FACTORS LEADING TO FATAL CRASHES AND FATALITIES ON THE SOUTH AFRICAN ROADS: 2005-2009

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ABSTRACT

The purpose of this paper is to identify the leading contributory factors towards road traffic fatal crashes and fatalities in South Africa for the period 2005 to 2009. The paper also provides the level of road traffic violations which results in fatal crashes and fatalities in the country. It further provides an analysis of fatal crashes and fatalities by vehicle type. The statistical data on road traffic fatal crashes and fatalities based on the police accident reports for the periods 2005 to 2009 are also analyzed. After analysis, the leading contributory factors are disaggregated into human, road and environmental as well as vehicle factors. The paper also analysed the crash types and time they occurred. The paper further isolates those factors that need consideration in the planning of law enforcement operations, road safety education initiatives, traffic engineering as well as monitoring and evaluation of road safety initiatives. The report concludes by providing recommendations on interventions to alleviate the occurrence and impact of the identified factors.

This paper aims to provide an analysis of:

1 INTRODUCTION

Background

According to the Road Traffic Management Corporation Act, 1999 (Act No. 20 of 1999, the RTMC Act), the RTMC should in the public interest, enhance the overall quality of road traffic service provision and, in particular, to ensure safety, security, order, discipline and mobility on the roads. In keeping with the Road Traffic Management Corporation Act, the African Union Conference held in April 2006 in Addis Ababa, Ethiopia, the Ministers of Transport in Africa committed themselves to delivering on the Millennium Development Goals for the Transport Sector in Africa by 2014. These goals were approved by the Heads of State for adoption by the United Nations. One of the targets adopted by the Conference was to reduce by half the rate of road traffic crash fatalities by 2014. Amongst others, the objective of the conference was to plan for the implementation of the recommendations of the World Report on Road Traffic Injury Prevention and the African Road Safety Initiative. One of the recommended actions of the World Report on Road Traffic Injury Prevention is to implement specific actions to prevent road traffic crashes, minimize injuries and their consequences and evaluate the impact of these actions. The First Global Ministerial Conference on Road Safety held in November 2009 in Moscow, Russia, also resolved to encourage UN member states to implement the recommendations of the World Report on Road Traffic Injury Prevention. Amongst others, the African Road Safety Conference made the following recommendation in terms of road safety education:

"Commit to educate the general public on road safety matters, taking into consideration special categories such as drivers and school children".

In line with the RTMC Act, Millennium Development Goals and the above recommendation, the RTMC conducts annual traffic offence surveys and fatal crash statistical analysis which help the Corporation to develop evidence-based intervention strategies to reduce carnage on the roads.

1.2 Problem statement

Road fatal crashes are a major contributor to deaths in South Africa and account for 32% of deaths caused by transport injury. Road traffic injuries are a major but neglected health challenge that requires concerted efforts for effective and sustainable prevention. It is estimated that 1.2 million people are killed in road crashes annually and as many as 50 million are injured worldwide. The World Health Organization/World Bank World Report estimates that these figures will increase by about 65% over the next 20 years unless there is new commitment to prevention. The economic cost of road traffic crashes for SA as a middle-income country is 1.5% of gross national product which undermines the country's sustainable development because of the country's competing needs. At least 14,200 people die annually on our roads and at least 10,000 vehicles are involved in fatal crashes annually. It is crucial to know the causes of these fatal crashes in order to develop intervention strategies to reduce the high rates of fatal crashes.

1.3 Aim of the paper

- Fatal crashes and fatalities in the country;
- Contributory factors to fatal crashes and fatalities;
- Crash types and time of the day;
- Traffic offence survey findings; and

on the basis of the analysis above, the paper will conclude by providing conclusions and recommendations on how to alleviate the occurrence of the fatal crashes and subsequently fatalities themselves.

1.4 Scope of the paper

This paper reviews the fatal crashes in which at least five (5) people died at the scene of an accident, where at least four (4) vehicles were involved in an accident, fatal accidents in which vehicles carrying hazardous substances are involved and or high profile fatal crashes for the period 2005 to 2009. **The paper provides an analysis of the leading contributory factors to fatal crashes and fatalities with a view to identify contributory factors with high frequency of occurrence**. This analysis culminates in recommendations to reduce the occurrence of these crashes as envisaged by the Millennium Development Goals.

