MEASURING STATES' ALIGNMENT TO THE MODEL MINIMUM UNIFORM CRASH CRITERIA (MMUCC) 5TH EDITION

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ABSTRACT

In 1998, the National Highway Traffic Safety Administration (NHTSA) and the Governors Highway Safety Association (GHSA) developed the Model Minimum Uniform Crash Criteria (MMUCC), a voluntary guideline to encourage greater crash data uniformity by identifying a minimum set of motor vehicle crash data elements and attributes that States should collect and include in their State crash data system. NHTSA relies on State crash data for the Fatality Analysis Reporting System (FARS). FARS is a nationwide census providing NHTSA, Congress, and the American public yearly data regarding fatal injuries suffered in motor vehicle traffic crashes. States have implemented MMUCC differently, often combining or deleting attributes, which causes problems with data uniformity when attempting to aggregate data across States. The purpose of this paper is to describe methods used to measure States' alignment to MMUCC 5th Edition, examine the variance of States' crash data to MMUCC data elements, and describe how NHTSA will use the results of this analysis to inform future editions of MMUCC with the goal of improving the quality of FARS data.

INTRODUCTION

In 1998, NHTSA published the MMUCC, a voluntary guideline to collect data on motor vehicle crashes that can generate the information necessary to improve highway safety within each State and nationally. Early editions of MMUCC lacked guidance on implementation, which led to each of the 50 States, the District of Columbia (DC), and the U.S. Territories enacting MMUCC differently. Between the 4th and 5th Editions, NHTSA created a methodology to measure States' alignment to MMUCC, which was later updated and incorporated into the MMUCC 5th Edition. In 2018, NHTSA mapped the crash data elements and attributes from all States, DC, and Puerto Rico to the MMUCC 5th Edition and established the first baseline measurement of alignment to MMUCC. The results of this mapping exercise provide NHTSA a framework for offering States and territories technical assistance and training to increase their alignment to MMUCC, and will inform future changes to NHTSA's crash data publications, from MMUCC to the Fatality Analysis Reporting System (FARS) / Crash Report Sampling System (CRSS) Coding and Validation Manual.

BACKGROUND

NHTSA uses police-reported motor vehicle traffic crash data to conduct research, analyze traffic crash trends, support safety programs, and make data-driven decisions daily. Understanding States' crash data capabilities are reporting is critical to ensuring accuracy for all data-driven programs. Historically, each State developed their own methods for collecting, managing, and analyzing data on motor vehicle crashes. Consequently, crash data varied substantially between States. The lack of uniform data elements and attributes made it challenging to understand national crash trends. In 1975, NHTSA began collecting a census of fatal crashes using the FARS to provide an overall measure of highway safety. NHTSA trained analysts in each of the 50 States, DC, and Puerto Rico to convert the State data sources into FARS data codes.

Similarly, in 1988, NHTSA began the National Automotive Sampling System General Estimates System (NASS GES), a program to collect a nationally representative sample of police-reported motor vehicle crashes of all severities (fatal, injury, property-damage-only) to identify traffic safety problem areas, provide a basis for regulatory and consumer initiatives, and form the basis for cost and benefit analyses of traffic safety initiatives. The NASS GES and its replacement the Crash Reporting Sampling System (CRSS), requires analysts to recode the crash data collected from different States into a standard format. Early on, it was apparent that the substantial variability in State crash data made it costly and challenging to produce national crash datasets.

In 1998, NHTSA and GHSA published the first MMUCC. This provided States voluntary guidance on the minimal set of standardized data elements and attributes necessary to describe the characteristics the vehicles, the persons, and the environment involved in motor vehicle crashes,. NHTSA and GHSA encouraged States to adopt MMUCC to increase crash data uniformity. Greater standardization of crash data enables State highway safety agencies to more efficiently and cost-effectively share data with other agencies in their State (such as public safety), compare their crash data with other States, and, exchange crash data with federal data systems. Since the initial release of the MMUCC Guideline in 1998, NHTSA and GHSA have revised MMUCC four times in response to technological changes and evolving traffic safety needs. Early editions of the MMUCC Guideline did not provide States with implementation guidance, resulting in each State adopting MMUCC differently. As States developed their own data collection guidelines regarding what crash data to collect, what is a reportable crash, and what data to maintain on their Crash Databases, the variance between States' crash data increased. As a result, States often use different formats and names for data elements and attributes or they may combine (or split) elements and attributes.

