

CT - TRCC



1:30pm – 3:30pm / Conf Rm B - ConnDOT Hdqts
Apr 19, 2016

*Multiple Data
Systems*



Data Integration

* * * **Agenda** * * *

TRCC Data Linkage Meeting

Greetings TRCCers – here is the information for next week's **Data Linkage Meeting**.

Tuesday, April 19, 2016 / 1:30pm-3:30pm / DOT Hdqts – Conference Room B

We will review some examples from the past few years of measured success at data linkage. We will talk about some initiatives that are in the works involving the traffic records six pack, and we will float the idea of a new project or two for the 2016-2017 fiscal year to map out a long range plan. Dr. Carol Flannagan from the University of Michigan Transportation Research Institute, who served on a blue ribbon panel (The Impact of Advanced Vehicle Technology on Traffic Records), during last year's National Traffic Records Forum, talks about the future of traffic records. Attached is her chart, which started out looking like the six pack chart we talk about all the time, but then took on many other links, which we expect to see in the years to come. In the second slide, Dr. Flannagan asks, "How do we build towards highly interconnected data systems from where we are?" You guessed it – **Linkage must be prioritized now!**

Hope to see you all at next week's meeting!

Driver / **Vehicle** / Roadway / **Crash** / Injury Surveillance / **Citation Adjudication**

Dr. Bharat Balasubramanian
Executive Director and Professor,
Center for Advanced Vehicle Technologies
The University of Alabama



Dr. Carol Flannagan
Interim Director,
University of Michigan
Transportation Research Institute



**Blue Ribbon
Panel 2015
TR – Forum
Advanced
Vehicle
Technology**



Cathie Curtis
Director, Vehicle Programs,
American Association of
Motor Vehicle Administrators



Ron Medford
Director of Safety,
Self-Driving Cars,
Google



Nat Beuse
Associate Administrator for
Vehicle Safety Research, *NHTSA*



Ken Leonard
Director, Intelligent Transportation
Systems Joint Program Office,
IISDOT

