Why do People Die in Road Crashes?

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INTRODUCTION

Safer Journeys is the Government's road safety strategy to 2020. It is implemented through action plans, one of which has been completed and the 2nd is nearing completion. The Ministry is in the process of developing the 3rd and final action plan and reducing the trauma from crashes when they do occur is an important component. Safety in the transport system is a key priority for the Minister of Transport.

The Ministry of Transport has engaged TERNZ to analyse a sample of fatal crashes in detail to enable it to get a better understanding of why people die in crashes. The focus is not on the driver or other road use behaviours that initiate an incident but rather on why there was an impact severe enough to result in death.

Factors of interest include:

- the characteristics of the roadside, including any objects struck, lack of barriers etc.
- pre-crash speeds (related to impact severity rather than crash cause)
- restraint or helmet use
- vehicle characteristics in terms of crash avoidance technology and aggressivity (how much damage a vehicle does to unprotected road users or other vehicles)
- after crash medical care including the time delay between the trauma and medical intervention

The specifications for the study required us to evaluate 120 crashes consisting of 70 open road crashes and 30 urban crashes involving trucks and/or cars and 20 crashes involving motorcycles. Crashes involving pedestrians and cyclists were excluded at this stage.

METHODOLOGY

Dataset Selection

The analysis is based on the data contained in the New Zealand Transport Agency's (NZTA) Crash Analysis System (CAS). This database contains record of all reported road crashes in New Zealand. Embedded in the database are the Traffic Crash Reports (TCR) prepared by the attending police officer and where applicable a separate Serious Crash Unit (SCU) report. Although CAS does not achieve 100% reporting for all crashes, it is very close to 100% for fatal crashes. SCU reports are only prepared for the most serious crashes but all fatal crashes fall into this category. Coroner's reports for many of the 2014 crashes are yet to be finalised.

There is often a time delay between the date of the crash and when all the reports are available on CAS. Thus it was decided to use the 2014 year data for this analysis. All fatal crashes for 2014 involving cars, trucks and motorcycles were selected and separated into the three categories, open road crashes involving cars and/or trucks, urban crashes involving cars and/or trucks, and crashes involving motorcycles. The number of urban fatal crashes for 2014 was not sufficient to meet the required sample size of 30. Thus additional crashes were obtained by using the data for the beginning of 2015. This required three crashes from January and one from February. For the other two categories, the required number of crashes were selected randomly from the total set of crashes.

During the analysis process, it was found that a few of these crashes were not able to be used and so additional crashes were added to the analysis dataset to replace these crashes and achieve the required total sample size for each category.

Analysis Procedure

Because of the timeframe and the number of crashes to be analysed two analysts were used. To ensure consistency between the analysts, the analysis procedure was formalised in the form of a questionnaire consisting of some 26 questions. This procedure is detailed in Appendix A. For each fatality, the questionnaire was applied and all the answers were entered into a row of a spreadsheet. Thus for crashes with multiple

fatalities, there were multiple rows of data. This approach makes it possible to review individual crashes without having to re-read all of the source documentation.

To test the procedure and to ensure consistency between the analysts, they began by each reviewing the same five crashes. The results of this were and discussed with the other researchers involved. As a result some minor adjustments were made to the analysis procedure to ensure that all relevant information was recorded.

The dataset was then divided up between the two analysts for processing. Several crashes were analysed by both as a cross-check. In addition any crashes where the analyst was uncertain were reviewed by both analysts and two additional researchers to obtain a consensus interpretation. Relatively few crashes required this additional level of review.

RESULTS

Introduction

The results of the analysis are shown in Appendix B. Table B1 gives the results for the open road crashes, Table B2 gives the results for the urban crashes and Table B3 gives the results for the motorcycle crashes. A few crashes were eliminated from the dataset because the SCU report was not available and so there was insufficient reliable information on the cause of the fatality. Two further crashes were eliminated because they involved machinery (a grader and a tractor) rather than trucks or cars. Finally several further crashes were removed because the victim died from a medical condition rather than from the crash itself.

