

## Road Fatalities in the Limpopo Province in South Africa

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**ABSTRACT** South Africa has high fatality rates on its roads. Between 2004 and 2008, the country had at least 50,000 fatal road accidents which caused over 70,000 deaths. The Limpopo Province contributed more than 5000 fatal road accidents with well over 6000 deaths during the same period. The most vulnerable road users to fatal road traffic accidents are the drivers, passengers, and pedestrians who collectively account for more than 5000 fatalities in the province between 2004 and 2008. The study, using data of 2008 from the Road Traffic Management Corporation, establishes that the leading contributory factors to fatal crashes and fatalities in Limpopo are human factors such as “speed too high for circumstances”, “pedestrian (jay walking)”, “overtaking when unlawful or unsafe” and “hit-and-run”; road and environmental factors such as “sharp bend”, “poor visibility (rain, mist, dust, smoke, dawn)”, “poor condition of road surface”, “animals (wild or stray)” and “road surface slippery/wet”; and vehicle factors such as “tyre (burst prior to crash)”, “brakes that are faulty” and “overloading”. The study reveals that the human factors accounted for 80.1 percent of fatal crashes and 84.9 percent of fatalities; road and environmental factors accounted for 11.5 percent of fatal crashes and 7.7 percent of fatalities, and vehicle factors accounted for 8.4 percent of fatal crashes and 7.4 percent of fatalities.

### INTRODUCTION

Road crashes in South Africa are a major contributor to deaths in the country, as is the case in other developing countries around the world. Road traffic accidents are the 6<sup>th</sup> leading cause of death in Limpopo (Medical Research Council 2008).

In most cases during busy periods such as Easter holidays, December holidays as well as other public holidays and some important occasions when Limpopo hosts many people who attend sessions at Zion Christian Church, one observes a lot of accidents on the road, most of which can be prevented. Holiday makers visiting the tourist destinations in the province increase the traffic volume in the major provincial roads which increases the potential for more traffic accidents in the Province. The high rates of traffic accidents resulted in the South African Government committing to the United Nations Millennium Development Goals of reducing deaths caused by road traffic accidents by 2014. The Ministers of Transport of all the countries in Africa thus committed the continent to achieving the UN Millennium Development Goals at the African Union conference in Addis Ababa, Ethiopia, in April 2006 (UNECA 2009).

The World Health Organization (WHO 1999) estimated that without effective action, road

crashes will rise to the second largest non-natural cause of deaths in South Africa by 2020. Road traffic accidents are a major cause of premature deaths, impairment and disability amongst people aged between 5-35 years (Duprex et al. 2002; WHO 2003).

Fatal road traffic crashes cost the province R4.86 billion (about \$ 0.7 billion) from 2004 to 2008 (Road Traffic Management Corporation (RTMC) 2008). As a rural province, Limpopo cannot afford to spend this amount of money on road traffic crashes and trauma which are preventable, when the province has so many competing developmental needs in education, health, housing, poverty, unemployment, etc.

### Background

Road traffic crashes are a major cause of premature death, avoidable injuries and long-term disability. They are a major public health problem, causing at least 1.2 million deaths and 50 million injuries per year in the world with a global cost of \$500bn (WHO 2004; Vasconcellos 2006). Research estimated that 85% of fatalities and 90% of the annual disability-adjusted life years (DALYs) occur in low-income and middle-income countries which by the year 2000 were 613,000.00 (World Bank 2008).

South Africa has high fatality rates on its roads, although the number of cars and their average kilometers driven are virtually the same as the developed countries, the number of fatalities is however 10 times higher in South Africa. South African cities are among the top five (5) unsafe cities with exceptionally high percentage of people killed on roads in the world (Vanderschuren 2002). Annually South Africa records at least 500 000 traffic accidents that result in deaths and severe injuries at a cost of R38 billion (Road Traffic Management Corporation (RTMC) 2008).

