Data Support

THE DATA TEAM

Kansas Dept. of Health and Environment

MARC
Mid-America Regional Council

NHTSA
National Highway Traffic
Safety Administration

Kansas Dept. of Transportation

Federal Highway Administration

AAA Allied Group

Data

Introduction

Good crash data are the backbone of road safety management. According to the American Association of State Highway and Transportation Officials, or AASHTO, strategic highway safety plans should improve data collection and, as a result, decision making.

The data support team will provide the emphasis area teams and the Executive Safety Council, or ESC with the data required to craft an information-based Strategic Highway Safety Plan. The data team will

- gather and present data to the ESC,
- collect and organize data at the request of other emphasis area teams,
- assist ESC in identifying data gaps, collection and reporting weaknesses,
- assist in deciding whether a need exists for additional emphasis area teams and
- collect data from different agencies represented on the ESC.

The data team was created not only to assist in the mining and presentation of data on behalf of other emphasis area teams but also to develop performance measures, outcomes and strategies specific to data collection, storage, analysis and reporting.

The team, which first met June 15, 2009, is represented by the following agencies:

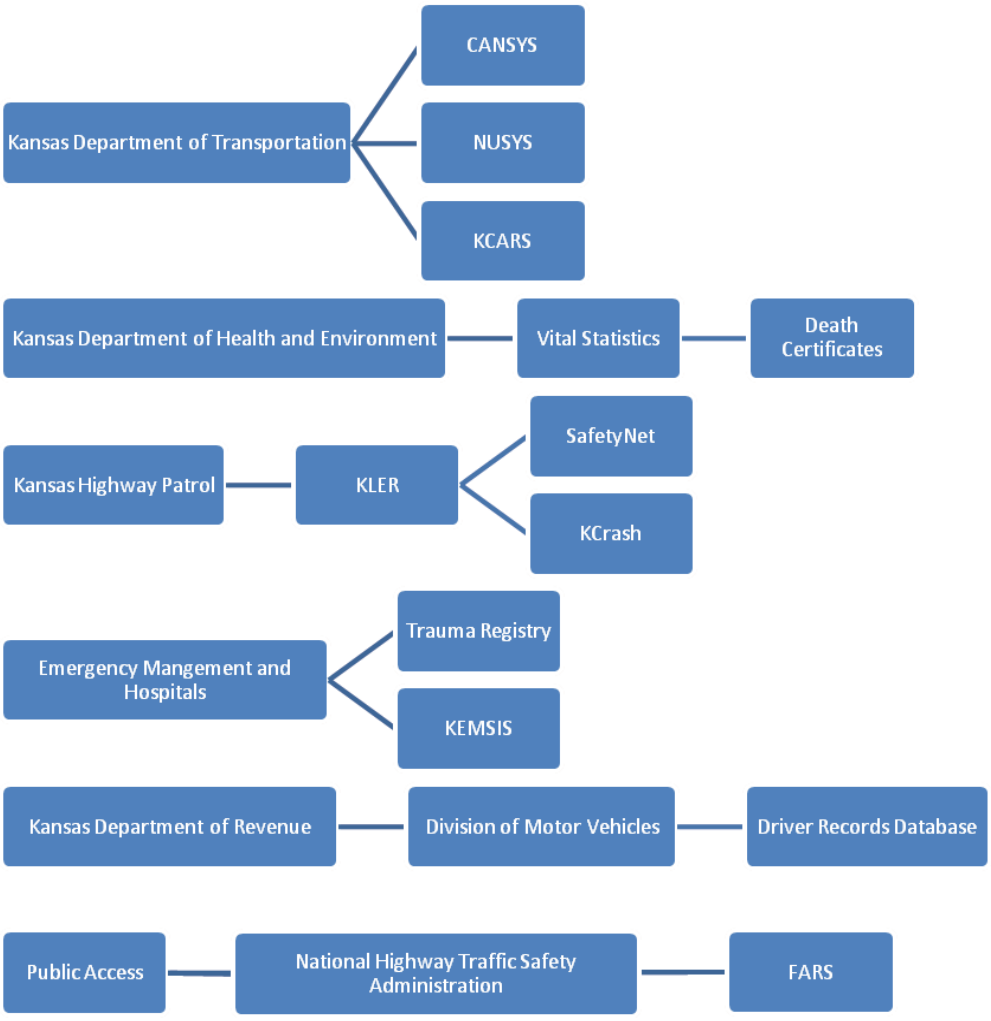
- AAA Allied Group (AAA)
- Mid-America Regional Council (MARC)
- Federal Highway Administration (FHWA)
- National Highway Traffic Safety Administration (NHTSA)
- Kansas Department of Health and Environment (KDHE)
- Kansas Department of Transportation (KDOT)