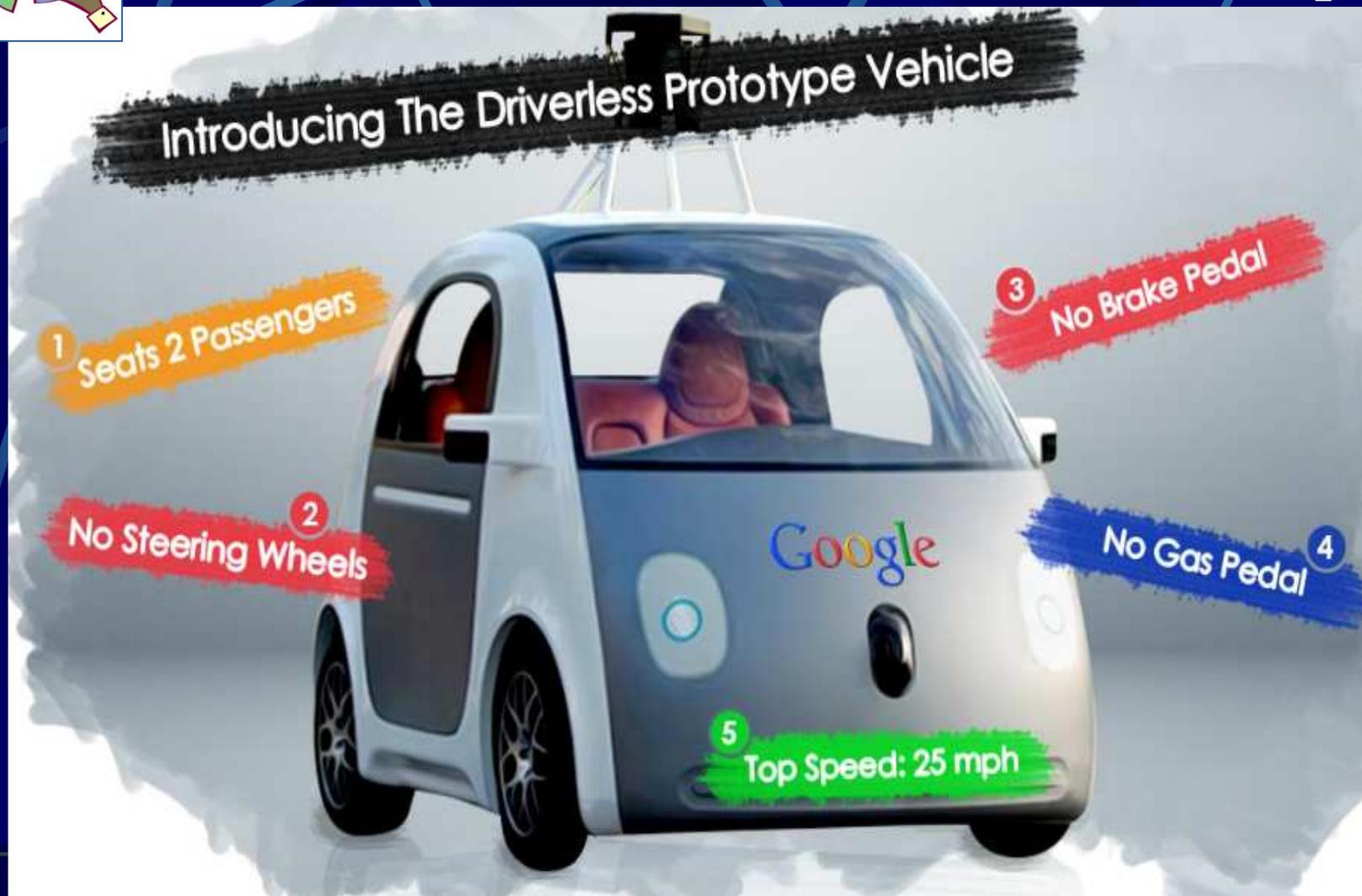


Data Integration



the Driverless Car

Multiple Data Systems



Introducing The Driverless Prototype Vehicle

1 Seats 2 Passengers

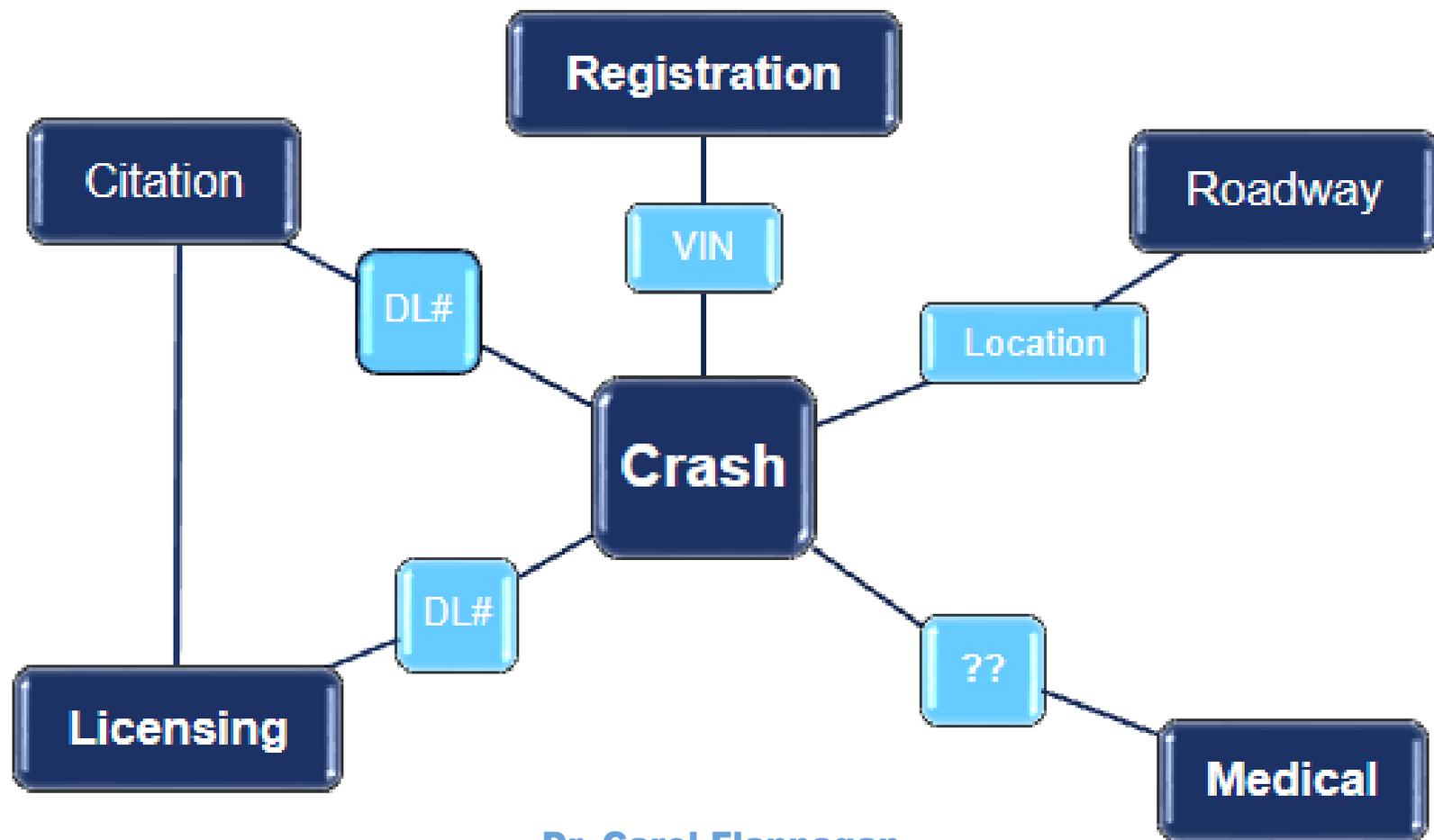
2 No Steering Wheels

3 No Brake Pedal

4 No Gas Pedal

5 Top Speed: 25 mph

Traffic Records Now



