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EVALUATION OF 2007 ARKANSAS CRASH DATA REPORTED TO MCMIS CRASH FILE

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16. Abstract

This report is part of a series evaluating the data reported to the Motor Carrier Management Information System (MCMIS) Crash File undertaken by the Center for National Truck and Bus Statistics at the University of Michigan Transportation Research Institute. The earlier studies showed that reporting to the MCMIS Crash File was incomplete. This report examines the factors that are associated with reporting rates for the state of Arkansas.

MCMIS Crash File records were matched to the Arkansas Crash file to determine the reporting rate and factors that affect the reporting rate. Only crashes with K, A, or B injuries could be evaluated directly for completeness of reporting. Within this group, 72.5 percent of reportable cases were reported. Two independent means were developed to estimate the overall reporting rate. These resulted in estimated overall reporting rates from 48 percent to 68 percent.

Reporting rates were related to crash severity, with fatal involvements most likely to be reported, than less serious crash involvements. The involvements of large trucks were more likely to be reported than those of smaller trucks or buses. Reporting rates also varied by the type of investigation agency (state police, county sheriff, or city police).

Missing data rates are low for most variables. Data on hazardous materials in the crash is only available from the supplemental form, and missing data is high for the hazmat materials name and the 4-digit hazmat class.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

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1. Introduction

The Motor Carrier Management Information System (MCMIS) Crash file has been developed by the Federal Motor Carrier Safety Administration (FMCSA) to serve as a census file of trucks and buses involved in traffic crashes meeting a specified selection criteria and crash severity threshold. FMCSA maintains the MCMIS file to support its mission to reduce crashes, injuries, and fatalities involving large trucks and buses. It is essential to assess the magnitude and characteristics of motor carrier crashes to design effective safety measures to prevent such crashes. The usefulness of the MCMIS Crash file depends upon individual states transmitting an accurate and complete set of data items on all trucks and buses involved in traffic crashes that meet a specific severity threshold.

The present report is part of a series evaluating the completeness and accuracy of the data in the MCMIS Crash file from individual states. Previous reports showed underreporting apparently due in large part to problems in interpreting and applying the reporting criteria. The problems were more severe in large jurisdictions and police departments. Each state also had problems specific to the nature of its system. Some states also overreported certain cases, often due to technical problems with duplicate records. [See references 3 to 31.] Each state is responsible for identifying and reporting qualifying crash involvements. Accordingly, improved completeness and accuracy of the overall MCMIS Crash file will be a product of improvements within each of the individual states.

This report focuses on MCMIS Crash file reporting from the State of Arkansas. In recent years, Arkansas has reported from 1,900 to 2,500 involvements annually to the MCMIS Crash file. According to the 2002 Vehicle Inventory and Use Survey (the last available), Arkansas had over 52,000 trucks registered in 2002, ranking 34th among the states and accounting for 1.0 percent of all truck registrations [1]. Arkansas is the 32nd largest state by population and generally ranks 21st in terms of the number of annual truck and bus fatal involvements.

1.1 Method

The method employed in this study is similar to previous studies.

1. The complete police accident report file (PAR file hereafter) from Arkansas was obtained for the most recent year available, 2007. This file was processed to identify all cases that qualified for reporting to the MCMIS Crash file.

2. All cases in the Arkansas PAR file—those that qualified for reporting to the Crash file as well as those that did not—were matched to the cases actually reported to the MCMIS Crash file from Arkansas.

3. Cases that should have been reported, but were not, were compared with those that were reported to identify the sources of underreporting.

4. Cases that did not qualify but which were reported were examined to identify the extent and nature of overreporting.

Police accident report (PAR) data recorded in Arkansas's statewide files as of August, 2008 were used in this analysis. The 2007 PAR file contains the computerized records of 118,408 vehicles involved in 66,393 crashes that occurred in Arkansas.

1.2 Limitations

As will be explained below in section 4 on identifying reportable cases within the Arkansas crash file, a full evaluation of Arkansas reporting to the MCMIS Crash file was not possible because the computerized crash data from Arkansas does not include two critical data elements. The computerized data does not include information on whether an injured person was transported for medical attention or whether a vehicle was towed due to disabling damage. However, about 94 percent of crashes involving a truck or bus and a fatality, incapacitating, or non-incapacitating but evident injury typically qualify as reportable. Accordingly, this report focuses primarily on evaluating how comprehensively that subset of cases is reported, and identifying the factors that hinder full reporting.

2. Data Preparation

The Arkansas PAR file and MCMIS Crash file each required some preparation before the Arkansas records in the MCMIS Crash file could be matched to the Arkansas PAR file. In the case of the MCMIS Crash file, the only step necessary was to extract records reported from Arkansas and to check for duplicate records. The Arkansas PAR file required more extensive work to create a comprehensive vehicle-level file from accident, vehicle, and person data. The following sections describe the methods used to prepare each file and some of the problems encountered.

2.1 MCMIS Crash Data File

The 2007 MCMIS Crash file as of August 27, 2008 was used to identify records submitted from Arkansas. For calendar year 2007 there were 1,975 cases. An analysis file was constructed using all variables in the file. The file was then examined for duplicate records (those involvements where more than one record was submitted for the same vehicle in the same crash; i.e., the report number and sequence number were identical). No duplicate records were found.

In addition, records were examined for identical values on accident number, accident date/time, county, city, street, officer badge number, vehicle license number, and driver license number, even though their vehicle sequence numbers were perhaps different. Sometimes, a record may be submitted with a different crash number, but which largely duplicates a previous record, as when a corrected record is submitted. But two records should not precisely duplicate each other. No such duplicates were found, so all 1,975 cases were considered unique.

2.2 Arkansas Police Accident Report File

The Arkansas PAR data for 2007 (as of August, 2008) was obtained from the state of Arkansas. The data were stored in Microsoft Access tables, representing Accident, Vehicle, and Person information. The combined files contain records for 66,393 crashes involving 118,408 vehicles.

Data for the PAR file are coded from the Arkansas Motor Vehicle Crash Report Form (Rev. 1/07) completed by police officers.

The PAR file was first examined for duplicate records. A search for records with identical case number and unit number found no such instances. In addition, examination of case numbers verified that they were recorded in a consistent format, so there was no reason to suspect duplicate records based on similar but not identical case numbers (such as 200704567 and 2007-4567).

