Alcohol and Drug Impaired Pedestrians Killed or Injured in Motor Vehicle Collisions

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Abstract
Collisions involving impaired pedestrians present a particular challenge because there are few known effective countermeasures to prevent them. This article examines the nature of impaired pedestrian casualty collisions in comparison to collisions involving non-impaired pedestrians. Police reports are the primary data source. Comparison to Coroners' reports on fatal pedestrian collisions suggests that police reports substantially underestimate the scope of the problem. The results are similar to those reported for other countries. The impaired pedestrians were mainly responsible for their collisions. However, the reports suggest that about 20% of drivers also contributed to these collisions. No evidence was found to suggest that police road check enforcement activity aimed at drinking drivers exacerbated the impaired pedestrian problem. The results suggest that countermeasures should target high risk areas where impaired pedestrian collisions are most frequent.

Introduction
The problem of alcohol-impaired pedestrian collisions has been described for the United States (MMWR, 1994), England (Clayton, Colgan and Tunbridge, 1997), France, (Fontaine and Gourlay, 1997) and Australia (Hulubowycz, 1995).   In an attempt to define and deal with the problem, the International Council on Alcohol, Drugs and Traffic Safety (ICADTS) established an Alcohol-Involved Pedestrian Working Group. The report of the working group was presented by Stewart (1995).

Stewart noted that the nature of the impaired pedestrian problem varies by country and geographic area, according to factors such as cultural and social conditions and customs. Nonetheless there are some striking similarities in the nature of impaired pedestrian collisions among those industrialized countries for which the problem has been documented. Based on the studies noted above, the following generalizations can be made:

- About 30-35% of fatally injured non-child pedestrians have blood alcohol levels exceeding 80-100 mg%
- The distribution of BACs among impaired pedestrians is skewed toward the very high end
- Progress in the reducing the impaired pedestrian collision problem has not kept pace with the world-wide decline in impaired driving

Combating the impaired pedestrian problem poses particular challenges because there is no legal blood alcohol limit for pedestrians and many are chronic alcohol abusers. Furthermore, the image of a chronic drunk falling into the path of an oncoming car or lying unconscious on the

road does not garner the same degree of public sympathy as that of the innocent victims of drunk drivers.

Foss et al. (1997) have suggested that countermeasures aimed at drivers or the transportation environment may be more successful in reducing pedestrian casualties than those which attempt to modify the pedestrians' behaviour. In order to design such countermeasures, one needs better information on the situational factors, which characterize impaired pedestrian collisions. These factors include time, lighting, visibility, road type and condition, location, pedestrian actions and driver actions. The present study examines these factors, by comparing impaired and non-impaired pedestrian collisions.

A second purpose of the paper is to test the hypothesis that impaired driving road check enforcement campaigns in British Columbia may inadvertently contribute to the problem of collisions involving impaired pedestrians by discouraging drinkers from operating vehicles after drinking.

In British Columbia, pedestrians account for about 12% of traffic fatalities and about 7% of injured traffic collision victims. Among non-child (age 16 and over) pedestrian casualties, police reports indicate that 14% of the fatally injured victims and 8% of the non-fatally injured victims are impaired by alcohol or other drugs. In contrast, Coroner's data based on blood alcohol analysis of essentially the same sample of fatally injured victims show that 30% have BACs greater than 80 mg% percent and 24% have BACs greater than 150 mg%. The latter findings are consistent with those reported by other authors and demonstrate that police reports grossly underestimate the scope of the impaired pedestrian traffic problem. The degree of underestimation of impairment is much greater in the case of impaired pedestrians than in the case of impaired vehicle drivers.

Methods
The sample for the present study includes pedestrians aged 16 and over, injured or killed in collisions with motor vehicles reported by the police in the province of British Columbia between January, 1993 and October, 1999. This sample accounts for 93% of all fatally injured pedestrian victims and 80% of non-fatally injured pedestrian victims in the province during this time period. The impaired sample includes those pedestrians for whom the police cited alcohol, illegal drugs or medications as contributing factors to the collision. A total of 783 impaired pedestrian casualty victims (including 48 fatalities) from 775 collisions and 12,902 non-impaired victims (374 fatalities) from 12,180 collisions were identified from police reports. BAC measurements were obtained for a sub-sample of 209 victims killed from 1993 to 1997.

A separate analysis was conducted to test the hypothesis that drinking driving road check activity by police is associated with an increase in impaired pedestrian casualties. The road check program (CounterAttack) has been running for four consecutive years in 10 communities, including the city of Vancouver. Communities added after 1996 were not included in the analysis. The years 1996, 1997 and 1998 were selected because collision data are complete for those years. The program has run from June through December. For the purpose of analysis each program month was paired with a non-program month: i.e., December-January; November-February; October-March; September-April; May-August to equate for approximate hours of

daylight and average temperature. Data from June and July were not used. Data from communities not participating in the program were available as a control for the confounding of program with month. The dependent measure of interest was the monthly number of collisions with impaired pedestrians (alcohol or other drugs cited as a contributing factor) occurring at nighttime (1800 to 0300 hours) for the 10 communities. Due to the known low level of police detection, a second dependent measure was used as a surrogate for impaired pedestrian collisions. The surrogate comprised nighttime collisions with pedestrians to whom any the following contributing factors were ascribed: alcohol, pedestrian error or confusion, failing to yield right of way and ignoring traffic control device.

