Locations for collisions involving alcohol and drug impaired pedestrians in urban areas

Jean Wilson, Ming Fang and Dennis LeBrun

Insurance Corporation of British Columbia, Post Office 3750, Victoria, BC Canada V8W 3Y8, telephone 250-414-7920; fax 250 978 8025; e-mail: jean.wilson@icbc.com

The alcohol or drug impaired pedestrian is one of the most over-looked and neglected problems in traffic safety. Previous studies conducted internationally suggest that 30-35 percent of fatally injured adult pedestrians have blood alcohol concentrations (BAC) exceeding 80 mg% (Stewart, 1995). In urban areas this percentage may exceed 40% (Blomberg and Cleven, 2000). Progress in reducing collisions between impaired pedestrians and motor vehicles has not kept pace with the world-wide decline in impaired driving collisions. The problem of impaired pedestrians is particularly frustrating to road safety experts because there is no strong public outrage or lobby groups to bring attention to the problem and few available proven countermeasures. There is no legal BAC limit for pedestrians and an impaired pedestrian must be contravening some law such public consumption or disorderly conduct in order to be arrested. In any case, legal approaches may have little preventative value because of the high proportion of chronic or severe alcohol abusers among pedestrian casualties (Blomberg et al., 1979).

There is one example of an intensive multifaceted multidisciplinary countermeasure program targeting alcohol-impaired pedestrians (Blomberg and Cleven, 2000). This program, named *Walk Smart Baltimore* operated in that city for a 1-1/2 year period from 1995 to 1997. A total of 31 different countermeasures were recommended that included the following: traffic engineering (correcting lighting deficiencies, removal of objects that obscured visibility, refreshing crosswalks and mounting special signs and banners to warn drivers of high pedestrian hazards and speed limits); special training to police, public education and awareness through radio, television and print media, inclusion of pedestrian safety as part of server training and mass mailings to liquor licensees. In addition, retroflective caps were distributed to pedestrians in high crash zones at night. The majority of countermeasures were implemented in urban zones identified as high crash areas for alcohol-impaired pedestrians. To evaluate the program, a surrogate for impaired pedestrian crashes was defined (male, aged 30-59, from 7:00 pm to 4:00 am, Thursday to Monday). The evaluation found that, during the program, surrogate crashes declined by 16% in all areas, 22% in targeted zones and 37% on treated roads, while crashes for other similar aged male pedestrians increased. The study results indicate that impaired pedestrian crashes concentrated in circumscribed areas are sensitive to treatment. Because the countermeasures were implemented as a package, it is not possible to determine which ones were most responsible for the outcome, or if indeed they worked together in some integrated fashion.

Wilson and Fang (2000) analyzed the characteristics of police-reported collisions involving impaired pedestrians aged 16 and over, as compared to similar aged non-impaired pedestrians in the province of British Columbia. Predictably, impaired pedestrians were predominantly male (75%) compared to 52% of non-impaired pedestrians. Impaired pedestrians tended to be between the ages of 21 and 45, whereas non-impaired pedestrian collisions peaked at age 16 and decreased linearly up to age 55, then leveled off. Impaired

pedestrian collisions were more than twice as likely to take place in darkness, with 76% occurring between 1800 and 0559 hours. The impaired pedestrian collisions were also much less likely to occur at intersections. Over one third of all impaired pedestrian casualty collisions in the province occurred in the City of Vancouver, although Vancouver accounts for only 17% of the province's population. Because many of the collisions appeared to be clustered in particular business areas of the city, a more detailed analysis of these locations was undertaken in the present study.

The purpose of the study was to determine the extent to which impaired pedestrian collisions are clustered in particular areas or road segments, and if knowledge of these locations and their risk factors may be of value in suggesting countermeasures.

