Identifying Traffic Safety Practices and Needs of Local Transportation and Law Enforcement Agencies

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As part of the effort to implement the Strategic Highway Safety Plan (SHSP), state departments of transportation are looking to reach out to local and law enforcement agencies. This paper presents a study by the Florida Department of Transportation (FDOT) to identify the existing safety practices and needs of local transportation agencies and law enforcement offices in Florida. Two comprehensive online surveys targeting local transportation agencies and law enforcement agencies are developed. The survey for local transportation agencies includes 39 questions on topics including standardization of crash analysis methods, training needs, and working with FDOT. For law enforcement agencies, the survey includes 25 questions covering topics on enforcement locations, traffic violations and safety campaigns, use of crash reports, and working with transportation agencies. Results from both surveys and lessons learned are discussed.

INTRODUCTION

A Strategic Highway Safety Plan (SHSP 2013) is required under the Safe Accountable Flexible Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU 2005) as part of the Highway Safety Improvement Program (HSIP 2013). The plan aims to provide a comprehensive framework for reducing highway fatalities and serious injuries on all public roads by integrating the four E's of highway safety: engineering, education, enforcement, and emergency medical services (EMS). The framework allows highway safety programs and partners in a state to work together in an effort to align goals, leverage resources, and collectively address the state's safety challenges. The Moving Ahead for Progress in the 21st Century (MAP-21 2013) continues the HSIP role as a core federal-aid program and requires states to develop, implement, evaluate, and update SHSP. As part of the effort to implement SHSP, state departments of transportation (DOTs) are increasingly looking to reach out to local and law enforcement agencies.

This paper describes an effort by the Florida Department of Transportation (FDOT) to identify the existing safety practices and needs of local transportation agencies and law enforcement offices in Florida. As local roads make up a large percentage of a state road network system, local transportation agencies play an important role in the state's overall safety performance. Working with these agencies, knowing their needs, and helping them meet their needs are critical to the success of the SHSP implementation. While local transportation and law enforcement agencies both aim to improve traffic safety, their approaches and needs are different (Gan et al. 2012). For example, a law enforcement officer may be more interested in identifying enforcement locations based on crash frequency over a shorter period (e.g., three months), while a safety engineer uses multiple years of crash data and exposure to prioritize locations for safety improvements.

As part of the study, two online surveys were conducted targeting local transportation agencies and the law enforcement community to identify their practices and needs. While the surveys were rather comprehensive in scope, including 39 questions for local transportation agencies and 25 questions for law enforcement agencies, this paper covers only those that are more likely to be of interest to the general readers. The surveys are easily transferable to other state DOTs that are willing to reach out to their local agencies.

LITERATURE REVIEW

As part of the survey design effort, a literature search was first conducted to identify relevant studies. It was found that studies that investigated traffic safety procedures and needs from the perspective of local transportation agencies and law enforcement officers were very limited. The majority of studies targeting law enforcement officers were found to focus on addressing data quality issues in crash reporting (Knezek and Hansen 2007, Bailey and Huft 2008, Mickee 2008), a better allocation of traffic safety personnel (Coffman and Monsere 2006), the impact of law enforcement on prohibiting hand-held cell phone use while driving (Nikolaev et al. 2010), and the officers' attitudes and problems encountered in enforcement (Hurst 1980, Jonah et al. 1999, Schrock et al. 2002, Chang and Shih 2012). For example, Knezek and Hansen (2007) designed the "Police Technical Assistance Program" for supporting the New Jersey Department of Transportation safety mission. As part of this program, assessments were conducted and technical assistance provided to reduce the reporting errors on New Jersey's crash reports. The project succeeded in changing the structure of the crash reporting form that was accepted by municipal law enforcement officers.

Mickee (2008) designed a law enforcement outreach survey to explore the data quality issues provided by law enforcement officers and to identify possible cost-effective solutions for the problematic lack of unreliable crash data in Massachusetts. Mickee (2008) emphasized two important criteria for a proper design of online surveys: surveys should have easy questions that could be answered in approximately 20 minutes and surveys should avoid open-ended questions as much as possible. Nikolaev et al. (2010) evaluated the impact of law enforcement on prohibiting cell phone use while driving in New York. They observed lower fatality crash rates after enforcement on banning cell phone use compared with crash rates before banning.

Studies targeting transportation agencies were limited compared with those targeting law enforcement agencies. Studies targeting transportation agencies focused mainly on methods to collect standard roadside information (Lee and Mannering 1999), perspective on various transportation modeling packages (Boile and Ozbay 2005), and opinions on potential benefits from technological innovations, e.g., electronic data entry and geographic information systems (GIS) (Cherry et al. 2006).

Lee and Mannering (1999) developed a standardized method to collect roadside information and estimate accident severity likelihood resulting from roadside attributes. The authors conducted a national survey of DOT agencies in the U.S. to investigate various states' practices regarding the collection of roadside information. The majority of responses agreed that the removal of unnecessary fixed objects along the roadside was essential, more so than relocation. Boile and Ozbay (2005) conducted a survey to obtain the perspective of different software users regarding the strengths and limitations of the most widely used transportation modeling packages. They illustrated that there was an increasing demand for sound graphical interface, GIS integration, and land use integration packages, as found in TransCAD and CUBE. Thus, the current study is considered the first to identify the existing safety practices and needs of local transportation agencies and law enforcement offices as part of the effort to implement the SHSP.

