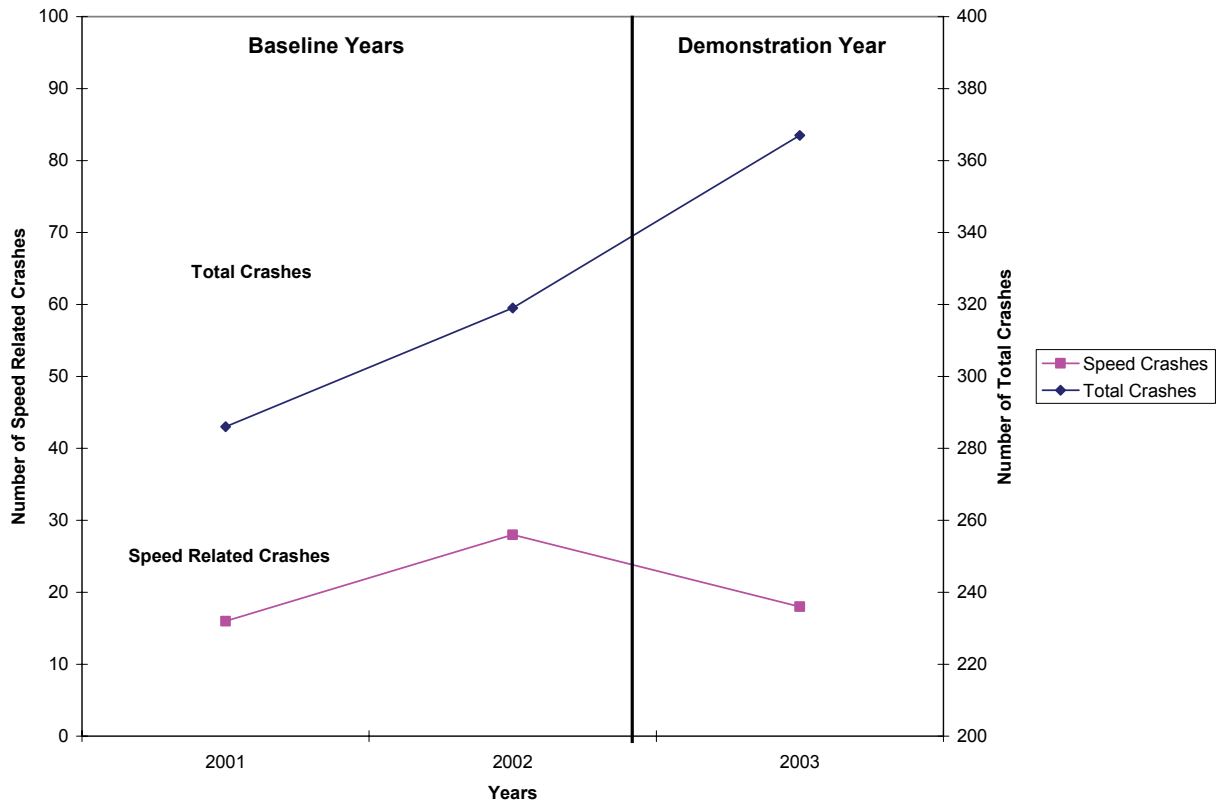


Figure 11. Annual crashes by type; comparison community

Although the average monthly number of non-speed-related crashes increased more than one-fourth during the demonstration period, the average monthly number of speed-related crashes declined slightly during that period. On average, there were 25 crashes of all kinds per month prior to the demonstration, increasing to 31 per month during the demonstration. However, speed related crashes decreased from 1.8 per month before the demonstration to 1.5 per month during the demonstration period. The monthly crash frequencies in the comparison community varied from less than 15 to more than 45, although speed-related crashes never exceeded 5 in any month. The average monthly frequency of crashes was about 25% higher during the demonstration period than during the prior 24 months. A summary of average monthly frequencies of crashes for the entire road segment is shown in Appendix A, Table A6. Figure 12 shows the monthly frequencies of speed-related and other crash types in the comparison community.

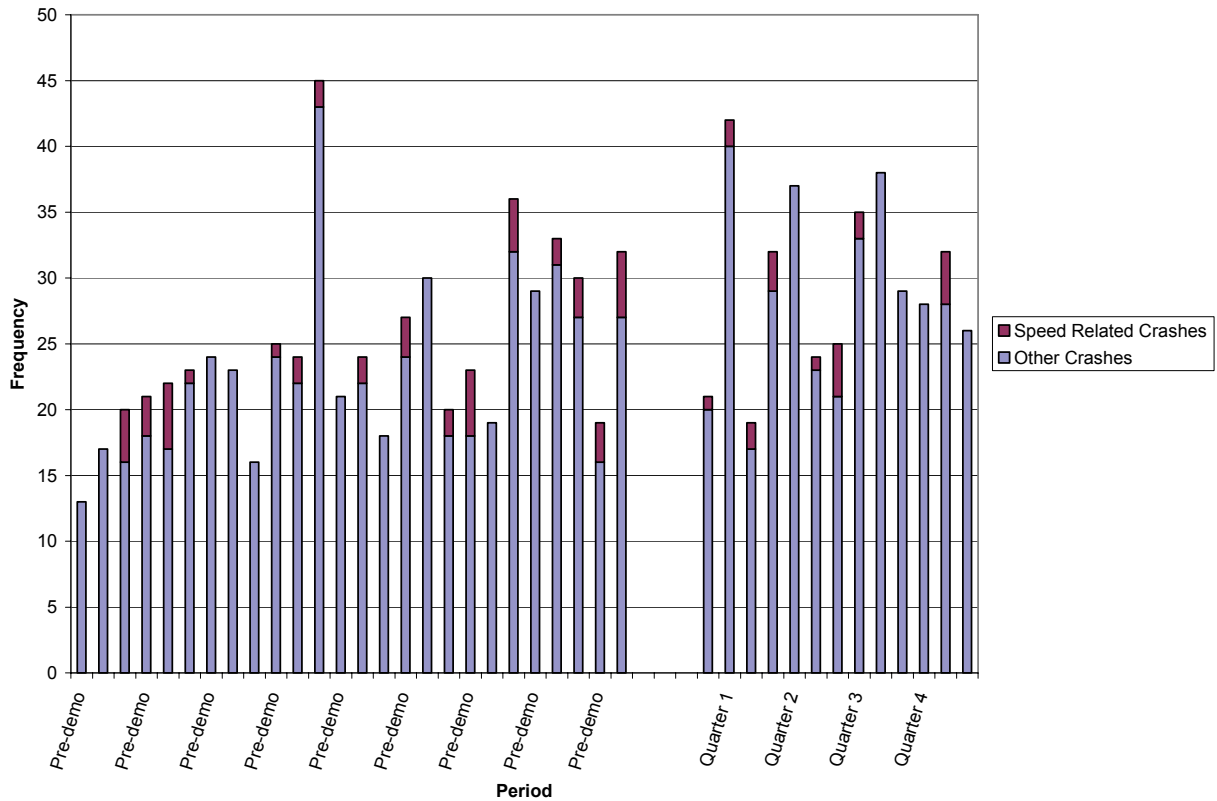


Figure 12. Monthly crashes by type; comparison community

The monthly numbers of speed related and other crashes in the comparison community suggest that while total crashes had an increasing trend, there was no growth in speed-related crashes. Considered in conjunction with the demonstration community findings, which did show growth in speed-related crashes, the monthly frequency for speed-related crashes in the demonstration community may have actually increased when compared to both the prior two-year and three-year periods. The availability of only two years of predemonstration period data at the comparison site limited the assessment of the extent to which the change in crashes over time on the comparison road could explain the change in crashes on the demonstration road.

3.3 Citations

3.3.1 Demonstration Community - US 49 Citations

The average monthly number of speeding citations issued during the demonstration period increased substantially compared with the predemonstration period. Speed limit violations constituted 32% of all moving citations issued prior to the demonstration and increased to 42% during the demonstration. During the 35 months for which citation data were available prior to the demonstration, police issued an average of 89 speeding citations per month. However, the monthly average increased by 65% to 146 speeding citations per month during the demonstration period. Considerably more citations were written during the first and third quarters of the

demonstration period than during other quarters in zones 2-5. Although the monthly average of all moving violations increased by just a very small amount, the proportion of speed-related citations grew by about one-third. This indicates that the Gulfport Police Department focused much more attention on speed limit enforcement during the demonstration period. The monthly average frequencies for speeding and other citations in the demonstration community are shown in Figures 13a through 13e. Appendix A, Table A7 presents a summary of the volume of speeding and other citations issued in the demonstration community.