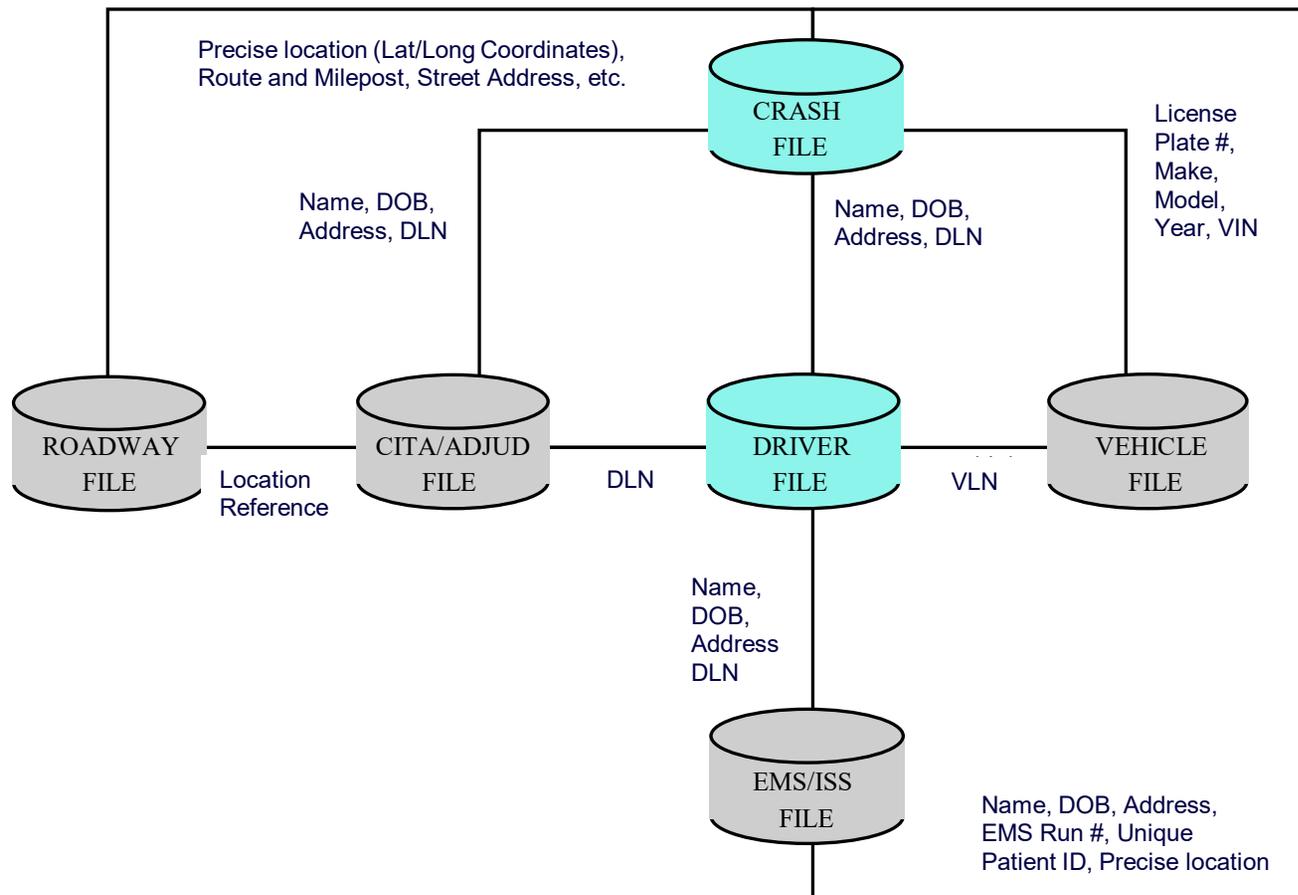
Dr. Carol Flannagan

TR Six Pack+ Chart

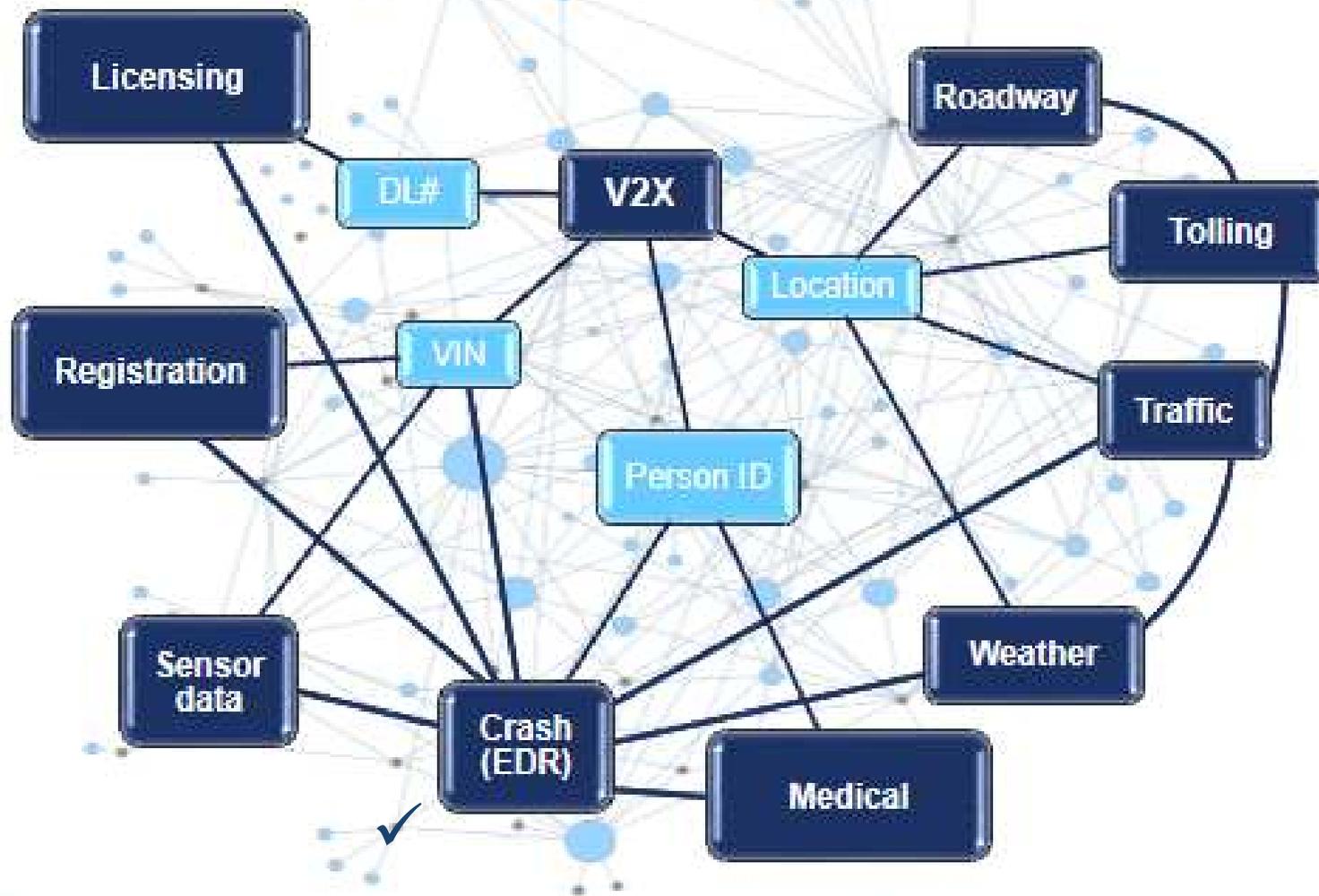
we talk about all the time

Crash, Driver, Vehicle, Roadway, Citation/Adjudication, Injury Surveillance

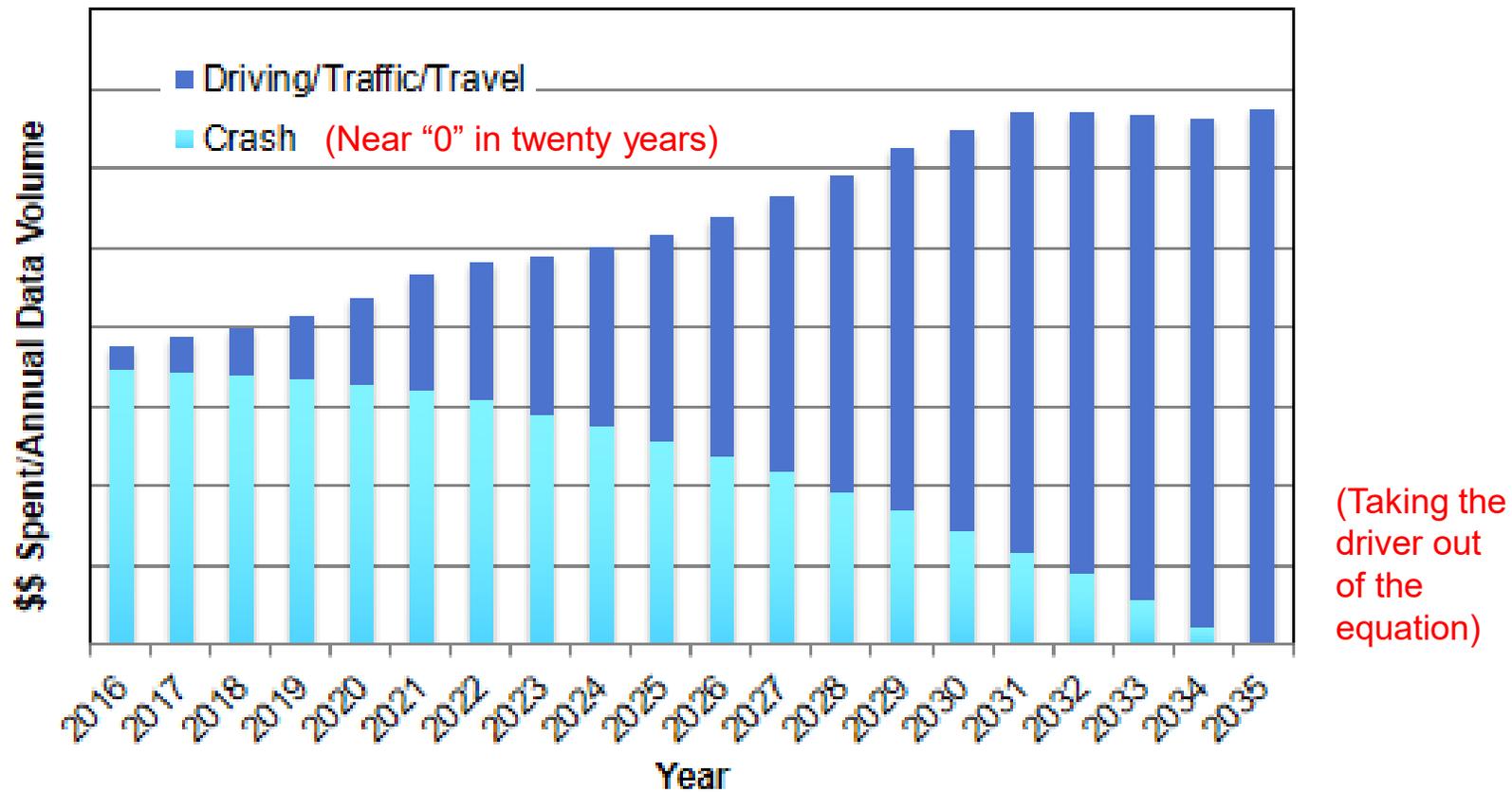
LINKAGE - TRAFFIC RECORDS SYSTEM - COMPONENTS



