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Traffic Records Data Quality Management Guide: Update to the Model Performance Measures for State Traffic Records Systems

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16. Abstract

The Traffic Records Data Quality Management Guide builds upon the information in the NHTSA 2011 report, *Model Performance Measures for State Traffic Records Systems*, by describing data quality performance measurement in the context of a data quality management program. The performance measurement process enables stakeholders to quickly identify potential data quality challenges within a traffic records system, track project progress, and monitor data quality improvements or degradations over defined periods. Establishing meaningful data quality performance measures is fundamental to that process and is essential to a successful data quality management program for a State's traffic records system. NHTSA created this update in response to a review of State Traffic Records Assessment reports and State Traffic Safety Information System Improvements grants funding applications. This review found that States struggle with developing and using meaningful data quality performance measures. To address this challenge, this guide includes information on data management, stakeholder involvement, and developing and using data quality performance measures.

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Acronyms List

AADT	average annual daily traffic
AAMVA	American Association of Motor Vehicle Administrators
ANSI	American National Standard Institute
CDIP	Crash Data Improvement Program
CDLIS	Commercial Driver's License Information System
CODES	Crash Outcome Data Evaluation System
DWI	driving while impaired
EDT	electronic data transfer
EMS	emergency medical services
FARS	Fatality Analysis Reporting System
FDE	fundamental data element
FHWA	Federal Highway Administration
GHSA	Governors Highway Safety Association
GIS	geographic information system
HPMS	Highway Performance Monitoring System
HSIP	Highway Safety Improvement Program
HSP	Highway Safety Plan
IT	information technology
LEA	law enforcement agency
LRS	linear referencing system
MIDRIS	Model Impaired Driving Records Information System
MIRE	Model Inventory of Roadway Elements
MMUCC	Model Minimum Uniform Crash Criteria
MOU	memorandum of understanding
NEMSIS	National Emergency Medical Services Information System
PDO	property damage only
QA	quality assurance
QC	quality control
RDIP	Roadway Data Improvement Program
SSN	Social Security Number
SMART	specific, measurable, attainable, relevant, timely or time-based
SSOLV	Social Security Online Verification
STRAP	State Traffic Records Assessment Program
PDPS	Problem Driver Pointer System
SHSP	Strategic Highway Safety Plan
TRCC	Traffic Records Coordinating Committee
TRSP	Traffic Records Strategic Plan
VIN	Vehicle Identification Number

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Key Terms

This document uses terms that have been defined in the National Highway Traffic Safety Administration's *Traffic Records Assessment Advisory, 2018 Edition* (NHTSA, 2018), NHTSA's *State Traffic Records Coordinating Committee Strategic Planning Guide* (Peach et al. 2019), and the Code of Federal Regulations' Uniform *Procedures for State Highway Safety Grant Programs,* Title 23, Chapter III, Part 1300.

Baseline: A minimum or starting point used for comparisons.

Data attribute: A specific value or selection for a data element (or variable). For example, for the data element "Type of Intersection," attributes could include T-Intersection, Y-Intersection, Circular Intersection, etc.

Data element: Individual variables or fields coded within each record (e.g., Type of Intersection).

Data file: A dataset or group of records within a data system or database. A data system may contain a single data file—such as a State's driver file—or more than one. For example, the injury surveillance system consists of separate files for the emergency medical service, emergency department, hospital discharge, trauma registry, and vital records.

Data governance: A set of processes that verifies that important data assets are formally managed throughout the enterprise.

Data integration: Refers to establishing connections between the six major components of the traffic records system (crash, vehicle, driver, roadway, citation and adjudication, and injury surveillance). Each component may have several sub-systems that can be integrated for analytical purposes. The resulting integrated datasets enable users to conduct analyses and generate insights impossible to achieve if based solely on the contents of any singular data system.

Data interface: A seamless, on-demand connectivity and a high degree of interoperability between systems that support critical business processes and enhances data quality. An interface refers to the real-time transfer of data between data systems (e.g., auto-populating a crash report using a bar code reader for a driver license).

Data linkages: The connections established by matching at least one data element from a record in one file with the corresponding data element or elements in one or more records in another file or files. Linkages may be further described as interface linkages or integration linkages depending on the nature and desired outcome of the connection.

Data system: One of the six State traffic records system components—crash, driver, vehicle, roadway, citation and adjudication, and injury surveillance—that may comprise several independent databases with one primary data file.

Goal: A high-level statement of what the organization hopes to achieve.

Need: A challenge that the State considers in the Traffic Records Strategic Plan.

Objective: A quantified improvement the Traffic Records Coordinating Committee hopes or wants to achieve by a specific date through a series of related projects.

Performance measure: A quantitative statement, established through the performance measurement process, which is used to assess progress toward meeting a defined performance target. Refer to Table 1. Performance Measurement Components for an example of a performance measure.

Performance measurement: The process of creating and maintaining performance measures to assess progress toward meeting a defined performance target. Refer to the Performance Measurement section for further information.

Performance value: A numeric indicator used for comparing and tracking performance over time. Refer to Table 1. Performance Measure Components for an example of a performance value.

Performance target: A quantifiable level of performance or a goal, expressed as a value, to be achieved within a specified time period. Refer to Table 1. Performance Measure Components for an example of a performance target.

Problem identification: The data collection and analysis process for identifying areas of the State, types of crashes, or types of populations (e.g., high-risk populations) that present specific safety challenges to efforts to improve a specific program area.

Record: All the data stored in a database file for a specific event (e.g., a crash record, a patient hospital discharge record).

State: The 50 States, Tribal Nations, the District of Columbia, Puerto Rico, and the U.S. Territories. These are the jurisdictions eligible to receive State Traffic Safety Information System Improvements grants. In this context, "State" should be understood to include these additional jurisdictions.

Executive Summary

A sustainable data quality management program is fundamental to data that is trustworthy and dependable for decision-makers. The consequences of making organizational decisions based on poor quality data can have an undesirable effect on traffic safety. Decisions based on poor data risk incorrect problem identification or the allocation of resources or funding to areas that have a lesser impact on improving traffic safety. The proper appropriation of a State's limited traffic safety resources is crucial to impacting key safety focus areas such as impaired driving, occupant protection, distracted driving, and non-motorist safety.

The *Traffic Records Data Quality Management Guide* builds upon the information in the *Model Performance Measures for State Traffic Records Systems* (NHTSA, 2011) by describing data quality performance measurement in the context of a data quality management program. NHTSA acknowledges and thanks the expert panel who created the original document for their efforts in improving data quality.

The performance measurement process enables stakeholders to quickly identify potential data quality challenges within a traffic records system, track project progress, and monitor data quality improvements or degradations over defined periods. Establishing meaningful data quality performance measures is fundamental to that process and is essential to a successful data quality management program for a state's traffic records system.

NHTSA created this update in response to a review of State Traffic Records Assessment reports and State Traffic Safety Information System Improvements grants funding applications. This review found that States struggle with developing and using meaningful data quality performance measures. To address this challenge, this guide includes information on data management, stakeholder involvement, and developing and using data quality performance measures.

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Overview

NHTSA developed the *Traffic Records Data Quality Management Guide* for State data collectors, managers, and users to implement methods for improving data quality to support safety decision-making. This guide represents an update to NHTSA's *Model Performance Measures for State Traffic Records Systems* (2011). The original document was a collaboration between NHTSA and the Governors Highway Safety Association in which an expert panel of State traffic safety professionals developed example traffic records data quality performance measures. While States adopted many of those example measures, State TRSPs and grant funding applications too often show a misunderstanding of the meaning, purpose, and effective application of data quality performance measures.

This update extends the scope by providing a context for data quality performance measurement and placing it as a vital part of the formal, comprehensive data quality management program described in the *Traffic Records Program Assessment Advisory,* 2018 edition (NHTSA, 2018).

Audience

Data users, Traffic Records Coordinating Committee members, and other traffic records stakeholders can use this guide to:

- Identify the roles and responsibilities of their agency personnel in managing data quality;
- Measure data quality over time;
- Identify opportunities for improvement and develop procedures to measure data quality over time; and
- Improve the understanding of how the traffic records system supports their safety initiatives.

Data system managers can use this guide to:

- Develop performance measures to evaluate system improvements;
- Articulate to the TRCC the business need for updating components of the State data system;
- Engage existing TRCC members and other traffic records stakeholders;
- Incorporate new stakeholders into performance management;
- Recognize the necessity of data system edit checks and articulate how to implement them as part of a data quality control program; and
- Understand and incorporate the needs of the data collectors when developing effective performance measures.

Data collectors can use this guide to:

- Identify the roles and responsibilities of their agencies' personnel in managing data quality;
- Understand why system managers and the TRCC use performance measures to track and improve the data they collect;
- Identify challenges and opportunities to improve the data collection process (including opportunities for human factors improvement) to inform the data system managers and the TRCC; and
- Articulate feedback to data system managers and the TRCC on the quality control efforts that have been implemented (e.g., new edit checks, procedures, documentation).

The Role of Data Quality Management in State Traffic Safety Programs

Quality traffic records data is vital for traffic safety analysis and traffic safety programming. Maintaining a traffic records system that supports data-driven decision-making is necessary to identify problems and opportunities for improvement; develop, deploy, and evaluate countermeasures; and efficiently allocate resources.

