Data Linkage

CODES

The Crash Outcome Data Evaluation System

Comprehensive, Complete Data are the Key...

To understanding why the injury outcome and financial consequences of motor vehicle crashes remain a major public health problem.

The Problem...

Crash data are not comprehensive and complete.

The Solution...

Link crash, injury, and other traffic records to improve the injury and financial conditions of the data.

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What is CODES?

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 costs.

CODES also links crash data to licensure, registration, roadway, citation, and other traffic records to understand the association of, for example, problem drivers, vehicle and roadway characteristics, and/or different types of violations with crash outcome.

History of CODES

CODES evolved from a congressional mandate to report on the benefits of safety belts and motorcycle helmets in terms of medical and financial outcome. The National Highway Traffic Safety Administration has funded almost two-thirds of the States to develop linkage capabilities.

Benefits of CODES

- Generates State-specific crash outcome information.

- Matches specific characteristics of the person, vehicle, and/or event to injury type, severity, and hospital charges.

- Identifies data quality problems during the linkage process.

- Creates a permanent database that includes all of the data elements in each data file that is linked.

Protection of Privacy

In each **CODES** State, the **CODES** Board of Directors controls access to its linked data in compliance with State privacy legislation and regulations.
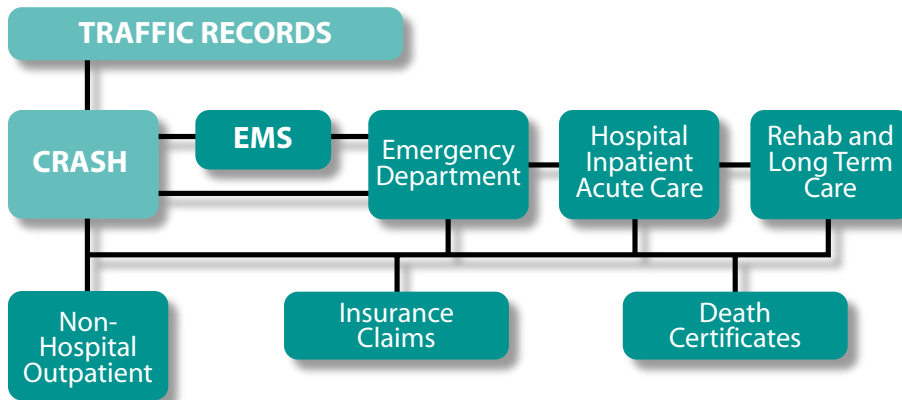
What Resources Does NHTSA Provide to Assist States to Implement CODES?

1. One week of training implementing the **CODES2000** software and the linkage/ imputation techniques onsite for new States.

2. Offsite technical assistance on demand.

3. An annual national meeting to provide technical assistance and training for all grantees and states interested in **CODES**.

What Do the States Need to Do to Implement CODES?

1. Two years of statewide, electronic data
   - Crash
   - Emergency Medical Services (EMS) or Emergency Department (ED)
   - Hospital Discharge
   - Death
   - Other Traffic Records

2. Data elements that discriminate between crashes and the persons involved in the crash.

3. Personnel experienced working with ACCESS, SAS, and crash and/or injury State data files.

4. Willingness to:
   - Collaborate with NHTSA
   - Provide State matching funds
   - Convene the data owners as the CODES Board of Directors to control release and use of the data
   - Convene linked data users as the CODES Advisory Committee to encourage use of the linked crash outcome data for more effective traffic safety decisions.

CODES Linked
Crash and Injury Outcome Data

TRAFFIC RECORDS

CRASH — EMS — Emergency Department — Hospital Inpatient Acute Care — Rehab and Long Term Care

Non-Hospital Outpatient — Insurance Claims — Death Certificates

Crash data alone make up only a portion of the traffic records collected before, during and after an event. The linkages of person-specific and event-specific traffic records generate the comprehensive crash outcome data that are needed to improve traffic safety.

What is Probabilistic Linkage?

Unique identifiers (e.g., name) usually are not available for linkage. To complicate matters, data may be missing or inaccurate. So, probabilistic linkage techniques are used to generate an estimate of the probability that a matched pair is a valid match.

Are the Linked Data Representative?

