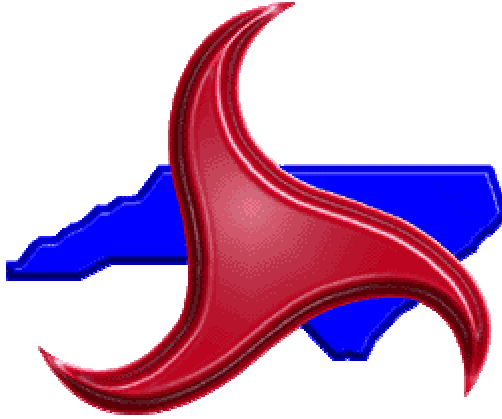


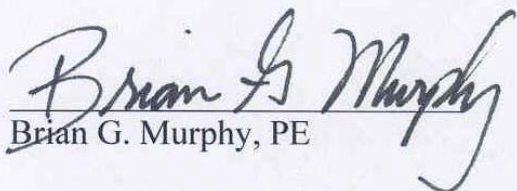
An Evaluation of the “No Need 2 Speed” Enforcement Program



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INTRODUCTION

The No Need 2 Speed program involves placing signing and enforcement on routes with a history of speed related crashes. The intent of the signing and enforcement is to promote awareness and compliance with the posted speed limits. No Need 2 Speed is a joint collaboration between the North Carolina Governor's Highway Safety Program (GHSP), the North Carolina Department of Transportation (NCDOT) Traffic Engineering Branch, and the North Carolina State Highway Patrol. The GHSP funded the project and the Highway Patrol was responsible for enforcing the speed limits on the selected treatment routes. The NCDOT Traffic Engineering Branch was responsible for selecting the treatment sites and evaluating the performance of the signing and enforcement at various stages throughout the project.

This particular implementation of No Need 2 Speed occurred on 20 routes in Cumberland, Harnett, Johnston, and Robeson Counties. It is anticipated that this would be a statewide program if the results of this implementation show promise. The purpose of this report is to outline the methodology and results of the evaluation of the No Need 2 Speed program.

METHODOLOGY

Site Selection

Treatment and comparison sites were picked based on their history of speed related crashes. The sites must have met at least one of the following two criteria:

- 30 or more total crashes in three years with at least 25% being speed related OR
- 50 or more speed related crashes in three years making up at least 15% of the total crashes

Speed related crashes were defined as those crashes having a contributing circumstance for the driver coded as "exceeded authorized speed limit" or "exceeded safe speed for conditions" on the North Carolina Crash Report Form (DMV-349).

Comparison sites were used to attempt to account for seasonal and other effects as the data collection for this project was spread over several months. The comparison sites were picked from the exact same criteria as was used to pick the treatment sites. In all, 20 treatment sites and 20 comparison sites were selected. There were 4 Interstate routes in each set and 16 two-lane roadways. All treatment and comparison sites were rural in nature.

Once the sites were identified through the crash data, field visits were made to select an appropriate data collection point and ensure that there was nothing along the route that would affect the validity of the data collection (e.g. speed limit change, work zone). The field visits were also useful in determining the exact limits of the treatment corridors and to make recommendations for sign placement.

Table 1 shows the selected treatment and comparison sites.