Strategic Planning

Quality traffic records data is essential to effective strategic planning. States are encouraged to implement a strategic planning process that is realistic and supported by their current structure, authority, and capabilities. Over time, States can refine and improve their strategic planning and implementation processes to address identified traffic records needs for data quality improvement. Traffic records stakeholders, such as the State TRCC, should engage in strategic planning efforts to help identify and address traffic safety data quality issues to move the State towards improved data and better data quality management.

Data Governance

The advisory describes data governance as the formal management of a State's data assets. Governance includes a set of documented processes, policies, and procedures that are critically important to integrate traffic records data. These policies and procedures address and document data definitions, content, and management of key traffic records data sources within the State. Such data standards applied across platforms and systems provide the foundation for data integration and comprehensive data quality management. Data governance is a comprehensive approach that includes data quality management as a necessary component.

Data governance varies widely by State and involves a variety of traffic safety stakeholders, including data stewards, custodians, collectors, users, and other traffic safety stakeholders. The TRCC is ideally positioned to aid in developing the necessary data governance, access, and security policies for datasets that include several sources from several agencies. This formal data governance process can lead to improved data quality and traffic record system documentation, greater support for business needs, more efficient use of resources, and reduced barriers to collaboration.

Relationship to Other Plans

Quality traffic records data provides the foundation for key State traffic safety plans. States need timely, accurate, complete, and uniform traffic records data to identify and prioritize traffic safety issues, develop appropriate countermeasures, and evaluate their effectiveness. There are many commonalities among State safety planning efforts including data quality performance measurement. Performance measurement is a key component of traffic records data quality management. States are responsible for developing, monitoring, evaluating, and updating State safety plans using performance measures and targets to track their progress toward data quality improvement.

One way to reduce duplication of efforts is to incorporate the State TRCC's strategic planning and data quality management practices into other State safety plans such as the Strategic Highway Safety Plan, Highway Safety Plan, Highway Safety Improvement Program, local agency plans, or State agency efforts. Through agency collaboration on these State safety plans,

States are better able to recognize the value of including traffic records data quality in their planning and encourage broad, multi-agency support for the State's data quality management efforts. The State's traffic records strategic planning process can benefit from stakeholders' engagement in the development of other safety plans. This can be accomplished by informing traffic records stakeholders of changes occurring in specific data systems that may have widespread impacts, expanding the TRSP to include non-§405(c) funded projects, and increasing visibility of the TRSP with other agencies. These strategic planning efforts enhance the State's ability to conduct traffic safety problem identification, select and develop countermeasures, and measure the effectiveness of said countermeasures.

States that do not have an existing comprehensive, formal data quality management program can start one by creating traffic records data quality performance measures and targets. The formal data quality management processes described in the advisory include a role for the TRCC in reviewing and providing oversight for data quality performance measurements. State TRCCs identify which Traffic Records Assessment recommendations the State intends to address, which projects will address each recommendation, and the performance measures used to track progress. The TRCC's TRSP performance management should be coordinated with the data quality performance measures of the State's SHSP, HSP, and any other traffic records improvement efforts to prevent States from implementing projects that overlap and to add new projects as new needs and opportunities are identified.

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Introduction to Data Quality Management

Overview

Data quality management is a formal, comprehensive program that includes policies, procedures, and the people responsible for implementing them. In this guide, data quality improvement has the specific goal of supporting traffic safety decision-making to save lives, prevent injuries, and reduce the economic costs of traffic crashes.

As part of data quality management, it is important to distinguish between quality assurance and quality control. QA comprises the program- and policy-level aspect of data management and is typically the same for all data a department manages. It sets out the roles and responsibilities, program components, and expectations for the quality management program. QC comprises the specific steps and the organization's reaction to identified data quality problems. It is the list of data quality initiatives—how quality is measured and the actions that can be taken in response to specific data quality problems. QA is the manual, and QC is the toolkit. QA and QC together comprise the organization's formal, comprehensive data quality management program.

To accomplish this goal, a traffic records data quality management program should include the following QC components:

- **Edit checks and validation rules:** These are automated evaluations of values in data fields against defined ranges or allowed (expected) values, including verifications of logical agreement among the values. Often called data system business logic, validation rules test the consistency within a data element and edit checks test the consistency between two or more data elements. The purpose is to objectively assess the data against established standards, definitions, and requirements. When implemented as part of a data quality management program, edit checks and validation rules can minimize data entry errors by alerting data collectors to problems before they submit their report. They can also serve as filters at data intake so that reports containing errors can be flagged for rejection or correction. Edit checks and validation rules must be regularly monitored for effectiveness and efficiency and modified as necessary. Data collector feedback is essential to confirm that the edit checks and validation rules are working properly.

- **Periodic quality control data analysis processes:** This is a periodic analysis of most (or at least the key or important) fields in the database to compare newly received data to data from the past. This type of analysis is used to flag unexpected changes in the data so that analysts and other key personnel can investigate what may have happened and if the changes indicate a data quality problem or reflect reality. States may choose to repeat the monthly, quarterly, or annual QC analyses as best fits their quality management program.

- **Data audit processes:** An audit process using a random selection of reports from the database and expert-level review of the data in each of the cases helps data managers identify if there are any data collection problems (such as misinterpretations of data element definitions) that are not being flagged as errors by the current edit checks and validation rules. Audits can prompt changes to training, guidance, manuals, data definitions, supervisors' data reviews, and edit checks.

- **Error correction processes:** When errors are identified in accepted data (i.e., in the production version of the database), a formal procedure for correcting those errors should include a method for logging the correction, providing information to the original data collector (and agency), and retaining both the original and the corrected data (i.e., the potential to review the error and the correction). An error log table in the database serves this purpose. States can set reasonable limits on the types of changes that can be implemented and for how long after the original submission. Some errors and corrections are more important than others and impact specific uses. For example, incorrect location information affects engineering studies and enforcement efforts—the State may wish to correct these errors whenever they are noticed.

- **Data quality performance measures:** There are six data quality attributes that NHTSA recognizes—timeliness, accuracy, completeness, uniformity, integration, and accessibility—for each of the six core components of a traffic records system. There are many ways to measure each attribute and there are many databases within the six core system components. This guide explains *performance measurement*—how to create meaningful data quality performance measures that help identify when there is a need to address a data quality problem and help point to potential solutions.

Stakeholders

Data quality management is the concern of those who collect, manage, and use traffic records data for decisions impacting traffic safety. The stakeholders in data quality management come from local, Tribal, State, and Federal Government agencies. They may also be members of the public, research organizations, and advocacy groups. Important roles and responsibilities in a data quality management program include:

- **Data owners/system administrators/data managers**: These are the custodial agencies and designated positions, given authority (often defined in statute) over data sources. The data owner may be charged with establishing the official, required contents and format of data collection forms; implementing and meeting State and Federal standards or guidelines for collection, maintenance, and access to data; and managing staff and resources required to maintain the system. The person exercising this authority may or may not be an information technology professional but is often tasked with overseeing, managing, and maintaining responsibility for the work of IT staff and IT contractors supporting the system.

- **Data stewards and data custodians**: These are often the IT professionals assigned to maintain and upgrade the system. Where the two roles are separate, data stewards are tasked with creating datasets, developing policies, and managing high-level communications about data use and access. Data custodians are IT staff responsible for

the technical aspects of data movement, security, storage, and user access. These positions are often tasked with system documentation responsibilities.

- **Data entry specialists, quality assurance QA/QC reviewers, and supervisors**: These are levels of staff trained to handle data intake, post-processing, quality reviews, and oversight. This type of staff member often reports to the data owner as part of the data system administration team. As data collection operations move from paper-based to electronic data collection and data transfer, many States have transitioned these positions toward data quality review roles with expanded responsibilities focusing especially on data quality.

- **Data analysts and data scientists/statisticians**: These staff may also report to the system administrator. They develop QA policies and QC analyses to test the quality of data. They also conduct analyses to support programs and key users. Data analysts may also help to maintain user documentation for the system and may take on responsibility for training content development for data collectors. Data scientists and statisticians may also work on new ways of integrating and analyzing data that will then be used by the data analysts. Data scientists are often focused on developing tools and automated systems for others to use.

- **Data collectors**: Depending on the system, many people may supply records to the database. This may or may not be their primary job responsibility, and, in most cases, they do not report to the system administrator, but rather are part of a different office or agency. For some databases, there are many (sometimes hundreds) agencies with thousands of data collectors. The data collector role may include trainers and supervisory personnel in each agency as well.

- **Data users**: These are stakeholders in the system by virtue of their need for data and analytic results. Data users have a defined role in data quality management because they can provide valuable feedback on the data's suitability for meeting specific needs. Their feedback can take the form of error notifications (a record contains mistakes or is missing critical information) and by adding to the discussion of data needs (e.g., data gaps).

Each person may take on more than one role—a data collector in one scenario may be a data user in another situation. Data managers are often data users as well. Data quality management requires the expertise of specialized roles such as system developers in IT, database administrators, field personnel, supervisors, data entry specialists and QC staff, executive decision-makers, engineers, planners, statisticians, research scientists, and more.

The work of data quality management is task-oriented but requires planning, oversight, and cooperation. To be effective, data quality management should involve collaboration among stakeholders, preferably within a formal data quality management program or data governance framework. This can be established for individual systems, at the agency level, or statewide, depending on the capabilities and maturity level of the programs. This guide describes managing data statewide or agencywide, but the principles of data quality management apply to individual systems. The same data quality management structures, policies, and procedures can work for all traffic records systems or a single system.