Conclusions generated by case control studies are To improve traffic safety, information is needed about the people, vehicles, and environment involved before, during, and after the crash. Based on high-probability linked pairs (excluding low-probability linked pairs, of which many would be valid with complete data) cannot be presented as representative of the population. To compensate for the imperfect data, linkage imputation techniques are implemented to generate sets of data that can be used to statistically fill in the gaps. The linked data are then complete for traffic safety analyses and planning.

Linkage Variables

Types of data elements that identify a **PERSON**:

Age
Day and Month of Birth
Year of Birth
Gender
Vehicle Number for Crash
Seating Position
Injury Status
Transport by EMS
Admission as Hospital Inpatient
Residence ZIP code
Name (if available)
Social Security Number
    (if available)

Types of data elements that identify a **CRASH**:

Day and Month of Crash
Year of Crash
Hour and Minute of Crash
Latitude/Longitude for Crash
County/City of Crash Location
Type of Crash
Type of Vehicle
Vehicle Identification Number
EMS Agency Providing
    Transport
Service Areas: Police, EMS,
    Hospital

To improve traffic safety, information is needed about the people, vehicles, and environment involved before, during, and after the crash.

State-Specific CODES Applications

CODES States have developed different formats for presenting the linked data.

Fact Sheets

A one- or two-page, issue-based format that focuses the data so the reader gets the message in a glance.

Standardized Reports

A one-page format that displays descriptive data using columns for outcome measures, increasing in severity level from left to right, and changing rows to reflect the units being studied for the intended audience. These reports facilitate interstate comparisons and identify local, regional, and statewide problems.

Research Reports

A multipage format for providing an in-depth analysis of traffic safety issues, such as the effectiveness of safety belts in terms of preventing or reducing fatalities, injuries, severity, and hospital charges within the region. Statistical significance is tested and the results are reported with confidence intervals. These reports are useful in analyzing the significance of less-frequent events on crash outcome.

CODES Data Network

CODES States that have successfully linked at least two years of data are invited to collaborate with NHTSA to facilitate timely access to the linked data by NHTSA analysts for rulemaking and other NHTSA activities. NHTSA provides partial funding to these States to support institutionalization of the CODES linkages.

Uses of CODES Data

State Traffic Records Coordinating Committee (TRCC) and NHTSA

- Identify traffic safety priorities that will have an impact on improving mortality, morbidity, severity, and charges statewide and nationally.

Legislators

- Support traffic safety legislation (belts, helmets, etc.)

Traffic Safety Trainers

- Provide realistic crash outcome data for training traffic safety professionals.

Program Manager

- Monitors results before and after implementation of a specific countermeasure.

Injury Control Professionals

- Target specific population groups, locations, seasons, time periods, and vehicle types to reduce deaths, injuries, severity, and costs.

Emergency Medical Service (EMS) Professionals

- Support a systems approach to evaluating EMS effectiveness.

CODES Web Sites

NHTSA www.nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/ CODES.html

| State	Location
Arizona	http://www.arizona.edu/spotlight/2000/Jan242000.html
Delaware	www.state.de.us/highway/Delaware%20Codes/CODESHome1.html
Kentucky	www.kiprc.uky.edu/projects/CODES
Maine	www.mhic.org/CODES
Maryland	medschool.umaryland.edu/NSCforTrauma/2002%5Cmedian%20charges%20graphs.pdf
Missouri	www.dhss.mo.gov/MICA/index.html (select motor vehicle crashes)
Minnesota	www.dps.state.mn.us/OTS/crashdata (select CODES project)
Nebraska	www.hhs.state.ne.us/srd/codesreport99.pdf www.hhs.state.ne.us (search CODES; select #8)
New Hampshire	www.state.nh.us/safety/ems/projects.html
Oklahoma	codes.ou.edu
South Carolina	www.ors2.state.sc.us (select SC CODES project)
South Dakota	www.usd.edu/brbinfo/codes
Tennessee	http://www2.state.tn.us/health/statistics/PdfFiles/CODES_1998_1999.pdf
Utah	www.utcodes.org
Wisconsin	www.chsra.wisc.edu/codes

Samples of State-specific fact sheets, standardized reports, and publications can be found on the CODES Web sites. Some also provide interactive query capabilities that allow the user to directly access the linked data in compliance with State privacy legislation/regulations.