METHOD

The data for the study were derived from the database containing all police-reported collisions in British Columbia. From the database, collisions occurring in the City of Vancouver from January 1, 1998 to December 31, 2002, in which a pedestrian, aged 16 or over was injured or killed, were extracted. A total of 2047 collisions were found. From this total, three samples were defined:

1. impaired pedestrian collisions - those where a causal factor of alcohol or illegal drugs was attributed to the pedestrian (n =163)
2. "surrogate" impaired pedestrian collisions - those involving a pedestrian aged 21-50 occurring in darkness where the pedestrian was assigned any one of the following contributing factors: pedestrian error/confusion, failure to yield right of way or ignoring traffic control device but not alcohol or illegal drugs (n = 121)
3. "control" (probable non-impaired) sample - collisions occurring in daylight involving pedestrians aged 16 or older in which the pedestrian had no factors indicating impairment or fault and the driver had at least one contributing factor. (n = 662)

Police reports fail to identify many pedestrian collision victims as alcohol or drug impaired (Blomberg and Cleven, 2000; Wilson and Fang, 2000). In the present sample of urban pedestrian collision victims aged 16 and older, only 8% were identified as impaired. For this reason, a surrogate measure was used to augment the number of likely impaired cases. However, these are distinguished from the impaired-confirmed cases throughout the paper.

The geodocodes for each geocodable collision were transferred to a map, using ArcView© software and a digital road atlas. Collision locations could be linked to a geocode latitude and longitude for 57.5% of the collisions overall, and this percentage was similar for the three samples. This was because the collision location link to the digital road atlas was available only for collisions occurring after December 31, 1999. However, street address or intersection location was available for 95% of all the collisions, and these collisions were used in the analysis (but could not be mapped). The locations of drinking establishments (pubs, cabarets and nightclubs) from Dominion Directory, March 2001 were also added to the map. The directory is not a complete listing of all establishments. Note that multiple collisions occurring at the same intersection or address will be represented by a single symbol on the map.

Through visual inspection of the map, areas of collision concentration were identified. The approach involved establishing approximate boundaries for each high-concentration zone and analyzing each zone for identifying characteristics of the involved pedestrians, the collisions and the environment.

RESULTS

The map of impaired pedestrian collisions revealed six zones where such collisions were clustered, although the boundaries between adjacent zones are arbitrary. The remaining 30 mapped impaired pedestrian collisions occurred outside these six areas. The six zones and the locations of all geocodable Vancouver impaired pedestrian collisions are shown in Appendix 1:

The six zones, their approximate boundaries and number of collisions are as follows:

A. Gastown (Granville to Carrall, Alexander to Pender) (13 collisions)

B. East Hastings (Carrall to Hawks, Keefer to Alexander) (32 collisions)

C. East Hastings (Clarke to Nanaimo, Powell to Hastings) (14 collisions)

D. Granville (Pacific to Georgia, Howe to Homer) (9 collisions)

E. Main Street (Union to East 4th , Quebec to Via station) (8 collisions)

F. East Broadway (300 to 600 block) (9 collisions)

The characteristics of the impaired pedestrian victims in each of the areas are summarized in Table 1. The characteristics of the total Vancouver impaired pedestrian sample, as well as the surrogate sample, are also provided for comparison. Although the sample sizes are small, there appear to be some notable differences between locations. Locations A, B and C are comprised of a much larger proportion of female victims, and Location A has the highest proportion of victims impaired by illegal drugs (23%). Location D victims were notably younger than at other locations, and were 100% male.

Table 1. Impaired pedestrian victim characteristics by zone

Location		n	% Female	Mean age	% with illegal drugs
A	Gastown	13	38	41	23
B	Hastings/Main	32	31	40	12
C	East Hastings	14	50	41	7
D	Granville	9	0	30	11
E	Terminal/Main	8	0	38	0
F	East Broadway	9	22	41	10
Vancouver total		163	25	38	8
Surrogate sample		1211	42	35	NA

The environmental conditions and the collision characteristics for each area are summarized in Table 2. For all the locations, most collisions occurred in full illumination and, for all but two locations, at least 20% of the collisions occurred in daylight. Locations C and D had the highest proportion of collisions between 9:00 pm and 3:00 am, while only Locations A and D had a high concentration of drinking establishments. The percentage of collisions occurring

at intersections varied from 20.0 % to 75%. Where collisions occurred at intersections, the pedestrian was likely to be crossing against a signal. Two areas with a high percentage of non-intersection collisions (C and F) are characterized by long distances between pedestrian crosswalks.