TRCC Involvement

The State TRCC may be able to facilitate the multi-agency stakeholder engagement that data quality management requires, especially to meet the need for oversight and collaboration. Ideally, TRCCs meet regularly throughout the year and are tasked with improving State traffic records data. They are charged with creating the State TRSP that includes projects proposed by stakeholders to address problems and take advantage of opportunities for data improvement and increased efficiency. Their inputs include the data quality management programs, custodial agencies, and various stakeholders expressing data needs and ideas for improvement. The TRCC can take on several important roles in data quality management, including:

- **Identify stakeholders:** The TRCC is a good source of stakeholders for most of the traffic records system components and the roles and responsibilities defined for the data quality management program. One possibility is that data quality management can become a working group within the TRCC.

- **Review system edit checks and validation rules:** The process of reviewing data edit checks and validation rules often involves a small group of experts with detailed knowledge from several perspectives (collectors, managers, and users). The TRCC can include these people or recruit them specifically for review efforts.

- **Define performance measures:** Through the performance measurement process, the TRCC can help data managers define data quality performance measures if agencies need assistance. This can happen through collaboration among agencies that have successfully implemented data quality programs and share that knowledge with partners in the TRCC setting. The TRCC can also take the lead in creating a formal, comprehensive data quality management program that all agencies can participate in together. Part of that effort would be the development of data quality performance measures for each of the systems.

- **Monitor data quality performance measures and set goals:** The data quality performance measurement effort will include comparisons against baseline performance and target setting. The TRCC can help agencies establish the goals for data quality performance and monitor the achievement of the projects aimed at improving traffic records quality by including periodic reports in the TRCC meetings.

- **Work with or foster data governance efforts:** The TRCC can contribute to data governance efforts within agencies or at the statewide level by sharing its knowledge of data quality management for the State's traffic records system. The formal policies, procedures, roles, and responsibilities in data quality management are all like those needed for data governance. The two processes can work well together and the TRCC can share its progress with the data governance group or borrow from what that group has already accomplished.

Consideration of Data Quality Management When Updating Data Systems

Data quality management programs involve several activities that can be supported with automated tools or database records. These include analyses that are run periodically (e.g., trend

analyses and comparisons to prior years' data), reviews and updates to system edit checks or validation rules, and creation of error logs when data is corrected. While it is possible to add features to an existing system, the cost can be quite high and the timeline for execution may be long. The costs and timing are barriers if the work is not considered part of a critical departmental priority or if the requested change will not generate revenue. When departments are upgrading their systems, however, the opportunity arises to include functionality that will support data quality management as part of the new system specification. At that time, the additional cost for adding a feature such as flexible analytic output, edit check specifications controlled by the agency's management, or a separate data table to track error corrections may be marginal.

It is important to have systems designed so that users can specify their own analyses and save those specifications for reuse and modification. Similarly, suppose the system design includes an edit check and validation rule tool. In that case, that tool should allow the system's managers to write new edits, save them, turn them on and off, and specify what happens when a rule is violated. Any new edit checks created should be thoroughly vetted in a test environment before implementation in a production environment to determine that there is no adverse impact to the system. Also, for the suggested error log data table, the system should track all changes to the database by who made the change, when they made it, and what the change was so that the data can always be recovered to the immediately preceding value if desired. These features will give a State more control over future changes to the system and avoid the costly and time-consuming need to consult with contractors or IT staff to perform minimal functions such as modifying an edit check or creating a new analysis. The tools for performing these tasks should be simple to use and accessible to authorized users based on management's approval.

Electronic Data Transfer and How to Use Data Quality Management to Support EDT

The EDT protocol is NHTSA's automated transfer of State motor vehicle crash and injury data from State data repositories. NHTSA uses EDT to advance near real-time data collection and transfer, enable more timely decision-making, reduce the burden of data collection, improve data quality, and make data available sooner. Ultimately this supports the Fatality Analysis Reporting System and Crash Report Sampling System programs, which align to many MMUCC data elements. The closer a State aligns to MMUCC and other national data standards, the easier it is to share data and there is less work to do in translating between the State data elements and NHTSA's data elements. States can request additional information about EDT by contacting their NHTSA Regional Offices.

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Traffic Records "Twelve Pack": Six Core Data Systems and Six Data Quality Attributes

Six Core Data Systems

Six core data systems make up a comprehensive traffic records program. These data systems are briefly described below. More detailed information about the core data systems and their components can be found in the *advisory*.

Crash

The crash data system is the repository for law enforcement reported motor vehicle traffic crash reports. The crash system collects and maintains critical crash data used to develop and implement data-driven traffic safety countermeasures. At a minimum, crash data includes information about who was involved in the crash, what types of vehicles were involved, when and where the crash occurred, how the sequence of events of the crash played out, and any related factors. See the *Model Minimum Uniform Crash Criteria* (NHTSA, 2024) for more information on data collected for the crash system.

Interfacing the crash data system with other traffic records data systems can increase the ease and efficiency of data collection, while creating potential for robust data analysis efforts. Data analysis provides information about driver behavior, environmental factors, injury severity, and medical outcomes of crash-related injuries.

Refer to Table 3. Crash System Performance Measures Examples for examples of crash system performance measures.

Driver

The driver system contains personal information about motor vehicle operators. Each licensed driver should have one identity, one license, and one driver history record. The driver history record includes prior traffic crashes, sanctions, convictions, administrative actions, license classes, and endorsements, license issuance and expiration dates, and any restrictions. The driver system may contain information on unlicensed drivers and out-of-State drivers who were involved in in-State crashes or received in-State traffic sanctions. Custodial responsibility usually lies with the State's Department or Division of Motor Vehicles. See the *American Association of Motor Vehicle Administrators Data Element Dictionary for Traffic Records Systems* (2020) for more information on data collected for the driver system.

Data from the driver system can be used by law enforcement officers to populate data on crash and incident reports, complete citation forms, and determine appropriate sanctions or charges. Data analysis of driver system data can identify drivers with a pattern of high-risk behaviors who pose a safety risk to other road users. Driver data is useful as a source of demographic data and in effectiveness evaluations for driver training, information campaigns, and various behavioral countermeasures focusing on specific driver types or violations. Linking driver data to the citation and adjudication system can be particularly useful because doing so supports improved updates to records on people and can help States keep better track of repeat violators who may be subject to enhanced charges.

Refer to Table 4. Driver System Performance Measures Examples for examples of driver system performance measures.

Vehicle

The vehicle registration system is the repository for information on titled and registered vehicles within the State. Usually, a State's Department or Division of Motor Vehicles has custodial responsibility for this data system. The vehicle system may include information on vehicles registered out-of-State but involved in a crash or traffic violation in-State. Data housed in the vehicle system includes vehicle specifications (e.g., make, model), owner/registrant information, motor carrier information, vehicle history (including recalls), and identifies financial responsibility. See the *American Association of Motor Vehicle Administrators Data Element Dictionary for Traffic Records Systems* (2020) for more information on data collected for the vehicle system.

Law enforcement officers may use vehicle registration data to populate data on crash, incident, and citation reports. The Vehicle Identification Number can be used to identify patterns of specific vehicle involvement in crashes and other traffic-related incidents and to identify stolen vehicles more readily during traffic stops. When driver and owner records are expected to match with respect to other key data elements (e.g., address changes), linking the two can help with data validation and update processes.

Refer to Table 5. Vehicle System Performance Measures Examples for examples of vehicle system performance measures.

Roadway

The roadway system contains data about the characteristics, conditions, operation, and ownership of roadways within the State. Ideally, this system includes information on Federal, State, Tribal, and local roadways. The custodial agency for the roadway system is generally each State's Department of Transportation. Examples of data collected in the roadway system include road classification, condition, number of travel lanes, shoulder type and width, traffic control devices, pavement type, and average annual daily traffic. See the Federal Highway Administration's *Model Inventory of Roadway Elements – MIRE 2.0* (Lefler et al., 2017) for more information on the data collected for the roadway system.

Analysis of roadway data supports network screening and traffic safety countermeasure development. Integrating roadway and crash or citation data allows for a better understanding of the circumstances of crashes and other traffic incidents. This combined data analysis can identify locations for safety improvements and assists project prioritization to allocate funds to high-risk locations. Creating an interface between the crash report and the roadway system can allow officers to select the crash location on the State's linear reference system to populate roadway data onto the crash report. The LRS and traffic volume data are useful in law enforcement planning and EMS response. Agencies that prepare community-level safety analyses can use the roadway spatial data to identify areas of high risk and compare those with information about their areas that have a high concentration of night life, locations of schools and universities, lack of sidewalks, density of vulnerable road users, or other factors that may contribute to the risk of injuries or fatalities. Additional data may include things like prevailing speeds, distance or time to nearest level 1 or level 2 trauma center, average EMS response times, and other information not usually captured in a linkage to crash reports alone.

Refer to Table 6. Roadway System Performance Measures Examples for examples of roadway system performance measures.

Citation and Adjudication

The citation and adjudication system is made up of component repositories that store traffic citation, arrest, and final disposition of charge data. Responsibility for the systems is interdependent on the data-owning agencies, which includes Federal, State, Tribal, and local agencies. A functional traffic records citation and adjudication system relies on the willingness of data-owning agencies to share data. Ideally, all relevant traffic records-related citations are housed in a central, statewide repository to allow for thorough data analysis.

