

EVALUATION OF WASHINGTON CRASH DATA REPORTED TO MCMIS CRASH FILE

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16. Abstract <p>This report is part of a series of reports 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 significantly incomplete. This report examines the sources of under-reporting for the state of Washington.</p> <p>MCMIS Crash File records were matched to the Washington Police Accident Report (PAR) file to determine the nature and extent of underreporting. Evaluation of the Washington data was significantly complicated by the fact that not all of the criteria to identify cases that should be reported to the Crash file are included in the Washington PAR file. However, using reference distributions from other states, it was possible to estimate that between 37.6 percent and 53.7 percent of reportable cases are uploaded to the MCMIS Crash file.</p> <p>Crashes involving a fatality are more likely to be reported than crashes in which the most serious injury was an A- or B-injury. Crashes involving large trucks such as tractor-semitrailers or doubles combinations were more likely to be reported than crashes involving single-unit trucks or buses. Crashes covered by the Washington State Police were more likely to be reported than those covered by either county sheriffs or local police departments.</p> <p>Missing data rates are low for most variables, although the important body type variable is almost all missing data, and rates are high for some hazardous materials variables. Inconsistencies were identified for some variables. In particular, the vehicle type description in the PAR file differs greatly from the corresponding vehicle configuration variable in the MCMIS Crash file.</p>					
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Evaluation of Washington Crash Data Reported to MCMIS Crash File

1. Introduction

Full and comprehensive reporting to the Motor Carrier Management Information System (MCMIS) Crash file is an important goal of the Federal Motor Carrier Safety Administration. The MCMIS Crash file plays an important role in the evaluation of motor carriers. Moreover, the MCMIS Crash file promises to provide a complete account of serious truck and bus crash involvements, which would be valuable to safety researchers. However, the Crash file is widely acknowledged as incomplete, though improving. An estimate from 2003 showed that, nationally, only about two-thirds of reportable truck involvements are reported. The reporting rate for buses is even lower, at about 40%. [1] (See references at the end of the report.) Reporting is more complete for severe crashes, with about 90% of truck fatal involvements and 65% of bus fatal involvements appearing in the file, but rates are much lower for less severe crashes.

The States are responsible for reporting qualifying crashes, and thus the solution for underreporting must ultimately lie with the individual states. This report is part of a series of evaluations of reporting from each state. Previous reports on Ohio [2], Missouri [3], and Michigan [4] showed substantial underreporting due in large part to problems police officers experience in 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. Both Missouri and Ohio also had substantial overreporting of cases, often due to technical problems with duplicate records.

The method employed in this study is generally similar to that of previous studies with some important limitations. The Washington crash data do not include information to determine if any injured person was transported for immediate medical attention or if any vehicle was towed due to disabling damage. Both points are part of the criteria to identify crash involvements reportable to the MCMIS Crash file. However, it was possible to partially overcome these limitations. Certain crash injury severities are nearly all qualify for reporting, and those crash severities can be identified in the Washington crash data. By limiting the analysis to those crash severities it is possible to evaluate whether underreporting occurs and to identify the sources of any underreporting that may exist. It is likely that the conclusions will be applicable to crash severities that cannot be evaluated specifically.

The method is as follows:

1. The complete police accident report file (PAR file hereafter) from Washington was obtained for the most recent year available, 2003. This file was processed to eliminate duplicate records as well as to identify all cases that qualified for reporting to the MCMIS Crash file.
2. All non-duplicate records in the Washington 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 Washington.
3. Cases that, from the crash severity, are highly likely to be qualify as reportable, but were not, were compared with those that were reported to identify the sources of underreporting.

Normally, these state evaluations identify cases that should not have been reported. Because of data limitations, only cases that do not qualify by vehicle type can identified with certainty.

Police accident report (PAR) data recorded in Washington's statewide files as of December 22, 2004 were used in this analysis. The 2003 PAR file contains the computerized records of 238,983 vehicles involved in 127,836 crashes that occurred in Washington.

Evaluation of the Washington data is hindered by the fact that the file does not include information on whether a person was transported for immediate medical attention or a vehicle was towed due to disabling damage. Thus, there is no way to identify in the PAR data the population of crash reports that are reportable to the MCMIS Crash file.

It is, however, possible to identify subsets of the cases that should have been reported, just using the injury severity information that is in the PAR file. Washington uses the KABCO scale to classify injuries to persons in crashes, and certain of the injury classes are either definitely reportable per se, or highly likely to be reportable, given the experience in other states.

Qualifying vehicles in a crash that involved a fatality must be reported, regardless of whether an injured person was transported or a vehicle towed. Crashes that include either an A or B-injury are very likely to be reportable, either because the injury was severe enough that the person was transported for immediate medical attention or because the crash was severe enough to disable a vehicle and require towing. Experience in three states that have been evaluated previously shows that roughly 96 to 99 percent of A-injury crashes qualify as reportable, either because an injured person was transported for treatment or a vehicle was towed due to damage. Between 86 and 92 percent of B-injury crashes were reportable.

Given that crashes involving either a fatal, A-injury, or B-injury are either certainly reportable (fatal) or highly likely to be reportable (A- or B-injury), it was decided to confine the evaluation of reporting rates to those crash severities. It is not possible to evaluate the reporting of towaway crashes from Washington because Washington does record the information necessary to identify

all crashes in which a vehicle was towed.¹ Accordingly, the sections of this evaluation that discuss the factors associated with reporting cases are based only on K, A, and B crashes. Note that one consequence of evaluating the reporting of crashes that are highly likely but not certain to be reportable is that the standard for full reporting is somewhat below 100 percent of the crashes. Full reporting of A-injury crashes falls in the range of 96 to 99 percent of A-injury crashes with qualifying vehicles, and full reporting of B-injury crashes would be considered to be 86 to 92 percent of B-injury crashes with qualifying vehicles. Actual reporting rates in Washington were considerable below those rates, however.

2. Data Preparation

The Washington PAR file and MCMIS Crash file each required some preparation before the Washington records in the MCMIS Crash file could be matched to the Washington PAR file. In the case of the MCMIS Crash file, the only processing necessary was to extract records reported from Washington and to eliminate duplicate records. The Washington PAR file required more extensive work, primarily to develop means of identifying cases that should have been reported to the MCMIS Crash file. This section discusses the methods used to prepare each file and some of the problems uncovered.

2.1 MCMIS Crash File

The 2003 MCMIS Crash file as of March 14, 2005, was used to identify records submitted from Washington. For calendar year 2003 there were 1,494 cases submitted. An analysis file was constructed using all variables in the MCMIS 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; e.g., the report number and sequence number were identical). Only one pair of such duplicate records was found. Upon further examination, the accident time differed, as did values for a few other variables, including change date and upload date. However, vehicle identification number (VIN) and driver name were identical. The record with the earlier dates was not on the PAR file, implying that a corrected record had been submitted to MCMIS, and the earlier one had not been deleted. Thus, it was considered to be a duplicate, and was excluded from the file.

In addition, records were examined for identical values for accident date, time, crash county, crash city, officer badge number, vehicle identification number, and driver's date of birth. No duplicate pairs were found. After eliminating the duplicate record identified above, the resulting MCMIS file contained 1,493 records.

¹ There is a check-box on the Supplemental form for any vehicle towed, but that is only checked if the reporting officer has decided to complete the Supplemental form. To determine if Supplemental forms are filled out for all qualifying crashes that have a towed vehicle, the vehicle towed information must be available for all crashes.

2.2 Washington PAR File

The Washington PAR file for 2003 (dated December 22, 2004) was obtained from the state of Washington. This file contains records for 127,836 crashes involving 238,983 vehicles. Data for the PAR file are coded from the State of Washington Police Traffic Collision Report completed by police officers [11].

A search for records with identical case and vehicle numbers found no such instances. Inspection of report 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 030127435 and 03-127435, for example). Cases were also examined to determine if there were any records that contained identical time, place and vehicle/driver variables. Two crashes would not be expected to be identical on all variables. To investigate this possibility, records were examined for duplicate occurrences based on the variables accident date, time, county, city, vehicle identification number (VIN), and driver date of birth. A total of 186 duplicate instances were found, representing 92 unique occurrences of the examined variables.

Duplicate pairs were examined more closely for any patterns that might explain why they were occurring. Report number differed between both members of all pairs, and a few other variables differed as well. The “duplicate” records could be grouped into two broad categories: those where a flag variable identifying the type of transaction was “new record” in both records, and those where the transaction flag was “new record” for one case, and “updated record” in the other.

In cases where the duplicates were all new records, one possibility is that the duplicates actually identify crashes that occurred in close succession. Once crash events are stabilized, the common rule is to report subsequent crashes as new crashes. If this is the case, one would expect accident date, location, vehicle and driver information to be identical, but accident time to vary by a few of minutes or longer. However, in the case of these records, accident hour and minute are identical, suggesting they are in fact duplicate records.

The manual states that the officer can supply corrections to the crash report by submitting additional crash forms and checking the “correction” box on the Part B form or the Supplemental form. Perhaps in some of these cases the officer intended to correct or supply additional information to a previous report, but overlooked checking the correction box. This could possibly result in a new case with a different report number.

The second group of cases (three pairs) were identical on variables accident date, time, county, city, vehicle identification number (VIN), and driver date of birth, but the transaction flag was “new record” in one case, and “updated record” in the other. In Pair 1, report number differed by only one digit (1397117 vs. 1397177) indicating a duplicate due to a typographical error. In Pair 2, the updated record had fewer unrecorded data items, so it appeared the other record was a

duplicate that did not get deleted when the update was applied. In Pair 3, several variables differed between the updated and new records.

The pairs identified above were considered to be duplicates and all but one member of the pair (or triplicate, etc.) was excluded. Since there was no variable indicating a date the record was updated or processed, in Group 1 the member of each pair with the lowest report number was excluded. For the three pairs in Group 2, the "updated" record was kept, and the "new record" was deleted. In total, 94 records were deleted, resulting in 238,889 records in the final PAR file.

The next step in data preparation is to identify records that qualify for reporting to the MCMIS Crash file. It was necessary to develop a set of criteria using the variables in the Washington PAR file to identify records that should have been reported. The purpose of the criteria 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 1.

Table 1. 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.