If nothing is done to reduce the road traffic deaths (fatalities) in less developed countries, it is estimated to rise almost 100% by 2020 to 1.2 million fatalities. It is also predicted that road traffic fatalities will be the sixth leading cause of death worldwide and the second leading cause of disability-adjusted life-years lost in developing countries by 2020 (WHO 2004).

Currently, between 60,000 and 70,000 injury deaths occur in South Africa. Road traffic crashes contribute 32% of injury deaths in South Africa (Medical Research Council 2008). South Africa is faced with the triple burden of road traffic-related injuries involving drivers, passengers, pedestrians and cyclists.

Motor vehicle crashes are the leading cause of death and disability amongst adolescents, youths and young adults. Pedestrian deaths are ranked as the top external cause of death among children aged 5-14 years (Duperrex et al. 2002; WHO 2003; Solagberu et al. 2002). According to the Medical Research Council of South Africa (2008), road traffic crashes is the 9th leading cause of death among children aged 1-4 years in South Africa.

Pedestrians and cyclists are the most vulnerable road user groups within the road network of South Africa and are often seriously or fatally injured in road crashes. Deaths among pedestrians are on the rise. Pedestrians, in particular are one of the major road casualty categories in road crash statistics (Ribbens 2003). According to Statistics South Africa (2006), road traffic crashes are the second leading non-natural cause of death in the country.

## METHODOLOGY

Secondary data from Road Traffic Management Corporation were used as the source of this study to determine the pattern and trends

of contributory factors of fatal road traffic crashes and fatalities. Basic descriptive statistical analyses including simple bar, multiple bar charts and line graphs as well as trend analysis (time series) were used in the analysis.

Time series (trend) analysis involves variables whose values represent equally spaced observations of a phenomenon over time. Aggregate data was used in the analysis. Classic time series involves forecasting future values of a time series based on patterns and trends found in the history of that series (exponential smoothing and simple ARIMA).

South Africa has nine (9) Provinces, 53 Districts, 5 Metropolitans and 283 Local Municipalities. Limpopo has five districts and 26 municipalities. Aggregated data at the Limpopo provincial level covering the following have been taken:

- ♦ All fatal crashes in which at least 5 or more people were killed per route.
- ♦ All fatal crashes in which at least 4 or more vehicles were involved per route.
- ♦ All accidents which occurred in Limpopo Province.
- ♦ All reported and registered fatal road traffic crashes of period from 01 January 2004 to 31 December 2008.

## RESULTS AND DISCUSSION

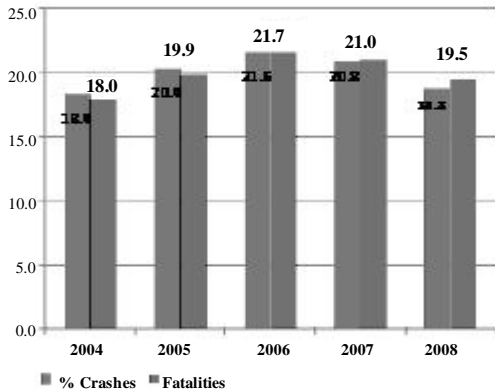
Basic statistical analysis performed on the number of fatal crashes and fatalities in South Africa from 2004 to 2008 produced the following results:

As shown in Table 1, there was an increase in fatal crashes from 2004 to 2006 resulted in an increase in fatalities for the same period. This was followed by decreases in both fatal crashes and fatalities from 2006 to 2008 (see Fig. 1). Increases in fatal crashes of 10.6% and 6.1% were registered for the periods 2004 to 2005 and 2005 to 2006 respectively. The periods 2006 to 2007 and 2007 to 2008 saw decreases in fatal crashes of 3.6% and 10%, respectively. Law enforcement interventions could be an explanation of these decreases. Examples of some of the interventions are road safety debates targeted at school learners, road safety education and communication interventions as well as road safety awareness campaigns targeted at pedestrians, these could be an explanation for the decreases.