In 2014, NHTSA and GHSA recognized the need to develop a methodology for measuring the alignment of the crash data States collected on their Police accident reports (PAR) and the data entered and maintained on Crash Databases to the data elements and attributes in the MMUCC Guideline. Through extensive consultation with the State stakeholders at the Association of Traffic Records Information Professionals (ATSIP) International Traffic Records Forum, NHTSA and GHSA developed a methodology to map the data elements and attributes from States PARs and their crash databases to MMUCC. This process recognized that while State data systems often use different terminology and formatting, different data sets can often be mapped to the MMUCC data elements and attributes. Thus, if an element or attribute on a State PAR or in its Crash Database did not match a MMUCC element or attribute verbatim, but is essentially the same, it is considered "mapped" to MMUCC. In 2015, NHTSA published *"Mapping to MMUCC: A Process for Comparing Police Crash Reports and State Crash Databases to the Model Minimum Uniform Crash Criteria,"* [1] a set of rules to assist States in evaluating their alignment to MMUCC.

In 2017, NHTSA and GHSA published the 5th Edition of MMUCC [2], which included updated mapping rules to address significant changes to the MMUCC content and format. In addition, the MMUCC 5th Edition no longer designated elements to be "collected at the scene," "derived," or "linked." Instead, MMUCC encouraged States to collect data elements based on the States' capabilities. States that have integrated traffic records datasets collect less data for their crash reports at the scene of a crash because they can instead link or derive data elements from other sources, such as the roadway, driver, and vehicle file. As a result, comparing a State's crash database to MMUCC is more useful than comparing a State PAR to MMUCC.

Following the publication of the 5th Edition of MMUCC, NHTSA collected crash data documentation (data dictionary, police instruction manual, database schema, and crash report forms) for all 50 States, DC, and Puerto Rico to measure how each States' crash database structure aligns to MMUCC. The objectives for this project included establishing a baseline for understanding the States' crash data capabilities, identifying the data elements and attributes that are problematic for States, providing States a measure of how they align to MMUCC and detail opportunities for improvement, and to inform future editions of MMUCC by understanding potential impacts changes might have on the States.

METHODS

Measuring the alignment of a State's crash data to MMUCC involves several steps to compare the data elements and attributes within the State crash database (the source) to the data elements and attributes in the target). Figure 1 provides a brief overview of this process. The first step involves gathering the relevant documentation, which includes the most recent version of MMUCC and documentation on the State's crash data system. Typically, a State's crash database is comprised of the corresponding data collected on police crash reports, derived from data collected on crash reports, and obtained from other data sources (e.g., a roadway database). Ideally, the State's crash data elements and attributes should contain all 115 MMUCC data elements and their attributes. If the data dictionary for the State Crash Database does not list all data elements and element attributes used in the crash database, then analysts examine the State's PAR and police instruction manual for all relevant terms and definitions needed to map to the MMUCC.

