

CRASH DATA AUDIT EXECUTIVE SUMMARY

An Investigation of Police Crash Reports to Establish and Assess Current Obstacles and Future Performance Measures & Monitoring

Each year in Massachusetts, motor vehicle crashes result in hundreds of fatalities and thousands of injuries. These numbers represent an outstanding toll, not only in terms of lives lost, but also due to the financial burden put upon Massachusetts residents. Facing a reality of fewer resources, highway safety professionals need a strategic approach to programming. To reduce traffic crashes, high quality crash data is needed. This information helps transportation safety stakeholders to identify problems, develop and implement countermeasures, and evaluate outcomes. Therefore, the timely, accurate, complete, consistent, and accessible crash data produced from crash reports is critical for saving lives and preventing injuries associated with motor vehicle crashes. This data helps decision-makers to understand the nature, causes, and injury outcomes of varying crashes, so they can design strategies and interventions that will reduce crashes and their consequences. Crash prevention programming is only possible because of the data collected by police on crash reports.

With Traffic Safety Information System Improvement Grant (405c) funds, awarded by the Traffic Records Coordinating Committee (TRCC) and the Executive Office of Public Safety and Security (EOPSS) Highway Safety Division (HSD), the University of Massachusetts Traffic Safety Research Program (UMassSafe) conducted a quality control review by means of a crash data audit (CDA). The CDA investigated police crash reports in order to establish and assess current obstacles and future performance measures, and monitor criteria and findings to develop a Police Crash Report Data Quality Improvement Plan (DQ Improvement Plan).

PROJECT OBJECTIVES

The overarching goal of the project was to improve the accuracy, completeness, timeliness, and consistency of police-collected crash data, along with the overall quantity and quality of data collected, by identifying existing issues and concerns. In order to more effectively identify problems and evaluate program effectiveness, the objectives were:

Accuracy

- To assess and establish accuracy rates of police crash report fields, to be used as performance measures for assessing progress over time; and
- To identify a minimum of five police crash report fields with discrepancies or incomplete data, with recommendations for correction.

Completeness

- To assess and establish completeness rates of police crash report fields, to be used as performance measures for assessing progress over time; and
- To identify a minimum of five police crash report fields with incomplete or invalid data, with recommendations for correction.

CRASH DATA AUDIT PROCESS

The CDA was a quantitative review of a random representative sample of crash reports, including paper reports submitted by local police, electronic reports submitted by local police, and electronic reports submitted by State Police. The CDA focused on the areas of concern listed below (recommendations within the DQ Improvement Plan are outlined for these areas as well).

- Areas of concern that could be addressed by modifications to the crash report form, including design or wording changes to improve usability, and accuracy of data recorded;
- Areas of concern that could be addressed with improvements to data collection and entry systems used by State and local police; and
- Areas of concern that could be addressed through guidance, technical assistance, and training of police.

A panel of experts in crash data collection and reporting, and/or crash data analysis, performed a manual review of each crash report in the sample. These reviewers worked in teams of two to review a subset of crashes in the sample for accuracy, which in the context of this audit referred to internal consistency and completeness of the data. Sufficient internal consistency indicated that the report's description of the crash, the vehicles, and the people involved, contained no contradictory information. Sufficient completeness indicated that the appropriate data fields were utilized and that the report contained the minimum information required. For a report to have the minimum information required fields had to have valid responses/values and the narrative and diagram had to be completed. The level of detail associated with these sections was reviewed individually by the reviewers.

CRASH DATA AUDIT FINDINGS

The audit of a sample of police-completed crash reports that were submitted by local and State Police (both in paper format and electronically) provided interesting information that may be used as guidance for future efforts aimed at improving the quality of Massachusetts crash data. The most notable findings are outlined below, divided into the following sections: 1) crash level, 2) location level, 3) vehicle level, 4) non-motorist level, 5) driver level, and 6) passenger level.

Crash Level Findings

- *Latitude* and *Longitude* were fields often left incomplete by local police (paper and electronic reports). This field was completed more often on State Police reports, but it was often 0.00 or an irrelevant location.
- *Time of Crash* was often found to be invalid due to the use of the standard (AM/PM) format, instead of the required military time. Most often, this was true for State Police electronic reports.
- Although the *Speed Limit* field was completed by State Police often, it was left empty by local police more than 50 percent of the time.
- The *Traffic Device Functioning Code* presented challenges for all police types, due to a value being entered for the Traffic Device Functioning Code when 'No Device' was selected in the preceding field, *Traffic Control Device Type*.