Like several other states, Washington has a separate supplemental form that the reporting officer fills out if a commercial motor carrier is involved in the collision. On this form, the officer reports some, not all, of the information required to be submitted to the MCMIS Crash file for qualifying crashes. The data includes carrier name and address, DOT and ICC numbers, vehicle and cargo body type, whether any vehicle was towed, whether the carrier is inter- or intrastate, hazardous materials placard including name and number, and the source of the carrier name. Other required information comes from the main crash form. This multi-purpose form is also used to correct or add information to a previously submitted report, as well as to report information on commercial motor vehicles involved in the collision.

Washington instructs officers to fill out the Commercial Motor Carrier (CMC) section of the supplemental form based on the following, extracted from the officer's instruction manual:

Did this collision involve –

1. A truck with at least 2 axles and 6 tires?
2. A bus with seats for 16 or more people, including driver?

3. Any vehicle requiring a hazardous material placard?

If the response to all of the above is "No," **do not** complete the Commercial Motor Carrier section of the report. If any one of the responses is "Yes," **continue on** with the next set of questions.

Did this collision involve -

4. A fatal injury?
5. An injured person who was transported for immediate medical attention?
6. A vehicle which was towed because of disabling damage?
7. A vehicle requiring intervening assistance before proceeding under its own power?

If the response to all of the last 4 items is "No," **do not** complete the Commercial Motor Carrier section of the report. If any one of the responses is "Yes," **complete** the Commercial Motor Carrier section of the Supplemental Police Traffic Collision Report.¹

These instructions are also repeated on the back of the Police Traffic Collision Report Overlay that the reporting officer uses to complete the numbered boxes on the main police traffic collision report form. But note that there is nothing on the main collision report form itself that guides the officer to fill out a Supplemental form if the crash is reportable to MCMIS. Some states that use a supplemental form include a small section on the main form that lays out the criteria for completing the supplemental form. In Washington, the reporting officer either has to recognize the crash as qualifying or notice the instructions on the back of the overlay.

A further complication is that the Supplemental Police Traffic Collision Report form is used to capture information on additional vehicles when there are three or more vehicles in a crash. There is space only for two vehicles on the main form, so when three or more vehicles are involved, supplemental forms must be filled out. If the officer is filling out the form to capture required information for the MCMIS Crash file, he completes the Commercial Motor Carrier section at the top of the form that includes some of the data elements required for MCMIS.

The instructions to officer as to when the Commercial Motor Carrier section on the supplemental form must be filled out accurately capture the original criteria for the MCMIS Crash file. However, they do not reflect the adjustments to the criteria implemented in 2002. Current MCMIS criteria include buses with seating for nine or more, including the driver, and trucks with a GVWR or GCWR over 10,000 pounds.

In any event, in Washington the officers are responsible for identifying crashes that meet the MCMIS Crash file criteria and then completing appropriate section of the supplemental police traffic collision report.

¹ State of Washington, *Police Traffic Collision Report Instruction Manual*, January 1997, p. 25.

Variables available in the Washington PAR data permit the MCMIS Crash file criteria to be applied reasonably well with respect to vehicles. The Vehicle Type variable—which is available in the Washington PAR data for all vehicles, not just commercial vehicles—identifies several categories of trucks and buses. Table 2 shows the available codes. The police traffic collision report instruction manual does not provide the specific meanings of these vehicle codes, so codes were interpreted for their typical meaning. Vehicle Type was unrecorded or coded “not stated” in 4.3% of cases. There is a Vehicle Commercial Class variable that is coded on the main form and this variable was used to identify some few additional vehicles as eligible. These additional vehicles were coded as passenger or other vehicles but were identified as a commercial vehicle with an appropriate GVWR in the Vehicle Commercial Class variable.

Table 2. Washington PAR File Vehicle Type Variable Used to Identify Eligible Vehicles

Vehicle type code	Description
0	Not stated
1	Passenger car
2	Pickup, panel truck or vanette under 10,000 lbs
3	<i>Truck (flatbed, van, etc.)</i>
4	<i>Truck and trailer</i>
5	<i>Truck tractor</i>
6	<i>Truck tractor and semitrailer</i>
7	<i>Truck – double trailer combinations</i>
8	Farm tractor and/or farm equipment
9	Taxi
10	<i>Bus or motor stage</i>
11	<i>School bus</i>
12	Motorcycle
13	Scooter bike
14	Other
15	Moped

Note: Codes in italics were used to identify eligible trucks and buses.

Buses are identified using two vehicle type codes, “Bus or Motor Stage” and “School Bus” (Table 2, codes in italics). It is also possible that some other vehicles, such as vans, could qualify as buses. Vans would be included if they have seats for nine or more occupants and are used for transporting passengers, and not personal transport. However, since the number of seats is not recorded and a description of vehicle use did not appear to be reliable, there was no basis on which to include any other vehicles as qualifying buses.

According to state officials, the Vehicle Type variable is not entered by the officer on the scene, but is derived from the Vehicle Identification Number (VIN). Since the variable includes vehicle types with one or two trailers, the trailer information from the main PAR form must also be consulted in determining the vehicle type. It should also be noted that the VIN only identifies the

vehicle as manufactured, and cannot record subsequent modifications. Vehicles that are later altered, for example, by converting a truck tractor into a straight truck, would be misidentified.

A variable on the primary crash form, Hazardous Materials Transported, was used to identify the third group of eligible vehicles—those that were placarded to transport hazardous materials. (Appendix A includes a complete discussion of variables used to identify qualifying vehicles).

In total, there were 9,187 vehicles meeting the MCMIS vehicle criteria in the Washington PAR file (Table 3). These represent 3.7 percent of all vehicles in the PAR file, which proportion is within the range of other states that have been examined previously (ranging from 2.6 percent to 6.1 percent).

Table 3. Vehicles Meeting MCMIS Vehicle Criteria, Washington PAR File, 2003

Vehicle type	N	%
Trucks	7,470	81.3
Buses	1,471	16.0
Non-trucks with hazmat placard	246	2.7
Total	9,187	100.0

While the information on vehicle type is sufficient to identify vehicles that meet the MCMIS Crash file criteria, the Washington PAR file does not include all the information necessary to identify crashes that meet the MCMIS severity threshold. While crashes with fatally injured persons can be identified in Washington, the PAR file does not indicate whether injured persons were transported or whether any vehicle was towed. The lack of these crash severity variables makes it impossible to identify the full population of Washington crash involvements that qualify for reporting to the MCMIS Crash file.

The Washington PAR data only includes a variable coded for each person involved that identifies injury severity on the so-called KABCO scale. This scale classifies injuries as fatal (K), incapacitating (A), nonincapacitating but evident (B), complaint of pain (C), and no injury (O). Using this person-level injury classification, the most severely injured person in a crash can be identified, which sets the crash severity. But the lack of a vehicle towed variable, or any satisfactory surrogate, means that cases that qualify because a vehicle was towed cannot be specifically identified.

The inability to identify all the specific cases that ought to have been reported to the MCMIS Crash file means that this report cannot provide a full evaluation of reporting to the Crash file. However, it is possible to provide a plausible estimate of the total number of cases that ought to have been reported as well as to identify a specific subset of the crashes that should have been reported. This can be done using the reporting experience of other states and applying that experience to Washington where the same specific subset of crashes can be identified in Washington and the other states.

Three states previously evaluated—Missouri, North Carolina, and Ohio—include all the information necessary to identify crashes that qualify for reporting to the MCMIS Crash file. As such, each state can be treated as a reference distribution that can be applied to the Washington data to determine the overall level of reporting and the expected level of reporting for specific subsets of crashes, where the same subset can be identified in Washington. For example, it is likely that the overall level of cases that should have been reported in Washington will not differ significantly from the experience of the other states. All four states use the same KABCO severity scale. Though there may be some state-to-state differences in its application, it is unlikely that Washington differs too greatly from the other three in the proportion of injured persons transported for treatment or crash-involved vehicles towed. Table 4 illustrates the point. It shows the distribution of the severity of crashes involving trucks and buses (MCMIS-qualifying vehicles) in North Carolina, Missouri, Ohio, and Washington. The distributions of severity vary somewhat by state, but the differences are not gross. Washington's distribution is fairly similar to that of North Carolina.

**Table 4 Percentage Distribution of
Crash Severity of Trucks and Buses in Four States**

Crash severity	North Carolina	Missouri	Ohio	Washington
Fatal	0.9	0.7	0.6	0.6
A-injury	1.3	3.2	2.3	1.6
B-injury	7.2	8.3	8.8	7.7
C-injury	18.2	8.6	10.0	17.9
No injury	72.4	79.1	78.3	72.1
Total	100.0	100.0	100.0	100.0

Accordingly it is reasonable to use the experiences of these states to make inferences about the number of reportable cases in Washington state. Again, this is only necessary because the PAR data in Washington does not include all the appropriate variables to identify cases that meet the MCMIS Crash file reporting criteria.

Table 5 shows the percentage of cases that were reportable to the MCMIS Crash file by crash severity in North Carolina, Missouri, and Ohio. Of course, all crashes involving a fatality are reportable, so the percentage for fatal crashes is 100 in all three states. But not all A-injuries are transported for treatment, despite the fact that an incapacitating injury is indicated. The table also shows the proportion of truck or bus crash involvements that were reportable by the most severe injury in the crash. Note that the cases qualified either because the injury was transported or at least one vehicle was towed due to disabling damage.

**Table 5 Percentage by Crash Severity
of Cases Reportable to MCMIS Crash file in Three States**

Crash severity	North Carolina	Missouri	Ohio
Fatal	100.0	100.0	100.0
A-injury	96.1	99.3	98.2
B-injury	92.0	89.0	85.9
C-injury	73.4	70.4	59.4
No injury	28.8	22.7	14.9
Total	43.0	35.4	28.1

Virtually all A-injury crashes are reportable in each state. The proportion reportable ranges from 96.1 percent in North Carolina to 99.3 percent in Missouri. The proportion of B-injury crash involvements reportable is also very high, ranging from 85.9 percent to 92.0 percent. Even a majority of C-injury crashes are reportable. Only in the no-injury crashes is the proportion of reportable involvements relatively low, ranging from 14.9 percent to 28.8 percent.

Using the experience of the three states as reference distributions, it is possible to estimate the number of crash involvements in Washington that qualified for the MCMIS Crash file. Table 6 shows the application of reporting percentages from the three states to the set of MCMIS-eligible vehicles in the Washington PAR file. The first column of numbers shows the percentage of reportable crash-involvements averaged for each crash severity across the three reference states. The next column shows the number of MCMIS-eligible vehicles by crash severity in the Washington data. The last three columns show the estimated number of reportable cases, based on the three-state average, the low end of the range (Ohio) and the high end of the reporting range.

