Factors Contributing to Police Attendance at Motor Vehicle Crash Scenes

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Police attendance at a motor vehicle crash scene is important for investigating the causes of crashes, reducing secondary crashes, managing traffic, and reducing congestion. However, very little research has been conducted to examine the factors contributing to the likelihood of police attendance. This study hypothesizes that the policies of the police services concerned, convenience and comfort, and expectations of injuries or driver violations will increase the likelihood of police attendance at a crash scene. This conceptual framework is supported by the results from fitting a logistic regression model to crash data from the City of Calgary in Alberta, Canada.

INTRODUCTION

Road crashes are a major cause of deaths and injuries in many countries. For example, 2,755 road users were killed and 192,744 were injured in 2007 in Canada (Transport Canada 2010). In the province of Alberta alone, 485 road users were killed and more than 24,530 were injured in over 113,357 motor vehicle crashes in 2007 (Alberta Transportation 2010). In an effort to improve safety and reduce the social cost associated with automobile crashes, many jurisdictions have developed engineering, enforcement, and education countermeasures, as well as plans to improve emergency response. An area of overlap between enforcement and emergency response that has received very little attention in a typical road safety action plan is the role and the importance of police attendance at crash scenes. In the event of an automobile crash, police officers responding to a service call are expected to administer basic first aid until emergency medical services arrive, interview the relevant people involved, gather information, and complete a police report. More importantly, officers are expected to take precautions to prevent further incidents and to manage traffic at the crash site. Despite its importance, police attendance at crash scenes has not received much attention in the road safety and transport economics literature.

According to the Federal Highway Administration (2004), approximately 20% of all incidents are secondary and caused by a previous automobile crash. Police present at a crash scene may help reduce secondary incidents, as one of the duties of the attending officer is traffic control. A less obvious and sometimes overlooked factor is the effect of an automobile crash on traffic congestion. According to the SWOV Institute (2011), congestion cost is about 13%-14% of the total cost of traffic collisions. The ability of the police to clear obstructions and manage traffic contributes considerably to reducing congestion costs. Additionally, the quality of collision reports and the accuracy and completeness of the data collected are expected to improve significantly with police presence at crash scenes. For example, preliminary examination of the data in this study shows that the percentage of missing data is much smaller for many of the contributing factors when police attended crash scenes. Because traffic safety experts, researchers, and policy makers rely on these data there is a need to improve the quality of their collection and reporting as well as identifying the factors which contribute to police attendance at these crashes.

Despite its importance, very little research has been conducted to examine the factors contributing to the likelihood of police attendance at crash scenes. This study develops and tests a conceptual framework to identify these factors and provides evidence-based recommendations to assist police services and transport agencies in managing their policies and optimizing their scarce resources. Having police attendance at crash scenes results in better traffic management and prevents secondary incidents, contributes significantly to reducing crash severity, and improves the quality of data collection. Therefore, this research contributes extensively to reducing the social costs of automobile crashes and increasing the efficiency of road safety resource allocation. Although the study uses data from Calgary, Canada, the results are relevant to jurisdictions with similar policies.

POLICE ATTENDANCE AT CRASH SCENES

In most jurisdictions, the police have the responsibility to manage traffic incidents and enforce traffic regulations. One of these traffic management responsibilities relates to attendance at vehicle crash scenes to provide emergency services and submit a collision report. For example, the Calgary Police Services policy states that police officers will attend all traffic collisions where there is a report of injury and emergency medical service has been requested, involving property damage only, hit-and-runs, and when they involve criminal code violations. The policy also provides that police will attend crash scenes when the vehicles involved are inoperable, when vehicular traffic is impeded or there is an indication that the person involved in the collision who is reporting the crash is distorting the facts, when police attendance is necessary to keep peace, and when road conditions, types of vehicles involved, or other factors pose a threat to life or create the potential for further property damage.

In addition to the above policy, the executive of the Calgary Police Service has determined that a call for service will be dispatched where none of the above conditions are present but one of the parties insists on police attendance. However, since the call does not meet the response criteria, it will typically be assigned the lowest priority. This policy is consistent with those of many police services, including the Edmonton Police Services, which requires police attendance only when someone has been seriously injured; an individual does not have documentation, including a driver's license, registration or insurance; if it is suspected that the driver is impaired, and if one or more vehicles cannot be driven.