SURVEY DESIGN AND ADMINISTRATION

To identify the existing safety practices and needs of local transportation agencies and law enforcement offices, two separate online surveys targeting local transportation agencies and law enforcement offices were designed. Local transportation agencies include both county and city public works departments. Each county public works department constructs and maintains the county's roads, bridges, canals, sidewalks, street signs, pavement markings, traffic signals, and storm-water drainage facilities. The city public works department maintains and improves the city's infrastructure by conducting reviews for plans submitted by the involved county and FDOT.

Both departments have safety-related responsibilities as part of their work. For example, local county agencies rely on police crash reports to identify problematic (i.e., high crash) locations at intersections and corridors based on various crash types. Afterward, they adopt countermeasures as recommended by FDOT and National Cooperative Highway Research Program (NCHRP) reports. Local city departments address traffic safety issues and rely on police reports to identify problematic locations within the borders of the city.

Law enforcement offices have police officers who complete crash reports for every crash. Law enforcement officers deal with traffic safety problems while stressing education and enforcement. For example, they initiate safety programs to alert drivers of potential crash risk, e.g., DON'T TEXT AND DRIVE, and they use speed trailers (i.e., devices that visually display drivers' real-time speeds compared to the speed limit) to enforce speeding violations. Law enforcement officers could also perform crash analysis to assist in their enforcement campaigns by prioritizing the most hazardous intersections with specific safety issues, e.g., speeding, pedestrian crashes, and bicyclist crashes.

According to previous studies, e.g., Mickee (2008), online surveys are preferred for opinionated questionnaires for their cost-efficiency. A comprehensive list of questions in both surveys has been prepared while taking into consideration the criteria provided by Mickee (2008) for designing online survey questions. The list was further shortened to fit the planned completion time of 30 minutes for the local transportation agencies survey and 20 minutes for the law enforcement offices survey. The research team then went through each question with the FDOT project manager from the State Safety Office. The surveys were distributed in the fall of 2011.

To initiate a perspective about the adopted safety analysis procedures, on-site visits to two local transportation agencies in the South Florida region were conducted, which were the Miami-Dade and Broward Counties' Public Works Departments. These two agencies were selected on the basis of: (1) conducting traffic safety analysis as part of their duties and (2) being located in the South Florida region to be close to Florida International University. Face-to-face interaction with the traffic safety engineers in both agencies helped to fine-tune the survey questions. In addition, the two surveys were pretested by sending out the survey links to several graduate students to ensure that the survey instrument worked as intended.

The survey of local transportation agencies was comprehensive, including 39 questions covering the following eight areas of interest:

1. use of crash data
2. identification of high crash locations
3. project selection, implementation, and evaluation
4. crash analysis software systems
5. crash analysis standardization
6. crash analysis documentation
7. training
8. working with FDOT

An invitation email along with a link to the survey questions was sent out to a broad list of local county and city transportation agencies in Florida using the Safety Office Emailing System. Reminder emails were sent to non-responding recipients. A total of 37 responses were received and the responding agencies were geographically diverse, covering the entire state, including five from Northern Florida, 12 from Southern Florida, five from Eastern Florida, seven from Western Florida, and eight from Central Florida. In addition, the agencies represented both rural and urban regions, where the northern region is mostly rural.

The survey targeting law enforcement agencies included 25 questions covering the following four areas of interest:

a. selection of enforcement locations,
b. traffic violations and safety campaigns,

c. crash reports, and
d. working with local transportation agencies.

The State Safety Office also assisted in sending out the law enforcement agencies survey through each District Community Traffic Safety Team (CTST) coordinator. Florida CTSTs are groups of highway safety advocates who are committed to solving safety problems through a multi-disciplinary approach. The CTST individuals represent each of the four E's and consist of local city, county, state, and private industry representatives, as well as local citizens. Each FDOT district has a CTST coordinator who works closely with the CTSTs in their jurisdiction. The survey was sent out through each district CTST coordinator to a broad list of local law enforcement agencies. Furthermore, to increase the response rate, multiple reminder emails were sent to non-responding recipients.

In total, 46 law enforcement agencies responded to the survey. The responding agencies were classified as 30 county sheriff offices, 14 city and university police departments, and two district offices of the Florida Highway Patrol (FHP). Of the 46 responding agencies, 13 were from Northern Florida, seven were from Southern Florida, 14 were from Eastern Florida, seven were from Western Florida, and five were from Central Florida. Again, the responding agencies were well represented and included different spatially-diverse agencies from across the five geographic regions of Florida. In addition to sending the invitation email, follow-ups were performed to obtain clarifications on some of the responses.

A precise response rate for each survey could not be calculated. The surveys attempted to reach out to as many agencies as possible by making use of existing mailing lists (i.e., the Safety Office Emailing System for distributing the local transportation agencies survey and the assistance of each district CTST coordinator for distributing the law enforcement agencies survey). The precise number of subscriptions in these mailing lists could not be determined as the number of emails in these lists was not made known to the research team. In addition, it is expected that these mailing lists, like any others, are likely to contain a number of invalid emails.