Table 6 Estimated Number of Washington Cases Reportable to MCMIS Crash File

Crash severity	Percent Reportable, Three state average	Washington qualifying vehicles	Reportable Washington Cases		
			Based on three state average	Low (Ohio)	High (NC)
K	100.0	58	58	58	58
A-injury	97.8	149	146	146	143
B-injury	89.0	711	633	610	654
C-injury	67.7	1,645	1114	978	1207
No injury	22.2	6,624	1469	990	1911
Total	35.5	9,187	3420	2782	3973

Table 7 shows the number of cases reported and the percentage of reportable cases actually reported based on the three states. Overall, only an estimated 43.7 percent of expected cases were reported, with a range of 37.6 percent to 53.7 percent. Reporting varied by crash severity, with fatal involvements more likely to be reported and less severe crashes less likely to be reported. Only 67.2 percent of fatal involvements were reported. Crash involvements with an A- or B-

injury were only reported around 42 to 45 percent of the time, and only about one-third of C-injury crash involvements were reported.

Table 7 Estimated Washington Reporting Percentage by Crash Severity Based on Three States

Crash severity	Washington Cases Reported to MCMIS	Estimated Reporting Rates		
		Three State Average	Low (Ohio)	High (NC)
Fatal	39	67.2	67.2	67.2
A-injury	62	42.5	42.4	43.3
B-injury	276	43.6	45.2	42.2
C-injury	368	33.0	37.6	30.5
No injury	642	43.7	64.9	33.6
Total	1,493*	43.7	53.7	37.6

* Includes 106 cases with unknown crash severity

One goal of this evaluation is to provide some insight into the reasons some cases that qualify for the MCMIS Crash file are not in fact reported. Because the Washington PAR file does not include all the information necessary to identify all qualifying cases, this study will not be able to entirely achieve that goal. However, the experience of other states has shown that certain crash subsets, which can be identified in the Washington PAR data, are almost all reportable. All fatal crashes are reportable, as well as about 98 percent of A-injury crashes and 89 percent of B-injury crashes. Since the proportion of reportable crashes is so high in these categories, we will take all fatal, A-injury, and B-injury crashes as reportable, and determine the sources of underreporting for those crash severities. This is not ideal, particularly since those crashes represent only about one-quarter of the crash involvements that should be reported. But focusing on the K, A, and B subset is the best course given the current limitations of the Washington PAR file.

3. Matching Process

The next step in the evaluation of Washington crash reporting involved matching records from the Washington PAR file to corresponding records from the MCMIS file. After removing duplicates, there were 1,493 Washington records from the MCMIS file available for matching, and 238,889 records from the Washington PAR file. All records from the Washington PAR data file were used in the match, since reporting of ineligible cases is also of interest.

Matching records in the two files requires finding common variables that can identify a specific vehicle involved in a specific crash. Report Number, which is the crash identifier used to uniquely identify a crash in the Washington PAR data, and Report Number in the MCMIS Crash file, are obvious first choices. Report Number in the Washington PAR file is a seven-digit character value, while in the MCMIS Crash file, Report Number is stored as a 12-character alphanumeric value, a combination of alphabetic characters and numbers. It appears that the

report number in the MCMIS Crash file is constructed as follows: The first two columns contain the state abbreviation (WA, in this case), followed by three zeros, then by seven digits.

Examination of PAR and corresponding MCMIS records showed that for most cases the PAR report number was embedded in the MCMIS report number, allowing a value corresponding to the Washington Report Number to be extracted and used in the match. Other matching variables at the accident level included crash month, day, hour, minute, crash city, and county. Crash city was unrecorded 24.0% of the time in the PAR file, possibly when a crash did not occur with city limits.

Variables in the MCMIS file to identify specific vehicles within a crash include vehicle license plate number, driver license number, vehicle identification number (VIN), driver date of birth, and driver last name. However, only vehicle identification number (VIN) and driver date of birth were available on the PAR file. VIN was unrecorded in 16.7% of PAR file records, and driver date of birth was not recorded in 14.8% of cases.

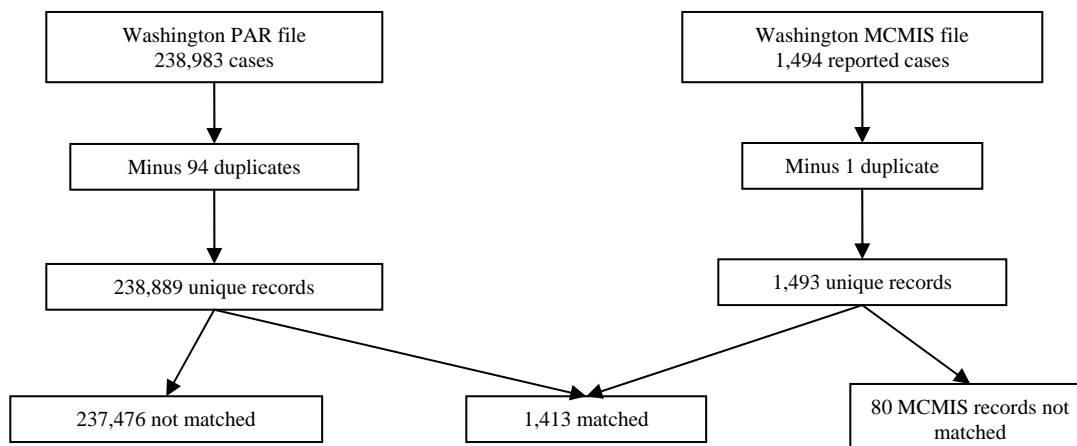
Six separate matches were performed using the available variables. In each match step, records in either file with duplicate values on the match variables were excluded, along with records that were missing values on the match variables. The procedure begins with the most stringent match, and at each successive step substitutes alternative match variables. The first match included the variables accident number, crash month, day, hour, minute, crash city and county, VIN, and driver birth date. The second match step eliminated city and VIN, and matched on accident number, month, day, hour, minute, county, and driver birth date. The third match step matched on accident number, month, day, hour, minute, county, and VIN. The fourth match used accident number, month, day, hour, minute, county, driver year of birth and VIN (only the rightmost six digits). Eliminating minute resulted in only a few additional matches. After trying various combinations of variables the fifth match only used report number and driver year of birth. Each of the matched cases in the fifth match were individually verified, and a few were determined not to be valid matches. These records were subsequently “un-matched.” At this point, an attempt was made to match the remaining 113 unmatched records in the MCMIS file “by hand” to records in the PAR file. Thirty-three additional cases were matched. See Table 8 for the variables used in each match step along with the number of records matched at each step.

Table 8. Variables Used in MCMIS-Washington PAR File Match, 2003

Match step	Matching variables	Cases matched
Match 1	accident number, crash month, day, hour, minute, crash city, county, VIN, and driver birth date	164
Match 2	accident number, crash month, day, hour, minute, county, and driver birth date	1,141
Match 3	accident number, crash month, day, hour, minute, county, and VIN	19
Match 4	accident number, crash month, day, hour, minute, county driver year of birth, and VIN (rightmost six digits)	5
Match 5	accident number and driver year of birth	51
Match 6	hand-matched, based on all variables	33
Total cases matched		1,413

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 1,413 matches, representing 94.6% of the 1,493 non-duplicate records reported to MCMIS.

Figure 1 shows the case flow during the match. There were 80 (5.4%) MCMIS records that could not be matched to the Washington PAR file.

**Figure 1 Results of MCMIS-Washington PAR File Match, 2003**

At least 61 of the cases that were reported to the MCMIS Crash file and matched with the Washington PAR file should not have been because they did not involve a truck, bus, or vehicle carrying hazardous materials. It is also possible that some fraction of the other reported cases did not qualify because they did not meet the severity criteria. However, such cases cannot be identified because it is not possible to determine if the cases involved an injury transported for treatment or a vehicle towed due to disabling damage.

4. Factors Associated with Reporting

In this section we discuss the factors that are associated with underreporting crashes to the MCMIS crash file.

Evaluation of reporting will be approached two ways. The first approach will be to consider the cases for which the reporting officer completed the Commercial Motor Carrier (CMC) section. These are cases that the officer apparently thought met the instructions he was given. Yet not all were selected for the crash file. The question here has to do with why were some sent to the crash file and others not. Some clearly met the criteria but were not uploaded to the MCMIS Crash file.

Recall that at the highest level, there are two steps that have to be taken to move information from the crash scene to the MCMIS Crash file. First, the officer must recognize that a crash meets the MCMIS reporting criteria and collect it. Second, the system has to select cases and send them on.

The first question has to do with how well the system selects the right cases and sends them on. The second question is, what factors play into an officer recognizing that a case is reportable. In this evaluation we will attempt to identify factors associated with successfully taking each step. That is, what are the factors that affect an officer identifying a crash that is reportable? And secondly, what are the factors that affect the likelihood of a crash, once in the system, being extracted and submitted to the MCMIS Crash file? Answering these two questions amounts to evaluating reporting of cases that can be identified as reportable from the primary police traffic collision report and from the supplemental traffic collision report. Table 9 lays out the salient characteristics of the two files. The CMC supplemental data is only available for cases in which the officer recognized a crash as reportable. And, unlike data from the main police report, the CMC supplement includes a check-box to indicate if any vehicle in the crash was towed. So a certain subset of MCMIS-reportable cases can be identified and evaluated. The main police report data includes information on all crashes, not just those recognized by the reporting officer, but only a subset of reportable crashes can be identified with confidence.