In summary, whether or not the police attend a crash scene is dependent upon the severity of the crash and the likelihood of a criminal offense having occurred. Nevertheless, police officers have a fair amount of discretion in their decisions to attend crash scenes. But, more importantly, police attendance is possible only if notified of a crash by the drivers involved or others at the scene, and an officer decides to go to the crash scene. If no one at the crash scene notifies the police, but later a driver reports it, then the crash is recorded as not attended by the police in the crash database. In addition, if the police are notified but choose not to attend, and one driver subsequently reports it, it is recorded as not attended by the police in the crash database.

Thus, the final outcome on police attendance at a crash scene is determined not only by the officer involved but also by the people present at the crash scene. The actions of these two parties may be influenced by many factors besides the official policy of the police regarding attendance at crash scenes. Therefore, it would be useful to examine whether decisions leading to police attendance at crash scenes are affected by factors like weather and road conditions, time and location of the collision, number of persons or vehicles involved, crash severity, and the characteristics of the road users involved.

CONCEPTUAL FRAMEWORK AND HYPOTHESES

There are many factors that may contribute to decisions of motorists to notify the police of a crash and a police officer's decision not to go to a crash scene. To account for these factors, it is assumed that a motorist will be more likely to call the police to report a crash if the benefit of doing so outweighs the cost. Similarly, it is assumed that a police officer is more likely to go to a crash scene if the benefit of doing so outweighs cost, and that if motorists do not notify the police of a crash immediately, they may do so subsequently if the benefit of reporting it outweighs the cost. Certainly, many factors affect these costs and benefits. However, the conceptual framework is restricted to those for which data are readily available.

From the sample of policies described in the previous section, it is hypothesized that police attendance at a crash scene is more likely for crashes which involve casualty or injury, hit-and-run, impaired drivers, those who drive at unsafe speeds, and others who act improperly. In addition to their reporting being required by police policies, hit and run (Tay et al. 2008, 2009), speeding (Retting et al. 2008a,b; Tay 2010) and alcohol/drug impairment (Tay 2005a,b,c; Williams et al. 2007) are driving violations that are also associated with high levels of crash severity. Additionally, it is assumed that motorists who have committed violations are less likely to call the police immediately after a crash to request police attendance at crash scenes though other parties may do so. Regardless of violations, motorists present at crash scenes are more likely to call the police if there is an injury or a fatality.

Besides policy related factors, a group of potential factors likely to increase crash severity and the cost of police going to a crash scene are weather related. It is assumed that the disutility, discomfort, inconvenience, and/or costs associated with waiting for police discourage motorists from calling the police unless necessary. Similarly, the cost of police attendance at crash scenes will be high in adverse weather conditions, and adverse weather conditions in turn are expected to affect the frequency and severity of crashes (Barua and Tay 2010, Obeng 2007) as well as the likelihood of hit-and-run accidents (Tay et al. 2009). Accordingly, it is hypothesized that bad weather (snow or rain, relative to clear weather) and poor road conditions (snow covered, relative to dry) will reduce the likelihood of police attendance at crash scenes.

Another potential factor likely to increase the cost of notifying the police about a crash is the cost of police going to a crash scene and the expected severity of the crash at the time of the crash (Kattan et al. 2009, Lee and Abdel-Aty 2005). It is hypothesized that the cost of the police going to a crash scene will increase with the times that are more inconvenient for travel such as peak hours relative to off-peak hours. Moreover, most people prefer traveling during the day and early evening than late night due to physiological and psychological effects of being on the road during those times (Newbold et al. 2005, Tay 2006, 2008). Finally, drivers generally do not like to drive with sun-glare due to both physical discomfort and vision impairment (Mitra 2014, Hagita and Mori 2014). Thus, it is hypothesized that the likelihood of police attendance at crash scenes will be less on weekdays relative to weekends, peak hours and late nights relative to off-peak hours, and when there is sun-glare and at night relative to daylight.

Returning to policies for police attendance at crash scenes, it is noted that the data in police crash reports are collected after decisions have been made to go to crash scenes. Ex-ante, in deciding whether to go to a crash scene, a police officer may develop a prior expectation of the severity of the crash or the likelihood of a violation occurring based on the types and locations of crashes, highway design and traffic control devices there, and the number of people involved in the crash. These factors will also affect decisions by motorists at the crash scene to call or notify the police. Without these calls the police will be unable to go to the scenes of most crashes.