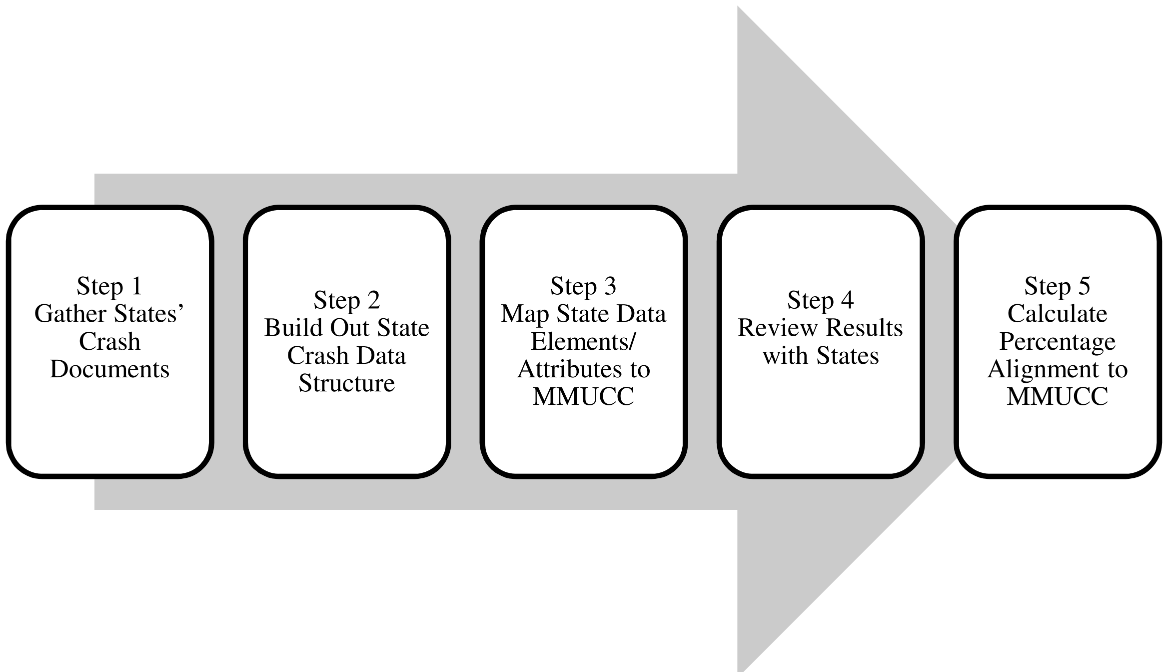

Figure 1: The MMUCC Mapping Process

The second step for measuring a State's alignment to MMUCC involves building out the target MMUCC data structure and the source State data structure to compare and evaluate the similarity of the State's data elements and attributes to those of the MMUCC. Table 1 is an example of the table used to map a State's data element and attributes for "Weather" to the MMUCC date element and attributes for "C11. Weather conditions". Since the MMUCC Guideline allows two attribute selections for "C11. Weather Conditions" the table is set up to include both subfields. Initially, analysts used an Excel spreadsheet to facilitate side-by-side comparisons of the data elements and attributes, which was cumbersome. NHTSA developed an IT application for analysts to build and update the source and target data structures, record the analyst's comments and mapping decisions, and export a final report. The application can maintain the mappings when either the target MMUCC data structure or the source State data structure are updated, which will facilitate future efforts to re-map a State's data to MMUCC when either change. This application also included many safeguards to ensure the integrity of the mapping results (i.e. color-coded mapping status notations and preventing attributes from being coded twice).

The third step involves determining how consistent the States crash data structure is with MMUCC by identifying which of the State's crash data elements and attributes can map to each MMUCC data element and attributes. Analysts apply mapping rules published in the MMUCC 5th Edition to determine if a State data attribute can be mapped, or matches MMUCC. All mapping decisions are binary at the attribute level where analysts decide whether the State's data matches MMUCC or not. The mapping process is a "top-down mapping" approach that starts with the data elements and works down to attributes. Individual elements with zero attributes (i.e., VIN) either will map to a corresponding MMUCC element/attribute or will not. While there is no partial mapping for data elements with no attributes, data elements with multiple attributes can partially map, if at least one State attribute matches an attribute for that MMUCC element. Many States collect more data elements than what MMUCC prescribes. The MMUCC mapping process is only concerned with the 115 MMUCC data elements and their associated attributes. The mapping rules include two primary sets of rules: The general rules, such as the many-to-one rule, where two State data attributes can match to one MMUCC data attribute, and the one to many rules that prohibits one State data attribute from mapping to two MMUCC data attributes. Another set of rules covers specific data elements that have unique characteristics requiring additional explanation and interpretation.