Table 9 Comparison of CMC Supplement and Main Police Report Data

	CMC Supplement	Main police report data
Use of file	To identify factors associated with uploading cases to the MCMIS Crash file for which a CMC Supplement was completed.	To identify factors that affect whether a CMC supplement is filled out and the case submitted to the MCMIS Crash file
Data relevant to MCMIS-reportable criteria	<ul style="list-style-type: none"> • Vehicles: truck, bus, hazmat placard linked from PAR data • Crash Severity: Fatal, A, B, C-injury information linked in from PAR data • Any vehicle towed on CMC supplement only 	<ul style="list-style-type: none"> • Vehicles: truck, bus, hazmat placard • Crash Severity: Fatal, A, B, C-injury information linked in from PAR data • No information on towed vehicles

	CMC Supplement	Main police report data
How well can reportable crashes be identified?	<ul style="list-style-type: none"> Qualifying vehicles adequately identified. Fatal crashes identified, but no information on transported for treatment. A- and B-injury crashes surrogate for injuries transported, but C-injuries transported are missed. MCMIS towaway criterion met by the towed variable in the CMC data. <p>CMC data can be analyzed to determine how well fatal, A-injury, B-injury, or towaway crashes with a CMC supplemented are reported to MCMIS. A- and B-injury crashes are an adequate surrogate for transported injuries. C-injury crashes in which a person was transported for immediate medical attention cannot be identified.</p>	<ul style="list-style-type: none"> Qualifying vehicles adequately identified. Fatal crashes identified, but no information on transported for treatment. A- and B-injury crashes surrogate for injuries transported, but C-injuries transported are missed. Cannot identify towaway crashes <p>The data from the main police report form can be analyzed to determine how well fatal, A-injury, and B-injury crashes are reported. A- and B-injury crashes are an adequate surrogate for transported injuries. However, C-injuries transported cannot be identified, and crashes in which a vehicle is towed due to disabling damage cannot be identified. The analysis is restricted to just fatal, A- and B-injury crashes.</p>

We will evaluate reporting from the two sources separately, because they really bear on two different questions. One just bears on the question of how to help officers recognize reportable crashes. But the other attempts to identify factors within the crash reporting system that may be hindering full reporting.

Reporting to MCMIS from the Commercial Motor Carrier Supplement.

As mentioned above, in Washington the officers are instructed to fill out the Commercial Motor Carrier section of a supplemental police report for vehicles that meet the MCMIS Crash file reporting requirements. In 2003, 2,519 such supplements were completed and the data were supplied by Washington along with the rest of the crash data. In this section we will discuss factors associated with reporting cases with records in the CMC data.

Only about half of the supplements, 1,228 of the 2,519 supplements, were submitted to the MCMIS Crash file. Thus there were 1,291, 51.3 percent of the total cases with CMC supplements, that were not submitted. In addition, there were 185 cases among the 1,413 MCMIS Crash file cases matched to the Washington PAR file that did not have a CMC supplement record. Figure 2 illustrates this somewhat complex situation.

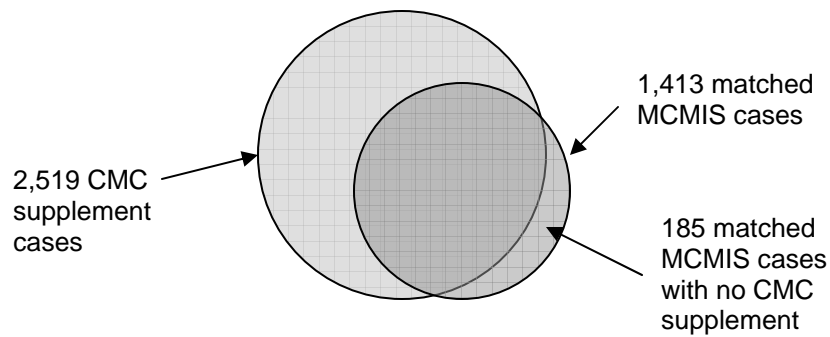


Figure 2 CMC Supplement Cases Submitted to MCMIS Crash File

Overall, it appears that officers complete the supplemental form on vehicles that meet the MCMIS vehicle type criteria. Of the 2,519 records in the CMC supplemental data, there are only 23 passenger cars, 63 light trucks, and a handful of other vehicles. Taking into account that some light vehicles can qualify if placarded to transport hazardous materials, only 48 (1.9 percent) of the vehicles did not qualify for reporting.

CMC cases match the crash severity reporting criteria less successfully. Though there is no variable recording the towaway status for all vehicles in crashes, the supplement includes a check box that indicates whether a crash met the towaway threshold. Since this variable is on the CMC supplement, and the officer has already determined that a crash is reportable in order to fill out the section, it cannot be used to identify independently crashes that qualify for reporting to MCMIS. But it can be used, in conjunction with injury coding, to identify crashes that do not qualify for reporting. The only cases that can be identified with relative certainty as cases for which the CMC supplement should not have been filled out are those in which there were no injuries and no towed vehicles. Of the 2,519 supplements, 971 or 38.5 percent included no injury and no vehicle towed. According to the instruction manual, supplements should not have been completed for these cases.

However, completing a CMC supplement for crashes that do not meet the MCMIS severity criteria is not actually a problem for the Crash file. The problem would be if those cases were submitted to the MCMIS crash file.

Table 10 tabulates the cases in the CMC supplement file by their reporting status and whether they were actually reported to the MCMIS Crash file. Determining whether a case is reportable cannot be completely determined because of gaps in the information available in the Washington crash file. The principle gap is whether an injured person was transported for treatment. Based on the analysis above, crashes with K-, A-, or B-injuries were defined as reportable, since they either qualify outright (in the case of fatal crashes) or have a high

probability of including an injury transported for treatment (crashes with A or B injuries). Cases that were classified as reportable included a truck, bus, or hazmat placarded vehicle in a crash with either a fatal, A-, or B-injury or at least one vehicle towed. The “not reportable” cases include non-trucks or cases with no injury and no towed vehicle. The unknown category consists of cases with C-injuries or unknown injuries and no vehicle towed. It is possible that some portion of the C-injuries were transported for treatment. Since that cannot be determined from the available data, they are left as unknown whether reportable or not. Based on the experience of the other states discussed above, only one-quarter to one-third of those cases would likely be reportable.

Table 10 CMC Supplement Cases by Reporting to MCMIS Crash File

Qualify for MCMIS Crash file?	Reported to MCMIS Crash file		Total
	Yes	No	
Reportable	990	251	1,241
Unknown	99	179	278
Not reportable	139	861	1,000
Total	1,228	1291	2,519

Overall, it appears that, generally speaking, CMC supplement cases that ought to have been reported to the MCMIS Crash file were reported, and that, for the most part, cases that did not qualify were not reported. But the record is decidedly mixed. Of the 1,241 supplements that clearly qualified, only 990 or 79.8 percent, were reported. Over 20 percent of those cases were missed. The missed cases included five with fatal injuries and 218 in which at least one vehicle was towed. Similarly, of the 1,228 CMC supplement cases that were reported, 139 cases (11.3 percent) clearly did not meet the MCMIS crash file criteria. In six of the cases, the vehicle was not a truck, bus, or hazmat placarded vehicle, and in the remainder no one was injured and no vehicle was towed.

We are unable to suggest a plausible explanation for these errors. There is no consistent pattern. Buses account for about 20 percent of cases that should have been reported and were not, which is a significant overrepresentation. A variety of factors were checked that might explain the failure to forward reportable cases to the MCMIS Crash file. These include whether US DOT number or carrier name information had been entered, the type and size of the vehicle, whether the vehicle was based in Washington, and even the month of the crash, on the theory that the crashes had occurred too late to meet a reporting schedule, even though the Washington Crash file used was dated December 22, 2004, nearly a year after the close of the data year.

Other than significant underreporting of reportable bus involvements, none of the factors examined significantly affected whether a reportable case in the CMC supplemental data was reported to the MCMIS Crash file. This poses a conundrum. The appropriate information is

available in the computer record to determine if a case should be submitted. If the errors were only a few percent, they might be dismissed as random. The fact that the errors run from 10 to 20 percent suggests a systematic problem. Cases may not be selected to submit to the MCMIS Crash file by a computer algorithm, but by some other means. However, the nature of the problem cannot be determined from the available data.

In summary, when reporting officers complete the CMC supplemental section, they do so for appropriate vehicles. However, it also appears that the supplement is completed for both crashes that qualify due to severity and those that do not. In almost 40 percent of the cases in the 2003 CMC data, the crashes do not meet the MCMIS criteria. For the MCMIS Crash file, this is not an issue. The state may use the data for purposes other than satisfying the reporting requirements for MCMIS.

But on the other hand, not all the appropriate cases are extracted and reported to MCMIS, and a significant number of inappropriate cases are reported. Overall, 79.6 percent of CMC cases that can be identified as reportable are in fact reported. And of the cases that were reported, 80.6 percent clearly qualified. So while the bulk of cases in the CMC supplemental file are properly handled, there is still a large proportion that are not. If the 251 cases in the CMC supplemental file that clearly are reportable were in fact reported, the estimated reporting rate for Washington would have been raised by six to nine percentage points.

Factors associated with reporting to the MCMIS Crash file

The second question to be addressed is to identify the factors that affect whether an officer recognized a case as reportable and so began the process of getting the record into the MCMIS Crash file by filling out a CMC supplement. Why are some cases not reported and others reported?. The evaluation here is confined to fatal, A-injury, and B-injury cases, as discussed above. A-injury and B-injury were earlier established to have a high probability of being reportable, even without information on whether an injury was transported or a vehicle towed due to disabling damage. There are 918 cases in the Washington PAR data that fall into this group. The reporting of these cases will be discussed in this section, and these 918 cases will be referred to as reportable. Of the 918 cases, 369 were reported (40.2 percent) and 549 were not (59.8 percent).

Figure 2 above illustrates that completing the CMC supplement is highly associated with submitting a record to MCMIS. Of 1,413 MCMIS Crash cases matched to the Washington PAR data, 1,228 or 86.9 percent had a CMC supplement completed. In contrast, of the 549 cases that can be identified as reportable but not reported, 95.1 percent did not have the CMC section completed. Thus, filling out the CMC section appears to be necessary, but not sufficient, to submitting a case, as previous analysis indicates.

Police officers more readily recognize fatal crashes as meeting the reporting criteria than nonfatal crashes. Table 11 shows that reports were submitted to the MCMIS Crash file for over two-thirds of fatal crashes, but only 40.9 percent of A injury crashes and 37.8 percent of reportable B injury crashes. The important point here is the step-change in reporting percentage from fatal crashes to the serious nonfatal injury crashes. The difference in reporting percentage is significant. Based on this finding, it is likely that reporting rates are even lower for towaway crashes, though this cannot be determined because of limitations in the Washington PAR data.