Citation and adjudication data are used by the driver and vehicle systems to maintain accurate driver history and vehicle records. Citation and adjudication data are also used in national safety data repositories, such as the Problem Driver Pointer System (PDPS) and the Commercial Driver's License Information System (CDLIS). Integrating crash and traffic citation data with other crime data can identify hot spots or high-risk areas to aid in effective resource allocation. Analyzing citation and adjudication data can also support traffic safety programs by examining the effectiveness of law enforcement campaigns. Accurately tracking impaired drivers helps reduce recidivism. See the NHTSA *Model Impaired Driving Records Information System* (Greer, 2011) for more information.

Refer to Table 7. Citation and Adjudication System Performance Measures Examples for examples of citation and adjudication system performance measures.

Injury Surveillance System

The injury surveillance system is a network of data repositories, comprising several component systems (e.g., EMS, trauma registry, emergency department, hospital discharge, vital statistics, and rehabilitation). The injury system is responsible for tracking the frequency, severity, causation, cost, and outcome of injuries. The data contained in this system is representative of the patient care lifecycle. Custodial responsibility is usually shared among several State and other agencies. Stakeholders from traffic safety, public health, and law enforcement communities drive the development of a statewide injury surveillance system. The injury surveillance system family of records begins with a patient care record from EMS response—see the *National Emergency Medical Services Information System's EMS Data Standard* (NHTSA, 2023) for more information on the data collected by EMSs. There is also a national standard for trauma registry data captured once a patient has been seen in an emergency department and coded into a trauma registry—see the American College of Surgeons (n.d.) *National Trauma Data Bank Data Standard*.

Integrating crash and injury data can provide information about the outcome of injuries sustained in motor vehicle crashes and other traffic related incidents. Injury data analysis supports problem identification, research into prevention, and the development of traffic safety countermeasures. Analysis of injury data can inform policy-level decision-making, including changes to legislation, and the allocation of resources. Although no longer directly sponsored by NHTSA, the data linkage techniques developed for the Crash Outcome Data Evaluation System are still used by some States to support data analysis, problem identification, project evaluation, and programmatic decisions. Injury data can also be linked to traffic and roadway data to help inform planning, safe communities, and transportation equity efforts.

Refer to Table 8. Injury Surveillance System Performance Measures Examples for examples of injury surveillance system performance measures.

Data Quality Attributes

A comprehensive traffic records program tracks the six core data quality attributes for each of the six core traffic records data systems. These attributes are briefly described below and are used as the basis for measuring data quality in the next section.

Timeliness

Timeliness reflects a measure of the length of time between the event and the entry of data into the appropriate data system. Timeliness could also measure the length of time between when the data is entered into the system and when the data is available for analysis.

Accuracy

Accuracy measures the degree to which the data is error-free. An error occurs not when the data is missing (see completeness, later in this section), but when the data in the system are incorrect. Erroneous data can be difficult to detect but edit checks and validation rules for data entry can help minimize errors and direct the user to a more appropriate response. Verifying data with external sources is another method for identifying errors. Accurate data is error-free, pass edit checks and validation rules, and are not duplicated within a single database.

Completeness

A complete database contains records for all relevant events where each record is not missing data. Missing data does not indicate errors (see accuracy, above), but it does make a database incomplete. Completeness can be measured internally (e.g., the number of records in a system that are not missing data element selections) or externally (e.g., the percentage of incidents that are entered into a system out of all known incidents).

Uniformity

A database is uniform when there is consistency among records and among procedures for data collection across the State. Uniformity should be measured against an independent data standard, preferably a national standard if available. Uniformity may assess consistency among data collection sources (e.g., law enforcement, health care providers, courts, vehicle registration clerks, etc.) that provide records to the database. Uniformity may also assess how closely a data system aligns to the applicable national standard such as the *MMUCC)* and the *American National Standard Manual on Classification of Motor Vehicle Traffic Crashes (ANSI D.16-2017)* for crash data, NEMSIS for EMS data, MIRE for roadway data, and others.

Integration

The ability to link data records from one traffic records data system to records in another of the six core component data systems presents States with an opportunity to conduct complex data analysis. This integration between two or more traffic records systems involves matching records from one system to another by using common or unique identifiers. Rather than measuring performance in one system only, integration measures the ability of two or more systems to successfully match their records. Integration can be measured at the database level (e.g., two traffic records source files are linked, so a State might show a simple performance measure value of "two"). A more informative measure is the percentage of records that can be matched from

two or more data systems. For example, 1,000 people were transported to hospital emergency departments because of crash-related injuries and 800 were admitted to the hospitals. The integration of crash data and health data would be measured on the expectation of up to 800 linked in-patient records and up to 1,000 EMS and emergency department records. If 600 in-patient records are successfully linked with crash records, the measure is 75 percent.

Accessibility

Accessibility is unique among the traffic records data quality attributes. Unlike the first five, which focus on the overall quality of data in the six core component data systems, accessibility evaluates the ability of data users to obtain data. Data users and traffic safety stakeholders need timely access to data that is accurate, complete, and uniform. However, measuring users' ability to access the data they need for traffic safety programs and data-driven decision-making can be difficult.

One method for measuring accessibility is to consider it in terms of customer satisfaction. Legitimate data users must be able to request and obtain the data necessary for their business needs. Are these data users able to access the relevant data? Are they satisfied with the data they can access and the process in place for obtaining the data? To answer these questions and measure a system's accessibility, States can develop and administer a survey to data users. States should first identify who the principal users of the data are. Next, query the principal users to assess both their ability to access the data and their level of satisfaction with the data (e.g., in terms of timeliness, accuracy, completeness, uniformity). Finally, States should document the methodology and responses from their principal users.

Another method for measuring accessibility is to measure the number of unique users who access the data system over a set period. This is possible by tracking internal system data, such as logins, data queries, or data extracts. With a nationwide increase in electronic data reporting, many States are offering public data dashboards. These dashboards allow access to traffic safety stakeholders who are not principal data users and would not historically have access to the data. Tracking the number of website or dashboard hits, or the number of data queries run, can also inform States of data accessibility.

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Performance Measurement

Performance measures are intended for use by traffic safety stakeholders to develop, implement, and monitor traffic records data systems with a focus on data quality. They can be used in strategic plans, data improvement grant processes, and data governance efforts. They should be used to quantify system improvements and for ongoing monitoring of the quality of traffic safety data collected by a state's traffic records system. The information outlined in this document is expected to help stakeholders quantify and evaluate quality improvements to their traffic records systems.

The data quality performance measure examples in this guide serve to assist States in developing their own measures to monitor and improve the quality of traffic records data. Performance measures gauge the performance of a specific data system in one of the six core traffic records component systems. The measures should be based on State needs and can be used to track progress in a TRSP, HSP, SHSP, or any system-specific planning efforts. Performance measures help accurately measure the impact of system improvement or enhancements, assess the quality of data being captured, create transparency, and answer important questions about overall system performance. Performance targets can be used to measure past, current, and future performance. They can help identify both weaknesses and strengths.

Performance measures can originate from several sources. One important origin is the State's QC data analyses resulting in problem identification. When data quality problems are identified, one QC step may be to establish a performance measure that quantifies the problem and helps the State monitor improvements toward an established goal over time. Another frequent source of performance measures is data improvement projects, especially those funded with traffic records grants and highlighted in the State's traffic records strategic plan. A well-constructed project description will include data quality performance measures with a baseline value and predicted improvements over the life of the project. States and agencies can choose which of their data quality performance measures are included in strategic plans, reports to the TRCC or NHTSA, and which are kept primarily for internal tracking by the data custodians and data managers. Different measures can serve different purposes. The important common feature is that all the performance measures are quantifiable and that they each serve a specified need for the State.

Defining Data Quality Performance Measures

A complete data quality performance measure arises from an identified need, works toward a goal, identifies an objective, contains a baseline measure, and defines a performance target within a set timeframe. Table 1 shows an example of the components of performance measurement and how these parts fit together.

In this example, a State identified the need for a timeliness performance measure for crash report submissions. The State noted the data system and data quality attribute being measured and set the goal of increasing timeliness. Next, the State created a time-bound objective (the next 5 years) over which the State would achieve the timeliness improvement. The State defined the performance measure using a quantitative statement to achieve the desired 10-day submission performance target —move from the baseline of 65 percent (year 0—2023) of crash reports entered the Crash Data System within 10 days after the crash to the performance target of 95 percent by year 5 (2028). Further, the State set annual performance values for each year of the defined time period to compare and track performance. The table shows planned and actual

performance, providing evidence that the State has tracked performance and that it has achieved its crash report submission timeliness goal.