The final dataset analysed contained 122 fatalities consisting of 72 open road fatalities involving trucks and cars, 30 urban fatalities involving trucks and cars and 20 motorcycle fatalities. There were some differences between these three groups and so we will present the results for each group separately.

Rural road fatalities

There were 72 of these in the dataset consisting of 46 (64%) men and 26 (36%) women. Of these 72 fatalities, 34 were very probably caused by an impact with another vehicle[1]. A further 29 (25 very probably and 4 possibly) were the result of impacts with roadside objects. This includes 12 impacts with trees, 6 impacts with embankments and 5 impacts with poles/posts. We have included the two rollovers in the 29 impacts on the basis that these are impacts with the ground. So, in total, up to 88% of the fatalities were the result of impacts including 47% of the total that were the result of impacts with other vehicles.

It was not always easy to determine the pre-crash and impact speeds with any accuracy so we have considered two speed categories; low speed where the impact speed was estimated to be less than 60km/h and high speed where the impact speed was estimated to be greater than 60km/h. To some extent this threshold is arbitrary but generally we would expect the occupants of a modern car with a 5-star safety rating to be able to survive a crash of up to 60km/h. Of the 72 fatalities we estimated that 66 (92%) were at high speed and 6 (8%) were at low speed. Clearly the vast majority of impacts occurred at high speed and basic physics tells us that lower impact speeds would have resulted in fewer fatalities.

Reviewing the low speed impacts led us to discover that in a few cases there were post-impact factors that caused the fatality. Specifically there were 2 cases where the victim drowned, there were 3 cases where the vehicle caught fire and the victims, if not killed in the initial impact, would have died in the subsequent fire and 1 case where the victim was electrocuted.

A significant number of victims were not wearing seatbelts and in a number of cases were ejected from the vehicle. Based on the SCU reports and the survival of other occupants who were wearing seatbelts we determined that 13 (18%) of the 72 victims would very probably have survived if they had been wearing

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[1] In this analysis we have considered a parked vehicle to be a roadside object, while an impact with a stationary vehicle in the traffic stream is considered to be a vehicle impact.

seatbelts and a further 10 (14%) would possibly have survived had they been wearing seatbelts. This is an astonishingly high number of avoidable deaths.

An assessment was undertaken as to whether the crash mitigation technologies currently available on new vehicles would have prevented the fatality. The technologies considered were front and side curtain airbags and electronic stability control (ESC). Many of the roadside objects were hit side-on (trees, power poles) and the predominantly older vehicles involved did not have side curtain airbags. It was difficult to determine whether side curtain airbags would have been effective in preventing the fatality because we did not have other crashes of vehicles with side curtains to compare with so these were classified as "possibly" rather than "very probably". In these side-on impacts, the frontal airbags were not deployed when fitted. Coming technologies such as automated collision avoidance, lane keeping warning, and fatigue monitoring were not included as they are not widely available yet. The assessment found that a further 3 fatalities would very probably have been prevented and a further 10 would possibly have been prevented if the vehicles had been fitted with these technologies. This finding is further reinforced when we look at the age of the vehicles. The average age of the victims' vehicles was 15.9 years while the average age of the other vehicle in the crash was 8.4 years. Clearly the survival rate for newer vehicles is much higher.

It is also interesting to consider the vehicle types of the vehicles involved in the crashes. Of the 34 fatalities that were the result of an impact with another vehicle, 29 were occupants of a car and 5 were occupants of an SUV. The SUV fatalities occurred in two crashes which both involved an impact with a truck. Of the 29 car-based fatalities, 10 involved an impact with a truck, 1 involved an impact with a bus and 8 involved an impact with a Ute, SUV or van, while only 10 involved impacts with cars. Clearly the difference in vehicle mass between the impacting vehicles has a substantial effect on the outcome.