**Table 1: The distribution of fatal crashes and fatalities in South Africa from 2004 to 2008**

Year	Fatal crashes	Fatalities	% crashes	% fatalities	Percentage in years crashes	Percentage in years fatalities
2004	10607	12772	18.4	18.0	10.6	10.7
2005	11736	14135	20.4	19.9	6.1	9.1
2006	12456	15419	21.6	21.7	-3.6	-3.2
2007	12011	14920	20.8	21.0	-10.0	-7.0
2008	10805	13875	18.8	19.5		
Total	57615	71121	100.0	100.0		

Source: Road Transport Management Corporation, 2008



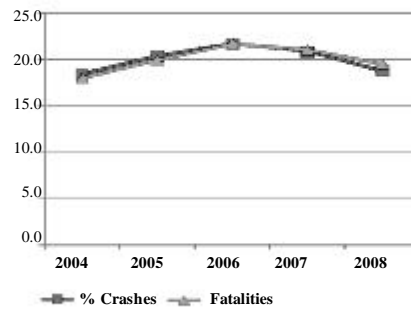
**Fig. 1. Percentage of fatal crashes and fatalities in South Africa from 2004 to 2008**

The increases in fatal crashes for the same period brought about increases in fatalities by 10.7% and 9.1% for the periods 2004 to 2005 and 2005 to 2006, respectively (see Fig. 2). However, the same increases in fatal crashes brought about decreases of 3.2% and 7% fatalities for the periods 2004 to 2005 and 2005 to 2006, respectively. Noteworthy is the observation that Limpopo contributed 8.7% to fatal crashes and 9% to fatalities in the country between the period 2004 and 2008. There are some reasons that could explain the trends. Either the data qualities are not the same over the years, or if they are, then the interventions mentioned earlier could cause the lowering of the magnitudes at those years. As they relax after the intervention (after being taught), everything gets relapsed and the magnitude shoots up again.

**Table 2: The distribution of fatal crashes and fatalities in Limpopo**

Year	Fatal crashes	Fatalities	% crashes	% fatalities	Percentage in years crashes	Percentage in years fatalities
2004	890	1070	17.8	16.7	10.7	23.4
2005	985	1320	19.7	20.6	2.5	-2.2
2006	1010	1291	20.2	20.1	2.4	6.1
2007	1034	1370	20.7	21.3	4.5	0.1
2008	1081	1372	21.6	21.4		
Total	5000	6423	100.0	100.0		

Source: Road Transport Management Corporation, 2008



**Fig. 2. Percentage of fatal crashes and fatalities in Limpopo from 2004 to 2008 – Trend Analysis**

Table 2 and Figure 3 show fatal crashes and fatalities in Limpopo. As can be seen from the table, there has been an increase in fatal crashes from 2004 to 2008 resulting in an increase in fatalities from 2004 to 2005 and a decrease in fatalities from 2005 to 2006, followed by increases in fatalities from 2006 to 2008. Thus, there were increases in fatal crashes of 10.7%, 2.5%, 2.4% and 4.6% registered in Limpopo annually from 2004 to 2008.

The case of fatalities for the 4-year period in the province is a bit different in that, there has been an increase, a decrease and then an increase again. From Table 2 and Figure 4, we observe that there was an increase of 23.4% in fatalities for the period 2004 - 2005, followed by a decrease of 2.2% for the period 2005 - 2006, then increases of 6.1% and 0.2% in fatalities for the periods 2006 - 2007 and 2007 - 2008 respectively. It is important to note that Limpopo had 5000

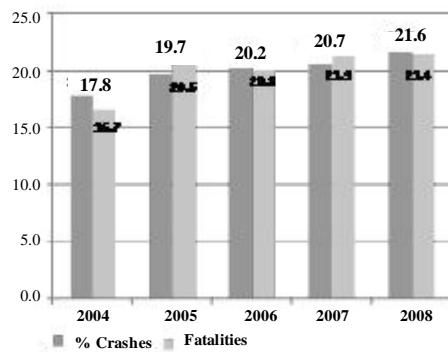
**Table 3: The distribution of fatalities per road user group in the Limpopo Province**