Table 1.
Mapping State Data Element "Weather" to the MMUCC "C11. Weather Conditions"

Target: **MMUCC Data Element "C11. Weather Conditions" Selection 1**	**Ability to Map? (1 = Yes, 0 = No)**	***Source:*** **State Data Element "Weather"**		***Target:*** **MMUCC Data Element "C11. Weather Conditions" Selection 2**	**Ability to Map? (1 = Yes, 0 = No)**	***Source:*** **State Data Element "Weather"**
Blowing Sand, Soil, Dirt	0	(9) Blowing Sand, Soil, Dirt, or Snow *cannot be split.*		Blowing Sand, Soil, Dirt	0	*N/A*
Blowing Snow	0			Blowing Snow	0	*N/A*
Clear	0	(1) No Adverse Conditions (Clear, Cloudy) *cannot be split*		Clear	0	*N/A*
Cloudy	0			Cloudy	0	*N/A*
Fog, Smog, Smoke	1	(2) Fog (7) Smoke/Dust *includes Dust*		Fog, Smog, Smoke	0	*N/A*
Freezing Rain or Freezing Drizzle	0	*N/A*		Freezing Rain or Freezing Drizzle	0	*N/A*
Rain	1	(4) Rain		Rain	0	*N/A*
Severe Crosswinds	1	(10) Severe Crosswinds		Severe Crosswinds	0	*N/A*
Sleet or Hail	1	(6) Sleet/Hail		Sleet or Hail	0	*N/A*
Snow	1	(5) Snow		Snow	0	*N/A*
Other	0	*N/A*		Other	0	*N/A*
Unknown	0	*N/A*		Unknown	0	*N/A*

Table 1 identifies the State's data attributes that can map to the MMUCC attributes and the rules that apply. Specifically, the State's attribute *'(1) No Adverse Condition (Clear, Cloudy)'* cannot map to the MMUCC attributes '*Clear'* or '*Cloudy'* because the State combines two MMUCC attributes '*Clear'* and '*Cloudy.'* Likewise, the State attribute '*(9) Blowing Sand, Soil, Dirt, or Snow*' cannot map to the MMUCC attributes '*Blowing Snow'* or *'Blowing Sand, Soil, Dirt.'* However, the State attributes *'(2) Fog'*, and *'(7) Smoke/Dust'* can map to the MMUCC attribute '*Fog, Smog, Smoke'* without a loss in data integrity. Four attributes from the State were mapped one-to-one to a MMUCC attribute ('*Rain,' 'Sleet or Hail,' 'Snow,'* and '*Severe Crosswinds'*). According to the general mapping rules, the State attribute '*Other*' cannot map to the MMUCC *'Other'* because the State did not possess all other C11 attributes. The State did not have an attribute to map to the MMUCC attribute *'Unknown.'* Finally, the State only allows for one attribute, while the MMUCC guideline suggests States should choose up to two attributes. However, C11 provides two attribute selections, which means that any State must provide 24 total attributes (12 C11 attributes, selected twice). Therefore, this State element has five attributes that map to the 24 possible attributes in MMUCC.

After analysts completed the mappings for each State's crash data, NHTSA encouraged each State to participate in a debriefing to provide that State an opportunity to learn which of their crash data elements and attributes did not map to MMUCC. States could also use the debriefing to provide additional documentation about their crash data, which often led to revised results. NHTSA encourages States considering updating their PAR or crash database to review their MMUCC mapping report to identify opportunities to increase alignment with MMUCC.

Finally, the MMUCC mapping method results in standardized scores that measure the percentage of alignment to MMUCC at the element level, system level, and overall total. Each MMUCC data element was scored by dividing the number of attributes that the State could map to MMUCC by the total number of MMUCC attributes for that element.

$$\text{MMUCC Element Mapping Score (\%)} = \frac{\text{Number of State Attributes that Map to the MMUCC Data Element}}{\text{Total Number of Attributes for the MMUCC Data Element}}^{*}$$