2 RESULTS AND DISCUSSION

The information captured in the tables and depicted in the figures below is based on a five-year period to make trends analysis possible.

2.1 Fatal Crashes and Fatalities

It is clear from Tables 1 to 3 and Figure 1 that from the year 2007, there is a constant decrease in both the number of fatal crashes and fatalities year-on-year. It is only from the year 2005 to 2006 which saw a 6% and 9% increases for fatal crashes and fatalities, respectively. Otherwise, the subsequent years registered show a decline.

Table 1: Number of fatal crashes and fatalities in SA: 2005-2009

Year	Number of Fatal Crashes	Fatalities
2005	11,736	14,135
2006	12,456	15,419
2007	12,011	14,920
2008	10,805	13,875
2009	10,857	13,768
TOTAL	**57,865**	**72,117**

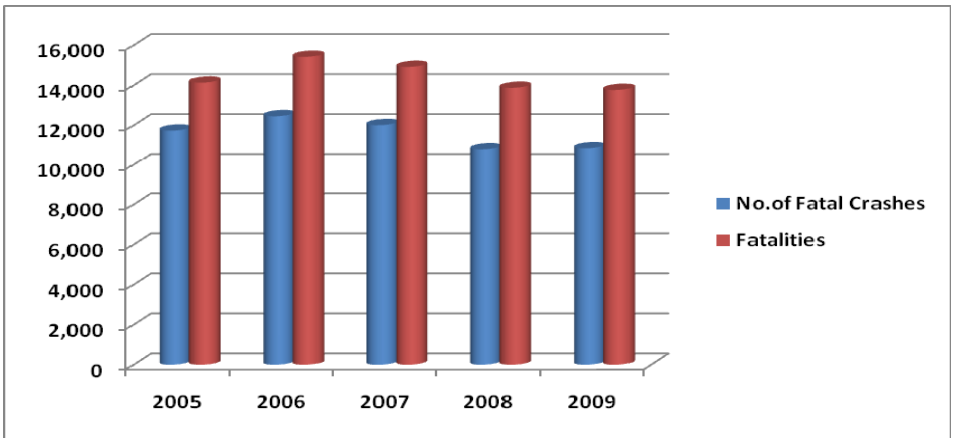

Figure 1: Number of fatal crashes and fatalities per year: 2005-2009

Table 2: Comparison of fatal crashes year on year: 2005-2009

Year	Change	% Change
2005-06	720	6.13
2006-07	-445	-3.57
2007-08	-1,206	-10.04
2008-09	52	0.48

Table 3: Comparison of fatalities year on year: 2005 - 2009

Year	Change	% Change
2005-06	1,284	9.08
2006-07	-499	-3.24
2007-08	-1,045	-7.00
2008-09	-107	-0.77

An upward trend has been observed for passenger fatalities which could be attributed to inappropriate speeding, non-roadworthy vehicles or passengers not wearing seatbelts.

The downward trend for pedestrians in Table 4 and Figure 2, demonstrates the positive impact of road traffic campaigns.

Table 4: Percentage Contribution of fatalities per user group per year: 2005 - 2009

User Group	2005	2006	2007	2008	2009
Drivers	27.4	29.0	29.7	28.7	29.5
Passengers	30.8	32.8	32.9	35.8	36.5
Pedestrians	41.8	38.2	37.4	35.5	34.0
Total	**100**	**100**	**100**	**100**	**100**