Cases were also examined to determine if there were any records that contained identical case number, time, place, and vehicle/driver variables, even though their vehicle numbers were different. Again, the purpose of this check is to identify cases where a correction record was submitted, but the first record was not deleted. To check for this possibility, records were examined for duplicate occurrences based on the variables case number, accident date/time, county, city, route, driver date of birth, license state, and vehicle model.

Based on the above algorithm, two potential duplicates were found, representing one unique occurrence of the examined variables. Further examination of the pair showed that although driver date of birth and vehicle model were identical, number of occupants and vehicle body style differed between the two members of the pair. Since it was not possible to confirm they were duplicate records, both were left in the file. The resulting PAR file has 118,408 unique records.

3. Matching Process

The next step involved matching records from the Arkansas PAR file to corresponding records from the MCMIS file. There were 1,975 Arkansas records from the MCMIS file available for matching, and 118,408 records from the Arkansas PAR file. All records from the Arkansas PAR data file were used in the match, even those that did not qualify for reporting to the MCMIS Crash file. This method allows the identification of cases in the MCMIS Crash file that do not meet the MCMIS Crash file reporting criteria, i.e., that are overreported.

Matching records in the two files requires finding combinations of variables common to the two files that have a high probability of uniquely identifying accidents and specific vehicles within the accidents. Crash Number, used to uniquely identify a crash in the Arkansas PAR data, and Report Number in the MCMIS Crash file, are obvious first choices. Crash Number in the Arkansas PAR file is a nine-digit numeric field, while in the MCMIS Crash file Report Number is a 12-character alphanumeric value. The report number in the MCMIS Crash file is constructed as follows: The first two columns contain the state abbreviation (AR, in this case), followed by ten numeric digits. It appears the rightmost five numeric digits correspond to Crash Number in the Arkansas crash file. These digits were then used in the match.

Other variables in the MCMIS Crash file that are typically used in matching at the crash level include Crash Date, Crash Time (stored in military time as hour/minute), Crash County, Crash City, Crash Street and Reporting Officer's Identification number. The PAR file did not contain a variable recording Reporting Officer's ID, and Crash Street on the MCMIS file did not directly correspond with the PAR Route variable. Thus, these two variables could not be used in the computer matching process. However, Route and Crash Street were useful in the manual verification process.

Variables in the MCMIS file that distinguish one vehicle from another within the same crash include vehicle license plate number, driver license number, vehicle identification number (VIN), driver date of birth, and driver last name. Of these variables, only driver date of birth was present in the Arkansas PAR file. The absence of VIN presented a particular problem, since it uniquely identifies a specific vehicle, and thus is very powerful in verifying that a correct match has been made. The driver date of birth variable was unrecorded approximately 3.5 percent of the time in the PAR data and was unknown in 1.3 percent of MCMIS cases. Other variables useful for verification purposes included driver license state, and vehicle type.

Four separate matches were performed using the available variables. At each step, records in either file with duplicate values on all the match variables were excluded, along with records that were missing values on the match variables. The first match used case number, crash date (month, day), crash time (hour, minute), county, city, and driver date of birth. The second match step matched on case number, crash date, county, and driver date of birth. After some experimentation, the third match step used case number, crash date, crash time, county, driver birth month, and driver birth year. In the fourth match case number was dropped, and cases were matched on crash date, time, county, driver birth day, and birth year. All of the matched cases in the third and fourth match steps were also hand-verified to the extent possible, given the limited number of vehicle-specific variables. This process resulted in matching 91.9 percent of the MCMIS records to the PAR file. The percentage of MCMIS records matched to the Arkansas PAR file is lower than usually obtained, (though still adequate), because the VIN is not included in the PAR file. See Table 1 for the variables used in each match step along with the number of records matched at each step.

Table 1 Steps in MCMIS/Arkansas PAR File Match, 2007

Step	Matching variables	Cases matched
Match 1	Case number, crash date, crash time, county, city, and driver date of birth	838
Match 2	Case number, crash date, county, and driver date of birth	911
Match 3	Case number, crash date, crash time, county, driver birth month and year	15
Match 4	Crash date, crash time, county, driver birth day and year	51
Total cases matched		1,815

Matched records were verified using other variables common to the MCMIS and PAR file as a final check to ensure the match was valid. The above procedure resulted in 1,815 matches, representing 91.9 percent of the 1,975 non-duplicate records reported to MCMIS.

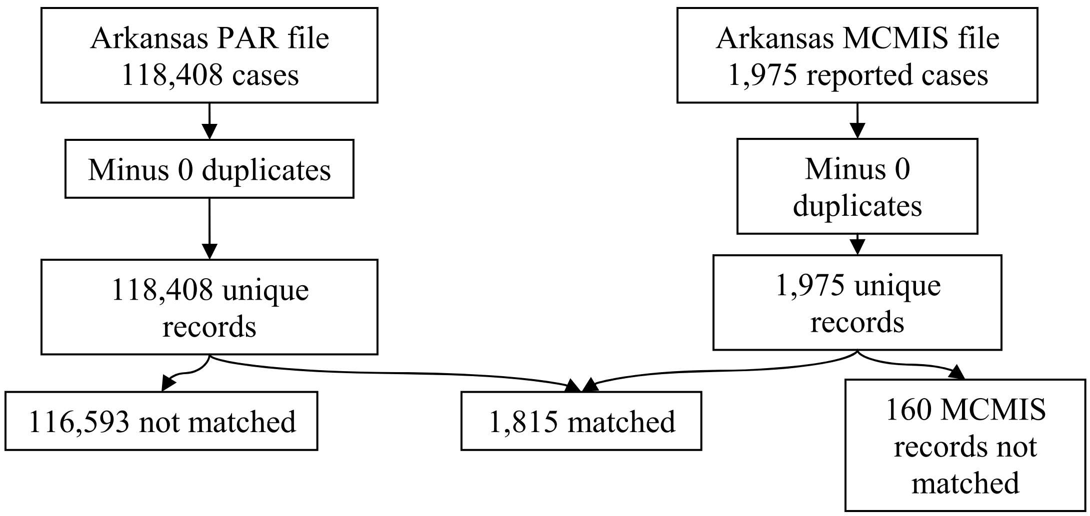

Figure 1 Case Flow in MCMIS/Arkansas Crash File Match

The method of identifying cases reportable to the MCMIS Crash file is discussed in the next section.