The final issue to consider was whether the after-crash medical care contributed to the fatality. In general this was not easy to determine because the crash reports did not usually record the arrival time of medical assistance. As a general principle we assumed that where the victim died instantaneously or nearly so, faster medical intervention would have made no difference. Furthermore if general assistance was on hand quickly and delay to medical assistance were not noted, it was assumed that the response time was acceptable. In a few instances, there were delays in discovering that the crash had occurred and there was evidence that the victim survived the initial impact. Clearly in this situation it is possible and in some cases even probable that the victim would have survived with a more rapid response. In the case of the rural crashes we found 3 (4%) occasions where more prompt medical intervention could possibly have prevented the fatality and no cases where it would very probably have prevented the fatality.

The review of medical intervention led us to consider two other factors, health and age. In several of the crashes, the victim or the driver suffered from a medical condition which contributed to the crash. Note that this medical condition was not the cause of death because if it had been the fatality would have been eliminated from the dataset. For the rural crashes, there were 2 (3%) fatalities where a medical condition very probably contributed to the crash and 3 (4%) fatalities where a medical condition possibly contributed to the crash.

Similarly we considered whether the age (and hence frailty) of the victim was a factor in their death. The assessment was based on a range of factors including the level of damage to the vehicle and the survival of other vehicle occupants in the same crash. There were 2 (3%) fatalities where frailty due to age was very probably a cause of death and 7 (10%) fatalities where this was possibly the case.

Urban road fatalities

There were 30 of these in the dataset consisting of 25 (83%) men and 5 (17%) women. Of these 30 fatalities, 6 were very probably caused by an impact with another vehicle. A further 23 (22 very probably and 1 possibly) were the result of impacts with roadside objects. This includes 8 impacts with trees, 2 impacts with embankments and 5 impacts with poles/posts. In total, up to 97% of the fatalities were the result of impacts including 20% of the total that were the result of impacts with other vehicles.

For the urban crashes we used the same 60km/h threshold to distinguish low speed and high speed crashes. Of the 30 fatalities we estimated that 25 (83%) were at high speed and 5 (17%) were at low speed. Thus the

proportion of high speed crashes was only slightly lower than for the rural fatalities even though the 60km/h threshold is above the urban speed limit. As before the vast majority of impacts occurred at high speed and basic physics tells us that lower impact speeds would have resulted in fewer fatalities.

For the urban crashes there was only one where the fatality was the result of post-impact factors and in this case the victim was electrocuted.

As for the rural crashes a significant number of victims were not wearing seatbelts and in a number of cases were ejected from the vehicle. Several urban crashes were at low speeds and the damage to the vehicle was minimal, so the lack of a seatbelt was the critical factor. Based on the SCU reports and the survival of other occupants who were wearing seatbelts we determined that 3 (10%) of the 30 victims would very probably have survived if they had been wearing seatbelts and a further 6 (20%) would possibly have survived had they been wearing seatbelts. Again around 30% of the fatalities are potentially avoidable.

The assessment of the impact of crash mitigation technologies found that a further 2 fatalities would very probably have been prevented and a further 7 would possibly have been prevented if the vehicles had been fitted with these technologies. This finding is further reinforced when we look at the age of the vehicles. The average age of the victims' vehicles was 17.0 years while the average age of the other vehicle in the crash was 10.5 years. Again the victims' cars are significantly older than the vehicles that they impacted.

It is also interesting to consider the vehicle types of the vehicles involved in the crashes. Of the 6 fatalities that were the result of an impact with another vehicle, 5 were occupants of a car and 1 was the occupant of truck. The truck fatality occurred as the result of an impact with a train. Of the 5 car-based fatalities, 1 involved an impact with a bus, 2 involved an impact with a Ute, SUV or van, while 2 involved impacts with cars. Clearly the difference in vehicle mass between the impacting vehicles has a substantial effect on the outcome.