In Table1, there are 24 attributes for the for MMUCC element "C11 Weather Conditions" (12 attributes, selected twice). Of these 24 attributes, the State can map five attributes. The score for this data element is calculated as follows:

$$\text{MMUCC Element Mapping Score (\%)} = \frac{5}{24} = 20.8\%$$

The score for each of the eight data sections of MMUCC were calculated by summing the scores for all the data elements in each section and dividing by the number of data elements in each section. Table 2 shows the distribution of MMUCC data elements by section

$$\text{MMUCC Section Mapping Score (\%)} = \frac{\sum \text{MMUCC Element Mapping Scores in the Section}}{\text{Number of MMUCC Elements in the Section}}$$

Table 2.
MMUCC Data Elements by Section

Section	**Data Elements**
Crash Section	27
Vehicle Section	24
Person Section	27
Roadway Section	16
Fatal Section	3
Large Vehicle and Hazardous Materials Section	11
Non- Motorist Section	6
Dynamic Data Element Section	1
Total	115

The score for each State's alignment to MMUCC is the sum of each element mapping score divided by the total number of MMUCC data elements. The result is the overall State mapping percentage:

$$\text{Overall State to MMUCC Mapping Score (\%)} = \frac{\sum \text{MMUCC Element Mapping Score}}{115}$$

RESULTS

Overall, States' alignment to MMUCC is low and varies greatly. More than half the States aligned to less than 50% of the 115 MMUCC data elements. The mean percentage of States' alignment to MMUCC is 45.9%, with alignment ranging from a low of 9.4% to a high of 84.8% and a standard deviation of 13.66. As Figure 2 shows, a little less than half the States (46.2%) scored between 39.6% and 54.7%.

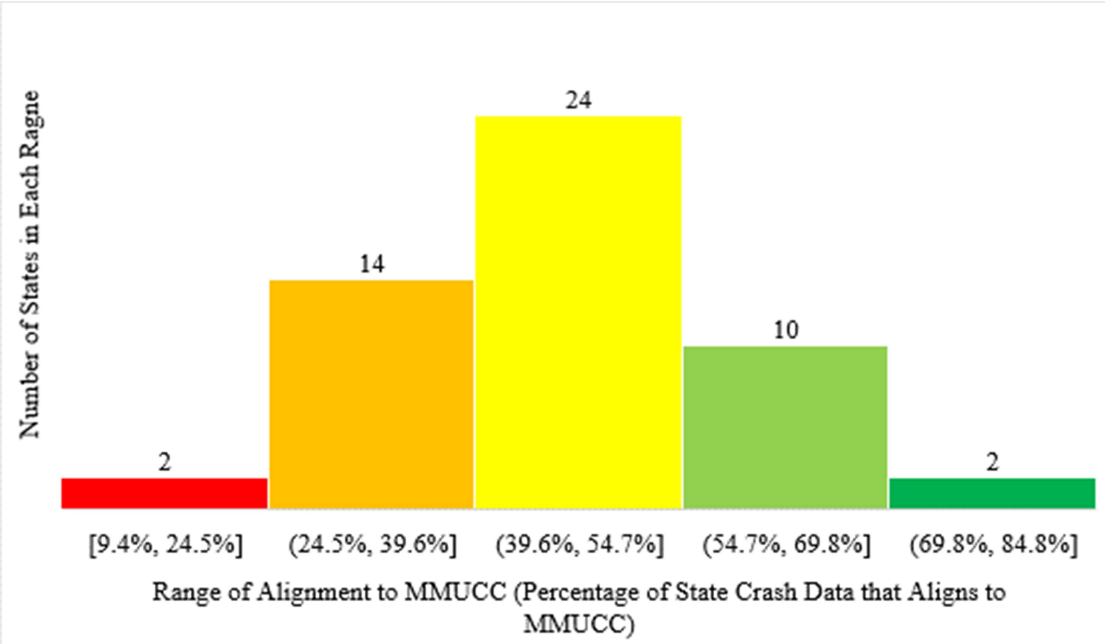

Figure 2. States' Alignment to the MMUCC 5th Edition

The MMUCC guideline includes eight sections that focus on a different type of data. As **Error! Reference source not found.**Table 3 shows, States alignment to MMUCC varies according to the different types States. States had the greatest alignment to MMUCC's crash data elements with a mean score of 70.5% ranging from a low of 32.8% to a high of 96.4%. States had the lowest alignment to the dynamic data element, which is the most recent addition to MMUCC and measures *Motor Vehicle Automated Driving System(s)*. Only one State's data was aligned 100%, and 46 States had zero alignment to this data element, resulting in a mean score of 3.4%.