LOCAL TRANSPORTATION AGENCY SURVEY RESULTS

While the number and type of crashes are readily available, the objectives of the study could only be accomplished through the expert opinions of traffic safety professionals. The survey results for four select areas from the 37 local transportation agencies are summarized in the sections below.

Crash Analysis Standardization

Uniformity of Crash Analysis Methods and Procedures. Local transportation agencies have been using several crash analysis software tools. Some tools that were developed in-house include the Accident Reporting System (ARS), a crash mapping system, and other GIS crash analysis systems.

Identifying the opinions of local transportation agencies about the uniformity of crash analysis methods could help determine the feasibility for statewide standardization of crash analysis methods. As shown in Figure 1(a), over 70% of responding local agencies either agreed or strongly agreed to standardize crash analysis procedures across the state. Close to 25% of the agencies were neutral, while a minority (5%) opposed standardization. It can be inferred that there was a general consensus on standardizing crash analysis methods and procedures across Florida. Important reasons justifying standardization included:

- Standardization would be beneficial when applying for grants.
- Standardization results in consistent, predictable, and repeatable results.
- Standardization provides cost effectiveness.
- Standardization protects analysts from potential liabilities.

On the other hand, the following were some of the opinions that discouraged the standardization process:

- It is difficult for all agencies to have access to the same data.
- There is too much inconsistency between agencies.
- The same methods and procedures might be very expensive for rural counties compared with urban counties.
- A standard method might not work well for all types of safety issues, e.g., fatal crashes.

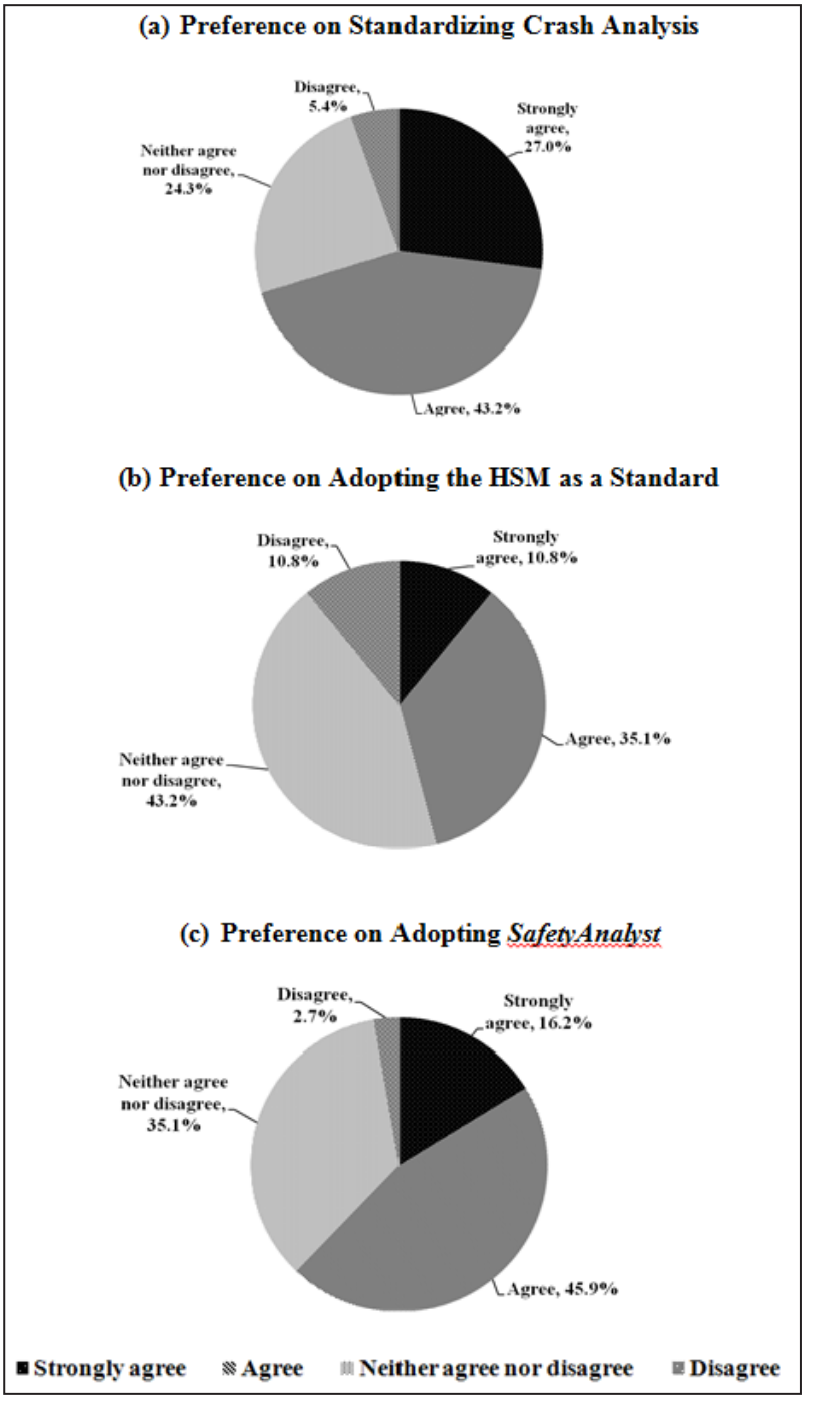
Adoption of the Highway Safety Manual as Standard for Crash Analysis. The Highway Safety Manual (HSM) (AASHTO 2010a), released in July 2010, provides analytical tools for quantifying effects of potential changes at individual sites. Although the manual is in the initial stages of its adoption, states and local agencies are looking for ways to implement it. The respondents were provided a link in the survey to the HSM homepage to learn more about the manual. As shown in Figure 1(b), about 46% of responding local agencies either agreed or strongly agreed to adopt the HSM as a standard for crash analysis, 43% were neutral, while the rest (11%) opposed adopting the manual.