Traditionally, crash data have been housed in isolated repositories. However, in June 2005, an interagency committee, the Traffic Records Coordinating Committee, or TRCC, began developing a statewide traffic records system. The statewide Traffic Records System, or TRS will allow state and local agencies to access data by integrating information that is now housed in KDOT, KDHE, the Kansas Department of Revenue, or KDOR, the Kansas Bureau of Investigation, or KBI and the Kansas Board of Emergency Medical Services, or KBEMS. The result will be a more complete picture of traffic safety in Kansas.

The data team would like to work with the TRCC to promote and expand use of the Kansas Law Enforcement Reporting System, or KLER. KLER is a field-based reporting system developed by the Kansas Highway Patrol that lets law-enforcement officials complete and view electronic records in their cars during traffic and crash stops. It's discussed in more detail below.

Data Collection and Storage

To address highway safety problems requires data of all sorts. There are roads of many kinds with twists and turns, rises and falls. There is an array of vehicles used by drivers young and old, drunk and sober, some with cell phones, some texting, some speeding, some fully attentive. Those who design, construct and maintain the infrastructure work to make it safe. Law enforcement works at managing those who use the infrastructure and emergency services – and are called on when crashes occur. So "crash data" include roadway geometrics, vehicles, drivers, injuries and fatalities, emergency management and more. Because of the complexity of data and the need to keep it secure, it is housed in databases maintained by various agencies. The graphic below reflects this.



Below are thumbnail sketches of these databases.

- **CANSYS** - State Highway Network Data

  This KDOT database contains information about the geometrics, condition and extent of the 10,000-plus miles of road in the state highway system, as well as a small percentage of off state system local roadways. It contains data on bridges, access permits and at-grade rail crossings and supports the work of various bureaus at KDOT, as well as of the FHWA and Kansas Legislature. CANSYS is maintained by the KDOT Geometric and Accident Data Unit, or GAD.

- **NUSYS** - Non-State Classified Network Data

  This KDOT database contains information about roads classified as collector and above within the 40 areas in Kansas designated as urban by the U.S. Census Bureau. NUSYS is a central repository of geometric inventory information on off state system local roadways and is used to produce required federal reports. It provides answers to questions posed by the FHWA, Kansas Legislature, KDOT management and employees, and other state agencies. NUSYS is also maintained by GAD.

- **KCARS** - Kansas Crash & Analysis Reporting System

  KCARS contains records of all reportable crashes in Kansas from 1990 to the present. The data in KCARS are provided to KDOT by law enforcement agencies. The data includes any field that is listed on the Kansas Motor Vehicle Accident Report and recorded by law enforcement. Like CANSYS and NUSYS, KCARS is maintained by GAD and provides answers to questions posed by the FHWA, Kansas Legislature, KDOT management and employees and other state agencies.

- **Vital Statistics** - Death Certificates

  The Office of Vital Statistics within the KDHE supplies KDOT, at KDOT's request, with records that permit the coding of fatal crashes. The information helps researchers understand the cause and nature of injuries suffered in crashes, and the time that elapses between injury and death.

- **KLER** - Kansas Law Enforcement Reporting System

  The KHP has recently developed KLER, a field-based reporting system, which incorporates data from more than 15 reports, including KDOT crash forms, KBI incident forms and KDOR insurance forms. Law-enforcement officials use it to complete and view critical records on mobile laptop computers in their cars during traffic and crash stops. Eventually, KLER will include in its records a new statewide uniform traffic e-citation system. To learn more about the KLER System and its benefits, go to http://portal.kstrs.org/Shared%20Pages/KLER.aspx

  The SHSP data support team would like to work with the TRCC in promoting and expanding use of KLER. The expansion would require additional training and education for law enforcement officers and administrators emphasizing the importance of electronic crash reporting.