Road user group	Drivers	Passengers	Pedestrians	Total	% Fatalities for			% Change in years		
					Drivers	Passengers	Pedestrians	Drivers	Passengers	Pedestrians
2004	289	389	390	1068	15.3	14.7	20.6	23.9	48.3	-1.5
2005	358	577	384	1319	18.9	21.9	20.3	7.3	-9.4	0.0
2006	384	523	384	1291	20.3	19.8	20.3	10.7	9.9	-3.6
2007	425	575	370	1370	22.5	21.8	19.5	2.1	0.0	-1.1
2008	434	575	366	1375	23.0	21.8	19.3			
Total	1890	2639	1894	6423	100.0	100.0	100.0			
% of fatalities	29.4	41.1	29.5	100						

Source: Road Transport Management Corporation, 2008

fatal crashes from 2004 to 2008 which accounted for 6423 fatalities (deaths) during the same period.

Table 3 shows that there were increases in fatalities for drivers of 23.9%, 7.3%, 10.7% and 2.1% annually from 2004 to 2008. An increase in fatalities for passengers was 48.3% between the period 2004 to 2005, followed by a decrease of 9.4% for the period 2005 to 2006, then an increase of 9.9% for the period 2006 to 2007 and then stabilized for the period 2007 to 2008.



**Fig. 3. Percentages of fatal crashes and fatalities in Limpopo from 2004 to 2008**

Table 3 equally shows that there was a decrease of fatalities of pedestrians from the period 2004 to 2005, a constant fatality of pedestrians from 2005 to 2006, a decrease again from 2006 to 2008. In terms of percentages, a decrease of 1.5% was recorded in Limpopo for the period 2004 to 2005, a zero (constant fatality) for the periods 2005 and 2006, then decreases of 3.7% and 1.1% for the periods 2006 to 2007 and 2007

to 2008 respectively. Road safety debates targeted at school learners, road safety education and communication interventions as well as road safety awareness campaigns targeted at pedestrians could be an explanation for these decreases. Overall passenger fatalities were the highest at 41.1%, followed by pedestrian fatalities of 29.5%, and driver fatalities coming closely in third at 29.4% for the periods between 2004 and 2008.

Similar results were obtained in other studies conducted in both South Africa and other countries. The following are the results of such studies:

- ♦ Studies conducted in Libya on victims of road traffic crashes showed that pedestrians account for 34% of fatalities (Mekky 1984).
- ♦ Studies conducted in South Africa by Brysiewicz (2001) found that approximately 45% of road traffic deaths involve pedestrians.
- ♦ Studies conducted in 24 developing countries to determine road traffic injuries on road-user groups in 1997 found that pedestrian fatalities were the highest in 75% of the studies accounting for between 41% and 75%, followed by passengers accounting for between 38% and 51% in 62% of the studies. Drivers were third in 55% of studies and never ranked first in any of the 24 developing countries (Odero et al. 1997:445-460).

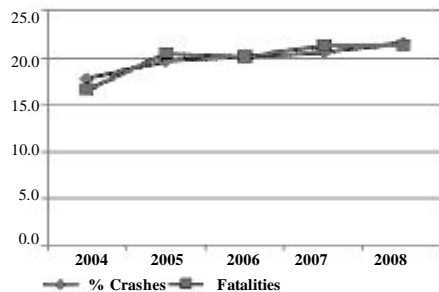
Table 4 and Figure 7 show that "Speed too high for the circumstances" and "Pedestrian: jay walking" were the leading contributory human factors to fatal crashes from 2004 to 2008 contributed to 47.3% and 39.0% respectively. The other two human factors that contributed significantly to fatal crashes from 2004 to 2008 were "Overtaking when unlawful/unsafe" and "Hit-

and-run”; they account for 7.2% and 6.5% respectively. Similar studies have given results close to these. For example, in Great Britain, data collected on road traffic crashes in 1999 to 2002 concerning the factors involved in each crash found that “Excessive speed” was the most common contributory factor in fatal crashes (www.bobulous.org.uk/articles/road\_traffic\_accident.html).