On the question of more prompt medical intervention we found 1 (3%) occasion where more prompt medical intervention would very probably have prevented the fatality and 1 (3%) case where it could possibly have prevented the fatality.

For the urban crashes, there was 1 (3%) fatality where a medical condition very probably contributed to the crash and 1 (3%) fatality where a medical condition possibly contributed to the crash. There were no fatalities where frailty due to age was very probably a cause of death but 3 (10%) fatalities where this was possibly the case.

Motorcycle fatalities

There were 20 of these in the dataset consisting of 18 (90%) men and 2 (10%) women. Of these 20 fatalities, 9 were very probably caused by an impact with another vehicle. A further 11 (8 very probably and 3 possibly) were the result of impacts with roadside objects. This includes 6 impacts with the road itself, 2 impacts with poles/posts, 1 impact with a crash barrier and 1 impact with a parked vehicle. In total, up to 100% of the fatalities were the result of impacts but this includes 6 impacts with the road itself. 45% of the total fatalities were the result of impacts with other vehicles.

For the motorcycle crashes we used the same 60km/h threshold to distinguish low speed and high speed crashes. Of the 20 fatalities we estimated that 17 (85%) were at high speed and 3 (15%) were at low speed. Thus the proportion of high speed to low speed crashes is similar to that of the urban crashes. Half the motorcycle crashes were urban and half were rural. As before the vast majority of impacts occurred at high speed and basic physics tells us that lower impact speeds would have resulted in fewer fatalities.

There were no motorcycle crashes where the fatality was the result of post-impact factors.

For motorcycle crashes the key factor is helmet wearing rather than seatbelts. Generally the police reports do indicate whether or not the rider was wearing a helmet. Based on the SCU reports we determined that 2 (10%) of the 20 victims would very probably have survived if they had been wearing helmet and a further 2 (10%) would possibly have survived had they been wearing a helmet. Thus for motorcycles 20% of the fatalities are potentially easily avoidable. Two of the motorcycle crashes involved motorcycles that were not

registered for use on the road. Both of these crashes were at low speed and in both cases the victim was not wearing a helmet.

Crash mitigation technologies are far less available for motorcycles. One safety technology that is becoming more widely available is ABS brakes. BMW introduced ABS for motorcycles in 1988 and all BMW motorcycles have been optionally fitted with this technology since about 2000. Other manufacturers have been slower to adopt this technology but it is now widely available. European regulations require all motorcycles above 125cc to be fitted with ABS from 1 January 2016. There are several studies which have shown substantial reductions in fatal and serious crash risk for motorcycles fitted with ABS brakes. For example, the Insurance Institute for Highway Safety[2] reports a 31% lower fatal crash rate for motorcycles fitted with ABS compared to the same models not fitted with ABS. However, the focus of this study is to determine why the crash victims died not why the crash occurred in the first place. Thus the question that we have to consider when looking at crash mitigation technologies is not whether the technology would have prevented the crash but rather whether the technology would (or could) have reduced the severity of the crash to the extent that the victim would have survived. This question is much more straightforward to answer for passive safety technologies such as seatbelts, airbags and crash helmets than for active safety technologies such as ABS and ESC.

ABS assists the rider to maintain control of the bike under heavy braking where wheel lock-up is possible. It is particularly effective in low friction situations. Experienced motorcyclists do not brake while cornering because the combination of the cornering forces and the braking forces is likely to cause the wheels to slide sideways while they are still rotating. ABS brakes typically cannot prevent this sideways sliding. Thus the crashes where we might expect ABS to make a difference are those where the motorcyclist has braked heavily and has experienced some loss of control as a result. The SCU reports do not provide any guidance on the potential benefit of ABS in any of the crashes.