Table 1. No Need 2 Speed Treatment and Comparison Sites

<i>Site</i>	<i>Site Type</i>	<i>County</i>	<i>Route</i>	<i>Location</i>
T1	Treatment	Cumberland	I-95	From I-95 Bus / US 301 (North Loop) to Harnett County Line
T2	Treatment	Cumberland	SR 2252	From I-95 to Bladen County Line
T3	Treatment	Harnett	NC 27	From SR 1202 to SR 1129
T4	Treatment	Harnett	NC 210	From SR 2048 to SR 1133 / SR 2034
T5	Treatment	Harnett	SR 1120	From NC 24 / 87 to SR 2045
T6	Treatment	Harnett	SR 1229	From SR 1291 to SR 1213
T7	Treatment	Johnston	I-40	From NC 42 to NC 242
T8	Treatment	Johnston	I-95	From Harnett County Line to US 701 / NC 96
T9	Treatment	Johnston	NC 96	From SR 1120 to SR 1178
T10	Treatment	Johnston	SR 1003	From SR 1934 to NC 42
T11	Treatment	Johnston	SR 1330	From SR 1010 to US 301
T12	Treatment	Johnston	SR 1700	From SR 1553 (Shotwell) to NC 96
T13	Treatment	Johnston	SR 1934	From NC 42 to NC 39
T14	Treatment	Robeson	I-95	From US 301 / SR 1997 (Fayetteville) / Exit 22 to US 301/ Exit 33
T15	Treatment	Robeson	US 74	From SR 1166 / SR 1354 to I-95
T16	Treatment	Robeson	US 301	From SR 1789 to Cumberland County Line
T17	Treatment	Robeson	US 501	From NC 710 to NC 83
T18	Treatment	Robeson	NC 71	From SR 1001 to US 301
T19	Treatment	Robeson	SR 1006	From SR 2041 to SR 1779
T20	Treatment	Robeson	SR 1339	From SR 1552 to SR 1352
C1	Comparison	Chatham	NC 42	SR 1006 to SR 2306
C2	Comparison	Chatham	NC 902	SR 1141 to SR 2178
C3	Comparison	Chatham	SR 1003	SR 1553 to US 64
C4	Comparison	Chatham	SR 1005	SR 1138 (North Loop) to Randolph County Line
C5	Comparison	Chatham	SR 1700	US 15 to US 64
C6	Comparison	Franklin	SR 1003	Vance County Line (2.18) to SR 1222
C7	Comparison	Randolph	I-73	From SR 1127 to US 220 Bus / SR 1138
C8	Comparison	Randolph	I-85	From Davidson County Line to SR 1577
C9	Comparison	Randolph	SR 1002	SR 1003 to SR 2849
C10	Comparison	Randolph	SR 1006	SR 2417 to Guilford County Line
C11	Comparison	Randolph	SR 1114	SR 1113 to SR 1138
C12	Comparison	Randolph	SR 1143	SR 1112 to SR 1176
C13	Comparison	Vance	I-85	SR 1312 (Parham) to Warren County Line
C14	Comparison	Vance	SR 1101	SR 1103 to US 1 Bus
C15	Comparison	Vance	SR 1303	SR 1308 to SR 1342
C16	Comparison	Vance	SR 1519	SR 1115 to SR 1551
C17	Comparison	Warren	I-85	Vance County Line to Virginia State Line
C18	Comparison	Warren	NC 43	SR 1519 / SR 1634 to NC 58
C19	Comparison	Warren	SR 1001	1 Mile North of SR 1120 to Vance County Line
C20	Comparison	Warren	SR 1305	SR 1300 to SR 1322

Data collection

The primary measure of effectiveness for this project was vehicle speeds. Speed collection was done with a Lidar gun. All data collection was done during off peak hours on typical weekdays (Tuesday, Wednesday, and Thursday) to ensure free flow traffic could be observed. Data collectors targeted only vehicles that were setting their own speed. Vehicles in platoons were excluded from the study, as they were not actively choosing the speed at which they were travelling. This is standard protocol when evaluating a countermeasure that is aimed at affecting driver behavior.

Data collection was performed at the same point on the roadway for each collection period to permit comparisons and eliminate locational differences. Data was not collected near major

intersections, driveways, or other features that would affect normal driving behavior. All collection was done in an inconspicuous manner so as not to influence the driver’s speed. The collectors attempted to get at least 100 speed samples from each site. At some sites this was not reasonable due to the low traffic volumes present. Data for each of the sites was collected on the same day of the week and during the same general time range for each of the four analysis periods. This was done as an attempt to minimize the effects that day of week or time of day would have on the study.

Data collection at each of the sites was done during four different analysis periods. The analysis periods were:

- Before Signs: Before signs were installed or enforcement was implemented
- After Signs: After signs had been installed, prior to increased enforcement
- During Enforcement: After signs had been installed and during increased enforcement levels
- After Enforcement: After signs had been removed and increased enforcement activities had been ceased.

It should be noted that routine enforcement was in place throughout all the analysis periods. The idea was to concentrate enforcement at the treatment sites for the “During Enforcement” analysis period. Table 2 contains the data collection dates for each of the analysis periods. Data collection was held back at least one week from when the signs were installed and when the enforcement campaigns began to allow for an adjustment period. Data collection for the “After Enforcement” period was held back for over a month to determine if there were any lingering effects after the signs were taken down and enforcement activities had ceased.

Table 2. Data Collection Date Ranges for Treatment and Comparison Sites

	Data Collection Date Range		
Before Signs	3/15/2006	-	3/30/2006
After Signs	5/9/2006	-	5/23/2006
During Enforcement	6/13/2006	-	6/29/2006
After Enforcement	8/8/2006	-	8/29/2006

RESULTS

Table 3 contains a summary of the enforcement campaign.