Table 3.
States' Alignment to 115 MMUCC Data Elements

MMUCC Data Elements	Mean Score (%)	Median Score (%)	Lowest Score (%)	Highest Score (%)	Standard Deviation
Crash (N=27)	70.5	72.1	32.8	96.4	13.88
Vehicle (N=24)	56.7	58.3	6.7	95.4	17.61
Person (N=27	46.5	44.2	1.5	91.7	17.21
Roadway (N=16)	12.0	0.0	0.0	85.9	17.55
Fatal (N=3)	20.3	16.3	0.0	100.0	22.40
Large Vehicles and Hazardous Materials (N=11)	30.4	24.9	0.0	87.9	25.87
Non-Motorist (N=6)	28.0	26	0.0	96. 7	22.48
Dynamic Data Element (N=1)	3.4	0.0	0.0	100.0	14.56
Total (N=115)	45. 9	44.4	9.4	84.8	13.66

Collecting national data on alcohol-related crashes is central to NHTSA's work to understand risky driving behavior. Approximately one-third of all traffic crash fatalities in the United States involve drunk drivers (with blood alcohol content of .08 grams per deciliter (g/dL) or higher). MMUCC includes several data elements to capture data on alcohol-related crashes. Table 4 summarizes States alignment to MMUCC alcohol-related data elements and attributes. MMUCC data element "C25. Alcohol Involvement" is the most uniformly adopted alcohol-related element by States with a mean national alignment of 74.4% that includes 28 States that are in complete alignment with this data element, seven States with no alignment to this data element, and 17 States that can map to some of this data element's attributes. In contrast, the lowest level of alignment was for "F2. Alcohol Test Type and Results", which had a mean national score of 27.9% that includes only one State in complete alignment and 11 States with no alignment to this data element.

Table 4.
States Alignment to MMUCC Alcohol-Related Data Elements and Attributes

MMUCC Alcohol-Related Data Elements and Attributes	Mean Score (%)	Median Score (%)	N States with 0.0% Alignment	N States with 100.0% Alignment	Standard Deviation
"C25. Alcohol Involvement"	74. 4	100.0	7	28	34.35
"P19. Condition at Time of the Crash" Attribute 5, 'Under the Influence of Medications/Drugs/Alcohol'	34.0	34.4	16	2	30.21
"P20. Law Enforcement Suspects Alcohol Use"	66. 7	66.7	8	20	34.59
"P21. Alcohol Test"	55.0	65.4	11	5	35.36
"F2. Alcohol Test Type and Results"	27.9	22.2	11	1	25.94

NHTSA collects data on other risky driving behaviors, including drowsy driving, drugged driving, speeding, and distracted driving. Table 5 identifies the MMUCC data elements and attributes that relate to each risky behavior.

Table 5.
Risky Driving Behavior captured in MMUCC

Issues	MMUCC Data Elements and Attributes
Drowsy Driving	"P19. Condition at Time of the Crash" 1.1 and 1.2 *Asleep or Fatigued*
Drugged Driving	"C26. Drug Involvement", "P19. Condition at Time of the Crash Subfield 1.1 *Under the Influence of Medications/ Drugs/ Alcohol* Subfield 1.2 *Under the Influence of Medications/ Drugs/ Alcohol*, "P22. Law Enforcement Suspects Drug Use", "P23. Drug Test", "F3. Drug Test Type and Results".
Speeding	"P13. Speeding Related"
Distracted Driving	"P18. Distracted By"

As Table 6 show, States alignment to the MMUCC data elements related to risky driving behavior varies greatly with standard deviations ranging from 19.24 to 42.43. States had the greatest alignment to the MMUCC data elements related to drowsy driving (41. 4%). Data elements that States were in complete alignment to MMUCC was limited to 15 States collecting data on drowsy driving, nine States collecting data on speeding, and one State collecting data on distracted driving . No States collected data on drugged driving that aligned completely to MMUCC.