Traffic Records Future

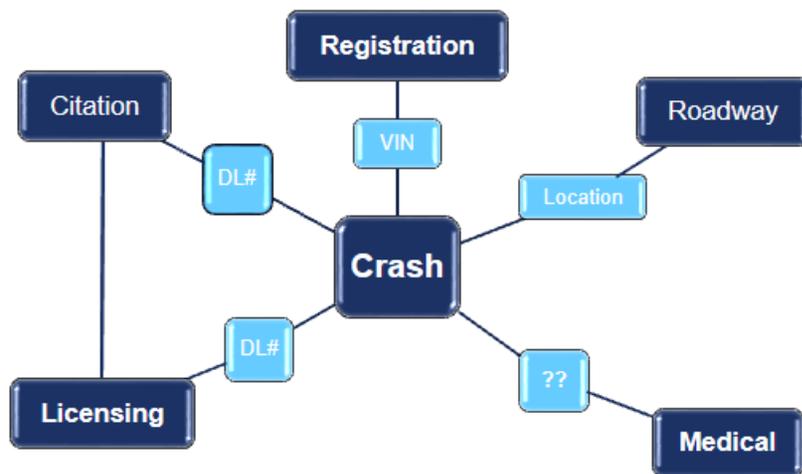


Traffic Records Future



Dr. Carol Flannagan

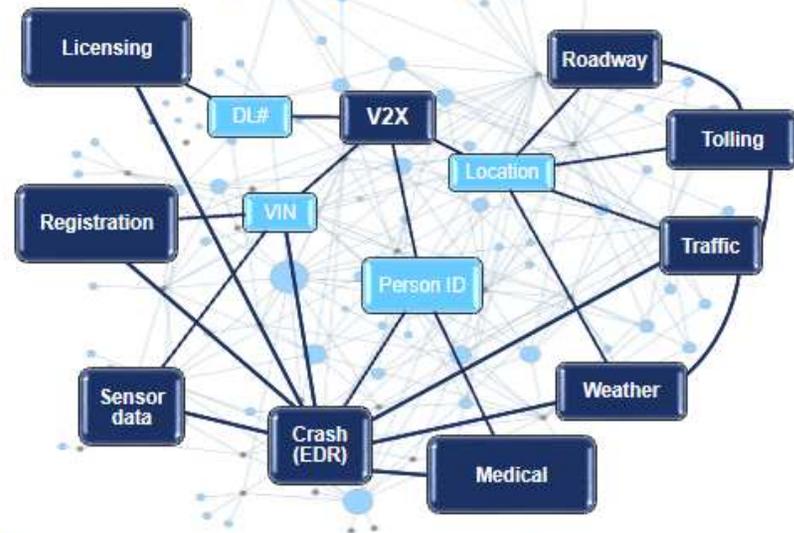
Traffic Records Now



If we're going to go from this ...

to this ...

Traffic Records Future



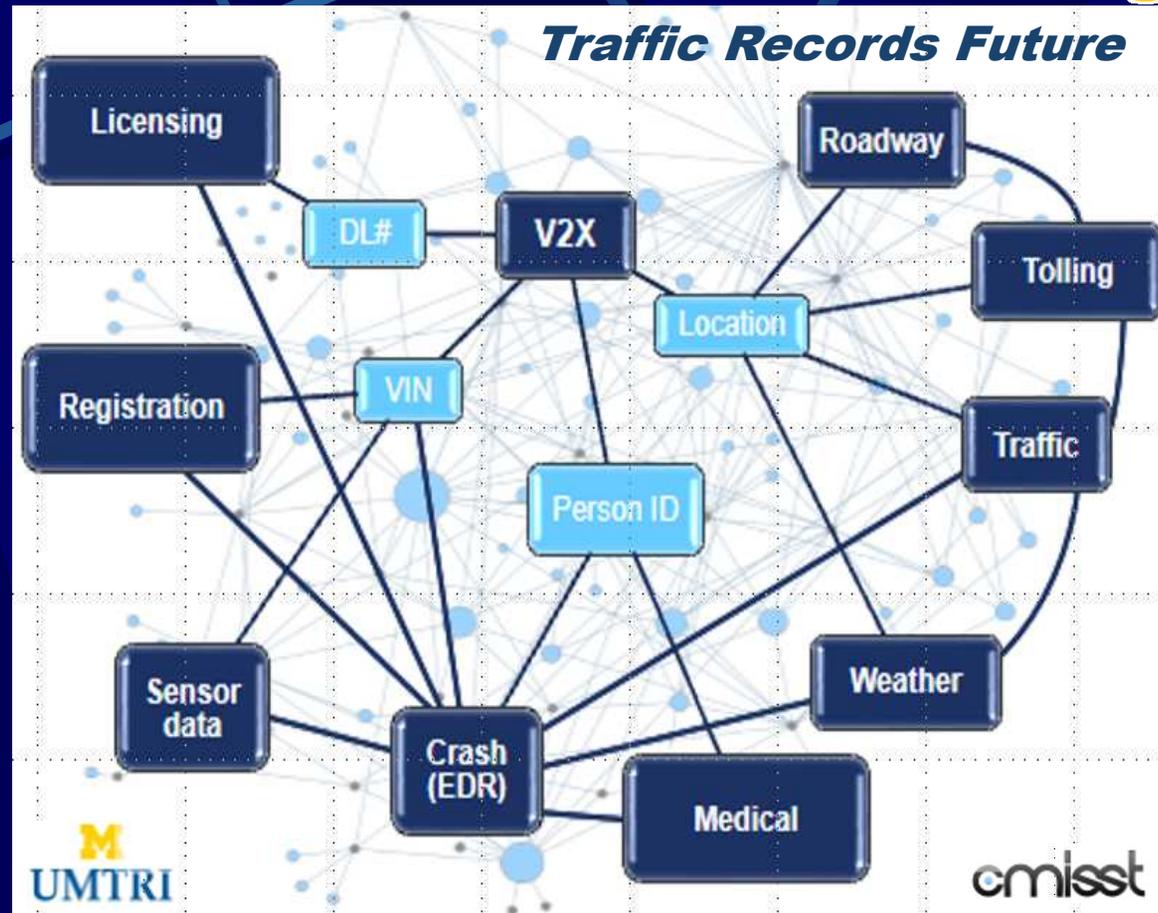
Data Integration



Multiple Data Systems



Getting Started



Dr. Carol Flannagan - to build towards highly interconnected data systems from where we are now ... **Linkage must be prioritized now** (as a first step)

