THE "AIS-0" CONUNDRUM: THE COMPLEXITIES OF IDENTIFYING THE UNINJURED IN NASS-CDS

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ABSTRACT

"Uninjured" occupants are part of many NASS-CDS safety analyses. However, the issue of precisely identifying "uninjured" persons in NASS-CDS is complex. There is no such severity code as "AIS-0". Neither the AIS-90 or NASS-93 manuals contain codes for persons whose medical records are examined and who have been found to have no codeable injuries. As a consequence, there is no such thing as "MAIS 0" defined by the AIS and as a result there is no way to query the NASS-CDS data on the NHTSA website for MAIS=0 injuries. The more appropriate statement about persons without AIS coding would be that the person either sustained no codeable NASS/AIS injuries, or was not coded at all. However, there is no data "flag" to identify which one is which.

This paper examines the approximately 90,000 vehicles in CDS from 1997 through 2007 and their occupants to illustrate the issues with identifying uninjured persons. More than 1/3 of these vehicles do not qualify under CDS rules for occupant coding. Therefore, AIS severity or MAIS codes cannot be used for the occupants of these vehicles, even if the codes appear in the data base as "blank" or "0".

In addition, for the approximately 90,000 occupants who do qualify for AIS/NASS coding (1997 through 2007) 35% (32,000) occupants have no AIS/NASS codes. A data run that relies on the MAIS code in the occupant file, (not the injury file), (which may be blank or zero) may assume these 32,000 occupants are "uninjured" rather than having "no codeable injury. This may result in a substantial overestimate of actual occupants without injury. This can seriously impact evaluation of safety interventions.

This paper identifies 5 occupant groups and several methods that can be used to help identify which of the 35% of occupants qualifying for AIS coding but without AIS codes are most likely to be uninjured. Issues created by using both the police KABCOU and AIS/NASS scales in mixed analyses to identify uninjured persons are also discussed. This paper is intended to be a general resource for researchers conducting safety analyses in NASS CDS that include uninjured persons.

INTRODUCTION

There is no "AIS=0" severity code defined in either the AIS-90/98 injury coding books used for trauma registry coding or in the NHTSA NASS-CDS 1993/2000 injury coding books used for coding injuries in NASS-CDS.(1,2) AIS severity levels of 1 through 6 and 9 for AIS and 1 through 7 for NASS-93 are defined. There is no injury code in either system to identify a person whose injury records have been reviewed and who was found to not have any codeable AIS / NASS injury. The AIS/NASS injury coding manuals alone do not identify occupants with no codeable injuries.

NASS-93/2000 Only In this paper we focus on the NHTSA NASS-CDS version of the AIS; as there are significant differences between AIS-90/98 and NHTSA's NASS-CDS injury coding systems we will not address the AIS-90/98 system further.(3,4,5) In addition, because there are significant differences between the NASS-CDS 1988 injury coding system (used 1988-1992) and the NASS-CDS 1993/2000 system, we will address only the NASS-CDS 1993/2000 system used for NASS-CDS data between 1993 and 2010.(6,7,8)

No NASS Injury The terms "uninjured" and AIS/NASS=0 are not equivalent. An individual whose injury information has been examined by a NASS coder and found to have no AIS/NASS injury is exactly that - there is no codeable AIS/NASS injury. That does not mean they are uninjured. A number of conditions and injuries that the lay public would consider quite serious fall into this category including electrocution, hypothermia and drowning. The AIS/NASS is not an outcome scale; therefore a person can have no codeable AIS/NASS injury and be deceased.(1)

The NASS-CDS injury coding manual states that "NASS does not code unsubstantiated injuries". However, it does allow persons to be coded as

"uninjured" who may not be. On page 15 of the NASS Injury Coding manual it states "Presumption of No Injury" - that if the Police Accident Report (PAR) is blank for KABCO injury severity and the person was at the scene, the AIS/NASS coder should code "no injury". To complicate issues further, it also states that if the PAR codes an individual with "complaint of pain" it is not necessary to do any AIS/NASS injury coding for the occupant.(2) As we show later, this likely causes many low severity AIS/NASS injuries to be missed.