4. Identifying Reportable Cases

The next step in data preparation is to identify records in the Arkansas data that qualified for reporting to the MCMIS Crash file. Records are identified using the information available in the computerized crash files that were sent by Arkansas. To identify reportable records, we use the information that is completed by the officers for all vehicles. That is, some police reports place certain data elements that are to be collected for the MCMIS file in a special section or supplemental form, with the instruction to the officer to complete that section if the vehicle and crash meets the MCMIS reporting criteria. But since one purpose of this evaluation is to determine if all cases that *should* be reported are reported, we attempt to identify all vehicles that meet the reporting criteria, and not rely on the state's identification of cases that meet the criteria. In order to do this, we must use the data available for all records in the PAR file.

Like many other states, Arkansas has a separate form (Truck and Bus Crash Report) for recording additional information about the vehicles that meet the criteria for reporting to the MCMIS Crash file. The instructions accompanying the form state that officers must complete the form for qualified vehicles in qualified crashes. In other words, for cases that the reporting officer recognizes as meeting the criteria, the supplemental form is to be completed. The screening criteria on the form describes qualifying vehicles and crashes as follows:

COMPLETE THIS REPORT FOR EACH OF THE FOLLOWING INVOLVED VEHICLES:

1. **Any truck having a gross vehicle weight rating (GVWR) of more than 10,000 lbs. or a gross combination weight rating (GCWR) over 10,000 pounds used on public highways,**

2. **Any** motor vehicle with seats to transport nine (9) or more people, including the driver's seat,

3. **Any** vehicle displaying a hazardous materials placard (regardless of weight).

AND THIS CRASH INCLUDES:
at least one motor vehicle in-transport operating on a trafficway open to the public, which results in:

A FATALITY: Any person(s) killed in or outside of any vehicle (truck, bus, car, etc.) involved in the crash or who dies within 30 days of the crash as a result of an injury sustained in the crash, **OR**

AN INJURY: Any person(s) injured as a result of the crash who immediately receives medical treatment away from the crash scene, **OR**

A TOW-AWAY: Any motor vehicle (truck or truck combination, bus, car, etc.) disabled as a result of the crash and transported away from the scene by a tow truck or other vehicle.

These criteria reasonably reflect the criteria for cases that should have been reported to the MCMIS file. However, to evaluate the completeness of reporting, it is necessary to identify all reportable cases, even those an officer may have overlooked. For this purpose, data from the primary crash form that is completed for all cases is used. The goal of this selection process is to approximate as closely as possible the reporting threshold of the MCMIS file. The MCMIS criteria for a reportable crash involving a qualifying vehicle are shown in Table 2.

Table 2 Vehicle and Crash Severity Threshold for MCMIS Crash File

Vehicle	Truck with GVWR over 10,000 or GCWR over 10,000, or Bus with seating for at least nine, including the driver, or Vehicle displaying a hazardous materials placard.
Accident	Fatality, or Injury transported to a medical facility for immediate medical attention, or Vehicle towed due to disabling damage.

The process of identifying reportable vehicles is straightforward in the Arkansas PAR file, though there are major limitations on identifying qualifying accidents. The method of identifying qualifying vehicles will be discussed first.

4.1 Identifying qualifying vehicles

The Arkansas crash data includes two variables that can be used to identify qualifying vehicles. Their names in the Access file supplied to us are VehicleType and VehicleBody. VehicleType has fewer levels, classifying vehicles into broad types, while VehicleBody has many more levels and provides more detail about the vehicles.

Each variable is derived from what is recorded on the Arkansas PAR. On the PAR, the reporting officer either types or hand-writes an alphanumeric string to identify the vehicle. The vehicle area of the PAR includes Year, Make, Model, Body Style, and Color. The *Instructions Guide* for the PAR gives guidelines on what to enter [2], but the officer does not choose from a fixed list, instead he enters identifying text. There is no separate area on the form for body and type. Since the data are entered as text, and then appear in the crash data file in two separate variables it appears that there is a manual processing step to enter the data into the computerized crash file. In this step, it appears that a coder extracts the information to be entered into the VehicleBody and VehicleType fields from what is entered on the main form and possibly also from the Truck and Bus Crash Report.

We compared the two fields and found them to be remarkably consistent. (Table 3) There are no cases where the code in one contradicts the code in the other, e.g., a truck type in one and a bus in the other. VehicleBody serves primarily to add additional detail about the vehicle. This additional detail allowed us to identify vehicles that we believe are consistent with the vehicle-type criteria of the MCMIS Crash file. In the table, the shaded boxes show the codes that identify vehicles that best meet the vehicle criteria for the MCMIS Crash file. In the actual selection, we used the VehicleType field, taking vehicles coded as Bus, Single-Unit Truck; Tractor only, and 2-Unit or Multi-Unit Truck. This resulted in selecting 5,213 vehicles.

Table 3 Comparison of VehicleType and VehicleBody, Arkansas Crash File, 2007

VehicleType	VehicleBody	N
Passenger car	2 door	10,645
	2dr	4
	3/5 door hatchback	68
	4 door	44,786
	4dr	9
	Convertible	159
	Station wagon	1,389
Pickup	Pickup	1
Pickup truck	Pickup	26,863
Utility vehicle	Large utility vehicle	4,337
	SUV	14,959
Van	Van	1
	Van (full size)	2,117
	Van-mini	4,077
Bus	Bus (cross country)	17
	Bus (transit-city)	75
	Church bus	8
	School bus	310
	School bus (vehicle used as)	7
Single-unit truck; tractor only	Campus, postal, state govt., etc.	39
	Truck, single unit	1,409
	Truck, tractor only	117
2-unit or multi-unit truck	Truck (>1 trlr) multi-unit	84
	Truck (18-whlr) two-unit	3,147
Motorcycle, moped, ATV etc.	ATV(3, 4, 6 wheeler)	93
	Moped	37
	Motorcycle	1,637
	Motorscooter	46
Other	Campus, postal, state govt., etc.	5
	Fire, police, ambulance, etc	70
	Limo, taxi, wrecker, etc (for hire)	47
	Maintenance equipment (rollers, graders)	53
	Motor home, go-cart, skidder, etc.	80
	Other	228
	Water co., elec. co., phone, etc.	13

VehicleType	VehicleBody	N
Unknown	Farm equipment (tractors, combines, balers)	63
	Unknown	1,408

By using the VehicleType field, cases coded Campus, Postal, State Govt., etc. on VehicleBody are selected if they are coded as Single-Unit Trucks in VehicleType, but excludes those coded "Other" on VehicleType. We believe this decision identifies qualifying trucks but excludes other vehicle types that might be operated by the Postal Service, state government, and so on, which are likely non-qualifying light vehicles. Note also that vehicles coded Large Utility Vehicle in VehicleBody are also excluded. The *Instruction Manual* [2] gives examples of large utility vehicles. Most of those vehicles have a GVWR under 10,000 pounds, so they were excluded from the set of vehicles that meet the MCMIS Crash file criteria.