The surrogate impaired pedestrian collisions were not clustered to the same degree as the police-confirmed impaired pedestrian collisions, except in Area B. An additional 11 surrogate impaired collisions occurred in Area B while five were added to Area D, four to Area A, two to Area C, one to area F and none to area E. Thus 36.5% of the surrogate collisions occurred within the six zones compared to 67.4% of the impaired collisions. The first two maps in the Appendix show the location of the surrogate collisions and the impaired collisions in relation to the six zones.

Table 2. Collision and environmental factors for impaired pedestrian collisions by zone

Location		% day-light	% full illumin.	% 9pm -3am	% at inter-section	% against signal	% No signal/no crosswalk	# drinking outlets
A	Gastown	23	61	46	46	54	23	14
B	Hastings/Main	18	57	52	39	36	42	1
C	East Hastings	0	64	57	36	14	50	1
D	Lower Granville	22	78	56	33	44	44	20
E	Terminal/Main	25	63	50	75	63	25	1
F	East Broadway	40	100	40	20	20	40	1
Total Vancouver		19	69	46	32	15	41	83
Surrogate sample		NA	NA	40	43	22	45	NA

The control sample of collisions was intended to represent pedestrian collisions where the pedestrian was not impaired, although this could not be verified. The sample represents pedestrian collisions where the driver was most likely at fault. The distribution of these so-called non-impaired pedestrian collisions is shown in the Appendix. There is a high concentration of control collisions in the six key zones (23%), but they are also spread throughout other areas of the city.

DISCUSSION

The results suggest that a spatial analysis of impaired pedestrian collisions followed by an analysis of the victims, the collisions and the environment of each high-risk zone can serve as a first step in the development of countermeasures to reduce such collisions. The present analysis showed that the collisions tend to occur in identifiable areas and that the different characteristics of each zone would tend to lead to somewhat different remedial approaches. For example, the high proportion of females in Zone A suggests that social agencies serving women in this area might be an appropriate intervention point. Zone D had the highest concentration of young male victims, late night collisions and drinking establishments, suggesting that interventions through the liquor licensing agency, targeting both servers and clients might hold some promise. Traffic engineering countermeasures would require a detailed examination of each zone and its roads. The results suggest that inadequate lighting was not a major problem in any of the six high-risk zones because the majority of collisions occurred in full illumination. However, there may be ways to improve visibility by removal of roadway obstructions and parked cars and improving pedestrian conspicuity through promoting use of retroflective clothing. Although police reports of impaired pedestrian collisions rarely implicate drivers as being at fault in these collisions, countermeasures aimed at drivers may actually have the greatest success in reducing the chances of collisions with pedestrians, impaired or not. Foss et al. (1997) suggest that traffic calming techniques hold the most promise because of the difficulties in changing the behaviour of alcohol-abusing pedestrians. The fact that impaired and non-impaired pedestrian collisions in Vancouver are clustered in some of the same zones indicates that countermeasures in these zones should address the total pedestrian collision problem, in addition to impaired pedestrians.

The *Walk Smart Baltimore* program demonstrated that alcohol impaired collisions are treatable when a barrage of countermeasures is implemented as part of an integrated program. However, *Walk Smart Baltimore* was a federally funded demonstration program that could not be sustained through regular municipal resources. Therefore it may be unrealistic to recommend such an approach be adopted elsewhere. Rather, countermeasures must be selected carefully after a detailed local analysis of the problem. An analysis such as the one presented in this paper represents the first step.

REFERENCES

Blomberg, RD and Cleven, AM (2000). Development, implementation and evaluation of a countermeasure program for alcohol-involved pedestrian crashes. Final report. Washington, DC, National Highway Traffic Safety Administration, Contract #DTNH22-91-C-0202.

