

## **An exploratory study of pedestrian fatalities in Limpopo Province of South Africa**

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### **Abstract**

Road users have the responsibility to ensure their safety on the road by following the rules of the road. Law enforcement officials must ensure that they implement the law at all times to ensure consistency and save lives. The inability of road users to understand and interpret the rules of the road is a major problem in South Africa and it put vulnerable road users such as pedestrians at risk of being killed on the road. This article focus on preventive measures to curb pedestrian fatalities in Limpopo Province. The article is based on a qualitatively rooted methodology including a wide range of primary and secondary sources such as documents from Road Traffic Management Corporation, academic books, articles, dissertations, thesis and reports from non-governmental organisations focusing on road safety in South Africa. The article further draws on the findings from the world on road safety and formulate steps to counteract pedestrian fatalities in South Africa. Road users should play a vital role in protecting themselves on the road by understanding the rules of the road and be able to interpret them. Law enforcement is a critical component of road safety, it is important to have law enforcement officials of integrity and respect for the law. The research based key steps leading to the prevention of pedestrian fatalities in South Africa. The first process related to implementing effective traffic control and other pedestrian safety measures, improve the reflectorization of pedestrians, promote enforcement and provide safe routes to school programmes and road safety education.

**Keywords:** Pedestrian, Fatality, Enforcement, Road Safety Education, Limpopo Province and South Africa.

### **Introduction**

Road traffic accidents remain one of the leading causes of death around the world. World Health Organisation (2013) notes that most of the road users who are killed on the roads are the motorists because of reckless and negligent driving behaviour they end-up in hospitals or die at accident scene. The other group which is vulnerable on the road is pedestrians because if they struck by vehicle the chances of them surviving are very low as compared to motorists. Pedestrians have the right to adequate opportunities to safely and conveniently crossroads. However, lack of knowledge of pedestrian right of way by motorists and pedestrians could endanger pedestrians who try to accomplish this simple but dangerous task of sharing the same road with motorists. This single fact is backed up by both local and international statistical figures which, flawed as they are, agree that travelling on South African roads is a gamble against time (Arrive Alive, 2014). You face these likelihoods of fatalities every time you travel to work, walk down to the grocery store or simply taking a stroll around your block. Horrific collisions reach the headlines of various local news publications

on a frequent basis from trucks overturning on top of family cars to informal taxis colliding with school buses and killing children and pedestrians. According to Smith (2014), South Africa is one of the world's most dangerous countries to drive and is deemed by the WHO (2013) as having the world's sixth deadliest roads with a death rate of 31, 9% people per 100,000. Human factor is a major problem in South Africa as many road users use the road without following the rules of the road. Negligent and reckless driving as well as distracted road users contribute to high number of fatalities on the road. A better understanding of contributing behaviour such as distraction could assist in addressing road safety behaviour. Internationally a good deal of research has been dedicated to investigating the contribution that distracted driving practices play in crashes and near-crashes.

### **Methodology**

This article utilised qualitative, case study based approach. The approach is supported by analysis of primary and secondary sources such as documents from Road Traffic Management Corporation, academic books, articles and reports from non-governmental organisations focusing on road safety. This article draws on the findings from the world on road safety and formulate steps to counteract pedestrian fatalities in Limpopo Province (South Africa). Road users should play a vital role in protecting themselves on the road by understanding the rules of the road and be able to interpret them. This article seeks to produce wide range of methods to curb pedestrian fatalities as many road users are dying on the roads in Limpopo Province and also to check other strategies or measures used in other countries around the world especially on law enforcement, road safety education, road design and promotions of road safety. The epistemological grounding of the project is rooted in the interpretative methodology as exemplified by Saunders, Lewis and Thornhill (2007).

### **Brief literature review**

Road traffic accidents constitute global health problem, claiming approximately 1.2 million fatalities per annum (World Health Organisation, 2004). The largest group of road user fatalities are pedestrians hit by motorised vehicles (Mohan, 2002:79; World Health Organisation, 2004), thus there is a compelling need for the worldwide implementation of effective pedestrian injury mitigation and collision-avoidance counter-measures. Kyei and Masangu (2012:1) noted that South Africa has high fatality rates on its roads. Between 2004 and 2008, the country had at least 50 000 road accidents which caused over 70 000 deaths. The Limpopo province contributed more than 5 000 fatal road accidents, with well over 6 000 3 deaths during the same period. Road users such as pedestrians, passengers, and drivers are most at risk (Kyei and Masangu, 2012:1). Street lights to improve visibility and it can be regarded as an intervention that can be implemented more easily than other interventions such as behavioural changes or large infrastructure setups (Road Traffic Management Corporation (RTMC), 2008). For a large proportion (60%) of the South African population, walking is their primary means of transport. Forty-five per cent (45%) of all deaths on South African roads involve pedestrians (Road Traffic Management