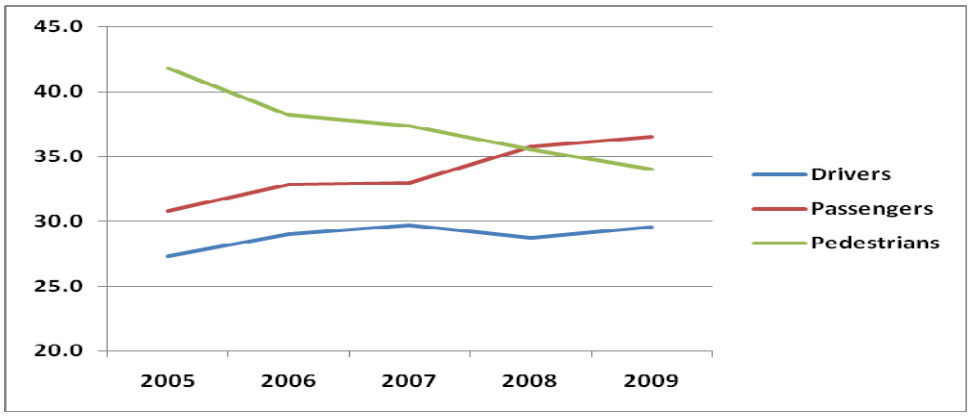

Figure 2: Percentage of fatalities per user group per year: 2005 - 2009

2.2 Contributory Factors

Table 5 and Figure 3 respectively show that pedestrian jay-walking and speed are the human factors that contribute the most towards fatal crashes. Both factors contributed above 25% compared to the others. A downward trend can be observed for pedestrian jay-walking as from 2005, and an upward trend can be observed for speed as from 2005 to 2008.

2.2.1 Human Factors

Table 5: Percentage Contribution per Human Factor: 2005 - 2009

Human Factors	2005	2006	2007	2008	2009
Pedestrian: Jay walking	44.26	37.69	37.81	32.21	36.06
Speed too high for circumstances	29.51	35.15	36.90	44.25	34.64
Hit-and-run	11.74	8.28	7.20	7.69	9.71
Overtook when unlawful / unsafe	4.09	4.83	5.03	5.55	8.18
Turn in front of oncoming traffic	3.07	4.60	4.82	3.63	3.99
Disregard: red traffic light / stop sign / yield sign	2.13	3.33	3.12	2.74	3.48
Intoxicated Driver	2.03	2.62	2.05	1.90	1.89
Intoxicated Pedestrian	1.28	1.55	1.26	0.58	0.69
Fatigue / Driver fell asleep	1.88	1.96	1.82	1.45	1.36
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

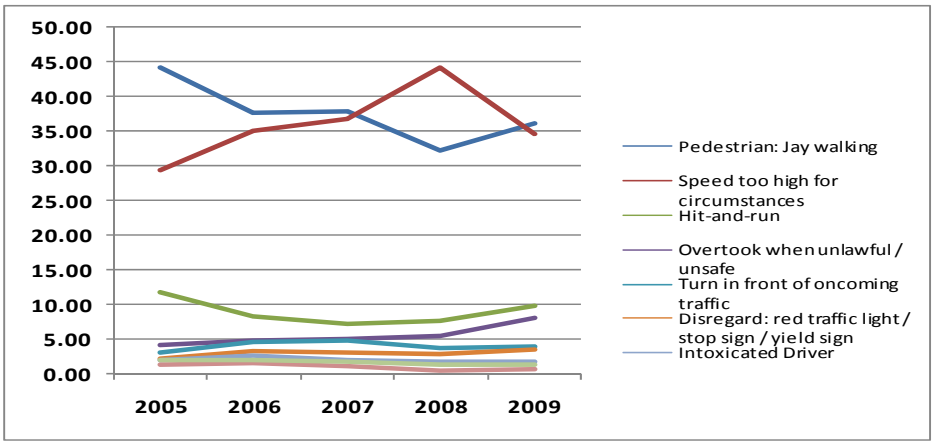

Figure 3: Percentage of Human Factor: 2005 -2009

2.2.2 Vehicle Factors

Tyre burst was the highest compared to other two factors in 2005, however a drastic decline can be seen in Figure 4 and Table 6 for the subsequent years with the exception of the increase observed from 2008 to 2009. Brakes and steering being faulty demonstrated an upward trend as from 2006 to 2007 and for the periods 2005 to 2006 and 2008 to 2009, faulty brakes contributed to just fewer than 30% of the fatal crashes considered for this study.