Some responding agencies indicated that they support the HSM adoption as it provides the guidelines and specific procedures for conducting crash analysis. Another strong reason to adopt the manual was to maintain consistency in the policies and procedures for evaluations. One of the agencies wished that the HSM adoption would lead to an initiative to set aside local funds to pursue safety projects. On the other hand, the lack of analysis of limited access facilities (i.e., freeways), the lack of state-specific crash reduction factors (CRFs), and the lack of extensive data were the three main reasons for the agencies' existing reluctance in adopting the manual. Of the 37 responding agencies, 11 were unfamiliar with the manual to provide a response.

Deployment of SafetyAnalyst. *SafetyAnalyst* (AASHTO 2010b) is a state-of-the-art analytical tool for making system-wide safety decisions that incorporates all the steps in the roadway safety management process. The software incorporates the advanced empirical Bayes (EB) approach and acts as a complete "safety toolbox" for any safety office. Although data requirements are intense, once the data are imported the analyses are easy requiring minimum statistical expertise. Again, the respondents were provided a link in the survey to the *SafetyAnalyst* homepage to learn about the tool.

From Figure 1(c), 62% of responding local agencies either agreed or strongly agreed to take advantage of *SafetyAnalyst*; 35% were neutral and a minority (3%) disagreed. The survey responses showed that the local agencies had a motivation to adopt *SafetyAnalyst*. The agencies hoped that *SafetyAnalyst* could be provided free of charge, along with low-cost training tools. However, at this time, FDOT cannot provide it for free since the tool is maintained by the American Association of State Highway and Transportation Officials (AASHTO).

Figure 1: Pie Charts of Key Survey Results



Adoption of Standard Web-Based GIS Application. Since different local agencies adopt multiple GIS systems for crash analysis, it is important to obtain their opinion about standardizing web-based GIS applications. It was found that the majority of responding local agencies (62%) either agreed or strongly agreed on the statewide adoption of a standard web-based GIS system for crash analysis. The responding agencies considered GIS applications to be efficient, accurate, and manageable compared with the existing non-GIS methods. Many agencies also indicated that a GIS system would enable engineers to spatially map crashes, spatially identify crash locations, and produce reports showing traffic crash statistics. Moreover, a web-based GIS system could increase the accuracy of crash data and the speed with which crash data could be obtained and analyzed.

Although most agencies embraced the idea of a standard GIS application, 8% of responding agencies were against it. These agencies were concerned about the costs associated with the tool in addition to the resources to be allocated. One agency felt that a standard GIS system could restrict some of their employees. Further, the non-uniform nature of data being collected and analyzed was considered to be a hurdle to standardize the GIS applications.

If a standard procedure for crash analysis is to be adopted, the respondents identified the following as key issues that have to be accounted for: differences between the old and new crash report forms, crashes involving vulnerable road users (i.e., elderly people, bicyclists, and pedestrians), differences between urban and rural agricultural communities, and lack of short-form crash reports. Note that Florida used to have a standard crash report that had been adopted until December 31, 2010. As of January 1, 2011, a new crash report has been released and is currently the standard for crash reporting. Compared with the previous crash report, the current one is more detailed and requires more time to complete.

Training on Crash Analysis

With the release of the recent safety analysis tools, the HSM and *SafetyAnalyst*, training on their adoption for crash analysis is essential. This section of the survey sought to determine whether FDOT should provide training on crash analysis procedures for local agencies. It was found that more than 90% of responding local agencies either agreed or strongly agreed and the remaining 10% were neutral. The responding agencies were interested in seeking training in the following priority areas:

- thorough analysis of crashes, interpretation of data using statistical methods, and provision of engineering solutions
- use of the HSM and *SafetyAnalyst*
- use of the data in the crash reports
- application of CRFs
- process of conducting field reviews
- use of GIS applications for crash analysis
- methods to improve safety of vulnerable road users, e.g., bicyclists and pedestrians

When asked about the preferred mode of training, a majority of responding agencies (21 agencies) preferred face-to-face meetings, followed by online web-based training and webinars, which received equal preference.

Working with FDOT District Office

A good working relationship between local agencies and state district offices is beneficial in improving the state's traffic safety practice. It was found that 62% of responding local agencies worked with their district office only when a situation arose, 22% held regular meetings for coordination of efforts, 8% held meetings with CTST, while 3% could not recall their recent encounter with their

district office. This shows that more coordination between both major traffic safety stakeholders is beneficial.