Corporation, 2008). Road infrastructure may be an important influencing factor in pedestrian fatalities, such as street infrastructure furniture (e.g. traffic control devices) and infrastructure such as crosswalks and street lights. Driver behaviour is a major contributing factor to pedestrian-vehicle collisions globally, as well as in South Africa. It is also apparent as we have seen an increased number of road accidents, especially involving pedestrians. According to Xu, Li, Lu and Zhou (2008:1), pedestrian-vehicle accidents is a worldwide problem. Significant efforts have been made to improve the protection of vulnerable road users against injuries and deaths, especially pedestrians. Drivers can play a vital role in road safety if they follow the rules of the road and follow the correct procedures when applying for driver's licences. As a result, many lives can be saved. Heinonen and Eck (2007:2) noted that drunk driving is the cause of many traffic accidents throughout the world. Similarly, drinking contributes to unsafe pedestrian behaviour which results in collisions with vehicles. Pedestrians who have been drinking run an even higher risk of getting killed in traffic, constituting between 39% and 60% of all pedestrian fatalities, (Heinonen and Eck, 2007:2). Heinonen and Eck (2007:3) noted that impaired pedestrians can contribute to pedestrian-vehicle accidents because they are likely going to have a slower reaction time and poor judgment, and are not likely to assess the safeness of walking conditions. Heinonen and Eck (2007:6) noted that some pedestrians might be injured or killed because they are unaware of their own risk of being involved in a pedestrian-vehicle accident. Pedestrians often have perceptions of low risk when they frequently travel familiar routes. In fact, pedestrians who regularly use certain paths or crosswalks are likely to reduce the time they wait at pedestrian crossings. Conversely, pedestrians who have been involved in or who have witnessed a pedestrian-vehicle collision are willing to wait longer at crosswalks (Heinonen and Eck, 2007:8). The Arrive Alive Scholar Patrol is an important part of road safety education and is essential to enhancing the safety of scholars at their schools. Not only does it regulate traffic, improve speed calming, and facilitate safe crossing of the road, but it also instils an awareness of the importance of road safety in the minds of young pedestrians. The scholar patrol also sets a good example and encourages all students to observe the rules of the road. They have to provide assistance to other patrol members when necessary. They have to know and enforce all safety walking and crossing rules. Lastly, they have to attend regular meetings to discuss problem areas of traffic and street crossings, (Arrive Alive, 2014). Teachers who are in charge of scholar patrols play a vital role in terms of educating pedestrians on how to conduct themselves on the road (Arrive Alive, 2014). Arrive Alive (2014) noted that some pedestrians may conform to walking regulations because of personal preference or habit, while other pedestrians calculate the risk of getting caught by the police against the benefits of jaywalking. Because many cities and police departments do not give high priority to jaywalking, the risk of getting caught and cited is quite low. Enforcing traffic laws is unpopular with officers because it is perceived as trivial and can lead to friction between citizens and police. However, the lack of enforcement or penalties could result in a larger disregard for pedestrian safety rules, which results in higher accident rates (Arrive Alive, 2014). Another problem related to pedestrian laws is the possibility that pedestrians might be unaware of or misunderstand pedestrian laws that designate where and when

they have the right of way. It is also possible that some drivers are unaware of their rights and duties or pedestrian's rights and duties. Arrive Alive (2014) indicated that a test on pedestrian safety in one police department revealed that a large majority of officers had a difficult time identifying pedestrian safety laws and the rights and duties of both drivers and pedestrians. Given that some police officers have trouble identifying driver and pedestrian laws and rights, it is possible that many people in the general population are unaware of pedestrian laws and safe behaviour. This too may contribute to pedestrian-vehicle accidents (Arrive Alive, 2014). Wegman, Aarts and Bax (2007:13) noted that not everyone is motivated to comply with the rules, not even when the environment has been adapted optimally. The threat of penalties is needed to encourage road users to comply with the rules; for instance, by making the cost for non-compliance outweighs the perceived benefits of it. Specific enforcement focused on target groups and inspection prior to entering traffic fits within sustainably safe road traffic. In order to significantly reduce road traffic collisions, especially those involving pedestrians, it is a must for law enforcement officials to enforce the law and make South African roads safer for all road users.