Table 6.
States Alignment to MMUCC Data Elements for Risky Driving Behavior

MMUCC Data Elements for Risky Driving Behavior	**Mean Score (%)**	**Median Score (%)**	**N States with 0.0% Alignment**	**N States with 100.0% Alignment**	**Standard Deviation**
Drowsy Driving	41.4	50.0	24	15	42.43
Drugged Driving	32.5	26.3	5	0	28.67
Speeding	30.4	0	28	9	39.12
Distracted Driving	6.3	0	42	1	19.24

NHTSA promotes road safety through grants to States and countermeasures programs, which focus on school bus safety, seat belts, teen driving, child passenger safety, non- motorist safety, and motorcycle safety. Table 7 identifies the MMUCC data elements and attributes that relate to each safety countermeasure program. Collecting this data helps States and NHTSA understand the effectiveness of safety countermeasure programs.

Table 7.
Critical Safety Issues Captured in MMUCC

Issues	**MMUCC Data Elements and Attributes**
School Bus Safety	"V10. Special Function of Motor Vehicle in Transport" Attribute 01 *'Bus – School (Public or Private)'*; "P12. Driver License Number, Class, CDL and Endorsements" Attribute 04 *'School'*.
Seat Belt Safety	"P8. Restraint Systems/Motorcycle Helmet Use" Attributes 05 *'Lap Belt Only Used'*, 06 *'None Used – Motor Vehicle Occupant'*, 07 *'Restraint Used – Type Unknown'*, *08 'Shoulder and Lap Belt Used'*, 09 *'Shoulder Belt Only Used'*, and Subfield 2 'Any Indication of Improper Use?'
Teen Driving Safety	"P16. Driver License Restrictions" Attributes 08 *'Intermediate License Restrictions'*, 09 *'Learner's Permit Restrictions'*; "P17. Driver License Status" Attribute 02 *'Non-CDL Restricted Driver license (Learner's permit, Temporary/ Limited, Graduated)'*.
Child Passenger Safety	"P8. Restraint Systems/Motorcycle Helmet Use" Attributes 01 *'Booster Seat'*, 02. *'Child Restraint System – Forward Facing'*, 03 *'Child Restraint System – Rear Facing'*, 04 *'Child Restraint – Type Unknown'* ; and Subfield 2 'Any Indication of Improper Use?'
Non Motorist Safety	"C22. Number of Non-Motorists" "P4. Person Type" Attributes 04 *'Bicyclist'*, 05 *'Other Cyclist'*, 06. *'Pedestrian'*, 07 *'Other Pedestrian (wheelchair, person in a building, skater, personal convey.)'*, 08 *'Occupant of a Non-Motor Vehicle Transportation Device'*, 09 *'Unknown Type of Non-Motorist'*, and 99 *'Unknown'*.
Motorcycle Safety	"P8. Restraint Systems/Motorcycle Helmet Use" Attributes 12 *'DOT-Compliant Motorcycle Helmet'*, 13 *'Not DOT-Compliant Motorcycle Helmet'*, 14 *'Unknown If DOT-Compliant Motorcycle Helmet'*, 15 *'No Helmet'*, 97 *'Not Applicable'*, 98 *'Other'*, 99 *'Unknown'*; and Subfield 2 'Any Indication of Improper Use?'

As Table 8 show, States' crash data alignment to the MMUCC data elements related to critical traffic safety issues was low and varies greatly. States had the greatest alignment to those MMUCC data elements related to school bus safety (56.4%) and seat belt safety (56.0%). In contrast, motorcycle safety ("P8. Restraint Systems/Motorcycle Helmet Use" per **Error! Reference source not found.**) has the least alignment by States with an average of 30. 6% alignment including nine States that cannot map anything to this data element. Of note also are the 16 States that do not map anything to the MMUCC child passesnger safety data elements.