Table 3. Summary of Enforcement Data for No Need 2 Speed Project

Site	County	Route	Number of Enforcement Days	Number of Enforcement Periods	Number of Total Enforcement Hours	Number of Stops	Number of Citations
T1	Cumberland	I-95	21	37	117.8	136	132
T2	Cumberland	SR 2252	12	15	33.0	52	40
T3	Harnett	NC 27	5	5	8.3	9	9
T4	Harnett	NC 210	7	7	12.2	7	7
T5	Harnett	SR 1120	7	7	12.3	8	8
T6	Harnett	SR 1229	4	4	3.3	5	5
T7	Johnston	I-40	16	38	60.6	143	157
T8	Johnston	I-95	13	38	45.1	99	96
T9	Johnston	NC 96	5	5	1.6	4	3
T10	Johnston	SR 1003	3	3	1.5	1	1
T11	Johnston	SR 1330	7	9	2.2	5	5
T12	Johnston	SR 1700	2	2	4.8	10	10
T13	Johnston	SR 1934	1	1	0.1	0	0
T14	Robeson	I-95	6	6	12.0	49	40
T15	Robeson	US 74	5	5	10.0	47	42
T16	Robeson	US 301	6	6	12.0	30	23
T17	Robeson	US 501	2	2	4.0	8	4
T18	Robeson	NC 71	5	5	10.0	29	23
T19	Robeson	SR 1006	3	3	6.0	10	6
T20	Robeson	SR 1339	4	4	8.0	11	10
Total:					364.7	663	621

Table 4 contains the results of the speed data collection. The data was adjusted to incorporate the speed data collected at the comparison sites. The comparison site data were used to attempt to account for seasonal and other effects as the data collection for this project was spread over several months. The data was also adjusted to account for differences in directional splits during the different data collection time frames. In some cases the speeds may vary by direction if there was a significant grade or other feature on one side of the data collection point. An additional adjustment was made on the Interstate sites to account for the differences in lane utilization. Generally, speeds in the left most lane are higher than speeds in the right lane. An adjustment was made to account for this.

Table 4. No Need 2 Speed Adjusted Speed Data at Treatment Sites

		Observations	Average Speed	Percent Change	85th Percentile Speed	Percent Change	% Vehicles Above Speed Limit	Change	Standard Deviation	Percent Trucks
Interstate	Before Signs	404	71.9		76.4		82%		5.1	17%
	After Signs	412	72.2	0.40%	77.0	0.78%	84%	3%	5.1	20%
	During Enforcement	404	73.0	1.52%	77.6	1.49%	87%	6%	5.0	20%
	After Enforcement	404	72.9	1.40%	78.0	2.01%	85%	3%	5.7	19%
Two-Lane At Grade Roadways	Before Signs	1518	57.4		62.7		65%		6.2	12%
	After Signs	1479	55.5	-3.37%	60.6	-3.34%	55%	-10%	5.7	11%
	During Enforcement	1442	56.8	-1.09%	62.7	0.08%	60%	-6%	5.8	12%
	After Enforcement	1436	56.7	-1.28%	61.3	-2.23%	59%	-6%	5.7	12%

* Bold, Italicized Items are Statistically Significant at the 90% Confidence Level

Perhaps the most important measures at the sites are the 85th percentile speed and the percent of vehicles travelling above the speed limit. One would expect to see greater reductions in these categories if there is a true effect on the speeds at a given site. Changes to the average speeds would tend to be less dramatic as there is typically a limit (posted speed) around which the data points tend to converge even if perfect compliance is achieved.

Data in Table 4 suggests that there was some benefit from the project seen on two-lane roadways. All evaluation periods showed a statistically significant decrease in average speeds and in the percent of vehicles travelling above the speed limit. It seems the biggest change in the data came directly after the signs were installed. This could be due, in part, to a novelty effect. The signs may be more apparent on the two-lane rural sites because they are something new and different in the environment. Drivers perhaps used more caution for a while and then the effects tapered off.

Table 4 suggests that there was no measurable benefit seen on Interstate routes. The Interstate sites all showed an increase at the different data collection periods when using the before period as a benchmark. One would expect, at worse, that the measureables at the sites would remain unchanged by the signs and the enforcement. The author can not readily explain the significant increase in speeds.

The majority of the enforcement time was spent on the four Interstate treatment sites. A total of 236 hours were spent enforcing the Interstate routes, opposed to 129 hours on the two-lane roadways. One way to look at the intensity of the enforcement is to examine enforcement hours per vehicle exposure. Vehicle exposure is simply a measure of the number of vehicles that pass through the enforcement zone during the enforcement period. Exposure is calculated by multiplying the average annual daily traffic (AADT), the number of days of the enforcement period, and the length of the enforcement zone. Standard practice is to divide this sum by 100,000,000 to put the exposure in units of 100 million vehicle miles traveled (100 MVMT). The enforcement hours per 100 MVMT was 349 for Interstate routes and 707 for two-lane roadways. Essentially what this means is that even though the raw enforcement hours for Interstate routes was more than double the value for two-lane routes, a much smaller percentage of the vehicles that traveled through the Interstate treatment sites actually encountered enforcement. This may help to explain why the program seems to have been more effective on the two-lane treatment sites.