### **Factors contributing to road traffic accidents**

#### **Human factors**

The death of pedestrians is one of the problems the authorities in the Limpopo province are facing, especially in Limpopo Province and it is a challenge for which the Department of Transport and other stakeholders must devise solutions. It is important for all stakeholders to participate in ensuring road safety for all road users, especially pedestrians. Junju-Omara and Van der Schuren (2006:454) stated that human factors are the main causes of road fatalities in South Africa. Other aspects of human behaviour which influence the road safety risk are jaywalking, age, gender, and the violation of traffic rules and regulations. Road users who use the road while intoxicated put other road users at risk of being involved in road traffic accidents. Pedestrians are at risk because most of them in Limpopo use walking as a means of transport from and to work and as a result their lives are always at risk since most pedestrians are killed on the road. The Department of Transport (2012) stated that human factors in rural and urban areas in South Africa contributed a total of 738 fatalities in 2003, whereby urban areas constituted 133 and rural areas 605. Since most of people in rural areas use walking as a means of transport, it is the reason why most pedestrians are at risk of being involved in road accidents which can lead to death. In South Africa, similar high figures were recorded in 2003; the MRC-UNISA National Injury Mortality Surveillance System (NIMSS) revealed that pedestrians accounted for the largest percentage (39.5%) of traffic-related deaths (Matzopoulos, 2004). The most important action pedestrians should take is to wear reflective clothes, especially during the night, because it helps motorists to see pedestrians crossing the road.

#### **Hit and run**

Hit-and-run collisions, in which the driver involved in the collision leaves the scene before the arrival of law enforcement officials, are a unique type of traffic violation. While many traffic violations, such as red light running or speeding increase the risk for or the damage from a collision, hit-and-run is a post-collision violation, Grembek

and Griswold, S.a: 2). Put in another way, the driver's decision is a question of damage control rather than damage prevention. To reduce hit-and-run violations, state must impose legal sanctions to deter drivers from leaving the scene prematurely (Grembek and Griswold, S.a.:3).

#### The severity of punishment

The severity of the punishment is estimated using the maximum prison sentences for drivers guilty of hit-and-run. A comparison of the hit-and-run rates with the maximum length of prison sentence reveals whether an association exists between the severity of the legal sanctions and hit-and-run rates, (Grembek and Griswold, S.a.:4). Hit-and-run is a post-collision response in which the driver must decide between suffering the consequences of staying, or risking the consequences of fleeing. Therefore, it would also be beneficial to evaluate the association between the additional consequence caused by fleeing, approximated by the difference between being guilty of a fatal collision, and being guilty of a hit-and-run. Since there are differences in the punishment level for a hit-and-run by level of injury severity, an additional method to evaluate the impact of the severity of punishment of a hit-and-run is to examine whether the level of injury to the victim is a factor in the driver's decision to flee (Grembek and Griswold, S.a.:4).

#### Case study of reckless and negligent driving from department of Justice

[1] In the case of *Ndlanzi v The State* (318/13) [2014] ZASCA 31, the appellant was charged in the regional court in Johannesburg on multiple charges, including one count of murder, read with the provisions of s51(2) of the Criminal Law Amendment Act, 105 of 1997, reckless or negligent driving of a motor vehicle, failure to stop his vehicle after an accident, failure to ascertain the nature of the injury sustained by any person(s) and failure to render such assistance to the injured person(s), as he was capable of rendering.

[2] The appellant was convicted on all the counts and sentenced as follows:

- (a) Ad Count 1 (murder) – 15years" imprisonment;
  - (b) Ad Count 2 (negligent driving) – 12months" imprisonment;
  - (c) Ad Count 3 (failure to stop the vehicle after a collision);
  - (d) Ad Count 4 (failure to ascertain the nature and extent of the injuries sustained by a person after the collision); and
  - (e) Ad Count 5 (failure to render assistance to an injured person after the collision).
- (See [www.justice.gov.za](http://www.justice.gov.za)). This kind of sentencing by court of law could help road users to adhere to the rules of the road because if the law is not biting, the issue of lawlessness will thrive and more people lose their lives.

