## ALCOHOL AND DRUG USE AMONG VICTIMS OF VEHICULAR CRASHES ADMITTED TO TRAUMA CENTERS

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#### Summary

During the period from January 1, 1988 to June 30, 1988 there were 517 victims of vehicular accidents admitted directly to MIEMSS, a large level I trauma center which serves as the hub of a statewide EMS system. On admission 95% of patients had a toxicology screen conducted. Using data from 3 sources (trauma registry, police reports, and toxicology reports) a confidential linked data set was created. Characteristics of accidents involving alcohol, drugs, both or neither are presented.

Alcohol use in fatal crashes is well-documented, but little information exists concerning usage of other drugs, since testing is only done on select cases. Williams and associates, in an autopsy study of 440 male drivers killed in California, found the incidence of use of marijuana, cocaine and phencyclidine (PCP), either alone or in combination with alcohol, to be 36.8%, 10.7%, and 4.1%, respectively (1). Mason and McBay, in a study of fatally injured North Carolina drivers, detected possible cocaine use in 0.3%, and marijuana use in 7.8% (2). An Ontario study documented a 3.3% incidence of marijuana use among fatally injured drivers and pedestrians (3).

Less information still is available concerning use of drugs and alcohol among victims with non-fatal injuries. In a major prospective study of marijuana use among trauma patients at the Maryland Institute for Emergency Medical Services Systems (MIEMSS), 34.7% had used marijuana (4). The present study, also based on the patients seen in the MIEMSS clinical setting, examines the incidence of drugs other than marijuana, specifically with respect to the characteristics of the crashes involved. The data being presented are descriptive; no attempt is being made to determine causality or culpability.

#### METHODS

Vehicular trauma patients admitted to the MIEMSS Shock Trauma Center from January 1 to June 30, 1988 were included in the study. MIEMSS is a large Level I trauma center which serves as the hub of a statewide EMS system. During this time there were 517 victims of vehicular trauma, excluding those who were not admitted directly from the scene of the accident, and those involved in out-of-state crashes. The majority of patients transported from the scene arrive at the trauma center within an hour of the crash. Included in this group were 293 car/truck drivers, 109 car/truck passengers, 59 motorcyclists and 56 pedestrians.

On admission, a toxicology screen was conducted on 95% of the patients. Such tests are conducted because the physiologic impairments caused by drug abuse may influence patient management and outcomes. While the completeness of testing varies slightly for each drug tested, the vast majority of patients were tested for alcohol, amphetamines, barbiturates, cocaine, methadone, opiates, and phencyclidine (PCP). Using the name of the patient and the date and time of the accident, police reports have been obtained wherever possible, in order to ascertain the characteristics of the various crashes and to contrast those involving alcohol and drugs to those not. Once such a match is made a unique ID is created, using the police report number, the vehicle number, and the occupant seating position. Once this unique ID is created, a linkage can be made between the injury and toxicology information and that from the police report. All data are maintained in a strictly confidential manner, and once the linked file has been completed, all identifiers which might enable identification of an individual are destroyed. In addition, other variables are "masked"; for example, date is changed to month, and age to an age range.

## RESULTS

As shown in Figure 1, there were 517 primary admissions to the Trauma Center for vehicular trauma during this six-month period. The mean age of this group was 31.6 years, and 68% of the patients were males. The mean ISS score was 13.6, and the case fatality rate was 8.4%. Table 1 shows the overall testing rate and results for each of the drugs in question, including alcohol. Also shown in this table are the proportion positive. Alcohol tests were positive for 39%. Among the other drugs, the highest positive rate was for PCP (5.1%), followed by cocaine (4.4%).