**Table 4: The distribution of leading fatal crashes per human factors in Limpopo**

Human factors	Pedestrian: Jay walking	Speed too high for circumstances	Over-took when unlawful/unsafe	Hit-and-run	Total
2004	248	278	23	52	601
2005	232	326	28	34	620
2006	172	204	30	29	435
2007	244	258	49	34	585
2008	242	313	79	42	676
Total	1138	1379	209	191	2917
% per human factor	39	47	7	7	100

Source: Road Transport Management Corporation, 2008



**Fig. 4. Percentage of fatal crashes and fatalities in Limpopo from 2004 to 2008 – Trend Analysis**

In the USA, the factor attributed to the greatest number of fatal crashes in 2003 was “Failure to keep in the proper lane or running off road”, which accounted for over 32% of fatal crashes. “Driving too fast for conditions or excess of posted speed limit or racing” was reported as being the other factor where the proportion is over 20% of fatal crashes. All these figures support the assertion that the faster the speed of a vehicle, the greater the risk of an accident be-

cause the forces experienced by the human body in a collision increases exponentially as the speed increases (www.smartmotorist.com/traffic-and-safety-guideline/what-causes-caraccidents.html).

According to the studies conducted by Crilly (1998), 27.4% of all fatal crashes involved speeding vehicles and 32% of drivers were prosecuted for speeding and unsafe driving. The study reveals that 75% of fatal crashes were pedestrians failing to look before crossing the road, an occurrence which is more prominent among older pedestrian fatal crashes and the youth. In the USA studies, “Driving under the influence of alcohol, drugs, or medication”, had accounted for over 10% of fatal crashes, and the same studies conducted by Crilly (1998), 60% of adult fatalities, including both pedestrians and vehicle occupants had alcohol in their blood when tested.

The study in Limpopo revealed however that intoxicated drivers and pedestrians account for 3.6% of fatal crashes in the province which is a low proportion over a period of five years. The study further shows that the other human factors such as turn in front of oncoming traffic, fatigue/driver fell asleep, intoxicated driver, disregard for red light/stop sign/yield sign, among others jointly contribute significantly to fatal crashes; they account for 14.9% (see also Debbie et al. 2000).

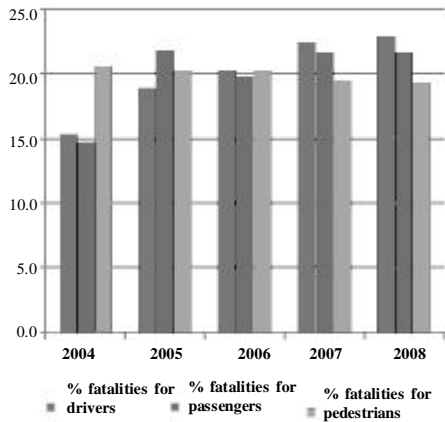
Table 5 shows that tyres burst (prior to crash) and brakes (faulty brakes) were the leading contributory vehicle factors to fatal crashes accounting for 56.9% and 17.9% respectively, then followed by overloading, faulty brakes, bicycle (no rear reflectors), and unknown/other accounting for 6.7%, 4.7%, 3.6% and 2.8% respectively.

The data collected in Gauteng on mechanical failures as a contributing cause to motor vehicle accidents gave similar results (Van-Schoor et al. 2001). In that study it was found that 40% of the tested vehicles had potential mechanical defects and the accidents investigated were the results of defective tyres and brakes. This was followed by overloading. The findings of the study did compare well with other international studies concerning the magnitude of mechanical failures to accidents. For example, the country report on road safety in Cambodia presented by the Director General of Transport and Secretary General of NRSC in June 22, 2007, stated that vehicles had caused road accident because

**Table 5: Distribution of leading fatal crashes per vehicle factor in Limpopo: 2004-2008**

Vehicle factors	Over-loading	Brakes: Faulty	Tyres: Burst prior to crash	Bicycle: No rear reflectors	Total
2004	4	12	34	-	50
2005	5	16	44	-	65
2006	1	7	28	1	37
2007	6	13	45	5	69
2008	8	16	54	11	89
Total	24	64	205	17	310
% per vehicle factor	8	21	66	5	100