Table 1. Performance Measurement Components

Need	Establish a timeliness performance measure related to crash report (electronic and paper) submission.	
Data System	Crash	
Data Quality	Timeliness	
Goal	Increase the timeliness of traffic records data.	
Objective	Improve the timeliness of the Crash Records Data System in the next 5 years.	
Performance Measure	Increase the percentage of crash reports entered in the Crash Records Data System within 10 days after the crash, from 65% in 2023 to 95% in 2028.	
Baseline *(e.g., 2023)*	65%	
Performance Target	95%	
Performance Values	**Planned**	**Actual**
Year 1 *(e.g., 2024)*	70%	72%
Year 2 *(e.g., 2025)*	75%	75%
Year 3 *(e.g., 2026)*	80%	84%
Year 4 *(e.g., 2027)*	88%	90%
Year 5 *(e.g., 2028)*	95%	95%

Performance measures should:

- Be quantifiable—able to be expressed or measured as a quantity (amount or number).
- Be measurable—able to estimate or assess the extent, quality, value, or effect of something.
- Be meaningful and useful to States.
- Contain a baseline (current/historic value).
- Reference a target.

When the performance measure components are put together to form a statement, it should read something like this:

- *Increase the percentage of crash reports entered in the crash records data system within 10 days after the crash, from 65 percent in 2023 to 95 percent in 2028.*

Over the life of the performance measure, the State can track actual progress against the target measures to see if they are on course. For example, in year 2 the State finds that they are only at 70 percent instead of the target measure of 75 percent. The State now knows how to adjust their efforts to get back on track to reach the year 3 target measure of 80 percent. Setting and routinely monitoring smaller targets (e.g., quarterly) can add greater safety nets to help keep projects from straying off course.

Identifying Stakeholders

Defining Stakeholders

When creating performance measures for traffic records systems, first identify stakeholders and system owners. Below is a list of questions agencies can use to identify stakeholders.

- Who is responsible for oversight of the system?
- Who can affect changes, improvements, or enhancements to the system?
- What people have a vested interest in how the system performs and the quality of data it collects?
- Whose work is impacted by the quality of data collected by the system?
- Who can help determine if there are mechanisms in place to collect data for the performance measures selected?
- Who can help evaluate if the performance measures established have meaning, usefulness, and relevance to stakeholders and system owners?

Various stakeholders and system owners can develop meaningful and realistic performance measures. Stakeholders of traffic records systems may include system users, data collectors, data users, system owners and managers, TRCC members, and others. Identify people from each of these groups for each respective traffic records system before beginning to draft performance measures. Ideally people networking and building connections with traffic records professionals across State agencies from all traffic records systems is vital to a successful TRCC as well as establishing useful and meaningful performance measures for each system.

Addressing Challenges

States may not always have someone with the expertise to draft appropriate performance measures for each respective system. The State Highway Safety Office has program management authority over NHTSA-funded traffic records grants and should know how performance measures are created and reported on a statewide level. Often this task falls to the TRCC, or the person(s) tasked with updating the State's TRSP. Also, lack of TRCC involvement from data system representatives can make it harder to develop performance measures representative of the core component systems. Lack of contributions to TRSP updates can also make identifying performance measures challenging. States are encouraged to establish contacts, network, build, and maintain relationships with traffic records system owners, database managers and users, and other stakeholders. States may want to focus on the areas with the greatest potential for improving data quality and enhancing the collection of traffic safety data.

The TRCC's Role in Performance Measurement

Performance measures are designed to provide important actionable information to data system managers. The development, implementation, and maintenance of a TRSP, as well as including each core component area in the plan is a key responsibility of the TRCC. Ideally, each traffic records system would have meaningful and useful performance measures including baselines, goals, and targets. It is important when establishing performance measures for a data system that the measures selected are meaningful to system owners and stakeholders.

Routine monitoring of performance measures and reporting on progress toward performance targets at TRCC meetings is important to an effective strategic plan. The tracking of problems, successes, and solutions benefit the entire traffic safety community. This helps establish that the performance measures in place continue to be useful and can also help to identify when it may be time to review, update, or revise existing performance targets as traffic records systems evolve through the years.

Developing Performance Measures

Well-crafted performance measures with meaningful goals, baselines, and targets are crucial to monitoring a system's progress over time and provide a mechanism to evaluate system improvements or enhancements. States might consider asking the following questions during the development of each performance measure.

- Is it meaningful?
- Is it relevant?
- Is it useful or does it have value to data collectors, data users, or system owners?
- Is it realistic (i.e., is it achievable)?
- Do changes in the measure reflect changes in the data's quality?
- Is it reliable? Will stakeholders trust what the measure tells them?
- Is it helpful to inform decision-making when evaluating system improvements or enhancements?
- Is the quality of data collected improving?

SMART

When establishing performance measures for a traffic records system, incorporate the following SMART principles.

- **Specific:** Measures are well-defined, appropriate, understandable, and target the area of improvement.
- **Measurable:** Measures are quantifiable and detect changes over time using data that are readily available at reasonable cost.
- **Attainable:** Measures are realistic, achievable, and reasonable.
- **Relevant:** Measures are pertinent to the traffic records system, have meaning and usefulness to a system's owners, managers, and users and align with the values, long-term goals, and objectives for the system.
- **Timely or Time-Based:** Measures have a defined period during which improvement will be measured or quantified; from a beginning date to an end date that relates back to the goals and objectives.

Steps to Create Measures

The steps to creating quality performance measures:

1. **Engage stakeholders:** Identify and seek input from those most affected by the data quality issues (collectors, managers, and users) to be addressed.
2. **Identify the problem:** Describe the data quality issue(s) with as much precision as possible using available data.
3. **Establish the baseline:** Use historical or most-recent-year data as the baseline (starting point) against which to plan and assess improvements.
4. **Set a goal:** Establish an ultimate quantitative value of the performance measure to achieve.
5. **Define the time period:** Establish the time range over which the goal will be achieved.
6. **Plan the action steps:** Develop an action plan for achieving the goal over the established time period.
7. **Set targets:** Set numeric targets throughout the identified time period (e.g., quarterly, yearly) of the action plan.
8. **Measure progress:** Compare the actual performance values and the planned performance values periodically throughout the identified time period, and report at least annually.
9. **Monitor and adjust:** Judge the continued validity and utility of the performance measure, goals, targets, time periods, and action plans. Update or adjust as needed.
10. **Evaluate:** Assess the actual improvements in data quality against the plan.

Using Performance Measures

Establishing performance measures for each traffic records data system allows States to continually seek improvement in data quality. By adopting SMART performance measures, States can monitor the quality of collected data and manage regressions in data quality. Decision-makers rely on data that are trustworthy, reliable, and accurate to inform their decisions and efficiently allocate resources. States use traffic records data to develop and implement countermeasures to increase traffic safety, save lives, and reduce injuries on roadways.

When creating performance measures, define baseline values, performance targets, and goals from which to measure and evaluate progress. It is also important to decide on a process for regular monitoring of the performance measure, whether that be on a monthly, quarterly, bi-annual, or annual basis. Without baselines, targets, goals, and regular monitoring, performance measures are not useful. States can measure progress and regress by comparing the current system status to the baseline. Establish a standard schedule for monitoring performance measures, either through regular reporting to stakeholders at quarterly TRCC meetings, or along some other consistent and relevant time interval. Performance measures that are not regularly monitored may be forgotten and States may miss out on important information that could better inform decision-making. Tracking performance measures will help States accurately assess situations and make the necessary adjustments to get programs back on track when issues arise.

The scope of performance measures is variable and can change over time. Some measures assess performance at a statewide or systemwide level, while others assess the performance of specific jurisdictions, agencies, or organizations. States may be tempted to only focus on the system, but tailoring performance measures to local groups can provide valuable insight to data collectors and users at the local level. Local data collectors and users can assist with identifying and addressing data quality trends that may be applicable statewide. For example, States can create a

performance measure for the data quality attribute Timeliness that assesses the time between a crash incident occurring and when the corresponding crash report is submitted to the State's crash database. Track this statewide but applying this performance measure to local law enforcement agencies can highlight areas that fall below the State's average. Working with local agencies to improve their reporting capabilities improves the quality of the data throughout the system. States can also use performance measures to assess individual performance by county sheriff offices, city police departments, driver license service centers, judicial districts, court systems, court or county clerks, hospitals, trauma centers, or others. Applying performance measures to the local level can also help States identify gaps in reporting. By only tracking the number of crash reports submitted statewide, States may miss if an agency, city, or county slows down or stops submitting crash reports. States can identify and correct data quality anomalies by routine monitoring of performance at the local level.

For example, in the process of monitoring report submissions each month or quarter, a State identifies that a certain department has ceased sending reports to the repository, or their report submission volume has decreased by an abnormal percentage for a given time period. This enables system managers to take corrective action to certify that system data remains complete, timely, and accurate. The information gained from monitoring submissions at the agency level in this scenario informs the system manager and allows them to reach out to the relevant department and troubleshoot any problems to facilitate the restoration of processes that might have been interrupted.

States can use performance measures in many ways. Performance measures can be used to monitor an overall system's data quality, but also to see fluctuations or changes in reporting from different jurisdictions, agencies, or geographic areas over time. Performance measures can help States focus on specific user groups who may need additional training or assistance to verify that their reporting is timely, reliable, and accurate.

Retiring Measures

Traffic records systems evolve over time. The quality of data collected by a system also changes as part of that evolution. Performance measures that were established while a system was in its infancy, or immediately after rollout, may not have the same merit years later. For example, there are many performance measures in place across various States that measure percentage or volume of electronic reporting or paper-based/manual reporting to the statewide system. If a system is still transitioning users over to electronic reporting, that measure might still be relevant and meaningful. But for States where their respective system has achieved full electronic reporting, or perhaps gets to the point where most records are received electronically, those original measures may no longer be relevant. Performance measures must evolve with their respective traffic records systems.