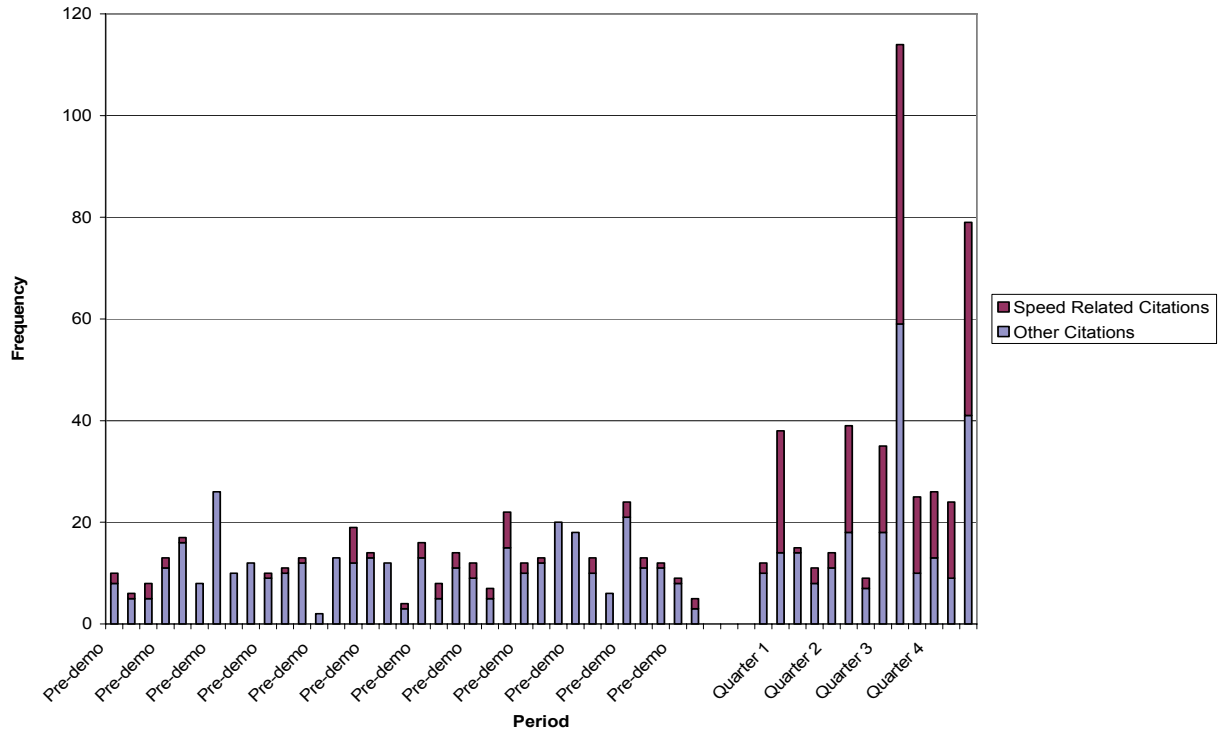


Figure 13a. Monthly citations by type, zone 1; demonstration community

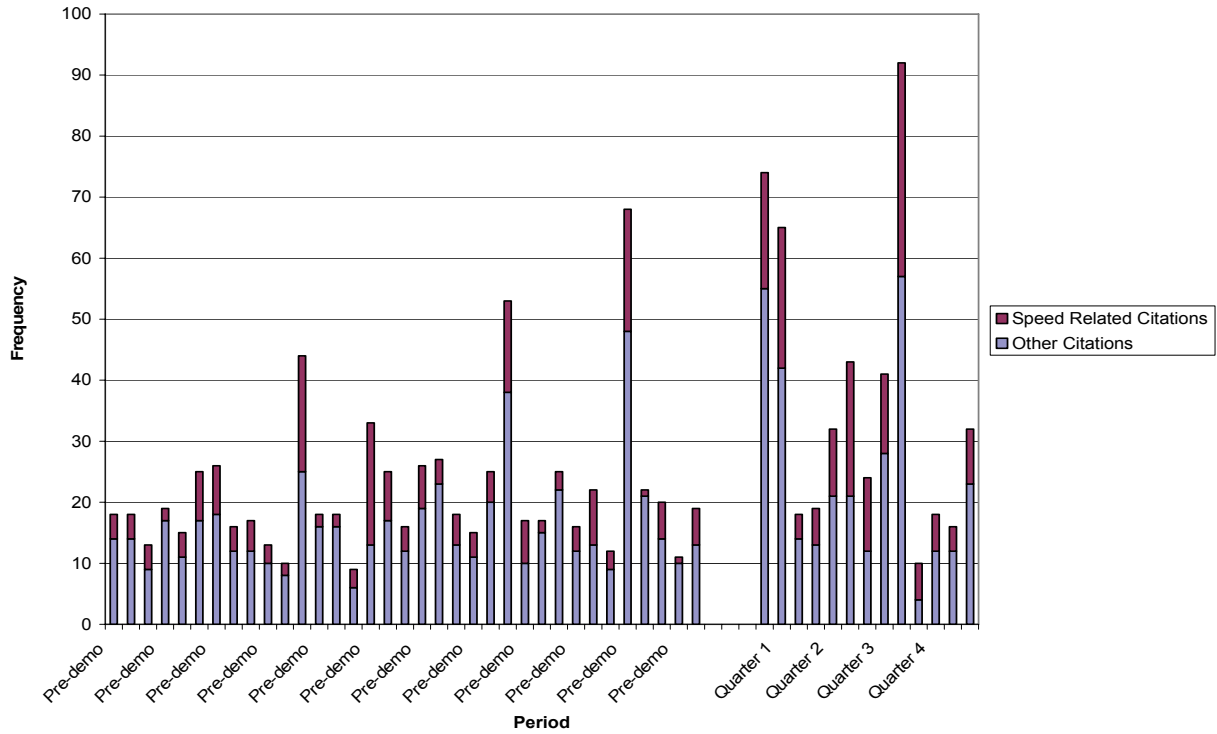


Figure 13b. Monthly citations by type, zone 2; demonstration community

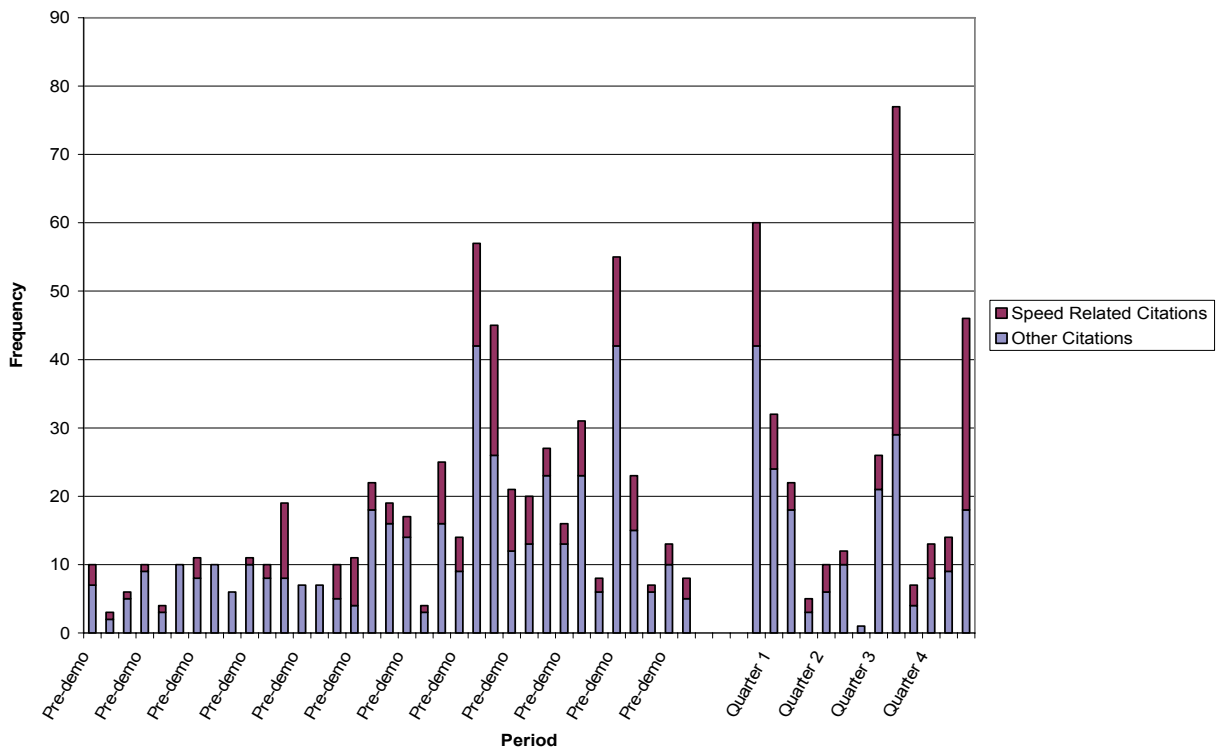


Figure 13c. Monthly citations by type, zone 3; demonstration community

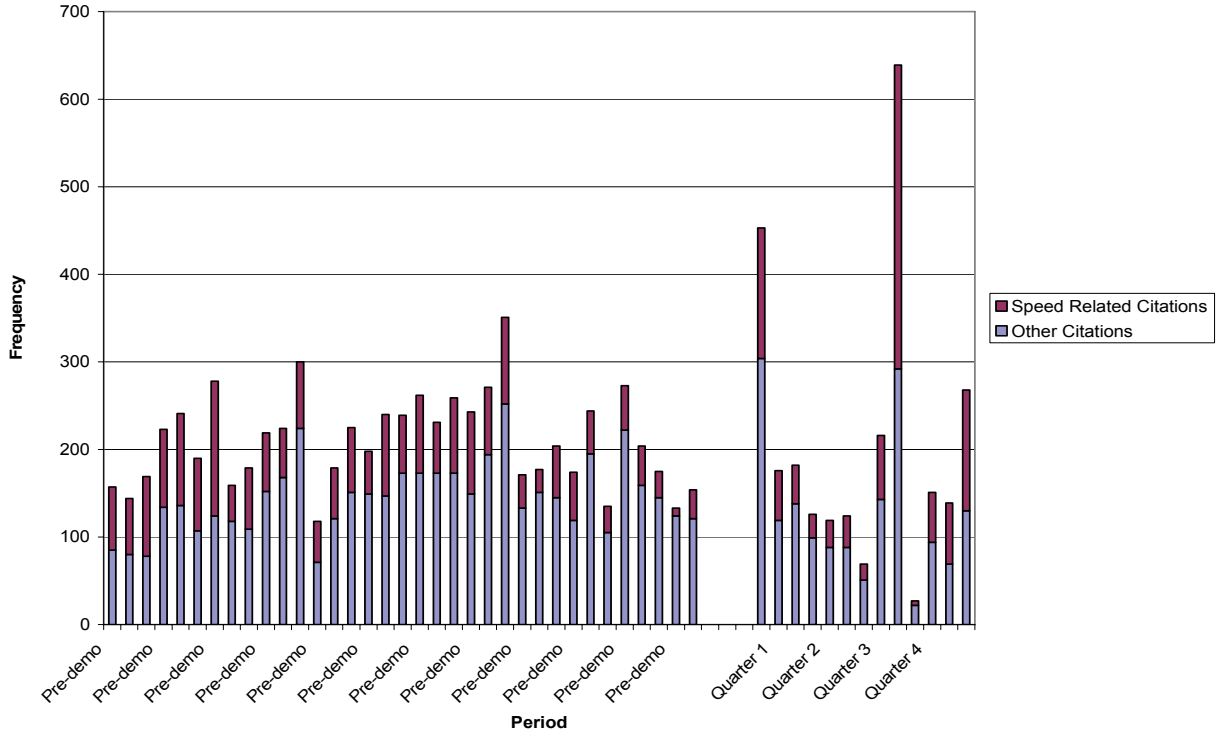


Figure 13d. Monthly citations by type, zone 4; demonstration community

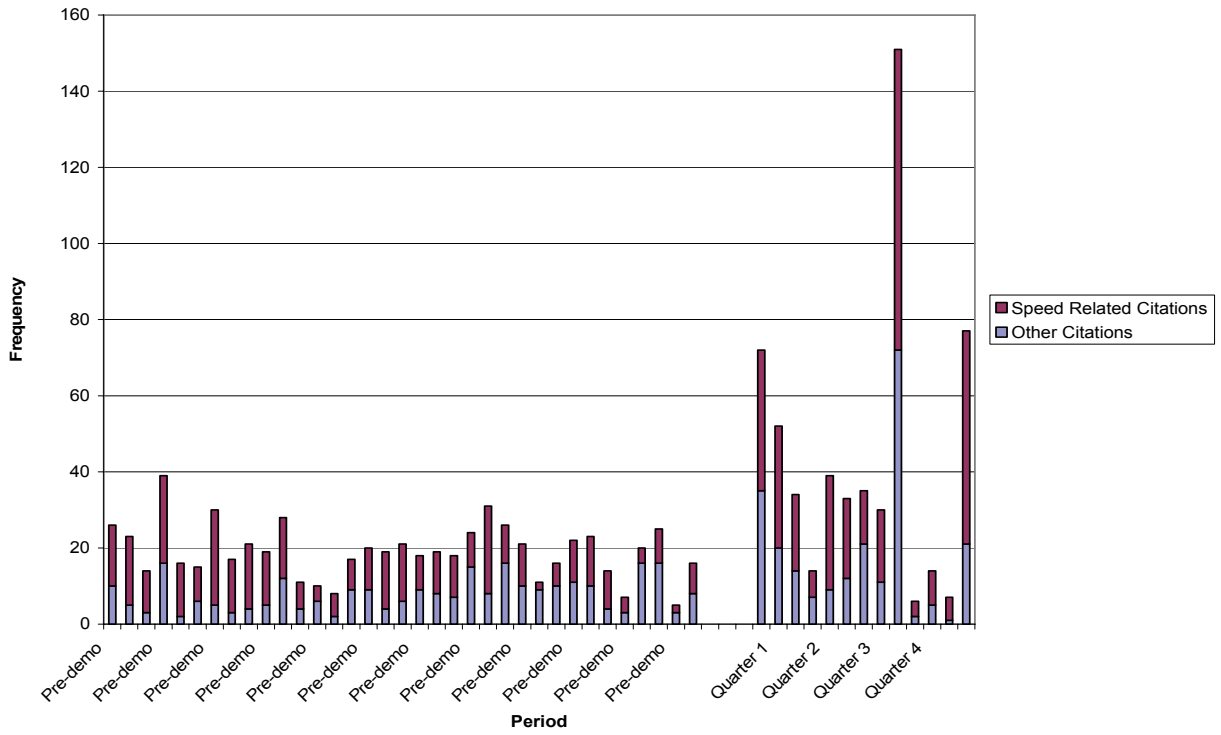


Figure 13e. Monthly citations by type, zone 5; demonstration community

3.3.2 Comparison Community - MS 302 Citations

There was little change in the ratio of speeding citations to all citations, however, the average monthly number of citations doubled during the demonstration period. Despite the agreement with the comparison community that the enforcement level during the demonstration period was to remain the same as it was prior to the demonstration, traffic enforcement increased substantially, especially during quarters 2, 3, and 4. Fortunately, the overall level of enforcement in comparison community was just one-tenth the level in demonstration community, thus the increased enforcement level probably had little impact on speeds. Speed limit violations constituted 30% of all moving citations issued prior to the demonstration and increased to 36% during the demonstration. Compared with the 27 months for which citation data were available prior to the demonstration, the average monthly number of speeding citations nearly tripled during the demonstration period and the average monthly number of other citations more than doubled. Monthly citations by type and speed zone are shown in Figures 14a and 14b. Appendix A, Table A7, shows the numbers of speeding and other citations issued in the comparison community.