Source: Road Transport Management Corporation, 2008



**Fig. 5. Number and percentages of fatalities per road user group in Limpopo**

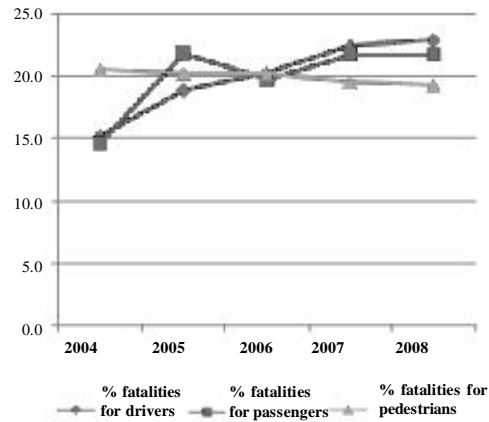
their owners did not properly maintain and regularly inspect the vehicle. Hence, the road acci-

**Table 6: The distribution of leading fatal crashes per road and environmental factors in Limpopo: 2004-2008**

Road and environmental factors	Poor visibility (rain, mist, dust, smoke, dawn)	Poor street lighting	Sharp bend	Poor condition of road surface	Road surface slippery/wet	Animals: Stray/Wild	Total
2004	15	4	10	6	5	5	45
2005	11	8	11	20	8	6	64
2006	17	14	25	17	11	7	91
2007	24	21	23	18	8	5	99
2008	17	6	35	21	7	18	104
Total	84	53	104	82	39	41	403
% of road and environmental factors	20.8	13.2	25.8	20.3	9.7	10.2	100.0

Source: Road Transport Management Corporation, 2008

dent occurred as a result of brake failure, tyre blowout, power steering failure and headlight failure. That fatality has increased since 1998 with the highest rate recorded in 2007 (www.grsroadsafetv.org).



**Fig. 6. Percentages of fatalities per road user group in Limpopo - Trend Analysis**

Table 6 shows that the leading fatal crashes per road and environmental factors are “Sharp bend”; “Poor visibility (rain, mist, dust, smoke, dawn)”; “Poor condition of road surface”; “Poor street lighting”; “Animals (stray/wild)”; and “Road surface slippery/wet”, They account for 25.8%, 20.8%, 20.3%, 13.2%, 10.2% and 9.7% respectively.

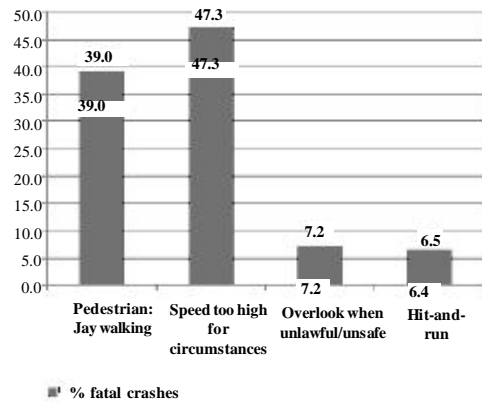
The study conducted by Crilly in 1998 established that darkness and poor visibility as a result of poor street lighting and poor weather conditions and road surfaces accounted for 34.8% of the fatal crashes in Liverpool in Great

Britain. Lack of fencing of the roads by the authorities was found to be a contributory factor to fatal crashes in the studies conducted on “Fatal road traffic accidents in the Mthatha area of South Africa” in 1993-2004. Fatal crashes attributed to swerving due to rain, snow, fog, sand, dirt, oil or wet leaves accounted for 20.9% of the fatal crashes (Marmor et al. 2006).