Agencies should regularly ask themselves, is this measure still a good performance measure?

- Is it still meaningful?
- Does it still have relevance?
- Does it still provide actionable information to help drive decisions?
- Has the performance target become stagnant or plateaued?

Depending on the answer to these questions, it may be time to consider retiring a performance measure and begin the transition to new performance measures that have value in the agency's

current environment and meaning to current stakeholders. Agencies regularly evaluate their performance measures to identify when it is time to update them. Agencies should periodically review their measures using the SMART framework (i.e., are the measures still specific, measurable, attainable, relevant, and timely). For example, once a State has incorporated uniform data elements, established data linkages, or provided appropriate data file access, further improvement may not be expected. At this point the measure no longer serves the State and should be replaced by a more relevant measure.

Periodic review of performance measures and performance measure retirement is crucial for States' performance measures to remain current and applicable. Measures may become stagnant or no longer useful when trying to demonstrate continued improvement in States traffic records systems to outside entities. If a State regularly monitors, reviews, and retires the performance measures, the whole system of performance measurement for the State will be much more useful for the agency and its stakeholders.

Example Performance Measures

The example performance measures that follow are classified in two sections. The first section (Table 2) contains example performance measures that can be applied across all six core component traffic records systems by performance attribute. In these cases, the measures can be applied to the data captured within each respective traffic records system component. While the subject matter of the data collected within a system differs (e.g., crash data, driver data, vehicle data), the example performance measure can still be applied to any one of or each of the six core component traffic records systems. The second section (Table 3 to Table 8) contains additional example performance measures that are specific to a certain component data system (only to Roadway, only to Injury Surveillance, etc.).

Additionally, the boundaries between some performance attributes are not exclusive. For example, correct location coding in the crash system could be an accuracy measure (verified against the State's roadway database), a completeness measure (capturing latitude and longitude coordinates), or an integration measure (linked with a geographic information system master database). The example measures are used in the performance attribute that appears to be most appropriate. Some measures could be used for other performance attributes as well.

Model Performance Measures by System

When creating measures for traffic records data systems, States may use the examples below when relevant to their systems and meaningful to their stakeholders. However, they are intended to give States ideas for how to create their own performance measures that are unique and specific to their needs. States should create, implement, and monitor performance measures that have value and usefulness and help inform decision-making regarding ongoing improvement projects and future enhancements to data quality and data systems.

If a State can apply the same example performance measure across all six core component traffic records systems, it is included in Table 2 rather than repeated in all six traffic records system sections (Table 3 to Table 8). For these example performance measures that can be applied across all traffic records systems, the only thing that changes from one system to the next is the data type. There are several general performance measures in each category (Timeliness, Accuracy, Completeness, Uniformity, Integration, and Accessibility) that can be applied to any one of the six traffic records core component systems.

Table 2. Performance Measures Examples Applicable to All Traffic Records System Databases

PERFORMANCE MEASURES EXAMPLES APPLICABLE TO ALL TRAFFIC RECORDS SYSTEM DATABASES
TIMELINESS EXAMPLES
Decrease the average time from (a) the incident/action date to (b) the date the record/report is entered into the database, from X days in 20XX to X days in 20XX. Increase the percentage of reports entered into the database within XX days after the incident/action from XX percent in 20XX to XX percent in 20XX. Examples: • Crash reports • Vehicle records • Driver adverse action/disposition notification • Roadway data element (e.g., AADT)/Roadway project completion • Citations/disposition • EMS runs
ACCURACY EXAMPLES
Increase the percentage of database records with no errors in critical data elements from XX percent in 20XX to XX percent in 20XX. Examples: • Crash severity • VIN • Date of birth (Driver) • Surface/pavement (Roadway) • Time citation issued • Citation reference number (Adjudication) • Response time (EMS patient care reports)
COMPLETENESS EXAMPLES
Increase the percentage of records with no missing critical data elements from XX percent in 20XX to XX percent in 20XX. Increase the percentage of records with no missing data elements from XX percent in 20XX to XX percent in 20XX. Decrease the percentage of unknowns or blanks in critical data elements for which unknown is not an acceptable value from XX percent in 20XX to XX percent in 20XX.

UNIFORMITY EXAMPLES

Increase the number or percentage of records or data elements entered into a database or obtained via linkage with other databases that are standards-compliant from XX (or XX percent) in 20XX to XX (or XX percent) in 20XX.

Examples:

- MMUCC
- MIRE
- Model Impaired Driving Records Information System (MIDRIS)
- NEMSIS*

**Where applicable, analogous national standards for uniformity may be used as follows: State Emergency Dept. File & Universal Billing 04 (UB04) State Hospital Discharge File & Universal Billing 04 (UB04) State Trauma Registry File & National Trauma Data Standards (NTDS) State Vital Records & National Association for Public Health Statistics and Information Systems (NAPHSIS).*

INTEGRATION EXAMPLES

Increase the percentage of appropriate records in the database that are linked with (or populated from) another system or file from XX percent in 20XX to XX percent in 20XX.

Examples:

- Crash with in-State driver linked with or populated from Driver file
- Crash with in-State vehicle linked with or populated from Vehicle file
- Crash with EMS response linked with EMS file
- Vehicle registration linked with Driver file
- Driver in crash linked with Adjudication file
- Bridge inventory linked with roadway basemap
- Driving while impaired citation linked with Adjudication file
- EMS response linked with Trauma file

Increase the number of signed current Memoranda of Understanding governing data sharing agreements for data integration for traffic records components from XX in 20XX to XX in 20XX.

ACCESSIBILITY EXAMPLES

To measure accessibility:

- Identify the principal users of the database
- Query the principal users to assess (a) their ability to obtain the data or other services requested and (b) their satisfaction with the timeliness of the response to their request
- Document the method of data collection and the principal users' responses

Increase the number of unique users accessing system data over a set period of time from X in 20XX to X in 20XX.

Increase the number or times system data is accessed from X in 20XX to X in 20XX. This can be done by tracking logins, queries, data retrievals or extracts run, web site or dashboard hits, or other methods.

Table 3 to Table 8 contain examples of data quality performance measures that are targeted toward each traffic records component system.

Crash - Performance Measures Examples

Table 3. Crash System Performance Measures Examples

CRASH - PERFORMANCE MEASURES EXAMPLES
TIMELINESS EXAMPLES
Decrease the average time it takes from crash occurrence to entry into the governing agency's crash reporting system from X days in 20XX to X days in 20XX. (Hours and/or minutes may also be included for improved granularity.) Decrease the average time it takes for crash data to be available for analysis and traffic safety-related projects from X days in 20XX to X days in 20XX.
ACCURACY EXAMPLES
Increase the percentage of in-State registered vehicles on the State crash file with VIN matched to the State vehicle registration file from XX percent in 20XX to XX percent in 20XX. Decrease the percentage (or number) of non-motorists that were coded as an incorrect non-motorist type (e.g., should have been reported as bicyclists but incorrectly reported as pedestrians, or vice versa) from XX percent in 20XX to XX percent in 20XX. Decrease the percentage of miscoded lighting condition on crash reports (e.g., daytime hours coded "dark," nighttime coded "daylight," improper use of "unknown") from XX percent in 20XX to XX percent in 20XX. This measure is used in the Crash Data Improvement Program (CDIP) as an indicator of data quality and potential need for additional data validation edit checks.
COMPLETENESS EXAMPLES
Increase the percentage of crash records (initially with pending test results) amended to include alcohol and/or drug test results from XX percent in 20XX to XX percent in 20XX. Verify all agencies are within 10 percent of the statewide proportion of serious (fatal + injury)/total crashes reported by law enforcement from XX percent in 20XX to XX percent in 20XX. * **This measure is used as a conversation starter to help assess uniform application of the State's reporting threshold among law enforcement agencies. States use it to encourage*

agencies to submit data on all reportable crashes and (as needed) to encourage agencies to accurately indicate when they are submitting reports of crashes that do not meet the reporting threshold.
UNIFORMITY EXAMPLES
Increase the percentage of crash reports entered into the crash database that use the same standard statewide schema with uniform data elements and attributes collected across all crash report forms and electronic submission methods, from XX percent in 20XX to XX percent in 20XX. Increase the number of MMUCC-aligned data elements on the State's crash report form from X data elements in 20XX to X data elements in 20XX.
INTEGRATION EXAMPLES
Increase the percentage of crashes linked with the statewide GIS master database by intersection or segment from XX percent in 20XX to XX percent in 20XX.
ACCESSIBILITY EXAMPLES
Increase the number of authorized agencies with access to crash data for analysis and reporting from XX agencies in 20XX to XX agencies in 20XX.

Driver - Performance Measures Examples

Table 4. Driver System Performance Measures Examples

DRIVER - PERFORMANCE MEASURES EXAMPLES
TIMELINESS EXAMPLES
Decrease the average time to post convictions after receipt at the Department of Motor Vehicles from XX days in 20XX to XX days in 20XX. Decrease the average time from court disposition to receipt at the DMV from XX days in 20XX to XX days in 20XX.
ACCURACY EXAMPLES
Decrease the percentage of records on the State driver file with Social Security Numbers successfully verified using Social Security Online Verification (SSOLV) or other means from XX percent in 20XX to XX percent in 20XX. Decrease the number (and percentage) of possible duplicate driver licenses and identification cards from XX duplicates in 20XX to XX duplicates in 20XX.
COMPLETENESS EXAMPLES
Improve the percentage completeness of reporting conviction data in the Driver System from XX percent in 20XX to XX percent in 20XX.