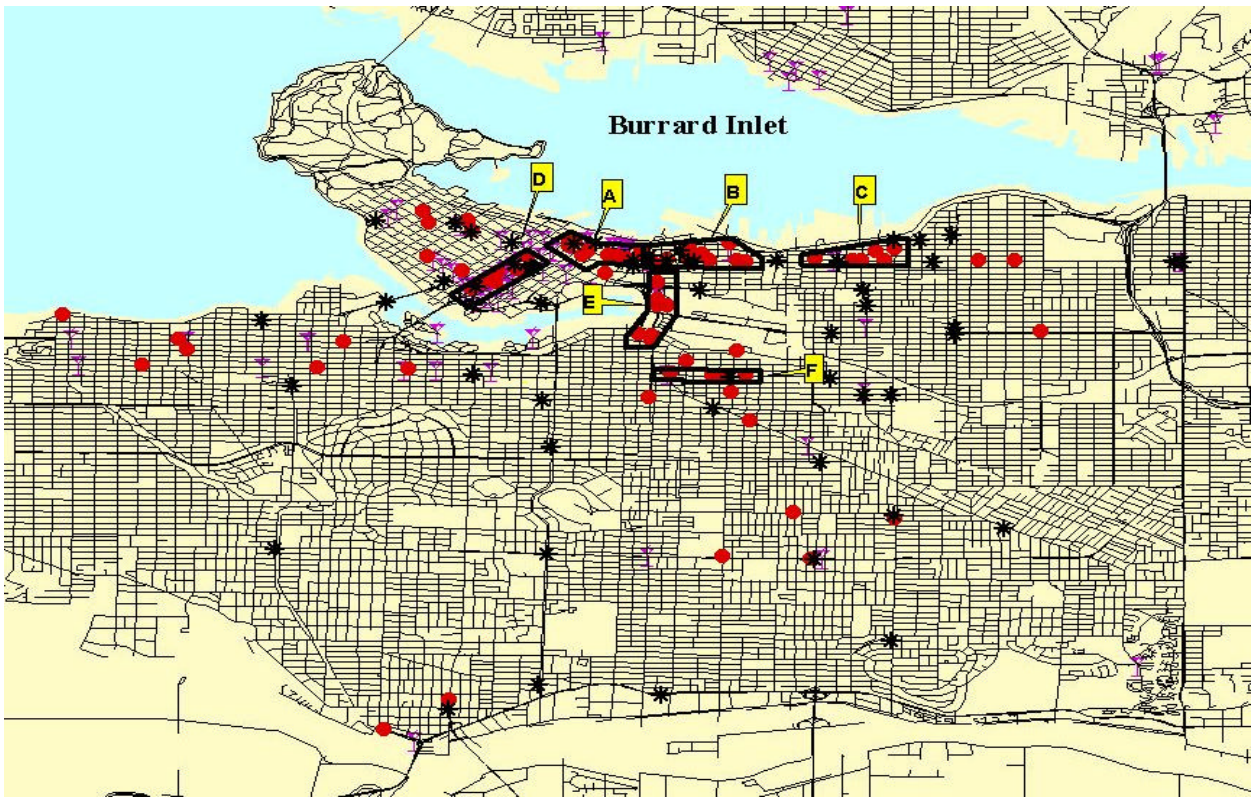
Blomberg, RD, Preusser, D, Hale, A and Ulmer, R. (1979). A comparison of alcohol involvement in pedestrians and pedestrian casualties. Washington, DC, National Highway Traffic Safety Administration, DOT HS 805 248.

Foss, RD, Harkey, DL, Reinfurt, DW and Marchetti, LM. (1997). High alcoho-involved pedestrian crash sites: Driver and pedestrian behaviour. In: Mercier-Guyon, C (ed). Proceedings of the 14th International Conference on Alcohol, Drugs and traffic Safety, CERMT, Annecy, France, pp. 1-167.