Table 6: Percentage Contribution per Vehicle Factor: 2005 - 2009

Vehicle Factor	2005	2006	2007	2008	2009
Tyres: Burst prior to crash	67.63	68.49	46.63	31.69	42.56
Brakes: Faulty	29.19	28.39	44.72	30.79	29.24
Steering: Faulty	3.18	3.13	8.65	37.52	28.20
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

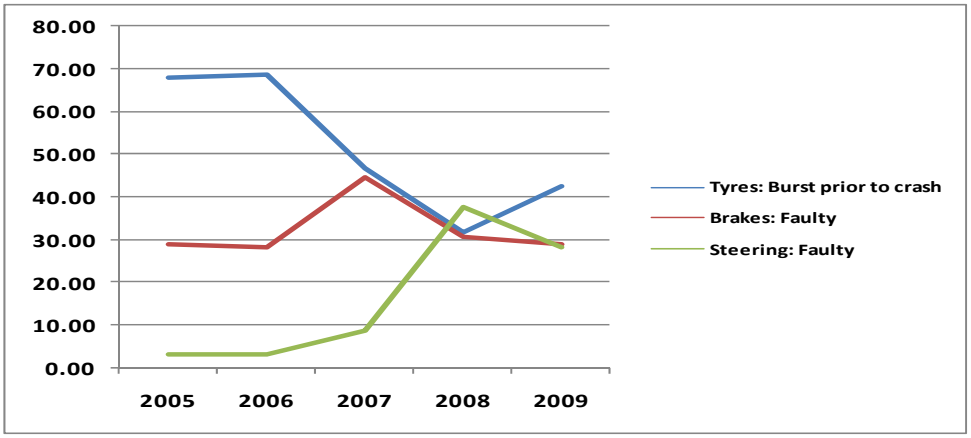

Figure 4: Percentage of Vehicle factors

2.2.3 Road Factors

The road factors percentage in Table 7 and Figure 5 range between 10% and 40%, with sharp bend being in the lead. Poor condition of the road surface is the second road factor for all the years with exception of 2007, followed by poor visibility.

Table 7: Percentage Contribution per Road Factor: 2005 - 2009

Road Factor	2005	2006	2007	2008	2009
Sharp bend	32.13	30.96	37.71	28.27	38.66
Poor visibility	23.83	20.60	33.14	20.39	21.06
Poor condition of road surface	25.74	30.62	19.29	23.07	24.31
Road surface slippery / wet	18.30	17.82	9.86	28.27	15.97
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

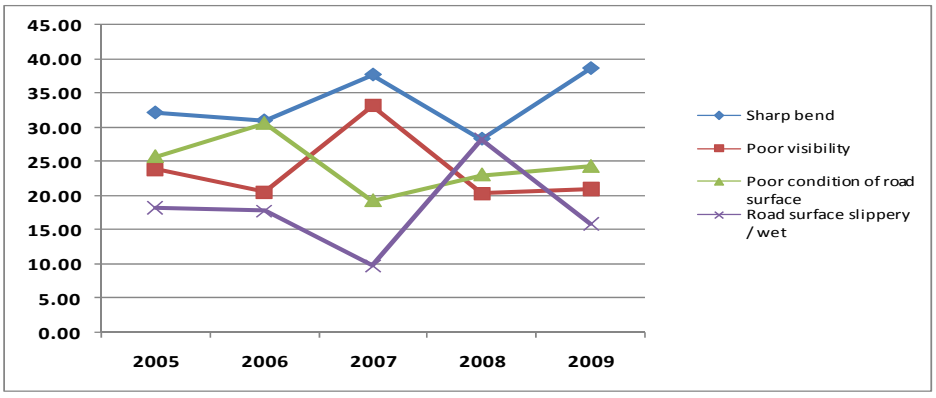

Figure 5: Percentage of Road Factor

2.2.4 Summary of contributory factors

Table 8 shows that human factors account for 86.4% on average per year, followed by road and environmental factors which account for 7.2% on average per year of fatal crashes and vehicle factors accounted for 6.4% on average per year of fatal crashes for the periods 2005 to 2009.

Table 8: Percentage Contribution per Contributory Factor: 2005 - 2009

Year	Human	Vehicle	Road
2005	90.0	4.2	5.8
2006	86.3	4.1	9.6
2007	87.2	6.3	6.5
2008	84.0	8.3	7.7
2009	84.5	8.9	6.6
Average %	**86.38**	**6.38**	**7.24**

2.3 Crash Types

Tables 9 and 10 show that four leading crash types were: Head on, Hit and run, Overturned and Pedestrian. The most leading one is the pedestrians with more than 30% for fatal crashes and more than 25% per year for fatalities which could be attributed to jay walking, and lack of pedestrian facilities on the roads.