There is one crash where the motorcycle is identified as being fitted with ABS. This was a head-on collision with a car that was on the wrong side of the road. There were six crashes (30%) where ABS may possibly have made a difference. In two of these cases, the motorcycle was travelling too fast entering a corner and lost control while cornering. For the other four cases, the braking took place was while the motorcycle was travelling in a straight line and there was some loss of control during the braking. In all six cases the fatality was the result of an impact with either another vehicle or a roadside object. ABS brakes may have given the rider better control of the motorcycle during braking which could possibly have lessened the severity of the crash. In none of the crashes was it clear that this was probably the case.

In the case of the motorcycle fatalities the other vehicle is always larger and heavier than the motorcycle. Of the 9 fatalities that were the result of an impact with another vehicle, 2 involved an impact with a truck, 5 involved an impact with a Ute, SUV or van, while 2 involved impacts with cars.

On the question of more prompt medical intervention we found 1 (3%) occasion where more prompt medical intervention could possibly have prevented the fatality.

For the motorcycle crashes, there was 1 (5%) fatality where a medical condition very probably contributed to the crash and 1 (5%) fatality where a medical condition possibly contributed to the crash. There were no fatalities where frailty due to age was found to be a factor.

Summary

The vast majority of fatalities were caused by an impact with either another vehicle or with a roadside object. This is shown in Table 1.

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[2] http://www.iihs.org/iihs/topics/t/motorcycles/topicoverview accessed 27 January, 2016

Table 1. Fatalities caused by impacts.

Dataset Category	Number of fatalities	Impact with moving vehicle[3]				Impact with roadside object[4]			
		Very probably		Possibly		Very probably		Possibly	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Rural	72	34	47%	0	0%	25	35%	4	6%
Urban	30	6	20%	0	0%	22	73%	1	3%
Motorcycles	20	9	45%	0	0%	8	40%	3	15%
Total	**122**	**49**	**40%**	**0**	**0%**	**61**	**50%**	**8**	**7%**

A small number of fatalities were caused by post-crash factors. Similarly a small number of fatalities were possibly the result of delays in receiving medical treatment or the health and age of the victim. These results are summarised in Table 2. Most of these numbers are so small that, given the sample size, there is considerable uncertainty about their magnitude. The exception to this is the number of instances where a medical condition or the age of the victim could possibly have been a factor in the fatality. For the car and truck crashes this is around 13-14%.

Table 2. Other factors causing the fatality.

Dataset Category	Number of fatalities	Fatality caused by post-crash factors (electrocution, fire, drowning)		Would more prompt medical intervention have prevented the fatality?				Did the victim have either a medical condition or was age a factor in the fatality?			
				Very probably		Possibly		Very probably		Possibly	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Rural	72	6	8%	0	0%	3	4%	4	6%	10	14%
Urban	30	1	3%	1	3%	1	3%	1	3%	4	13%
Motorcycles	20	0	0%	0	0%	1	5%	1	5%	1	5%
Total	**122**	**7**	**6%**	**1**	**1%**	**5**	**4%**	**6**	**5%**	**15**	**12%**

A surprisingly large number of fatalities (up to 30%) could have been avoided if the victims had been wearing seatbelts or crash helmets (for the motorcycle crashes). The most recent Ministry of Transport figures for seatbelt wearing by front seat vehicle occupants are for 2014 and show a 97% wearing rate. This makes the 30% avoidable fatality figure even more remarkable.   A smaller but still significant number of fatalities (up to 18%) could have been avoided if the victims vehicles had been equipped with the crash mitigation technologies that are readily available on current vehicles. These figures are summarised in Table 3.

Table 3. Fatalities that could have been avoided with the use of safety equipment.