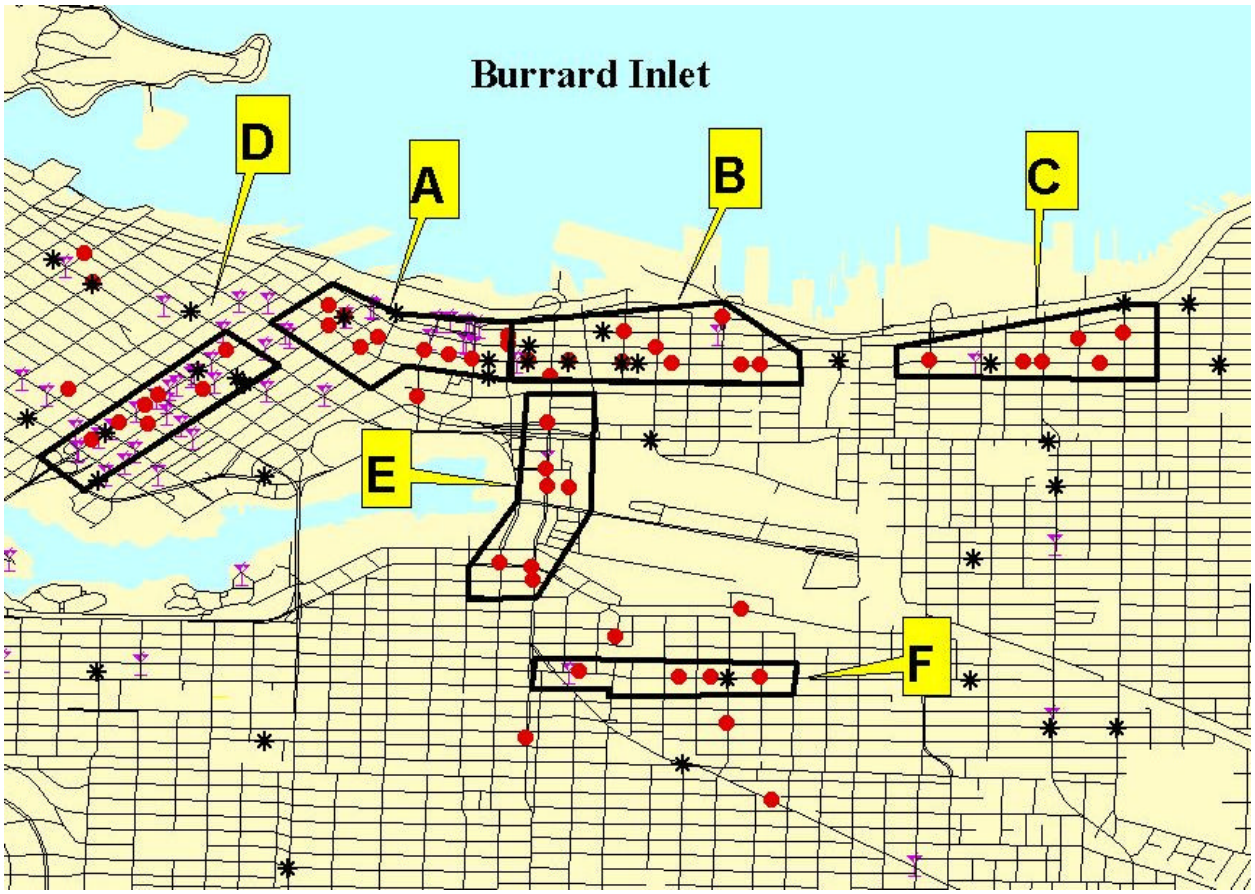
Stewart, K. (1995). Report of the ICADTS working group on alcohol-involved pedestrians: In: Kloeden, CN and McLean, AJ (eds). Proceedings of the 13th Internationa Conference on Alcohol, Drugs and Traffic safety, NHMRC Road accident Research Unit, University of adelaide, Adelaide, AU, pp. 700-710.

Wilson, RJ and Fang, M. (2000). Alcohol and drug impaired pedestrians killed or injured in motor vehicle collisions. T2000, Proceedings, 15th International Conference on Alcohol, Drugs and Traffic Safety, Stockholm, SE.