When asked about ways to improve traffic safety in each agency's area, 24.5% of local agencies wished to work more closely with FDOT and 13.5% would like to get trained by FDOT. The remaining 62% were already working closely with their respective district offices. This shows that FDOT is successful in coordinating crash analysis across the agencies. Based on their responses, the following were the key barriers that have been preventing the agencies from working closely with their district office, in order of priority:

- lack of funding
- staff limitations
- geographical location of local offices, e.g., the FDOT Central Office is far away from the local agencies
- differences in priorities and concerns
- time constraints
- restricted access to statewide tools and training

Local agencies were also asked about the recommended assistance with FDOT to improve traffic safety in their jurisdictions. Key suggestions, in order of priority, included:

- provide more funding to purchase safety-related equipment and crash analysis software tools
- increase communication, coordination, and information exchange efforts
- provide training courses on safety analysis
- provide more exposure on the Road Safety Audit tools
- implement less restrictive policies
- emphasize safety concerns of vulnerable road users, i.e., pedestrians and bicyclists
- encourage participation in quarterly meetings with the Safety Office and the CTST, and in the Safety Summit meetings (the Safety Summit brings in multi-disciplinary individuals who deal with traffic safety)
- implement a standard crash analysis software that all agencies can use
- prioritize safety-related projects

Safety Concerns, High Crash Locations, and Project Selection and Evaluation

According to the Federal Highway Administration (FHWA) Systemic Safety Project Selection Tool (Preston et al. 2013), the identification of focus crash types and high risk factors is the highest priority in the systemic safety planning process. Furthermore, the prioritization of candidate locations (i.e., identification of high crash locations [HCLs]) and appropriate selection of improvement projects are crucial steps in this process. This is because incorrect identification of HCLs often results in less cost-effective solutions and biased prioritization processes. From the survey responses, the highest safety concerns were speeding-related, distracted driving, intersection-related, and red-light running crashes. Furthermore, the responding agencies identified specific crash types, e.g., pedestrian, bicycle, rear-end, angle, and left-turn crashes, as potential safety concerns. Particularly, speeding, pedestrian and bicycle crashes, and rear-end crashes were commonly listed as major safety issues.

The survey responses also indicated that the majority of local agencies rank HCLs by crash frequency, crash rate, crash type, safety index, or crash severity. Besides these methods, several local transportation agencies used the following approaches:

- use web-based crash analysis systems
- use GIS analysis and compare locations with those published statewide, as well as with specific district
- use observations made by law enforcement officers and field investigations
- directly use the list of HCLs provided by FDOT

- use FDOT crash records
- perform crash analysis only when improvement projects are scheduled or upon request

While selecting safety improvement projects, the majority of responding local agencies (14 agencies) used the benefit-cost (B/C) ratio. Other methods included field visits, requests from citizens and law enforcement officers, CRFs from the HSM, engineering judgment, and Road Safety Audits. Close to 43% of responding agencies evaluated all implemented projects to determine their effectiveness, 30% assumed that treated locations were improved, while 27% evaluated a sample of implemented projects. Local agencies mostly used before-and-after crash data analysis to determine the effectiveness of the implemented countermeasures. Other evaluation procedures included the number of complaints after the improvement projects were implemented, public opinion, field observations, continuous monitoring of locations, and observation of traffic operations following the project implementation.

Summary of Results

Key findings from the survey of the local transportation agencies were:

- The majority of local agencies were receptive to the idea of standardizing the crash analysis method for agencies in the state.
- Some agencies preferred to consider the HSM as a standard, mandating its adoption, while some others preferred to have the HSM only as a guide, as the HSM analysis was considered to be too cumbersome. Some agencies were also unfamiliar with the HSM to formulate an opinion about its adoption.
- Local agencies were generally interested in adopting *SafetyAnalyst*. For extensive adoption, the responding agencies wished for the software to be provided free of charge along with low-cost training tools.
- The majority of local agencies agreed that a statewide standard web-based GIS system should be adopted for crash analysis.
- The majority of local agencies agreed that FDOT should provide statewide training on crash analysis.
- Face-to-face meetings were by far the most preferable mode of providing training on crash analysis, followed by online training and webinars.
- Providing more funding to local agencies, increasing communication and coordination efforts (i.e., via Road Safety Audits), providing additional training courses, and launching less restrictive policies were the most important needs of the local agencies.
- Speeding, pedestrian crashes, bicycle crashes, and rear-end crashes were the highest safety concerns to the majority of local agencies.
- Agencies have been using different methods for evaluating safety improvement projects.

LAW ENFORCEMENT OFFICE SURVEY RESULTS

This section summarizes the survey results from 46 law enforcement offices on questions related to enforcement locations, traffic violations, safety campaigns, use of crash reports, and working with transportation agencies.

Selection of Enforcement Locations

When asked about the specific locations for enforcement of traffic violations, 83% of the responding agencies stated that they regularly focus on specific locations, mostly locations with relatively high prior citation records. However, two-thirds of responding law enforcement agencies analyzed crash records to identify enforcement locations. One of the approaches was to rank the three most

hazardous signalized intersections with respect to total crash count every month, and conduct traffic enforcement at these intersections. After enforcement, one-month before-and-after crash data were compared. Crash data analysis was also performed by time of the day, day of the week, and contributing factors.