Source of Injury Information

NASS CDS injury coding is not carried out to treat persons or evaluate medical care. Its purpose is to locate injuries and identify their type and severity. Consequently the rules for what source of injury information can be used are relaxed compared to AIS-90/98. As the NASS-CDS Coding Manual indicates, NASS-CDS coders may rely solely on injuries described by "unofficial" sources such as an interviewee (not necessarily the occupant), a lay corner (often a police officer), as well as EMS personnel or the police.(9) (page OI05) Verification by X-Ray, CT or MRI does not appear to be required for unofficial sources. This is different from the AIS system where verification of injuries is emphasized.(1)

Persons reviewed for AIS/NASS Coding

There is no flag in NASS-CDS that identifies persons whose injury information was reviewed by the NASS-CDS injury coders but who were found to have no codeable AIS/NASS injuries. However, the individuals whose records were reviewed can be partially determined by using NASS-CDS "missing record" rules. These rules are enumerated in the NASS-CDS Analytic User's Manual associated with each year's data. The following section discusses methods to identify occupants with no codeable AIS/NASS injuries in NASS-CDS.

MAIN BODY

Methodology

We used crash data from eleven years (CY 1997-2007) of the National Highway Traffic Safety Administration's (NHTSA), National Automotive Sampling System (NASS), Crashworthiness Data System (CDS). NASS-CDS is "a probability sample of all police reported crashes in the U.S."(10) Each year contains approximately 4,000 crashes in which a late model year (+1 / -2 model years around sampling calendar year starting in 1996) light passenger vehicle sustained sufficient damage to require towing from the scene. We used the SAS version of the files. There are several file types available that handle variable values differently.

The CDS sampling frame employs information from Police Accident Reports (PARS) to determine whether the crash is included in CDS or not. (No investigation has been done at the time the crash is selected). If persons are marked "uninjured" by the police and no later AIS coding is conducted, the occupants will remain marked in the police injury scale (KABCO) code as "uninjured". Note that the ANSI standard for KABCO (from which NHTSA derives the version they use) does not include any "uninjured" category, instead choosing to call those crashes "property damage only".(11)

Rules for Injury Coding Not all crashes selected for inclusion in the sample are subject to injury coding. "Missing record" rules identify which occupants are subject to complete injury coding. The following conditions must be met.(12)

1. The vehicle must be "applicable" (meaning a late model light vehicle with a type code of 1 to 49)
2. The vehicle must be towed from the scene due to damage
3. The Occupant Assessment (OA) file must show that the number of injuries recorded by the AIS/NASS coders is greater than zero. Since there is no zero injury code, this means that a person with zero codeable injuries has no number of injury codes, and therefore would not have an Occupant Injury (OI) file. This might be considered a "catch 22".

The above missing data rules are not adequate to identify which persons had no codeable AIS/NASS injuries. This situation is compounded by analysis programs that might change blanks or character variables into numeric "zeros" that could be interpreted as zero number of injuries.

Air Bag Deployment

During the introduction of frontal airbags, NASS-CDS altered the missing record rules so that more data was collected for vehicles with airbag deployment whether the vehicle was "applicable" or not. Starting with 2003, these additional airbag cases no longer qualified for additional coding. As a result, the number of vehicles being inspected dropped. However, the rules for occupant injury missing records were not altered during these changes.

Inspected Vehicles

The data used in this paper is based on the above rules, but included the additional NASS-CDS rule that the vehicle be inspected. Inspected vehicles are

the only vehicles guaranteed under CDS rules to have complete record information in the following CDS component files - Accident, Event, General Vehicle, Exterior Vehicle, Interior Vehicle, and Occupant Assessment.(12) All occupants in applicable, towed, inspected vehicles qualify for injury coding (but may or may not receive it). As stated in the NASS-CDS Analytic User's Guide "at least one of each record type will be required for a crash which includes a towed, inspected, CDS applicable vehicle involved in a CDC (Collision Deformation Classification) applicable event (or CDC is blank) with an occupant having a recorded injury".(12)

Occupant Compartment Intrusion

Any analysis that requires occupant compartment intrusions by necessity must use only inspected vehicles. CDS measures intrusions only above a certain magnitude (generally 3cm). Intrusions less than that magnitude are not recorded. Therefore, to compare vehicles with and without intrusions, it is necessary to identify all the inspected vehicles, then subtract the subset with measured intrusions to determine the subset of inspected vehicles that did not have intrusion in the location of interest. Otherwise there will be no correct accounting for vehicles without any intrusion.

We compiled all NASS-CDS occupants for years 1997-2007 from applicable, towed, inspected vehicles. The data presented is based on this group.