Dataset Category	Number of fatalities	Fatalities that were avoidable through seatbelt or motorcycle helmet use				Fatalities that were avoidable through other current crash mitigation technologies			
		Very probably		Possibly		Very probably		Possibly	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Rural	72	13	18%	10	14%	3	4%	10	14%
Urban	30	3	10%	6	20%	2	7%	7	23%
Motorcycles	20	2	10%	2	10%	0	0%	6	30%
Total	**122**	**18**	**15%**	**18**	**15%**	**5**	**4%**	**23**	**19%**

Table 4 shows a number of other relevant factors. The first is that the vast majority of fatalities were at higher speeds (above 60km/h). This is not really surprising because this increases the severity of any impacts that occur. If anything the fact that some fatalities occurred in low speed crashes is of more interest. For the car

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[3] Includes impacts with stationary vehicles in the traffic stream but not parked vehicles.
[4] Includes impacts with the road/ground. In the case of the rural crashes there are two rollovers and in the case of the motorcycle crashes there were six impacts with the ground causing death.

and truck crashes, the average age of the victims' vehicles is significantly higher than the average age of the other vehicles involved in the crashes. This reinforces the finding from Table 3, that a number of the fatalities could have been prevented with crash mitigation technologies. The newer vehicles are much more likely to be fitted with these technologies. Finally, the gender of the victims is very heavily biased towards males. There is no reason to believe that the risk exposure is this heavily biased towards males or that males are significantly more vulnerable and hence more likely to die in a crash. Thus the indications are that male driving behaviour is more likely to result in a fatal crash.

Table 4. Other relevant factors.

Dataset Category	All crashes		Impacts with other vehicles		Gender of victims	
	Low speed	High speed	Average age of victim's vehicle (years)	Average age of other vehicle (years)	Male	Female
Rural	6	66	15.9	8.4	46	26
Urban	5	25	17.0	10.5	25	5
Motorcycles	3	17	10.9	10.8	18	2
Total	**14**	**108**	**15.1**	**9.1**	**89**	**33**

CONCLUSIONS

The purpose of this study is to identify why people die in road crashes. Thus the focus is not to identify why the crash occurred but rather why the outcome was a fatality rather than something less serious. The analysis considered three groups of crashes, rural crashes involving trucks and cars, urban crashes involving trucks and cars and motorcycle crashes. Fatalities of pedestrians and cyclists were explicitly excluded. The dataset for analysis was extracted from the CAS records for 2014 and aimed to consider 70 rural road fatalities, 30 urban road fatalities and 20 motorcycle fatalities. In fact, there was insufficient data on urban road fatalities in 2014 and thus for the urban road fatalities the timeframe was extended into the first few months of 2015.

The vast majority of fatalities involved an impact with some other object. Nearly half of these impacts were with another moving vehicle. All of the vehicle impacts involved another vehicle that was either the same or a heavier weight category than the victim's vehicle. There were no instances where the victim's vehicle impacted a lighter type of vehicle. Trains are assumed to be heavier than trucks which, in turn, are assumed to be heavier than utes, SUVs and vans, which are heavier than cars.

About 30% of fatalities would have or possibly could have been avoided if the victim had been wearing a seatbelt or a crash helmet (for the motorcycle crashes). A further 23% of fatalities would have or possibly could have been avoided if the victims' vehicles had been fitted with the safety mitigation technologies that are readily available on current new vehicles. This latter finding is reinforced by the fact that the victims' vehicles were, on average, significantly older than the vehicles that they impacted which implies that the survival rate in the newer vehicles is significantly higher.

Most of the crashes occurred at a relatively high speed (over 60km/h). Clearly in many instances a lower impact speed would have improved the victim's chances of survival.

The timeliness of medical intervention was a factor in a very small number of cases. In several of these cases the crash was not discovered until sometime after it had occurred. In two cases, the at-fault drivers left the scene and others involved in the crash (passenger, other driver) subsequently died. The crash reports often do not provide any information on the arrival of medical emergency services and so this data is not particularly reliable.

The analysis also considered whether a medical condition or the age and frailty of the victim contributed to the fatality. There were a small number of instances (6) where this was probably the case and a larger number (15) where this was possibly the case.

The analysis did not determine what the impact of future crash mitigation technologies would be because this involves a degree of speculation. However, it is clear that technologies such as automated collision avoidance braking, automated lane keeping and active cruise control could prevent a number of the fatalities.