Increase the percentage of driver records requested (and received) from prior States of licensure from XX percent in 20XX to XX percent in 20XX.
UNIFORMITY EXAMPLES
Increase the percentage of SSN and Vital Statistics documents verified online prior to Driver License issuance from XX percent in 20XX to XX percent in 20XX. Increase the number of AAMVA D.20-aligned data elements in the driver data system, from XX data elements in 20XX to XX data elements in 20XX.
INTEGRATION EXAMPLES
Increase the percentage of driver judgments that link with enforcement citations written in the State's Citation system from XX percent in 20XX to XX percent in 20XX. Increase the percentage of people placed in high-risk insurance pool with required flags set in vehicle registration system (requires linkage with vehicle owner file) from XX percent in 20XX to XX percent in 20XX.
ACCESSIBILITY EXAMPLES
Increase the percentage of traffic courts using online portal to driver histories at time of court hearing from XX percent in 20XX to XX percent in 20XX.

Vehicle - Performance Measures Examples

Table 5. Vehicle System Performance Measures Examples

VEHICLE - PERFORMANCE MEASURES EXAMPLES
TIMELINESS EXAMPLES
Increase the average time from a) the date of a critical status change in the vehicle record to b) the date the status change is entered into the database from XX days in 20XX to XX days in 20XX. (Hours and/or minutes may also be included for improved granularity.) Increase the percentage of registrations and title brands posted within 24 hours from XX percent in 20XX to XX percent in 20XX.
ACCURACY EXAMPLES
Increase the percentage of VINs successfully validated with VIN checking software from XX percent in 20XX to XX percent in 20XX.
COMPLETENESS EXAMPLES
Increase the percentage of records with complete owner name and address from XX percent in 20XX to XX percent in 20XX.

UNIFORMITY EXAMPLES
Increase the number of AAMVA D.20-aligned data elements entered into a database or obtained via linkage with other databases from XX data elements in 20XX to XX data elements in 20XX.
INTEGRATION EXAMPLES
Increase the percentage of vehicle owners and operators that can be linked with the driver database from XX percent in 20XX to XX percent in 20XX. Increase the percentage of people placed in high-risk insurance pool with required flags set in vehicle registration system (requires linkage with driver records file) from XX percent in 20XX to XX percent in 20XX.
ACCESSIBILITY EXAMPLES
Increase the number of State agencies that can access vehicle registration data from XX agencies in 20XX to XX agencies in 20XX.

Roadway - Performance Measures Examples

Table 6. Roadway System Performance Measures Examples

ROADWAY - PERFORMANCE MEASURES EXAMPLES
TIMELINESS EXAMPLES
Decrease the average time from (a) the date a roadway project is completed to (b) the date the updated critical data elements are entered into the database from XX days in 20XX to XX days in 20XX.
ACCURACY EXAMPLES
Increase the percentage of all roadway segment records with no errors in critical data elements (example: Surface/Pavement) from XX percent in 20XX to XX percent in 20XX.
COMPLETENESS EXAMPLES
Increase the percentage of public road miles or jurisdictions identified on the State's basemap or roadway inventory file from XX percent in 20XX to XX percent in 20XX. Increase the percentage of total roadway segments that include location coordinates, using measurement frames such as a GIS basemap from XX percent in 20XX to XX percent in 20XX.
UNIFORMITY EXAMPLES
Increase the number of MIRE-compliant data elements entered into a database or obtained via linkage with other databases from XX data elements in 20XX to XX data elements in 20XX.

INTEGRATION EXAMPLES
Increase the percentage of appropriate records in a specific file in the roadway database that are linked with another system or file from XX percent in 20XX to XX percent in 20XX. Increase the percentage of locations with valid LRS location code, roadway attributes from the inventory, and traffic volume data linked in spatial database from XX percent in 20XX to XX percent in 20XX. Increase the percentage of appropriate MIRE Fundamental Data Elements (FDE) linked with crash locations in the Crash database from XX percent in 20XX to XX percent in 20XX.
ACCESSIBILITY EXAMPLES
Increase the number of authorized Traffic Records users with access to roadway file from XX in 20XX to XX in 20XX. Increase the percentage of roadway data that is available for online spatial reporting from XX percent in 20XX to XX percent in 20XX.

Citation and Adjudication - Performance Measures Examples

Table 7. Citation and Adjudication System Performance Measures Examples

CITATION AND ADJUDICATION - PERFORMANCE MEASURES EXAMPLES
TIMELINESS EXAMPLES
Decrease the average time from citations issuance to entry into the court system (centralized database) from XX days in 20XX to XX days in 20XX. Increase the percentage of convictions sent to the DMV within 10 days of conviction from XX percent in 20XX to XX percent in 20XX.
ACCURACY EXAMPLES
Increase the percentage of citations that can be located on the State-supplied GIS-basemap from XX percent in 20XX to XX percent in 20XX.
COMPLETENESS EXAMPLES
Increase the percentage of citations in the Statewide Citations Repository from XX percent in 20XX to XX percent in 20XX.
UNIFORMITY EXAMPLES
Increase the percentage of citation records entered into the database with common uniform statewide violation codes from XX percent in 20XX to XX percent in 20XX. Increase the number of agencies using the State's uniform traffic citation form from XX agencies in 20XX to XX agencies in 20XX.

INTEGRATION EXAMPLES
Increase the percentage of court case dispositions linked with citation or crash records management systems from XX percent in 20XX to XX percent in 20XX. Increase the percentage of citation and court records in the citation management system and court management system linked with the associated impaired driving crashes (positive test value) in the crash database from XX percent in 20XX to XX percent in 20XX. Increase the percentage of dispositions in the court records data system linked with the associated impaired driving crashes (positive test value) in the crash database from XX percent in 20XX to XX percent in 20XX.
ACCESSIBILITY EXAMPLES
Increase the percentage of criminal traffic-related charges that authorized users can track through a central citation system from LEA to courts and then to DMV from XX percent in 20XX to XX percent in 20XX. Increase the percentage of DUI-related cases that can be tracked from offense (initial charge/arrest) through to final disposition, treatment, interlock program participation, etc. from XX percent in 20XX to XX percent in 20XX.

Injury Surveillance System - Performance Measures Examples

Table 8. Injury Surveillance System Performance Measures Examples

INJURY SURVEILLANCE SYSTEM - PERFORMANCE MEASURES EXAMPLES
TIMELINESS EXAMPLES
Decrease the average time from death to appearance of record in mortality database from XX days in 20XX to XX days in 20XX. Increase the percentage of EMS run reports sent to governing agency in the prescribed time from XX percent in 20XX to XX percent in 20XX. Decrease the average time for EMS reports to be processed from XX days in 20XX to XX days in 20XX.
ACCURACY EXAMPLES
Decrease the percentage of EMS reports with invalid entries from XX percent in 20XX to XX percent in 20XX.
COMPLETENESS EXAMPLES
Increase the average validity score for records in the EMS Data Repository from XX in 20XX to XX in 20XX. (Agency records entered into the EMS Data Repository are given a "validity score" that rates the level of completeness of the record against the State and NEMSIS data

element requirements. The higher the score, the more complete/accurate the records are compared to the State and NEMSIS validation.) Decrease the percentage of EMS reports with any blank fields from XX percent in 20XX to XX percent in 20XX.
UNIFORMITY EXAMPLES
Increase the percentage of records on the State EMS data file that are NEMSIS compliant from XX percent in 20XX to XX percent in 20XX.
INTEGRATION EXAMPLES
Increase the number of EMS records linked (using the Patient Care Report or EMS UUID) to the corresponding people and crashes in the State's crash database from XX in 20XX to XX in 20XX. Increase the percentage of EMS reports electronically populated with EMS dispatch data from XX percent in 20XX to XX percent in 20XX. Increase the percentage of EMS records on seriously injured crash-involved persons linked with another injury data system (e.g., Emergency Department, Trauma, Hospital Discharge) from XX percent in 20XX to XX percent in 20XX.
ACCESSIBILITY EXAMPLES
Increase the percentage of trauma registry data available for analysis in a web-based Trauma Dashboard Reporting System from XX percent in 20XX to XX percent in 20XX.

Key Takeaways

- NHTSA developed the *Traffic Records Data Quality Management Guide* for State data collectors, managers, and users to implement methods for improving data quality to support traffic safety decision-making.

- Data quality management is a formal, comprehensive program and is the concern of those who collect, manage, and use traffic records data for decisions that impact traffic safety. To be effective, data quality management should involve collaboration among stakeholders, preferably within a formal data quality management program or data governance framework.

- It is imperative to establish a sustainable data quality management program that facilitates good data quality so that data can be trustworthy and dependable for decision-makers. Decisions based on poor data risks incorrect problem identification or the allocation of resources or funding to areas that have lesser impact on improving traffic safety.

- Traffic records stakeholders, such as the State TRCC, should engage in strategic planning efforts to help identify and address traffic safety data quality issues to move the State towards improved data and better data quality management. One way to reduce duplication of efforts within a State's traffic records system is to incorporate the State TRCC's strategic planning and data quality management practices into other State safety plans (e.g., SHSP, HSP, HSIP).