NHTSA CDS Query Portal The operation of the NASS-CDS online query portal is consistent with the above sections. Requesting results for MAIS=0 produces the warning "The value should be a number 1-7". Likewise, requesting results for injuries with AIS/NASS code=0 produces the result "Cases Found: 0".(13) However, researchers running their own copies of the datafiles using database programs may obtain erroneous results, depending on how they have set up their databases.

Results

Identifying Occupants Qualifying for AIS/NASS Coding There are 89,996 vehicles in CDS from 1997 through 2007. Of these vehicles 58,026 (64%) qualify as applicable, towed, inspected vehicles, whose occupants qualify for (but may or may not receive) injury coding. The 89,996 number is an unweighted (actual vehicle count) the "weighted" national estimate equivalent is 49,501,785. The issue we are exploring in this paper is related to the actual unweighted cases that are sampled, not the national estimate, and therefore we report only numbers based on the unweighted values from this point forward.

The result of the above is that AIS/NASS injury data does not exist for the other 36% of the vehicles. These vehicles did not qualify for occupant AIS/NASS coding. We confirmed this with a data run - none of the occupants in the 36% of vehicles had Occupant Assessment (OA) records or Occupant Injury (OI) records.

The above 58,026 qualifying, inspected and towed vehicles contain 90,556 occupants who qualify for AIS/NASS coding. However 78 vehicles have no occupants with Occupant Assessment files, and therefore per CDS rules, none of those occupants will receive AIS/NASS coding, leaving 57,948 vehicles with occupants that qualify for coding.

Sixty-five percent of the occupants (n=58,757) in these 57,948 vehicles have at least one AIS/NASS injury code (the maximum number of injury codes for any one occupant was 59).

Occupants without AIS/NASS codes The remaining 35% of occupants (n=31,799) in qualifying vehicles have no AIS/NASS codes. The breakdown of these occupants are as follows:

a. 1,193 Unknown if Injured
b. 4,663 Injured but unknown severity
c. 25,943 Number of Injuries (InjNum) = zero

We confirmed that all these occupants, in accordance with CDS's missing records rules, do not have an OI file or any AIS/NASS injury codes recorded. Occupant types "a" and "b" types cannot be said to be "uninjured". This leaves the 25,943 occupants with InjNum=0. The question is whether these occupants are actually uninjured or not.

MAIS

CDS provides a pre-computed one-per-occupant Maximum AIS/NASS code. The computation for this is listed in the Analytic Users Guide. It is correctly computed so that levels 1-6 take precedence over levels 7 (injured, but unknown severity) and 9 (unknown if injured). The Analytic User's Manual states that an InjNum value of "00" indicates that the person was "uninjured" and will be allocated a MAIS=0. However, this statement is not supported anywhere in the injury coding manual or NASS-CDS Coding Manual. Note that the value zero-zero "00" is not possible numerically; and in fact the SAS files are supplied with InjNum as a "character" variable, in which case "00" is a possible character value (InjNum in the SAS dataset also includes values of 1-59, 97 and U). Note that changing the properties of this variable to numeric would eradicate the "U"

values (some database software will convert character values to “blanks”, other database programs will convert blanks to “zeros”) - and that the code “00" would be converted to a plain numeric “0". This makes it indistinguishable from values that were converted from “U” or blanks. Occupants coded with “blank”, U or 97 values are not uninjured. Compounding this confusing situation, the SAS dataset, even in character format does not contain the stated “00" values; only “0". This brings into question whether it is reliable to use MAIS to detect persons with only a “0" indicating no codeable AIS/NASS injuries. It is possible that a number of the “zero” values are artifacts as described above, and not actual entered data. We recommend that NHTSA change the CDS coding rules for InjNum so that a value of 98 indicates that the person’s medical records were examined and they were found to have no codeable injuries.

Occupants with InjNum=0 and MAIS=0

These 25,943 occupants (type b above) are the most probable to have no codeable AIS/NASS injuries. However, we identified the following groups within the 25,943 occupants using other available CDS variables who are most likely NOT "uninjured". Our categorization of these groups is based on work we have done with state crash and injury data (11,12,13,14).