APPENDIX A

Procedure for Evaluating Why People Die

The terms of reference specified that the factors to be considered are:

- the characteristics of the roadside, including any objects struck, lack of barriers etc
- pre-crash speeds (related to impact severity rather than crash cause)
- restraint or helmet use
- vehicle characteristics in terms of crash avoidance technology and aggressivity
- after crash medical care including the time delay between the trauma and medical intervention.

A related study from Australia found that nearly 50% of fatalities were the results of an impact and thus impacts will be a starting point in the analysis.

The proposed procedure takes the form of a questionnaire. The answers to all questions will be recorded in a spreadsheet. This will simplify any subsequent review by other analysts. The questionnaire is based on a single victim. Where a crash has multiple victims, there should be a set of answers for each victim.

The questionnaire is:

1. Enter crash identification number.
2. Enter crash time and date.
3. Enter time and date of death.
4. Enter arrival time of emergency services (if known).
5. What vehicle type was the victim in? Truck/Car/Motorcycle
6. Enter vehicle registration number and year of manufacture.
7. Enter victim's age, gender and whether driver or passenger.
8. Was the victim wearing a seatbelt (or helmet if a motorcyclist)? Yes/No/Unknown *(if yes or unknown go to question 10).*
9. Would wearing a seatbelt (or helmet) have prevented the fatality? Yes *(or very probably)*/Possibly/ No *(or probably not).* Key indicators are comments from investigating officers, other occupants who were restrained surviving, victims thrown from the vehicle, low to moderate impact speeds.
10. Would crash mitigation and prevention technologies available on current vehicles have prevented the fatality? Yes *(or very probably)*/Possibly/ No *(or probably not).* Key indicators are investigating officer comments, older vehicles, low to moderate speeds, loss of control crashes in curves particularly those resulting rollover where electronic stability control would be effective.
11. Did the victim's vehicle impact another object?   Yes/No *(if no go to question 19)*
12. Categorise the object impacted. Tree/Post/Bridge abutment/crash barrier/vehicle/other *(if "other" gives details in comments section)*
13. What was the victim's vehicle speed? High (*60km/h or more*)/Low (*less than 60km/h*)/*Specific value in km/h.*
14. If the impact involved another moving vehicle enter vehicle make, model, registration number and year of manufacture? *(if no other moving vehicle go to question 17)*
15. Enter speed of other vehicle. High (*60km/h or more*)/Low (*less than 60km/h*)/*Specific value in km/h.*
16. Were the airbags in the other vehicle deployed? Yes, No, no airbags fitted.
17. Was the fatality the result of the impact? Yes *(or very probably)*/Possibly/ No *(or probably not).* The appropriate answer can best be determined by considering the inverse question: If there had been no impact would the victim have died?
18. Was the fatality the result of the impact speed? Yes *(or very probably)*/Possibly/ No *(or probably not).* The appropriate answer can best be determined by considering the inverse question: Would the victim have died if the impact speed was lower?

19. Would crash mitigation and prevention technologies available on current vehicles has prevented this fatality? Yes *(or very probably)*/Possibly/ No *(or probably not).*
20. Did the victim survive the initial crash? Yes/No/Unknown *(if no go to question 23)*
21. Did medical emergency services arrive within one hour? Yes/No/Unknown
22. Would more prompt medical intervention have prevented fatality? Yes *(or very probably)*/Possibly/ No *(or probably not).* Key indicators are investigating officer comments, coroner reports, time between crash and intervention.
23. Did the victim have a medical condition that contributed to the fatality? Yes *(or very probably)*/Possibly/ No *(or probably not).*
24. Was the victim's age (or frailty) a factor in their death? Yes *(or very probably)*/Possibly/ No *(or probably not).*
25. Were there post-impact factors that caused or contributed to the fatality? (fire, electrocution, drowning etc.)
26. Comments? Write brief notes on any notable aspects of this crash.