- *Roadway Intersection Type* was found to be unacceptable more often for local police (paper and electronic), which may have been due to the higher variety of intersection types on local roads patrolled by local police, as compared to interstates and state routes patrolled by State Police.
- The *First Harmful Event Location* field had a 6 percent rate of inconsistent/incomplete information.
- While *Weather Conditions* were often completed in an acceptable manner, State Police had a slightly higher incidence of leaving the field empty, while local police had a higher rate of inconsistencies between this field and other fields on the crash report.
- The *Road Contributing Circumstances* field, a new crash report field, was left empty about 5 percent of the time. This was only examined for police departments using the new crash report, which excluded State Police.
- The *First Harmful Event* field was found to be incomplete more often for local police (paper and electronic) than State Police, but was inconsistent with other information on the crash report for both police types.

Location Information Findings

For 89 percent of reports reviewed, the *Crash Diagram* was rated as adequate. Additionally, approximately 87 percent of reports contained a north arrow. Auditors were unable to determine whether the existing north arrow was being used correctly. Other challenges included a missing *Roadway* name or a general lack of specificity. Also, some crashes (most often submitted by local police) were found to have occurred on a private way or in a parking lot, and should not have been reported to the Massachusetts Department of Transportation (MassDOT) Registry of Motor Vehicles (RMV) Division. Auditors explained that some officers responding to crashes that occurred in a parking lot may have completed a crash report to be helpful for insurance or store liability purposes. Even in these situations, the report could be filed at the police department, instead of being submitted to the RMV.

A later review, conducted by UMassSafe, identified 25 crashes that occurred on a private way that should not have been reported. The majority of these crashes occurred in the local police (electronically submitted) sample, which was likely due more to varying police department policies on reportable crashes, and less because of vendor differences.

The Intersection Method was the method of location that had the highest percentage of crashes that could be adequately geolocated (81 percent). The rates of successful geolocation were much higher for local police than State Police. However, State Police rarely used this location method (n=20). The *Direction* was often missing on reports using the *Intersection* Method. In almost 32 percent of these cases, the *Narrative* and/or *Diagram* provided additional information that was helpful for geolocating the crash. The common inconsistency on local police reports was whether the crash occurred in an intersection or in close proximity to an intersection. State Police auditors indicated that even if two intersecting roadways were entered into the State Police Record Management System, called RAMS in the 'At Intersection' section, it is populated and transferred to the RMV in the 'Not at Intersection'

section. The way RAMS is designed, the officers likely do not realize that their default is 'Not at Intersection'.

Auditors deemed the Address Method to be inadequate when either the road name was given, but not the address number, or if the Intersection Method would have been more appropriate. The Address Method was used effectively by local police, meaning that the crashes were able to be geolocated, 78 percent of the time. Conversely, when State Police used the Address Method, crashes could only be geolocated 14 percent of the time. However, State Police rarely used this location method (n=13). As described earlier, for State Police reported crashes that should have used the Intersection Method, some may have been populated and/or transferred to the RMV using the Address Method. The *Narrative* and/or *Diagram* provided additional information that was used to locate the crash in 38 percent of the sample reviewed.

The Mile Marker Method of locating a crash was only used by State Police. Although auditors found this method to be adequate 73 percent of the time, after further review by UMassSafe, it was determined that none of these crash reports had the *Distance from Mile Marker* filled in, and only 63 percent had the *Route Direction* filled in, making it difficult to determine the precise location of the crash. Furthermore, the Mile Marker Method had the lowest percentage (22 percent) of reports containing additional information in the *Narrative* and/or *Diagram* that would help in the geolocation of the crash. Even though mile markers are self-explanatory, and don't leave much room for error (exactly why they are preferred), discussion with officers helped to explain the potential for problems. Officers suggested that when they're situated on the side of a busy roadway, they are focused on collecting the pertinent people/vehicle information, and plan to complete the remaining pieces (including location) after they have left the crash scene.

The Exit Ramp Method was only used by State Police, with less than 28 percent of reports within the sample having adequate information to geolocate the crash. The *Route Direction* of the roadway (connected to the ramp) was provided on only 49 percent of the reports reviewed. Another issue with this location method was that the *Distance* of the crash location from the exit ramp was only provided on about 5 percent of reports. Furthermore, only 31 percent of the reports audited in this sample had additional information in the *Narrative* and/or *Diagram*.