1. 34 =Died - Deaths were identified using Treatment=Fatal or Fatal ruled disease, Time to Death not zero, or Kabcou=fatal. AIS/NASS is not an outcome scale, so it is possible to die and have no AIS/NASS score. This can also occur because the person was dead at the scene or was not admitted to a medical facility so no medical record was created to code from. The death also could be due to disease or drowning. This highlights the distinction between “No codeable AIS/NASS”and “uninjured”.
2. 916=Received Treatment - These occupants either received treatment of some type or had treatment types of unknown. These occupants had treatment codes of Hospitalized, Treatment at scene, Treatment later, Treatment-Other, Transported to a medical facility-Unknown if Treated, and Unknown.
3. 2319=Transported but released but with a non-zero KABCO score. The non zero KABCO score is an indication of injury, along with the transport.
4. 2639=Non zero Kabcou score. The police coded these occupants with an injury - in the absence of a clear indication that the AIS/NASS coders examined these occupants we believe they should be considered injured.
5. 541=Received Initial Treatment at a Medical Facility - these occupants either received treatment at a medical facility or their treatment was unknown.

The above 5 groups total 6,449 occupants. This is 25% of the 25,943 occupants that are most likely to be “uninjured” with InjNum=0 and MAIS=0 and no AIS/NASS injury codes. It is possible that some of the above individuals received treatment for a medical condition - but that is unknown. The threshold to reach an AIS/NASS severity 1 injury is low (a bruise). On that basis we believe these 5 groups of occupants should not be considered “uninjured”.

Returning to the breakdown of the original 31,799 Occupants without AIS/NASS codes:

a. 1,193 Unknown if Injured
b. 4,663 Injured but unknown severity
c. 6,449 Died, Treated, non-zero KABCO (From groups 1-5)
d. 19,494 Most likely to be uninjured

The use of the original 31,799 occupants would over-estimate persons without any injury by 163% (31,799/19,494). However, this result assumes that the 19,494 occupants of group d above can be confirmed as uninjured.

Test of the Remaining Occupants The remaining 19,494 occupants of the applicable, towed, inspected vehicles have "zero" marked for all the factors used in the last section. It would appear that these persons should be "uninjured". However, a QC check of the NASS data identified cases that disproved this hypothesis. For example, case 2005-04-085 (available online) is an end over end pitch pole roll of an SUV with 3 occupants. The roof is crushed to half height. It is difficult to believe that all three occupants were "uninjured" - not even a NASS-MAIS=1 bruise. Although this is an applicable, towed, inspected vehicle, we note that much of the required "inspection" data is missing for the vehicle (for example occupant seat information that is clearly available from what is shown in the photos). It is possible that this case did not receive the complete investigation or documentation it was supposed to receive and most likely AIS/NASS coding was not attempted and the occupant injury was mistakenly coded as “0" instead of “97=unknown.. This might seem to be an "isolated" case - except it has a weighed value over 1,000 - which means it would dominate thousands of other, possibly more accurately coded cases if NASS-CDS

weighted case values are used. This is because the median NASS-CDS crash weight (RATWGT) for 1997-2007 is 124. Eighty-seven percent (87%) of the approximately 51,000 NASS-CDS crashes from 1997-2007 have case weights less than 1,000. We identified other CDS crashes that appear to have the same coding issue as the example above. We have not yet identified a method to reliably identify these types of occupants so they are not considered "uninjured".

Using KABCO - NASS-CDS contains the police injury KABCO scores for a subset of occupants. However, a major problem with using both the KABCO and AIS/NASS injury systems at the same time is that they do not apply to the same group of occupants. The AIS/NASS is a subset of the occupants with KABCO scores. A national estimate of injured occupants in late model applicable vehicles based on KABCO will produce a different result than a national estimate based on MAIS or AIS/NASS scores. This is because the missing record rules are different for the two groups. Attempting to use the KABCO "uninjured" codes to identify the "uninjured" occupants for an AIS analysis errs unless the KABCO scores are taken only for the applicable, towed, inspected vehicles used with the AIS/NASS coded occupants.

An AIS/NASS=1 injury in KABCO

Another issue with KABCO is that a police rating of "uninjured" is unlikely to accurately distinguish between AIS/NASS=0 or 1 injuries. Severity 1 injuries are very "minor" - for example, code 790402.1 upper extremity contusion can be a bruise of any size (lesion sizes are not considered in NASS until they are higher severity). The data discussed in the next section shows that MAIS severity=1 injuries occur in multiple KABCO categories.