#### Vehicle factors

Mohan (2002:79) described the relationship between motorisation and pedestrian fatalities, where the proportion of pedestrians killed in traffic collisions is much higher in less motorised countries. Vehicle factors contribute to pedestrian fatalities in South Africa because some vehicles are not in a roadworthy condition. It is important for law enforcement officials to be serious when dealing with vehicles which are not in a good condition and penalties should be imposed to those particular drivers as they put other road users at risk. Mohan (2002:82) stated that with little public transport and infrastructure for pedestrians, it can be surmised that the primary

contributing factor to pedestrian injury is increased exposure to traffic. Motorists need to ensure that their vehicles are roadworthy before embarking on a journey, to protect themselves and other road users. Road users like to take short cut especially when law enforcement officials are not visible on the road, it is important for them to adhere to the rules of the road at all times regardless of lack of visibility by the officials on the road. All vehicles need to be roadworthy and comply with laws of the country.

#### Environmental factors

Weather conditions play an important role in road accidents, as well as on their impact, due to slippery roads, poor visibility, and other adverse weather circumstances. Radun and Radun (2006) provided an additional explanation for the summer peak of road accidents. Their study showed that falling asleep while driving is more prevalent during summer months. The authors explained that in relation to different driving and lifestyle habits between seasons, including sleep quality, during the summertime many drivers are engaged in unusual activities on the day or night before the accident, such as partying, alcohol consumption, long drives, and outdoor activities. Pedestrian facilities may be an important influencing factor on pedestrian fatalities, such as street infrastructure furniture (e.g. traffic control devices) and infrastructure such as curb ramps, grade passes, crosswalks, traffic calming devices, and centre refuge islands, Radun and Radun (2006). The other problem in South Africa is road infrastructure, and it is important for the Department of Transport to do something in terms of upgrading or building new roads that can accommodate pedestrians; for example, in the Limpopo Province there are many vehicles travelling to Moria over weekends and that on its own increases the dangers of pedestrian fatalities since that road does not accommodate pedestrians because there are no street lights and low visibility by municipal police officials. There should be a serious intervention to ensure that pedestrians using that road are safe because there are children crossing the road to and from school and playing soccer next to the road, as well as people who cross the road while intoxicated. In the area next to Polokwane called Mohodi-GaManthata which the researcher studied together with the area called Mentz, next to Moria the conditions of the roads are not conducive for pedestrians; for example, there are no street lights and pedestrian bridges while those areas are busy every day with most of the road traffic accidents occurring in the evening. Other aspects of the environment are traffic lights, it is also important for municipal police to identify hotspots for accidents and to develop countermeasures to resolve those particular problems. Most of the roads are not properly marked and also have two lanes with no yellow line for pedestrians to use. In these areas the road dividing the community into two does not have street lights, therefore it is of paramount importance for the agency under the DoT, which is Sanral (South African National Roads Agency Limited), to identify hotspots and improve the conditions of the roads to be safer for all road users, especially pedestrians.

The importance of road safety in South Africa South Africa is concerned about ensuring road safety for all road users through the DoT and other agencies responsible for road safety, even though there are challenges facing law enforcement officials in terms of the behaviour of road users who disobey the rules of the road, as well as

law enforcement officials who do not execute their mandates at their level best. It is important to strengthen the collaboration between all stakeholders involved in road safety, so that we can maintain a zero tolerance approach towards pedestrian fatalities in South Africa. One death is too many, and if all stakeholders can use this approach, we can win the battle against pedestrian fatalities. The Road Traffic Management Corporation (2005:2) stated that pedestrian-related collisions increased by (27.72%) from 466 in December 2004 to 595 in December 2005. In 2004, pedestrian-related collisions represented 46.93% of all collisions; in 2005 this increased to 50.01%. On a provincial percentage basis, the province with the biggest increase was Limpopo, where the number of collisions increased by 38 (44.71%) from 85 collisions in 2004, to 123 collisions in 2005, (Road Traffic Management Corporation, 2005:2). A lot must be done to resolve issues which contribute to road traffic accidents in the province.