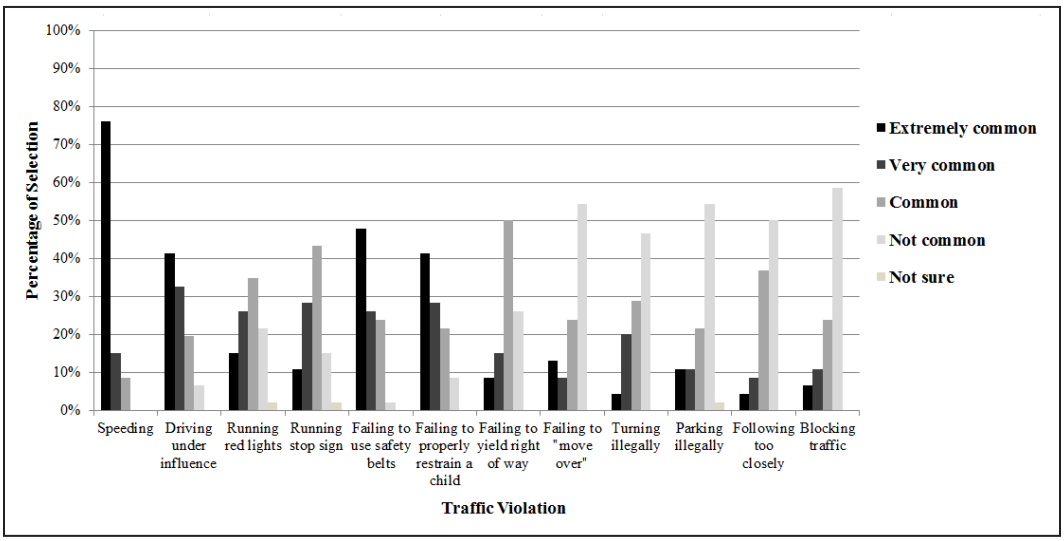
Other popular methods included identifying the top ten locations based on recent short-term crash history. A few law enforcement agencies plotted crashes on GIS maps, while other agencies reviewed actual police reports in addition to analyzing crash summary data. Besides analyzing crash records, several methods were adopted for identifying enforcement locations, such as: citizen complaints, surveys conducted annually to identify HCLs for specific time periods, review of dispatched calls, and the statewide list of HCLs.

Among the above identified methods to identify enforcement locations, 41% of agencies identified citizen complaints as the most common method, followed by frequently observed violations by patrolling officers (33%) and analysis of crash records (22%). Requests from local elected officials were among the least common methods. A majority of respondents (87%) noted that they would make use of FDOT's crash location maps for enforcement, while 7% were neutral. This shows that the majority of the agencies are willing to use the available assistance from FDOT.

Traffic Violations and Safety Campaigns

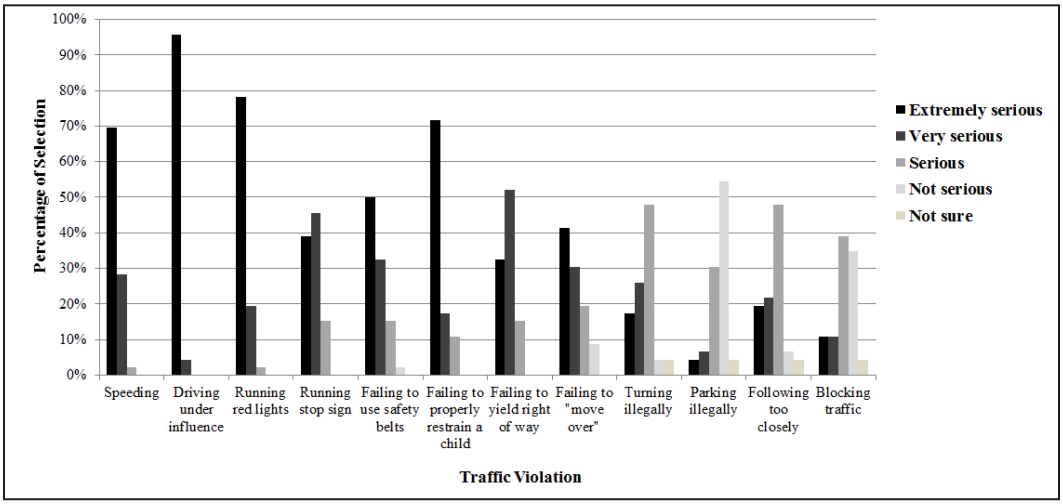
Frequency and Seriousness of Traffic Violations. This section identifies the frequency (Figure 2) and seriousness (Figure 3) of different types of traffic violations to highlight the necessary safety campaigns to be prioritized by law enforcement officers. Note that these violations were mainly identified from the standard crash report. The results in Figures 2 and 3 were generated from the responses of the law enforcement officers while calculating the percentage of selection of each traffic violation under each category. It should be noted that both figures were based on the impressions of the respondents, and not based on actual data.

Figure 2: Frequency of Occurrence of Different Traffic Violations



As shown in Figure 2, the five most common traffic violations were speeding (75%), failing to use safety belts (50%), failing to properly restrain a child (40%), driving under influence (DUI) (40%), and running red lights (15%). On the other hand, the five most uncommon violations included traffic blockage (60%), failing to move over (55%), illegal parking (55%), following too closely (50%), and illegal turning (45%).