In addition to these vehicle types, any vehicle, regardless of size, displaying a hazardous materials placard, also meets the MCMIS vehicle type definition. Arkansas's supplemental form includes variables that indicate if a vehicle was placarded and records other information about hazardous materials transported. However, there are no variables on the main PAR form that give any information about whether a vehicle was transporting hazmat. Since hazmat variables were not captured on the PAR file, vehicles transporting hazmat could not be identified.

In total, there were 5,213 vehicles identified as eligible trucks or buses in the Arkansas PAR data. Table 4 shows the distribution by vehicle type. The great majority of qualifying vehicles are trucks, while about 8.0 percent are buses. No non-trucks transporting hazardous materials could be identified in the Arkansas crash data because the file does not include that information. The 5,213 eligible vehicles represent 4.4 percent of all 118,408 vehicles in the PAR file. This result is consistent with other MCMIS evaluations in which the percentage of eligible vehicles has ranged from 2.6 to 6.1 percent.

Table 4 Vehicles Meeting MCMIS Vehicle Criteria, Arkansas PAR File, 2007

Vehicle type	N	%
Trucks	4,796	92.0
Buses	417	8.0
Transporting hazardous materials	n/a	n/a
Total	5,213	100.0

4.2 Identifying qualifying crashes

Having identified qualifying vehicles, the next step is to identify crashes of sufficient severity to qualify for reporting to the MCMIS Crash file. Qualifying crashes include those involving a fatality, an injured person transported for immediate medical attention, or a vehicle towed from the scene due to disabling damage.

Some of these criteria could not be applied in the Arkansas PAR file data, because of the omission of critical variables from the PAR file. Whether the crash included a fatal injury can be determined from the computerized data, but the other two criteria—an injured person transported for immediate medical attention or a vehicle towed due to disabling damage—can not be applied to the data. The information for both circumstances is collected on the PAR form, but it is not incorporated into the computerized crash file. There is information in the computerized crash file about the severity of personal injury, but not whether the injured person was transported for treatment. And there is no information in the computerized file about whether a vehicle was damaged, let alone towed due to damage.

The omission of this information from the computerized file makes it impossible to identify all the crash involvements that should be reportable to the MCMIS Crash file. So a full and comprehensive evaluation of reporting from Arkansas is not possible. However, it is possible to identify a subset of cases with a very high likelihood that they are reportable. These are not all reportable cases, but the vast majority of them are reportable.

The Arkansas Person file contains the information needed to identify crashes involving an injury. The officer records the severity of the injury (using the usual KABC0 scale), however, the information on the PAR form about transport is not captured in the computerized crash data. Since it is not known if an accident involved a transported injury, the decision was made to use A and B injuries as a surrogate for injured/transported. This seems like a reasonable rule, since from the definitions of injuries, immediate medical attention is warranted or likely. With respect to crashes in which a vehicle was towed due to disabling damage, there is no information in the computerized file at all, or any suitable surrogate.

Since it is not possible to identify the full set of reportable cases in the Arkansas crash file, a subset of crashes that have a high probability of being reportable was identified. Reporting rates can then be evaluated for this subset, to shed light on the primary factors that affect reporting. It is expected that the factors identified for this subset will apply to the full set of reportable cases.

Crash involvements with either a fatality, incapacitating injury, or nonincapacitating injury (K, A, or B injuries) are highly likely to qualify for reporting. The National Automotive Sample Survey General Estimates System (NASS GES or just GES) files can be usefully employed to demonstrate that KAB involvements have a high probability of being reportable. GES includes all the information necessary to identify vehicles that meet the MCMIS Crash file criteria and crashes that meet the severity criteria. GES includes not only an appropriate vehicle type variable, but also whether an injury was transported for attention or a vehicle was towed due to damage.

Combining six years of GES data (2000-2005) showed that 93.7 percent of truck or bus involvements with a K, A, or B injury were reportable. Table 5 shows the percentage of crash involvements of trucks and buses with respect to the MCMIS crash severity thresholds by the most severe injury in the crash. All fatal involvements are reportable, of course. More interesting are the proportions for the non-fatal injuries. Note that 95.5 percent of the cases in which the maximum injury severity was an incapacitating injury (A-injury) were in the injury/transported group and an additional 3.3 percent met the tow/disabled criteria. So, 98.8 percent of truck and bus involvements in which the most severe injury was an A injury met at least one of the MCMIS crash severity reporting criteria. For non-incapacitating (B) injuries, 89.9 percent (67.3 + 22.6) are reportable. A majority of involvements are reportable even where the most severe injury is a possible (C) injury, with 69.6 percent meeting either the injury/transported or tow/disabled criteria. Where no injury occurred, only 18.5 percent were reportable, almost all because of the tow/disabled requirement.

Table 5 Distribution of MCMIS Reporting Threshold by Most Severe Injury in Crash, GES 2000-2005

Maximum injury severity in crash	MCMIS Reporting Level				Total
	Fatal	Injury/ transported	Tow/ disabled	Non-reportable	
Fatal (K)	100.0	0.0	0.0	0.0	100.0
Incapacitating (A)	0.0	95.5	3.3	1.2	100.0
Nonincapacitating (B)	0.0	67.3	22.6	10.1	100.0
Possible (C)	0.0	45.5	24.1	30.4	100.0
None	0.0	0.1	18.4	81.5	100.0

Overall, 93.7 percent of truck and bus crash involvements in which there was a K, A, or B injury qualified for reporting. Thus, the K, A, or B involvements can be reasonably identified as reportable, even though we do not have information on whether an injured person was transported for treatment. In the GES data, K, A, or B involvements constituted only 31.4 percent of all reportable involvements, so the set of cases evaluated here is only a small proportion of all those reportable. Nevertheless, it is likely that the factors affecting reporting rates identified here will be applicable to the true total of reportable cases.