Head on crashes may be attributed to illegal overtaking, inappropriate speeding as well as turning in front of oncoming traffic.

Overturned crashes maybe as a result of speed to high for circumstances, tyre burst, faulty brakes, poor condition of road surface, road surface slippery or wet.

Table 9: Percentage Contribution of Crash Type to Fatal Crashes: 2005-2009

Crash Type	Percentage Contribution of Crash Type to Fatal Crashes				
	2005	**2006**	**2007**	**2008**	**2009**
Animal	0.48	0.44	0.54	0.58	0.48
Approach at angle	1.11	1.50	1.19	2.15	2.22
Collision - Fixed object	4.71	4.28	5.09	5.25	4.44
Cyclist	2.59	2.90	2.57	2.42	2.07
Head on	8.61	8.44	8.34	9.39	10.68
Head-Rear end	5.10	5.34	5.33	5.30	4.86
Hit and run	9.61	7.22	6.74	7.68	8.14
Motorcycle	0.80	1.93	1.34	0.77	0.43
Multiple vehicle	0.53	0.12	0.34	0.75	0.74
Overturned	20.07	19.85	21.24	21.75	23.52
Pedestrian	39.23	39.00	39.30	36.70	34.94
Person fell off vehicle	1.89	1.58	1.25	1.39	1.33
Reversing	0.42	0.31	0.03	0.08	0.29
Sideswipe opposite direction	1.81	2.12	3.38	3.19	3.20
Sideswipe same direction	1.22	2.89	2.04	1.68	1.69
Train	0.12	0.05	0.11	0.09	0.12
Turn from wrong lane	0.09	0.39	0.38	0.20	0.32
Turn in face of oncoming traffic	1.60	1.62	0.79	0.50	0.43
Unknown	0.03	0.03	0.00	0.12	0.09
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 10: Percentage Contribution of Crash Type to Fatalities: 2005 - 2009

Crash Type	Percentage Contribution of crash type to the Fatalities				
	2005	**2006**	**2007**	**2008**	**2009**
Animal	0.53	0.46	0.59	0.57	0.44
Approach at angle	1.06	1.78	1.39	2.35	2.49
Collision - Fixed object	5.13	4.31	4.98	5.32	4.45
Cyclist	2.19	2.42	2.20	1.96	1.71
Head on	12.74	12.29	12.50	14.11	16.63
Head-Rear end	5.89	6.78	6.41	5.95	5.45
Hit and run	8.03	5.92	5.58	6.12	6.50
Motorcycle	0.70	1.72	1.16	0.62	0.35
Multiple vehicle	0.77	0.11	0.51	1.34	0.96
Overturned	21.36	21.46	22.64	23.68	24.57
Pedestrian	33.38	32.67	32.80	29.94	28.52
Person fell off vehicle	1.62	1.32	1.05	1.11	1.06
Reversing	0.35	0.27	0.05	0.06	0.23
Sideswipe opposite direction	2.32	2.51	4.20	3.61	3.79
Sideswipe same direction	1.62	3.41	2.39	2.07	1.70
Train	0.26	0.23	0.12	0.19	0.18
Turn from wrong lane	0.11	0.40	0.42	0.17	0.30
Turn in face of oncoming traffic	1.92	1.90	1.01	0.70	0.52
Unknown	0.03	0.04	0.00	0.11	0.12
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

2.4 Fatal Crash Types by time of the day: 2005 – 2009

Information on table 11 shows the time that crashes occurred per year. It's clearly shows that most of the crashes occurred between 16h00 and 22h00. This could be attributed to lack of traffic policing.