- **SafetyNet** and **KCrash**

  The KHP maintains SafetyNet and KCrash for federal reporting purposes and state use. KHP supplies data on inspections and collisions to SafetyNet. SafetyNet was developed, and is supported, by the Federal Motor Carrier Safety Administration (FMCSA). The KHP is the lead agency for state participation in the Motor Carrier Safety Assistance Program, which focuses on roadside inspections. The KHP is also required to document federally reportable collisions. There are three criteria for these: a fatality involving a commercial motor vehicle (CMV); an injury collision involving a CMV that requires immediate medical attention away from the scene; or a collision with a CMV resulting in disabling property damage to at least one unit.

  The KCrash program has accelerated the filing of collision reports with FMCSA. It facilitates the electronic filing of SafetyNet reports, in place of paper forms. The KHP receives electronic copies of all collision reports involving a CMV to determine whether they meet federal reporting requirements. Paper copies of collision reports involving a CMV are converted to an electronic format by KDOT. KCrash screens all state highway system crash reports in order to populate the required SafetyNet fields before they are forwarded to FMCSA.

- **Trauma Registry**

  The trauma registry system is organized to facilitate a multidisciplinary response to those who suffer trauma related injuries during car crashes or other events. The trauma registry houses data on trauma patients from all Kansas hospitals. The data guide systemic improvements that reduce morbidity and mortality related to traumatic events. Registry data are used by emergency medical service personnel, hospital staff and the KDHE staff to identify injury trends, prioritize needs, and implement and evaluate prevention strategies.

- **KEMSIS** - The Kansas EMS Information System

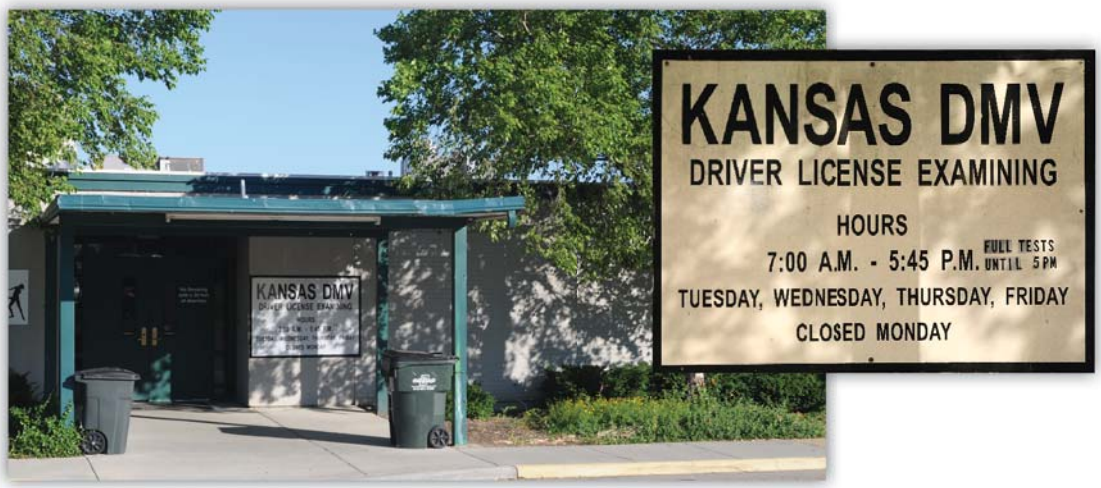
  KEMSIS is data system that captures the condition of patients and the treatments they receive before they arrive at a hospital. KEMSIS is a voluntary reporting system whose elements mirror those in the National Emergency Medical Service Information System dataset. Services utilize this information for quality improvements, equipment decisions, staffing adjustments, unit locations and treatment modalities. The system also provides an electronic patient care report for hospitals. As of June 2010, 55 emergency medical services and 23 hospitals were filing reports with KEMSIS.