**Table 7: Summary of fatal crashes per human factor, vehicle factor and road and environmental factors in Limpopo**

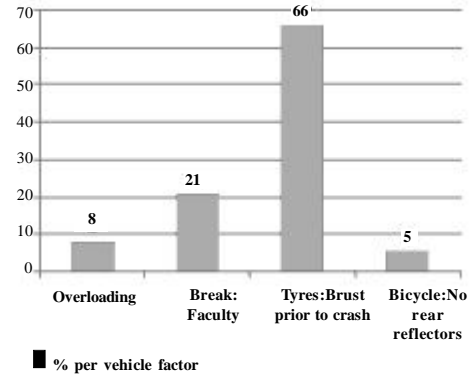
Factors	Human factors	Vehicle factors	Road and environmental factors	Total
2004	664	54	57	775
2005	682	76	74	832
2006	521	48	121	690
2007	763	78	119	960
2008	801	104	120	1025
Total	3431	360	491	4282
% per factor	80.1	8.4	11.5	100.0

Source: Road Transport Management Corporation, 2008



**Fig. 7. Percentages of leading fatal crashes per human factors in Limpopo**

Table 7 and Figures 5 and 6 show that there is an increase of fatal crashes caused by human factors by 2.7% from 2004 to 2005, followed by a decrease of 23.6% from 2005 to 2006, an increase of 46.5% from 2006 to 2007 and lastly an increase of 5% from 2007 to 2008. The table further shows that there is an increase of fatal crashes caused by vehicle factors of 40.7% for the period 2004 -



**Fig. 8. Percentages of leading fatal crashes per vehicle factors in Limpopo**

2005, followed by a decrease of 36.8% from 2005 to 2006, an increase of 62.5% from 2006 to 2007 and an increase again of 33.3% from 2007 to 2008.

It is also evident from the table that there are increases in fatal crashes caused by road and environmental factors for the periods 2004 - 2005 and 2005-2006 of 29.8% and 63.5% respectively, then by a decrease of 1.7% for the period 2006 - 2007. The period 2007- 2008 saw an increase of fatal crashes of 0.8%. Table 7 further shows that the human factors, road and environmental factors and vehicle factors account for 80.1%, 11.5% and 8.4% in fatal crashes respectively between 2004 and 2008 (see Fig. 8).

These findings agree with the results of international studies on causes of fatal crashes. In particular, the study conducted at the Indian Institute of Technology in Madras on bus drivers of Metropolitan Transport Corporation of the city of Chennai of 30 male drivers with a history of accidents and 30 male drivers who were accident free (anxiety, locus of control, subjective-Well-being and knowledge of road rules correlates of accidents among public transport drivers) revealed that between 80 and 90 percent of accidents are due to human failure and the rest are attributed to other factors such as vehicle failure and environmental hazards (Singh 2004; Katwal 2004).

In the study conducted by Odero et al. (1997), it was established that human error is estimated to account for between 65% and 95% of all causes of traffic crashes in developing countries.

## CONCLUSION

This study has found that there is significant difference in contributory factors of road fatal accidents under human factors, vehicle factors and road and environmental factors. This study established that the leading contributory factors to fatal crashes and fatalities in Limpopo are human factors such as speed too high for circumstances, pedestrian jay walking, overtaking when unlawful or unsafe and hit-and-run; followed by road and environmental factors such as sharp bend, poor visibility (rain, mist, dust, smoke, dawn), poor condition of road surface, animals (wild or stray) and road surface slippery/wet and vehicle factors as tyre burst prior to crash, brakes that are faulty and overloading.

The study also revealed that the human factors accounted for 80.1% of fatal crashes and 84.9% of fatalities; followed by road and environmental factors which accounted for 11.5% of fatal crashes and 7.7% of fatalities, and vehicle factors accounted for 8.4% of fatal crashes and 7.4% of fatalities for the periods 2004 to 2008. According to this study, the victims of road traffic fatal crashes in Limpopo are passengers, pedestrians and drivers with fatalities of 41.1%, 29.5% and 29.4% for the periods 2004 to 2008, respectively.