Table 11 Reporting by Crash Injury Severity, Washington 2003

Injury severity	Reportable	Reporting rate	Unreported	% of total unreported
Fatal	58	67.2	19	3.5
A injury	149	40.9	88	16.0
B injury	711	37.8	442	80.5
Total	918	40.2	549	100.0

Table 12 shows reporting rates by vehicle type, among the 918 cases that can be identified as reportable in the Washington data. Reportable crashes involving trucks are the most likely to be reported, with a rate of 45.4 percent. In contrast, a relatively low proportion of reportable crashes involving buses are submitted to the MCMIS Crash file, with only 16.0 percent, and none of the 20 hazmat placarded vehicles that were not trucks were reported. The underreporting of truck involvements accounts for most of the unreported cases, with 76.3 percent, so clearly the most ground can be made up there. Buses account for many fewer MCMIS-reportable involvements, but the low reporting level means that buses are seriously underrepresented in the file. Finally, hazmat placarded vehicles that are not trucks involved in qualifying crashes are not recognized as reportable at all. None of the 20 hazmat placarded vehicles involved in reportable crashes were reported.

Table 12 Reporting by Vehicle Type, Washington 2003

Vehicle type	Reportable	Reporting rate	Unreported	% of total unreported
Truck	767	45.4	419	76.3
Bus	131	16.0	110	20.0
Hazmat placard	20	0.0	20	3.6
Total	918	40.2	549	100.0

Reporting by a more detailed vehicle type shows significant variations in the reporting levels of different vehicles. Crash involvements of the largest truck combinations—truck and trailer, tractor-semitrailer, and tractor-double—are reported at a significantly higher rate than the average, ranging from about two-thirds of cases to over 90 percent for doubles. (Table 13) In contrast, only 17.6 percent of the reportable crash involvements of single-unit trucks are

reported. Since single units make up over half (51.2 percent) of unreported cases, increased reporting of this category would contribute a substantial improvement in the overall rate.

Table 13 Reporting by Detailed Vehicle Type, Washington 2003

Vehicle type	Reportable	Reporting rate	Unreported	% of total unreported
Pickup, Panel Truck, Van less than 10,000 lbs. GVWR	20	40.0	12	2.2
Truck (Flatbed, van, etc.)	341	17.6	281	51.2
Truck and Trailer	121	65.3	42	7.7
Truck Tractor	26	42.3	15	2.7
Truck tractor & semitrailer	237	67.5	77	14.0
Truck-Double trailer	31	90.3	3	0.5
Bus or Motor Stage	95	9.5	86	15.7
School Bus	36	33.3	24	4.4
Other	11	18.2	9	1.6
Total	918	40.2	549	100.0

It is interesting to note the difference in the reporting rates for the two bus types. One-third of reportable school bus involvements were reported, but less than 10 percent of buses classified as “bus or motor stage” were reported. One might expect the proportions to be reversed. The bus/motor stage group should include intercity scheduled buses and tour buses, which one might think would be readily recognized as reportable. However, transit buses would also be included here and it is possible that the majority of buses in this category are transit buses. In any case, all buses, regardless of the type of carrier operating them, are reportable if involved in a qualifying crash. Clearly, certain vehicle types are recognized by officers as reportable at much lower rates.

License state of the vehicle also plays a significant role in the likelihood of a case being reported to the Crash file. Crash-involved qualifying vehicles with out-of-state licenses are much more likely to be reported than comparable vehicles with a Washington license. Over 55 percent of out-of-state vehicles were reported, compared with only 34.8 percent of Washington-licensed vehicles. (Table 14) It is possible that some reporting officers do not understand that the reporting requirement includes all vehicles, including those that are purely intrastate. The unreported Washington-licensed vehicles make up almost 80 percent of the unreported cases, so improvement here would make a significant impact in the overall rate.

Table 14 Reporting by License State, Washington 2003

Vehicle license state	Reportable	Reporting rate	Unreported	% of total unreported
Washington	669	34.8	436	79.4
Out of state	243	55.6	108	19.7
Missing data	6	16.7	5	0.9
Total	918	40.2	549	100.0

Policing agency also has a substantial effect on the probability that a reportable case is in fact reported. Reportable crashes covered by the Washington State Police have the greatest chance of being reported, with such crash involvements reported at a 57.2 percent rate. (See Table 15.) The reporting rate for county sheriffs is significantly lower, with only 20.6 percent. Reportable involvements policed by city or municipal officers are reported at a 34.1 percent rate, intermediate between the state police and county sheriff rates. The Washington State Police account for a majority of the reportable cases, but county sheriffs also cover a substantial number of the reportable cases. Almost half of the unreported cases were covered by county sheriffs.

Table 15 Reporting by Reporting Agency, Washington 2003

Investigating agency	Reportable	Reporting rate	Unreported	% of total unreported
State patrol	465	57.2	199	36.2
County sheriff	340	20.6	270	49.2
City/municipal police	91	34.1	60	10.9
Missing data	22	9.1	20	3.6
Total	918	40.2	549	100.0

The counties of King, Pierce, and Snohomish account for 58.6% of all truck crash involvements in Washington State. These counties are in the western part of Washington, along a major corridor from Canada and to points south. The area lies along the eastern shore of Puget Sound and includes Seattle and the area just north and south. The table shows that these three counties account for over half of the unreported cases in the subset of reportable cases that can be identified with certainty. Reportable crash involvements in each of the three counties is lower than the overall reporting rate, though in the case of Pierce County it is quite close. But King County, the largest, reports at only a 27.7% rate and accounts for almost a third of the unreported cases by itself. Targeting these three counties could result in a substantial improvement in the overall rate.

Table 16 Reporting by Crash County, Washington 2003

Counties	Reportable	Reporting rate	Unreported	% of total unreported
King	249	27.7	180	32.8
Pierce	95	36.8	60	10.9
Snohomish	71	29.6	50	9.1
All others	503	48.5	259	47.2
Total	918	40.2	549	100.0

5. Data quality of reported cases

Beyond reporting rates, the quality of the reported data is important to the use of the MCMIS Crash file. The MCMIS Crash file data contribute to evaluating individual motor carriers, and

can also be used to establish and track overall trends in crash frequency. It is therefore important that reportable crashes be fully and accurately reported. Data quality was considered in two regards: rates of missing data and the accuracy with which the data in the Washington PAR file is translated and submitted to the MCMIS Crash file.

Rates of missing data are important because variables with no data cannot contribute to an analysis. Table 17 shows the percentage of unrecorded data for several MCMIS Crash file variables. For the variables that establish the overall structure of the case, such as crash date, county, vehicle configuration, crash severity, and so on, missing data rates are low or in many cases zero. Vehicle identification number (VIN), which can be decoded to determine many important details about the vehicle, is missing in only 2.1 percent of the cases. Rates are also very low for variables that describe the immediate environment of the crash, such as weather, light condition, roadway surface, access, and trafficway type. The sequence of events variable has high rates of missing data for the second and subsequent events, but is nearly complete for the first event. In part this reflects the reality that most traffic crashes consist of only one primary event, typically a collision with another motor vehicle or object.

In contrast with the good performance just noted, body type is missing in almost 94 percent of the records. Body type can be an important variable in determining the usage of the vehicle. Moreover, as the second section of Table 17 shows, reporting of hazardous materials data is seriously incomplete. Whether the vehicle was displaying a hazmat placard is unrecorded in over 97 percent of the records. For those vehicles that were recorded with a hazmat placard, cargo release was unrecorded in 93.3 percent of the cases. Hazmat name was similarly left blank in 86.7 percent. However, it should be noted that the class and UN number was not reported in only 6.7 percent and 3.3 percent of the cases respectively.

Table 17 Missing Data Rates for Selected MCMIS Crash File Variables, Washington 2003

Variable	Percent unrecorded	Variable	Percent unrecorded
Accident year	0.0%	Event one	0.6
Accident month	0.0	Event two	70.2
Accident day	0.0	Event three	88.3
Accident hour	0.0	Event four	96.9
Accident minute	0.0	Number of vehicles	0.0
Body type	93.5	Officer badge number	0.0
Configuration	0.2	Report number	0.0
County	0.0	Road access	4.3
DOT number	4.7 *	Road surface	0.6
Driver date of birth	1.9	Road trafficway	2.2
Driver license number	1.8	Towaway	0.0
Driver license state	1.5	Truck or bus	0.0
Fatal injuries	0.0	Vehicle license number	0.9
Non-fatal Injuries	0.0	Vehicle license state	0.7
Interstate	0.0	VIN	2.1
Light	0.5	Weather	0.6

* Counting cases where the carrier is coded interstate.

Hazardous materials variable	Percent unrecorded
Hazardous materials placard	97.3
Percentages of hazmat placarded vehicles only:	
Hazardous cargo release	93.3
Hazardous materials class (1-digit)	6.7
Hazardous materials class (4-digit)	3.3
Hazardous materials name	86.7

Accuracy of the data strictly speaking cannot be measured directly, since there is no way to independently validate the data. However, it is possible to compare the reporting on individual variables of the data in the Washington PAR file and the same variable as reported to the MCMIS Crash file. Inconsistencies would indicate that there are errors in the formatting and mapping of the data from the way it is captured on the Washington PAR file to the way the same information appears in the MCMIS Crash file. The code levels for road surface, light condition, weather, sequence of events, and trafficway on the Washington police report differ slightly from the comparable variables in the MCMIS Crash file. Each, however, can be cleanly mapped to the comparable variables in the Crash file. Thus, gross or systematic differences between comparable variables in the two files would indicate likely programming errors.

Generally, agreement of similar variables between the two files is good. For the weather variable, there were significant differences for only nine of the 1,413 matched records. For example, there were three cases coded “no adverse conditions” in the MCMIS Crash file which were coded “Raining” in the Washington PAR data. In the road surface condition variable, only 12 cases had significant differences. The number of differences are not consequential and could be explained by corrections made to one file but not the other.

In the case of light condition, there may be some problems. Table 18 shows the coding of light condition in the MCMIS Crash file and the comparable coding in the Washington PAR file. Note that 43 of the cases coded “dawn” in the Washington data are coded “dark, unknown road lighting” in the Crash file. At the same time, all of the cases coded “dawn” in the Crash file are coded something else in the PAR data, mostly “dusk.” “Dark, lighted” and “dark not lighted” are generally comparable, and 99.4 percent of the cases coded “daylight” in the Crash file are also “daylight” in the PAR file, but there are no cases coded “dusk” in the Crash file. It appears that there is an error in the mapping of the dawn and dusk levels in the PAR file to the Crash file.

