CHAPTER 25
Improving Information and Decision Support Systems

KEY TOPICS

- communicating highway safety information
- crash analysis and crash analysis tools
- data sources and collection tools
- geographic information systems (GIS)
- interdisciplinary and inter-agency teamwork
- police crash reporting

GOALS

- Increase crash data timeliness for local and statewide applications.
- Improve data accuracy by setting and implementing data quality standards among all data source and data user entities.
- Develop analysis tools for highway safety practitioners across various disciplines and jurisdictional and geographic levels.
- Provide training for analysts.
- Expand use of data in engineering strategies.
- Continue the integration of safety data with other data systems and information sources.
- Provide effective data summary and presentation products for managers and users of highway safety information.
- Continue the Strategic Traffic Records Advisory Committee (STRAC) to sustain and further develop coordination of the collection, management, and use of highway safety information.

BACKGROUND

Transportation and public safety agencies are under increasing pressure to identify and change the conditions that lead to crashes. When traffic safety practitioners can use data to identify repeating patterns in the dynamic interaction of people, pavement, vehicles, traffic, and other conditions, there is increased potential for effective mitigation results. From this comes reduction in the number and severity of crashes, resulting in fewer fatalities and injuries. Agencies can improve decision making through increased technology coincident with inter-agency collaboration and distribution of multidisciplinary transportation information.

NATIONWIDE

The availability and use of crash data at the state level varies greatly. The U.S. Department of Transportation, Federal Highway Administration (FHWA), National Highway Safety Administration (NHTSA), and Federal Motor Carrier Safety Administration (FMCSA) seek to assist states in improving their collection and use of integrated data to improve highway safety management.

In addition to federal transportation agencies, other disciplines including health, commerce, and insurance entities track crash data for various purposes. A number of national organizations—both commercial and nonprofit—research and analyze crash data and trends.

Fatal Analysis Reporting System

State data are reported at the national level in several ways, one of the most useful being the Fatal Analysis Reporting System (FARS). The national FARS contains motor vehicle crash fatality data for U.S. states, the District of Columbia, and Puerto Rico. FARS includes motor vehicle traffic crashes that result in fatality to a vehicle occupant or nonmotorist, from injuries resulting from a traffic crash, that occur within 30 days of the crash.

This data system assists the U.S. traffic safety community in identifying traffic safety problems, developing and implementing vehicle and driver countermeasures, and evaluating motor vehicle safety standards and highway safety initiatives.

The final annual FARS file is normally completed around Memorial Day. The National Center for Statistics Analysis (NCSA) releases the new data in summarized form on NHTSA fact sheets, which are a helpful reference for states in reviewing their own state data and identifying transportation safety priorities.

Commercial Vehicle Analysis Reporting System

The Commercial Vehicle Analysis Reporting System (CVARS) has been initiated and will soon have pilot programs in several states, including Iowa.

Performance and Registration Information Systems Management

Performance and Registration Information Systems Management (PRISM) provides another range of data regarding safe motor carrier operation. The PRISM program includes two major processes—the Commercial Vehicle Registration Process and the Motor Carrier Safety Improvement Process—that work in parallel to identify motor carriers and hold them responsible for the safety of their operation. The performance of unsafe carriers is improved through a comprehensive system of identification, education, awareness, safety monitoring, and treatment.

IOWA

The state of Iowa is a model for the nation in how agencies can work together to define new business processes and streamline the flow of safety information. A number of entities and efforts have contributed to Iowa's progress in capturing, processing, and applying data related to highway safety concerns in Iowa.