This study has also found that the causes of motor vehicle crashes are multi-factorial and involve the interaction of pre-crash factors that include people, vehicles and road environment. The speed too high for circumstances, pedestrian jay walking, overtaking when unlawful or unsafe, sharp bend, poor visibility (rain, mist, dust, smoke, dawn), poor condition of road surface, animals (wild or stray), road surface slippery/wet, tyre burst prior to crash, brakes that are faulty and overloading are all the pre-crash factors that contributed to one or more road traffic fatal crashes in Limpopo.

## RECOMMENDATIONS

It is hoped that this study will contribute to the body of knowledge on road safety. It is therefore being recommended that:

- all stakeholders, including road traffic authorities, health sector, education sector, traditional leaders, community organizations,

policy makers will look at the issues raised in this study critically,

- strive for increased co-operation, innovation and commitment to preventing road traffic crashes,
- have regular review of statistics and adopt measures that will curtail the incidence.

This will give hope to the people in the province as they see that the death tolls on the roads in Limpopo are reduced.

## NOTES

### Definition of Concepts

*Road Traffic Crash:* A road traffic crash is an accident, event, collision or crash between two or more vehicles, a vehicle and a train, a vehicle and a fixed object, such as a bridge, tree, post, etc., or a single vehicle that overturned on or near a public road. A road traffic crash is a single road traffic incident, regardless of the number of vehicles or persons involved in any particular crash. A road crash happens when two road users, regardless of mode of travel, try to occupy the same road space at the same time.

*Fatal Crash:* A crash resulting in the death of one or more persons. The persons killed may be drivers and passengers of vehicles, or cyclists and pedestrians. Such crashes can include serious and slight injuries.

*Fatality:* Person or persons killed during or immediately after a crash, or death within 6 days after a crash happened as a direct result of such crash".

*Serious injury:* Persons sustained injuries to such an extent that hospitalization is required. Serious injuries include fractures, crushing, concussion, internal injuries, severe cuts and lacerations, severe shock, etc which require medical treatment, hospitalization and/or confinement to bed.

*Fatal Accident:* Accident in which person or persons are killed during or immediately after an accident.

*Fatality Rate Per Human Population:* The fatality rate per 100 000 population is calculated by dividing the number of fatalities by the population, in hundred thousands, of the relevant region, province or country.

*Fatality Rate Per Vehicle Population:* The fatality rate per 10 000 vehicles is calculated by dividing the number of fatalities by the vehicle population, in ten thousands, of the relevant region, province or country.

*Crash Type:* Head/rear end collision; head on collision; Sideswipe -opposite directions; Sideswipe-same direction; Approach at an angle-both travelling straight; Single vehicle overturned; Single vehicle left the road; Person fell off; Accident with pedestrian; Accident with animal; Hit and run; Accident with fixed object.



*Vehicle Type:* Motorcars, Minibuses (Taxis), Buses, Motorcycles; LDV's-Bakkies, Trucks, Other and unknown

*Human Factors:* Accidents caused as a result of human error such as cell phone holding/usage, disregard for red traffic lights; disregard for stop sign; fatigue-driver falling asleep; hit and run, intoxicated driver with liquor /drug usage, intoxicated pedestrian with liquor/drug usage, intoxicated cyclist with liquor/drug, overtaking in the face of oncoming traffic, speed too high for circumstances, turned in front of oncoming traffic, U-turn, amongst others.

*Vehicle Factors:* Bicycle: no rear reflectors, bicycle: no head lamp, brakes faulty, brake lights dirty, chevrons dirty, chevrons without reflective stripes, headlights blinding, headlights faulty, headlights not switched on, overload cargo, overload passengers, steering faulty, tyres burst prior to accident, tyre smooth, amongst others.

*Road and Environmental Factors:* Stray/ wild animals, blind corner, blind rise, lighting poor, road markings poor/inadequate/none, road traffic lane narrow, road signs poor/inadequate/none, road surface poor, road surface wet/slippery, road works, sharp bend, traffic lights defective, visibility poor, visibility smoke, fog, rain, etc.

*Pre-Crash Factors:* Factors that contribute to road traffic accident.

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