- Data governance is a comprehensive approach to collecting and managing data. Formal data governance can lead to improved data quality, traffic record system documentation, greater support for business needs, more efficient use of resources, and reduced barriers to collaboration.

- States that do not have an existing comprehensive, formal data quality management program can start one by creating traffic records data quality performance measures and targets.

- Performance measures are tools used to gauge the performance of a specific system in one of the six core traffic records areas and can help accurately measure the impact of system improvement or enhancements, assess the quality of data being captured, create transparency, and answer important questions about overall system performance.

- Performance measures can be developed by system owners and various stakeholders. Stakeholders of traffic records systems may include system users, data collectors, data users, system owners and managers, TRCC members, and others.

- The development, implementation, and monitoring of a TRSP, as well as including each core component area in the plan is a key responsibility of the TRCC. Ideally, each traffic

records system should have meaningful and useful performance measures including baselines, goals, and targets.

- States can use performance measures in many ways. Performance measures can be used to monitor an overall system's data quality, but also to see fluctuations or changes in reporting from different jurisdictions, agencies, or geographic areas over time. Performance measures can help States focus on specific user groups who may need additional training or assistance to verify that their reporting is timely, reliable, and accurate.

- It is important to periodically review performance measures and ask if they are still specific, measurable, attainable, relevant, and timely. Over time, some measures can get to the point where they are no longer useful to stakeholders.

Resources

Improvement to data system performance measures can be accomplished by making use of NHTSA resources, described below. For those systems where development of performance targets can be challenging, this guide serves as a resource for identifying and implementing appropriate measures for all traffic records systems.

Traffic Records Program Assessment Advisory, 2018 Edition (NHTSA, 2018)

The traffic records assessment is a review of a state's traffic records system, analyzing the traffic records "Twelve Pack" as a part of the State's structure. Within the assessment, each of the State's six core data systems are evaluated in the context of the six data quality attributes, providing an in-depth look of the status of these to the State TRCC and other stakeholders. An accurate image of the current standing of a state's traffic records system allows for informed decisions on improvements to data collection, governing, and examination.

NHTSA's State Traffic Records Assessment Program (STRAP) provides a traffic records assessment to a State upon request. STRAP peer reviews a State's system with questions from the NHTSA traffic records assessment tool, headed by a designated facilitator and consisting of both on-site meetings and online reports. Performing the assessment are a selection of independent, qualified assessors, who, in response to the State's assessment question answers, return an evaluation, recommendations, and a report. NHTSA provides traffic records assessments performed through STRAP to the States at no cost.

While traffic records assessments have traditionally reviewed the entirety of a State's traffic records system, NHTSA recently introduced a customizable traffic records assessment. This option provides the ability for States to build their own traffic records assessments based on their needs, choosing which component system (e.g., crash, vehicle, roadway) to assess, and selecting any single or combination of modules. There is no 5-year waiting period from prior assessments and States can request this assistance at any time. A State could pair the NHTSA customizable assessment with other related assistance, such as a GO Team.

GO Team Technical Assistance Program

NHTSA's Traffic Records GO Team program responds to State's requests for technical assistance and support for their traffic records systems, delivering help based on State's identified needs. Each GO Team consists of subject matter experts selected for their knowledge in the areas of the State's request, having up to three members. GO Teams provide tailored training, resources, and assistance to traffic records professionals within the State, supporting and supplementing their goals in bettering the adeptness of their traffic records systems.

The GO Team technical assistance program has helped agencies develop and deliver training on performance measures and satisfy State TRCC goals with tailored support. NHTSA encourages States to submit GO Team requests that address a specific improvement needed within their traffic records system, whether it was identified in a State's traffic records assessment or by the State's TRCC and Highway Safety Office. NHTSA's Regional Offices can provide additional information.

Guide to Updating State Crash Record Systems (DOT HS 813 217)

NHTSA's *Guide to Updating State Crash Data Systems* provides tools to crash data system owners and stakeholders for improvements and updates specific to State crash data systems.

Processes, procedures, and noteworthy practices aim to practice stakeholder engagement, identify, and analyze database gaps, and develop action plans for deploying a new system.

State Traffic Records Coordinating Committee Strategic Planning Guide (Peach et al., 2019)

NHTSA's *State Traffic Records Coordinating Committee Strategic Planning Guide* provides processes to State TRCCs for creating and administering strategic plans that successfully improve State Traffic Records data systems. A TRSP details the goals for a State's traffic records data systems in which to promote data-based safety decisions, as well as how to reach those goals. NHTSA developed this guide as an answer to State's requests for specific guidance on traffic records strategic plans, with strategic planning processes, templates, and examples. State TRCCs using this guide can promote identification of, and interactions with, stakeholders across their traffic records systems, as well as generating wide-reaching improvements to their traffic records strategic plan.

Crash Data Improvement Program (CDIP) Guide (Scopatz et al., 2019)

The CDIP provides the means for data quality assessment and measurement of a State's crash database. The CDIP guide supplies a synopsis of crash data quality, with direction on how to use the six data quality attributes to address it, alongside additionally providing support for mapping a State's police crash report to MMUCC. The CDIP guide was developed for use by State crash database owners, State TRCC members, SHSOs, and other traffic safety professionals across a range of jurisdictions.

Roadway Data Improvement Program (RDIP) (Chandler et al., 206)

FHWA developed the RDIP as the means for data quality assessment and measurement of a State's roadway data inventory. The RDIP is a review of a State's methods to handle its roadway data in relation to safety, supplying a technical assistance team to complete the process, who assesses the State's roadway data system and delivers recommendations in turn. Other features of the RDIP include analyzing the State's ability to coordinate and exchange roadway data with local agencies such as cities, counties, and metropolitan planning organizations.

Model Minimum Uniform Crash Criteria (NHTSA, 2024)

NHTSA's MMUCC guideline identifies a minimum set of motor vehicle crash data elements and their attributes that States should consider collecting and including in their State's crash data system. This standard set of data elements and attributes effectively detail a motor vehicle traffic crash and are essential to improving traffic safety both at the State and national level. Most elements in MMUCC are designed for collection from the traffic crash scene by law enforcement officers. Much of the MMUCC guideline is based on the *ANSI D.16-2017 Manual on Classification of Motor Vehicle Traffic Crashes*, intending the two national standards to function together for crash data collection uniformity.

References

23 CFR Part 1300, Uniform procedures for state highway safety grant programs [Docket submission in Regulations.gov. Docket No. NHTSA–2022–0036]. (2023, February 6). www.ecfr.gov/current/title-23/chapter-III/part-1300

American Association of Motor Vehicle Administrators. (2020, November). *Data element dictionary for traffic records systems (D20),7.0*. www.aamva.org/getmedia/4373f9e2-468b-4304-b0ee-12d7c867ad7e/D20-Data-Dictionary-7-0.pdf

American College of Surgeons . (n.d.) *National trauma data standard*. [Web page and portal]. www.facs.org/quality-programs/trauma/quality/national-trauma-data-bank/national-trauma-data-standard/

American National Standards Institute (2017, December). *Manual on classification of motor vehicle traffic crashes, 8th edition*, *ANSI D.16-2017*. www.transportation.gov/sites/dot.gov/files/docs/resources/government/traffic-records/304331/ansid16-2017.pdf

Chandler, B., Smadi, Omar., & Cheema, Adil. (2016, December). *Roadway data improvement program technical assistance* (Report No. FHWA-SA-17-027). Federal Highway Administration. https://safety.fhwa.dot.gov/rsdp/downloads/fhwasa17027.pdf

Greer, P. (2011, July). *Model impaired driving records information systems – Tying together data systems to manage impaired drivers* (Report No. DOT HS 811 489). National Highway Traffic Safety Administration. www.nhtsa.gov/sites/nhtsa.gov/files/811489.pdf

Lefler, N., Zhou, Y., Carter, D., McGee, H., Harkey, D., & Council, F. (2017, July). *Model inventory of roadway elements - MIRE 2.0* (Report No. FHWA-SA-17-048). Federal Highway Administration. https://safety.fhwa.dot.gov/rsdp/downloads/fhwasa17048.pdf

National Highway Traffic Safety Administration. (2011, February). *Model performance measures for state traffic records systems* (Report No. DOT HS 811 441). https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811441

NHTSA. (2024, January). *MMUCC guideline: Model Minimum Uniform Crash Criteria, 6th edition* (Report No. DOT HS 812 433). www.nhtsa.gov/mmucc

NHTSA. (2018, August). *Traffic records program assessment advisory, 2018 edition* (Report No. DOT HS 813 525a). https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813525

NHTSA. (2023, March). *National Emergency Medical Services Information System EMS data standard, v3.5.0.* https://nemsis.org/media/nemsis_v3/release3.5.0/DataDictionary/PDFHTML/EMSDEMSTATE/NEMSISDataDictionary.pdf

Peach, K., Brown, R., DeFisher, J., Zhou, Y., Haney, K., Bryson, M., Scopatz, B., & Chestnutt, C. (2019, July). *State Traffic Records Coordinating Committee strategic planning guide* (Report No. DOT HS 812 773a). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812773A

Scopatz, B., Brown, R., Zhou, Y., Benac, J., Peach, K., Bryson, M., & Lefler, N. (2017, December). *Crash data improvement program guide* (Report No. DOT HS 812 419). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812419

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