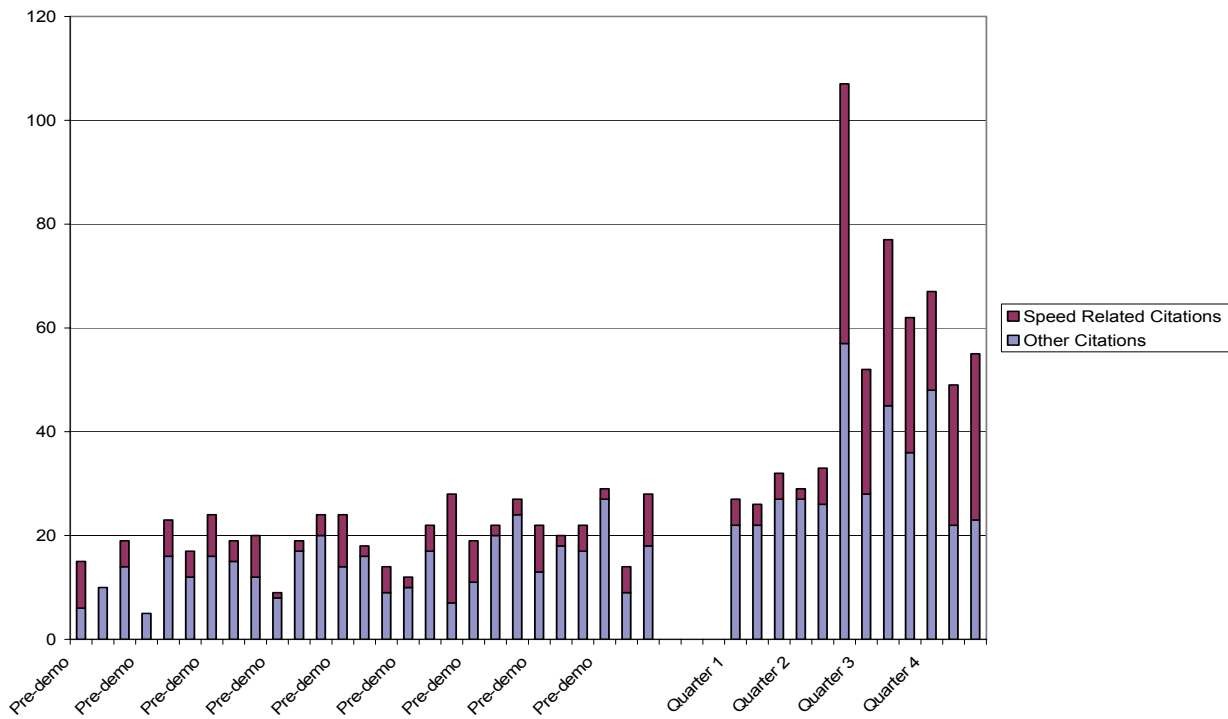


Figure 14a. Monthly citations by type, zone 1; comparison community

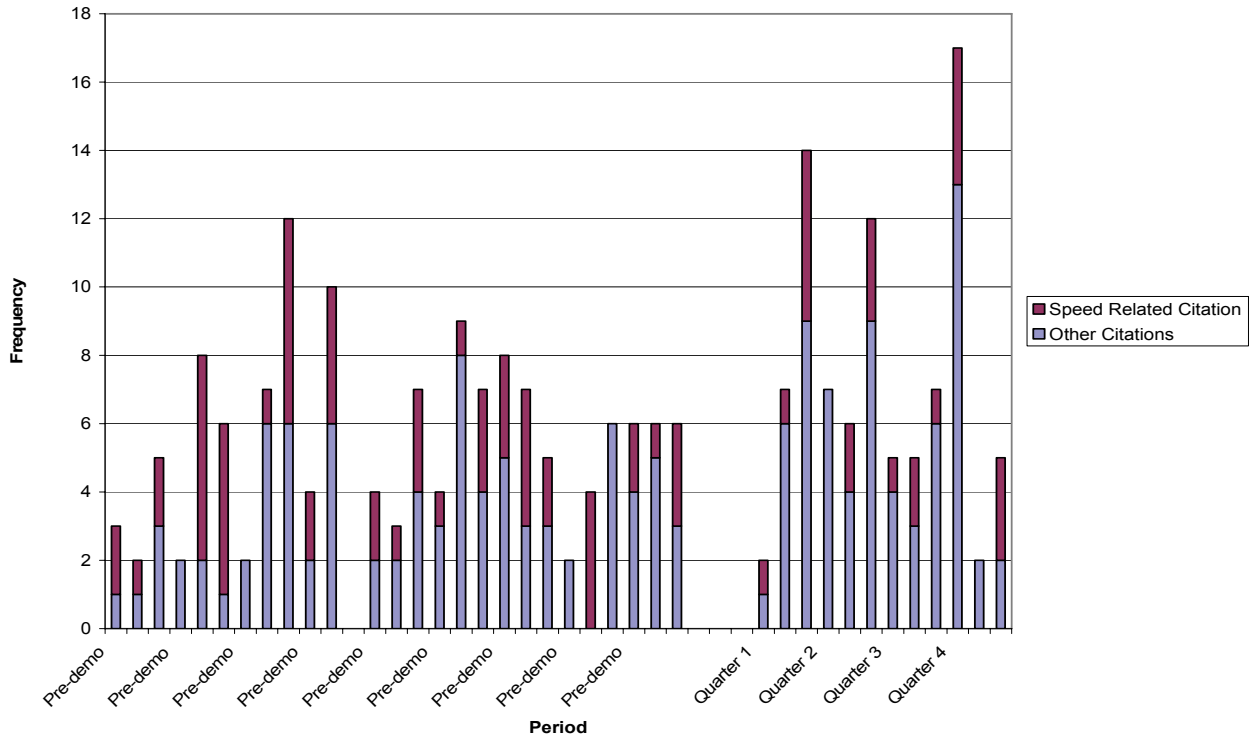


Figure 14b. Monthly citations by type, zone 2; comparison community

3.4 Public Information and Education

There are no findings to report on the process of the PI&E campaign because no information was made available on this. MDOT provided few details of the relatively modest PI&E program conducted during the demonstration period. No data were provided on the number of media events, news articles, or paid and earned media events associated with the demonstration program.

3.5 Public Knowledge and Attitudes

MDOT collected public knowledge and attitudes data in the demonstration community during both the predemonstration and demonstration periods, and in the comparison community during the predemonstration period. However, insufficient data were collected in the comparison community during the demonstration period. The principal findings were that drivers in the demonstration community became more aware of traffic enforcement and believed that the likelihood of getting a speeding ticket increased during the demonstration period. Drivers also felt that the “safe and appropriate” speed limit for the test road was higher during the demonstration period. Small respondent sample sizes for both the demonstration and comparison communities limit the reliability of the findings. The results of the survey are summarized in Appendix A, Table A8.

3.5.1 Demonstration Community - US 49 Public Knowledge and Attitudes

Speed Awareness

The posted speed limit along US 49 varied during the predemonstration period from 35 mph in the heavily-commercial areas to 55 mph in the less heavily-developed and more rural areas. The new speed limits ranged from 35 mph in the commercial areas to 60 mph in the more rural areas. Responses to the speed limit and speed choice questions indicate that most respondents traveled 5 to 10 mph over the speed limit and believed that the speed limit should be 5 to 10 mph higher. Findings include:

- **Posted Speed Limit:** After speed limits were raised, fewer respondents believed the speed limit was in the lower range and many more indicated a higher posted speed limit. Although the southernmost 1.25 miles (downtown section) of the demonstration roadway was posted at 35 mph, no respondents believed that the speed limit was less than 45 mph prior to the demonstration period. Thirty-eight percent of respondents thought that the posted speed limit was 55 mph or greater during the demonstration compared to just 2% prior to raising the speed limits.
- **Safe and Appropriate Travel Speed:** During the demonstration period, an upward shift occurred in response to what a safe and appropriate speed for that road should be. Prior to raising the speed limits, just 2% of respondents believed that the travel speed should be less than 45 mph, and more than half felt the appropriate speed should be at least 50 mph. After speed limits were raised, about one-third of respondents stated that the speed limit should be 60, 65, or 70 mph compared with just 1% prior to the demonstration. This suggests that when speed limits are raised, drivers accommodate to the raised speed limits and may think they should be even higher.
- **Self Reported Travel Speed:** The distribution of stated average speeds shifted during the demonstration period toward higher speeds. Just 7% of respondents said they traveled at speeds of at least 55 mph prior to the demonstration period. After speed limits were raised, almost half said they traveled at 55 mph or more.

Enforcement Awareness

The survey indicated that awareness of heavy police enforcement substantially increased during the demonstration period. The proportion of respondents who said that they "always" see law enforcement along US 49 nearly tripled to 68 percent, while the percentage who said law enforcement was present only some of the time was reduced by about two-thirds. Similarly, the proportion who thought that enforcement had increased during the past six months also tripled to 36 percent. The proportion who thought that speeding might cause them to get a ticket "always" increased to 8% from none prior to the demonstration, and fewer thought that they would "rarely" get a ticket. Many more thought the chance of getting a speeding ticket had increased compared with six months ago.

3.5.2 Comparison Community - MS 302 Public Knowledge and Attitudes

Results are reported for only the predemonstration period in the comparison community because an insufficient number of responses were obtained for the demonstration period.

Speed Awareness

The posted speed limits along MS 302 were 45 mph in the western, more heavily traveled commercial segment and 55 mph in the eastern, more residential and rural segment.

- **Posted Speed Limit:** Although a small proportion of respondents said that the speed limit should be 5 to 10 mph lower than what was posted, most felt that an appropriate speed limit would be about the same as the current posted speed limit. Sixty-one percent of the respondents indicated the legal speed limit was 45 mph, while 26% thought it was 50 or 55 mph.
- **Safe and Appropriate Travel Speed:** Forty-five percent of the respondents felt that 45 mph was an appropriate speed for that road, while a total of 40% felt a more appropriate speed for Goodman Road was 50 or 55 mph. Three percent of those surveyed felt a more appropriate speed limit would be 60 mph or above. Thirteen percent of respondents felt that the speed limit should be lower, at 35 or 40 mph.
- **Self Reported Travel Speed:** The less urban nature of the Southaven road segment, compared to Gulfport, was reflected in the respondent's stated travel speed. Twenty-nine percent admitted to traveling at speeds between 45 and 50 mph, 26% traveled at speeds between 50 and 55 mph, and approximately 15% traveled at speeds above 55 mph.