Accordingly, the evaluation of reporting completeness will focus on just those crash involvements that included a fatality, incapacitating (A) injury, or nonincapacitating but evident (B) injury. Implementing the eligible vehicle and crash severity filters identified a total of 888 reportable cases in the Arkansas crash data in 2007. There were 888 vehicles—either a truck or a bus—involved in a crash that included either a fatality, an A, or a B injury.

Table 6 Reportable Records in Arkansas Crash File, 2007

Crash type	Total	%
Fatal	113	12.7
A injury accident	199	22.4
B injury accident	576	64.9
Total	888	100.0

As Figure 1 above shows, there were 1,975 records reported to the MCMIS Crash file by Arkansas in 2007. Of these, 1,815 were matched to the Arkansas file.

4.3 Estimating Overall Reporting Rate

Of these 888 crash involvements identified in the Arkansas Crash file as reportable, 644 were actually reported to the MCMIS Crash file, for a reporting rate for that subset of 72.5 percent. However, the 72.5 percent cannot be regarded as a reasonable estimate of the overall reporting rate, since, as will be shown below, they are the most serious crashes and serious crashes are more likely to be reported than less serious crashes.

The usual method of estimating the overall reporting rate for a state is simple. First, all reportable cases are identified in the state crash file, and then the cases in the MCMIS crash file are examined to determine the number of reportable cases that were actually reported. Since the computerized version of the Arkansas crash data cannot support identifying all reportable cases, it is necessary to find other means.

Two methods are discussed here. The results of each differ but are reasonably consistent with each other.

The first method uses information from the GES file, as discussed above. The analysis of the GES file showed reportable KAB involvements of qualifying vehicles are 31.4 percent of all involvements. There are 888 involvements of vehicles that meet the MCMIS crash file criteria involved in a KAB crash (that is, a fatality, A-, or B-injury). The results from GES suggested that 93.7 percent of KAB involvements of qualifying vehicles meet one or more of the crash severity criteria. Applying this proportion to the 888 KAB involvements in the Arkansas data means 832 cases were reportable. The results from the GES analysis also suggest that reportable KAB involvements are 31.4 percent of all involvements. If we use the estimated 832 as reportable KAB cases, there would be a total of $832/0.314 \approx 2{,}650$ total reportable cases from Arkansas. Assuming all the 1,815 Arkansas cases in the MCMIS crash file met all the reporting criteria, and that none were overreported, that implies a reporting rate of 68.5 percent.

The second method is based on reporting patterns from other states that have been evaluated and whose data are sufficiently complete to identify all reportable cases with some confidence. These data were used to develop a means of predicting reportable nonfatal involvements from counts of fatal involvements. Since the number of fatal involvements is well-established in NHTSA's Fatality Analysis Reporting System (FARS) and UMTRI's Trucks Involved in Fatal Accidents and Buses Involved in Fatal Accidents files, it is possible to estimate the number of nonfatal reportable cases from the number of fatal involvements. The development of this method is fully developed and discussed in *Updated Ratio of Crash Severities Reportable to the MCMIS Crash File.* [32] The method developed in the paper provides an equation from which it is possible to predict the number of reportable cases. From 1999 through 2006, there was an average of 111 fatal truck or bus involvements in Arkansas. Given the relationship between fatal involvements and nonfatal involvements established in the UMTRI report, this implies an estimated 3,700 nonfatal reportable involvements, for a total of 3,811 total reportable involvements, with a 90 percent confidence interval ranging from 2,650 to 5,200. Assuming all the 1,815 Arkansas cases in the MCMIS crash file met all the reporting criteria, and that none were overreported, this method of estimation implies a reporting rate of 47.6 percent.

The two approaches here provide an estimated reporting rate ranging from 47.6 percent to 68.5 percent.

5. Factors Associated with Reporting

Evaluation of the factors that affect reporting can only cover the 888 crash involvements that can be identified as highly likely to be reportable.

5.1 Overreporting

Overreporting results when cases are submitted to the MCMIS Crash file that do not meet the criteria for a reportable crash. This evaluation cannot address the question of overreporting in a comprehensive way, because there is not enough information in the file to identify all reportable cases. Accordingly, there will be no attempt to estimate the extent of overreporting.

5.2 Underreporting

In this section, reporting rates are calculated by various factors to identify variations in the rate at which reportable cases are actually reported. The factors include reporting latency associated with case processing, crash severity, vehicle type, agency covering the crash, whether a fire resulted from the crash, and whether the crash occurred in an urban or rural area.

5.2.1 Case Processing

Delays in transmitting cases may partially account for the incompleteness of the MCMIS Crash file. The time lag in extracting and submitting reports to the MCMIS Crash file might explain some portion of the unreported cases. All reportable crash involvements for a calendar year are required to be transmitted to the MCMIS Crash file within 90 days of the date of the crash. The 2007 MCMIS Crash file as of August 27, 2008 was used to identify records submitted from Arkansas, so all 2007 cases should have been reported by that date.

Table 7 shows reporting rates according to month of the crash. Reporting rates range from 59.5 to 86.5, with August, September, and December having the lowest reporting rates, and May and June having the highest. August and February accounted for the largest proportions of the unreported cases. There is some tendency for the later months to have lower reporting rates. Reporting rates for the first half of the year average about 76 percent and for the second half, about 68 percent. However, there is no marked pattern that accounts for the overall KAB reporting rate.

Table 7 Reporting Rate by Accident Month in Arkansas Crash File, 2007

Month	Reportable	Reporting Rate	Unreported	% of total unreported
January	69	71.0	20	8.2
February	79	67.1	26	10.7
March	77	76.6	18	7.4
April	77	72.7	21	8.6
May	75	81.3	14	5.7
June	96	86.5	13	5.3
July	82	74.4	21	8.6
August	74	59.5	30	12.3
September	62	61.3	24	9.8
October	75	72.0	21	8.6
November	63	79.4	13	5.3

Month	Reportable	Reporting Rate	Unreported	% of total unreported
December	59	61.0	23	9.4
Total	888	72.5	244	100.0

5.2.2 Reporting Criteria

In this section we discuss factors that are associated with the observed reporting rate for KAB crash involvements. It is expected that the factors that are associated with reporting for this subset will also be valid for the full population of reportable crash involvements.