Data Integration



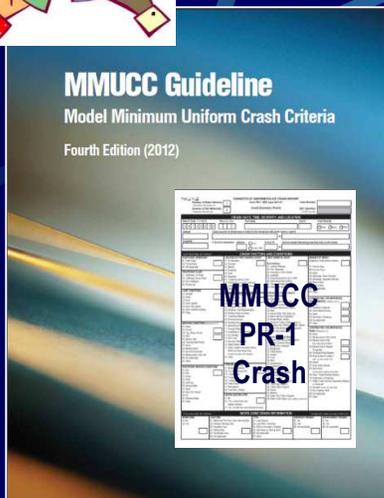
Data Integration

Multiple Data Systems



***** Parallels *****

Crash Reporting vs Linkage

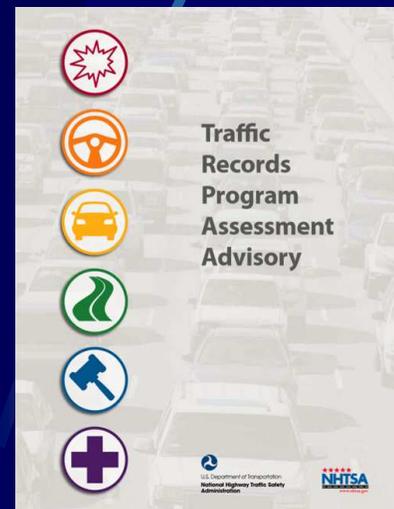


A few years ago, TRCC agreed to go with MMUCC Guideline for Crash Data

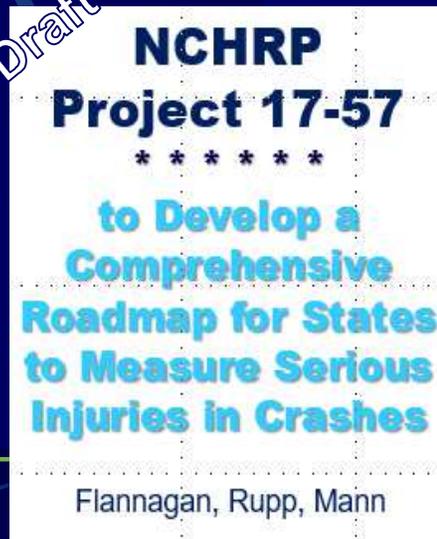
FHWA supported & helped push ahead MMUCC Crash effort through CDIP
Resulted in new State MMUCC PR-1 Crash System

TRCC is now reviewing Data Linkage, as recommended in Traffic Records Advisory

FHWA is offering support to help push Data Linkage through NCHRP research project
Results unknown - TRCC needs to emphasize Data Linkage in TRSP!



Draft



Data Integration



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Multiple Data Systems



Separating Interface Linkages
- from Data Integration



Data Integration



Multiple Data Systems



The T-R Program Advisory makes a distinction between **interface and integration linkages**. Both rely on connections among traffic records data system components, but their desired outcomes and connection protocols differ.

Interface Linkage reflects a standing or real-time relationship between datasets and a high degree of system interoperability. In practice, system interface linkage is useful when circumstances demand real-time relationships between databases that need to be connected and accessible at all times. Interface linkages exist primarily to support key business processes, for example allowing law enforcement officers to validate and verify drivers' license information in the crash report or citation.

Data Integration generally describes a linking of administrative databases to support in-depth analysis. Integration linkages are often executed at set points in time, such as the end of a calendar year or when all records for the period are considered final.



Data Integration



Multiple Data Systems



DOT

DMV

JUD

DPH

CSP

LLEA

COG

OTH

Interface Linkage

Crash/Driver Interface linkage enables law enforcement officers to validate and verify a driver's license in the field when filling out a crash report or citation

Driver/Vehicle Interface linkage - for a customer centric database, eliminating customer-related data errors

Citation/Adjudication Real-time access to individuals' driving and criminal histories in order to appropriately cite, charge, adjudicate, and impose penalties and sanctions

Injury Surveillance System Relationships within the system that enhance the continuity of patient care, and support system enhancements

Roadway Interface linkages that can be established between discrete systems within the State's roadway data component

Interface Linkage - a seamless, on-demand connectivity and a high degree of interoperability between systems that supports critical business processes



Data Integration



Multiple Data Systems



DOT

DMV

JUD

DPH

CSP

LLEA

COG

OTH

Data Integration

Crash/Driver Analysis of crash vs previous violation/crash history, license restriction type, license classification, driver improvement action types, etc.

Crash/Vehicle Analysis of crash vs vehicle description, type, condition, attributes, age, inspection history, mileage, registered owner type (business, private, etc.)

Citation/Adjudication Analysis indicating more effective allocation of law enforcement resources - in areas targeted for most frequent and serious injury crashes and traffic citations

Crash/Injury Surveillance System Analysis of injury type/severity vs crash type, vehicle type, occupant protection, location, EMS response, treatment type, etc.

Crash/Roadway Analysis that associates crash risk with roadway conditions, design, signing, pavement type, project/countermeasure type

Data Integration - a linking of the six-pack components to support in-depth analysis impossible to achieve if based solely on the contents of any singular data system.