Perhaps another reason the No Need 2 Speed program seems to work better on the two-lane roadways has to do with driver behavior. It is possible that drivers react differently when seeing enforcement on Interstate routes than on two-lane roadways. Drivers are likely much more accustomed to seeing police vehicles on Interstate routes than they are on two-lane roadways. This, in itself, may lead to a different reaction by drivers on those different route types. Some drivers may feel more protected on Interstates because they may be in a group of traffic so they feel they are not singled out. When drivers encounter police vehicles on two-lane roads they may feel more vulnerable to getting a ticket and adjust their speeds accordingly. Another factor that likely plays a role in the different result for Interstate and two-lane roadways is the make up of drivers that travel those facilities. Many drivers on Interstates are from another state or on long trips and travel those routes very infrequently. This is particularly true on I-95. On the other hand, drivers traveling two-lane roadways are likely local commuters that either live in the general area or pass through that area as part of routine commutes. Local drivers may be more responsive to the presence of enforcement, especially if the enforcement is continually reinforced. Many of these issues are deeply rooted in the realm of human factors research.

DISCUSSION

There are several factors that may play a role in the limited impact that was measured in this version of the No Need 2 Speed campaign. The first is that this initial version of the project did not have a media campaign. Since this project was only focused on a few counties, it was decided that such a focused media campaign may be difficult to develop and successfully implement. A full media campaign is suggested if this project is to be implemented statewide. It is likely that many of the drivers that saw the signs did not know what they meant. A formal driver survey was not conducted, but several residents on the treatment routes approached the data collectors and inquired as to what the signs actually meant. A couple had never noticed the signs. A strong media campaign would educate the public as to what the signs mean, and hopefully encourage the drivers to slow down as they pass through these corridors.

Sign size and location should also be considerations if this project is to be implemented again. The signs on both the two-lane roadways and the Interstates were rather small and perhaps difficult to see at highway speeds (See Figures 1 and 2). Some thought should also be given to the frequency and placement of the signs. For this initial project two signs for each direction were placed on the corridor. It may be beneficial to provide more signs throughout the corridor to catch traffic that enter between the corridor limits and to help reinforce the program. Perhaps a “Begin Enforcement Zone” and “End Enforcement Zone” sign would help to define the corridors as well.

It may be beneficial to revisit the site selection process for future program years. A manageable number of treatment sites should be identified and signed as enforcement corridors. One criteria that should be added is a minimum volume criteria. It was very difficult to get enough speed samples at several of the comparison sites. If the project is evaluated with speed data again, it would be worthwhile investigating the use of automated data collectors. This would allow for more speed samples to be collected over longer periods of time.

Figure 1. No Need 2 Speed Sign on I-40 in Johnston County



Figure 2. No Need 2 Speed Sign on SR 1330 in Johnston County



The end goal of the No Need 2 Speed enforcement program is to increase safety on our State's roadways. In this case, speed was used as a proxy for safety. The true measurement for a successful campaign would be a reduction in the frequency and severity of crashes on the treatment sites. Because of the relatively short time spans of the program, it is difficult to attribute any true safety benefits to the campaign. One consideration would be to develop sustained safety corridors, similar to what is done in several other states. The idea would be to sustain the enforcement and signing over a longer period, for instance, six months to one year. The longer time periods and the selection of sites to treat could allow the evaluation team to set up a more defensible study to more accurately determine the effect of a campaign such as this on highway safety.

FINAL COMMENTS

The No Need 2 Speed program involves many entities that must all work together for a successful outcome. A great deal of coordination within several units of the Department was necessary to execute this program. This initial exercise provides valuable insight into how to increase the efficiency of future operations and provide for a more defensible study. Although the effects of the program on Interstate routes were perplexing, the effects on the two-lane roadways appear to be promising. With the incorporation of the comments in the Discussion section of this report, it is anticipated that a more valuable program will be achieved during the next implementation.

No Need 2 Speed is just one program aimed at decreasing the frequency and severity of speed related crashes in North Carolina. Factors such as the availability of officers to enforce speed limits and the adjudication of traffic tickets play a significant role in this issue. Overburdened officers generally aren't able to devote significant amounts of time to routine enforcement with their other duties and court systems, as they currently exist, can not handle the volume of traffic violations that come across their desk. As a result, many traffic violations such as speeding tickets are simply dismissed or downgraded. Enforcement programs, such as No Need 2 Speed, can provide an important step toward increasing the public's awareness of the issues surrounding speed-related crashes. The end goal is a reduction in the frequency and severity of speed related crashes in North Carolina.

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Please direct questions or comments on this evaluation to Brian Murphy, PE at (919) 733-3915 or via email at bgmurphy@dot.state.nc.us