There are several types of crashes that are more likely to result in injury and fatality (Kim et al. 1995, Obeng 2011). For example, for a two-vehicle crash, a head-on crash will result in more severe injury than an angular crash (passing, side-swipe, angle), which in turn would be more severe than a rear-end crash due to a greater speed differential. Hence, it is hypothesized that police attendance at crash scenes is less likely to occur for all other crash types relative to head-on crashes, and more likely to occur for all other crash types relative to rear-end crashes.

Also, several location and highway characteristics affect automobile crash severity (Rifaat et al. 2012, Kim et al. 2006, Lemp et al. 2011). First, a collision occurring at an intersection is likely to be more severe due to a higher chance of it being an angle crash. On the other hand, collisions at non-intersections or mid-blocks are more likely to be side-swiped and rear-end crashes and tend to be less severe. Additionally, crashes at intersections are also more likely to involve at least one driver violating a traffic regulation, especially failure to yield to traffic. Second, at locations with properly functioning traffic control devices, the likelihood of a driver violation is higher relative to other intersections. If these devices, especially signal lights, are not functioning properly, drivers often will slow down on approaching the site, resulting in lower crash severity. Third, vertical (slope) and horizontal road alignments (curve) affect both the likelihood and severity of crashes because they affect traction, speed and momentum, and sight distances. Also, street lighting provides better visibility for drivers and improves sight distance, which decreases the likelihood and severity of a crash by providing drivers with more time to react and reduce speed. With respect to road class, divided highways usually have higher design standards and posted operating speeds than undivided highways. The higher these speeds the higher the energy involved in collision, which in turn results in more damage or severe crashes. Therefore, it is hypothesized that police attendance is more likely for intersection crashes than in non-intersection crashes, less likely when a traffic control device is not functioning, more likely at locations with alignment issues than on flat and straight roads, less likely on roadways with artificial lights than on unlit roadways, and more likely at a divided highway relative to an undivided highway.

Again, these factors also are likely to influence decisions by motorists to call the police about crashes. For example, motorists involved in crashes are more likely to call the police if a traffic control device is not functioning to establish that the crash was not their fault. To a lesser extent, the same is true of collisions on roads with alignment issues. On the other hand, artificially lit roads, intersections, and divided highways tend to have heavier traffic volumes and thus, have more witnesses to crashes and a higher likelihood that a motorist will call police.

With regard to vehicle influences, there are three factors that may potentially affect crash severity (Yasmin et al. 2013, Obeng 2011). First, if a vehicle in a crash is inoperable, there is a higher likelihood that the crash is severe or may result in casualties, obstruct traffic, and cause congestion. Second, an older vehicle is hypothesized to provide less protection to occupants than a newer vehicle because it may have fewer safety features such as a collision avoidance system, an electronic stability control, side air-bags or seat-belt pre-tensioners. Third, if a crash involves three or more vehicles, it is hypothesized that it is more likely to result in casualties than collisions between two or fewer vehicles, and involve at least one driver who has committed a traffic violation.

Similarly, vehicle-related factors will also influence the decision of motorists to call the police. For example, occupants of an inoperable vehicle are more likely to call the police to the crash scene rather than reporting the crash subsequently. Also, the more the vehicles involved in a crash, the more likely it is that a driver or a motorist at the scene will call the police. Consequently, it is hypothesized that police attendance is more likely when a vehicle is inoperable, more likely when a vehicle involved in a crash is old, and a crash involves three or more vehicles.

Besides roadway and vehicle factors, the last group of variables affecting road safety relates to road user characteristics (Ferguson et al. 2007, Kim et al. 1995). First, the more people involved in a crash, the larger the benefit of having the police at crash scenes because of increased likelihood of needing professional help. Second, there is a common belief among traffic enforcement officers, based partly on evidence, that young males are more likely to be involved in serious crashes, and commit traffic violations in relation to a crash (McCartt et al. 2009, Lewis et al. 2007, Tay 2005d, 2009). Therefore, it is hypothesized that police attendance at crash scenes is more likely when three or more people and young males are involved.

Of note is that the factors contributing to motorists' decisions to call the police and the decision of police officers to go to crash scenes vary and often are interrelated. The analytical framework in this paper presents only a partial view of these complex relationships, and the factors chosen are primarily data driven. Nevertheless, this paper presents a reasonably strong case for the need to examine the different factors contributing to police attendance at crash scenes.