- **Driver Records**

  The Driver Records database is hosted by the Kansas Department of Revenue Division of Motor Vehicles (DMV). It contains the records of all licensed drivers in Kansas. The file depends on many sources. For example, KDOT provides crash records to the database and the court system supplies adjudication information. At this writing, the DMV was revising the database. When the database is finished it will provide those interested in traffic safety with a more complete picture of specific drivers. It is anticipated that this information will improve public safety and maximize the impact of traffic-safety resources.

- **FARS** - Fatality Analysis Reporting System

  FARS is a database funded by the NHTSA and open to the public on its website. It contains records of all fatal crashes in Kansas. To be included in FARS, a crash must involve a motor vehicle traveling on a trafficway customarily open to the public and result in the death of a vehicle occupant, or of a non-motorist, within 30 days of the crash. The FARS file contains descriptions of each fatal crash reported. Each case has more than 100 coded data elements that characterize the crash, the vehicles and the people involved. To view fatality data, go to http://www-fars.nhtsa.dot.gov/Main/index.aspx



The Five Percent Solution

KDOT's approach to reduce the number of deadly or disabling crashes is to start by identifying those stretches of state highways that produce the highest incidence of them.

Kansas has analyzed data and issued reports on those segments of highway since 2007. KDOT has purchased a new software tool – SafetyAnalyst – that does more than focus on the problem spots. Hopes are that it will help the state devise countermeasures that lower the death and disability toll.

In 2005, federal legislation, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, or SAFETEA-LU, created the Highway Safety Improvement Program, or HSIP. Its goal was to raise public awareness of highway safety needs and challenges and reduce fatalities and serious injuries. HSIP required Kansas, starting in 2007, to submit an annual report describing no less than 5 percent of its highway system that, according to crash data, was in the greatest need of safety improvement. The report had to discuss potential remedies for stretches of road with high death and disability statistics by reference to any combination of the 4 E's: engineering, enforcement, education and emergency medical services.

For the 5 percent reports issued in 2007, 2008 and 2009, KDOT used the High Accident Location System database (HALS) to identify stretches in need of improvement. The Kansas 2007 Five Percent Report used crash data from 2002 to 2006 but took into account only the most severe crashes. The 2008 report, covering crash data from 2003-07, included all crashes. The 2009 report, covering crash data from 2004 to 2008, covered all crashes except for those involving animals.

Each report identified about 1,500 segments representing about 500 miles -- or 5 percent of the 10,000 mile system. About 700 segments appeared in all three reports.

In the Kansas 2010 Five Percent Report, KDOT used newly developed software, SafetyAnalyst, to identify locations with high crash rates. The report used 2008 crash data for the 700 most problematic segments. The results were then compared with findings for this data in the Kansas 2009 Five Percent Report, which utilized the HALS database.

This test showed that using SafetyAnalyst will allow the agency to refine its crash analysis capabilities. To read the 2010 Five Percent Report, go to

http://safety.fhwa.dot.gov/hsip/fivepercent/2010/index.cfm?state=ks

Data Analysis

Two tools are particularly useful for analyzing the data found in state and federal databases.

- High Accident Location System (HALS)

  HALS was developed by GAD to identify those segments of the state highway system that are experiencing high numbers of automobile crashes. HALS was the primary tool used to create the first three five percent reports. But HALS relies on a linear referencing system, or LRS, that depends on the assignment of a crash to a reference point. For example, a crash might be mapped by using a milepost (the reference point) along a road (the linear element). However, that capability exists only for the 10,000-plus miles in the state highway system. In addition, HALS can't account for crash locations by the type of location: an intersection or a median, for example. This limits its usefulness in identifying certain segments of road that figure significantly in crashes. SafetyAnalyst should fill this role when it's fully implemented.

- Local Roadway Analysis

  This is a method for discovering stretches of road off the state highway system with high crash rates.

  KCARS supplies the data, and KDOT uses an analytical method that's compatible with the data available. The method has allowed it to rank counties in terms of the number of crashes from 2005 to 2009 on the three functional classifications of road outside the state highway system.

