1. The Driver, Pedestrian, and Passenger Safety Program implements safety activities concerning drivers, pedestrians, and vehicle passengers. The program includes procedures for the driver licensing (including driver history), law enforcement, law adjudication (courts), and driver education projects.

2. The Vehicle Safety Program implements vehicle safety activities including vehicle titling, registration, and inspection projects. The planning, coordination, and evaluation of these activities are included in the Planning and Evaluation Program.

3. The Post-Accident-Response Program is an operational program for emergency medical services (EMS) activities both before and after an accident. The program includes the decision-and-action procedures for the licensing of EMS personnel and organizations and the implementation of EMS program improvements defined in the Planning and Evaluation Program.

4. The Roadway Environment Improvement Program consists of the operational activities for designing, constructing, and maintaining highways when these functions are performed for safety reasons. The program includes the operational decision-and-action procedures for major roadway design and construction, spot roadway improvements, and roadway maintenance projects. All planning and evaluation activities are included in the Planning and Evaluation Program.

5. The Safety Planning and Evaluation Program is the nucleus of the MTRS. Planning, coordination, and evaluation of all programs and projects mentioned above are performed within this program. This program provides state officials with the means to make intelligent decisions on the effectiveness of the overall safety program and of the individual elements. The program also points out areas that need further attention.

The MTRS data base is implemented on an IBM 4341 by using the IMS data base management software. The data base consists of the driver, accident, citation, vehicle, and miscellaneous operational files. The EMS files and school bus files reside on microcomputers connected to the IBM system by high-speed communication lines.

Even though EMS, school bus, and roadway files are not physically resident on the IBM 4341 system, the data are accessible in an on-line environment and are linked to relevant mainframe data via key fields association. The IBM 4341 software is capable of accessing needed data from any of the distributed systems, and the distributed systems are also capable of accessing relevant data on the mainframe.

The MTRS data base contains the following major files:

1. Driver data base, which is used primarily for operational purposes. On-line statistical programs also use this and related data bases for safety program development, monitoring, and evaluation.

2. Accident data base, which is used primarily for operations and to provide detailed accident report inquiries and reports on request. On-line statistical programs are also available by using this and related data bases for safety program development, monitoring, and evaluation.

3. Vehicle data base, which is used solely for operational purposes in the on-line mode. Because the accident report contains vehicle data, the statistical process seldom uses these data except for vehicle inspection information.

These three data bases contain duplicate keys that facilitate analysis of accident frequency as related to (a) type of driver; (b) number of citations and frequency of driver; (c) age and type of vehicle; (d) roadway type, condition, and traffic volume; and (e) citation frequency for selected roadways. Information is extracted monthly to produce a series of accident inventory and analysis reports. The information is matched against the roadway environment file, and the combined data are used to update the statistical analysis data base and accident location master file.

At the end of each quarter, the monthly accident and UTC data extract files are merged to create quarterly accident and UTC master files. These files are then used to generate a series of scheduled reports. In most states, the accident file is extracted and an accident file is created for processing by some type of standard statistical package such as DART, RAPID, or OMNITAB. Although the MTRS uses this technique to create its standard statistical file, linkages to other information files allow MTRS to access driver files, UTC files, vehicle files, statistical table files, and roadway environment files to create an expanded record for each accident. This expanded accident record can then be processed by the statistical package in either an on-line or a batch mode.

Summary reports of the monthly and quarterly reports are prepared annually, and the MTRS history tape is created from the quarterly master files. A comparison report is prepared to show trends between annual tables on the MTRS statistical table files. Tables are purged as required, and each table is set up for the next year.

Cross-reference files, including the node/milepost, the node/railroad, and the milepost/node cross reference files, are updated as information is received and processed. Roadway environment data are updated as road inventories are taken.

In summary, the MTRS meets its objectives by solving the following problems:

- Integration of Information—The problem of fragmented and mismatched information is resolved by updating all related data from one input source and by linking related files by common keys.
- Integration of Operations—Communications and control problems are resolved by providing automatic system notifications when events occur that affect other operations.
- Elimination of Duplication—Duplication of data and operations is reduced by establishing the system on a function rather than an organizational structure. A single file of common data may be updated and shared by multiple agencies that perform similar functions.
- Comprehensive Planning and Evaluation—Highway safety problems are isolated by applying accident and UTC data supported by roadway environment, driver, and vehicle background information to (a) location analysis techniques to identify hazardous locations and (b) standard statistical analysis techniques to identify patterns that indicate possible problem areas.

## ADAAS AND USE OF SAFETY-RELATED DATA FILES

**James O'Day, University of Michigan**

The Automated Data Access and Analysis System (ADAAS) is a set of computer files used at the University of Michigan for looking at a variety of highway safety problems. It is not a particularly portable system—the computer programs are, but the installation with all the data is not.

The system began because questions needed to be answered and the only way to get answers was to go into the files by hand. So we put together a relatively small data set in a computer system and used a modification of an existing system developed by the Institute for Social Research at the university as an analysis package. The systems were essentially the type developed to process interview data, which is what a traffic accident record is.