Enforcement Awareness

Before the demonstration began, a higher percentage of respondents in Southaven (42%) believed that traffic enforcement was always present than did respondents in Gulfport (25%). Although a higher proportion of comparison community respondents stated that the presence of law enforcement had gone up in the past six months, far fewer felt that they might get a ticket for speeding, compared to respondents in the demonstration community. Although a third of Southaven respondents indicated that the enforcement had increased, when asked how often their speeding might cause them to get a ticket, only 20% said "always."

3.6 Enforcement Activity – Demonstration Community

Through MDOT, the Gulfport Police Department provided monthly hours of patrol activity and citations issued on US 49 during the demonstration period. On average, approximately 190 hours of patrol hours were expended each month. Patrol hours were substantially lower, at an average of approximately 140 patrol hours per month, during the first seven months of the demonstration (December 2001 to July 2002), while the hours nearly tripled to almost 380 hours per month during August and September 2003. The intensive patrol activity during August and September

coincides with the relatively large number of citations issued during that period in the demonstration community. Figure 15 illustrates the patrol hours of activity during the demonstration period.

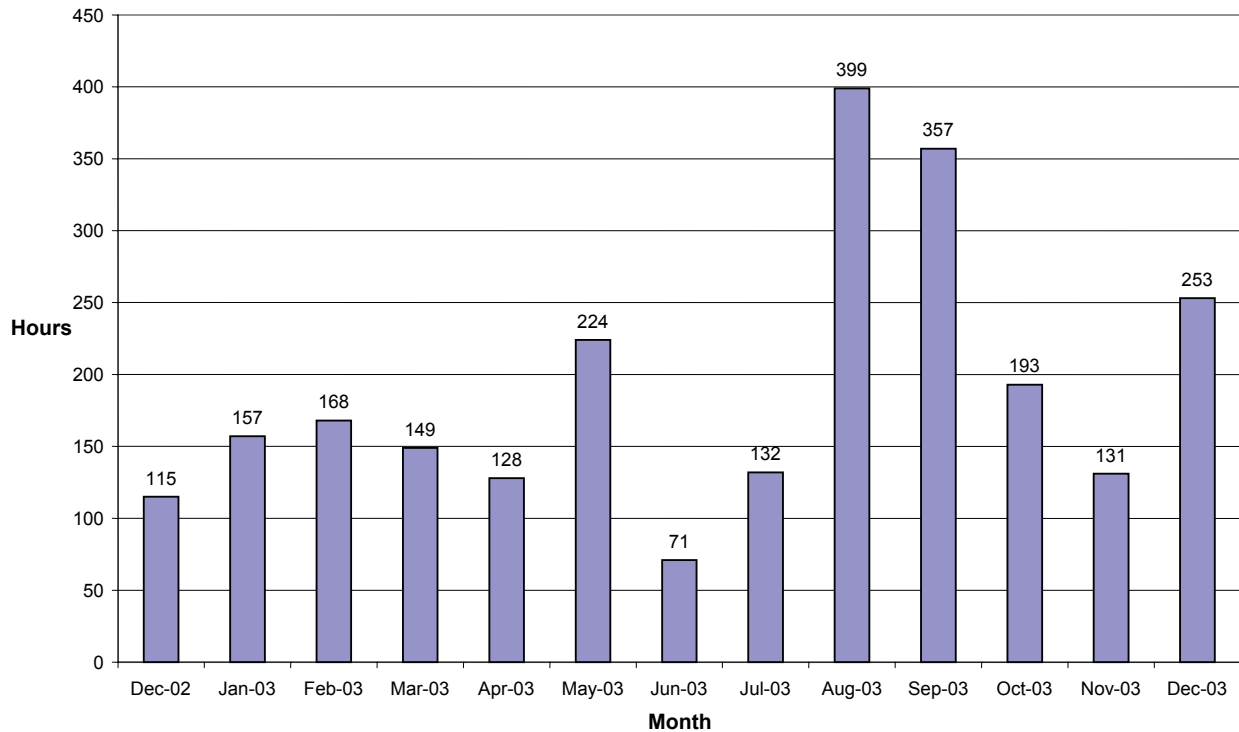


Figure 15. Patrol hours of enforcement on US 49 in the demonstration community during demonstration period

3.7 Traffic Volume

Traffic volume was measured along with the quarterly speed measurements in both the demonstration and comparison communities. NC-97 Hi-Star traffic counters were used to count the number of vehicles in each lane at each measurement site during a 24-hour period each quarter.

Examining the traffic volume of both the demonstration and comparison community sites revealed some quarter-to-quarter variation but little overall change in throughput over five quarters at most sites. Daily traffic volumes at demonstration sites ranged from about 20,000 to more than 50,000 vehicles, while the comparison community volumes ranged from about 30,000 to more than 40,000 vehicles per day. Fourth-quarter demonstration community volumes were higher at three measurement sites, lower at two sites, and unchanged at one site. Comparison community traffic volumes were lower in the fourth-quarter measurement than the predemonstration period measurement at five of six sites. Availability of only one quarter of predemonstration traffic volume data precluded analysis of seasonal variations and limited the

assessment of volume changes associated with changes in speed limits. Twenty-four-hour traffic volumes from each study period are shown for demonstration and comparison community sites in Figures 16 and 17 and listed in Appendix A, Table A9.

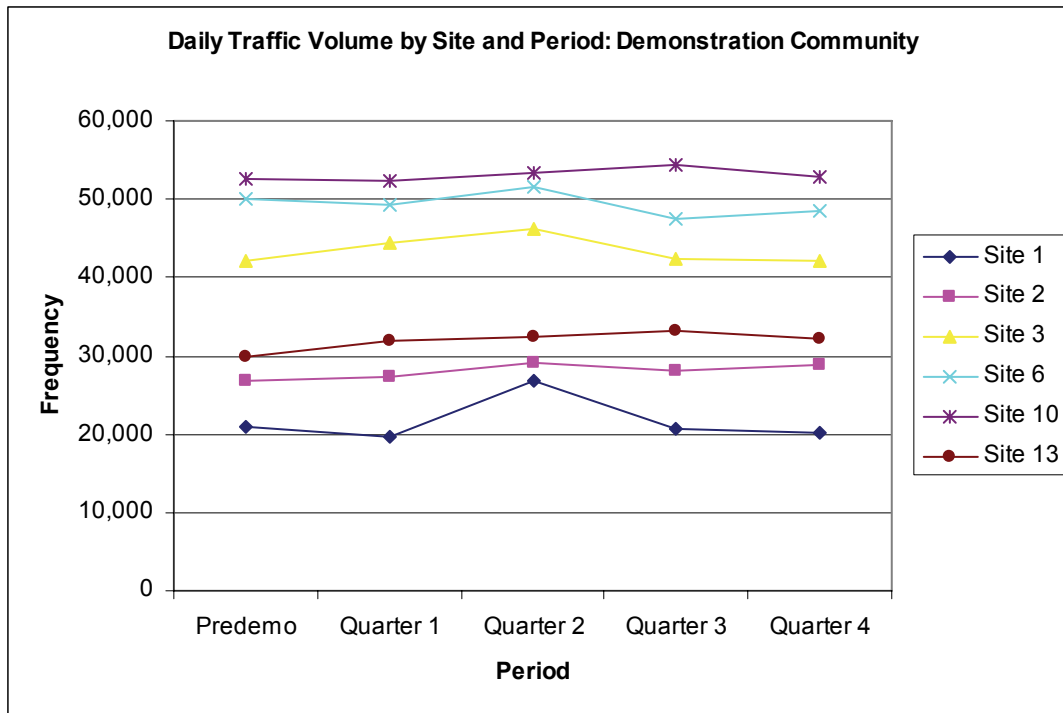


Figure 16. Daily traffic volume at demonstration community measurement sites

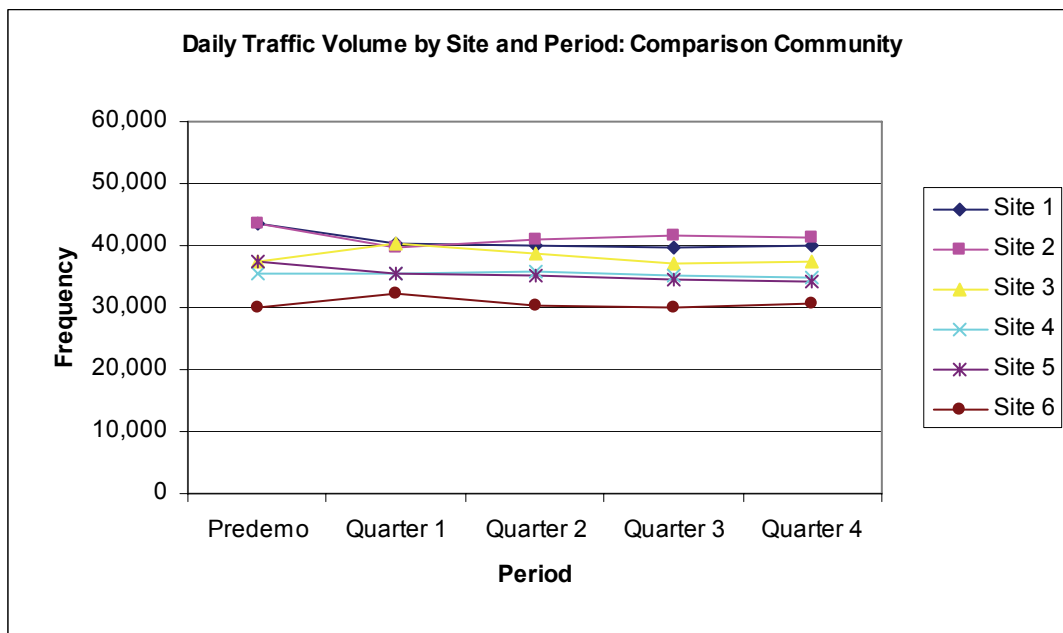


Figure 17. Daily traffic volume at comparison community measurement sites

4 Findings

The overall objective of conducting these tests was to determine whether speed limits set according to the rational speed limits method and combined with well-publicized and targeted enforcement, result in greater compliance, more uniform speeds, and improved safety. Principal findings regarding the independent variables of speed limit change, citations, and public awareness, and the dependent variables associated with speeds and crashes, are described below.

4.1 Findings

Demonstration Community -- Gulfport, Mississippi

- Citations
 - The demonstration community's endorsement of stricter enforcement of the speed limits resulted in a sharp increase in speeding citations during the demonstration, as evidenced by the 64% increase in the average monthly number of speeding citations.
- Public Awareness
 - Public awareness of both the raised speed limits and the heightened enforcement increased during the demonstration. The proportion of drivers who said they always see enforcement went from 25% prior to the demonstration to 68% during the demonstration. More people felt that speeding might always or sometimes cause them to be stopped or ticketed during the demonstration (40%) than prior to it (27%).
- Speeds
 - Mean and 85th percentile speeds on the test road in the demonstration community increased slightly (1 to 2 mph) after speed limits were raised. While this was statistically significant because of the large number of sample measurements, it is of no practical significance.
 - Even though enforcement increased and the threshold for ticketing was reduced during the demonstration period, 23 to 51% of traffic continued to exceed the revised speed limits. Nevertheless, this did represent an improvement over the predemonstration period when 55 to 92% of vehicles exceeded the speed limit.
 - The proportion of vehicles exceeding the speed limit by more than 10 mph (at sites where the speed limit was changed) decreased from a range of 8.1 to 38.3% before the demonstration period to a range of 3.4 to 6.9% averaged across four calendar quarters during the demonstration. The variation of these proportions across demonstration period quarters at each site was small.