Arkansas, like many other states, uses a separate form that officers must complete for any vehicle that meets the reporting criteria in a crash that meets the severity criteria. The Arkansas Motor Vehicle Crash Report includes an instruction, in each vehicle area, to the officer to "Complete [the] Truck and Bus Crash Report of each qualifying vehicle, if [the] crash involves fatality, injury or tow." The separate Truck and Bus Crash Report form includes variables that are required to be reported to the MCMIS Crash file, such as carrier identification, gross vehicle weight rating (GVWR), and hazardous materials information. Thus, the officer is responsible for recognizing reportable crashes and reportable vehicles, and completing and submitting this form for all commercial vehicles.

Table 8 shows reporting rates, the number of unreported cases, and the proportion of unreported KAB cases by the most severe injury in the crash. Traffic crashes that resulted in a fatality were reported at the highest rate, with 90.3 percent of such crash involvements reported. The two less-severe levels of crash severity were reported at lower rates. Crashes in which the most severe injury was an A-injury (incapacitating) were reported at a 74.4 percent rate, while 68.4 percent of the B-injury (non-incapacitating but evident) involvements were reported. Note that the rate of reporting is linear with crash severity, with less severe crashes less likely to be identified and reported. B-injury crashes account for almost three-quarters of unreported crashes, even in this limited subset of crashes.

Table 8 Reporting Rate by MCMIS Crash Severity, Arkansas 2007

Crash severity	Reportable	Reporting Rate	Unreported	% of total unreported
Fatal Injury	113	90.3	11	4.5
Incapacitating injury	199	74.4	51	20.9
Non-incapacitating	576	68.4	182	74.6
Total	888	72.5	244	100.0

Reporting rates also vary by the type of vehicle, with larger, typically "heavy truck" types reported at higher rates than smaller trucks and buses. This can be seen in looking at reporting rates by the VehicleType and the VehicleBody variables. Table 9 provides detail about the general vehicle classification from the VehicleType variable. VehicleType provides a simple breakdown between single unit trucks (SUT) and combination unit trucks and buses. Overall, combination trucks (either a straight truck with a trailer or a tractor with one or more semitrailers) were reported at a 77.3 percent rate, compared with 60.8 for a SUT and only 51.6 percent for a bus. Combination trucks, though reported at the highest rate, also account for almost 60 percent of unreported cases, since they are the most common type among the reportable cases.

Table 9 Reporting Rate by Police-Reported Vehicle Type, Arkansas 2007

Vehicle type	Reportable	Reporting Rate	Unreported	% of total unreported
Bus	31	51.6	15	6.1
Single unit type	209	60.8	82	33.6
Combination unit	648	77.3	147	60.2
Total	888	72.5	244	100.0

Table 10 shows reporting rates by a more detailed vehicle configuration, provided by the VehicleBody variable. The biggest, most stereotypical trucks are reported at higher rates than smaller vehicles. Tractor-semitrailers and tractor-doubles combinations are reported at 77.2 percent and 80.0 percent rates, respectively. In contrast, SUTs are reported at a 59.8 percent rate. Buses are reported at even lower rates. Only 47.6 percent of KAB school bus involvements were reported, and only 33.3 percent of transit bus KAB involvements. The frequencies for some bus types are small (e.g., three cross-country buses, six transit buses, and one church bus) so the rates for these types are not reliable. The most common bus type (school) has a reporting rate significantly lower than any truck type.

Table 10 Reporting Rate by Police-Reported Vehicle Body Type, Arkansas 2007

Vehicle body type	Reportable	Reporting Rate	Unreported	% of total unreported
Bus (cross-country)	3	100.0	0	0.0
Bus (transit-city bus)	6	33.3	4	1.6
Church bus	1	100.0	0	0.0
School Bus	21	47.6	11	4.5
Campus, postal, state gov't, etc.	3	0.0	3	1.2
Truck, single unit	184	59.8	74	30.3
Truck, tractor only	22	77.3	5	2.0
Truck(18-whlr) two unit	628	77.2	143	58.6
Truck(>1 trlr) Multiple unit	20	80.0	4	1.6
Total	888	72.5	244	100.0

5.2.3 Reporting Agency and Area Type

In addition to the reporting criteria, there can be differences in reporting related to the type of agency that investigated the crash and the type of area. The level and frequency of training or the intensity of supervision can vary among agency types. Moreover, the different law enforcement levels have different areas of responsibility. There are also differences by population area type (classified as urban or rural) which may reflect variations in law enforcement focus. Such differences can serve as a guide for directing resources to areas that would produce the greatest improvement. This section examines reporting rates by agency and area.

Reporting rates vary to some extent by the type of investigating agency (Table 11). There are three primary levels of investigating agencies identified in the Arkansas crash file: state police, county sheriff, and city police. If reporting rates depended critically on the training and responsibilities of the reporting officer, one would expect that reporting rates would vary by the type of investigating agency. This is true in Arkansas, as city police have a reporting rate of 59.6 percent, compared with 79.8 percent for the state police. Overall, the state police accounted for 609 out of the 888 reportable cases that could be identified in the Arkansas crash file. City police covered 225, while county sheriff covered only 54. This disparity is no doubt explained by the differing responsibilities of the different levels of law enforcement.

Table 11 Reporting Rate by Investigating Agency, Arkansas 2007

Investigating agency	Reportable	Reporting Rate	Unreported	% of total unreported
Arkansas state police	609	79.8	123	50.4
City police	225	59.6	91	37.3
County sheriff	54	44.4	30	12.3
Total	888	72.5	244	100.0

Table 12 shows reporting rates by area of the crash, classified as urban or rural. Rural rates are somewhat higher than urban rates. This in part reflects the fact that city police cover most urban reportable crash involvements, but even in urban areas, reporting rates for crashes covered by the state police tended to be lower than in rural areas. The demands of law enforcement in urban areas may be more diverse, detracting from completely identifying reportable crashes and correctly completing the supplemental form.

Table 12 Reporting Rate by Urban/Rural, Arkansas 2007

Area	Reportable	Reporting Rate	Unreported	% of total unreported
Rural	483	78.5	104	42.6
Urban	405	65.4	140	57.4
Total	888	72.5	244	100.0

5.2.4 Fire Occurrence

Fire occurrence is coded at the crash level, not at the individual vehicle level. Thus, it is not possible to determine whether an individual vehicle caught fire in the crash. At the crash level, there were there were 27 reportable crashes in the 2007 Arkansas data in which a vehicle caught on fire. All 27 of the vehicles were trucks; six were single unit trucks and the other 21 were combination vehicles. None of the buses involved in a reportable crash had a fire. The overall reporting rate did not vary by whether a fire occurred in the crash. (Table 13) That is, the fact of the fire did not make the crash more or less likely to be identified as meeting the MCMIS reporting criteria, at least among KAB-severity crashes.