**Table 18 Comparison of Coding for Light Condition
in MCMIS Crash File and Washington PAR File**

MCMIS Crash File	Washington PAR File	Total	% of MCMIS Code
Light	Light		
Dark, unknown road lighting	Dark-No Street Lights	1	2.2
	Dark-Street Lights On	1	2.2
	Dawn	43	93.5
	Dusk	1	2.2
Dark, unknown road lighting subtotal		46	100.0
Dark-lighted	Dark-No Street Lights	2	1.5
	Dark-Street Lights On	130	97.7
	Daylight	1	0.8
Dark-lighted subtotal		133	100.0
Dark-not lighted	Dark-No Street Lights	178	95.2
	Dark-Street Lights Off	7	3.7
	Daylight	2	1.1
Dark-not lighted subtotal		187	100.0
Dawn	Dark-No Street Lights	2	8.3
	Daylight	1	4.2
	Dusk	21	87.5
Dawn subtotal		24	100.0
Daylight	Dark-No Street Lights	1	0.1
	Dawn	1	0.1
	Daylight	1010	99.4
	Dusk	2	0.2
	Missing data	1	0.1
	Unknown	1	0.1
Daylight subtotal		1016	100.0
Missing data	Dark-Street Lights On	1	16.7
	Daylight	2	33.3
	Other	2	33.3
	Unknown	1	16.7
Missing data subtotal		6	100.0
Other	Dark-No Street Lights	1	100.0
Other subtotal		1	100.0
Grand Total		1413	

Table 19 shows the comparison of the vehicle configuration as recorded in the MCMIS Crash file and the Washington PAR file. In this comparison, we use the vehicle_type variable in the PAR file. The reader will recall that vehicle type is not captured directly on the police report but, as explained to us by a Washington state official, is derived from the VIN. Since the VIN cannot include trailer information, vehicles with trailers must be identified using other information, possibly the trailer plate number fields from the PAR. In any case, the comparison of configuration as recorded in the Washington PAR file and the MCMIS Crash file shows numerous substantial differences.

The most important difference between the MCMIS Crash file configuration information and the Washington PAR file vehicle_type variable is probably in the coding of tractor-semitrailers. Tractor-semitrailers is one of the most common of the heavy truck configurations, but the table shows that only 28 of 1,413 vehicles are coded tractor-semitrailer in the MCMIS Crash file. There are 575 records coded tractor-semitrailer in the PAR data, but most of those are coded truck and trailer in the Crash file. Similarly, 23 of 122 cases coded as single-unit, 2 axle trucks are coded as truck and trailer, truck tractor, or tractor-semitrailer in the PAR data. Of 106 cases coded single-unit, 3+ axles, 37 are coded as truck and trailer, tractor-semitrailer or truck tractor in the PAR data. Most cases coded bus in the Crash file are also coded with a bus designation in the PAR file, but there are a handful of miscodes among the buses, and there are serious problems with the coding of truck configurations.

Table 19 Comparison of Vehicle Configuration in MCMIS Crash File and Washington PAR File

MCMIS Crash File	Washington PAR File		% of MCMIS Code
Configuration	Vehicle_Type	Total	
Bus(seats >15, including driver)	Bus or Motor Stage	21	36.2
	School Bus	35	60.3
	Truck and Trailer	1	1.7
	Truck Tractor & Semi-Trailer	1	1.7
Bus(seats >15, including driver) Subtotal		58	100.0
Bus(seats 9-15, including driver)	Bus or Motor Stage	8	34.8
	Pickup, Panel Trk, Van LT 10,000	1	4.3
	School Bus	11	47.8
	Truck (Flatbed, Van, etc)	1	4.3
	Truck and Trailer	1	4.3
	Truck Tractor & Semi-Trailer	1	4.3
Bus(seats 9-15, including driver) Subtotal		23	100.0
SUT, 2-axle, 6-tire	Bus or Motor Stage	1	0.8
	Other	2	1.6
	Passenger Car	2	1.6
	Pickup, Panel Trk, Van LT 10,000	33	27.0
	Truck (Flatbed, Van, etc)	61	50.0
	Truck and Trailer	11	9.0
	Truck Tractor	2	1.6
	Truck Tractor & Semi-Trailer	10	8.2

MCMIS Crash File	Washington PAR File	Total	% of MCMIS Code
Configuration	Vehicle_Type		
SUT, 2-axle, 6-tire Subtotal		122	100.0
SUT, 3+ axles	Bus or Motor Stage	1	0.9
	Other	3	2.8
	Passenger Car	1	0.9
	Pickup, Panel Trk, Van LT 10,000	4	3.8
	Truck (Flatbed, Van, etc)	60	56.6
	Truck and Trailer	17	16.0
	Truck Tractor	9	8.5
	Truck Tractor & Semi-Trailer	10	9.4
SUT, 3+ axles Subtotal		106	100.0
Truck trailer	Bus or Motor Stage	5	0.5
	Not Stated	1	0.1
	Other	6	0.6
	Passenger Car	14	1.4
	Pickup, Panel Truck, Van LT 10,000	11	1.1
	School Bus	3	0.3
	Truck (Flatbed, Van, etc)	73	7.2
	Truck and Trailer	268	26.6
	Truck Tractor	28	2.8
	Truck Tractor & Semi-Trailer	523	51.9
	Truck-Double trailer Combs	75	7.4
Truck trailer Subtotal		1007	100.0
Truck tractor (bobtail)	Truck and Trailer	2	33.3
	Truck Tractor	1	16.7
	Truck Tractor & Semi-Trailer	3	50.0
Truck tractor (bobtail) Subtotal		6	100.0
Tractor/semitrailer	Truck and Trailer	8	28.6
	Truck Tractor	1	3.6
	Truck Tractor & Semi-Trailer	16	57.1
	Truck-Double trailer Combs	3	10.7
Tractor/semitrailer Subtotal		28	100.0
Tractor/double	Other	1	1.7
	Truck (Flatbed, Van, etc)	3	5.1
	Truck and Trailer	11	18.6
	Truck Tractor & Semi-Trailer	10	16.9
	Truck-Double trailer Combs	34	57.6
Tractor/double Subtotal		59	100.0
Unknown heavy truck>10,000	Truck and Trailer	1	100.0
Unknown heavy truck>10,000 Subtotal		1	100.0
Missing data	Passenger Car	1	33.3
	Truck (Flatbed, Van, etc)	1	33.3
	Truck Tractor & Semi-Trailer	1	33.3
Missing data Subtotal		3	100.0
Grand Total		1413	

Some of the problems may be related to the specific period selected for evaluation. The levels for the configuration variable in the Crash file changed in 2000. The bus level in the configuration was split into two types, buses with seats for 9-15 and buses with seats for 16 or more, including the driver. The transition from the previous variable definitions to the new ones may have generated some of these problems. Also the fact that Washington generates vehicle_type using the VIN may also contribute to the problem, though it must be pointed out that the distribution of vehicle_type in the Washington PAR data is much more plausible than that in the MCMIS Crash file. It is exceedingly unlikely that only 28 of 1,413 vehicles were tractor-semitrailers. But the source of the problem is unknown.

6. Summary and Discussion

Evaluation of reporting from Washington to the MCMIS Crash file was complicated because certain key information was not available. Qualifying vehicles—medium and heavy trucks and buses—can be readily identified in the Washington crash file. But the Washington PAR file does not include information on whether an injured person was transported for medical attention or whether a vehicle was towed due to disabling damage. Because of these omissions, it is not possible to identify in the PAR data all the specific cases that qualified for reporting to the MCMIS Crash file. However, it was possible to derive, based on the experience of other states, an estimate of the total number of records that should have been reported. In addition, it was also possible to identify specific cases that fell into categories with a very high probability of being reportable. In particular, all crashes with a qualifying vehicle and a fatality must be reported. And the experience of other states has shown the virtually all crashes with an A-injury and around 90 percent of crashes with a B-injury must be reported. Accordingly, it was possible to evaluate the level of reporting overall, and to identify certain factors that were associated with low rates of reporting for the high-probability subset.

Washington reported 1,493 crash involvements for 2003 to the MCMIS Crash file. While Washington does not include all the information needed to specifically identify reportable crashes, qualifying vehicles can be identified and the Washington PAR file does include a crash severity variable that can be used to estimate the number of reportable cases. Three other states—Missouri, North Carolina, and Ohio—include all the information needed to identify crash involvements that qualify for reporting. These distributions can be used as reference distributions to estimate the number of reportable involvements from Washington. Based on the experience of other states, Washington uploaded to the MCMIS Crash file between about 38 percent and 54 percent of the total number of involvements that should have been reported. Reporting rates varied by crash severity, with the more serious involvements reported at a higher rate than less serious. About two-thirds of reportable fatal involvements were reported, with about 43 percent of crashes with lesser injury severities.

To evaluate factors associated with low reporting rates, it was necessary to match the cases reported to the Crash file with the original records in the Washington PAR data. A hierarchical matching procedure was employed and 1,413 (94.6 percent) of the 1,493 reported records were matched to the original record in the PAR data.

Evaluation of factors associated with reporting occurred in two stages. If a police officer recognizes a crash as reportable, he completes the Commercial Motor Carrier (CMC) section of a supplemental crash report. (This supplemental crash report is also used to record other vehicles when three or more vehicles are involved in a crash.) The CMC data is captured in a supplemental data set that is part of the Washington PAR file. The first stage of evaluating factors that affect reporting was to try to determine why some records in the CMC were reported and others were not. The second stage of evaluating reporting was to identify the factors that affected whether a police officer recognized a reportable case and thus filled out the CMC data.

In 2003, there were 2,519 records in the CMC supplemental file. Only about half of these records, 1,228, were reported to the Crash file. However, not all the records in the CMC data qualified for reporting to the Crash file, based on the severity of the crash. While it is not possible to unambiguously classify all the records in the CMC file as either reportable or not, (because of the lack of information on whether injured persons were transported for treatment, as described above), it is possible to identify groups of cases that are reportable and groups that are not reportable. This effort is assisted by the availability of a variable in the CMC data that captures whether any vehicle was towed, part of the reporting criteria for the MCMIS Crash file. Of the 1,241 definitely reportable cases in the CMC, 990 or 79.8 percent, were reported. In contrast, of the 1,000 cases that were classified as not reportable, 139, or 13.9 percent were reported.

Generally, it appears that cases in the CMC data that should be reported are in fact reported, while those that do not qualify for reporting are not. However, there are large numbers of reportable cases that are overlooked, and a significant number of non-reportable cases that are nonetheless reported.