- Speed variability, as measured by the SD, ranged from 6.5 mph to 11.5 mph at the six sites during the predemonstration period. Variability increased to a range of 7.9 to 12.2 mph averaged across the four quarterly measurements at each site during the demonstration. This represented an increase of 1 to 3 mph at four sites and a change of less than 1 mph at two sites. Standard deviation expressed as a percentage of the mean, which is the CV, increased at four of six sites and decreased at one site, with the proportional change in CV about the same as the proportional change in SD.
- Crashes
 - Comparing the number of crashes during the one-year demonstration period to just the year prior to the demonstration, both the average number of speed-related crashes per month and average number of crashes of all types per month decreased.
 - However, when the number of crashes during the one-year demonstration period is compared to the prior three years, both the average number of speed-related crashes per month and average number of crashes of all types per month increased following the increase in speed limits.
- Traffic Volume
 - Demonstration community sites revealed quarter-to-quarter variation in traffic volume but little overall change in volume over five quarters at most sites.

Comparison Community (Southaven, Mississippi)

- Citations
 - There was an increase in the number of citations issued by the Southaven Police Department during the demonstration period. However, the increase was due to an intensified local traffic law enforcement campaign about midway through the demonstration period. This was contrary to MDOT's understanding with Southaven that the enforcement level would not change during the demonstration period.
- Public Awareness
 - Forty-two percent of drivers in the control community claimed to always see enforcement along the comparison roadway prior to the raising of speed limits in the demonstration community. This level is 17 percentage points higher than was observed in the demonstration community and suggests a higher initial level of enforcement. During the same (predemonstration) period, 54% felt that speeding might sometimes or always cause them to be stopped or ticketed. Although MDOT had planned to measure public awareness in the comparison community

during the demonstration period, there were data from only a few interviews, which were not sufficient for analysis.

- Speeds
 - Mean and 85th percentile speeds on the control road in Southaven did not change substantially during the period of time corresponding to the predemonstration period or demonstration period in Gulfport.
 - There was little change in the proportion of vehicles exceeding the speed limit by more than 10 mph (range from 0.6 to 23.1% prior to the demonstration to 1.1 to 27.8% in the period corresponding to the demonstration period).
 - Speed variance as measured by the SD was unchanged (i.e., increased less than 1 mph) from the period corresponding to the predemonstration to the period corresponding to the demonstration at three measurement sites, and increased slightly (1 to 2 mph) at three of the six measurement sites. Coefficient of variation increased at four of six sites and was unchanged at two sites.
- Crashes
 - The average number of crashes of all types per month was higher during the period corresponding to the demonstration than during the predemonstration period. However, the average number of speed-related crashes per month actually declined slightly in the demonstration year from the previous year.
- Traffic Volume
 - Comparison community sites revealed quarter-to-quarter variation in traffic volume and a possible reduction in volume over five quarters at most sites.

4.2 Findings Summary

Conclusions regarding the impact of rational speed limits will be withheld until data from all of the seven test communities have been analyzed. Presented below is a summary of findings from the present study.

- Although a small proportion of drivers continued to violate the rational limits by more than 10 mph after the rational limits were implemented, the number of such speed violations was reduced by three quarters. Thus, rational limits resulted in better compliance with the law.
- Small increases observed in both mean and 85th percentile speeds in the demonstration community, but not in the comparison community, suggest that

implementing rational speed limits may not lead to increases all the way up to the newer raised limits, but that some increases in speeds are to be anticipated.

- The small increases observed at 4 of 6 measurement locations in the SD (1 to 3 mph) and CV (1 to 8 percentage points) of speeds in the demonstration community suggest that raising the speed limit, even with strict enforcement, may not result in decreased speed variation.
- A reduction in the proportion of extreme speeders (95th percentile) was observed only on the road segment where the limit was increased the most (+15mph).
- The reasons the proportion of extreme speeders did not decline on the roadways where limits were increased less are not clear.
- The average monthly frequency of crashes in the demonstration community was lower during the demonstration year when compared to crashes in just the year immediately preceding the demonstration. However, the average monthly frequency of crashes was higher in the demonstration year than it was in the *three*-year period preceding the demonstration year. Similar changes were observed in the comparison community where the speed limits were not changed. The availability of only two years of predemonstration period data at the comparison site limited the assessment of the extent to which the change in crashes over time on the comparison road could explain the change in crashes on the demonstration road.
- The effects on crash severity are unknown as measures of severity were not consistently available on police reports from either the demonstration or comparison community.

Further studies (currently ongoing in six other communities) are required to determine the full impact of rational speed limits.

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Appendix A

Tables of speed distribution, crashes, citations, and public awareness in demonstration and comparison community

Table A1. Mean and 85th Percentile Speeds on US 49 – Demonstration Community (mph)

Site Number	Predemonstration Period			Revised Speed Limit	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	Original Speed Limit	Mean Speed (SD)	85 th percentile Speed		Mean Speed (SD)	85 th percentile Speed	Mean Speed (SD)	85 th percentile Speed	Mean Speed (SD)	85 th percentile Speed	Mean Speed (SD)	85 th percentile Speed
1*	35	33(7.6)	41	35	35(9.4)	43	36(8.8)	44	35(8.8)	42	32(8.6)	40
2	35	38(6.5)	44	40	40(10.0)	46	37(7.8)	44	39(6.5)	45	40(7.4)	46
3	35	44(7.7)	51	45	46(8.3)	53	44(7.5)	50	45(8.5)	52	45(8.4)	53
6	35	44(8.9)	51	50	46(11.6)	54	46(13.1)	56	46(11.5)	54	46(12.6)	56
10	45	46(8.2)	54	50	46(9.0)	53	47(9.9)	56	46(9.4)	54	46(8.9)	53
13	55	54(11.5)	64	60	58(11.1)	66	58(10.8)	66	56(10.6)	65	57(10.9)	65

Note: Speeds were measured a subset of six of the original 14 sites each quarter after the revised speed limits were determined. These six sites provided representative speed data for travel in each of the five new speed zones.

Table A2. Coefficient of Variation of Speeds at Demonstration and Comparison Sites

Demonstration Community						
Site Number	Original Speed Limit	Pre-demo	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		CV	CV	CV	CV	CV
1*	35	0.230	0.269	0.244	0.251	0.269
2	35	0.171	0.250	0.211	0.167	0.185
3	35	0.175	0.180	0.170	0.189	0.187
6	35	0.202	0.252	0.285	0.250	0.274
10	45	0.178	0.196	0.211	0.204	0.193
13	55	0.213	0.191	0.186	0.189	0.191
Comparison Community						
Site Number	Speed Limit	Pre-demo	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		CV	CV	CV	CV	CV
1*	45	0.195	0.236	0.212	0.219	0.214
2	45	0.155	0.194	0.177	0.167	0.169
3	45	0.188	0.192	0.237	0.217	0.183
6	45	0.119	0.137	0.155	0.159	0.147
10	55	0.125	0.121	0.125	0.130	0.129
13	55	0.124	0.125	0.131	0.124	0.123

Table A3. Percentage of Vehicles Traveling Over the Posted Speed Limit by Site and Period; Demonstration Community						
Site Number	Site 1*	Site 2	Site 3	Site 6	Site 10	Site 13
Predemonstration						
Speed Limit	35	35	35	35	45	55
≥ Posted Speed	40.0	69.2	91.6	85.5	60.1	54.6
>5 MPH Over	12.4	28.0	68.1	65.6	24.6	25.4
>10 MPH Over	3.7	8.1	35.7	38.3	8.2	8.5
>15 MPH Over	1.2	2.1	12.9	15.1	2.4	2.2
>20 MPH Over	0.5	0.6	4.1	4.9	0.9	0.4
>25 MPH Over	0.3	0.3	1.5	1.6	0.3	0.0
Demonstration						
Adjusted Speed Limit	35	40	45	50	50	60
Quarter 1						
≥ Posted Speed	45.7	39.0	50.8	28.3	26.2	46.6
>5 MPH Over	19.5	14.9	18.0	10.9	7.3	16.8
>10 MPH Over	8.1	8.2	6.2	5.7	2.5	6.3
>15 MPH Over	3.7	5.4	2.2	3.7	1.2	2.7
>20 MPH Over	1.7	3.9	1.0	2.6	0.8	1.4
>25 MPH Over	1.1	2.8	0.6	2.0	0.5	0.9
Quarter 2						
≥ Posted Speed	60.0	25.8	41.9	30.6	34.1	46.4
>5 MPH Over	26.3	6.0	11.8	14.7	13.4	16.8
>10 MPH Over	8.9	1.8	3.6	9.0	5.5	5.8
>15 MPH Over	3.0	0.7	1.2	6.0	2.3	2.4
>20 MPH Over	1.4	0.4	0.6	4.2	1.1	1.2
>25 MPH Over	0.8	0.3	0.4	3.1	0.6	0.6
Quarter 3						
≥ Posted Speed	45.4	39.2	47.8	29.6	28.6	40.0
>5 MPH Over	17.0	9.4	18.1	11.4	10.0	13.4
>10 MPH Over	6.4	2.4	6.7	5.8	3.6	4.5
>15 MPH Over	2.6	0.8	2.5	3.5	1.6	1.7
>20 MPH Over	1.1	0.4	1.1	2.4	0.9	0.9
>25 MPH Over	0.6	0.2	0.7	1.8	0.6	0.6
Quarter 4						
≥ Posted Speed	32.5	46.4	48.2	31.0	23.4	41.3
>5 MPH Over	9.8	15.6	17.4	14.2	5.9	14.0
>10 MPH Over	2.9	4.8	6.3	7.2	2.1	4.9
>15 MPH Over	1.2	1.6	2.3	3.9	1.0	2.0
>20 MPH Over	0.6	0.6	1.0	2.4	0.7	1.1
>25 MPH Over	0.5	0.4	0.6	1.6	0.5	0.7

* Speed limit not changed

Table A4. Mean and 85th Percentile Speeds on MS 302; Comparison Community (mph)

Site Number	Predemonstration Period		Quarter 1		Quarter 2		Quarter 3		Quarter 4		
	Speed Limit	Mean Speed (SD)	85 th percentile Speed	Mean Speed (SD)	85 th percentile Speed	Mean Speed (SD)	85 th percentile Speed	Mean Speed (SD)	85 th percentile Speed	Speed (Std Dev)	85 th percentile Speed
1	45	36(8.6)	44	35(10.4)	44	35(9.1)	43	35(9.4)	43	34(9.2)	43
2	45	42(7.6)	49	40(9.5)	49	40(8.5)	48	41(8.0)	48	41(8.3)	49
3	45	43(9.6)	51	45(10.0)	52	40(12.1)	51	43(11.3)	52	44(9.5)	52
4	45	51(6.9)	58	55(8.5)	62	51(9.0)	58	51(9.2)	58	51(8.5)	58
5	55	54(7.5)	60	54(7.4)	61	54(7.5)	60	55(7.9)	61	55(8.0)	62
6	55	55(7.7)	62	55(7.6)	61	54(8.0)	61	55(7.7)	62	56(7.6)	62