Auditors determined that there is a lack of instruction and training on how to use this field properly. Often, an exit will be listed as the location by the officer because it is the nearest landmark, but the crash being described actually occurred in the travel lane of the highway. Additionally, there is confusion around how to properly use the distance field, and from where to measure. The greatest impact on the usability of this data is the lack of information in the *Direction* field. Without this piece, people using the data could be looking at a ramp that is different from where the crash occurred. For example, the northbound and southbound directions of a highway both have an 'Exit 4', but they are in different locations, connect to different sections of the cross-road, and could have completely different landscape attributes and roadway designs.

Vehicle Level Findings

- The *Hit and Run* field was found to be challenging for both police types, although less so for State Police reported crashes. Officers were confused about which vehicle the Hit and Run box should be checked for, and also how to complete information for the unknown driver/vehicle.
- State Police reports were often found to have the *Towed from Scene* field incomplete. In some instances, the field was left empty because the car in question was parked.
- The *Sequence of Events* field often had only one or two options completed, when other information on the report specified additional events that would have been appropriate to include in this field.
- The *Damaged Area* field was incomplete or inconsistent with other information on the report in more than 6 percent of reports reviewed. Law enforcement auditors indicated that the format for this field was easier on the older crash report.
- For the *Most Harmful Event* field, it appeared that officers found it challenging to single out which event was most harmful.
- *Owner Information* was incomplete more often when either the owner of the vehicle was a business, or when it was a case of hit and run, and therefore, officers did not have the information and were unclear on how to document the situation.
- Challenges with the *Number of Occupants* field were often due to having more occupants listed in this field than in the passenger section. Additionally, if the vehicle was involved in a hit and run, it was likely that the officer did not have information regarding the occupants, and was unclear on how to document the situation.

Non-Motorist Level Findings

Due to a very small percentage of crashes involving a non-motorist, these crash reports were specifically analyzed after the audit by UMassSafe staff. Although all non-motorist fields had acceptable findings that were under 95 percent, the small sample size (n=42) could be at fault. The non-motorist field that was most frequently considered unacceptable was *Non-Motorist Safety System Used*, followed by the *Non-Motorist Indicator Box*, *Non-Motorist Action*, and *Non-Motorist Location*.

Driver Level Findings

- The *Driver Distracted By* field was often incomplete. Auditors commented that informal policies varied by department, sometimes requiring that a citation be issued in order to use this field.
- *License Class* was often incomplete across all police submission types, but more often by State Police. This field presented the greatest challenge for law enforcement in cases where there was no license, or an out of state license.
- *Medical Facility*, for both driver and passenger, was often left incomplete, even with the Transport Code indicating that the driver or passenger was transported. Auditors recommended

providing a drop-down menu for Medical Facility that would include all such facilities, as well as options for 'not applicable' and 'unknown'.

- The *Safety System Used* field was often incomplete. In instances where this field was completed, auditors commented that the information was often unverified, based only on the information provided by the driver. This field was also challenging for collisions that involved a parked vehicle or a hit and run crash.
- *Responding to Emergency* is a field that was often incomplete for local police (paper and electronic) reported crashes. Law enforcement auditors indicated that when officers leave this field empty, it is an indication that the vehicle was not responding to an emergency.
- The Driver *Transported* field was often incomplete. It appears that many officers leave this field empty when the driver is not transported.
- The Driver *Airbag Status* field was often left blank, even though officers completing the crash report should have been able to determine whether the airbag deployed.
- *Travel Direction* was often incomplete for local police paper submitted reports. Auditors discussed the varying interpretation of this field, unsure if it's the overall road lane travel direction, or the trajectory in which the vehicle was moving. This confusion may contribute to the higher rate of incomplete data for crashes on local roads.
- In reports that had inconsistencies for the *Driver Contributing Code*, the greatest percentage came from paper submissions by local police, while incomplete information was found more often for State Police reports. Auditors commented that police departments had varying informal policies regarding their use of this field, along with its relationship to the cause of the crash and citations issued.
- The *Driver Ejected, Trapped* and *Injury Status* fields were incomplete in approximately 5 percent of the reports reviewed, most often on paper reports submitted by local police. Law enforcement auditors commented that police might leave this row of fields empty if the air bag was not deployed, or the driver was not trapped. Auditors also discussed the lack of specificity for each injury status option, and suggested more detailed clarification on each of the options.

Passenger Level Findings

- All passenger level fields were incomplete or inconsistent in more than 10 percent of the reports audited. The greatest challenge was for State Police reports, where these fields were left incomplete more than 25 percent of the time. Furthermore, these fields were left incomplete more often when there were no passenger injuries.