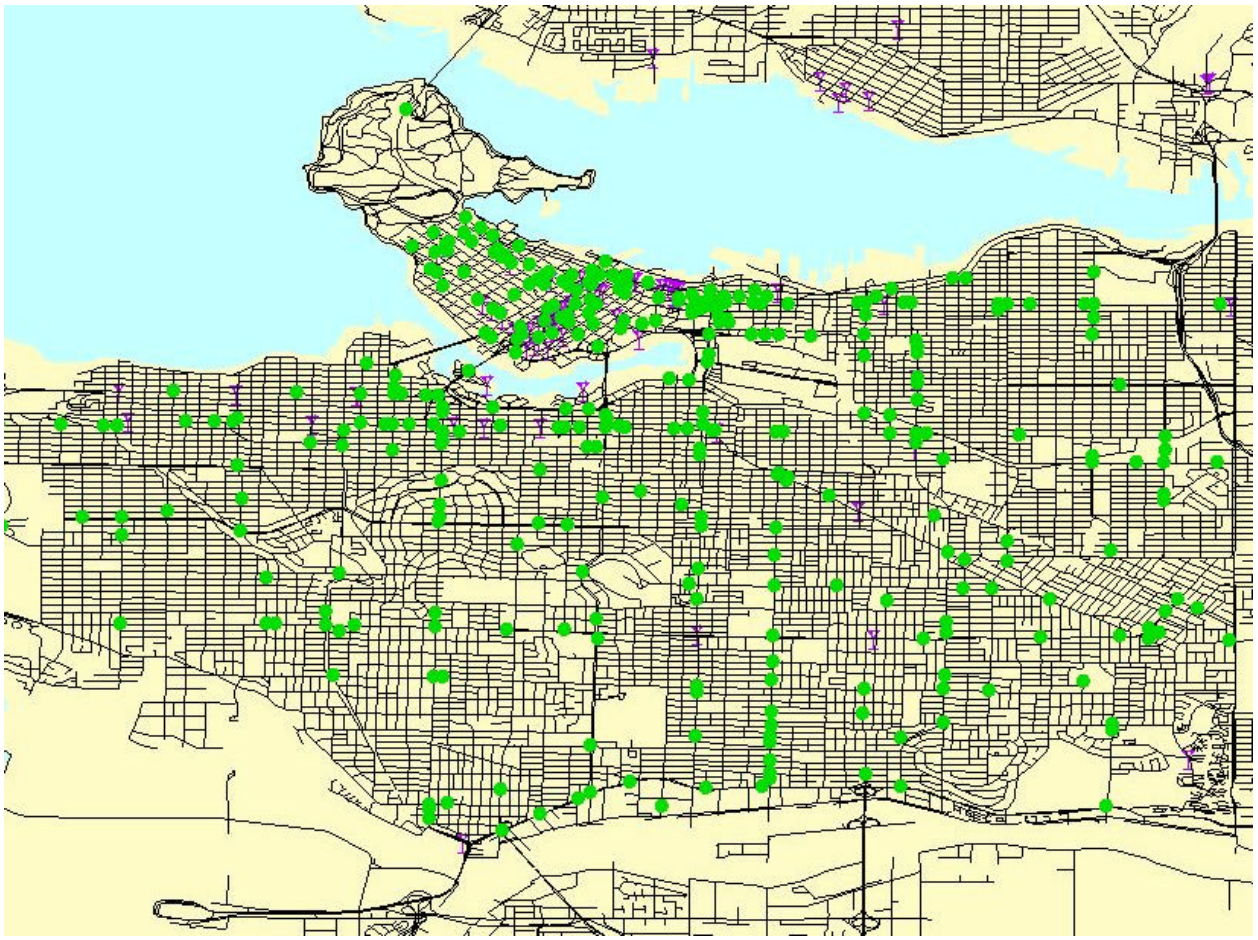
Appendix 1: Maps of pedestrian collision locations



Map of Vancouver showing six high-risk zones for impaired pedestrian collisions. Red dots represent police-identified impaired pedestrian collisions, black dots are surrogate impaired pedestrian collisions and purple drinking glasses represent drinking establishments listed in Dominion Directory, March 2001. See second map for a zoomed-in view



Map of six high-risk zones for impaired pedestrian collisions. Red dots represent police-identified impaired pedestrian collisions, black dots are surrogate impaired pedestrian collisions and purple drinking glasses represent drinking establishments listed in Dominion Directory, March 2001.



Map of Vancouver showing locations of "control" (probable non-impaired) pedestrian collisions (green dots). See text for an explanation.