Table A5. Percentage of Vehicles Traveling Over the Posted Speed Limit by Site and Period; Comparison Community						
Site Number	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Speed Limit	45	45	45	45	55	55
Predemonstration						
≥ Posted Speed	7.05	27.19	37.37	90.54	45.09	56.31
>5 MPH Over	1.59	6.52	14.03	58.5	11.98	18.7
>10 MPH Over	0.61	1.72	5.44	23.1	2.7	4.61
>15 MPH Over	0.31	0.57	2.13	5.99	0.54	0.95
>20 MPH Over	0.18	0.26	0.85	1.4	0.1	0.15
>25 MPH Over	0.11	0.11	0.31	0.35	0	0
Period Equivalent to Demonstration						
Quarter 1						
≥ Posted Speed	8.11	22.26	40.39	94.11	47.77	53.76
>5 MPH Over	3.04	6.37	14.87	74.02	13.09	15.91
>10 MPH Over	1.77	2.16	6.31	43.08	3.43	4.6
>15 MPH Over	0.86	1.05	3	18.5	1.15	1.58
>20 MPH Over	0.6	0.68	1.71	6.84	0.54	0.72
>25 MPH Over	0.49	0.52	1.16	2.72	0.33	0.44
Quarter 2						
≥ Posted Speed	7.22	19.75	31.3	85.18	44.65	48.48
>5 MPH Over	2.05	4.77	14.41	52.05	12.18	14.63
>10 MPH Over	0.99	1.44	7.1	22.14	3.28	4.36
>15 MPH Over	0.58	0.62	3.86	7.96	1.11	1.67
>20 MPH Over	0.4	0.41	2.22	3.3	0.55	0.77
>25 MPH Over	0.29	0.26	1.32	1.82	0.31	0.45
Quarter 3						
≥ Posted Speed	6.68	22.84	37.25	85.41	51.91	58.2
>5 MPH Over	1.81	5.71	15.8	53.87	15.56	20.16
>10 MPH Over	0.91	1.93	7.24	23.77	4.49	5.99
>15 MPH Over	0.62	0.92	3.64	9.04	1.5	1.9
>20 MPH Over	0.44	0.57	1.97	3.74	0.69	0.76
>25 MPH Over	0.34	0.42	1.17	1.87	0.41	0.34
Quarter 4						
≥ Posted Speed	5.96	22.61	37.97	86.71	53.73	58.25
>5 MPH Over	1.63	6.02	13.37	52.37	18.27	20.54
>10 MPH Over	0.78	1.88	5.04	22.39	5.67	6.05
>15 MPH Over	0.49	0.83	2.19	7.8	1.98	1.86
>20 MPH Over	0.3	0.54	1.13	2.94	0.83	0.59
>25 MPH Over	0.22	0.38	0.66	1.54	0.46	0.31

Table A6. Speed-related and Other Crashes in Demonstration and Comparison Community									
	3-Year Predemonstration Period*			Year Before Demonstration*			Demonstration Period		
Demonstration Community	Speeding Crashes	Other Crashes	Total Crashes	Speeding Crashes	Other Crashes	Total Crashes	Speeding Crashes	Other Crashes	Total Crashes
Total	96	2367	2463	56	1127	1183	40	1104	1144
Monthly Average	2.7	65.8	68.4	4.6	93.9	98.5	3.3	92.0	95.3
	2-Year Predemonstration Period			Year Before Demonstration			Demonstration Period		
Comparison Community	Speeding Crashes	Other Crashes	Total Crashes	Speeding Crashes	Other Crashes	Total Crashes	Speeding Crashes	Other Crashes	Total Crashes
Total	44	607	655	28	291	319	18	349	367
Monthly Average	1.8	23.4	25.2	2.3	24.3	26.6	1.5	29.1	30.6

* Adjusted for one month missing data in 1st and 3rd predemonstration years

Table A7. Speeding and Other Citations in Demonstration and Comparison Community								
	Predemonstration Period				Demonstration Period			
Demonstration Community	Posted Speed Limit	Speeding Citations	Other Citations	Total Citations	Posted Speed Limit	Speeding Citations	Other Citations	Total Citations
Zone 1	35	57	375	432	35	209	232	441
Zone 2	35	208	558	766	40	170	314	484
Zone 3	35	156	421	577	45	132	193	325
Zone 4	35	2283	5060	7343	50	1052	1637	2689
Zone 5	55	396	274	670	60	334	230	564
	=====	=====	=====	=====	=====	=====	=====	=====
Total		3100	6688	9788		1897	2606	4503
Monthly Average		88.6	191.1	279.7		145.9	200.5	346.4
	Predemonstration Period				Demonstration Period			
Comparison Community	Posted Speed Limit	Speeding Citations	Other Citations	Total Citations	Posted Speed Limit	Speeding Citations	Other Citations	Total Citations
Zone 1	45	144	381	525	45	233	383	616
Zone 2	55	59	86	145	55	23	66	89
	=====	=====	=====	=====	=====	=====	=====	=====
		=						
Total		203	467	670		256	449	705
Monthly Average		7.5	17.3	24.8		21.3	37.4	58.8

Table A8. Results of Public Awareness and Attitudes Survey by Community and Period

Question	Response	Comparison Community Predemo	Demonstration Community Predemo	Demonstration Community Demonstration
Sample Size		138	91	63
Average Age in Years		39	37	39
Sex	Female	62%	48%	46%
	Male	38%	52%	54%
Race/Ethnicity	African American	15%	22%	16%
	American Indian	0	0	5%
	Asian	0	3%	0%
	Caucasian	80%	73%	73%
	Hispanic/White	4%	0	7%
	Refused or Other	2%	1%	0%
Purpose of Visit to DMV	To renew driver's license	62%	74%	45%
	To obtain first driver's license	4%	4%	7%
	To obtain an identification card	1%	11%	5%
	To reinstate license	4%	4%	3%
	Other	28%	1%	40%
	Refused	0%	4%	
How often do you travel along the specific roadway	Daily	50%	47%	65%
	2-4 times per week	22%	43%	8%
	Once a week	11%	10%	5%
	2-3 times per month	9%	0	7%
	Once a month	3%	0	2%
	Rarely	4%	0	15%
	Never	1%	0	0%
What is your average speed along the specific roadway	Less than 35	0	0	0
	35-40 mph	16%	0	8%
	40-45mph	15%	13%	12%
	45-50mph	29%	52%	18%
	50-55 mph	26%	29%	15%
	55-60 mph	13%	7%	15%
	60-65 mph	1%	0	25%
	65-70 mph	1%	0	7%
70 mph or higher	0	0	2%	

Table A8 (continued). Results of Public Awareness and Attitudes Survey by Community and Period

Question	Response	Comparison Community Predemo	Demonstration Community Predemo	Demonstration Community Demonstration
What is the posted speed limit	30mph	0	0	2%
	35 mph	5%	0	3%
	40 mph	8%	0	7%
	45 mph	61%	63%	26%
	50 mph	9%	35%	26%
	55 mph	17%	2%	18%
	60mph	0%	0%	2%
	65 mph	0	0	18%
What do you think would be a safe and appropriate speed	35	2%	0	2%
	40	11%	2%	7%
	45	45%	38%	21%
	50	19%	40%	27%
	55	21%	18%	15%
	60	2%	1%	13%
	65	0%	0%	11%
	70	1%	0	5%
How often do you see law enforcement on the roadway	Always	42%	25%	68%
	Sometimes	43%	69%	26%
	Rarely	12%	5%	5%
	Never	3%	0	2%
Compared to six months ago, is this:	More often	39%	13%	36%
	Less often	4%	4%	3%
	Same as six months ago	42%	80%	29%
	Don't know	15%	1%	32%
How often do you feel that your speeding might cause you to get stopped and ticketed	Always	20%	0	8%
	Sometimes	34%	27%	32%
	Rarely	30%	52%	38%
	Never	15%	21%	22%
Compared to six months ago, is this:	More often	16%	2%	15%
	Less often	10%	1%	8%
	Same as six months ago	57%	95%	49%
	Don't know	15%	1%	28%
Have you seen the Logo	Yes			39%
	No			61%

Table A9. 24-Hour Traffic Counts by Site and Quarter

Demonstration Community				Comparison Community			
Site Number	Period	24-Hour Traffic Volume	Average Volume Across 4 Quarters	Site Number	Period	24-Hour Traffic Volume	Average Volume Across 4 Quarters
1	Predemo	21,035	21,819	1	Predemo	43,457	40,002
	Quarter 1	19,617			Quarter 1	40,400	
	Quarter 2	26,879			Quarter 2	39,982	
	Quarter 3	20,666			Quarter 3	39,616	
	Quarter 4	20,114			Quarter 4	40,009	
2	Predemo	26,862	28,300	2	Predemo	43,480	40,943
	Quarter 1	27,307			Quarter 1	39,664	
	Quarter 2	28,990			Quarter 2	41,043	
	Quarter 3	28,168			Quarter 3	41,724	
	Quarter 4	28,736			Quarter 4	41,342	
3	Predemo	42,163	43,815	3	Predemo	37,460	38,389
	Quarter 1	44,541			Quarter 1	40,179	
	Quarter 2	46,214			Quarter 2	38,856	
	Quarter 3	42,388			Quarter 3	37,177	
	Quarter 4	42,115			Quarter 4	37,342	
6	Predemo	50,059	49,235	4	Predemo	35,416	35,394
	Quarter 1	49,320			Quarter 1	35,601	
	Quarter 2	51,541			Quarter 2	35,872	
	Quarter 3	47,527			Quarter 3	35,153	
	Quarter 4	48,550			Quarter 4	34,951	
10	Predemo	52,479	53,268	5	Predemo	37,346	34,820
	Quarter 1	52,341			Quarter 1	35,620	
	Quarter 2	53,458			Quarter 2	35,141	
	Quarter 3	54,462			Quarter 3	34,447	
	Quarter 4	52,812			Quarter 4	34,072	
13	Predemo	29,775	32,464	6	Predemo	30,013	30,783
	Quarter 1	31,956			Quarter 1	32,099	
	Quarter 2	32,549			Quarter 2	30,348	
	Quarter 3	33,182			Quarter 3	29,965	
	Quarter 4	32,170			Quarter 4	30,721	

Appendix B

Figures showing mean, 85th, 90th, and 95th percentile demonstration and comparison community speeds by quarter

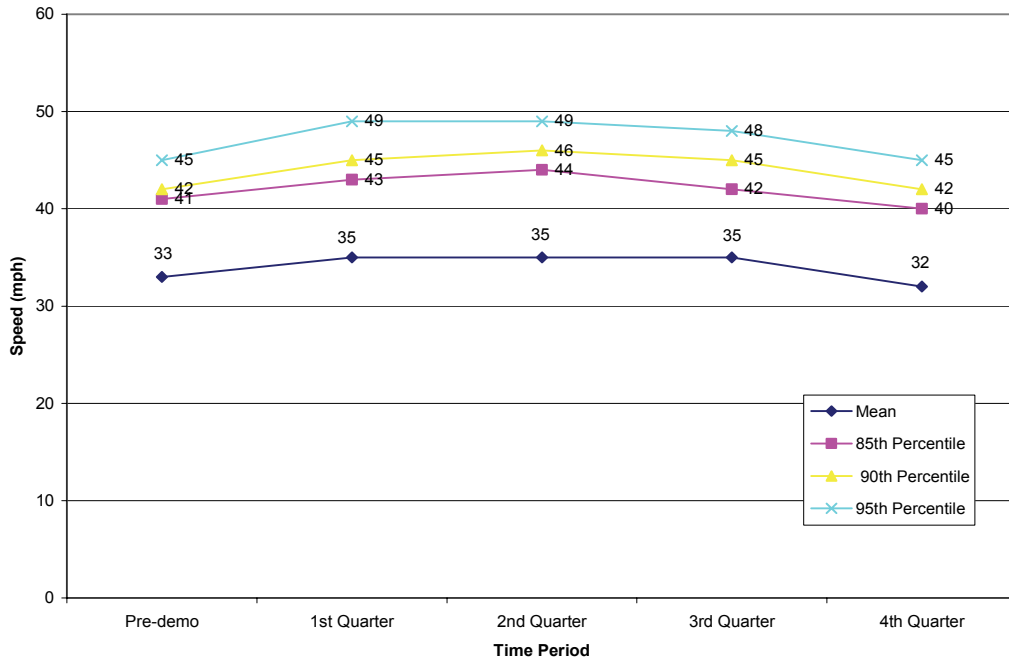


Figure B1. Demonstration community Site 1 speed distribution over time
Predemonstration speed limit: 35 mph; Demonstration speed limit: 35 mph