KABCO vs AIS/NASS An important issue with the dual use of KABCO and AIS/NASS is the lack of correspondence at the KABCO "Incapacitating" level. The KABCO definition used by NHTSA for FARS, GES and CDS (as well as many state's crash data) is based on an ANSI standard(10). The highest KABCO level injury (without being dead) is an "Incapacitating Injury". The ANSI standard states "An incapacitating injury is any injury, other than a fatal injury, which prevents the injured person from walking, driving or normally continuing the activities the person was capable of performing before the injury occurred." Injuries do not have to be very acute by AIS/NASS standards to reach this level. For example, a dislocation of the foot joint - which certainly prevents "normal activities" and qualifies as an "Incapacitating injury" is an AIS-1 level injury. ANSI does not define "uninjured" except by exclusion. If none of the other higher injury levels are coded for any person in the crash, then all persons involved in the crash are considered "uninjured" because it is a "property damage only" crash. This is similar to the lack of definition for AIS/NASS=0 severity.

Despite the above, a number of papers appear to mistakenly equate KABCO "Incapacitating" with AIS/NASS=3 "serious" severity or AIS/NASS MAIS=3. This practice is incorrect and misleading. Table 1 illustrates the large error introduced by equating AIS/NASS MAIS "3=serious" injuries with KABCO "Incapacitating Injury". As expected from the above example, "Incapacitating" is primarily (64% of the time) associated with AIS/NASS MAIS 1=minor and 2=moderate level injuries. It would be more accurate to say that KABCO "Incapacitating" predicts that the maximum AIS/NASS injury is NOT "serious" - exactly opposite what this literature appears to state.

Table 1 also illustrates the issues with KABCO ratings versus coding of AIS/NASS MAIS severity=1 injuries. AIS/NASS coders identified 5,814 persons with AIS/NASS MAIS 1=Minor injuries that were ranked as "No Injury" in the KABCO system. Note that since we cannot accurately account for persons with no codeable injuries, it is unclear how police code those occupants. However, if we use the total 19,494 occupants previously described as marked "uninjured" and account for the 6,006 shown in Table 1 as being marked "uninjured" but having MAIS 1 to 7, their highest possible accuracy is 69% (1-6,006/19,494).

Ninety-seven (97%) of the time KABCO "Possible Injury" corresponds to an AIS/NASS MAIS 1=minor or 2=Moderate Injury. KABCO "Non-Incapacitating Injury" 93% of the time also corresponds to an AIS/NASS MAIS 1=minor or 2=Moderate Injury. KABCO "Killed" has no correspondence with any one AIS/NASS MAIS level, demonstrating again that AIS/NASS is not an outcome measure and that occupants die at all AIS/NASS severity levels. We were surprised at the lack of any correspondence between AIS/NASS "Injured, Unknown Severity" and the seemingly equivalent KABCO "Unknown" and "Injury, Unknown Severity Ratings". These two KABCO groups correspond primarily (over 90%) with AIS/NASS MAIS 1=Minor and 2=Moderate Injuries.

Table 1 also shows that the practice of combining KABCO "Incapacitating" and "Killed" together as a

Table 1.
KABCO Injury Rating versus AIS/NASS MAIS Severity
Unweighted Occupant Counts and Percentages, NASS-CDS 1997-2007

AIS/NASS MAIS Severity	KABCO INJURY RATING (PAR)															
	No Injury		Possible Injury		Non Incapacitating Injury		Incapacitating Injury		Killed		Injury Unknown Severity		Unknown		Total	
1=Minor	5,814	97%	10,957	88%	9,284	77%	9,336	40%	234	6%	445	78%	381	87%	36,451	62%
2=Moderate	163	3%	1,171	9%	1,862	16%	5,670	24%	310	8%	74	13%	33	8%	9,283	16%
3=Serious	18	0%	238	2%	645	5%	5,489	24%	594	15%	36	6%	14	3%	7,034	12%
4=Severe	2	0%	52	0%	153	1%	1,813	8%	708	18%	6	1%	7	2%	2,741	5%
5=Critical	4	0%	8	0%	39	0%	1,017	4%	1,080	28%	6	1%	4	1%	2,158	4%
6=Maximum		0%		0%	1	0%	16	0%	866	22%	1	0%		0%	884	2%
7=Injured - Unknown Severity	5	0%	13	0%	16	0%	38	0%	130	3%	4	1%		0%	206	0%
Total	6,006	100%	12,439	100%	12,000	100%	23,379	100%	3,922	100%	572	100%	439	100%	58,757	100%