Results
Impairing substances
Table 1 shows that alcohol alone was the predominant factor cited. However other drugs were noted in 6% of the cases.

Table 1: Impairing substances attributed to impaired pedestrian victims

Impairing Substances	Injured	Killed	Total
Alcohol	689	47	736
Illegal Drugs	23	1	24
Legal Drugs	6	0	6
Alcohol & Illegal Drugs	16	0	16
Alcohol & Legal Drugs	1	0	1

Detection of Impairment
The testing rate among fatally injured pedestrians is typically lower than that for drivers. In BC, 75% of killed pedestrians age 16 and over are tested compared to 87% of drivers. The police reports clearly underestimate the presence of alcohol and drugs among dead pedestrians. Among 52 fatally injured pedestrians over age 16 determined by forensic tests to have BACs over 80 mg%, the police identified alcohol as a factor in only 32 (61.5%) of the cases. There was only one false positive case, where police judgement of alcohol was not supported by forensic evidence. Oddly enough, there were no differences in terms of mean BAC, time of collision, age or pedestrian action, between the BAC impaired cases correctly identified by the police and those they missed.

Characteristics of impaired pedestrian collisions
Impaired pedestrians in collisions are predominantly male – comprising 76% of adult impaired pedestrian casualties. Among non-impaired pedestrian casualties, only 52% are male. However, this gender imbalance is not nearly as high as for alcohol-involved drivers, where males comprise about 85% of impaired drivers involved in alcohol-related casualty collisions. The age distribution of impaired pedestrian casualties is much different than for non-impaired casualties. Whereas non-impaired pedestrian casualties show a decreasing linear relationship with age, impaired pedestrian casualties are about equally high for age groups 21 through 45.
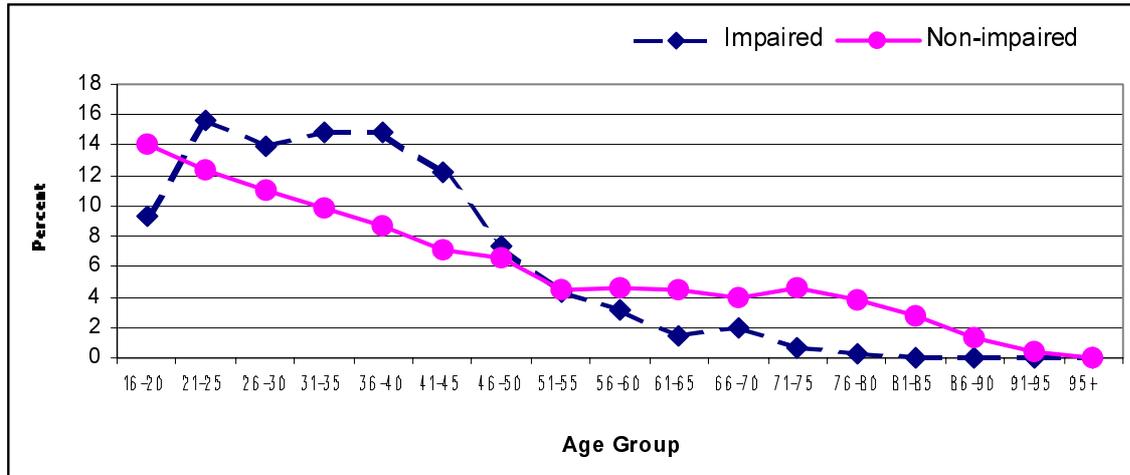
Figure 1: Pedestrian Victims by Age Group

Table 2 shows the distribution of collisions involving impaired and non-impaired pedestrians by hour of day, speed limit, land use of surrounding area, location in relation to intersections, light condition, and road condition. The expected differences were found for hour and light condition, although a substantial number (24%) of the impaired pedestrian collisions took place between 0600 and 1759 hours. Impaired pedestrian collisions are more likely to take place in business or commercial areas, less likely in residential areas, and more likely in rural areas compared to non-impaired pedestrian collisions. The vast majority of collisions for both groups took place on 50 km/h roads, however the impaired group is somewhat over-represented on roads with speed limits over 50 km/h. Non-impaired pedestrian collisions are much more likely to take place at intersections, while impaired pedestrians get struck more often between intersections. Road condition did not vary between the two groups.