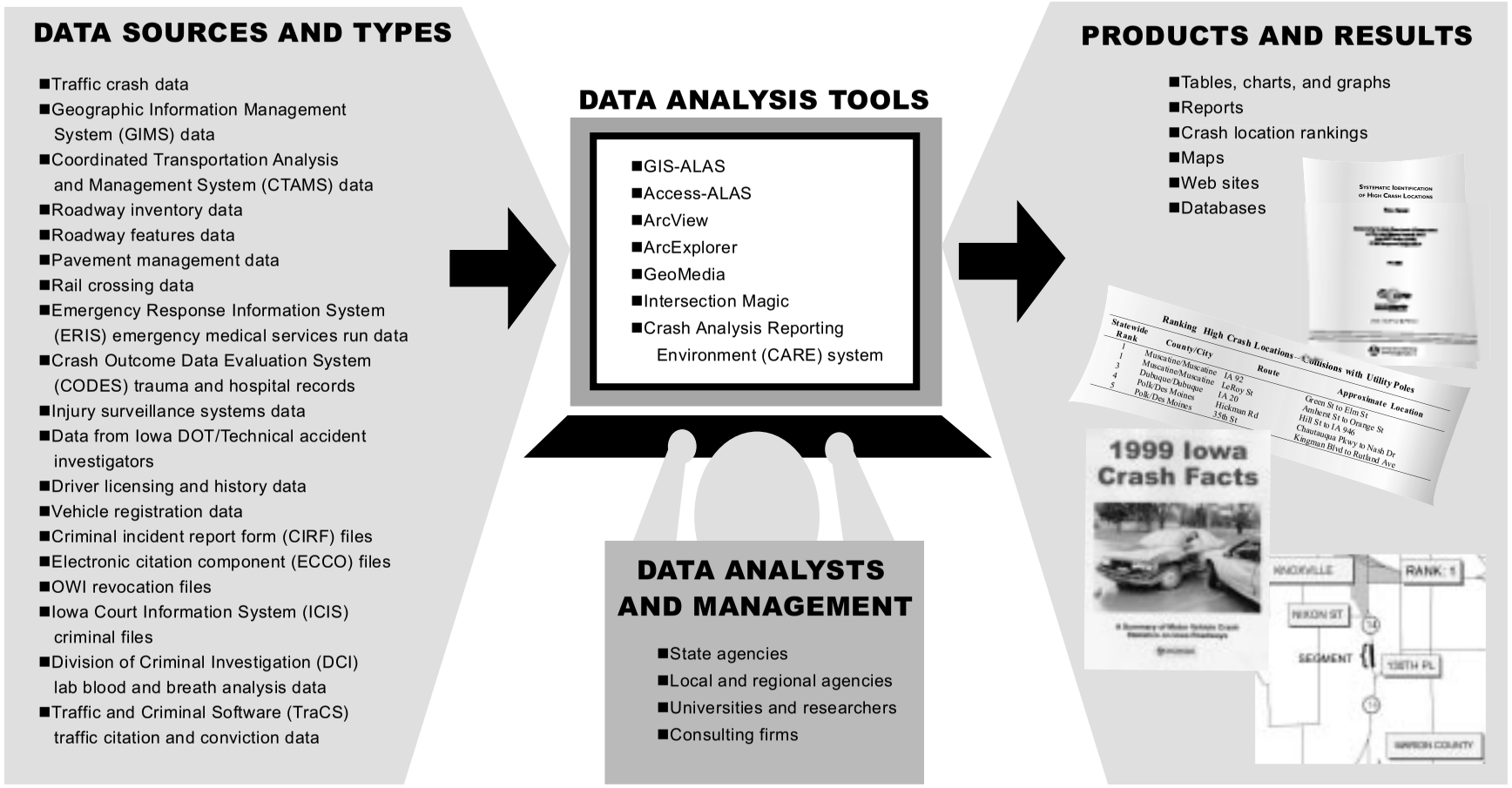
See the graphic representation of the data gathered and analyzed by various traffic safety-related agencies and entities (next page). Iowa's data and analysis are further discussed and exemplified in Appendix A, Iowa Data and Analysis.

Statewide Traffic Records Advisory Committee

STRAC is a multidisciplinary safety group much like the Iowa Safety Management System (Iowa SMS) Coordination Committee—drawing members from various agencies and levels of government. STRAC predates Iowa SMS but now functions similar to an Iowa SMS task force, receiving funding support for meetings, activities, and data-related projects that cannot be funded elsewhere.

STRAC membership includes many entities and continues to expand as related safety practitioners find common concerns, data that can be shared, and resources that can be leveraged for greater benefit to Iowans. STRAC is co-chaired by a member of the Iowa Governor's Traffic Safety Bureau (Iowa GTSB) and by a member of the Iowa Department of Transportation (Iowa DOT) Office of Traffic and Safety.