METHOD

Logistic Regression Model

The objective of this research is to determine the factors that contribute to police attendance at crash scenes. Since the dependent variable is discrete and dichotomous in nature, a binary logistic regression is an appropriate technique to use. In this study, the binary response variable, y, is defined as:

$$(1)\quad y = \begin{cases} 1, \text{ if crash is attended by police} \\ 0, \text{ if crash is not attended by police} \end{cases}$$

The logarithm of the odds ratio of a crash scene being attended by police is given by,

$$(2)\quad \ln\left(\frac{P}{1-P}\right) = \beta X.$$

Where, P is the probability of police attendance at a crash site, b is a vector of parameters to be estimated and X is a vector of independent variables. An estimated value of β_i greater than zero indicates that the probability of police presence will increase when variable X_i changes from zero to one, and vice-versa. In addition to the coefficients, it is customary to calculate the odd-ratios of the variables in a binary logistic model. From Eq. (2), the odds-ratio (OR_i) of a variable X_i is equal to $\exp(\beta_i)$ and it ranges from zero to positive infinity. It indicates the relative amount by which the odds of the outcome (police attendance) increase ($ORi>1$) or decrease ($OR_i<1$) when the value of the corresponding independent variable (X_i) increases by one unit or changes from zero to one.

Data

The data used in this study to estimate Eq. (2) are from the official crash database maintained by Alberta Transportation. In Alberta, collision data are collected by the Royal Canadian Mounted Police (RCMP) in the rural areas and by local municipal police forces in larger cities like Calgary and Edmonton. The crash records contain common types of information on collisions, including the time, location and severity of collisions as well as data on the driver, crash type, vehicle, environment, and any special road features at the crash location.

To avoid potential confounding factors due to differences across police services, only data from the City of Calgary are used in this analysis. Data from January 1, 2007, to December 31, 2007, were extracted for this study. Of the 44,931 cases reported, 14,588 (32.5%) were attended by police and 30,343 (67.5%) were not attended by police. The full set of the variables fall into six main groups: occurrence day and time, environmental factors, collision characteristics, road and traffic control device characteristics, and occupant and vehicle-related factors. A summary of the variables are in Table 1.

Because most factors are categorical, dummy variables are created for them. In addition, the time of crash occurrence and the age and gender of those involved were recoded into standard categories to facilitate interpretation. For, example, time of crash is recoded as morning peak, off-peak, afternoon peak, evening, and night; while gender and age are recoded as young male, young female, middle-aged male, middle-aged female, senior male, and senior female. In the regression model, one category of each factor is used as the reference and the estimated coefficients are interpreted relative to it.

Table 1: Summary Statistics (Percent Distribution)

Variables	Not Attended	Police Attended
Crash Severity		
Property Damage Only (PDO)	97.6	81.9
Casualty (fatal or injury)	2.4	18.1
Hit and Run		
No	79.0	82.4
Yes	21.0	17.6
Driver/Pedestrian Condition		
Normal	39.6	69.5
Impaired	0.4	9.0
Unknown	60.0	21.5
Speed		
Safe Speed	30.0	37.1
Unsafe Speed	3.5	10.8
Unknown	66.6	52.1
Driver Action		
Proper	3.0	6.5
Improper	34.1	52.2
Unknown	62.9	41.3
Weather Condition		
Clear	59.5	82.2
Rain	1.5	4.0
Snow/Hail	6.7	10.0
Unknown	32.2	3.8
Road Surface		
Dry	49.7	67.3
Wet	4.0	11.2
Ice	13.5	17.7
Unknown	32.9	3.7
Day of Week		
Weekday	29.5	31.7
Weekend	70.5	68.3
Time of Day		
Morning Peak (7am - 9am)	17.6	14.7
Daytime Off-peak (9am - 4pm)	43.9	34.7
Afternoon Peak (4pm - 6pm)	16.1	18.1
Evening (6pm - 10 pm)	11.7	23.0
Late Night (10pm - 7am)	10.6	9.5

Table 1 (continued)