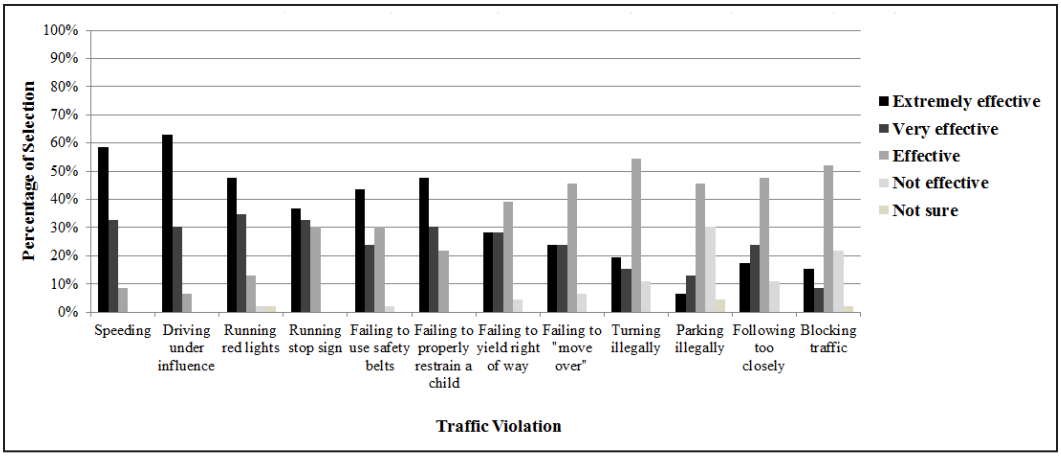
Figure 3: Seriousness of Different Traffic Violations



As shown in Figure 3, the extremely serious traffic violations were DUI (95%), running red lights (80%), failing to properly restrain a child (70%), and speeding (70%). The most trivial traffic violations included illegal parking (55%), traffic blockage (35%), failing to move over (10%), following too closely (5%), and illegal turning (5%). The results indicated that DUI, speeding, running red lights, and failure to properly restrain a child were seen as the most serious and most common violations, possibly because they could result in severe injury crashes. DUI was also cited as one of the highest risk factors of road safety in the study by Erke et al. (2009).

Effectiveness of Enforcement of Traffic Violations. This section discusses the opinions of law enforcement officers about the effectiveness of enforcing different traffic violations. As shown in Figure 4, the enforcement of DUI and speeding (60% each), running red lights and failure to properly restrain a child (50% each), and failure to use safety belts and running stop sign (40% each) were perceived as extremely effective. On the other hand, enforcement of illegal parking (30%), traffic blockage (20%), following too closely (10%), and illegal turning (10%) were considered ineffective. It is observed that those violations to be strictly enforced were also identified as the most serious violations.

Figure 4: Effectiveness of Enforcement of Different Traffic Violations



Effectiveness of Safety Campaigns. Law enforcement officers usually conduct safety campaigns to tackle traffic violations. It was found that over two-thirds of the responding agencies follow up with an evaluation to assess the effectiveness of their safety campaigns. Law enforcement officers used several methods for evaluation, which testifies to the diversity of the evaluation procedures implemented. In order of the frequency of adoption, the four common evaluation procedures were:

- comparing reduction in traffic violations pre and post safety campaigns
- conducting pre and post traffic surveys
- comparing before-and-after crash data
- comparing citizen complaints pre and post safety campaigns

Use of Crash Reports

Law enforcement officers are responsible for completing the crash report, the primary source of information for conducting crash data analysis. Therefore, the training they receive is vital. It was found that 57% of responding officers either agreed or strongly agreed that they received adequate training in completing the crash report, 22% were neutral, while 21% either disagreed or strongly disagreed on receiving adequate training. This indicates that most police officers acquire the required knowledge to fill out a crash report.

The main challenge in filling out a crash report was being lengthy and time-consuming. One interesting response was that "the report is considered difficult to understand without instructions manual." Another major issue was the time the officers took to do the paperwork or fill out the crash report electronically. On the other hand, the law enforcement officers considered crash location as the most useful information in the crash report, possibly since they could use this information for enforcement purposes. Much of the respondents' interest was geared toward crash type, crash cause, and manner of collision (or the first harmful event). Further, information on speeding, distracted driving, seatbelt usage, and DUI were of interest to the law enforcement officers.

Working with Local Transportation Agencies

Working Relationship with Local Transportation Agencies. In identifying the current working relationship with local agencies, it was found that 51% of the respondents held regular meetings with local transportation agencies for discussion and coordination of efforts; 29% worked with transportation agencies only when a situation arose; and 20% could not recall their recent encounter

with local transportation agencies. This shows that most law enforcement agencies were proactive in coordinating with local transportation agencies.