System of Data Gathering, Integration, and Analysis in Iowa



STRAC membership includes

- Iowa DOT
  - Office of Driver Services, Motor Vehicles Division
  - Office of Traffic and Safety, Highway Division
- Iowa Department of Public Safety
  - Iowa State Patrol
  - Iowa GTSB
- Iowa Department of Public Health
  - Emergency Medical Services (EMS) Division
- U.S. Department of Transportation
  - FHWA
  - FMCSA
  - NHTSA
- Iowa SMS
- Local law enforcement: police and sheriff's departments
- Local traffic engineers: county and city engineers
- University research
  - Center for Transportation Research and Education (CTRE), Iowa State University
  - Injury Prevention Research Center, University of Iowa
  - University of Northern Iowa
- Division of Criminal and Juvenile Justice Planning, Iowa Department of Human Rights
- Traffic records consultants
- Representatives from the insurance industry and from the court system

This data-focused group meets quarterly to guide the development of highway safety information systems in Iowa through strategic planning and to assist in the preparation of the proposal for Section 411 funds for the improvement of state traffic records systems.

National Model

The National Model: Statewide Application of Data Collection and Management Technology to Improve Highway Safety is a partnership between FHWA, the state of Iowa, and others to improve data acquisition for roadway incidents, leverage proven technology for law enforcement, streamline the communication of safety information to key stakeholders, and enhance the use of this information for safety programs. Iowa is the host state for this model.

As a part of the National Model effort, new approaches are being used to shorten data-collection time, minimize disruption to traffic, increase crash site safety, efficiency, and data reporting accuracy. An integrated set of electronic forms has been developed (Traffic and Criminal System, or TraCS) that shares data among all forms, eliminating duplicate entries and providing for immediate electronic transmission to remote files at both the state and local levels. The forms include

- Crash reports including on-site driver information exchange (revised January 1, 2001)
- Commercial vehicle inspections
- Traffic citations
- Administrative license revocation for drunk driving
- Crime incident reports

In using this suite of electronic forms, Iowa takes advantage of the following technologies:

- Pen-based computers
- Portable printers
- Bar code readers
- Digital cameras
- Global positioning system (GPS)
- "Smart" maps
- Laser measuring devices

The National Model in Iowa has provided a focal point for Iowa agencies and has helped to foster ongoing integration of data and technologies.

Police Crash Reporting

Iowa, like other states, has been concerned about the level of crash reporting from the primary data collectors for these data—the law enforcement community. As local budgets are squeezed, some agencies feel it necessary to cut back on crash investigations. In Iowa, state code requires that any crash investigated by police should be reported to the Iowa DOT when the investigation is complete. Any crash on a public road having at least $1,000 in property damage is a reportable crash. However, some agencies have reduced their investigations of property-damage-only crashes. This practice hampers both state and local crash analysts who find these crashes to be an important diagnostic tool for enabling appropriate engineering and enforcement crash countermeasures.

There are four approaches to this problem. The first is letting police and their local government officials know the far-reaching value of their reports and of the many applications of crash data to making streets and highways safer for all citizens. The costs of data collection by police must be balanced against the costs of deaths and injuries. Furthermore, many safety countermeasures represent major investments of public funds. Where and how these countermeasures are built or applied depend on the data. The second is providing a crash report form that is easy to understand and use, in electronic form if possible. TraCS and the new crash report form are major steps in this direction. The third is proper officer training in the completion of the report forms, and the fourth is enabling local law enforcement agencies to have immediate access to their local crash data for analysis and application. Efforts are underway in all these areas.

Several STRAC members have been engaged in the national project conducted by the National Association of Governor's Highway Safety Representatives and NHTSA to develop guidelines for Model Minimum Uniform Crash Criteria. This knowledge was used in creating a new crash report form for Iowa (implemented in January 2001).

Motor Carrier Reporting

Iowa uploads all commercial motor vehicle inspections to FMCSA's Motor Carrier Management Information System (MCMIS). The inspection information is downloaded to the roadside officer and into TraCS in a program called the Inspection Selection System, which is a prioritization of carriers' vehicles/drivers for roadside inspection. The Past Inspection Query is

another program utilizing electronic exchange of roadside inspection data to assist the roadside officer in tracking drivers/vehicles placed out of service. With some additional programming in TraCS, TraCS will be uploading inspections directly to a safety data mailbox, which will send the inspections to MCMIS for immediate integration into the above programs; this will shorten data exchange time immensely.