Variables	Not Attended	Police Attended
Natural Light		
Daylight	41.7	43.2
Sun-glare	14.6	25.8
Darkness	2.1	2.6
Unknown	41.5	28.4
Crash Types		
Head-on	0.3	1.2
Angle	5.0	12.5
Rear End	27.3	25.3
Sideswipe	8.2	7.7
Run-off-road	0.2	2.4
Strike Fixed Objects	47.2	36.4
Passing	1.2	2.3
Backing	7.4	2.1
Unknown	3.3	10.2
At Road Intersection		
No	86.9	56.6
Yes	13.1	43.4
Alignment Issues		
No (Straight and Level)	79.6	17.9
Yes (Curve or Slope)	20.4	82.1
Traffic Control Device		
Functioning	20.4	38.7
Not Functioning	59.6	58.0
Unknown	20.0	3.3
Artificial Lighting		
Yes	63.6	68.6
No	36.4	31.4
Road Class		
Undivided One-way	1.6	8.0
Undivided Two-way	11.6	35.9
Divided with Barrier	4.8	33.1
Divided No Barrier	0.7	6.0
Unknown	81.2	17.0
Vehicle Condition		
Reparable	49.8	82.5
Non Reparable	0.1	0.5
Unknown	50.0	17.0

Table 1 (continued)

Variables	Not Attended	Police Attended
Vehicle Age		
< 15 years old	66.1	70.0
> 15 years old	13.4	21.9
Unknown	20.5	8.1
Number of Vehicles Involved		
< 2	97.8	88.7
> 3	2.2	11.3
Number of People Involved		
< 2	60.6	73.1
> 3	39.4	26.9
Age and Gender of People Involved*		
Young Male	22.8	35.0
Middle-Aged Male	30.6	37.3
Senior Male	20.5	21.3
Young Female	15.8	18.3
Middle-Aged Female	22.5	21.4
Senior Female	13.0	10.5
Unknown	20.7	10.1
Note: * total is more than 100% because of multiple persons involved		

RESULTS AND DISCUSSION

The estimation results are in Table 2. In general, the model fits the data very well with a Chi-squared goodness-of-fit statistic of 29.631 and a probability of less than 0.0001, a relatively large pseudo R-square of 0.631 and adjusted count R-square of 0.563, and a very high percent-predicted-correctly (85.8%). Of the 21 factors considered, only artificial lighting had no statistically significant effect, whereas the other factors had one or more categories (or dummy variables) that were statistically significant. More importantly, most of the estimated coefficients had expected signs, providing some support for the proposed conceptual framework.

In terms of impact, crashes involving traffic violations and resulting in casualties have odds-ratios that are relatively high. This is because police attendance at these crashes is mandated by the official policies of the Calgary Police Services. Additionally, multiple vehicle crashes have the highest impact (OR = 6.103) among all the factors examined, ceteris paribus. This result may be because collisions are usually more severe and visible in multiple car crashes. In addition, since more people are involved in such crashes, there is a greater chance that someone will call the police.

Moreover, speeding (OR = 1.559) is substantially less influential than drunk-driving (OR = 5.523) or hit-and-run (OR = 4.971). This result is counter-intuitive because speeding is one of the main causes of serious crashes and it is often targeted in road safety enforcement and publicity campaigns (Tay 2005d 2010, Retting 2008a, b). Contrariwise, the estimated odds-ratio for other improper actions of drivers (besides speeding and drunk-driving) is less than one (OR = 0.871), indicating that police attendance at this type of crash is less likely than at a crash where the driver is driving properly. One possible explanation may be that these improper actions result in minor crashes, such as failure to yield at uncontrolled intersections in local areas, or failure to signal. It may also be a result of a strong focus by police on drunk-driving and speeding, which results in a lower priority for other improper actions.

In terms of weather and road surface conditions, it is noteworthy that while rainy weather conditions have no significant effect on police attendance at crash scenes, wet roads increase the likelihood of police attendance by 1.779 times, holding other factors constant. This result implies that police are more likely to attend crash scenes soon after rains when the roads are still wet, which is expected because of the higher likelihood of crashes. On the other hand, both snowy weather and snow covered roads have statistically insignificant coefficients and thus are unrelated to police attendance at crash scenes. These results are consistent with the findings from another study (Rahman et al. 2011) that wet roads are associated with more severe crashes in Alberta, whereas snow and icy roads are associated with lower crash severities.