Table 13 Reporting Rates for Vehicles In Crashes by Fire Occurrence, Arkansas 2007

Fire occurrence	Reportable	Reporting Rate	Unreported	% of total unreported
N	861	72.6	236	96.7
Y	27	70.4	8	3.3
Total	888	72.5	244	100.0

6. Data Quality of Reported Cases

In this section, we consider the quality of data reported to the MCMIS crash file. Two aspects of data quality are examined. The first is the amount of missing data. Missing data rates are important to the usefulness of a data file because records with missing data cannot contribute to an analysis. The second aspect of data quality considered here is the consistency of coding between records as they appear in the Arkansas file and in the MCMIS Crash file. Inconsistencies can indicate errors in translating information recorded on the crash report to the values in the MCMIS Crash file.

6.1 Missing data

Table 14 shows missing data rates for selected, important variables in the MCMIS Crash file. Missing data rates are generally quite low, with a handful of exceptions. On most fundamental, structural variables, such as date, time, number of fatalities and number of injuries, missing data rates are zero. DOT number is not recorded for 1.1 percent of interstate cases. Three of the four event variables are missing for over 66 percent of cases, though this is not necessarily an indication of a problem, since most crashes consist of a single impact. VIN is unrecorded in only 0.3 percent of cases, and GVWR class, Driver License Class, Driver License State, and Driver License Number in less than three percent. Overall, missing data rates for the variables not related to hazardous materials (hazmat) are exceptionally low.

Table 14 Missing Data Rates for Selected MCMIS Crash File Variables, Arkansas 2007

Variable	Percent unrecorded	Variable	Percent unrecorded
Report number	0.0	Fatal injuries	0.0
Accident year	0.0	Non-fatal injuries	0.0
Accident month	0.0	Interstate	0.0
Accident day	0.0	Light	0.5
Accident hour	0.0	Event one	0.9
Accident minute	0.0	Event two	66.7
County	0.1	Event three	87.2
Body type	0.0	Event four	95.5
Configuration	0.0	Number of vehicles	0.0

Variable	Percent unrecorded	Variable	Percent unrecorded
GVWR class	0.0	Road access	100.0
DOT number *	1.1	Road surface	0.4
Carrier state	0.0	Road trafficway	0.4
Citation issued	1.0	Towaway	0.0
Driver date of birth	1.9	Truck or bus	0.0
Driver license number	2.2	Vehicle license number	0.3
Driver license state	2.2	Vehicle license state	0.3
Driver license class	2.5	VIN	0.3
Driver license valid	1.0	Weather	0.5

* Based on cases where the carrier is coded interstate.

Hazardous materials variable	Percent unrecorded
Hazardous materials placard	98.1
Percentages of hazmat placarded vehicles only:	
Hazardous cargo release	78.4
Hazardous materials class (1-digit)	2.7
Hazardous materials class (4-digit)	8.1
Hazardous materials name	83.8

The second section of the table shows missing data rates for the hazardous materials (hazmat) variables. Hazmat Placard was unrecorded in 98.1 percent of cases. Of the 37 cases with a hazmat placard, the name of the hazmat was left blank for 83.8 percent, whether there was a release was missing for 78.4 percent, and the 4-digit hazmat number was missing in 8.1 percent. The one-digit class was missing in only 2.7 percent (one case). High rates of missing data on hazmat impair the utility of these data for crash safety analysis.

6.2 Inconsistent data

We also compared the values of variables in the MCMIS Crash file with the values of comparable variables in the Arkansas crash file. The purpose of this comparison is to identify any errors in translating variables from the values in the state crash file to the values required for Safetynet. Arkansas has adopted in many instances the same code levels for certain variables as are used in the MCMIS Crash file, though not for vehicle configuration

Table 15 shows the results of comparing the coding of a number of important variables in the Arkansas and MCMIS Crash files. For each pair of variables compared, cases with "inconsistent" codes were flagged. Generally speaking, the standard for classifying inconsistent codes was not strict. For example, cases coded "other" or "unknown" in one file were not classified as inconsistent if they were given a specific code in the other. For vehicle type, a case was considered to be inconsistent if it was a truck in one and something other than a truck in the other, or coded with a trailer in one and with no trailer in the other, or coded as a straight truck in one and a tractor in the other. All 1,815 matched cases were used in the comparison.

Table 15 Comparison of Variables in MCMIS and Arkansas Crash Files, 2007

MCMIS Variable	Comparable variable in Arkansas Crash file	% inconsistent
Configuration	Vehicle body	16.9
Configuration	Vehicle type	5.0
Truck/Bus	Vehicle type	0.3
Number of fatal injuries	Number of fatalities	0.3
Number of vehicles	Number of vehicles	2.0
Weather	Atmospheric conditions	1.2
Light	Light conditions	1.1
Road surface	Road surface condition	1.2
Road trafficway	Traffic flow	5.0

The comparison of vehicle configuration in MCMIS and vehicle body in the Arkansas data showed the highest rate of inconsistency, with almost 17 percent of the matched cases with inconsistent codes between the two files. Most of the problem cases were generated by inconsistencies in power unit type. Two hundred cases were identified as "truck trailer" in the MCMIS Crash file, but as "truck(18-whlr) two-unit in the other. Truck trailer in the MCMIS Crash file identifies a straight truck pulling a trailer. There is a separate code, "tractor/semitrailer," for 18-wheelers. There were also 25 cases coded with a trailer in the Arkansas crash file but with no trailer in the MCMIS Crash file. It is not possible to know which variable is correct.

Trafficway flow also shows a somewhat high rate of inconsistency between the two files. Traffic way flow records whether the road is divided and the type of divider. In this variable, we just recorded whether the variables agreed on whether the road was divided or not. The rate of inconsistency may be reflective of difficulties in applying the definitions to ambiguous locations, such as ramps or roads with center left-turn lanes.

Most of the other variables show low rates of inconsistency between the two files. Differences were identified in only 0.3 percent to 2.0 percent for vehicle type (depending on the comparison variable in the Arkansas file), number of fatalities, number of vehicles, weather, light condition, and road surface condition. Some fraction of these may be generated by corrections made to one file, but not updated in the other. However, since almost all the data on the Arkansas crash report is hand-entered or typed in, rather as a scannable form, inconsistencies may result as simple typographical errors.