Iowa Traffic Safety Data Service

The Iowa Traffic Safety Data Service (ITSDS) creates appropriate maps, graphs, or charts for safety practitioners at all levels to use in communicating highway safety information to the public or to policy decision makers.

ITSDS is located at CTRE, Iowa State University, and provides timely access to analyses and reports from many safety and GIS tools developed by the Iowa DOT and CTRE in recent years.

The service receives guidance from the Department of Public Safety, Iowa GTSB, Iowa DOT, and Iowa Department of Public Health. STRAC and Iowa SMS intend to sustain funding for this service through available sources.

Crash Outcome Data Evaluation System

NHTSA's Crash Outcome Data Evaluation System (CODES) has been adapted for use in Iowa. Using this system, the Iowa Department of Health has finished an initial match of hospital admissions data with crash records that begins to tie actual injury treatment costs with crashes. CODES fact sheets are compiled by the EMS Division of the Iowa Department of Public Health to demonstrate the hospital charges associated with various crash scenarios. These data provide a more complete picture of the actual costs and human suffering resulting from motor vehicle crashes.

Iowa Highway Safety Data Integration and Analysis Tools

Safety data file integration has long been an objective in the traffic records field. Many Iowa entities collect and maintain data for their individual programs to use. Most major questions in highway safety require multiple types of information from numerous disciplines to be answered. Without the ability to match and correlate various data related to persons, events, and locations, key problem areas cannot be effectively researched.

Data integration and analysis in Iowa will be achieved using many sophisticated software tools, such as the Geographic Information Systems–Accident Location and Analysis System (GIS-ALAS), Access-ALAS, ArcView, ArcExplorer, GeoMedia, Intersection Magic, and the Crash Analysis Reporting Environment (CARE) system.

Geographic Information Systems

Crash analysis software specifically developed to meet the needs of engineers and enforcement personnel has been used for over a decade. However, an additional desire for map-based analysis tools manifested itself within recent years. To address this, GIS tools have been and continue to be developed.

For the past decade or more, the Iowa DOT has had a rolling 10-year database available to its customers using the GIS-ALAS tool. Historically, crash records were referenced with a link-node system and the roadway data were referenced to a roadway-segment system. As part of the GIS tool development, the crashes were transferred into an *x*, *y* coordinate system and the link-node system was discarded. Crash data can now be integrated with other data (roadway, enforcement, EMS, etc.) using both spatial and nonspatial methods. In addition, standard analysis tool products (tables, graphs, and charts) and analyses (queries) are enhanced by the ability to produce maps and perform spatial analyses.

GIS tool development has allowed continuation of several past ALAS features, including provision of the tools to locals and other interested analysts and seamless transition from link-node to coordinate-based location. It has also fostered incorporation of noncrash data into analyses and evolved into the development of a series of peripheral efforts (Emergency Response Information System [ERIS], CTRE Location Tool, ITSDS, etc.). Development efforts have also considered incorporation of TraCS data.

Linear Referencing System

Internal to the Iowa DOT, the Information Technology, Planning and Programming, Motor Vehicle, Engineering, and Research Management Divisions have been working to coordinate programming that will allow data from any of the Iowa DOT's data sources to be analyzed with a common linear referencing system (LRS). This will enable any number of data elements to be overlaid for analysis related to selected roadways or road systems. Data available from other agencies can also be used in this manner.

Communicating Highway Safety Data

In order to influence and impact critical public policy decisions, it is important that meaningful highway safety data are summarized and formatted (in graphs, charts, etc.) to demonstrate trends in significant safety issues areas such as fatalities, alcohol-related fatalities, injuries, serious injuries, single vehicle crashes, fixed objects, serious violations, driver behavior issues, and seat belt use. The database should be easily accessible so other significant highway safety problems can be identified, analyzed, and presented for decision making and safety awareness. Not only should the data be available—it should be usable.