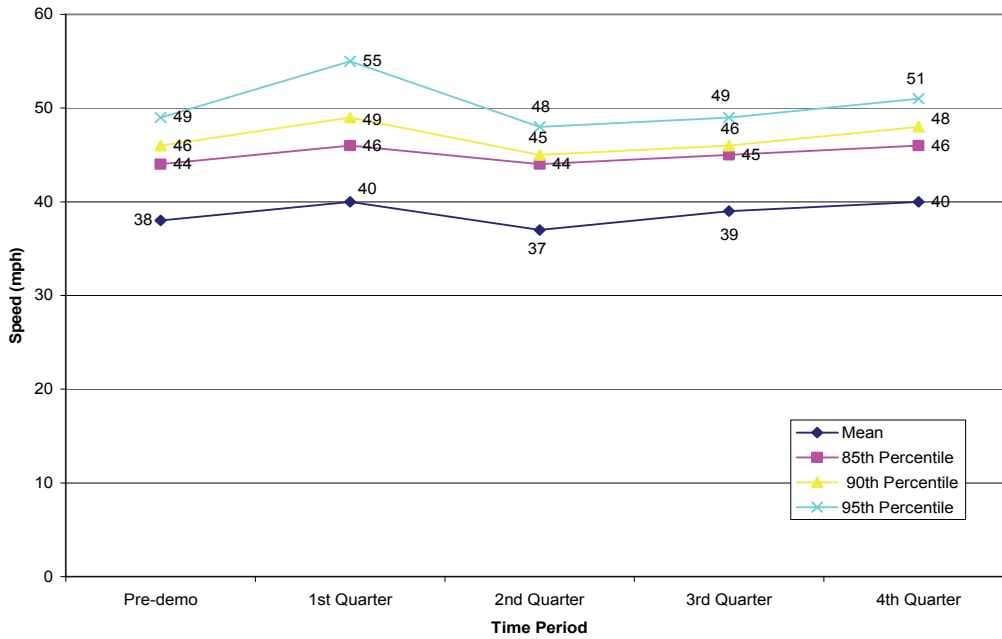


Figure B2. Demonstration community Site 2 speed distribution over time
Predemonstration speed limit: 35 mph; Demonstration speed limit: 40 mph

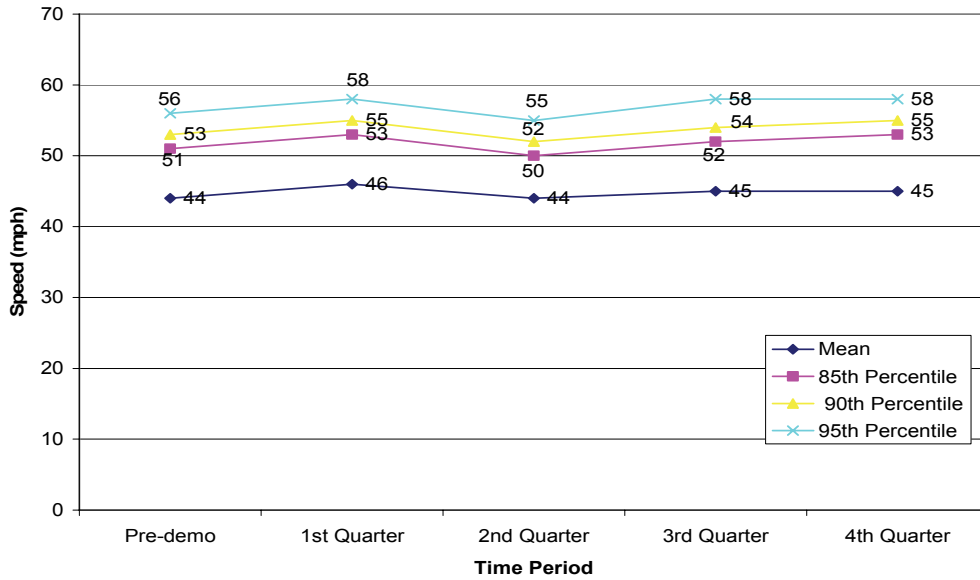


Figure B3. Demonstration community Site 3 speed distribution over time
Predemonstration speed limit: 35 mph; Demonstration speed limit: 45 mph

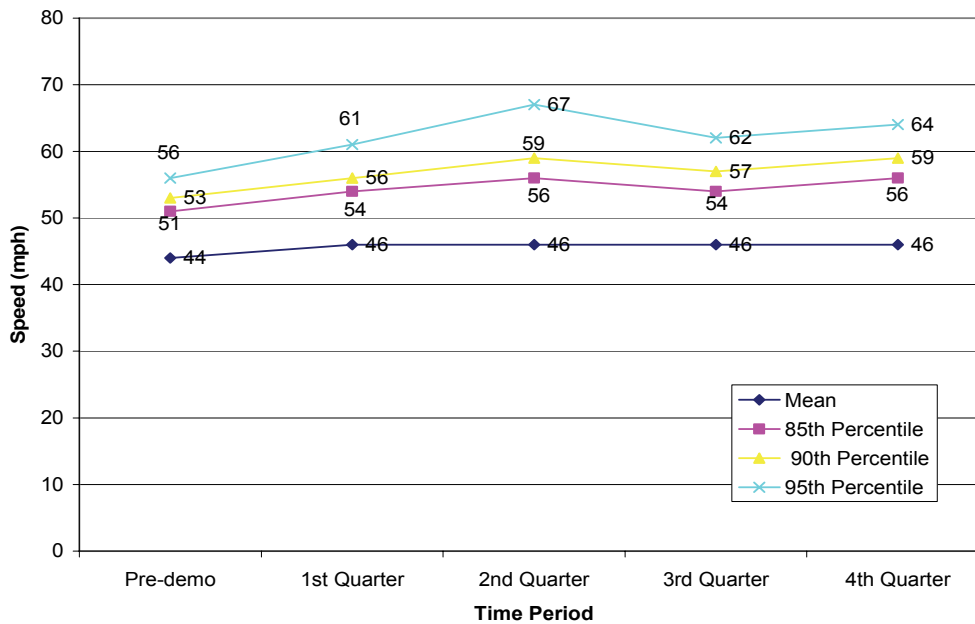


Figure B4. Demonstration community Site 6 speed distribution over time
Predemonstration speed limit: 35 mph; Demonstration speed limit: 50 mph

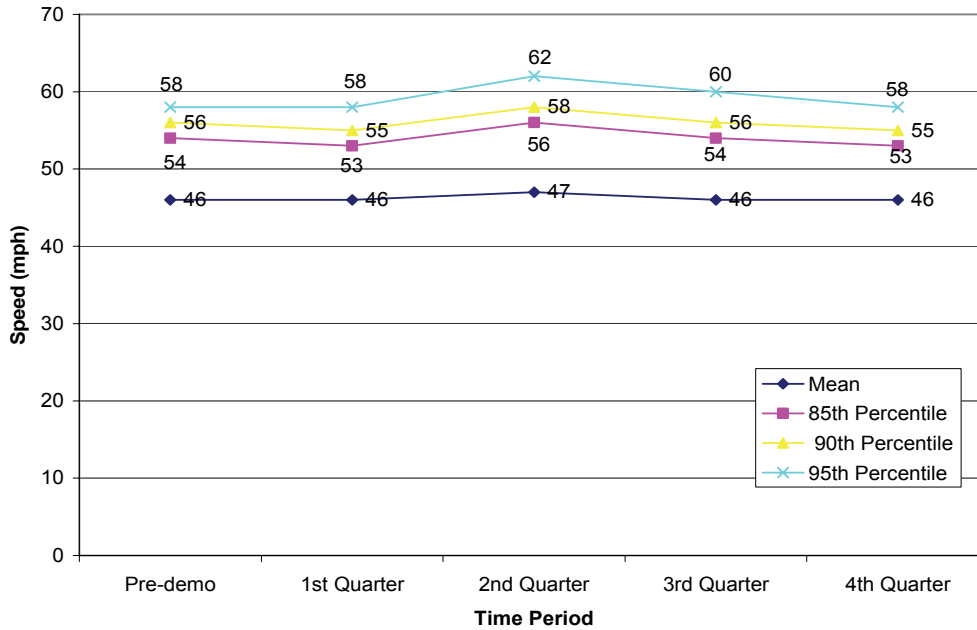


Figure B5. Demonstration community Site 10 speed distribution over time
Predemonstration speed limit: 45 mph; Demonstration speed limit: 50 mph