It was also observed that most of the barriers hindering the relationship included limited resources (budget, time, and manpower), minimum communication, lack of organized meetings, and politics; however, very few (five) agencies indicated that there were no barriers. To improve traffic safety, the law enforcement agencies provided the following key suggestions to local transportation agencies:

- organize more meetings with transportation agencies, e.g., through Road Safety Audits
- provide more assistance at DUI and safety check points
- provide more funding, e.g., to allow education and enforcement for pedestrians and bicyclists
- report any changes in the roadway cross-section/design
- receive continuous updates about changing traffic laws

Technical Assistance from FDOT. From the survey responses, it was noticed that the law enforcement community was interested in getting assistance from FDOT to help improve traffic safety and crash reporting. Specifically, the law enforcement officers were interested in technical assistance from FDOT on:

- up-to-date crash statistics in the jurisdiction's region
- funding to purchase items for traffic safety
- information on traffic counts and local crash data
- crime and traffic mapping

As for the software tools, the law enforcement agencies would like to be provided with:

- online crash database
- maps
- electronic crash reports
- electronic ticket writer for crash reporting
- major traffic tracking software for smaller agencies
- standard computer program to fill out and retrieve crash reports

Summary of Results

The following were the key findings from the survey of the law enforcement community:

- Most law enforcement officers monitor locations with high prior citation records.
- Citizen complaints, observed frequent violations by patrolling officers, and analysis of crash data were the most common methods of selecting enforcement locations.
- The majority of agencies were interested in receiving assistance from FDOT for enforcement purposes, e.g., using the HCL maps provided by FDOT.
- Speeding, failing to use safety belts, failing to properly restrain a child, and DUI were the most common violations.
- Traffic blockage, failing to move over, illegal parking, and following too closely were the least common violations.
- Enforcement of DUI, speeding, running red lights, and failure to properly restrain a child were perceived as the most effective measures to improve traffic safety.
- Enforcement of illegal parking, traffic blockage, following too closely, and illegal turning were considered to be least-effective in improving traffic safety.
- DUI and running red lights were the most serious traffic violations.
- Most agencies followed up with an evaluation to assess the effectiveness of the implemented safety campaigns.

- The most useful information in the crash report for the majority of law enforcement officers was the crash location.
- The majority of agencies held regular meetings with local transportation agencies for coordination of efforts.
- The majority of agencies emphasized a need to organize more meetings with transportation agencies and to get more assistance from them, especially at DUI and safety checkpoints.
- The police officers desired technical assistance from FDOT, which mainly included up-to-date crash statistics and funding to purchase items for traffic safety.

CONCLUSIONS

The SHSP aims to integrate the four E's of highway safety: engineering, education, enforcement, and EMS. To implement SHSP, state DOTs are increasingly looking to reach out to local agencies and law enforcement officials. This paper described an effort by FDOT to identify the existing safety practices and needs of local transportation agencies and law enforcement offices in Florida. This study attempted to find out current traffic safety practices and needs from the perspective of local transportation and law enforcement agencies. Two online surveys were developed targeting local transportation agencies and the law enforcement community in Florida. Both surveys are easily transferable to a larger audience in other state DOTs that are willing to reach out to their local agencies. Furthermore, both surveys supplement SHSP's effort with ways to improve the coordination between various safety agencies (i.e., state DOTs, local transportation, and law enforcement) to enhance traffic safety on all public roads.

Both the local transportation agencies and the law enforcement agencies emphasized the need to organize more frequent Road Safety Audit meetings to proactively improve traffic safety of public roads. In addition, both agencies agreed that speeding-related crashes were of highest safety concern and their continuous enforcement would be a major benefit. Also, conducting extensive campaigns to reduce DUI, running red lights, failure to properly restrain a child, running stop sign, and failure to use safety belts violations could be beneficial. Although some local agencies were reluctant to adopt the HSM and *SafetyAnalyst* due to extensive data requirements, required statistical expertise, and resource constraints, adequate training on these tools is expected to encourage their adoption.

Survey responses from local agencies revealed that over 70% of responding agencies agreed to standardize crash analysis procedures and over 90% agreed that FDOT should provide statewide training on crash analysis, and face-to-face meetings were by far the most preferable mode of training. The law enforcement agencies survey responses showed that speeding, failing to use safety belts, failing to properly restrain a child, and DUI were the most common violations. Law enforcement officers use diverse evaluation procedures to assess effectiveness of safety campaigns, such as comparing before-and-after crash data and comparing reduction in traffic violations pre and post safety campaigns. Two-thirds of responding law enforcement agencies analyzed crash records to identify enforcement locations. Besides analyzing crash records, citizen complaints, surveys, review of dispatched calls, and the FDOT list of HCLs were the other methods used to identify locations for enforcement.

The study identified several important lessons for other state DOTs to consider in order to improve traffic safety analysis procedures and practices. For example, one of the lessons learned from both survey responses is to improve coordination between various districts and related local transportation agencies, as well as between transportation agencies and the law enforcement community. This coordination could be organized via face-to-face meetings or webinars to discuss commonly identified safety issues and possible solutions, changes in the roadway cross-section, and changes in traffic laws. The study also highlighted suggestions from local agencies for better assistance with state DOTs, e.g., provision of training courses on safety analysis, greater exposure to the Road Safety Audit tools, more flexible information exchange, and provision of police reports

in a timely manner. In addition, addressing law enforcement officers' concerns about police reports and training police officers to correctly code the crash report are essential to improve the accuracy in crash reporting. More funding for local transportation and law enforcement agencies to conduct safety studies is also essential.

Results from the two surveys could be directed toward crash standardization, e.g., for inter-agency collaboration and data sharing. Based on the survey results, state DOTs could compare and identify the common practices and needs of the local transportation agencies and law enforcement agencies to assist in standardizing crash analysis procedures. Further research efforts could compare the results from this study with those from other states to determine how the crash analysis practices and needs vary and concur across states.

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