Other Entities with an Interest in Highway Safety Data

The concerns of highway safety overlap with a number of public and private entities. Ongoing communications with related entities can enhance the effective collection and use of data and also offer opportunities for future problem identification and decision making.

The "4 E's" of highway safety (engineering, enforcement, education, and emergency response) are each relevant when identifying highway safety data. Other related areas include enhanced 911, hazardous materials spill response, fire, incident management, disaster preparedness, access management, economic development planning, deer management, roadway inventories, farm safety, and infrastructure such as rural water systems and natural gas pipelines.

Many of these disciplines are developing information systems of their own and some communities are already using computer-assisted processing, data gathering, and analysis in their business operations. Similar data elements and mapping location tools available through STRAC members may assist communities in better utilizing both their highway safety data and related data to improve their decision making for planning and providing services.

POTENTIAL STRATEGIES

Legislation, Policy, and Enforcement

- Ensure that STRAC continues to be supported through Iowa SMS or other means.
- Improve data timeliness by
  - o releasing statistically complete crash data more often than yearly (quarterly is optimal for responsive decision making with this type of data)
  - o enabling immediate analysis of TraCS local databases
  - o developing access to the statewide crash files under formation (in preliminary form)
- Help identify and allocate funding from all available sources.
- Promote further utilization of data—reach out to other disciplines.
- Provide managers and users of highway safety information with the resources needed to make the most effective use of the data.
- Increase "cross-pollination" of data across disciplines, allowing use of key data across various platforms and addressing elements of roadway data, driver data, crash data, etc. for more complete analysis of crash factors and potential remedies.
- Coordinate data access to the public by developing and maintaining a data contact list of key contact agencies or individuals for the various data. Post this on the Iowa SMS web site with active links where appropriate and available.

Education and Public Awareness

- Model and promote public involvement in local problem solving.
- Publish results of studies by topic (e.g., traffic calming and access management).
- Increase traffic safety training for state, county, and city staff (see Successes and Strategies Implemented section in this chapter).
- Prepare more highway corridor safety analysis for selected contributing factors to crashes (e.g., corridors with high numbers of fixed object crashes).
- Increase public awareness of vehicle injury and fatality crash consequences in personal and economic terms.
- Enhance local use of data tools through communication and education methods.

- Include local use of data tools, data availability, etc. in the proposed Iowa DOT Office of Traffic and Safety handbook for district and local office traffic engineers (Washington, Michigan, and Wisconsin models).
- Promote or reactivate a statewide multidisciplinary incident management model and handbook.
- Advise local safety teams of data and tools available (see Successes and Strategies Implemented section in this chapter).
- Promote or create opportunities for various data producers and data users to interact and collaborate in data utilization (see Successes and Strategies Implemented section in this chapter).

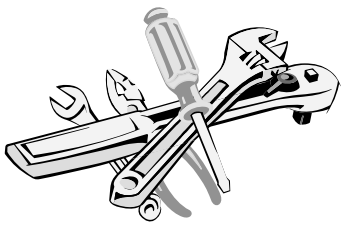
Design and Technology

- Improve the value of safety data statewide by implementing quality-enhancing practices and programs within agencies responsible for collecting and managing safety data.
- Continue the integration of safety data with other data systems and information sources when appropriate.
- Continue to seek out best practices and model programs of benefit to Iowa.
- Collaborate and share with peers.
- Ensure appropriate data access to state, county and local transportation, enforcement, and other safety practitioners.
- Provide online or kiosk crash reporting system for electronic driver reporting.
- Enhance roadway specification data access for district offices.

Other Initiatives

- Include economic evaluation factors in decision making data (e.g., access management business impact).

SUCCESSES AND STRATEGIES IMPLEMENTED



- Improved crash data and analysis tools are available or under development. The Access-ALAS platform has been made available to over 350 customers with training and availability, and its use is growing into many local jurisdictions. Intersection Magic Iowa Configuration has over 100 users statewide, under the statewide license agreement set up by the Iowa DOT. (See Chapter 25, Improving Information and Decision Support Systems.)