With regard to the time of collision, police attendance at a crash scene is less likely during times of sun-glare (OR = 0.551) and darkness (OR = 0.657), compared with daylight hours. Also, as hypothesized, relative to daytime off-peak hours, police attendance at crash scenes is less likely during the morning peak hours (OR = 0.855) and night-time (OR = 0.870), and 1.952 times more likely during evenings. However, contrary to expectations, police attendance is 1.192 times more likely during afternoon peaks.

As hypothesized, all the other types of collisions, except run-off-the-road collisions, are less likely to be attended by the police compared with head-on collisions. This result is expected because head-on and run-off-the road collisions are the most likely to result in fatalities and serious injuries. On the other hand, rear-end (OR = 0.160) and sideswipe (OR = 0.195) collisions have the lowest likelihoods of resulting in fatalities and serious injuries and thus, also have the lowest likelihoods of being attended by the police.

Since crashes at intersections and road segments with alignment problems often result in fatalities and serious injuries, it was hypothesized that they would result in a higher likelihood of police attendance at their crash scenes. This hypothesis is confirmed by this study's results which show that police are 1.159 times more likely to attend a crash at an intersection relative to one occurring mid-block, and 2.454 times more likely to attend a crash at a road segment with alignment issues compared with a crash on a straight and flat road segment. Similarly, it was hypothesized that crashes on divided roads are more likely to be attended by police because they tend to be more severe. Again, the results show that compared with one-way undivided roads, crashes on divided roads with and without barriers are, respectively, 1.392 and 1.664 times more likely to be attended by police.

As hypothesized, police attendance at a crash scene is more likely if the vehicle is inoperable because of the possibility that it could obstruct traffic. Obviously, an inoperable vehicle is also closely related to crash severity and the possibility of fatality and injury. Hence, it is not surprising that the odds of police attendance is 2.217 times more likely if at least one of the vehicles involved is not operable. Also, it is found that crashes involving newer vehicles are less likely (OR = 0.806) to be attended by police, a result that is consistent with our hypothesis.

Finally, it is found that crashes involving young males are the most likely to be attended by police, while all the other road user groups have estimated odds-ratios that are less than one. It is not surprising that crashes involving middle-aged females have the smallest odds-ratio (OR = 0.671) or are the least likely to be attended by the police. This is because this group is often perceived to be the least likely to be involved in serious crashes or traffic violations (Evans 2004, Tay 2009, 2006).

Table 2: Estimation Results

Number of Observations: 44,931 Share of Cases with Police Presence: 32.5% % Correctly Predicted = 85.8% Adjusted Count R-Square = 0.563 Nagelkerke R-Square = 0.631 Chi-square = 29.631 P-value < 0.0001			
Explanatory Variable	**Coefficient**	**P-value**	**Odd-Ratio**
Crash Severity (Reference: PDO)			
Casualty	1.574	<0.001	4.826
Hit and Run (Reference: No)			
Yes	1.604	<0.001	4.971
Driver/Pedestrian Condition (Reference: Normal Condition)			
Impaired	1.709	<0.001	5.523
Unknown	-1.209	<0.001	0.299
Speed (Reference: Safe speed)			
Unsafe Speed	0.444	<0.001	1.559
Unknown	0.115	0.001	1.122
Driver Action (Reference: Proper Action)			
Improper Action	-0.138	0.048	0.871
Unknown	-0.253	<0.001	0.776
Weather (Reference: Clear)			
Rain	-0.083	0.451	0.920
Snow	-0.111	0.080	0.895
Unknown	-0.354	<0.001	0.702
Road Surface (Reference: Dry)			
Wet	0.576	<0.001	1.779
Ice	-0.068	0.172	0.934
Unknown	-0.956	<0.001	0.384
Day of Week (Reference: Weekend)			
Weekday	-0.089	0.006	0.915
Time of Day (Reference: Daytime Off-peak)			
Morning Peak	-0.157	<0.001	0.855
Afternoon Peak	0.175	<0.001	1.192
Evening	0.669	<0.001	1.952
Night	-0.139	0.007	0.870
Natural Light (Daytime)			
Sun-glare	-0.596	<0.001	0.551
Dark	-0.421	<0.001	0.657
Unknown	-0.542	<0.001	0.581

Table 2 (continued)

Number of Observations: 44,931
Share of Cases with Police Presence: 32.5%
% Correctly Predicted = 85.8%
Adjusted Count R-Square = 0.563
Nagelkerke R-Square = 0.631
Chi-square = 29.631
P-value < 0.0001