7. Summary and Discussion

This study is an evaluation of reporting to the MCMIS Crash file by the state of Arkansas for crashes occurring during 2007. The complete Police Accident Report (PAR) file was obtained from the state of Arkansas, containing 118,408 unit-level records. These records were matched against Arkansas's 1,975 records submitted to the 2007 MCMIS Crash file. A total of 1,815 records were successfully matched.

The set of data elements included in the computerized Arkansas crash file is limited, which in turn limited the evaluation that could be performed. A full evaluation of reporting from the crash file requires data to apply the full MCMIS reporting criteria to the PAR file, including data to identify reportable vehicle types and reportable crash severities. Unfortunately, the computerized crash file from Arkansas does not capture all the information needed. The file does not include information on whether an injured person was transported for immediate medical attention or whether a vehicle involved in the crash was towed due to disabling damage. Both of these pieces of information are available on the Arkansas Motor Vehicle Crash Report, but they are not included in the computerized crash file.

A less serious but still important limitation is that the crash file does not identify whether a vehicle was transporting hazardous materials. That information is only recorded on the supplemental Truck and Bus Crash Report, so it is not possible to determine if light vehicles transporting hazmat are being properly reported. However, there are usually a relatively small number of such cases, so the lack of this information does not significantly affect the findings here.

The lack of information on transported injuries or towed, disabled vehicles, however, seriously limits the type of evaluation that can be performed, since it is not possible to identify all the cases that should be reported to the MCMIS Crash file. However, a procedure was developed to identify a subset of crashes that are highly likely to be reportable. Analysis of a nationally-representative crash file shows that about 94 percent of crashes involving a truck or bus and a fatal (K-injury), incapacitating injury (A-injury), or non-incapacitating but evident (B-) injury meet one or more of the requirements for reporting. The Arkansas data includes the injury severity sustained by each injured person in a traffic crash, so it is easy to identify the KAB subset of reportable crashes.

Among the KAB crash involvements of trucks and buses, about 73 percent were actually reported to the MCMIS Crash file. This rate probably overstates the effective reporting rate for all reportable crashes in Arkansas. Two methods were developed to estimate the overall reporting rate, one based on the ratio, developed in a national crash file, between the KAB subset and the full set of reportable crashes, and the other based the ratio between fatal and nonfatal reportable crash involvements in a set of states. These two methods produced an estimated reporting rate ranging from 48 to 68 percent. It is likely that Arkansas is underreporting the true number of crash involvements reportable to the MCMIS Crash file.

Using the KAB subset of crashes, we identified a number of factors apparently associated with reporting rates. The factors are severity of the crash, the type of vehicle involved in the crash, and the type of law enforcement agency responsible for reporting the crash. For each factor, the results were similar to those found in other states.

Trucks are reported at a higher rate than buses. Only 51.6 percent of reportable involvements of buses were reported, compared with 60.8 percent of single unit trucks and over 77 percent of combination trucks. The largest trucks were reported at the highest rates, with 77.2 percent of the

KAB involvements of 18-wheelers reported and 80.0 percent of tractors with more than one trailer reported.

(We typically find that out-of-state licensed vehicles are reported at a higher rate than in-state, but this could not be evaluated because vehicle license state was not included in the computerized crash file.)

More-serious crashes were also reported at a higher rate than less-serious crashes. Over 90 percent of fatal crash involvements were reported, compared with only 74.4 percent of A-injury crash involvements, and 68.4 percent of B-injury crash involvements. It is likely that crashes of lesser severity are reported at lower rates. It seems clear that more severe crashes are more readily identified as meeting the reporting thresholds.

We also found that the type of agency reporting the crash was influential in determining reporting rates. Almost 80 percent of reportable crashes covered by the Arkansas State Police were reported, compared with 59.6 percent of those covered by city police and 44.4 percent of crashes covered by county sheriffs. County sheriffs covered only 54 of the 888 involvements determined to be reportable, so the low rate at the county sheriff level is not a major factor in the overall rate. The State Police covered 609 of the 888 reportable cases that could be identified, while city police covered 225. It is likely that differences in law enforcement emphasis accounts for the completeness with which cases are reported by the different types of law enforcement agencies.

Successful reporting of needed data begins with the officer on the scene. Officers have to recognize a reportable crash and then fill out the separate supplemental truck and bus crash report. Thus reporting begins with the on-scene officer recognizing that the crash involves a vehicle that meets the vehicle type criteria and a crash that meets the severity criteria. A brief reminder is printed on each crash report, but nevertheless, it is incumbent on the officer at the scene, in the midst of many other duties, to recognize and correctly apply the reporting criteria. This may explain the differential reporting rates by vehicle type and crash severity. Vehicles that are obviously big trucks are more likely to be reported than other vehicles, and crashes that involve the most serious injuries are more likely to be reported than other crashes. It is the more difficult, ambiguous cases that are more likely to be overlooked.

The way vehicle type is captured on the PAR may also complicate the task of identifying reportable vehicles. The officer enters an abbreviation or word to identify the vehicle type, rather than choosing from a fixed list of types. In the computerized crash file, there is only a limited number of vehicle body types available, so at some point in the process, there must be a set of editors or coders who read what the officer has written and then choose the appropriate code. But this introduces another step in data processing, along with the possibility of misunderstanding, typographical errors, and the like. The greatest inconsistency was found in how vehicle configuration was coded between the Arkansas crash record and the data in the MCMIS Crash file, precisely the datum that is the most open-ended. Adoption of the MCMIS system of coding and then establishing a fixed list of code levels, as is done for many other variables in the crash file, may reduce errors.

In the long run, however, it may be noted that the Arkansas Crash report is remarkably complete and contains almost all the information necessary to identify reportable cases. The officer is already recording whether a person was transported for treatment, or a vehicle towed due to disabling damage. The problem is just that this information is not captured in the computerized record. With an improved vehicle type variable, one which used a fixed pick list of vehicle types, and if the information about injured/transported persons and towed/disabled vehicles were also computerized, it should be possible to develop a computer algorithm to select the cases that meet the MCMIS Crash file reporting requirements. Selecting crashes for reporting based on a computer algorithm should result in significant improvements in the completeness of reporting to the MCMIS Crash file.

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