Table 2: Comparison of impaired and non-impaired pedestrian collisions

	Impaired		Non-impaired		
	Collisions	%	Collisions	%	Chi sq
Hour of Day					
0600-1159	33	4.3	2,480	20.6	
1200-1759	147	19.3	5,446	45.3	
1800-2359	365	47.9	3,280	27.3	
0000-0559	217	28.5	822	6.8	727.7 *
Lighting Condition					
Daylight	170	22.0	7,424	61.4	
Dawn/Dusk	29	3.8	567	4.7	
Dark	572	74.2	4,099	33.9	515.3 *
Road Condition					
Dry	458	59.6	7663	63.4	
Wet	284	36.9	4056	33.5	
Snow/Slush/Ice	27	3.5	372	3.1	4.6

Land Use

Residential	224	29.1	4,519	37.5	
Business	468	60.8	6,240	51.8	
Rural	57	7.4	491	4.1	
Other	21	2.7	804	6.7	61.3 *
Speed Limit					
< 50 km/hr	21	2.9	600	5.5	
50 km/hr	389	54.6	6,321	58.1	
> 50 km/hr	302	42.4	3,963	36.4	16.1 *
Accident Location					
At intersection	245	31.9	6,061	50.4	
Between Intersection	428	55.7	3,810	31.7	
Other	95	12.4	2,166	18.0	163.8 *

* Indicates p-value < 0.001.

Table 3 summarizes the pedestrian's action at the time of the collision. The impaired pedestrians were more likely to disobey traffic laws and engage in dangerous practices than the non-impaired victims.

Table 3: Pedestrian action at time of collision

Pedestrian Action	Impaired	%	Non-impaired	%
Crossing with Signal	24	3.1	2023	15.7
Crossing Against Signal	106	13.5	787	6.1
Crossing - No Signal- Marked Crosswalk	40	5.1	1757	13.6
Crossing-No Signal No Crosswalk	283	36.1	3401	26.4
Walking along Highway	52	6.6	630	4.9
Emerging from behind parked vehicle	54	6.9	761	5.9
Child Getting on/Off School Bus	3	0.4	37	0.3
Adult Getting on/Off Vehicle	15	1.9	120	0.9
Pushing/Working on a Car	3	0.4	109	0.8
Playing in Roadway	23	2.9	244	1.9
Standing on Sidewalk	10	1.3	520	4.0
Other	147	18.8	2038	15.8
Unknown	23	2.9	475	3.7

This fact is also reflected in the likelihood of the pedestrian being cited as a possible offender. This designation is based on the police officers' opinion and does not always lead to the laying of charges. Forty-eight percent of the impaired pedestrians were judged to be possible offenders, compared to 20% of the drivers striking impaired pedestrians. However, in 43% of the collisions, the field was left blank. Among the non-impaired pedestrians in collisions, only 17% were judged possible offenders, while 45% of the drivers were judged culpable. When charges

are laid, they are frequently not cited on the collision report, perhaps due to the time delay. This fact renders charges an unreliable index of culpability.

The behavioural factors most commonly attributed to the impaired pedestrians in collisions, other than alcohol or drugs were: pedestrian error/confusion (42%), failing to yield right of way (9%), and ignoring traffic control device (7%). Only 8 cases (1%) were described as suicide attempts. Driver factors indicating some degree of culpability were cited in 20% of the collisions. The most frequently cited driver factors were driving without due care (8%), failing to yield right of way (7%) and alcohol (7%). In non-impaired pedestrian collisions, 42% of drivers had contributing behavioural factors.

Impacts of Police Road Checks
Table 4 shows the number of nighttime impaired pedestrian casualties and surrogate impaired pedestrian casualties aggregated over the 10 communities for the program months and the non-program months. The results appear to be essentially random with no pattern apparent in either measure. For this reason, the control group data are not shown and no tests of significance were performed.

Table 4: Number of impaired pedestrian casualties and surrogate impaired pedestrian casualties reported in 10 communities during program and non-program months.

	1996		1997		1998	
	No Program	**Program**	**No Program**	**Program**	**No Program**	**Program**
Impaired	18	19	16	20	13	15
Surrogate Impaired	38	54	52	47	41	36

More detailed analysis of these collisions by location showed that many of the collisions were clustered in circumscribed areas. These locations were primarily in the city of Vancouver in areas well known for their drug and alcohol problems.

Discussion
The results are very similar to those reported by other authors, and summarized by Stewart (1995) in terms of the characteristics of impaired pedestrian collisions and the individuals involved. The behaviour of impaired pedestrians is widely cited as contributing to their collisions with motor vehicles. However, the present study indicates that 20% of drivers involved in collisions with impaired pedestrians were partly responsible. This suggests that these collisions may have been avoidable. The demonstration that police reports fail to identify 40% of impaired pedestrian fatalities demonstrates that the scope of the problem is much larger than indicated by police data. Studies of pedestrian traffic casualties using BAC measurement are needed to measure the real scope of the problem. The failure to demonstrate any association between police road check activity and impaired pedestrian casualties may be explained by the nature of the pedestrians involved and the location of their collisions (areas of concentrated alcohol and illegal drug abuse). Most residents of these areas do not own vehicles. Clustering of impaired pedestrian collisions was also noted by Foss (1997) in two Florida cities. The fact that the problem is localized suggests that environmental countermeasures such as traffic calming

interventions or warning signs to motorists may be the most effective approach. This could be combined with public education aimed at modifying driver behaviour in relation to pedestrians in general. Note that these recommendations may not generalize to regions where the impaired pedestrian problem is more diffuse and where pedestrians have a choice in transportation mode.

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