  Barriers to a fine-grained analysis of crashes on local roads come from incomplete or inconsistent data. Mapping a crash location requires one of two data points: an LRS location of the kind used in HALS analyses or a latitude and longitude. KDOT is responsible for 10,000 miles of state highway. The system's crash records include LRS data. Many of the 130,000 miles of local roads managed by individual cities, counties and townships lack locational data because they have neither county mile posts nor a geo-coded road inventory.

  This results in analytical challenges.

  - For the local roads that do not have a local referencing system, KDOT must assign each crash a latitude and longitude manually.
  - Through the years, many off-system roads have accumulated multiple names. Different agencies and local residents refer to roads by different names. New roads are added every year, and it's a challenge to maintain a complete inventory.

  Despite these barriers, KDOT is producing a list of potential sites for improvement for the annual Five Percent Report.

Goals and Strategies

The data support team has chosen six strategies as the focus of its efforts. It seeks to

1. Coordinate the Data Needs of the Kansas Strategic Highway Safety Plan
2. Improve data analysis capability to better inform decision makers
3. Train those who create, input and utilize crash data
4. Map all crashes statewide using GIS tools

The challenge is to identify the strategies that will have the greatest impact on improving the availability, accuracy, and efficiency of data and data analysis.

Goal 1: Coordinate the Data Needs of the Kansas Strategic Highway Safety Plan

New Strategy:

- Identify and analyze outstanding variables related to crashes that occur away from intersections and don't involve animals, using the Kansas 2010 Five Percent Report
  - Background: KDOT is required by SAFETEA-LU to report annually on the top five percent of state highway miles linked to fatal or serious injury crashes. As explained above, in recent years KDOT has used HALS to do the report. When the three most recent reports, each referencing 1,500 locations, were compared, about 700 locations recurred. Of these 700, 146 do not include an intersection. The crashes at those 146 locations may have resulted from roadway departure. Plans are to analyze those crashes to see whether that's true.
  - Method: research
  - Costs: none
  - Lead agency and contact: KDOT, Highway Safety Unit
  - Challenges: securing accurate and timely data
  - Target date: November 2011

Future Strategies:

- Link crash data to the trauma registry
- Pursue implementation of a Crash Outcome Data Evaluation System
- Develop a tool that helps local jurisdictions and regional safety coalitions to access and analyze crash data
- Develop a methodology to identify high-frequency crash corridors on local roadways

Goal 2: Improve data analysis capability to better inform decision makers

New Strategies:

- Create an intersection inventory to support crash analysis
  - Background: The FHWA defines an intersection as "a planned point of conflict in the roadway system." A quarter of all crash fatalities in Kansas occur at intersections, but there is too little data on existing intersections. One problem is that there's no identification system for individual intersections. Creating unique identifiers for intersections would allow better crash reporting and data collection.

    The only intersections we have reliably identified and coded are system to system intersections, such as where one state highway intersects another. GIS allows the mapping of intersections, but that information can't be integrated with other data without a linear referencing system. Such data gaps impede our ability to analyze intersection crashes.

    GAD has begun identifying and collecting data about specific intersections, using KDOT's video-log. The goal is to identify and characterize all intersections in terms of more than 25 data elements, including the type of traffic control present at the intersection, the number of legs, directions of travel and pavement type.
  - Method: project
  - Costs: additional staff
  - Lead agency and contact: KDOT, GAD Unit
  - Challenges: ensuring additional staff
  - Target date: fall 2011

- Create a horizontal curve inventory to support crash analysis
  - Background: According to the FHWA, horizontal curves are those that change the alignment or direction of the road (as opposed to vertical curves, which change the slope). More than 25 percent of fatal crashes are associated with a horizontal curve, and the vast majority of these crashes involve roadway departure. The average crash rate for horizontal curves is about three times that of other types of highway segments.

    However, available data on existing curves is not thorough. As with intersections, the problem is that there's no identification system for individual curves. Creating unique identifiers for curves would allow better crash reporting. Once curves are identified in this way, data can be collected.