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Data Integration

Data Integration

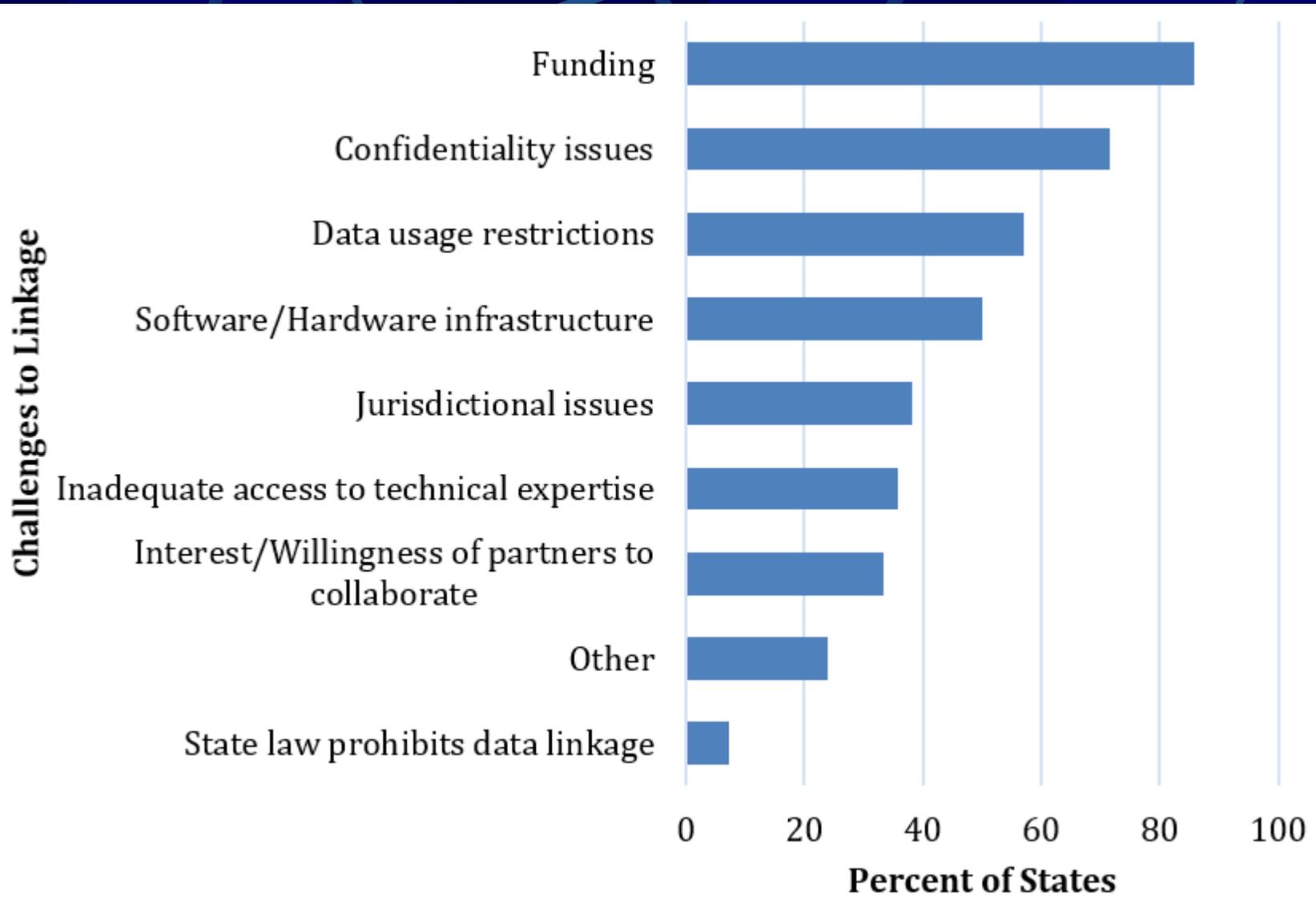


Multiple Data Systems



Challenges to Data Linkage
NCHRP Project
Survey of States

NCHRP Project Survey of States



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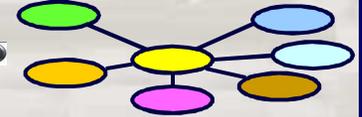


Data Integration

Multiple Data Systems

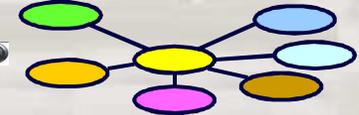


Connecticut
Examples - past few years
of measured success at
Data Linkage



The Advisory focuses primarily on the important linked datasets resulting from the integration of crash data with data from the other five components





Crash Data integration with Injury Surveillance Data

Linkages based on matching crash-involved people with their crash-related medical records results in integrated datasets incorporating person-related contributing factors (e.g., age, sex, behavior), crash dynamics (e.g., type of crash, ejection, vehicle compatibility), and information describing the resulting injury severity, medical treatments, outcomes, and charges. Analyses of these datasets can help describe the consequences of specific behaviors and choices and give decision-makers a more accurate picture of crash outcomes.



The CODES initiative had as a primary objective - the use of data linkage in pursuit of traffic safety by providing data and analyses to support Local, State and Federal programmatic decisions. CODES was designed to foster and cultivate the use and analysis of multiple highway safety data systems for highway safety applications, and facilitate State participation in CODES Data Network multi-state studies coordinated by NHTSA.

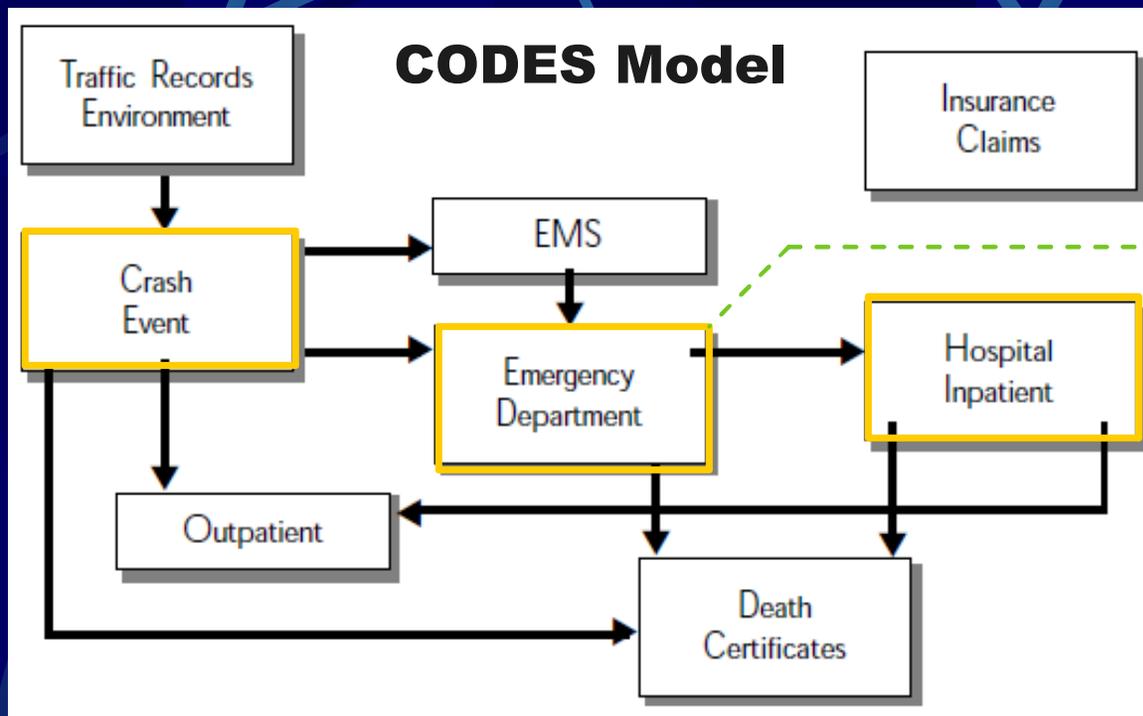
CT-TRCC



Crash Outcome Data

Probabilistic Linkage

Safety Data Systems



Trauma Center - hospital equipped and staffed to provide comprehensive emergency medical services to patients suffering traumatic injuries.