Explanatory Variable	**Coefficient**	**P-value**	**Odd-Ratio**
Crash Types (Reference: Head On)			
Angle	-0.627	0.001	0.534
Rear End	-1.831	<0.001	0.160
Sideswipe	-1.633	<0.001	0.195
Run-off-road	0.073	0.770	1.076
Strike Fixed Objects	-1.090	<0.001	0.336
Passing	-0.914	<0.001	0.401
Backing	-1.431	<0.001	0.239
Unknown	-0.305	0.115	0.737
At Road Intersection (Reference: No)			
Yes	0.148	0.001	1.159
Alignment Issues (Reference: No)			
Yes (Curve or Slope)	0.898	<0.001	2.454
Traffic Control Device (Reference: Functioning)			
Not Functioning	-0.266	<0.001	0.767
Unknown	-0.979	<0.001	0.376
Artificial Lighting (Reference: No)			
Yes	-0.003	0.928	0.997
Road Class (Reference: Undivided One-way Road)			
Undivided Two-way	-0.714	<0.001	0.489
Divided with Barrier	0.331	<0.001	1.392
Divided with No Barrier	0.509	<0.001	1.664
Unknown	-2.036	<0.001	0.131
Vehicle Condition (Reference: Reparable)			
Inoperable	0.796	0.006	2.217
Unknown	-0.265	<0.001	0.767
Vehicle Age (Reference: >15 years)			
Less than 15 years old	-0.216	<0.001	0.806
Unknown	-1.121	<0.001	0.326
Number of Vehicle (Reference: ≤ 2 vehicles)			
> Three	1.809	<0.001	6.103

Table 2 (continued)

Number of Observations: 44,931 Share of Cases with Police Presence: 32.5% % Correctly Predicted = 85.8% Adjusted Count R-Square = 0.563 Nagelkerke R-Square = 0.631 Chi-square = 29.631 P-value < 0.0001			
Explanatory Variable	**Coefficient**	**P-value**	**Odd-Ratio**
Number of People Involved (Reference: < 2)			
> Three	0.533	<0.001	1.703
Driver Age and Gender (Reference: Young Male)			
Middle-Aged Male	-0.210	<0.001	0.811
Older Male	-0.210	<0.001	0.811
Young Female	-0.288	<0.001	0.750
Middle-Aged Female	-0.399	<0.001	0.671
Older Female	-0.270	<0.001	0.763
Unknown	-0.004	0.966	0.996
Constant	2.268	<0.001	9.658

CONCLUSION

Police attendance at crash scenes is essential to prevent secondary incidents, manage traffic, reduce congestion, investigate crash causes, and collect crash information. Despite these important contributions, the majority of crashes are not attended by police and very little research has been conducted to examine the factors contributing to police attendance at crash scenes. This study finds that crashes involving casualties (fatalities or injuries), hit-and-run, impaired drivers, unsafe speed, run-off-road, older vehicles, inoperable vehicles, multiple vehicles, young males, or many people, as well as occurring at intersections, on roads with wet surfaces, divided roads, and during afternoon peaks or evening hours, are those which increase the likelihood of police attendance. On the other hand, angle, rear-end, side-swipe, passing, and backing crashes and crashes occurring in rain, snow, morning peak, night-time, sun-glare, or weekends, and on roads with icy surfaces, have less likelihood of police attendance.

In addition, this study finds that the percentages of missing data for many important crash contributing factors are much higher for crashes not attended by police, which reduces the completeness and quality of the data, the quality of the analyses using the data, and the quality of road safety investment decisions made. Also, as previously discussed, about 20% of all crashes are secondary incidents caused by previous collisions, and congestion costs constitute about 13%-14% of the total cost of traffic collisions. These social costs are expected to be substantially reduced with police attendance at crash scenes.

Hence, police policies in Calgary must be revised to encourage police attendance at crash scenes, not only for casualty-related crashes and those involving driver violations, but for all crashes whenever feasible and resources are available. Similarly, Alberta's driver handbook should be revised to encourage road users to notify the police of crashes. In addition, an increase in road user education is needed to increase the likelihood of motorists notifying the police of crashes, and a complementary education campaign is needed to increase police officers' awareness of the importance of attending crash scenes, regardless of whether or not injuries or traffic violations are expected. Finally, road users should be required to provide relevant information in collision report forms before the report can be accepted.

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