Once the data are in a computerized record, it should be fairly straightforward to extract the appropriate cases and upload them to the MCMIS Crash file. It is possible that other means are used to identify reportable cases, however. We attempted to identify factors that affected reporting rates from the CMC data, but were unable to determine significant associations. The bus vehicle type was underreported at a higher rate than other vehicle types, but overall no significant factors were identified. To identify significant factors would require a review of the specific system used to extract cases from the CMC data. It does appear that the CMC supplemental data is central to reporting to the Crash file. Almost all cases that are reported also have a record in the supplemental data, while very few reportable cases that are not reported have a CMC record.

The second stage of evaluation was to identify factors that affected whether officers recognized a reportable crash involvement. To do this, it is necessary to identify specific reportable cases in the Washington PAR data and then compare the involvements that were reported with the ones that were not. As described above, all specific reportable cases could not be identified. But it is possible to identify a subset of involvements that are either certainly or have a high probability of being reportable. Factors affecting reporting can be evaluated for this subset. It is highly likely that the same factors would affect the reporting of cases that could not be identified specifically.

The experience of Missouri, North Carolina, and Ohio showed that crashes with either an A-injury or B-injury were very likely to be reportable, either because an injured person was transported for medical attention or because an involved vehicle was towed due to disabling damage. Around 98 percent of A-injury involvements were reportable, and about 89 percent of B-injury involvements. Accordingly, it is appropriate to evaluate crashes that include either a fatal, A-, or B-injury. There were 918 such involvements to evaluate. Of these, 40.2 percent were reported, precisely in the estimated range of overall reporting.

Several factors clearly affect the probability that a qualifying crash involvement is reported in Washington. Crashes involving fatalities are much more likely to be reported, with over two-thirds of fatal crashes correctly reported. A- and B-injury crashes were reported at significantly lower rates, 40.9 percent and 37.8 percent respectively. Even if one considers that only an estimated 89 percent of B-injury crashes are reportable, the actual rate of reporting is much lower. So, reporting officers are more likely to recognize the most serious crashes as reportable, and much less likely to recognize lower injury severities.

Crashes involving large trucks are also more likely to be reported. Two-thirds of reportable crashes involving tractor-semitrailers were reported, and 90.3 percent of tractor-doubles involvements were. In contrast, only 17.6 percent of the reportable involvements of single-unit trucks were reported. Buses were reportable at a lower rate than trucks, but interestingly one-third of school bus involvements were reported, but only 9.5 percent of other reportable bus involvements. One possible explanation for this finding is that many of the non-school buses were transit buses and the officers did not realize that the vehicle type criteria applies to all buses.

Officers are much more likely to report the involvements of vehicles with out-of-state licenses than those in-state. Over half of the involvements of out-of-state vehicles were reported, compared with just over a third of in-state. It is possible that some officers are under the impression that only vehicles in interstate commerce are of interest for the national file.

There are also significant variations in reporting rates by reporting agency and county. Crashes covered by the Washington State Police are much more likely to be reported than those policed by county sheriffs or local police departments. This variation could be accounted for either by

intensity of training or frequency of experience, in that covering traffic crashes may be a less frequent event for local departments than the state police.

We also attempted to evaluate the quality of the data reported. Only two factors related to quality could be evaluated. The first is missing data rates. Records with high rates of missing data cannot contribute to an analysis. The second factor evaluated was the consistency of the record in the MCMIS Crash file with the same information in the Washington PAR data. This evaluation can uncover errors in translating variables from the codes used in the PAR data to the codes in the Crash file.

For most variables of interest, missing data rates were very low. For the basic variables that describe the crash—date, time, location—the rates were essentially zero. Some of the other variables, such as weather, road access, and trafficway, had nonzero but still very low rates. Unfortunately, the body type variable was missing in 93.5 percent of the cases. Data on hazardous materials was also missing at high rates, other than the numeric codes that identify the class and UN number. The variable that indicates whether the vehicle displayed a hazardous materials placard was missing in 97.3 percent of cases. No doubt officers simply leave the variable blank if no placard is displayed. But even considering the few cases that were recorded with a placard, hazmat release was not coded in 93.3 percent and the name of the material was not coded in 86.7 percent.

There also were a number of inconsistencies between the records in the PAR file and the same records in the MCMIS Crash file. For some variables, the inconsistencies amounted to a relative handful, and probably are explained by records being corrected in one file but not in the other. However there appears to be at least one variable for which there is likely an error in mapping of code values. For the light condition variable, it appears that the code levels for dawn and dusk are handled improperly. Most cases coded as dawn in PAR data are coded as dark, unknown road lighting in the crash file. And most cases coded dusk in the PAR file are coded as dawn in the Crash file. It should be a relatively simple matter to correct the computer code that makes the translation.

On the other hand, there are serious inconsistencies between the vehicle type variable in the PAR data and the configuration variable in the MCMIS Crash file. Only 28 of the 1,413 matched cases in the MCMIS Crash file are coded as tractor-semitrailers. Tractor-semitrailers are a very common truck combination type, so this number is certainly incorrect. The vehicle type variable in the PAR data identify 575 tractor-semitrailers, but most of those are coded as truck and trailer in the Crash file. Significant numbers of cases coded as single-unit trucks in the MCMIS Crash file are coded as a combination vehicle in the PAR data. This comparison only points up inconsistencies—it is not possible to determine which or if either coding is correct. But there is a serious inconsistency in this important area.

This analysis has identified a number of areas in which the reporting rates and quality of data reported could be substantially improved. It appears that reporting officers are not accurately recognizing reportable cases. Smaller vehicles, buses, and less serious crashes all are areas for substantial improvement. Similarly, in-state vehicles frequently escape reporting. It appears that many officers have the impression that the reporting is just for big trucks in interstate commerce in the most serious crashes. If the State continues to rely on the recognition of reporting officers, this will have to be addressed.

It also appears that some part of the reporting problem could be addressed by improvements to the crash form and certain programming changes. It would probably greatly assist the reporting officer, and certainly the people responsible for identifying reportable cases in the computerized record, if the full reporting criteria were captured on the main traffic collision reporting form. Including variables to capture whether an injured person was transported for treatment and whether a vehicle was towed due to disabling damage would help the officer recognize the appropriate crashes for the supplemental data. It would also allow the computer programmer to write a simple filter to identify cases for reporting. In addition, the problem with the light condition variable and, especially, the inconsistency between the description of the vehicle in the PAR data and the MCMIS Crash file should be addressed.

References

1. Blower, D., and Matteson, A., *Evaluation of the Motor Carrier Management Information System Crash File, Phase One*. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. March 2003. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.
2. Blower, D., and Matteson, A., *Patterns of MCMIS Crash File Underreporting in Ohio*. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. August 2003. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.
3. Blower, D., and Matteson, A., *Evaluation of Missouri Crash Data Reported to MCMIS Crash File*. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. January 2004. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.
4. Blower, D., and Matteson, A., *Evaluation of Michigan Crash Data Reported to MCMIS Crash File*. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. September 2004. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.

5. Blower, D., and Matteson, A., *Evaluation of Florida Crash Data Reported to MCMIS Crash File*. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. December 2004. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.
6. Matteson, A., and Blower, D., *Evaluation of California Crash Data Reported to MCMIS Crash File*. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. February 2005. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.
7. Green, P.E., and Blower, D., *Evaluation of New Jersey Crash Data Reported to MCMIS Crash File*. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. February 2005. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.
8. Matteson, A., and Blower, D., *Evaluation of North Carolina Crash Data Reported to MCMIS Crash File*. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. May 2005. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.
9. Federal Motor Carrier Safety Administration (FMCSA) MCMIS Crash File Documentation, April, 2005.
10. State of Washington, *Police Traffic Collision Report Instruction Manual*, January 1997.
11. State of Washington, *Police Traffic Collision Report*, revision December 1997.


**Appendix A: Variables Used for Washington PAR Data
to Identify a MCMIS-Reportable Crash**

MCMIS Reporting Criteria	Implementation in Washington PAR Data
<p>Truck with GVWR over 10,000 or GCWR over 10,000</p>	<p>Vehicle Type was the primary variable available for selecting trucks meeting the MCMIS criteria. According to state officials this variable is not entered by the reporting officer, but is calculated from the Vehicle Identification Number (VIN).</p> <p>To define eligible trucks, the standard Vehicle Type codes were selected, in combination with Vehicle Commercial Class and Commercial Vehicle Configuration.</p> <p>Eligible trucks were identified as follows:</p> <p>Vehicle_type = 3 (Truck (flatbed, van,etc.)) 4 (Truck and trailer) 5 (Truck tractor) 6=(Truck tractor and semitrailer) 7=(Truck – double trailer combinations)</p> <p>Additional trucks were identified by selecting all cases with non-bus vehicle type codes that had Vehicle Commercial Class = 2(single vehicle with GVWR GE 26,001 lbs., or any school bus), or 3 (single vehicle LE 26,000 lbs. designed for GE 16 passengers, or any hazardous placarded vehicle). The Commercial Vehicle Configuration variable was examined to determine if these cases were trucks or buses. All of the cases were designated as trucks.</p>
<p>or Bus with seating for at least nine, including the driver</p>	<p>The following codes were used to identify eligible buses:</p> <p>Vehicle_type = 10 (Bus or motor stage) 11 (School bus)</p> <p>It is also possible that some other vehicles, such as vans, could qualify as buses. They would qualify if they have seats for nine or more passengers and are used for transporting passengers, and not personal transport. However, since number of seats was not available and a description of vehicle use did not appear to be reliable, the decision was made not to</p>


MCMIS Reporting Criteria	Implementation in Washington PAR Data
	include any other vehicles as qualifying buses. As noted above, all of the additional cases (with non-truck and non-bus vehicle type codes) and with Vehicle Commercial Class = 2 or 3 were examined. All cases had a truck Commercial Vehicle Configuration code, so no additional buses were identified.
or Vehicle displaying a hazardous materials placard	A variable titled Hazardous Materials was included in the all-vehicle section of the crash report. Thus, vehicles displaying a hazardous materials placard were defined as: Haz_mat_indicator =1 (Hazmat transported – not released) or 2 (Hazmat transported –released)
AND	
at least one fatality	At the driver, passenger, pedestrian, and pedalcyclist levels, the Washington PAR file includes an injury severity variable coded as follows: Injury_severity = code 0 (unknown), code 1 (no injury), code 2 (dead at scene), code 3 (dead on arrival), code 4 (died at hospital), code 5 (disabling injury), code 6 (non-disabling, evident injury), code 7(possible injury), code 8 (non-traffic injury), and code 9 (non-traffic fatality). Based on these variables, the most severe injury in the accident was determined. A fatal accident was defined as: Most_severe_injury= code 2, 3, or 4