### **Agencies and Legislation guiding road safety in South Africa**

The Department of Transport has been tasked with ensuring the safety of road users with other agencies such as the RTMC, the Road Traffic Infringement Agency (RTIA), and other stakeholders. The primary mandate of these agencies or institutions is to ensure road safety and above all to maximise the contribution of transport to the economic and social development goals of our country by providing fully integrated transport operations and infrastructure. The vision of the White Paper on National Transport Policy (1996) is to provide safe, reliable, effective, efficient, and fully integrated transport operations and infrastructure which will best meet the needs of freight and passenger customers at improving levels of service and cost in a fashion which supports government strategies for economic and social development, whilst being economically and environmentally sustainable. Pedestrian fatalities remain a major concern for road safety and health authorities, especially in middle- and lower-income countries. Road collision fatality data reveal that approximately 35% to 40% of road deaths in South Africa are pedestrian deaths (Arrive Alive, 2015). Road traffic agencies are taking this problem seriously, even though the results are not satisfying and it is therefore imperative for researchers to devise solutions to curb the problem of pedestrian fatalities. It is important that law enforcement officials work together with all stakeholders involved in road safety to ensure the safety of pedestrians in the country. If laws can be enforced at all times, South Africa can overcome the problem of pedestrian fatalities. Important strategies need to be put in place to deal with this problem and we must look at other countries that also have this problem and determine how they deal with it and work with them or apply what has worked for them in order to overcome this challenge.

AARTO Act of 1998 (No. 46 of 1998)

Arrive Alive (2015) noted that the Administrative Adjudication of Road Traffic Offences (AARTO) Act, No. 46 of 1998, which was approved by Parliament in 1998, was, 20 amongst others, created with the view to forge a closer and more effective and efficient link between enforcement and the adjudication process. AARTO brings with it parity of fines to encourage road users to take traffic offences and resulting fines much more seriously. It also brings with it improved fine-collection procedures and a revenue stream that will be used for improving road safety, as well as more convenient

ways of paying fines and more penalties for not paying within the prescribed time, eventually leading to the confiscation of movable property and ultimately to being declared unfit to operate a motor vehicle.

Road Accident Fund Commission Act of 1998 (No. 71 of 1998)

This Act provides for the payment of compensation for the loss or damages wrongfully caused by the driver of a motor vehicle. The financial performance of the Road Accident Fund impacts on the public's expectation of what compensation they will receive for personal injury and fatalities due to certain road accidents. It therefore influences the portion of the fuel levy allocated to the Fund and also influences the concerns of stakeholders and the government regarding the sustainability of the Fund to meet its future commitments. The mandate of the Road Accident Fund, derived from section 3 of the Road Accident Fund Act (No. 56 of 1996), is the payment of compensation for loss or damage wrongfully caused by the driving of motor vehicles in South Africa. The Fund's strategic goals over the medium term are to develop a legislative dispensation that is aligned with the principles of social security, to ensure that the organisation is solvent, liquid, and sustainable by 2020, and to ensure that the organisation is customer friendly, operationally effective, and efficient by 2017. Its most pressing objectives are reducing the number of unfinalised claims, actively promoting and processing direct claims, managing liability, reducing legal costs, aligning the organisation to current and future service requirements, and improving service delivery. In recent years, the provision for claims incurred has grown substantially due to the number of open claims, the higher average cost of a claim, interest, and the reopening of previously finalised claims.

Road Traffic Management Corporation Act of 1999 (No.20 of 1999)

This Act aims to enhance the overall quality of road traffic services provision, and in particular to ensure safety, security, order, discipline, and mobility on the roads. The Corporation is responsible for road traffic law enforcement, training of traffic personnel, vehicle registration, licensing and roadworthiness testing, driver testing and licensing, management of traffic information systems, accident investigation and recording, and public road safety awareness communication. The financial performance of the RTMC influences the effectiveness and funding needs of all spheres of government involved in road traffic law enforcement.

SANRAL and National Roads Act of 1998 (No.7 of 1998)

The South African National Roads Agency Limited (SANRAL) was established by the South African National Roads Agency Limited and National Roads Act (No. 7 of 1998). The agency is responsible for the planning, designing, construction, operating, managing, controlling, maintenance, and rehabilitation of the South African national road network, including the financing of these functions. This includes both toll and non-toll roads. The Agency's main strategic goal over the medium term is to provide effective strategic road infrastructure to facilitate development, commerce, mobility, and access. Over the medium term, the Agency will continue with its preventive maintenance approach as it expands its network to the extended mandate of 35 000 km. It has also rolled out the Gauteng e-tolling system, and is awaiting ministerial approval to proceed with the implementation of further toll road projects throughout the country. It is important for this agency to build roads which are safer for road

users because most of the roads in rural areas do not accommodate pedestrians and as a result pedestrians are confused as to how to conduct themselves on the road.