Linkage Achieved - As of June 2011, years of linked CODES (Crash Outcome Data Evaluation System) data, both for hospitalization as well as emergency department visit to crash data totaled 12 years. CODES electronically tracks victims of a motor vehicle crash from the scene through the health care system to determine crash outcome in terms of mortality, injury, severity, and health care cost.

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CHIME

Connecticut Health Information and Management Exchange

*Safety Data
Systems*



Home » Member Services » Data Services » ChimeData

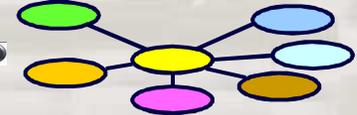
ChimeData

CHA Data Services offers data collection and reporting services to its acute care hospital members through its ChimeData program. In addition, ChimeData is used to help hospitals meet regulatory reporting requirements and to support CHA's advocacy efforts. ChimeData's database is the most comprehensive hospital database in the state, containing over 31 million patient encounters dating back to 1980.

ChimeData collects and edits administrative discharge (UB-04 claims-based) data from inpatient admissions, hospital-based outpatient surgery, and emergency department (ED) non-admissions. Hospitals can access a web-enabled decision support tool to analyze trends and changes in utilization. Custom data views can be created to include additional dimensions and measures. To learn more about our products and services please contact the CHA Data Services Help Desk at [203-294-7333](tel:203-294-7333) or chime.data@chime.org.

Analysis

Comprehensive data analysis and statistical services are also available to help hospitals analyze their performance across several dimensions.



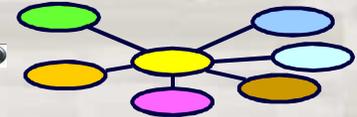
Crash Data integration with Roadway Data

Linkages based on location information (roadway names, location codes, geographic coordinates, etc.) result in integrated datasets incorporating crash descriptions, roadway characteristics, and traffic data (e.g., traffic counts, speed data). Analyses of these integrated datasets can help identify roadway features associated with increased crash frequency and severity, as well as countermeasures designed to address the increased risk of crashes, injuries and fatalities.

Linkage Achieved - state crash database linked (using route and milepost) for State, Interstate and U.S. Routes, with roadway and traffic volume data from the Connecticut Department of Transportation (ConnDOT's) Roadway Inventory System (RIS)



was achieved for calendar years 2002 through 2010 and made publically available in March 2013. This equates to 580,000 crashes or 71.2 percent of the total reported motor vehicle crashes (815,089) for the nine-year time period.



Crash Data integration with Citation/Adjudication Data

Linkages based on person and event identifiers from citation and adjudication data systems result in integrated datasets incorporating crash characteristics and traffic violations. Analyses of these integrated datasets can help identify relationships between crashes and illegal actions made by roadway users and aid in law enforcement and the evaluation of adjudication safety programs.

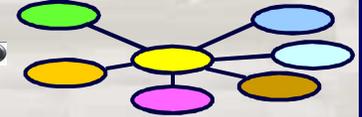
Integrating e-crash with e-citation enables a spatial relationship between crash locations and enforcement activities. DESPP - DPS has engaged the use of a geographic base, applied in a statewide DDACTS (Data Driven Approach to Crime and Traffic Safety) initiative.



Data Integration

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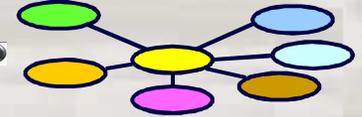
Traffic Records Systems



Any other examples of data linkage between components of the traffic records six pack and Crash

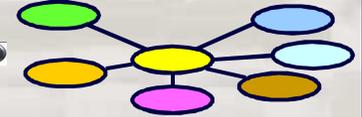
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Crash Data integration with Driver Data

Linkages based on drivers' personal identifiers result in integrated datasets incorporating crash contributing factors (e.g., behaviors, vehicle choice, driver maneuvers) and drivers' past histories. Analyses of these integrated datasets can help identify high-risk driver populations and predict future safety problems on past experiences.



Crash Data integration with Vehicle Data

Linkages based on fields such as license plate number or registration number result in integrated datasets that provide enhancements such as VIN-derived vehicle characteristics and registration and title information



describing the age and past history of vehicles. Analysis of these integrated datasets can help identify vehicle characteristics associated with crashes and at-risk drivers.

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Data Integration

Data Integration



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**Initiatives in the works
involving the traffic records
Six Pack**

**Data
Integration**



Office of EMS

Trauma Emergency Medical Services



**EMS/Trauma Re-deployment of Functional Systems ✓
Collect, Analyze, Share, Link Data**

- ✓ Data Dictionaries/Hosting EMS and Trauma datasets/Report Writer Upgrades
Provide access to data needed for Crash/Injury Research



Traffic Records GO TEAMS

Technical Assistance

Technical assistance with redeployment of the Trauma Registry and report writer / for successful integration of pre-hospital Emergency Medical Services data with hospital data entered into the Trauma Registry

Technical Problems:

- * Access to the Trauma Registry is not currently operational
- * Location of data previously collected is unknown, import needs to be repeated
- * Lack documentation of processes for collecting, correcting and reporting data
- * Lack a complete Trauma data dictionary
- * Identify fields to link EMS to Trauma data
- * Hospitals have no access to Trauma Registry or ability to submit trauma data
- * Identify all processes to redeploy, use and evaluate Trauma Registry and report writer
- * Create a timeline of activities and deliverables for redeployment and maintenance
- * Complete EMS data dictionary which includes linkage fields (linkage to Trauma data)
- * Locating the database and application. Unclear pathway of data flow.
- * Unable to locate server at DPH that was used to work with data at OEMS.
- * Unable to locate much program documentation, coding, report templates, etc. needs to be identified.

Data Integration



Yale-New Haven Hospital

Multiple Data Systems



Crash Injury Datasets

Link Datasets

In question - the comparison between officer assessments of personal injury as recorded on the PR-1 prior to 2015, the new MMUCC PR-1 crash reporting system, and assessments by health care providers following the crash.