For subsequent tables, results have been grouped in four categories: positive for alcohol alone, positive for drugs alone, positive for both, and negative for both. These tables, then, reflect the subset of patients who were tested for each of the drugs in question. Of this group of 396 patients, 35% had positive BAC's, 7% were positive for drugs alone, 5% were positive for both, and 53% were negative for both. Table 3 shows the results of these four categorical groupings by sex. It is apparent that a significantly larger proportion of the female patients were negative for both drugs and alcohol. In addition, although the numbers are small, drug usage was similar for men and women, and the most significant differences are reflected by the higher usage rates of alcohol among the men. In Table 4, results of toxicology screening are reported by age, grouped categorically as less than 30 or 31+ years. Although both drug and alcohol use is slightly higher in the younger group, these differences are not statistically significant.

Table 5 shows the results of testing for each particular drug, by the person injured. It is apparent that alcohol use was highest among motorcyclists. Cocaine use, on the other hand, was found to be highest among car/truck drivers and passengers. Opiate use does not seem to vary significantly by type of victim, while PCP use was again highest among motorcyclists. It must be pointed out, however, that these rates are all based on small numbers and therefore are subject to sampling variability.

Table 6 is based on a subset of the 396 patients who are drivers, and for whom linkage was successfully made between the trauma registry data and the police report. Patients have been grouped by "first harmful event" into three categories: two-car crashes, fixed object/ parked car crashes, and "other", including rollovers, etc. From these findings it may be noted that there is a striking difference between the two-car crashes, for which the majority of drivers have negative toxicology findings, and the other types of crashes, for which the majority of drivers have positive toxicology findings. Table 7 is also based on linkage with the police reports, and shows results based on time of day. Interestingly, although again the numbers are small, the group with positive drug findings appears to be similar to those who are normal. That is, while the patients with positive BAC's are more likely to be have had accidents between 6 p.m. and 6 a.m., the drug group and the negative group have more accidents during the daytime hours. The group with both drugs and alcohol appears to reflect the pattern of the "alcohol only" group.

Finally, Table 8 shows the results of toxicology screening for all patients, not just vehicular trauma patients, admitted to the Trauma Center during this period, and for whom testing was conducted for each of the various drugs. Patients admitted as a result of assault had higher rates of positive drug tests, while the lowest rates were noted among the "other" group, which primarily consists of patients who fell. Alcohol use is highest for the vehicular group.

#### DISCUSSION

Identification of particular groups of people likely to drive under the influence of drugs could be useful with respect to planning of effective intervention programs. Although there is no evidence for the causal role of drugs in vehicular crashes, there is some evidence to show that drugs such as amphetamines or marijuana can seriously impair driving performance.

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Patients admitted to trauma centers represent a select group of seriously injured persons and are therefore the "tip of the iceberg" with respect to injury as a public health problem. However, there is increasing recognition of the fact that examination of such serious injuries can aid in recognizing injury trends, developing strategies for intervention, and evaluating the effectiveness of such interventions. Especially when linked with more detailed sources of information describing the external cause of injury and the circumstances surrounding the injury, trauma registries can provide local injury surveillance data. With respect to statements related to "risk", however, trauma registry data must be interpreted with caution, as it is not possible to distinguish between factors related to the underlying epidemiology of injury as compared to factors related to the nature of treatment for those injuries - i.e triage to the trauma center. Further studies are planned to examine culpability for the crash as it relates to alcohol and drug use in this population. This would be especially interesting in light of the varying patterns of drug and alcohol usage by type of crash and time of day.

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# Figure 1. Vehicular trauma patients admitted between January 1 and June 30, 1988.

Drug	<u>% Tested</u>	<u>% Positive*</u>
Alcohol	94	39.0
Amphetamines	79	
Barbiturates	95	1.0
Cocaine	78	4.4
Methadone	79	0.2
Opiates	79	2.5
PCP	80	5.1

# TABLE 1 Results of Testing, by Drug (N=517\*\*)

\* Of those tested

\*\* For all subsequent tables N=396
(all persons tested for each drug)

TABLE 2 Distribution of Toxicology Results by Victim Classification (N=396<sup>\*</sup>)

## Toxicology Results (%)

Victim <u>Classification</u>	+ Alcohol <u>Alone</u>	+ Drugs Alone	+ Both	_ Both
Car/Truck driver	33.5	6.6	3.1	56.8
Car/Truck passenger	38.2	10.5	7.9	43.4
Motorcycle dvr/pasngr	34.0	8.0	10.0	40.0
Pedestrian	25.6	2.3	4.7	67.4
Total	34.6	7.1	5.0	53.3

\* 396 victims were tested for both alcohol and the six drugs of abuse.