#### Road Traffic Infringement Agency (RTIA)

The RTIA promotes road traffic quality by providing for a scheme to discourage road traffic contraventions and adjudication of road traffic infringements and supports the prosecution of road traffic offences. It is the independent adjudicator or arbiter of traffic infringements and fines issued under the AARTO Act, No. 46 of 1998. As an adjudicator it ensures that all matters that arise from traffic fines are resolved fairly. This is done by ensuring that traffic fines are decriminalised and dealt with through the administrative justice process to free the courts to deal with more serious crimes. It is of great importance to ensure that the RTIA deals with those infringers of the law because there are many fines which are not paid by infringers and as a result it impacts on the transport department and its agencies in terms of executing their mandates because those fines could help in terms of ensuring road safety to all road users in the country.

#### **Steps to overcome pedestrian fatalities in South Africa**

Implement effective traffic control and other pedestrian safety measures

In spite of many years of research and the development of guidelines for signs, signals, and markings by various countries, there are still many situations where pedestrians need assistance related to traffic control devices, (Zegeer and Bushell, 2010:14). Especially in the case of disabled pedestrians, accessible pedestrian signals should be included in street design guidelines. In addition, accessible pedestrian facilities around transit areas are also important. Although some jurisdictions around the world do a good job of trying to balance the needs of pedestrians with the needs of motorists, this is often not the case in South Africa. More needs to be done to encourage officials to provide for the safety needs of pedestrians, particularly at signalised intersections and multi-lane (unsignalised) pedestrian crossings. Numerous traffic signal-related measures have been found to significantly reduce pedestrian collisions. These include improving signal timing and implementing a leading pedestrian interval at some locations (to give pedestrians a "head start" at the start of each signal phase before motorists get the green light). Zegeer and Bushell (2010:14) noted that other potential safety improvements include removing unwarranted signals and protected only left-turn phasing (to reduce the conflict between left-turning motorists and crossing pedestrians). In addition, certain types of signs, markings, and operational countermeasures can reduce pedestrian collisions. It should be understood that not all of these countermeasures are needed or even appropriate at all locations. Each countermeasure needs to be chosen to fit the types of pedestrian collision/safety problems and site conditions. Examples of pedestrian collision reductions from some of these treatments are given by Harkey et al. (2008). Safe Routes to School programmes and safety education programmes

Safe Routes to School programmes are fundamental for the safety of children around the world and should be advanced as much as possible (Zegeer and Bushell, 2010:15). Pedestrian and bicycle safety education has been taught sporadically or not at all in elementary schools in many countries around the world, therefore it is

recommended that South Africa should develop and implement nationally accepted, well-coordinated pedestrian safety education programmes in schools nationwide as soon as possible. Australia's programmes towards providing safety education at a young age could serve as an example for South Africa (Cairney, 1999). Education and enforcement should be increased, starting with school zones and expanded to other problem areas to help reduce vehicle speeds and also to improve driver awareness of pedestrians in crosswalks and the need to yield to them. National Centre for Safe Routes to Schools (2007) stated that the school setting provides a unique opportunity to create an environment that encourages walking and bicycling as a way to travel to and from school and, especially for walking, as an activity during the school day. School-based walking programs have the potential to address several of the most commonly cited barriers to physical activity, including motor vehicle traffic dangers and lack of a safe environment, (National Centre for Safe Routes to Schools, 2007). Walking and bicycling to and from school can contribute towards the development of a lifelong habit and a community-wide norm of incorporating physical activity into daily routines, U.S. Centers for Disease Control and Prevention (2004).