KABCO levels as defined in the NASS-CDS Coding Manual
NASS-AIS severity levels as defined in the NASS-CDS NASS-2000 Injury Coding Manual
Percentages may not foot due to rounding
See paper text for methodology

proxy for AIS/NASS "Serious" and above injury (MAIS>=3) is wrong 57% of the time. Fifty-seven percent of occupants with "Incapacitating" or "Killed" KABCO ratings have AIS/NASS MAIS values of 1=minor or 2=moderate (15,550/27,301). Because the KABCO "Killed" group is 14% (3,922/27,301) of the combined "Killed" plus "Incapacitating Injury" group, the combined group is a predictor of nothing - it does not accurately predict the person died (86% wrong) nor does it predict MAIS>=3 accurately (57% wrong). Its use as a proxy for "Serious" is incorrect and misleading.
We also note, that in our experience, state data can vary widely in accuracy and that it is necessary to obtain the relevant police officer crash recording manuals and state database manuals in order perform QC checks on the data to confirm it can be used reliably.

CONCLUSIONS

There is no NASS-93/2000 (or AIS-90/98) injury code with a severity of 0. There is no definition for severity=0 in the above manuals.
Being "Uninjured" and having no AIS/NASS code are not the same. A person may be deceased and not have a AIS/NASS code. A person can be deceased and have no codeable AIS/NASS injury (often called "uninjured").
The identification of occupants with no codeable AIS/NASS injuries is problematic. Even using MAIS=0 and InjNum=0 with applicable, towed,

inspected vehicles is not adequate. The results we show indicate this approach can result in at least a 163% over estimate of occupants without injury. It is possible to improve the accuracy of results by using only applicable, towed, inspected vehicles, and then eliminating the occupants in groups 1-5 that may be injured, as shown in this paper. However, this is a reasonably complex %process, and as discussed in this paper it still leaves cases in the analyses that are questionable, as the example shown illustrates. The problem is exacerbated if case weights are used, as incorrectly coded cases with high case weights can overpower hundreds, or thousands of correctly coded cases.

We recommend that NHTSA consider changing the CDS coding rules to either:

A. Return to the use of "InjNum=00" to indicate occupants whose medical information were reviewed and were found to have no codeable AIS/NASS injuries .

B. Preferably, NHTSA could create an additional argument value for the InjNum variable. This added value, for example InjNum=98, would indicated that the available injury information was reviewed by the AIS/NASS coders and no codeable injuries were identified. This would completely resolve identifying occupants with no codeable injuries and avoid the confusion that can occur with using "00" as a character value.

Given the issues with identifying AIS/NASS=0 injuries, the simplest approach is to report results only for AIS/NASS injury codes for severities greater than one. All these occupants are guaranteed to have been injury coded. However, as discussed, even with this group, the source of the injury data should still be reviewed in analyses that require the highest accuracy. As mentioned previously, analyses using weighted results are sensitive to any coding error in the high-weight crashes.

KABCO and AIS scores are difficult to use togther in the same analysis without introducing confounding. At the very least, the data collected for both injury systems must come from the same group, generally applicable, towed, inspected vehicles with occupants with InjNum>0 (AIS coded occupants). Otherwise the national estimates (and raw counts) of the two systems are different and the results will be confounded.

There is no such KABCO injury rating as "Serious" and there is no positive correlation between KABCO "Incapacitating" and AIS/NASS MAIS 3=Serious. The use of the term "serious" in describing KABCO incapacitating injuries is misleading, as NASS-CDS shows that the majority of KABCO "Incapacitating" injuries are AIS/NASS MAIS severity 1=minor or 2=moderate. It is more accurate to say that KABCO "Incapacitating Injury" is associated with <u>not</u> having a 3=Serious or higher AIS/NASS severity injury. We believe the term "serious" should not be used when describing the KABCO injury rating system data in order to avoid any appearance of presenting misleading information. KABCO "killed" does <u>not</u> imply a high AIS/NASS MAIS level - 50% of KABCO "Killed" occupants have MAIS=4 (critical) or less.

The practice of combining KABCO "Incapacitating" and "Killed" as a proxy for AIS/NASS MAIS=3 and above "Serious" injury is wrong 57% of the time. When using the KABCO police injury rating system, the ANSI defined names should be used to avoid confusion, including the "property damage only" level to describe crashes where no occupant reaches the category of "Possible Injury". The term "serious injury" should not be used to describe KABCO rated injuries.

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