- The Iowa DOT sponsored a study of traffic safety improvement projects. The *Effectiveness of Roadway Safety Improvements* study (conducted by CTRE) of 94 traffic safety projects concluded that there was a mean crash reduction rate of 23% on these hazard elimination and safety improvement fund projects.
- The *Traffic and Safety Informational Series* is sponsored by the Iowa Department of Transportation Office of Traffic and Safety. The goal of this project was to make available clear, concise, and consistent answers to 25 traffic and safety questions, commonly asked by local officials and the public. The information may be altered, distributed, and used as seen fit by area officials and/or transportation professionals. It is available in print, on disk, and on the web.
- The Iowa DOT Office of Traffic and Safety is developing the "TAS" manual for highway safety practitioners and engineers at the state and local levels (to be available in print and on the Office of Traffic and Safety web site in 2002).
- The Iowa DOT Office of Traffic and Safety sponsors the annual Traffic and Safety Forum each fall to help city, county, state, and consulting highway safety engineers stay up-to-date on recent developments in highway safety technology and practice.
- A new Iowa crash form was completed and implemented January 1, 2001.
- An increasing number of reporting agencies (30%) are doing so by electronic means. TraCS has been successful.
- In February 2001, STRAC sponsored the multidisciplinary State Traffic Accident Records Symposium (STARS). Nearly 100 traffic records practitioners attended for learning and networking. (This was funded through Section 411 funding, Iowa GTSB.)
- ITSDS located at CTRE provides timely access to analyses and reports from many safety and geographic information systems tools developed by the Iowa DOT and CTRE in recent years. ITSDS can't supply all the safety information that safety professionals in the state require; rather, it is intended to fill the gap that exists between what data users can get for themselves and what can be obtained by experts with the best hardware and software. ITSDS is currently developing a general, jurisdiction-by-jurisdiction report of crash facts complemented with tables and maps.
- Using CODES, the Iowa Department of Health has finished an initial match of hospital admissions data with crash records that begins to tie actual injury treatment costs with crashes. CODES fact sheets have been compiled by the EMS Division of the Iowa Department of Public Health to demonstrate the hospital charges associated with various crash scenarios. CODES will provide an even more complete picture of the

actual costs and human suffering resulting from motor vehicle crashes as new data are gathered using new crash forms and new Iowa Department of Public Health procedures.

- Iowa's National Model (see earlier discussion in this chapter).
- Intersection data strategy: Include information about the classification, type, traffic control, lighting, channelization and configuration, existence of special signing or traffic control measures, and other pertinent inventory data. The database would be a valuable tool to improve the analysis of intersections and intersection features. GIS-ALAS, Access-ALAS, and Intersection Magic collision diagram software programs provide analysts with excellent tools to analyze individual intersections. The intersection database would allow the analyst to group intersections by various features to determine features and traffic control measures that produce either low or high crash incidence.
- Iowa SMS member organization data links are available on the web.
- Iowa SMS approved funding for a local multidisciplinary safety groups workshop in conjunction with the Iowa Traffic Control and Safety Association (ITCSA) held in October 2001. A data demonstration was presented.
- Additional data analysis theory and tools will be available online from the Iowa DOT Office of Traffic and Safety "TAS" manual and links from the Iowa SMS web site (www.IowaSMS.org).

NOTE

The potential strategies in this chapter do not represent specific recommendations of the Iowa SMS Coordination Committee or any agency, group, or individual represented in Iowa SMS. The strategies represent a range of alternatives for legislators, department or agency directors, local governments, and citizen groups to consider when they elect to address a specific highway safety concern.

This toolbox is a living document that will continue to provide information, direction, and ideas for highway safety decision makers. Any strategies selected for implementation by Iowa SMS or any other entity will require further development through identifying potential partners, entities impacted, potential funding, steps for implementation, evaluation, and other pertinent tasks.

RESOURCES

Information in this chapter is drawn from many individuals and sources. Known sources are listed here. **Contributors:** Joyce Emery (primary), Bob Thompson (primary), Pat Cain, Mary Jensen, Jack Latterell, John Nervig, Michael Pawlovich, Mary Stahlhut, and STRAC.

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A comprehensive plan to substantially reduce vehicle-related fatalities and injuries on the nation's highways.
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Statewide Traffic Records Advisory Committee
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