Table 11: Percentages of Fatal Crash Types by Time of the Day: 2005 - 2009

Year	Crash Type	HOURS PER DAY																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Tot
2005	Head on	2.68	2.55	2.81	2.68	3.32	3.32	2.94	3.83	2.94	2.43	2.30	4.47	1.92	3.45	5.11	5.11	3.96	4.60	7.54	6.13	8.17	6.90	4.98	5.87	100.00
	Hit and run	4.44	4.33	3.64	2.28	2.85	2.62	1.71	2.39	1.48	1.59	1.03	1.82	1.94	1.82	2.62	1.94	2.16	3.19	9.23	12.53	10.59	8.31	7.86	7.63	100.00
	Overturned	3.00	3.82	4.53	4.04	3.98	3.55	4.20	3.00	2.62	1.69	2.51	2.89	4.64	3.11	4.09	5.51	5.89	5.67	6.82	5.73	4.26	4.91	4.20	4.96	100.00
	Pedestrian	1.84	1.42	0.84	0.89	0.73	1.56	3.21	4.77	2.62	2.43	2.37	2.54	3.21	3.52	4.80	5.44	5.39	6.98	12.05	12.44	8.37	5.47	3.66	3.13	100.00
2006	Head on	2.68	3.75	2.41	1.74	2.95	3.35	3.49	2.68	2.41	1.88	2.41	2.14	3.08	3.89	4.96	5.63	4.56	5.23	7.91	10.05	6.30	7.24	4.96	3.62	100.00
	Hit and run	2.48	5.74	4.65	2.79	3.72	4.96	3.10	2.02	1.55	1.55	1.24	1.09	1.55	1.24	0.78	2.33	2.79	3.88	6.20	11.47	10.54	8.99	5.58	7.75	100.00
	Overturned	3.64	4.16	3.87	3.70	2.79	4.38	4.67	3.19	2.73	2.85	3.25	2.45	3.08	4.56	4.56	4.27	5.07	5.87	5.24	4.84	4.38	4.10	4.95	5.07	100.00
	Pedestrian	1.83	1.54	1.45	0.96	1.39	1.97	3.13	3.92	2.32	1.97	2.52	2.32	3.13	3.92	5.02	4.70	5.57	7.69	10.09	11.57	8.70	5.89	4.52	2.70	100.00
2007	Head on	3.94	3.69	2.95	2.09	3.69	3.57	3.94	3.94	2.58	2.58	1.48	2.09	1.97	2.71	3.20	3.57	4.18	5.17	6.64	8.98	8.73	7.38	5.17	4.67	100.00
	Hit and run	4.57	4.41	3.96	3.04	3.04	3.50	3.96	2.28	1.83	0.91	1.67	0.76	1.83	1.83	0.91	1.52	2.13	2.28	8.07	11.11	12.02	7.15	7.31	6.24	100.00
	Overturned	3.04	4.48	4.05	3.86	3.57	3.52	3.57	4.29	2.17	2.41	2.70	3.28	3.23	3.52	4.10	5.06	4.48	6.51	5.30	4.92	4.82	5.45	4.29	5.21	100.00
	Pedestrian	1.64	1.64	1.17	1.07	1.04	2.40	2.89	4.27	2.29	2.53	2.50	2.73	3.05	3.67	4.40	5.10	5.15	6.43	10.93	12.08	9.27	5.31	3.54	2.89	100.00
2008	Head on	2.44	2.87	2.15	2.44	2.15	3.72	4.73	3.58	2.87	2.58	1.43	2.15	2.44	4.15	4.15	4.73	3.87	5.59	7.31	8.88	6.88	7.16	4.73	4.30	100.00
	Hit and run	4.20	3.85	3.85	2.80	2.10	4.73	4.03	1.93	1.58	1.75	1.58	0.70	1.40	2.45	1.93	1.40	2.45	3.33	9.28	11.38	12.08	8.23	5.60	4.38	100.00
	Overturned	4.20	4.26	4.02	3.52	4.20	4.39	3.46	2.90	3.15	2.22	2.41	2.60	2.60	3.96	4.88	5.75	5.01	5.62	5.50	5.01	5.13	4.14	4.02	4.94	100.00
	Pedestrian	1.90	1.76	1.68	0.99	1.46	2.38	3.48	3.95	2.16	1.87	2.67	1.98	3.15	4.06	4.43	5.16	5.20	7.03	10.79	11.20	8.89	5.42	4.24	2.31	100.00
2009	Head on	3.30	4.01	3.30	2.44	3.58	3.01	4.73	1.86	3.30	2.44	2.44	3.44	2.15	2.44	5.16	3.58	4.15	6.16	7.31	7.59	7.88	5.01	4.73	4.58	100.00
	Hit and run	3.93	3.75	2.62	4.12	3.18	3.93	3.18	2.62	1.12	1.31	1.31	1.50	1.87	1.69	1.69	2.06	1.31	5.43	5.62	11.05	13.67	6.18	5.06	6.37	100.00
	Overturned	3.62	4.60	3.75	3.62	3.56	3.11	3.50	2.78	2.72	2.33	2.46	2.98	3.50	3.50	5.18	4.66	6.02	5.11	4.98	5.37	5.63	4.98	4.47	5.24	100.00
	Pedestrian	1.66	2.14	1.35	1.22	1.26	2.49	3.23	3.66	2.92	2.31	2.40	3.23	3.01	3.92	3.92	5.19	5.67	7.33	9.64	10.68	9.73	4.80	4.40	2.35	100.00