Table 8.
States Alignment to MMUCC data Elements for Critical Traffic Safety Issues

	Mean Score (%)	**Median Score (%)**	**N States with 0.0% Alignment**	**N States with 100.0% Alignment**	**Standard Deviation**
School Bus Safety	56.4	58.3	4	12	34.15
Seat-Belt Safety	56.0	57.1	5	4	24.72
Teen Driving Safety	43.1	41.7	2	2	23.78
Child Passenger Safety	43.0	50	16	3	32.25
Non-Motorist Safety	37.9	31.4	2	0	24.66
Motorcycle Safety	30. 6	22.2	9	1	24.35

DISCUSSION

The most common issue NHTSA encountered during this MMUCC mapping project was outdated, incomplete or missing documentation, especially related to States' crash data dictionary. However, as a result of this project, many States updated or created documentation because the initial measurement of their database alignment to MMUCC was not reflective of their crash data capabilities. After receiving the new documentation, analysts updated the mapping scores to accurately reflect the contents of the primary production database. While some States took steps to improve or create documentation, several States still lack documentation about the external data systems linked to their crash database, and specifically those States lack definitions for data elements with established time-lapsed linkages with other traffic records data system, such as roadway, driver, and vehicle data systems. Conversely, States that have robust interfaces (live linkages) all had documentation in some form, and most had documentation that was fully updated and reflective of their existing system

Another common issue NHTSA encountered was discrepancies between the States' crash report form (or forms) and their database. In one instance, the mapping uncovered that a State had updated their statewide crash report form, but had failed to plan for or update their State crash database. In this case, the database could not save the new crash data elements that law enforcement collected. As a result, NHTSA finds that States may benefit from conducting regular data mappings and other data quality assessments and adjustments to keep their crash data system accurate and operational.

Lastly, some jurisdictions collected elements at different levels than suggested in MMUCC (e.g., States collected vehicle or person-level elements at the overall crash level instead). The primary problem with collecting elements at higher levels than suggested is the loss in specific data about the people, vehicles or roadways involved. For example, the State might collect "Sequence of Events" for the entire crash, which yields a single value as opposed to collecting this for each vehicle involved. Conversely, States that opt to collect elements at lower levels than suggested collect more granular data than MMUCC. This provides more detailed data for State analysts and can still be rolled up into a MMUCC aligned mapping.

Each State can use their MMUCC alignment score to develop an action plan for updating their crash report (or reporting software) and crash database. Since it may not be possible or desirable to update everything all at once, States can prioritize the elements to revise. NHTSA encourages States to establish an action plan and include the priority for change, rationale, deadline, and the person or agency responsible for each element for which they are considering a change.

CONCLUSION

The results of this mapping exercise provide NHTSA with the first nationwide understanding of State crash data capabilities, from which several initiatives are planned. First, the results form a baseline of capabilities that NHTSA plans to use to design and implement appropriate technical assistance and training to increase State alignment with MMUCC and improve data quality. Second, NHTSA plans to use the results to inform future changes to both the

MMUCC Guidelines and FARS Coding and Validation Manual. By understanding where the States' capabilities currently reside, NHTSA can make better-informed decisions regarding additions, deletions, and changes to the existing data publications that will serve to enhance alignment between the States' crash data systems and NHTSA's MMUCC Guidelines and FARS Manual simultaneously. Thirdly, NHTSA plans to repeat this exercise on a regularly recurring basis to provide consistent, relevant information to all crash data stakeholders. This will result in NHTSA having the means and opportunity to conduct research and analysis on State crash data capability changes and trends over time, leading to further enhancements of all the programs listed herein.

REFERENCES

[1] National Highway Traffic Safety Administration. (2015, July). *Mapping to MMUCC: A Process for Comparing Police Crash Reports and State Crash Databases to the Model Minimum Uniform Crash Criteria.* (Report No. DOT HS 812 184). Washington, DC: National Highway Traffic Safety Administration.

[2] National Highway Traffic Safety Administration. (2017, July). *MMUCC Guideline: Model Minimum Uniform Crash Criteria Fifth Edition (2017).* (Report No. DOT HS 812 433). Washington, DC: National Highway Traffic Safety Administration