    All the curves to be identified are part of the state highway system. Data collected include curve location, length, advisory speed (if present) and radius. GIS allows the mapping of curves, but the mapping of curves can't be integrated with other data without a linear referencing system. Such data gaps impede the ability to analyze crashes at curves.
  - Method: project
  - Costs: additional staff
  - Lead agency and contact: KDOT, GAD Unit
  - Challenges: ensuring additional staff
  - Target Date: fall 2011

- Use SafetyAnalyst to couple data analysis with engineering solutions
  - Background: KDOT and 20 other state transportation departments pooled funds to develop SafetyAnalyst, software that can map and analyze safety data. KDOT and many of its peers are now in the process of implementing the software, which includes a network screening tool, diagnosis tool, countermeasure selection and evaluation tools, economic appraisal tool and priority ranking tool.

    SafetyAnalyst exceeds the capabilities of HALS. Both tools can scan the highway system for crash "hot spots," but, in addition, SafetyAnalyst, using statistical techniques, can recommend possible engineering countermeasures for specific locations.

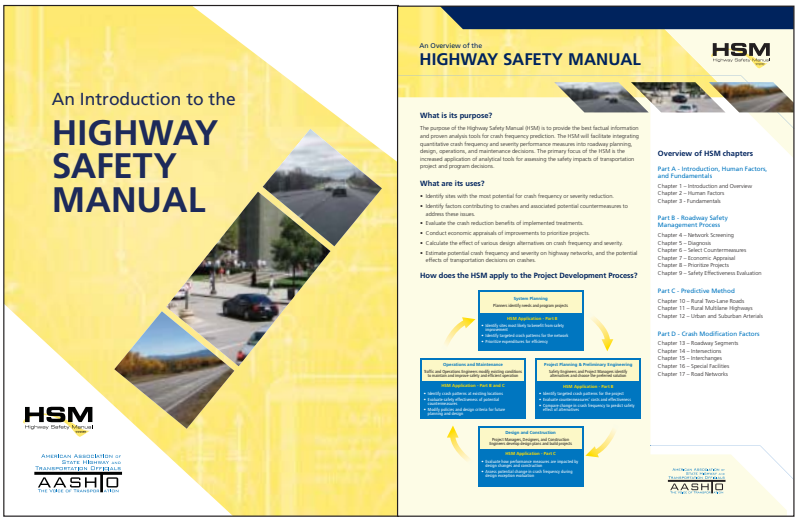
    When SafetyAnalyst implementation is complete the state highway safety analyst and the state highway safety engineer will be able to produce the five percent report and tailor analyses for the Executive Safety Council and other end users.

    The software will help the data team to provide the emphasis area teams with more detailed analyses, including

    - a complete statistical network screening to identify locations with high crash rates;
    - diagnoses that recommend engineering countermeasures;
    - suggest cost/benefit appraisals of proposed countermeasures;
    - suggest project prioritization; and
    - other analyses, as needed, for the Kansas SHSP process.
  - Method: software
  - Costs: annual license fees
  - Lead agency and contact: KDOT, Highway Safety Unit
  - Challenges: importing, processing and calibrating Kansas crash, roadway and traffic volume data for Safety Analyst use
  - Target date: fall 2011

Future Strategies:

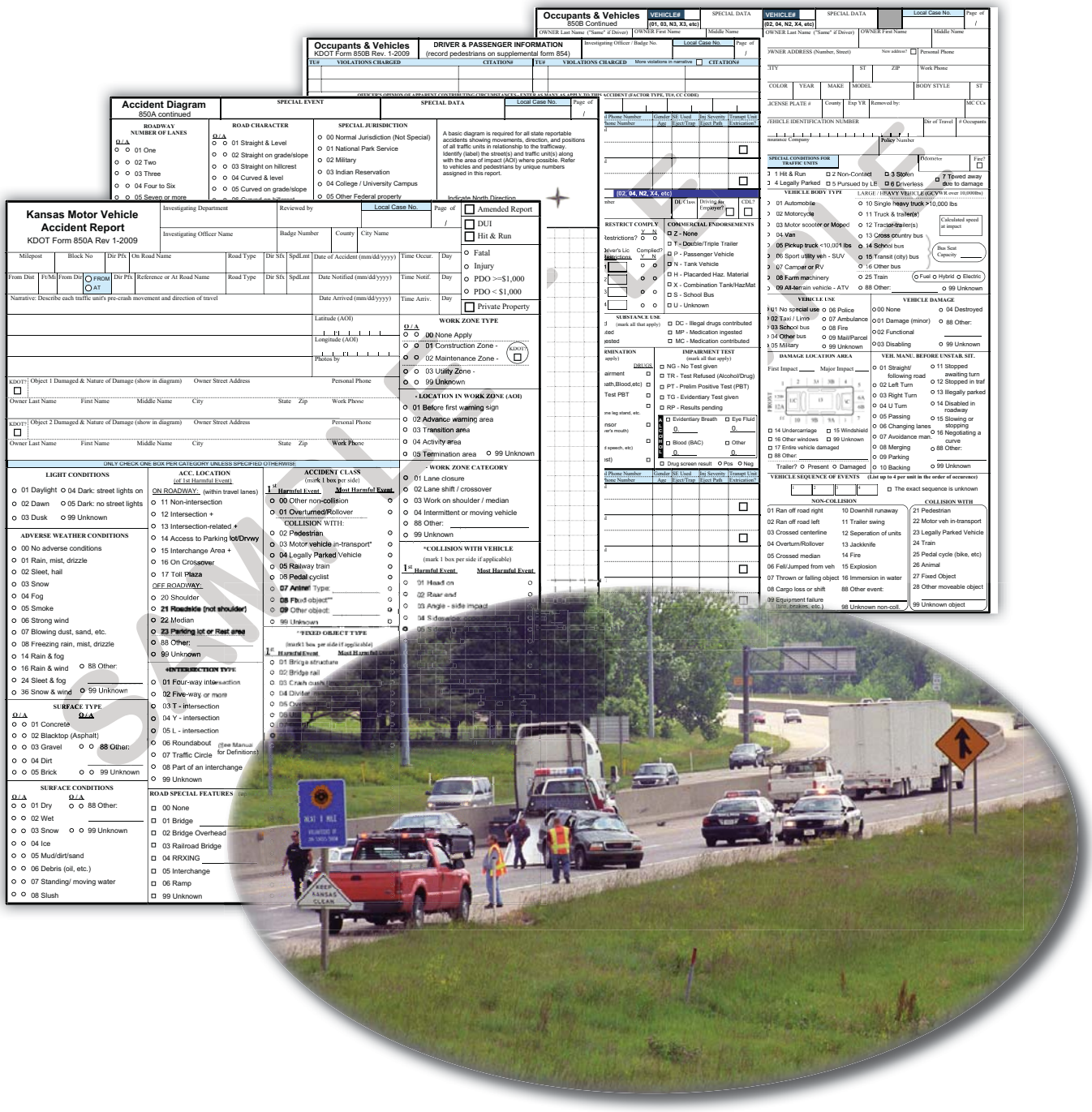
- Educate transportation professionals about the Highway Safety Manual published by AASHTO To view more information about the Highway Safety Manual, go to http://safety.fhwa.dot.gov/hsm/factsheet/factsheet.pdf



Goal 3: Train those who create, input and utilize crash data

Current Strategies:

- ❖ Continue to provide training to law enforcement on the use and importance of the crash reporting form
- ❖ Continue to provide training for officials in local government so they can understand and use crash data in their safety-related decision making
- ❖ Continue to promote electronic reporting of crash reports at city and county level



Goal 4: Map all crashes statewide using GIS tools

Current Strategies:

- Complete geo-coding (assignment of latitude and longitude) of crashes on local roads
  - Background: The GAD Unit at KDOT has been working to geo-code and geo-locate all crashes in Kansas. While CANSYS is able to support the geo-location of crashes on state highways, another method is being developed to geo-code crashes located on non-state highways and locally administered roads. The geo-coding of crashes relies on information provided by crash reports. Unfortunately, at this time, longitude and latitude are not initially captured in crash reports and must be inferred or found indirectly.

    At the time this report was being written, the geo-coding of crash data for 2004, 2006, 2007 and 2008 was complete. Geo-coding must still be completed for 2005, 2009 and 2010.