2.5 Traffic Offence Survey Findings

The following changes were observed in the SA averages for the different offences used to calculate the overall offence index:

- The urban speed offence index decreased from 6.7 to 6.3.
- The rural speed offence index increased from 5.8 to 7.9.
- The night time alcohol offence index decreased from 3.6 to 2.4.
- The unobserved seatbelt offence index for drivers decreased from 3.9 to 1.5.
- The unobserved seatbelt offence index for front passengers decreased from 4.7 to 4.5.
- The day time traffic signal offence index decreased from 29.8 to 24.7.
- The day time barrier line offence index decreased from 19.6 to 16.1.
- The driver's license offence index decreased from 3.9 to 1.5.
- The PDRP offence index decreased from 3.8 to 2.0.
- The worn tyres offence index decreased from 6.9 to 6.8.
- The front bright light offence index decreased from 3.1 to 1.1.
- The tail light offence index decreased from 1.7 to 0.6.
- The brake light offence index decreased from 5.3 to 2.3.
- The overall offence index has decreased from 6.8 to 5.6.

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

The paper established that human factors such as pedestrian jay-walking and speed too high for circumstances account for at least 30% to 45% of the fatal crashes. Followed by road and environmental factors such as sharp bend, poor visibility, poor condition of surface and road surface slippery or wet and they account for at least 9% to 40% of fatal crashes. Vehicle factors such as tyre burst and faulty brakes account for at least 28% to 48% of fatal crashes in the country.

In line with international and local studies, this paper established that human factors account for 86.4% on average per year, followed by road and environmental factors which account for 7.2% on average per year of fatal crashes and vehicle factors accounted for 6.4% on average per year of fatal crashes for the periods 2005 to 2009.

The paper has further found that there has been a decline in pedestrian fatalities from 41.8% to 34.0% for the period under review, which could be attributed to the education and communication campaigns undertaken by the various traffic authorities. There has been a steady increase of driver and passenger fatalities which could be a function of violation of traffic rules by drivers and the passengers not wearing seatbelts or passengers from buses and taxis, for the period under review.

The analysis in this paper has found that the following are the leading crash types: Head on, Hit and run, Overturned and Pedestrian for the period under review. The paper also found that these crash types occurred between 16h00 and 22h00.

3.2 Recommendations

The following intervention strategies are recommended to address the leading contributory factors that have been found to be playing a prominent role in the fatal crashes examined for the purpose of this study:

3.2.1 Human Factors

There is a need to improve and increase the existing speed calming measures. Traffic authorities and relevant stakeholders to conduct ongoing education campaign programs to address pedestrian jaywalking as a human factor.

3.2.2 Road Factors

The removal of hedges and trees will assist to improve visibility of sharp bends (curves). The traffic engineers should improve the delineation of curves to address challenges caused by the sharp bends. Improved road surface through ongoing road maintenance is recommended. Road authorities should provide for pedestrians facilities when planning and designing roads.

3.2.3 Vehicle factors

The traffic authorities should conduct thorough car inspection to address vehicle factors contributing to the occurrence of fatal crashes such as tyre burst, brakes faulty and steering faulty.

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