U.S. Department
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**National Highway
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CODES States
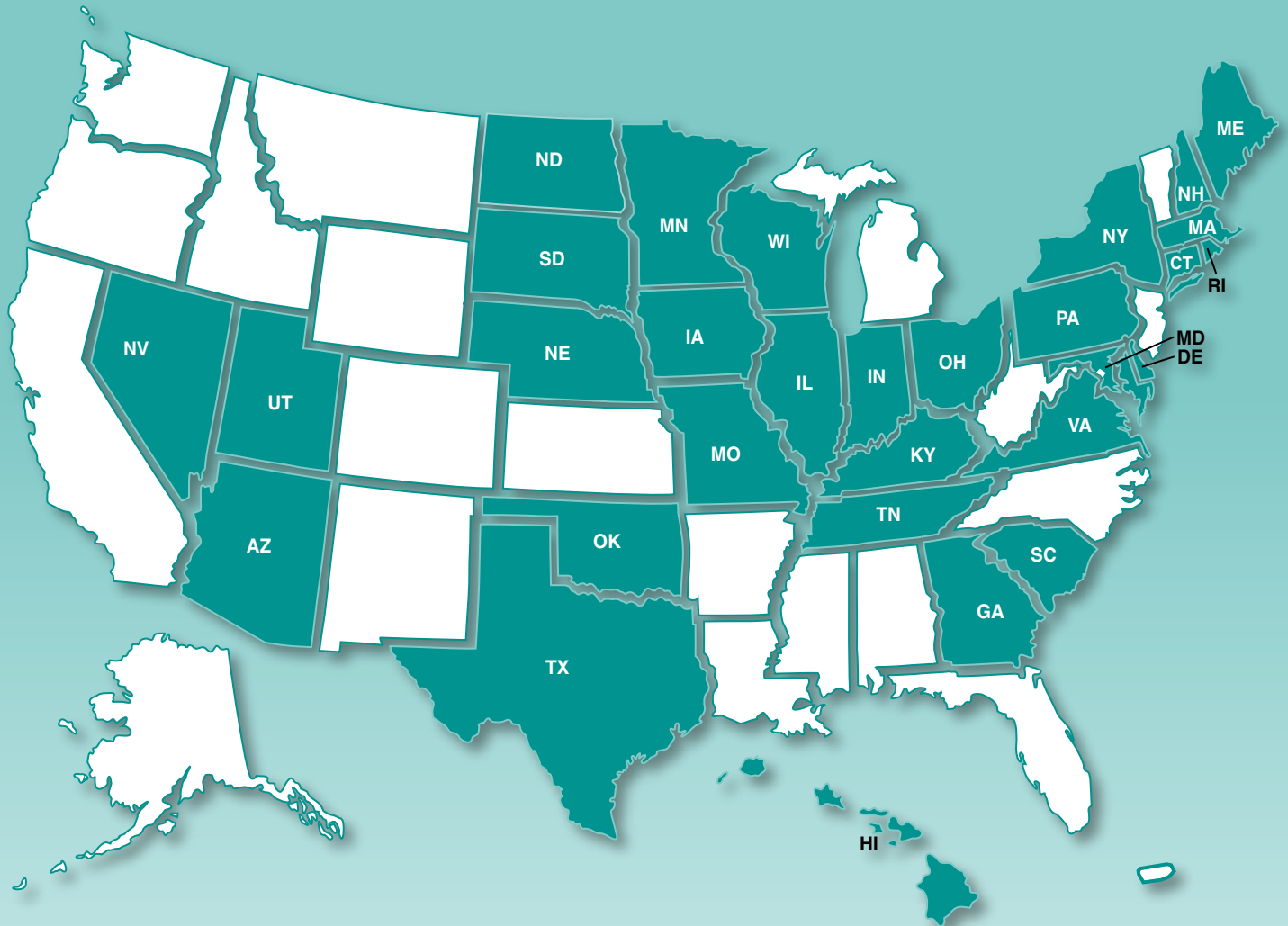
Is Your State a CODES State?

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