# TABLE 3 Toxicology Findings, by Sex

-	Sex	-	
Tox <u>Findings</u>	Male	Female	<u>Total</u>
+Alcohol Alone	111 (41%)	26 (21%)	137
+Drugs Alone	19 (7%)	9 (7%)	28
+Both	15 (6%)	5 (4%)	20
-Both	125 (46%)	86 (68%)	211
Total	270 (68%)	126 (32%)	396

X<sup>2</sup>=18.6, p<.001

TABLE 4 Toxicology Findings, by Age

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<u>Findings</u>		L-30		31+	Total
+Alcohol Alone	80	(36%)	57	(33%)	137
+Drugs Alone	21	(9%)	7	(4%)	28
+Both	14	(6%)	6	(4%)	20
-Both	108	(48%)	101	(59%)	209
Total	280	(58%)	206	(42%)	394*

\* Age is unknown for 2 victims

X<sup>2</sup>=7.6, p<=.056

# TABLE 5 Distribution of Specific Drug by Victim Classification (N=396)

## Victim Classification (%)

Drug	Car/Truck Driver	Car/Truck <u>Passngr</u>	Motor- cycle	Ped- <u>estrian</u>	<u>Total</u>
Alcohol	36.6	46.0	52.0	30.2	39.6
Amphetamines	-	-	-	-	-
Barbiturates	2.2	-	-	-	1.3
Cocaine	4.4	7.9	2.0	2.3	4.5
Methadone	0.4	-	-	-	0.2
Opiates	2.6	2.6	2.0	2.3	2.5
PCP	1.8	10.5	16.0	2.3	5.3

## TABLE 6 First Harmful Event by Toxicology Results (Drivers Only) (N=184<sup>\*</sup>)

# Toxicology Results (%)

First Harmful Event	+ Alcohol <u>Alone</u>	+ Drugs <u>Alone</u>	+ Both	- Both
Two-Car Crash	15.4	6.4	0.0	78.2
Fixed Obj/ Parked Car	56.0	3.0	6.1	34.9
Other	50.0	12.5	0.0	37.5
Total	31.5	5.4	2.2	60.1

\* Drivers linked with police reports and tested for both alcohol and the six drugs of abuse

 $X^2 = 44.7$ , p<.001

# TABLE 7 Toxicology Findings By Time of Accident

# Time of Accident

Tox <u>Findings</u>	0001 0559	- C	0600- 159	1	.200- .759	1 _2	800- 359	<u>Total</u>
+Alcohol Only	54 (48	%) 6	(5%)	13	(12%)	39	(35%)	112
+Drugs Only	2 (10	%) 4	(20%)	9	(45%)	5	(25%)	20
+Both	10 (59	%) 0	(0%)	4	(23%)	3	(18%)	17
-Both	14 (8%	) 52	(29%)	78	(43%)	35	(20%)	179
Total	80 (24	%) 62	(19%)	104	(32%)	82	(25%)	328*

\* Represents all victims matched to toxicology and police reports

## TABLE 8 All MIEMSS Patients Admitted for the Period Jan-June 1988

# Victim Classification

Tox <u>Findings</u>	Vehi	cular	Ass	ault	01	<u>cher</u>	Total
+Alcohol Only	137	(35%)	16	(31%)	17	(22%)	170
+Drugs Only	28	(7%)	8	(16%)	4	(5%)	40
+Both	20	(5%)	9	(18%)	1	(1%)	30
-Both	211	(53%)	18	(35%)	57	(72%)	286
Total	396	(75%)	51	(10%)	79	(15%)	526