Promote and advance the use of enforcement

Enforcement interventions refer to traffic measures that promote road user's adherence to traffic regulations, such as regulating driver behaviour and the monitoring of pedestrian behaviour (Stevenson and Sleet, 1997). Enforcement of traffic laws improves compliance and reduces road traffic fatalities, injuries and related socioeconomic costs and should be taken seriously by those who are tasked with the implementation of traffic laws in South Africa. Road rules will only be obeyed if people believe that not obeying them will result in unwanted outcomes like fines or license cancellation, it is important for South African law enforcement officials to enforce the law consistently and encourage road users to adhere to the rules of the road. To curb pedestrian fatalities in Limpopo Province, law enforcement officials need to work with all major stakeholders in preventing pedestrian fatalities and it is only through collaborative efforts to prevent pedestrian fatalities. Enforcement of road rules should be aimed primarily at causing general deterrence because then it is not necessary for police to catch and punish road users for them to be encouraged to obey the rules and to result in general deterrence, (Road Safety Toolkit, 2010). Goodwin et al (2013) noted that enforcement operations may also reduce crashes, injuries, and fatalities, although these outcomes are harder to track. In addition to their safety benefits, these operations tend to generate positive feedback from citizens, and may reveal related safety issues; for example, many drivers who fail to yield to pedestrians may also be speeding, distracted, or driving while impaired. Overall, pedestrian safety enforcement programs are practical and cost effective (Goodwin et al., 2013). Enforcement interventions should focus on traffic measures that promote road user's adherence to traffic regulations such as regulating driver behaviour and the monitoring of pedestrian behaviour to counteract pedestrian fatalities.

Improve the reflectorisation/ conspicuity of pedestrians

In South Africa, approximately 40% of road fatalities are pedestrian fatalities and accident investigations often reveal that pedestrians have not been visible to motorists, (Arrive Alive, 2021). Visibility of pedestrians plays integral part of ensuring safety of

motorists as well as pedestrians and it is of paramount importance to encourage road users especially pedestrians to wear reflective clothes to ensure their safety on the road. A high percentage of pedestrian collisions and deaths that occur at night or under poor lighting conditions, one of the strategies with the potential to reduce a large number of pedestrian injuries and deaths is to make pedestrians more visible to motorists. Implementing this strategy will require several key activities. Walking in the travel lane or crossing a high-speed street at night while wearing dark clothing and without watching for oncoming motor vehicles creates a high probability of pedestrian death. Pedestrians need to be made more aware of the fact that they are nearly invisible to drivers when walking in the dark if they are not carrying a flashlight or wearing retro-reflective material/clothing. Efforts should be made by the national, provincial, local, private companies, and safety organisations to develop high-visibility materials and equipment, such as low-cost reflective vests and flashlights (Zegeer and Bushell, 2010:16). National transportation and educational organisations should work with such suppliers to provide informational brochures to remind walkers, joggers, and cyclists to wear retro-reflective vests when walking, running, or cycling along roads at night or in poor light conditions, Zegeer and Bushell (2010:16). More public service announcements (PSAs) and other educational messages should be directed to pedestrians and motorists (slow down at night in urban, residential, and suburban areas, etc.) and pedestrians (be visible and do not assume that motorists see you). Colourful clothing, accessories and vehicle parts can make pedestrians, riders and non-motorized vehicles more visible to all road users, (World Health Organisation, 2004). Brightly coloured clothing or accessories may be suitable alternatives to the reflective vests that are used in high income countries and the use of bright colours for wheels and rear ends of non-motorized vehicles (e.g. rickshaws) may also have the potential to increase visibility, (World Health Organisation, 2004).

#### Develop and implement pedestrian-friendly ITS vehicle features

Pedestrian safety cannot be adequately achieved without also considering the potential for improving motor vehicles to make them more pedestrian friendly. Vehicle technology can help to supplement some of the strategies mentioned in the coming years (Zegeer and Bushell, 2010:16):

- Equip electric (or silent) motor vehicles with noise-making equipment so that pedestrians, particularly those with visual impairments, will be able to hear the vehicles approaching or idling nearby.
- Further develop pedestrian-sensing devices on motor vehicles, which would, for example, sense a pedestrian walking in the roadway ahead at night, and alert the driver, so the driver can slow down and take evasive action to avoid striking the pedestrian, or automatically apply the brakes if collision is imminent.
- Equip vehicles with pedestrian/object detectors which can detect, for example, a child playing behind a parked vehicle in a driveway by sending a warning to the driver (who cannot see the child while sitting in the driver's seat).
- Pedestrian (and bicycle)-friendly front ends of cars and trucks to reduce the injury severity in case of a collision with a pedestrian. Some auto companies and European countries have already begun implementing safer front-end vehicle designs.
- Some early technologies by various auto makers have already made progress toward

some of this Information Technology System (ITS) features. Further advancements of pedestrian safety features could help further reduce pedestrian deaths and injuries.

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