General Findings

- Across police types, there was no consensus regarding the appropriate level of detail to include in the narrative section of the crash report.
- Similar to the 2005 CDA, there were overall challenges associated with crashes, where critical information was not available. These instances included collisions with a parked car, where driver information either wasn't relevant or couldn't be easily collected, and hit and run crashes, where the driver information was relevant, but difficult or impossible to obtain.

Results by Vendor Type

Most of the fields described above were also examined by vendor type. However, the sample was not designed to provide statistically significant results by vendor type (beyond the scope of the project), and the sample size was small for some of the vendors. Nevertheless, crash reporting from IMC/Tritech appeared to be more complete and acceptable/consistent, while reporting from QED and the combined 'others' appeared to be less complete and acceptable/consistent.

OVERVIEW OF RECOMMENDATIONS

Based on the quantitative and qualitative findings of the CDA, as well as a review of the recommendations of the previous CDA and other data quality reviews, a list of recommendations was created. They have been grouped into three areas, with each area containing major recommendations, as well as a series of detailed recommendations that elaborate on the major ones. As an overview, the three areas, along with the associated major recommendations, are listed below. These serve as a framework for the DQ Improvement Plan. This plan can be used by the EOPSS HSD, TRCC, and other highway safety stakeholders, as a tool to prioritize projects, allocate resources, and work collaboratively to improve crash data quality in Massachusetts.

Modifications to Crash Report Form Used by Police to Record Crash Information

- Crash report and related database revisions: Phase 1.
- Establish standards for reporting fields that are currently less defined.
- Crash report and related database revisions: Phase 2.
- Consider long-term options for electronic data collection.

Improvement of Data Collection and Entry Systems Used by State and Local Police

- Standardize the data collection and entry systems.
- Improvements for State Police RAMS.
- Enhancements for both State and local police systems.

Guidance, Technical Assistance, and Training for Police Regarding Crash Reporting

- Provide crash reporting information regarding challenging fields and areas of concern.
- Expand knowledge and understanding among law enforcement on the importance of crash data and how it is used.
- Improve information exchange and dissemination with individual police departments on identified data quality issues.

MASSACHUSETTS POLICE CRASH REPORT DATA QUALITY IMPROVEMENT PLAN

The findings of the CDA and the associated recommendations were used to create a comprehensive DQ Improvement Plan that will be used to guide future data quality efforts. This plan was developed to provide recommendations to the TRCC, state agencies, police, and other stakeholders, for improving identified problem areas. Recommendations provided in the DQ Improvement Plan include details regarding the type of recommendation (systems, training, etc.), the problem being addressed, which agencies should be involved in the implementation of the recommendations, and an estimated timeframe for implementation (short, medium, or long).

Recommended Changes to Crash Report

For the recommendation suggesting modifications to the crash report used by law enforcement, the DQ Improvement Plan outlines specific crash report form changes. These include changes to instructions, fields, and the response options to fields. The plan also recommends the establishment of standards for specific fields, and the need to plan long-term crash reporting improvements, such as registration barcodes and the scanning of driver's licenses.

Recommended Changes to Data Collection Systems

Also outlined in the DQ Improvement Plan are enhancements to data collection/entry systems used by State and local police. These enhancements include the need for standardization across the various Record Management Systems (RMSs), as well as the possibility of creating a vendor certification process, or moving to one web-based data collection and entry system. The plan further outlines specific improvements that could be made to the State Police RAMS system and the local police RMSs. Some of these improvements include changes to specific fields that were found to be problematic in the CDA, and others would help to identify (for police) areas on the crash report that need more attention to detail. This might include a reminder pop-up window for particular information, or edit checks.

Recommendations for Educating Law Enforcement

The DQ Improvement Plan also outlines specific crash reporting problems that could be addressed through the provision of guidance, technical assistance, and training for police. This assistance could be provided by the Law Enforcement Liaisons (LELs), as they work with individual police departments. Further support will also come from the E-Crash Manual, which is currently in development. Specific information regarding challenging fields and areas of concern could be provided to law enforcement. In addition, sharing more about how crash data is used could give police officers more context around the importance of gathering complete and accurate information. Finally, the DQ Improvement Plan outlines methods for sharing identified data quality concerns with individual police departments.

These recommendations could be implemented through current and planned 405C-funded projects, and may include use of the LELs, and the RMV and UMassSafe project regarding *Crash Reports Accepted with Warning and Technical Assistance to Police Departments*. In addition, the planned project, *Tools for Improving Crash Report Reviews*, which includes guidelines for crash narratives and a web-based data quality tool, could be used for this purpose.