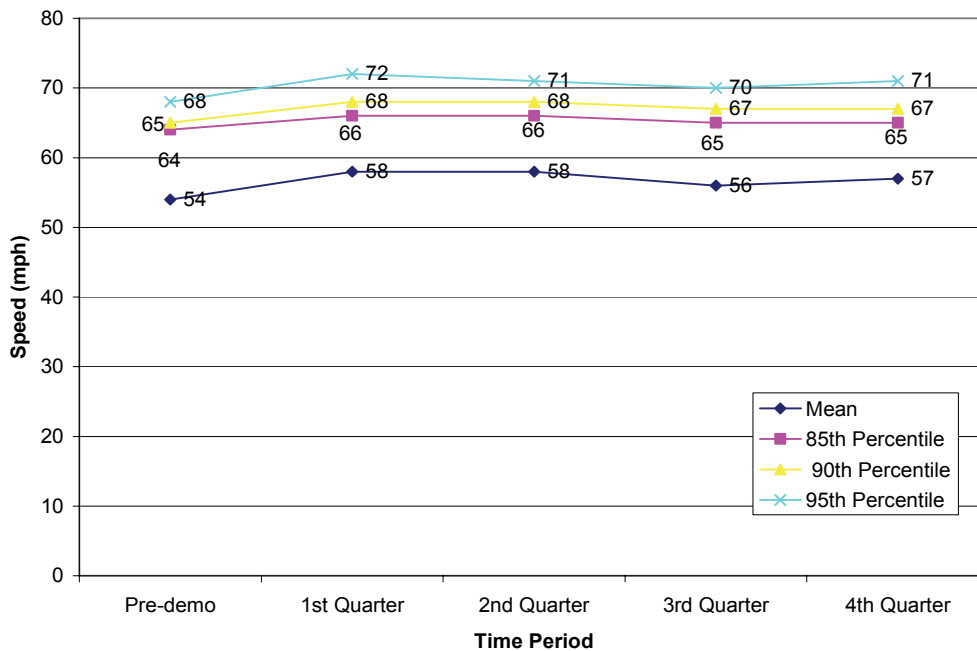
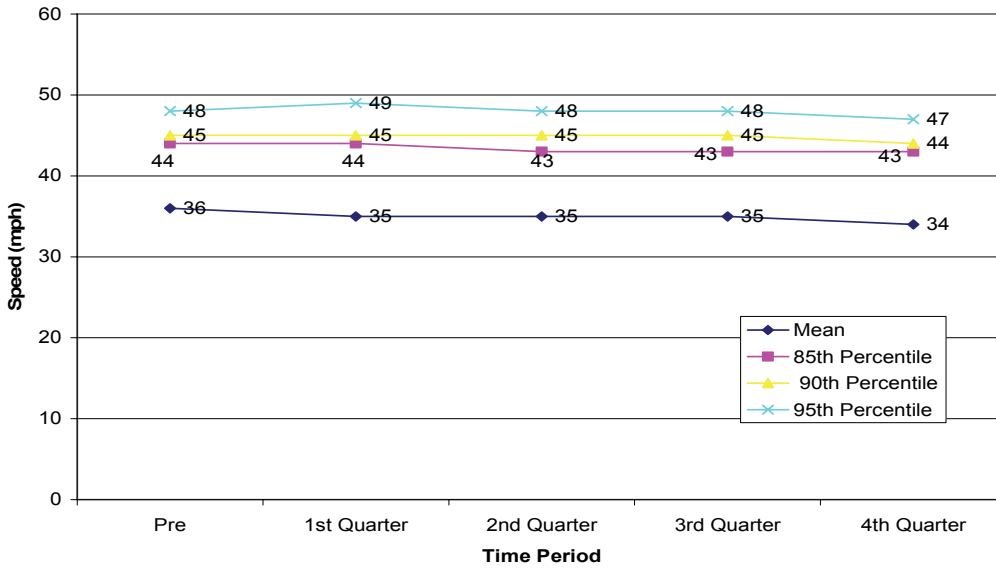
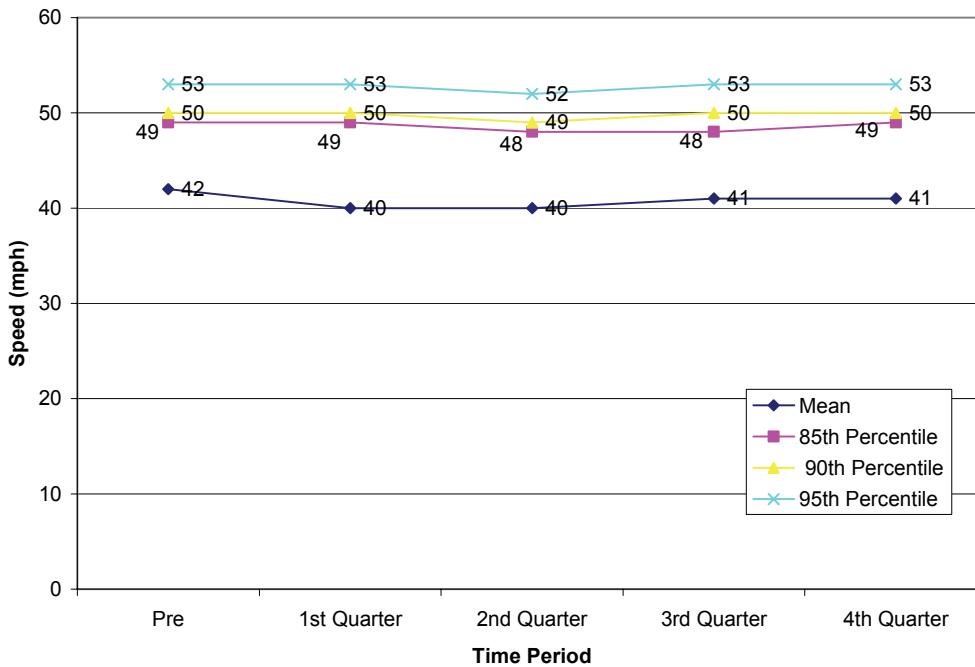


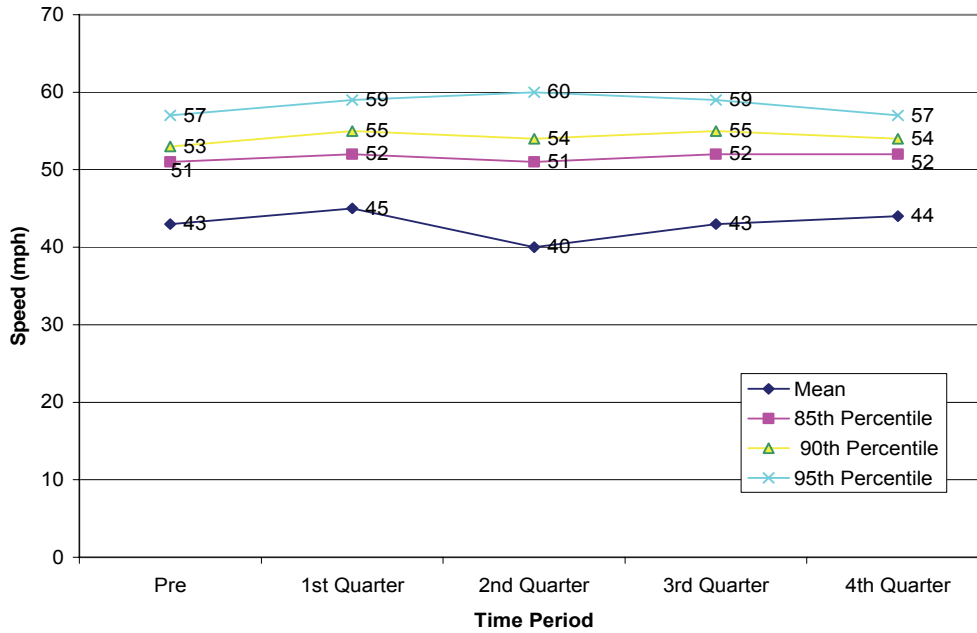
Figure B6. Demonstration community Site 13 speed distribution over time
Predemonstration speed limit: 55 mph; Demonstration speed limit: 60 mph



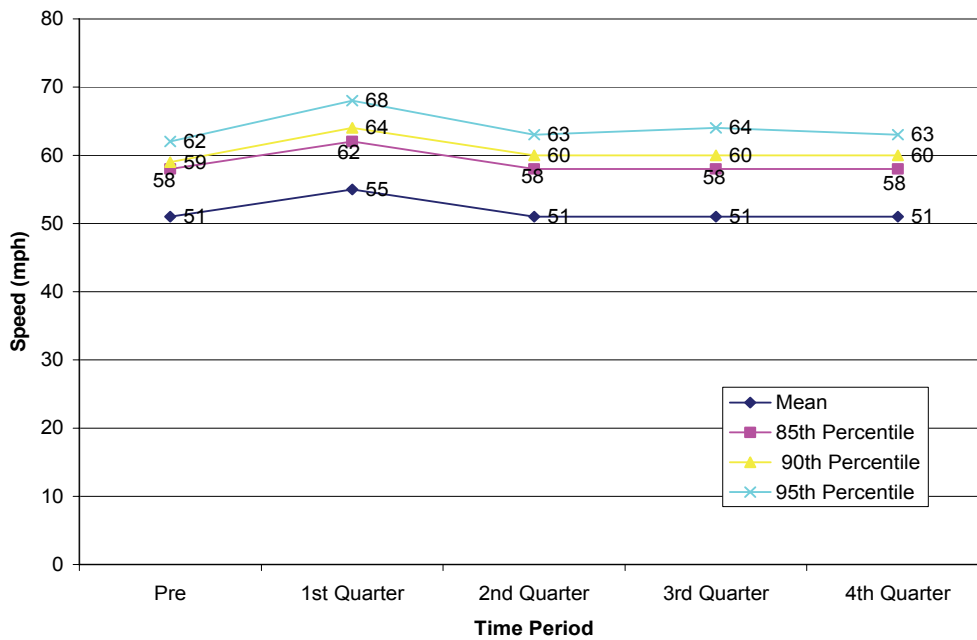
**Figure B7. Comparison community Site 1 speed distribution over time
Speed limit: 45 mph**



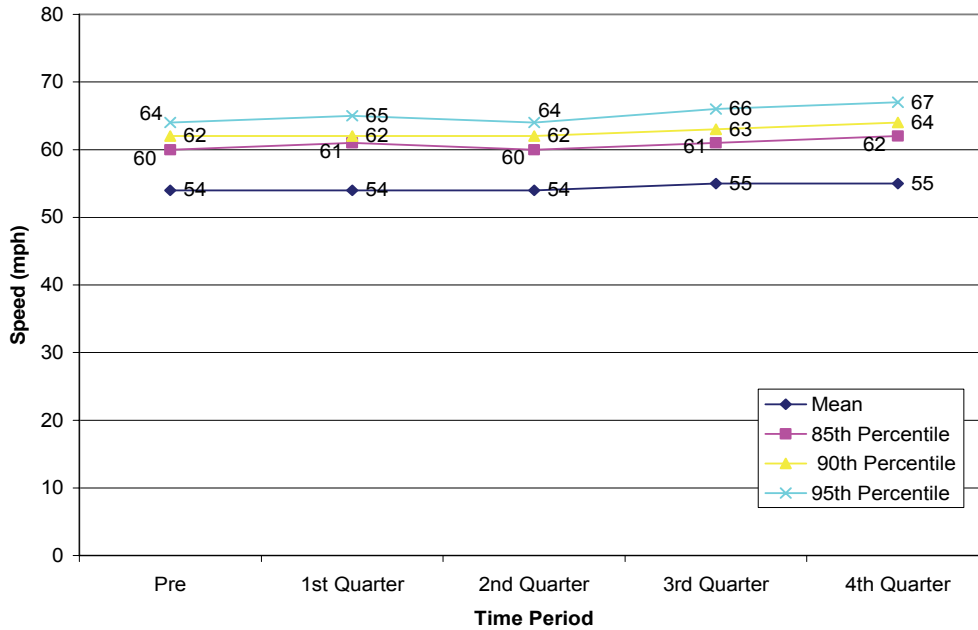
**Figure B8. Comparison community Site 2 speed distribution over time
Speed limit: 45 mph**



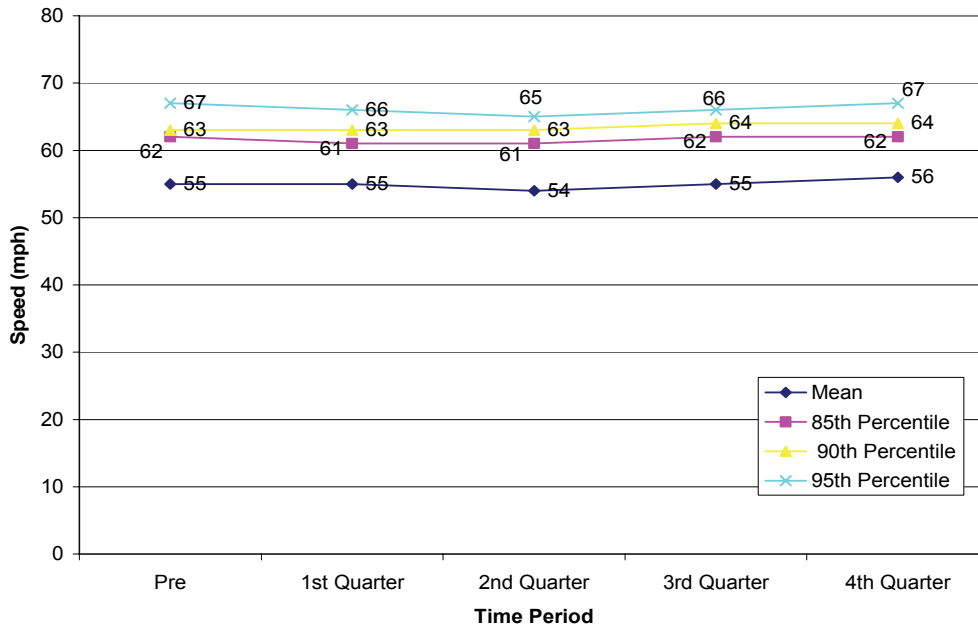
**Figure B9. Comparison community Site 3 speed distribution over time
Speed limit: 45 mph**



**Figure B10. Comparison community Site 4 speed distribution over time
Speed limit: 45 mph**



**Figure B11. Comparison community Site 5 speed distribution over time
Speed limit: 55 mph**



**Figure B12. Comparison community Site 6 speed distribution over time
Speed limit: 55 mph**

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