The system has grown in size and complexity. Today about 250 separate accident and other sorts of files are maintained. Because of the volume, they are stored on tape rather than disk. In addition to Michigan data, we keep data from other states that are particularly interesting to us.

We have kept the Washington State data since 1974. Washington has some particularly useful data that were not duplicated by other states. For instance, Washington maintains a record of vehicle occupants, and data are recorded on both injured and noninjured passengers. Most other states do not do this. It has been a longstanding practice to report only the injuries or fatalities on the accident report and to forget about anyone in the car who was not hurt. But Washington State seems to pay great attention to recording information on everyone in the car.

It is useful to have a large battery of data sets in order to be able to answer a variety of questions. State data sets vary in their level of detail from one state to another, so if information not in one file is needed, a second source can sometimes provide it.

Some distributions are not meaningful at the state level. For relatively rare events, one might find no occurrences in a year of data from a single state—unless it were a very large state. It is useful in such a case to look at a large set of national data and to estimate frequencies in a smaller jurisdiction from that. National data may be useful, too, as a standard of comparison for a state.

Several national data sources are available.

- National Accident Sampling System (NASS)
- Fatal Accident Reporting System (FARS)
- National Crash Severity Study (NCSS)
- Truck Inventory and Use Survey (TIU)
- National Personal Transportation Study (NPTS)
- Bureau of Motor Carrier Safety (BMCS)

The National Crash Severity Study includes such information as number of days a crash victim was hospitalized. From this, an estimate can be made of the number of days hospitalized by accident class or by age group. If this type of information is useful, it is only available on a national basis, and, although there is no ideal way of transferring the data to a state, reasonable estimates may be made by population ratio adjustment.

The Truck Inventory and Use Survey, a census for the U.S. Department of Transportation in 1977, represents the number of trucks in the United States. Data are included on all types of trucks—from pickup trucks to large tractor trailers. The information includes whether the truck had power steering, radial tires, drive reduction equipment, speed fans, and so on. This information, along with the number of miles traveled by such vehicles in the United States, can be compared with known accident data with the same characteristics and then used as an exposure data set.

To illustrate the use of the Truck Inventory and Use Survey and the exposure data, we can compare the number of miles traveled by tractors with single trailers with miles traveled by tractors with double trailers by type of product they were carrying. Products were grouped into four types: farm, light, heavy, and mixed; and then into three ranges: local, short haul (less than 200 miles), and long haul. It becomes obvious that double trailers were predominant in the long-haul, heavy-cargo group. That is just an example of the output of the exposure file.

The Truck Inventory and Use Survey is done nominally every five years, but it typically takes two or more years to get to the publication stage, so the data are always a few years old. The survey is a relatively straightforward sample and is easy to use.

Another useful exposure file is the National Personal Transportation Study, also done for the U.S. Department of Transportation. This study involved a series of interviews of people all over the United States. Detailed questions were asked about every trip on particular days, whether by foot, bicycle, bus, or passenger car. This information was relatively well recorded.

Data from this study are useful in developing such information as the number of miles per passenger or per driver as a function of the age. One may compute (by using a combination of FARS and NPTS) the number of driver or occupant fatalities per mile traveled, which is the ratio of the number of car fatalities (from FARS) divided by the occupant miles (from NPTS).

Using data has become rather easy over the past 10 years. Computers are set up to do complex things with simple instructions. The big problem is thinking up the right question. The computer takes away the drudgery and the need to learn a lot of very fancy programming skills, but it does not take away the responsibility for thinking. The advantage of a computer is that it allows the user time to think hard about what the problem is, what the answers mean, and where to go next.

The ADAAS system might best be thought of as a library of information. When I have a question, I can go to the library and look for a book with the data I need. If the data arrangement in published material is not what I want—and it often is not—I can then ask the computer to rearrange the data for me. If I have enough sources of data, I can usually find some that will give me the information I am after. The library analogy is an apt one; the data sets are comparable to the book on the shelves, the computer is equivalent to the research librarian, but the results can be information arranged to your needs more precisely than the normal library can accomplish.

## CLOSING REMARKS

**Robert L. Marshall, School of Public Services and Missouri Safety Center, Central Missouri State University**

I believe the three conference objectives have been met:

- To provide impetus for state program managers to maximize their use of safety data available within the states to effectively and efficiently administer their programs
- To present, discuss, and evaluate analytical techniques that augment the states' capabilities for using data
- To establish the level of data analysis necessary to adequately administer state safety programs

Our conference should make a significant contribution to highway traffic safety. I have drawn some conclusions from our discussions that I would like to share with you:

- The recent GAO report, entitled Highway Safety Grant Program Achieves Limited Success, may have been based on a nonrepresentative selection of cases, thus producing biased results. Therefore, policymakers should balance their views regarding program effectiveness with other credible evidence of program benefits.
- NHTSA and FHWA seem to disagree on the most basic requirements of a state accident data base (for example, should property-damage-only accidents be included, and, if so, what should the