MCMIS Reporting Criteria	Implementation in Washington PAR Data
<p>or at least one person injured and transported to a medical facility for immediate medical attention</p>	<p>The calculated most_severe_injury variable discussed above was also used to identify injury accidents. However, from the available variables it was not possible to determine if an injured person was transported for medical care. Therefore, an alternative method of distinguishing transported from non-transported injured persons was used. Since persons with Type A (incapacitating) or Type B (evident, but not incapacitating) injuries would likely require medical treatment, accidents involving an A or B-injured individual were considered to be "injury, transported" accidents.</p> <p>Thus, an injury/transported accident was defined as a crash with: Most_severe_injury= code 5 (disabling injury) or code 6 (non-disabling, evident injury).</p>
<p>or at least one vehicle towed due to disabling damage</p>	<p>Consultation with state officials verified that the 2003 Washington crash data file does not contain variables indicating vehicle tow status or degree of vehicle damage for all vehicles involved in the collision. There are plans to add such a tow variable to the crash form for future data years. At the current time the only variable related to tow status appears on the commercial carrier supplemental form, and thus cannot be used to identify the universe of towed vehicles. Thus, for this evaluation, reportable cases based on accidents involving a tow/disabled vehicle could not be determined.</p>

Appendix B: Washington Crash Report Form



**STATE OF WASHINGTON
POLICE TRAFFIC
COLLISION REPORT**



1591971

REPORT NO. 2241376 ▲

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CASE #										
LOCAL AGENCY CODING										
TOTAL # OF UNITS										
OBJECT STRUCK										

INTERSTATE	<input type="checkbox"/>	CITY STREET	<input type="checkbox"/>	FIRE RESULTED	<input type="checkbox"/>
STATE ROUTE	<input type="checkbox"/>	OTHER	<input type="checkbox"/>	STOLEN VEHICLE	<input type="checkbox"/>
COUNTY RD	<input type="checkbox"/>	PRIVATE WAY	<input type="checkbox"/>	HIT & RUN	<input type="checkbox"/>

DATE OF COLLISION	M M	D D	Y Y	Y Y	Y Y	TIME (2400)	COUNTY #	MILES	N <input type="checkbox"/>	E <input type="checkbox"/>	IN <input type="checkbox"/>	CITY #
									S <input type="checkbox"/>	W <input type="checkbox"/>	OF <input type="checkbox"/>	

ON (PRIMARY TRAFFIC WAY)	INTERSECTION	<input type="checkbox"/>	NON-INTERSECTION	<input type="checkbox"/>	BLOCK NO.		
					MILE POST		

DISTANCE	MILES	<input type="checkbox"/>	N	E	OF (REFERENCE OR CROSS STREET)
	FEET	<input type="checkbox"/>	S	W	

UNIT 01 MOTOR VEHICLE PEDAL CYCLE DAMAGE THRESHOLD MET PHONE

LAST NAME

FIRST NAME **MIDDLE INITIAL**

STREET

CITY **ST** **ZIP**

DRIVER'S LICENSE # **STATE** **SEX** **D.O.B.** MMDDYYYY

ON DUTY **STATUS** **AIRBAG** **RESTR.** **EJECT** **HELMET USE** **INJURY CLASS** **NATURE OF INJURIES**

LICENSE PLATE # **STATE** **VIN#**

TRAILER PLATE # **STATE** **TRAILER PLATE #** **STATE**

VEH. YEAR **MAKE** **MODEL** **STYLE** **TOWED BY**

REGISTERED OWNER INFO.

LIABILITY INSURANCE IN EFFECT **INSURANCE CO & POLICY #**

VEHICLE LEGALLY STANDING YES NO **CITATION #** **CHARGE**

UNIT 02 MOTOR VEHICLE PEDAL CYCLE PEDESTRIAN PROPERTY OWNER DAMAGE THRESHOLD MET PHONE

LAST NAME

FIRST NAME **MIDDLE INITIAL**

STREET

CITY **ST** **ZIP**

DRIVER'S LICENSE # **STATE** **SEX** **D.O.B.** MMDDYYYY

ON DUTY **STATUS** **AIRBAG** **RESTR.** **EJECT** **HELMET USE** **INJURY CLASS** **NATURE OF INJURIES**

LICENSE PLATE # **STATE** **VIN#**

TRAILER PLATE # **STATE** **TRAILER PLATE #** **STATE**

VEH. YEAR **MAKE** **MODEL** **STYLE** **TOWED BY**

REGISTERED OWNER INFO.

LIABILITY INSURANCE IN EFFECT **INSURANCE CO & POLICY #**

VEHICLE LEGALLY STANDING YES NO **CITATION #** **CHARGE**

OFFICER'S NAME (PRINT) **BADGE OR ID #** **AGENCY**

2241376

PAGE 01 OF

PART A 3000-345-159 R (12/97)

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STATE OF WASHINGTON
POLICE TRAFFIC
COLLISION REPORT



1591972

CORRECTION

REPORT NO.

CASE #

ADDITIONAL PERSONS INVOLVED (PASSENGERS AND/OR WITNESSES ONLY)

NAME (LAST, FIRST, MIDDLE INITIAL)											
ADDRESS & PHONE #										SEX	D.O.B. MMDDYYYY
PASSENGER <input type="checkbox"/>	WITNESS <input type="checkbox"/>	UNIT #	SEAT POS.	AIRBAG	RESTR.	EJECT	HELMET USE	INJURY CLASS	NATURE OF INJURIES		
NAME (LAST, FIRST, MIDDLE INITIAL)											
ADDRESS & PHONE #										SEX	D.O.B. MMDDYYYY
PASSENGER <input type="checkbox"/>	WITNESS <input type="checkbox"/>	UNIT #	SEAT POS.	AIRBAG	RESTR.	EJECT	HELMET USE	INJURY CLASS	NATURE OF INJURIES		
NAME (LAST, FIRST, MIDDLE INITIAL)											
ADDRESS & PHONE #										SEX	D.O.B. MMDDYYYY
PASSENGER <input type="checkbox"/>	WITNESS <input type="checkbox"/>	UNIT #	SEAT POS.	AIRBAG	RESTR.	EJECT	HELMET USE	INJURY CLASS	NATURE OF INJURIES		
NAME (LAST, FIRST, MIDDLE INITIAL)											
ADDRESS & PHONE #										SEX	D.O.B. MMDDYYYY
PASSENGER <input type="checkbox"/>	WITNESS <input type="checkbox"/>	UNIT #	SEAT POS.	AIRBAG	RESTR.	EJECT	HELMET USE	INJURY CLASS	NATURE OF INJURIES		

DIAGRAM

	<p>INDICATE NORTH BY ARROW</p> <div style="text-align: center;"> </div>
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NARRATIVE

I CERTIFY (DECLARE) UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF WASHINGTON THAT THE FOREGOING IS TRUE AND CORRECT. (RCW 9A.72.085)

INVESTIGATING OFFICER'S SIGNATURE _____	UNIT OR DIST. DET _____	DATED _____	PLACE SIGNED _____
APPROVED BY _____	DATE _____		
BADGE OR ID # <input type="text"/>	ORI # <input type="text"/>	TIME POLICE DISPATCHED <input type="text"/>	TIME POLICE ARRIVED <input type="text"/>

PART B 3000-345-160 R (9/97)

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SUPPLEMENTAL POLICE TRAFFIC COLLISION REPORT



013197

CORRECTION REPORT NO.

CASE #

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COMMERCIAL MOTOR CARRIER ANY VEHICLE TOWED? INTERSTATE INTRASTATE

UNIT # USDOT ICC # VEHICLE TYPE CARGO BODY TYPE

CARRIER NAME

CARRIER ADDRESS

CITY ST ZIP

NAME SOURCE # AXLES GWR PLACARD NAME IF NO NUMBER

ADDITIONAL UNITS

UNIT # MOTOR VEHICLE PEDAL-CYCLE PEDESTRIAN PROPERTY OWNER DAMAGE THRESHOLD MET PHONE

LAST NAME

FIRST NAME MIDDLE INITIAL

STREET NEW ADDRESS

CITY ST ZIP

DRIVER'S LICENSE # STATE SEX D.O.B. MMDDYYYY

ON DUTY STATUS AIRBAG RESTR. EJECT HELMET USE INJURY CLASS NATURE OF INJURIES

LICENSE PLATE # STATE VIN#

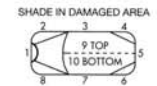
TRAILER PLATE # STATE TRAILER PLATE # STATE

VEH. YEAR MAKE MODEL STYLE TOWED BY

REGISTERED OWNER INFO.

LIABILITY INSURANCE IN EFFECT INSURANCE CO & POLICY #

VEHICLE LEGALLY STANDING YES NO CITATION # CHARGE



UNIT # MOTOR VEHICLE PEDAL-CYCLE PEDESTRIAN PROPERTY OWNER DAMAGE THRESHOLD MET PHONE

LAST NAME

FIRST NAME MIDDLE INITIAL

STREET NEW ADDRESS

CITY ST ZIP

DRIVER'S LICENSE # STATE SEX D.O.B. MMDDYYYY

ON DUTY STATUS AIRBAG RESTR. EJECT HELMET USE INJURY CLASS NATURE OF INJURIES

LICENSE PLATE # STATE VIN#

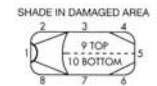
TRAILER PLATE # STATE TRAILER PLATE # STATE

VEH. YEAR MAKE MODEL STYLE TOWED BY

REGISTERED OWNER INFO.

LIABILITY INSURANCE IN EFFECT INSURANCE CO & POLICY #

VEHICLE LEGALLY STANDING YES NO CITATION # CHARGE



I CERTIFY (DECLARE) UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF WASHINGTON THAT THE FOREGOING IS TRUE AND CORRECT. (RCW 9A.72.085)

INVESTIGATING OFFICER'S SIGNATURE UNIT OR DIST DET DATED: PLACE SIGNED

BADGE OR ID # ORI # APPROVED BY DATE PAGE OF

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