- * **Proposed project in accordance with MAP-21, focusing on linking Crash with Injury data to derive more precise injury outcomes**
- * **Officer assessments using KABCO scale**
- * **Health Care assessments using**
 - **Abbrev Injury Scale (AIS)**
 - **International Class of Diseases (ICD)**
- * **Steps include acquiring disparate datasets, performing linking functions, managing the resulting dataset, and conducting in-depth analyses on the linked data**

Data
Integration



Yale-New Haven Hospital

Multiple Data
Systems



Crash Injury Datasets

Focus on a sample dataset in New Haven

- * 1665 injury crashes in New Haven in 2014 (using the old PR-1) - determine whether the injured person was taken to Yale-New Haven Hospital. Guidance for officer in assessing injury severity provided on page 8 of the Investigator's Guide

Compare the Trauma Registry Injury Severity Score

- * 1966 injury crashes in New Haven in 2015 (using MMUCC PR-1) - determine whether the injured person was taken to Yale-New Haven Hospital. Guidance for officer in assessing injury severity provided with greater detail/examples in MMUCC Guideline

Compare the Trauma Registry Injury Severity Score

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**A new project or two
for the '16-'17 fiscal year
to map out a long-range plan
for Data Linkage**

Data Integration



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NCHRP Project – including:

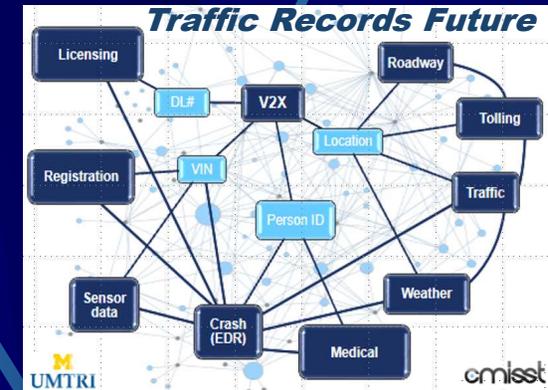
- A definition of serious injury
- Measuring serious injuries in crashes

which called for:

- Data linkage
- A survey, which indicated that data linkage is a priority for a majority of states

what resulted:

- A roadmap for states to be able to develop comprehensive crash related data linkage systems



Draft

NCHRP Project 17-57

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to Develop a
Comprehensive
Roadmap for States
to Measure Serious
Injuries in Crashes

Flannagan, Rupp, Mann

Data Integration



Data Integration

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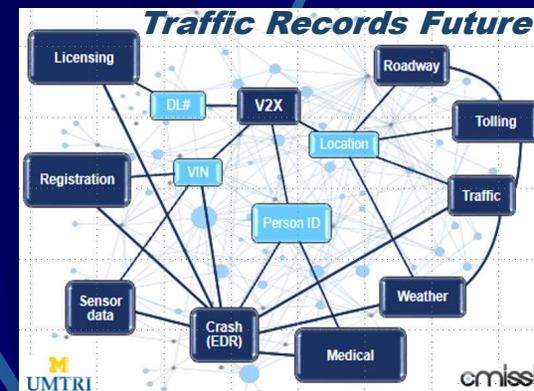


MAP-21 Requires Measurement of Serious Injury ----- However, it does not define serious injury

Due to a slow time frame for linkage in most states, FHWA is proposing “A” injury from KABCO (MMUCC 4th Edition) as the definition of serious injury for use through 2020

★ NCHRP authors recommend maximum MAIS 3+ as the target definition / the time has come to move to a **medical-outcome based metric**

Injury	AIS Score
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Unsurvivable



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NCHRP Project 17-57

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to Develop a Comprehensive Roadmap for States to Measure Serious Injuries in Crashes

Flannagan, Rupp, Mann

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Data Integration



Data Integration



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MAIS 3+ requires medical outcome data from either a state hospital discharge or trauma registry database

Roadmap for Data Linkage

Requirements

- 1) Having statewide datasets in place
- 2) Having common identifiers in the datasets to be linked
- 3) Having access rules and a mechanism for controlling access
- 4) Having a place or mechanism for storing the linked data



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Roadmap for



Data Linkage

Steps to Linking Data Systems



1) Set up a System for Collaboration and Communication

Coordinate through TRCC - Data Linkage / Focused Advisory Group

2) Catalog all Available Relevant Data Systems

Contents, schemas, inclusion criteria, coverage, quality issues

3) Determine which Data Systems will be Linked

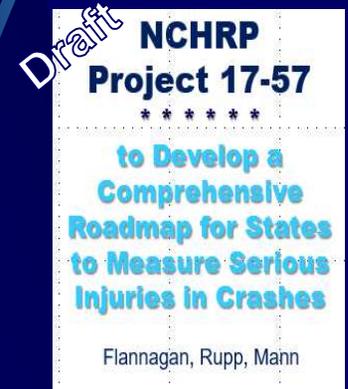
Map out a long-term plan/hurdles that need to be overcome

4) Determine what Variables the Data Systems Have in Common

Know what is available in existing data systems to aid linkage

5) Determine the Linkage Mechanism

If unique identifier – direct linkage; otherwise,
Probabilistic linkage, using a group of common identifiers



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Roadmap for



Data Linkage

Steps to Linking Data Systems



6) Determine Storage Mechanism for the Linkage

Data must be stored and managed, and access must be protected

7) Common Variables must have the Same Schema

Variable formats as well as codes and values

8) Pilot Test Linkage (limited size or area)

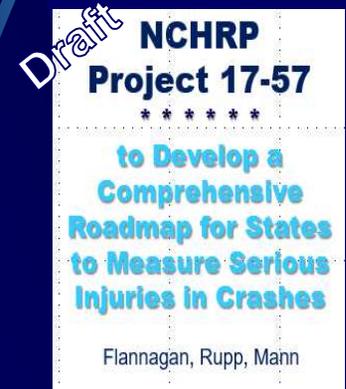
Identify logistical and dataset issues before full-scale effort

9) Set up a Sampling Program (optional/pre-linkage ability to measure)

Provides a way of evaluating the outcome of a developing linkage system

10) Link Data Systems (expand on pilot test)

Expanded version of the pilot program, resolving issues during pilot test



Data Integration



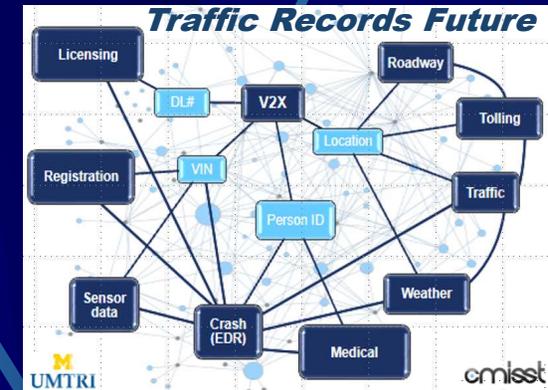
Data Integration

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NCHRP Authors Recommend Addressing Challenges to Linkage on a National Level

- * National crash data schema / XML, based on MMUCC with same benefits as NEMSIS for EMS community; facilitate linkage to NEMSIS and NTDB (trauma data) schemas,
- * Develop criteria for testing quality of linkage systems. Levels of linkage quality (in terms of bias, accuracy, and completeness) should be associate with guidance in how to analyze the data
- * Develop a repository for lessons learned,
- * Develop marketing materials for TRCCs - Benefits of Linkage,
- * Host workshops for state data holders to learn about linkage,
- * Generate a clear, written interpretation of HIPAA in the context of data linkage that defines clearly what mechanisms must be in place to link data and still maintain HIPAA compliance.



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NCHRP Project 17-57

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Flannagan, Rupp, Mann